3727

30 Ovington Street, London, SW3 2JB

Structural Specification

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A33 QUALITY STANDARDS/CONTROL

STANDARDS OF PRODUCTS AND EXECUTIONS

110 INCOMPLETE DOCUMENTATION
- General: Where and to the extent that products or work are not fully documented, they are to be:
  - Of a kind and standard appropriate to the nature and character of that part of the Works where they will be used.
  - Suitable for the purposes stated or reasonably to be inferred from the project documents.
  - Contract documents: Omissions or errors in description and/or quantity shall not vitiate the Contract nor release the Contractor from any obligations or liabilities under the Contract.

120 WORKMANSHIP SKILLS
- Operatives: Appropriately skilled and experienced for the type and quality of work.
- Registration: With Construction Skills Certification Scheme.
- Evidence: Operatives must produce evidence of skills/qualifications when requested.

130 QUALITY OF PRODUCTS
- Generally: New. (Proposals for recycled products may be considered).
- Supply of each product: From the same source or manufacturer.
- Whole quantity of each product required to complete the Works: Consistent in kind, size, quality and overall appearance.
- Tolerances: Where critical, measure a sufficient quantity to determine compliance.
- Deterioration: Prevent. Order in suitable quantities to a programme and use in appropriate sequence.

135 QUALITY OF EXECUTION
- Generally: Fix, apply, install or lay products securely, accurately, plumb, neatly and in alignment.
- Colour batching: Do not use different colour batches where they can be seen together.
- Dimensions: Check on-site dimensions.
- Finished work: Not defective, e.g. not damaged, disfigured, dirty, faulty, or out of tolerance.
- Location and fixing of products: Adjust joints open to view so they are even and regular.

140 COMPLIANCE
- Compliance with proprietary specifications: Retain on site evidence that the proprietary product specified has been supplied.
- Compliance with performance specifications: Submit evidence of compliance, including test reports indicating:
  - Properties tested.
  - Pass/fail criteria.
  - Test methods and procedures.
  - Test results.
  - Identity of testing agency.
  - Test dates and times.
  - Identities of witnesses.
- Analysis of results.

150 INSPECTIONS
- Products and executions: Inspection or any other action must not be taken as approval unless confirmed in writing referring to:
  - Date of inspection.
  - Part of the work inspected.
  - Respects or characteristics which are approved.
  - Extent and purpose of the approval.
  - Any associated conditions.

160 RELATED WORK
- Details: Provide all trades with necessary details of related types of work. Before starting each new type or section of work ensure previous related work is:
  - Appropriately complete.
  - In accordance with the project documents.
  - To a suitable standard.
  - In a suitable condition to receive the new work.
- Preparatory work: Ensure all necessary preparatory work has been carried out.

161B STABILITY: Accept responsibility for the stability and structural integrity of the Works during the Contract and support as necessary. Prevent overloading; details of design loads may be obtained from the CA.

162B EXISTING STRUCTURES:
- Check proposed methods of work for effects on adjacent structures inside and outside the site boundary.
- Provide and maintain during the execution of the Works all incidental shoring, strutting, needling and other supports as may be necessary to preserve the stability of existing structures on the site or adjoining, that may be endangered or affected by the Works.
- Support existing structure as necessary during cutting of new openings or replacement of structural parts.
- Monitor adjacent structures and immediately report excessive movement to the CA.
- Do not remove supports until new work is strong enough to support the existing structure. Prevent overstressing of completed work when removing supports.

170 MANUFACTURER'S RECOMMENDATIONS/INSTRUCTIONS
- General: Comply with manufacturer's printed recommendations and instructions current on the date of the Invitation to tender.
- Changes to recommendations or instructions: Submit details.
- Ancillary products and accessories: Use those supplied or recommended by main product manufacturer.
- Agrément certified products: Comply with limitations, recommendations and requirements of relevant valid certificates.

180 WATER FOR THE WORKS
- Mains supply: Clean and uncontaminated.
- Other: Do not use until:
  - Evidence of suitability is provided.
  - Tested to BS EN 1008 if instructed.
SAMPLES/APPROVALS

210 SAMPLES
- Products or executions: Comply with all other specification requirements and in respect of the stated or implied characteristics either:
  - To an express approval.
  - To match a sample expressly approved as a standard for the purpose.

220 APPROVAL OF PRODUCTS
- Submissions, samples, inspections and tests: Undertake or arrange to suit the Works programme.
- Approval: Relates to a sample of the product and not to the product as used in the Works. Do not confirm orders or use the product until approval of the sample has been obtained.
- Complying sample: Retain in good, clean condition on site. Remove when no longer required.

230 APPROVAL OF EXECUTION
- Submissions, samples, inspections and tests: Undertake or arrange to suit the Works programme.
- Approval: Relates to the stated characteristics of the sample. (If approval of the finished work as a whole is required this is specified separately). Do not conceal, or proceed with affected work until compliance with requirements is confirmed.
- Complying sample: Retain in good, clean condition on site. Remove when no longer required.

250B APPROVAL OF ALTERNATIVE MATERIALS/PRODUCTS/SEQUENCES OF WORK:
Should the Contractor propose alternative materials, products, sequences of work, or other elements that differ from those specified or indicated on the drawings:
- Any additional time spent by the Engineer/Design Team in the examination of such alternatives, or in implementing them shall be reimbursed by the Contractor at an hourly rate of £95 per hour.
- Examination of the Contractor’s alternative proposals does not guarantee that such proposals will prove to be acceptable.

ACCURACY/SETTING OUT GENERALLY

320 SETTING OUT
- General: Submit details of methods and equipment to be used in setting out the Works.
- Levels and dimensions: Check and record the results on a copy of drawings. Notify discrepancies and obtain instructions before proceeding.
- Inform: When complete and before commencing construction.

340A CRITICAL DIMENSIONS
- Critical dimensions: Set out and construct the Works to ensure compliance with the tolerances stated. Refer to Architects’ drawings for critical dimensions.
341B SITE SURVEY
   - All areas of construction are within the existing structure. The construction/fabrication details are therefore to suit site dimensions, levels details etc. A comprehensive site survey is to be undertaken by the contractor to ascertain all relevant dimensions, levels etc.
   - This survey information will be required before the steelwork contractor can commence his shop drawings.

350 LEVELS OF STRUCTURAL FLOORS
   - Maximum tolerances for designed levels to be:
     - Floors to be self-finished, and floors to receive sheet or tile finishes directly bedded in adhesive: +/- 10 mm.
     - Floors to receive dry board/ panel construction with little or no tolerance on thickness: +/- 10 mm.
     - Floors to receive mastic asphalt flooring/ underlays directly: +/- 10 mm.
     - Floors to receive mastic asphalt flooring/ underlays laid on mastic asphalt levelling coat(s): +/- 15 mm.
     - Floors to receive fully bonded screeds/ toppings/ beds: +/- 15 mm.
     - Floors to receive unbonded or floating screeds/ beds: +/- 20 mm.

360 RECORD DRAWINGS
   - Site setting out drawing: Record details of all grid lines, setting-out stations, benchmarks and profiles. Retain on site throughout the contract and hand over on completion.

SERVICES GENERALLY

460B CUTTING FOR SERVICES: to be the minimum necessary. Obtain prior approval of sizes and locations.

470B SUSPENDED SERVICES: In the design of the structure, the following loads have been allowed for suspended services:
   - Floors 0.25 kN/m²
   - Roofs 0.25 kN/m²

   If the Contractor requires secondary support for services, either by suspension from the main structure above, or by support from frames placed on the floor below, he is to allow in his tender for the design, supply and installation of such secondary structure. Submit details and obtain approval of the secondary structure and the fixings to the main structure.

480B BUILDERS WORK HOLES: In accordance with E20:331A, all holes less than 300 mm square or 300 diameter have not been shown on the structural drawings. Holes additional to those shown on the drawings will not normally be permitted in the following:
   - Through any part of a beam, including flanges of Tee and Ell beams.
   - Through any part of a column.

   Holes less than 300 mm square or 300 mm diameter in size may be permitted in walls and slabs, subject to approval by the Engineer.
SUPERVISION/INSPECTION/DEFECTIVE WORK

510 SUPERVISION
- General: In addition to the constant management and supervision of the Works provided by the Contractor's person in charge, all significant types of work must be under the close control of competent trade supervisors to ensure maintenance of satisfactory quality and progress.
- Replacement: Give maximum possible notice before changing person in charge or site agent.

540 DEFECTS IN EXISTING WORK
- Undocumented defects: When discovered, immediately give notice. Do not proceed with affected related work until response has been received.
- Documented remedial work: Do not execute work which may:
  - Hinder access to defective products or work; or
  - Be rendered abortive by remedial work.

560 TESTS AND INSPECTIONS
- Timing: Agree and record dates and times of tests and inspections to enable all affected parties to be represented.
- Confirmation: One working day prior to each such test or inspection. If sample or test is not ready, agree a new date and time.
- Records: Submit a copy of test certificates and retain copies on site.

610 PROPOSALS FOR RECTIFICATION OF DEFECTIVE PRODUCTS/EXECUTIONS
- Proposals: Immediately any execution or product is known, or appears, to be not in accordance with the Contract, submit proposals for opening up, inspection, testing, making good, adjustment of the Contract Sum, or removal and re-execution.
- Acceptability: Such proposals may be unacceptable and contrary instructions may be issued.

620 MEASURES TO ESTABLISH ACCEPTABILITY
- General: Wherever inspection or testing shows that the work, materials or goods are not in accordance with the contract and measures (e.g. testing, opening up, experimental making good) are taken to help in establishing whether or not the work is acceptable, such measures:
  - Will be at the expense of the Contractor.
  - Will not be considered as grounds for extension of time.

630 QUALITY CONTROL
- Procedures: Establish and maintain to ensure that the Works, including the work of subcontractors, comply with specified requirements.
- Records: Maintain full records, keep copies on site for inspection, and submit copies on request.
- Content of records:
  - Identification of the element, item, batch or lot including location in the Works.
  - Nature and dates of inspections, tests and approvals.
  - Nature and extent of nonconforming work found.
  - Details of corrective action.

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640B CONSIDERATION OF NON-COMPLAINT SUBMISSIONS/PROCEEDURES
MATERIALS/WORK CONSTRUCTED:
Where submissions, procedures, materials or work constructed do not comply with
the requirements of the specification or drawings:
- Any additional time spent by the Engineer/Design Team in the examination of (a)
  non-compliant submissions, (b) submissions to justify work constructed which is
  initially non-compliant, (c) remedial works proposals or (d) remedial works shall be
  reimbursed by the Contractor at an hourly rate of £75 per hour.
- Examination of the Contractor’s proposals or submissions does not guarantee that
  such proposals will prove to be acceptable.
  These provisions shall apply even if submissions are eventually accepted or work is
  allowed to remain unchanged in the completed structure.

WORK AT OR AFTER COMPLETION

740 HIGHWAY/SEWER ADOPTION
- Work to be adopted under the Highways Act, Section 38, or the Roads (Scotland)
  Act, Section 16 to 18, or the Water Industry Act, Section 104: Description: Foul and
  surface water sewers.
- Work for adoption must be:
  - Completed by the Contractor to the satisfaction of the Highway/ Sewer
    Authorities before the certificate stating the Works are complete is issued.
  - Subject to a Defects Liability/Rectification Period of 12 months (see
    Appendix to the Contract/Contract particulars).
  - Maintained during the Defects Liability/Rectification Period, including making
    good of damage due to reasonable wear and tear occurring during the Period and
    cleaning at the end of the Period, all to the satisfaction of the Highway/ Sewer
    Authorities.

810B GENERAL DESCRIPTION OF THE STRUCTURE:
The works comprise the internal refurbishment/modification of, and extension to, an
existing domestic building of traditional construction. The existing property extends
over four floors – lower ground, ground, first and second – some of which will be
modified slightly to provide new room layouts. This will involve the demolition of
internal loadbearing walls and their replacement with steel framing and, where
necessary, floor strengthening to take account of new finishes. The primary work will
be undertaken at lower ground floor level, to the rear of the property, where a new
basement is to be constructed. This basement will largely occupy the garden area
with the remainder, approximately one quarter of it, extending under the existing
building.

The basement structure will take the form of a reinforced concrete “box” comprising a
300 mm thick roof slab and 125 mm or 250 mm thick retaining walls, depending upon
location, and a 300/400 mm thick ground floor slab. Mass concrete underpinning is
specified to the two side (Party) walls while reinforced pins are required under the
main rear elevation of the property. The remaining side stops short of the rear (party)
garden wall and temporary works in the form of a sacrificial king post wall and panel
system, or similar, are anticipated to be necessary to support the excavation until the
basement is complete. A suggested method sequence for the construction of the
basement is given on drawing 3727/07.
The contractor should note in particular the need for temporary support to wall A prior to the start of bulk excavation and the subsequent need to install lateral support to the pins under walls B, C, and D until such time as the basement can function structurally as intended. The details and sequencing of the installation and removal of temporary supports to wall A needs to be carefully coordinated with the temporary works needed for the construction of the basement itself.

The Contractor will be responsible for the design of all temporary works and for the production of all reinforcement details and bending schedules for the basement construction itself. The engineer will provide sufficient outline information for the Contractor to produce own detailed drawings.

The new basement structure is to be built tight to the face of existing perimeter wall foundations. The construction sequence for the basement will require that these pins be temporarily restrained against the lateral forces that will develop as excavation progresses and the Contractor’s temporary works design shall take this into account. Such temporary support shall minimise any possible movement of the retained masonry walls and their foundations and those of the adjacent properties. The Contractor should note that the 125 mm thick side walls provide permanent lateral support to the pins and permanent vertical support to the roof slab. Lateral props need to remain in place until these particular walls are connected to the basement roof slab. The pins to wall B will be reinforced and are designed to cantilever from the basement in the permanent condition. Temporary lateral support is only needed therefore to these pins until such time as the basement slab concrete has matured.

The basement is designed in watertight concrete with an internal drained cavity membrane (Delta or similar). The roof slab supports up to 1.2 metre depth of soil in the final condition and the waterproofing of the top surface of the slab is integrated with that for the basement itself.

830B NUMBERS OF STRUCTURAL DRAWINGS: The Contractor will be issued with the following numbers of structural drawings for each issue of a drawing:
   - Electronic copy.
   - Prints: one print
   - A3 & A4 sketches: two prints

Additional prints of drawings can be supplied to the Contractor, if requested, at a cost of £1.15 per print.

Structural drawings will not be issued to sub-contractors, unless otherwise stated.

840B PREPARATION OF REINFORCEMENT DRAWINGS: Reinforcement drawings are to be prepared by the Contractor and he is to allow, within his Tender return, for all associated cost and programme implications. The engineer will provide sufficient design information to permit the Contractor to prepare his detailed drawings and bending schedules.
C20 DEMOLITION

To be read with Preliminaries/General conditions.

GENERAL REQUIREMENTS

100B DESCRIPTION OF THE WORK: Removal of minor internal walls and demolition of part of the rear extension. Refer to the Architects drawings for the full scope of demolition. The existing external walls rely on the existing floor and roof structure for stability. Demolition works should take this into account.

102B SUBMIT FULL METHOD STATEMENT including full working details of the following:
   - Security of site
   - Method and sequence of working
   - Plant and operatives to be used
   - Shoring, tying and propping
   - Disposal of materials arising
   - Programme

This method statement is to be submitted to the CA for comment not less than two weeks before starting work.

110 DESK STUDY/ SURVEY
   - Scope: Before starting demolition work, examine available information, carry out a survey of the structures, site and surrounding area.
   - Report and method statements: Submit describing:
     - Form, condition and details of the structures.
     - Form, location and removal methods of flammable, toxic or hazardous materials.
     - Type and location of adjoining or surrounding premises which may be adversely affected by noise, vibration, dust or removal of structure.
     - Identification and location of services above and below ground, including those required for the Contractor's own use. Arrangements for disconnection and removal of services.
     - Type and location of features of historical, archaeological or geological importance.
     - Sequence and method of demolition including details of any specific pre-weakening.
     - Arrangements for protection of personnel and the public including exclusion of unauthorized persons.
     - Arrangements for control of site transport and traffic.
     - Special requirements:

130 GROUNDWORKS
   - General:
   - Old foundations, slabs and the like: Break out where and to the extent stated.
   - Contaminated material: Remove and carry out remediation required by the Enforcing Authority.
FEATURE(S) TO BE RETAINED: The following are to be kept in place and adequately protected: Refer to the Architects drawings for details.

SERVICES AFFECTED BY DEMOLITION

SERVICES REGULATIONS: Any work carried out to or which affects new or existing services must be in accordance with the bylaws or regulations of the relevant statutory authority.

LOCATION OF SERVICES
- Services affected by the Works: Locate and mark positions.
- Mains services: Arrange with the appropriate authorities for location and marking of positions.

DISCONNECTION - ARRANGED BY CONTRACTOR
- General: Arrange with the appropriate authorities for disconnection of services and removal of fittings and equipment prior to starting demolition.

DISCONNECTION OF DRAINS: Locate and disconnect all disused drain connections. Seal within the site to approval.

DRAINS IN USE: Protect drains, manholes, inspection chambers, gullies, vent pipes and fittings still in use and ensure that they are kept free of debris at all times. Make good any damage arising from demolition work and leave clean and in working order at completion.

BYPASS CONNECTIONS: Provide as necessary to maintain continuity of services to occupied areas of the same and adjoining properties. Give a minimum 72 hours notice to occupiers if shutdown is necessary during changeover.

SERVICES WHICH ARE TO REMAIN: Notify the CA and service authority or owner of any damage arising from the execution of the works. Make all arrangements for repair to the satisfaction of the CA and service authority or owner. Bear any costs arising.

DEMOLITION WORK

WORKMANSHIP
- Standard: Demolish structures in accordance with BS 6187.
- Operatives: Appropriately skilled and experienced for the type of work and hold or be training to obtain relevant CITB Certificates of Competence.
- Site staff responsible for supervision and control of work: Experienced in the assessment of risks involved and methods of demolition to be used.

FORMING OPENINGS IN EXISTING LOADBEARING WALLS: Where openings are to be formed in existing external loadbearing walls, all work is to be in accordance with BRE Good Building Guide no 15: “Providing temporary support during work on external walls.” Unless otherwise instructed, all propping, work sequences, timing etc is to be carried out in accordance with this document.
315B STABILITY: The Contractor is to be responsible for the stability and structural integrity of the Works during the Contract, and support/restrain as necessary.

320 GAS OR VAPOUR RISKS: Take adequate precautions to prevent fire or explosion caused by gas or vapour.

330 DUST: Reduce dust by periodically spraying demolition works with water.

340 HEALTH HAZARDS: Take adequate precautions to protect site operatives and the general public from health hazards associated with vibration, dangerous fumes and dust arising during the course of the Works.

350 ADJOINING PROPERTY:
- When demolishing structure(s) against adjoining property leave adequate temporary support and protection at each stage and arrange for inspection by the CA. Maintain and alter temporary supports and protection as necessary as work progresses.
- Demolish structure(s) causing a minimum of damage to adjoining property and leave no unnecessary or unstable projections.
- Do not disturb support to foundations of adjoining property unless otherwise instructed.
- Report to the CA any defects exposed or becoming apparent in adjoining property.
- Promptly repair any damage caused to adjoining property by demolition work. Make good to ensure safety, stability, weather protection and security.

360 STRUCTURE(S) TO BE RETAINED:
- Adequately protect parts of existing structure(s) which are to be kept in place.
- Cut away and strip out the minimum necessary and with care to reduce the amount of making good to a minimum.
- Prevent debris from overloading any part of the structure which is not to be demolished.

370 PARTLY DEMOLISHED STRUCTURE(S):
- Leave partly demolished structure(s) in a stable condition, with adequate temporary support at each stage to prevent risk of uncontrolled collapse.
- Prevent debris from overloading scaffolding platforms.
- Prevent access of unauthorised persons to partly demolished structure(s). Leave safe outside working hours.

380 DANGEROUS OPENINGS: Illuminate and protect as necessary.

391 ASBESTOS CONTAINING MATERIALS
- Discovery: Give notice immediately of suspected asbestos containing materials discovered during demolition work. Avoid disturbing such materials.

410 UNFORESEEN HAZARDS: Inform the CA of any unrecorded voids, tanks, chemicals, etc. discovered during demolition work. Agree with the CA, methods for safe removal, filling, etc.
MATERIALS ARISING

510 CONTRACTOR’S PROPERTY
- Components and materials arising from the demolition work: Property of the Contractor except where otherwise provided.
- Remove from site as work proceeds.
E05 IN SITU CONCRETE CONSTRUCTION GENERALLY

To be read with Preliminaries/General conditions.

220 DESIGN OF STRUCTURAL CONCRETE
- Standards:
  - Design: To BS8110 and BS 8007.
  - Reinforcement schedules: To BS 8666.
  - Finished product: To comply with the requirements of design standard.

225 TEMPERATURE RECORDS
- Requirement: Throughout period of concrete construction record:
  - Daily: Maximum and minimum shade temperatures.
  - Under adverse temperature conditions: Temperature at commencement and end of placing.
  - Location: In the shade, close to the structure.

235 OPENINGS, INSERTS AND FIXINGS
- Requirement: Collate all information.
- Submit: Details where openings, inserts and fixings can only be accommodated by adjustments to reinforcement.
- Locate reinforcement: To ensure specified minimum cover at openings and inserts and to be clear of fixing positions.

290 ACCURACY OF CONSTRUCTION
- Reference system: To BS 5964-1
- Element shape and position: To BS 5606.
- Substitution of alternative requirements: None.

300 LEVELS OF STRUCTURAL CONCRETE FLOORS
- Tolerances (maximum):
  - Level of floor: As Preliminaries Section A33.
  - Steps in floor level: Not applicable.

310 SURFACE REGULARITY OF CONCRETE FLOORS TO BS 8204 - GENERAL
- Standard: To BS 8204-1 or -2.
- Measurement: From underside of a 2m straightedge (between points of contact) placed anywhere on surface and using a slip gauge.

311B PERMITTED DEVIATIONS: for finished concrete work to be:
1. All setting out dimensions with respect to one datum each way:
   + or - 6 mm per 30 m.
2. Levels of beams and slabs + or - 3 mm.
3. Plumb of vertical members in storey height: + or -3 mm.
4. Sections of in-situ concrete members: + or -3 mm.
5. Clear distances between adjacent columns and walls where accuracy is required for doors, windows etc:
   + or - 6mm.
6. Flatness of surfaces measured from a line stretched between any two points on the surface:
   up to 3 m long + or - 2 mm.
up to 6 m long + or - 4 mm
up to 9 m long + or - 6 mm
over 9 m long + or - 6 mm
7. Storey height, floor to floor + or - 3 mm.

Errors in plumb to be corrected on successive lifts.

315 SURFACE REGULARITY OF CONCRETE FLOORS TO BS 8204 - TOLERANCE
CLASS SR1
- Location: All surfaces.
- Abrupt changes: 2 mm maximum.
E10 MIXING/CASTING/CURING IN SITU CONCRETE

To be read with Preliminaries/General conditions.

CONCRETE MIXES

101 SPECIFICATION
- Concrete generally: To BS 8500-2.
  - Other requirements: None.
- Exchange of information: Provide concrete producer with information required by BS 8500-1, clauses 4 and 5.

105 DESIGNATED CONCRETE FOR basement walls and slabs.
- Embedded metal: Carbon steel reinforcement.
- Fibres: Not required.
- Aggregates:
  - Size (maximum): 20 mm.
  - Coarse recycled concrete aggregates (RCA): Not permitted.
  - Additional aggregate requirements: None.
- Special requirements for cement/ combinations: None.
- Consistence class: S3.
- Chloride class: Cl 0,40.
- Admixtures: Concrete producers choice.
- Additional mix requirements: None.

106 DESIGNATED CONCRETE FOR REINFORCED UNDERPINNING.
- Designation: Mix RC35
- Embedded metal: The concrete will be reinforced and unreinforced.
- Fibres: Not required.
- Aggregates:
  - Size (maximum): 20 mm.
  - Coarse recycled concrete aggregates (RCA): Not permitted.
  - Additional aggregate requirements: None.
- Special requirements for cement/ combinations: None.
- Consistence class: S3.
- Chloride class: Cl 0,40.
- Admixtures: Concrete producers choice.
- Additional mix requirements: None.

108 DESIGNATED CONCRETE FOR MASS CONCRETE UNDERPINNING AND FILLING.
- Designation: GEN1
- Embedded metal: The concrete will be unreinforced.
- Fibres: Not required.
- Aggregates:
  - Size (maximum): 20 mm.
  - Coarse recycled concrete aggregates (RCA): Allowed to BS 8500:2 Cl 4.3
  - Additional aggregate requirements: None.
- Special requirements for cement/ combinations: None.
- Consistence class: S3.
- Chloride class: Cl 0.40.
- Admixtures: Concrete producers choice.
- Additional mix requirements: None.

MATERIALS, BATCHING AND MIXING

215A READY-MIXED CONCRETE must be used for all reinforced concrete works.
Production plant: Currently certified by a body accredited by UKAS to BS EN 45011
for product conformity certification of ready-mixed concrete.
- Source of ready-mixed concrete: Obtain from one source if possible. Otherwise,
  submit proposals.
  - Name and address of depot: Submit before any concrete is delivered.
  - Delivery notes: Retain for inspection.
- Declarations of nonconformity from concrete producer: Notify immediately.
- Do not add water to concrete on site.

217B READY MIXED CONCRETE: Vehicles must be filled to not less than 50% capacity
for each load, unless the supplier demonstrates compliance with the mixing
performance required in BS 3963 for the small loads proposed. Clean inside of drum
and chutes after discharging load to remove surplus concrete. Empty out washing
water and residue before re-loading.

219B PUMPED CONCRETE: where it is proposed to use pumped concrete submit to C.A.
for approval:
1. Location of work affected.
2. Outline of equipment to be used including stand-by equipment and
   availability.
3. Revised mix data together with evidence of suitability.

220B CHEMICAL DRUM WASH SYSTEMS for ready-mixed concrete may be used when
covered by an appropriate Agrément certificate. Keep records of the deliveries and
where they have been incorporated.

221 INFORMATION ABOUT PROPOSED CONCRETES
- Submit when requested:
  - Details listed in BS 8500-1, clause 5.2.

225 CHANGES TO SPECIFICATION
- Changes to specification of fresh concrete (outside concrete producer’s
  responsibility): Prohibited.

230 INTERRUPTION OF SUPPLY DURING CONCRETING
- Elements without joints: Where elements are detailed to be cast in a single pour
  without joints, make prior arrangements for a back-up supply of concrete.
- Elsewhere:
  - Preparation: Manage pour to have a full face, and have materials available to
    form an emergency construction joint while concrete can still be worked.
  - Before pour is completed: Submit location and details of joint, make
    proposals for joint preparation.
415  ADMIXTURES
- Calcium chloride and admixtures containing calcium chloride: Do not use.
- Increase addition rate if necessary to achieve required properties.
- Dispersion in fresh concrete: Uniform without balling.

490  PROPERTIES OF FRESH CONCRETE
- Adjustments to suit construction process: Determine with concrete producer. Maintain conformity to the specification.

PROJECT TESTING/ CERTIFICATION

505  PROJECT TESTING OF CONCRETE
- Purpose: Where required for early age testing.
- Testing: To BS EN 206-1, Annex B and BS 8500-1, Annex B.
  - Nonconformity: Obtain instructions immediately.
- Recording: Maintain complete correlated records including:
  - Concrete designation.
  - Sampling, site tests, and identification numbers of specimens tested in the laboratory.
  - Location of the parts of the structure represented by each sample.
  - Location in the structure of the batch from which each sample is taken.

520  TESTING LABORATORY
- Laboratory: Accredited by UKAS or other national equivalent.
- Name and UKAS reference number: Submit well in advance of making trial mixes or concrete for use in the works.

530  TESTS RESULTS
- Submission of reports: Within one day of completion of each test.
  - Number of copies: 3.
- Reports on site: A complete set, available for inspection.

PLACING/COMPACTING/CURING AND PROTECTION

630  PREMATURE WATER LOSS
- Requirement: Prevent water loss from concrete laid on absorbent substrates.
  - Underlay: Select from:
    Polyethylene sheet: 250 micrometres thick.
    Building paper: To BS 1521, grade B1F.
  - Installation: Lap edges 150 mm.

640A  CONSTRUCTION JOINTS
- Locations of construction joints: Submit proposals where not shown on drawings.
- Preparation of joint surfaces: Select from:
  - Brushing and spraying: Remove surface laitance and expose aggregate finish while concrete is still green.
  - Other methods: Submit proposals.
- Condition of joint surfaces immediately before placing fresh concrete: Clean and damp.
- Stop roughening 25mm from arrisses to surfaces which will be exposed to view in the finished work; remove small mortar lips from exposed arrisses with carborundum stone.

648 ADVERSE TEMPERATURE CONDITIONS
- Requirement: Submit proposals for protecting concrete when predicted ambient temperatures indicate risk of concrete freezing or overheating.

650 SURFACES TO RECEIVE CONCRETE
- Cleanliness of surfaces immediately before placing concrete: Clean with no debris, tying wire clippings, fastenings or free water.

670A TRANSPORTING
- General: Avoid contamination, segregation, loss of ingredients, excessive evaporation and loss of workability. Protect from heavy rain.
- Clean equipment immediately after use and whenever cement or aggregate is changed and remove free water.
- Use suitable walkways and barrow runs for traffic over reinforcement and freshly placed concrete.
- Entrained air: Anticipate effects of transport and placing methods in order to achieve specified air content.

680 PLACING
- Records: Maintain for time, date and location of all pours.
- Timing: Place as soon as practicable after mixing and while sufficiently plastic for full compaction.
- Temperature limitations for concrete: 30°C (maximum) and 5°C (minimum), unless otherwise specified. Do not place against frozen or frost covered surfaces.
- Continuity of pours: Place in final position in one continuous operation up to construction joints. Avoid formation of cold joints.
- Discharging concrete: Prevent uneven dispersal, segregation or loss of ingredients or any adverse effect on the formwork or formed finishes.
- Thickness of layers: To suit methods of compaction and achieve efficient amalgamation during compaction.
- Poker vibrators: Do not use to make concrete flow horizontally into position, except where necessary to achieve full compaction under void formers and cast-in accessories and at vertical joints.

690 COMPACTING
- General: Fully compact concrete to full depth to remove entrapped air. Continue until air bubbles cease to appear on the top surface.
- Areas for particular attention: Around reinforcement, under void formers, cast-in accessories, into corners of formwork and at joints.
- Consecutive batches of concrete: Amalgamate without damaging adjacent partly hardened concrete.
- Methods of compaction: To suit consistence class and use of concrete.

720 VIBRATORS
- General: Maintain sufficient numbers and types of vibrator to suit pouring rate, consistency and location of concrete.
- External vibrators: Obtain approval for use.
730 PLASTIC SETTLEMENT
- Settlement cracking: Inspect fresh concrete closely and continuously wherever cracking is likely to occur, including the top of deep sections and at significant changes in the depth of concrete sections.
  - Timing: During the first few hours after placing and whilst concrete is still capable of being fluidised by the vibrator.
  - Removal of cracks: Re-vibrate concrete.

810 CURING GENERALLY
- Evaporation from surfaces of concrete: Prevent, including from perimeters and abutments, throughout curing period.
  - Surfaces covered by formwork: Retain formwork in position and, where necessary to satisfy curing period, cover surfaces immediately after striking.
  - Top surfaces: Cover immediately after placing and compacting. If covering is removed for finishing operations, replace it immediately afterwards.
- Surface temperature: Maintain above 5°C throughout the specified curing period or four days, whichever is longer.

811 COVERINGS FOR CURING
- Sheet coverings: Suitable impervious material.
- Curing compounds: Selection criteria:
  - Curing efficiency: Not less than 75% or for surfaces exposed to abrasion 90%.
  - Colouring: Fugitive dye.
  - Application to concrete exposed in the finished work: Readily removable without disfiguring the surface.
  - Application to concrete to receive bonded construction/finish: No impediment to subsequent bonding.
- Interim covering to top surfaces of concrete: Until surfaces are in a suitable state to receive coverings in direct contact, cover with impervious sheeting held clear of the surface and sealed against draughts at perimeters and junctions.

812 PREVENTING EARLY AGE THERMAL CRACKING
- Deep lifts or large volume pours: Submit proposals for curing to prevent early age thermal cracking, taking account of:
  - Temperature differentials across sections.
  - Coefficient of thermal expansion of the concrete.
  - Strain capacity of the concrete mix (aggregate dependent).
  - Restraint.

815 ADDITIONAL CURING REQUIREMENT - WATER CURING
- Commencement of water curing: As soon as practicable after placing and compacting concrete.
  - Surfaces covered by formwork: Expose to water curing as soon as practicable.
  - Top surfaces: Cover immediately with impermeable sheeting to prevent evaporation before commencement of water curing.
  - Water curing: Wet surfaces continuously throughout curing period.
  - Select methods from:
Mist spray.
Wet hessian covered with impermeable sheeting.

820 CURING PERIODS

- General: Curing periods are in days (minimum).
- Definition of ‘t’: The average number of degrees Celsius air temperature during the curing period.
- Curing periods for concrete surfaces which, in the finished building, will be exposed to the elements; concrete wearing surface floors and pavements; water resistant concrete:

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Concrete made using CEM1 strength class 42.5 or 52.5; SRPC (BS 4027)</th>
<th>Concrete made using cements indicated in BS 8500, table A.17 except those listed in adjacent column and supersulphated cement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drying winds or dry, sunny weather (relative humidity &lt; 50%)</td>
<td>140 t+10</td>
<td>180 t+10</td>
</tr>
<tr>
<td>Intermediate conditions</td>
<td>100 t+10</td>
<td>140 t+10</td>
</tr>
<tr>
<td>Damp weather, protected from sun and wind (relative humidity &gt; 80%)</td>
<td>100 t+10</td>
<td>100 t+10</td>
</tr>
</tbody>
</table>

- Curing periods for other structural concrete surfaces (cements/combinations as above):

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Concrete made using CEM1 strength class 42.5 or 52.5; SRPC (BS 4027)</th>
<th>Concrete made using cements indicated in BS 8500, table A.17 except those listed in adjacent column and supersulphated cement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drying winds or dry, sunny weather (relative humidity &lt; 50%)</td>
<td>80 t+10</td>
<td>140 t+10</td>
</tr>
<tr>
<td>Intermediate conditions</td>
<td>60 t+10</td>
<td>80 t+10</td>
</tr>
<tr>
<td>Damp weather, protected from sun and wind (relative humidity &gt; 80%)</td>
<td>No special requirements</td>
<td>No special requirements</td>
</tr>
</tbody>
</table>
- Curing periods for concretes using admixtures or other types of cements/combinations: Submit proposals.

830B TEMPERATURE OF WATERTIGHT CONCRETE:
- Prevent the build-up of high temperatures and steep temperature gradients during the first 24 hours after casting, particularly in hot weather,
- Prevent rapid changes in temperature during the first 7 days after casting.
- Submit proposals designed to achieve these objectives (taking into account the nature of the design, the mix specification and the prevailing climatic conditions).

840 PROTECTION
- Prevent damage to concrete, including:
  - Surfaces generally: From rain, indentation and other physical damage.
  - Surfaces to exposed visual concrete: From dirt, staining, rust marks and other disfiguration.
  - Immature concrete: From thermal shock, physical shock, overloading, movement and vibration.
  - In cold weather: From entrapment and freezing expansion of water in pockets, etc.
E20 FORMWORK FOR IN SITU CONCRETE

To be read with Preliminaries/General conditions.

GENERALLY/PREPARATION

100B GENERALLY: Provide all necessary formwork to produce finished concrete work to required dimensions and finishes. Support the formwork firmly, and adequately brace, strut and tie. Provide capability for accurate adjustment to line and level.

101B PLYWOOD MADE FROM TROPICAL HARDWOODS: Do not use.

110A LOADINGS
- Requirement: Design and construct formwork to withstand the worst combination of the following:
  - Total weight of formwork, reinforcement and concrete.
  - Construction loads including dynamic effects of placing, compacting and construction traffic.
  - Wind and snow loads.
  - Temperature and moisture

120 FORMWORK DETAILS
- Provide the following:
  Position and types of construction joints.

122B TOP SURFACES: Provide formwork to the top surface of concrete where the slope or nature of the work requires it.

131B PARTITIONS AND SCREEDS: do not erect partitions or lay floor screeds until at least 14 days after the removal of props. Allow a further 28 days before plastering to permit the natural deflection of the slab to take place.

132 PROPPING
- General: Prevent deflection and damage to the structure. Carry down props to bearings strong enough to provide adequate support throughout concreting operations.
- Method statement: Submit proposals for prop bearings and sequence of propping/repropping and backpropping.
  - Timing of submission: Minimum 14 days prior to construction.

133B BEARINGS:
- Prop through other decks if construction load on a particular deck exceeds:
  - the design loading, or
  - where less than 28 days have elapsed from casting, a reduced loading agreed with CA.
- Submit details of proposed prop bearings and through propping to CA. Accept responsibility for cost of checking effects on structure.
  - Do not adjust after concrete has set.
134B PROPPING: where beams are not concreted to their full section in one operation, do not adjust or remove any supporting props until all parts of the beam (rectangular, downstand, upstand, tee or ell sections) have reached a maturity of 21 days and whose works cube crushing strength is at least 28 N/mm².

203B TANKING MEMBRANE
- Substrate: Compacted blinded formation.
- Manufacturer: Cetco. www.cetco.com
- Product reference: Voltex.
- Fix in accordance with manufacturers instructions and Section J40.

CONSTRUCTION

310 ACCURACY
- General requirement for formwork: Accurately and robustly constructed to produce finished concrete in the required positions and to the required dimensions.
- Formed surfaces: Free from twist and bow (other than any required cambers).
- Intersections, lines and angles: Square, plumb and true.

320A JOINTS IN FORMS
- Requirements including joints in form linings and between forms and completed work:
  - Prevent loss of grout, using seals where necessary.
  - Prevent formation of steps. Secure formwork tight against adjacent concrete.
  - Fix panels with their joints either vertical or horizontal unless otherwise specified.

330 INSERTS, HOLES AND CHASES
- Positions and details: Submit proposals.
- Positioning relative to reinforcement: Give notice of any conflicts well in advance of placing concrete.
- Method of forming: Fix inserts or box out as required. Do not cut hardened concrete without approval.

331B INSERTS, HOLES, CHASES: these may not be shown on the structural drawings; refer to drawings by others as necessary.

332B BUILDERS WORK HOLES: In accordance with E20:331A, all holes less than 300 mm square or 300 diameter have not been shown on the structural drawings. Holes additional to those shown on the drawings will not normally be permitted in the following:
  - Through any part of a beam, including flanges of Tee and Ell beams.
  - Through any part of a column.
Holes less than 300 mm square or 300 diameter in size may be permitted in walls and slabs, subject to approval by the Engineer.

345B KICKERLESS CONSTRUCTION: Unless shown otherwise form horizontal construction joints at base of walls and columns without kickers, using one of the methods described in BCA Publication 47.023 ‘Kickerless construction’. The Contractor must satisfy himself as to the suitability of the chosen method.
350 FORM TIES
- Metal associated with form ties/devices: Prohibited within cover to reinforcement. Compatible with reinforcement metal.

470 RELEASE AGENTS
- General: Achieve a clean release of forms without disfiguring the concrete surface.
- Product types: Compatible with formwork materials, specified formed finishes and subsequent applied finishes. Use the same product throughout the entire area of any one finish.
- Protection: Prevent contact with reinforcement, hardened concrete, other materials not part of the form face, and permanent forms.

480 SURFACE RETARDERS
- Use: Obtain approval.
- Reinforcement: Prevent contact with retarder.

STRIKING

510 STRIKING FORMWORK
- Timing: Prevent any disturbance, damage or overloading of the permanent structure.

521 MINIMUM PERIODS
- Determination of minimum periods for retaining formwork in position:
  To BS 8110 Table 6.2.

FORMED FINISHES

620 PLAIN SMOOTH FINISH generally.
- Finish: Even with panels arranged in a regular pattern as a feature of the surface.
- Permissible deviation of surfaces:
  - Sudden irregularities (maximum): 5 mm.
  - Gradual irregularities when measured from the underside of a 1 m straightedge, placed anywhere on surface (maximum): 5 mm.
- Variations in colour:
  - Permitted: Those caused by impermeable form linings.
  - Not permitted: Discoloration caused by contamination or grout leakage.
- Surface blemishes:
  - Permitted: Blowholes less than 10 mm in diameter and at an agreed frequency.
  - Not permitted: Voids, honeycombing, segregation and other large defects.
- Formwork tie holes: In a regular pattern and filled with matching mortar.
E30 REINFORCEMENT FOR IN SITU CONCRETE

To be read with Preliminaries/General conditions.

REINFORCEMENT

110 QUALITY ASSURANCE OF REINFORCEMENT
- Standards:
  - Reinforcement: To BS 4449, BS 4482, BS 4483 or BS 6744.
  - Cutting and bending: To BS 8666.
  - Source of reinforcement: Companies holding valid certificates of approval for product conformity issued by the UK Certification Authority for Reinforcing Steels (CARES).

150 RIBBED BAR REINFORCEMENT
- Standard: To BS 4449.
  - Strength grade: B500B.

210 STANDARD FABRIC REINFORCEMENT
- Standard: To BS 4483.
  - Grade: B500A.

255 PREFABRICATED CONTINUITY REINFORCEMENT STRIPS
- Source: Obtain from a manufacturer holding a valid Technical Product Approval certificate issued by the UK Certification Authority for Reinforcing Steels (CARES) or equivalent.

CUTTING AND BENDING

310 CUTTING AND BENDING REINFORCEMENT
- General: To schedules and to BS 8666.
  - Bending on site, including minor adjustments: Provide on site facilities for cutting and hand bending to deal with approved minor adjustments of bars up to and including 16mm dia.

320A PROTECTION OF REINFORCEMENT
- Dropping from height, mechanical damage and shock loading: Prevent.
- Cleanliness of reinforcement at time of pouring concrete: Free from corrosive pitting, loose millscale, loose rust and contaminants which may adversely affect the reinforcement, concrete, or bond between the two.
- Store reinforcement clear of the ground and prevent contamination by other materials.
- At time of fixing and placing of concrete, reinforcement to be clean and free of corrosive pitting, loose millscale, loose rust, ice, oil and other substances which may adversely affect the reinforcement, concrete, or bond between the two.

410A LAPS OR SPLICES
- The Contractor will be preparing his own reinforcement drawings from information provided by the Engineer. Some lap locations will be indicated but the Contractor may adjust these to suit his method of working or to work around the location of temporary propping and the like. Minimum lap lengths are noted in E30:425 below and further guidance may be obtained from BS8110, Part 1.
425 LAPS NOT DETAILED ON DRAWINGS
- Laps in bar reinforcement (minimum): 40 x bar diameter.
- Laps in fabric reinforcement (minimum): 40 x bar diameter.
  - Laps at corners: Avoid four layer build-up.

451A FIXING REINFORCEMENT
- Standard: To BS 7973-1 and -2.
- Installation: In addition to any spacers and chairs shown on drawings or schedules, provide adequate support, tie securely and maintain the specified cover.
- Unless otherwise permitted fix reinforcement in position before placing concrete. In addition to any spacers and chairs shown on drawings or schedules, provide adequate support, tie securely and maintain the specified cover. Comply generally with Concrete Society Report CS 101 'Spacers for reinforced concrete'.
- Tying:
  - Wire type: 16 gauge black annealed. Use stainless steel wire for stainless steel reinforcement.
  - Ends of tying wire: Prevent intrusion into the concrete cover. Remove loose ends.
- Compatibility of metals: Prevent contact between ordinary carbon steel and stainless or galvanized reinforcement.
- Do not tack weld unless authorised by the CA and recommended by the reinforcement manufacturer.

470 TOLERANCES ON COVER
- Definition of nominal cover to BS 8500-1: Minimum cover plus tolerance for fixing.
  - Tolerance (maximum): 10 mm.
- Checking specified cover dimensions: Before concreting check that cover dimensions will be achieved.

510 RUST STAINING
- Staining of surfaces of concrete which will be exposed to view in the finished work: Prevent.
E40  DESIGNED JOINTS IN IN-SITU CONCRETE

To be read with Preliminaries/General conditions.

120  CONSTRUCTION/ MOVEMENT JOINTS GENERALLY
- Accuracy: Position and form joints accurately, straight, well-aligned and truly vertical or horizontal or parallel with setting out lines of the building.
- Modifications to joint design or location: Submit proposals.
- Placing concrete to form movement joints:
  - Maintain effectiveness of joints. Prevent concrete entering joints or penetrating or impregnating compressible joint fillers.
  - Do not place concrete simultaneously on both sides of movement joints.

210  FORMED JOINTS
- Forms/stop ends generally: Rigid and grout-tight.
- Forms/stop ends for projecting continuity reinforcement: To accommodate bars or fabric without temporary bending or displacement.

230  PREPARATION OF CONSTRUCTION JOINTS
- Roughening of joint surfaces: Select from:
  - Brushing and spraying: Remove surface laitance and expose aggregate finish while concrete is still green.
  - Other methods: Submit proposals.
- Condition of joint surfaces immediately before placing fresh concrete: Clean and damp.

320  HYDROPHILIC WATERSTOPS TO CONSTRUCTION JOINTS
- Manufacturer: Cetco. www.cetco.com
  - Product reference: Waterstop RX.
- Location: Basement slab and retaining walls.
- Method of fixing: To manufacturers specification.
- Condition of concrete surface at time of fixing: Clean and free from ponded or running water.
- Protection: Prevent wetting of exposed sections of waterstop.

510  SHEET MEMBRANE FOR SLIDING JOINTS
- Manufacturer: Grace Construction. www.graceconstruction.com
  - Product reference: Slipstrip 2.
- Fixing: Bond to first cast concrete surface, or otherwise hold in position during concreting.

520  SHEET JOINT FILLER FOR ISOLATION JOINTS
- Manufacturer: Grace Construction. www.graceconstruction.com
- Joints finished with sealant: Leave sufficient space for sealant by using temporary formers.
E41 WORKED FINISHES TO IN SITU CONCRETE

To be read with Preliminaries/General conditions.

150 FINISHING
- Timing: Carry out at optimum times in relation to setting and hardening of concrete.
- Prohibited treatments to concrete surfaces:
  - Wetting to assist surface working.
  - Sprinkling cement.

310 SMOOTH FLOATED FINISH
- Surface on completion: Even with no ridges or steps.
G10 STRUCTURAL STEEL FRAMING

To be read with Preliminaries/General conditions.

GENERAL REQUIREMENTS/INFORMATION

105B DESCRIPTION OF WORK:

The works consist of the fabrication and erection of miscellaneous beam elements within the superstructure of the above development. These elements either replace internal loadbearing masonry walls that currently support traditional timber floor/roof construction or form the framing necessary to accommodate new or enlarged openings.

Construction/fabrication details will require that a comprehensive site survey be undertaken by the contractor to ascertain all relevant dimensions, levels etc. prior to the completion of shop drawings.

Overall stability of the superstructure in the final condition is provided by the diaphragm action of the floor plates acting in conjunction with new internal partition walls and, at ground floor level by a diagonally braced internal bay.

106B SITE VISIT: Before tendering, ascertain the nature of the site and all local conditions and restrictions likely to affect the execution of the works.

108B NUMBERS OF DRAWINGS: The steelwork sub-contractor will not be issued with drawings by the Design Team. The sub-contractor is to make arrangements with the main contractor for the numbers of drawings he requires.

See clause A33:730A for the drawings to be issued to the main contractor.

110 CONTRACTOR’S DESIGN OF JOINTS NOT ALREADY DESIGNED BY THE ENGINEER
- Design concept: Beams are designed as simply supported under dead and imposed loads.
- Design responsibility: Design connections and detail steelwork and connections.
  - Other responsibilities: None.
- Structural requirements:
  - Design: Design and detail those connections not already detailed by the Engineer to the requirements of BS 5950.
  - Loading requirements: As drawing.

- Fixings to foundations/ walls: To be designed and detailed by the Contractor. Bolt to padstone(s).

115 DESIGN CONSTRAINTS – GENERAL
- Members forming bracing systems or girders of lattice construction: Unless detailed or instructed otherwise, position so that their lines of action intersect at a point.
- Bolts:
  - Diameter (minimum): 16mm.
Number per connection (minimum): Two, unless otherwise indicated.
- Other requirements: Choose bolt dimensions to ensure that threads do not occur in the shear plane of the joint.
- Punching of bolt holes: Is not permitted.
- Welds: Continuous 6 mm fillet unless noted otherwise on the drawings.
- Other constraints: fix beams to padstones using 2 no. M12 chemical anchors.

120 DRAWINGS AND CALCULATIONS
- Requirement: Before preparing detailed fabrication drawings, submit:
  - General arrangement drawings with individual steel members clearly identified.
  - Calculations/selected standard joint detail for major connections.

121B DESIGN AND CO-ORDINATION: The sub-contractor/supplier must:
1. Complete the design and detailing of the work and provide complete production information (including, as appropriate, fabrication/installation drawings, all design calculations, specifications, etc.) based on the drawings, this specification, and other information provided, liaising with the C.A., Contractor and others as necessary to help ensure co-ordination of the work with related building elements and services.
2. Request additional information as necessary from the C.A. and/or Contractor and provide information as necessary in time to meet the programme.
3. Submit by post sufficient paper copies of the design/production information including 2 copies each for the C.A. and consultants, to the Contractor (or C.A. if Contractor has not been appointed). The Contractor (if he has been appointed) will check the design/production information and submit his comments to the C.A.
4. The C.A. will inspect the design/production information, record his comments and return to the Contractor. The C.A. will require 10 working days for such examination of design/production information.
5. Make any necessary amendments in accordance with any comments of the C.A. and without delay. Unless and until it is confirmed that re-submission is not required, re-submit for further comment, and incorporate any necessary further amendments all as before.
6. If submitted design/production information differs from the requirements of the Tender documents/Sub-contract documents/Contract of Sale document as applicable, each such difference must be the subject of a request for substitution or variation, supported by all relevant information.
7. Should any amendment to design/production information required by the C.A. be considered to involve a variation which has not already been acknowledged as a variation by the C.A. notify the Contractor and/or C.A. without delay and in any case within 7 days, and do not proceed with ordering, fabrication, or fixing until subsequently instructed. Claims for the extra cost of such work, if made after it has been carried out, may not be allowed.
8. Submit sufficient copies of final version of design/production information, including 1 copy each for the C.A. and consultants, to the Contractor for distribution to all affected parties.
9. The C.A.’s examination of the drawings will not relieve the Contractor of the responsibility for the work and for rectifying at his own expense any errors subsequently discovered.
10. The Contractor’s attention is drawn to the fact that this process of completing the design and detailing will inevitably involve collection of information from others and submission and agreement of details. The Contractor will need to make reasonable allowances of programme time and drawing office resources for this process and the steelwork rates will be deemed to include such allowances.

122B SHOP DRAWINGS: Submit any proposed variations from the engineer’s details in advance of the shop drawings to allow incorporation of Consultant’s comments onto shop drawings. Agree a programme for the submission of drawings with the C.A. and the engineer. Allow two weeks from the date of receipt of drawings for the engineer to prepare his comments. The engineer's review of the drawings shall not relieve the contractor of his responsibility for the accuracy of his drawings.

124B SHOP DRAWINGS
- The individual member mark of each member shall be incorporated into the member fabrication drawing number.
- Each individual member fabrication detail drawing shall be presented in “traditional” format, and show complete fabrication details of that particular member including all stiffeners, fittings, plates, holes etc that are to finally form part of that fabricated member. Separate base member and fitting drawings will not be accepted.
- Any drawings not complying fully with the above will not be examined, and the Contractor will be required to submit drawings that do comply with the above.

125 SPECIFICATION STANDARD
  - Document availability: For the duration of the work, at fabrication shop and on site.

126B QA PROCEDURES: When requested by the CA, submit details of QA procedures.

127B CERTIFICATION AT COMPLETION: On completion of the work, submit certificate(s) confirming that the work has been carried out in accordance with this specification and the sub-contractor's QA procedures.

130 GENERAL STEEL SECTIONS AND PLATES FOR INTERNAL STEELWORK
- Grade: S275.
  - Options: None.
- Source: Obtain steel from a source accredited to a national or internationally accepted quality standard.

135 HOLLOW STEEL SECTIONS FOR INTERNAL POSTS
- Standard: BS-EN-10210-1.
- Grade: S355.
  - Options: None.
- Source: Obtain steel from a source accredited to a national or internationally accepted quality standard.
136B HOLLOW STEEL SECTIONS: Unless otherwise stated on the drawings, all circular, square and rectangular hollow sections are to be hot rolled. Grade S355 is the normally available grade for these sections and grade S355 can be used even if a section is specified as grade S275.

140B ERECTION METHOD STATEMENT to be submitted at least 14 days before starting erection of steelwork, including details of (with drawings if necessary):
- Method and sequence of erection.
- Type of craneage.
- Temporary guys and bracing proposed for use during erection.
- If the sub-contractor does not intend to carry out the erection, he is to supply full details of his proposals and include the names of his own technical staff who shall supervise the works.

142B RATES: Include within the rates for all items required by this specification not specifically covered by bill items.

FABRICATION

181B GENERAL REQUIREMENTS:
- Inform CA when fabrication is due to start. Do not fabricate steelwork for which the drawings have not completed the design and co-ordination process described in G10:121B.
- Before fabricating, ensure that surface condition of steel which is to be coated complies with requirements for cleaning given elsewhere in this specification.
- Ensure that fabrication processes do not cause changes in properties of materials resulting in non-compliance with specified requirements.

182B QUALITY OF WORK:
The steelwork is hidden from view.
- Unless otherwise agreed, fill all holes and remove all fittings added to comply with the safety requirements of the Health and Safety Executive Guidance Note, when no longer required.
- Unless otherwise agreed, fill all holes and remove all fittings used for fabrication or erection purposes.

183B HOLLOW SECTIONS are to be hot formed.

184B NOTCHES and holes formed in members must not have sharp or over-cut internal corners. Use a 12mm diameter hole drilled at the corner and flame or saw cut run into the hole, or other approved means.

190 MARKING
- Identifying and recording materials and components: Submit details of proposed methods.
- Location of marks:
  - Generally: Visible for checking after erection.

- Weathering steel: On surfaces not exposed to open view in the completed work.
- Steel to be blast cleaned, pickled, metal sprayed or galvanized: Mark so that subsequent treatment cannot obliterate the marking.
193B MANUAL CUTTING: Obtain approval for thermal cutting by hand.

195 HARD STAMPING
- Usage: Not permitted except as indicated on drawings.

210 END CONNECTIONS
- Angle web cleats: Project 10 mm beyond ends of simply supported members.

211B PACKINGS: If the steelwork sub-contractor requires to incorporate packing plates additional to those shown on the details, to achieve the tolerances required, these are to be agreed with the C.A. and are to be at the sub-contractor’s expense. Packings with a total thickness greater than 6mm may not be permitted.

215 HOLLOW SECTIONS: Ensure that insides of sections are dry and clear of debris before sealing ends and openings.

220 ACCESS/VENTILATION HOLES IN BASE PLATES
- Base plates larger than 1 m²: Make 25 mm diameter holes as necessary for pressure grouting, escape of entrapped air or direct compaction of filling/bedding material.

WELDING

253B WELDING: In addition to the dimensioned welds show on the drawings, provide sealing welds to the full profile of all plates, cleats, etc. Where the construction requires, grind flush sealing welds to allow close fitting of steelwork.

255 SITE WELDING
- Usage: Permitted only where indicated on drawings.
- Working conditions: Suitable and safe. Do not weld when surfaces are wet or when ambient temperature is below 0°C.

261B HARDENED STEEL: Modify welding process for Grade 50 steel which has been hardened by flame cutting. Obtain C.A. comment on proposals.

270 ADDITIONAL WELDS
- Welds (including tack welds) not indicated on drawings: Not permitted without approval.

275B BUTT WELDS: Use run on and run off plates to ensure full throat thickness at ends of butt welds as follows:
- Material for plates to be of same grade as material being welded.
- Prepare plates in same manner as parts being joined.
- After completion of welding, remove plates by cutting and grind smooth the surfaces where they were attached.
- Retain and identify plates for inspection.
- Butt welds are architecturally exposed and must be ground smooth and level with the surface of adjacent steel to achieve a smooth, high quality finish.

276B BUTTS WELDS: All butt welds are to be full penetration welds. Partial penetration and full strength (i.e. reinforced partial penetration) welds are not acceptable unless specifically agreed with the C.A.
277B INTERMITTENT WELDS: Do not use unless specifically shown on the design drawings.

BOLT ASSEMBLIES

305 PROPRIETARY ANCHORS TO CONCRETE
- Manufacturer: Hilti.
  - Product reference: As noted on the drawings.

370 GALVANIZED COATING TO BOLT ASSEMBLIES
- Standard: To BS 7371-6.
  - Galvanizing: Applied by fastener manufacturer. Passivated and lubricated if no additional coatings are specified. Nuts tapped after galvanizing.
  - Use/location: All bolts, nuts and washers throughout the project.

390 SEALED HOLLOW SECTIONS
- Holes: Sealed to prevent access of moisture.
  - Method of sealing: submit proposals.

ERECTION

410 PRE-ERECTION CHECKS
- At least 7 days before proposed erection start date, check the following:
  - Foundations and other structures to which steelwork will be attached:
    Accuracy of setting out.
  - Holding down bolts: Position, protruding length, slackness and condition.
- Report inaccuracies and defects without delay.
- Obtain permission to commence erection.

421B SETTING OUT: Notwithstanding the requirements of the NSSS, set out and erect the steelwork to ensure compatibility with the following permissible deviations which have been specified for the building setting out:
Using methods and measuring instruments described in BS 5606 section 5:-
Linear dimensions: Up to and including 5m +/- 3mm,
Over 5m and up to and incl. 30m +/- 6mm
Over 30m pro-rata
Angular dimensions: +/- 2mm in 80m
Verticality: +/- 5mm in 50m
Levels: +/- 5mm per single sight of 60m.

424B WASHERS: Place under heads and nuts of all bolts.

425 MODIFICATIONS
- Steelwork: Do not modify without approval.

440 COLUMN BASES
- Levels: Adjust using steel shims or folding wedges no larger than necessary.
  - Location of shims/ wedges: Position symmetrically around perimeter of base plate.
  - Do not use a single central pack.
- Give notice: If space beneath any column base is outside specified limits for bedding thickness.
- Accuracy of erection: Check, and correct errors before filling and bedding beneath bases and carrying out other adjacent work.

444B MORTAR FILLING/ BEDDING OF COLUMN BASES
- Bolt pockets: Completely fill bolt boxes with pourable SBD Five Star Grout (from SBD Construction Products Limited) in separate operation prior to grouting of column bases. Method of placing to ensure no voids remain in tubes after grout has set.
- Spaces beneath base plates: Completely fill space beneath column base plates and space between bolts and holes in plate with SBD Five Star Grout strictly in accordance with the manufacturer’s recommendations.

TESTING

470 SITE TESTING OF ANCHORS TO MASONRY
- Standard: To BS 5080.
- Proof tests: Test 10% of the working fixings to 1.5 times working load.
- Test results: Report failures and seek instructions.

472B TESTING AUTHORITY: All tests to be carried out by an approved independent testing authority.

475 PRODUCTS
- Steel: Submit test certificates.

476B WELDER AND WELDING TESTING: When requested by CA submit copies of test certificates.

477B WELD PROCEDURES: When requested by CA submit copies of test certificates.

480B DEFECTIVE WORK: As soon as possible after any part of the work or any materials are known or suspected to be defective, submit proposals to CA for further testing, inspection or replacement and obtain instructions.

PROTECTIVE COATINGS

503B APPROVED FIRMS: The work specified in this section is to be carried out by the steelwork sub-contractor. If the sub-contractor does not intend to carry out all of the work specified in this section himself, he is to supply full details of his proposals for prior approval, stating the names of his own technical staff who shall supervise the work. Submit details at least 28 days before starting.

504B GENERAL: All painting is to be carried out in accordance with the recommendations in BS 5493, Code of Practice for “Protective coating of iron and steel structures against corrosion,” except as otherwise instructed by manufacturer’s recommendations or this specification.

505B LEAD BASED PAINTS: Do not use.

535 INSPECTION OF COATING WORK
- Work in progress: Permit coating manufacturer to inspect and take samples of products.
- Notice: Give notice of dates for:
  - Start of surface preparation and coating.
  - Coated members or components leaving the works.
  - Period of notice (minimum): 5 working days.

536B INSPECTION AUTHORITY TO BE: - All tests to be carried out by an approved independent tasting authority.

537B INSPECTION REPORTS: Arrange for inspecting authority to submit inspection reports to C.A. at weekly intervals or more frequently as instructed. Reports to include:
  1. List of members inspected.
  3. Dry film thicknesses.
  4. Number of coats applied.
  5. Condition of paint skin as dispatched from works.
  6. Condition of paint skin as erected at site.
  7. Amount of remedial work, if any, required.

538B QUALITY CONTROL: The sub-contractor is to note that he is responsible for ensuring all work is carried out in accordance with the specification, and that the independent inspection reports required by clause G10:536 do not relieve him of that responsibility.

539B PROGRAMME: Notify C.A. and inspecting authority of projected date(s) for start of surface preparation and coating. Give C.A. and inspecting authority at least 7 days notice before coated members or components leave the works.

PROTECTIVE COATING SYSTEMS

601B COATING THICKNESS: The stated coating thickness is the minimum required dry film thickness at each and every location on the surface of the steelwork.

602B NUMBERS OF COATS: The contractor may apply the specified coating in more than one coat, if permitted by the manufacturer's recommendations, and if required by the nature of the work, or the contractor's working methods. The contractor is to allow in his rates for the number of coats he prefers to use.

640A SHOP PAINTING WITH EPOXY ZINC PHOSPHATE
  - Use/ location: All steelwork.
  - Shop preparation:
    - Generally: Blast cleaning to BS EN ISO 8501-1, preparation grade Sa2½.
  - Welds/ edges/ areas with surface imperfections: To BS EN ISO 8501-3, preparation grade P2.
  - Shop primer: Protega Coatings ProtegaShield SPF series epoxy zinc phosphate primer.
    - Dry film thickness: 125 microns.
    - Colour: to be advised.

690B PACKINGS: Are to receive corrosion protection of a standard at least as high as the adjacent steelwork.
695B SITE BOLT COATS AND REPAIR OF DAMAGED AREAS
- Use/location: To all bolts and damaged/unpainted areas of steelwork.
- Paint manufacturer: to Protega recommendations
- Site preparation: Manual as clause 765.
- Site primer and intumescent where specified: To manufacturer’s recommendations to achieve a level of protection at least equal to that specified for the element.

PREPARATION FOR PAINTING

710 OFFSITE PREPARATION AND PAINTING
- Working area: Covered and properly lit, heated and ventilated.
- Sequence of working: Select from the following and submit proposals:
  - Fabricate, blast clean, prime.
  - Blast clean, fabricate, remove flash rust with a light overall sweep blast, prime.
  - Blast clean, apply weldable prefabrication primer, fabricate, prime.
- Prefabrication primer (option 3): Type recommended by manufacturer of post fabrication primer.
  - Thickness of post fabrication primer coat may be reduced if and as recommended by manufacturer.
- Surfaces inaccessible after assembly: Apply full treatment and coating system including, if necessary, local application of site coatings.

720B BLAST CLEANING FOR PAINTING:
- Ensure that steel complies with BS 7079:Part A1 at time of blasting as follows:
  - Dry blasting: Initial rust grade A or B.
  - Wet blasting: Initial rust grade A, B or C.
- Thoroughly degrease. Remove millscale by chipping, grinding and/or heat treatment.
- Blast clean to the specified BS 7079:Part A1 preparation grades, and control quality of preparation in accordance with BS 5493, Appendix F. Use abrasive of suitable type and size, free from contamination by fines, water and oil. Remove abrasive residues.
- Remove all surface defects likely to be detrimental to the protective painting system, including:
  - Defects in the steel, including cracks, surface laminations, shelling and deep pitting as required by BS 4360.
  - Defects resulting from fabrication, including fins at cuts, burrs, sharp edges and weld spatter.
- Apply primer as soon as practicable and while the surface is still in a condition acceptable to the primer manufacturer.

721B BLAST CLEANING of rust-pitted steel: after blast cleaning test to BS 5493, appendix G for contamination by iron salts. If present wash surfaces with clean water. Repeat test and washing as necessary until all traces of salt are removed. Obtain approval before proceeding with painting.

725 MANUAL CLEANING OF NEW STEELWORK
- Preparation: Remove fins, burrs, sharp edges, weld spatter, loose rust and loose scale.
- Surface finish: Clean but unpolished to BS EN ISO 8501-1, grade St 2.
- Finishing: Thoroughly degrease and clean down. Remove any consequent rusting back to grade St 2. Prime without delay.
727B FLAME CLEANING: Do not use:
   1. On or near HSFG bolted joints.
   2. On metal less than 6mm thick.
   3. On metal previously coated with lead based paints.
   4. Where the opposite side of the metal is not to be redecorated.

730 PREPARATION FOR SITE WELDING OF SHOP PAINTED STEELWORK:
   - Blast clean and mask weld areas before coating surrounding areas. If more than one coat is applied to surrounding areas, step each coat 30 mm back from edge of preceding coat. Remove masking immediately before welding.
   - Alternatively prepare and shop paint weld areas as specified, then grind off to bare steel immediately before welding.

735 TREATMENT OF SITE WELDED JOINTS IN PAINTED STEELWORK:
   - After welding, and without delay, remove all scale and weld spatter from the weld areas by grinding or chipping, abrade to remove all traces of rust, wash with clean water and allow to dry.
   - Prime without delay and apply further coatings to the weld areas to match the surrounding painted areas.

740 BOLTED JOINTS (OTHER THAN FRICTION GRIP JOINTS)
   - Steelwork to be shop painted: Apply full shop specification to joint faces.
   - Steelwork to be erected with mill finish then site painted: Before erection, prepare and prime joint faces and allow to dry.
   - Bolted joints in externally exposed steelwork:
     - Immediately before assembling, apply a further coat of primer and bring surfaces together while still wet.
     - After assembling and before applying site coatings, seal crevices to bolts and joint perimeters with a compatible sealant.

755 ALL FASTENINGS: After erection, thoroughly degrease and clean and, without delay, apply coating(s) to match surrounding shop painted areas before applying specified site coating(s).

765 SITE PREPARATION OF SHOP PAINTED STEELWORK
   - Preparation: Touch in shop coats, as necessary, and allow to dry. Before applying site coats (when specified), abrade surfaces or wash down or both, as recommended by paint manufacturer.

PAINTING

800B COATING MATERIALS: To be delivered in sealed containers, clearly labelled with the following information:
   Type of material.
   Brand name, if any.
   Intended use.
   Manufacturer’s batch numbers.
   Relevant safety precautions.

804B CODE OF PRACTICE: Comply with BS 5493, clauses 14, 22, 23, and 24 where not in conflict with manufacturer’s recommendations or this specification.
PREPARATION OF MATERIALS:
1. Do not intermix different coating materials.
2. Do not thin without permission of C.A.
3. Stir to attain an even consistency before use unless otherwise recommended by manufacturers.

CONTAMINATION: Ensure that brushes and spraying equipment are free from deleterious solvents, thinners, and cleaning agents.

ENVIRONMENTAL CONDITIONS
- General requirements prior to starting coating work:
  - Surfaces: Unaffected by moisture or frost.
  - Steel temperature: At least 3°C above dew point, with conditions stable or improving, and not high enough to cause blistering or wrinkling of the coating.
  - Relative humidity: Below 85%.

SPRAY PAINTING: Apply with a gun recommended by the paint manufacturer to give a uniform and continuous film covering all recesses, edges, intersections and surfaces generally.

ROLLER COATING: Do not use for first priming coat of any system.

COATINGS
- Surfaces to be coated: Clean, dust free and suitably dry. Previous coats to be adequately cured.
- Multiple coats of same material: Use different tints to assist checking of complete coverage.
- Penultimate coat: Colour recommended by paint manufacturer to suit top coat colour.
- Finish required: Smooth and even, of uniform thickness and colour, free from defects.

FILM THICKNESS
- Wet film thickness: During application, check thickness of each coat with a wheel or comb gauge used in accordance with BS EN ISO 2808.
- Accumulated dry film thickness: After each coat has dried, check total accumulated film thickness.
  - Method: Magnetic or electromagnetic meter.
  - Number and position of measurements: As directed.
  - Validation: Measurements to be independently witnessed.
  - Meter calibration: Check against standard shims and recalibrate regularly against a smooth steel reference plate.
- Average dry film thickness:
  - At least specified thickness over any square metre.
  - No reading to be less than 75% of specified thickness.
- Top coat dry film thickness: Sufficient to give an even, solid, opaque appearance.

STRIPE COAT
- External angles, nuts, bolt heads, rough weld seams, and areas difficult to coat:
826B COLUMN AND BEAM ENDS: Overlap paint coats applied to the sides of webs and flanges to ensure thorough painting of column and beam ends.

830 COLOUR OF TOP COAT to be selected by CA (unless already specified). Colour of preceding coat to be as recommended by the paint manufacturer to suit the top coat colour.