24060 | **PENZANCE DRY DOCK, PENZANCE**

STRUCTURAL SPECIFICATION

TENDER

September 2024

MBA CONSULTING

Boscawen House, Chapel Hill
Truro, Cornwall
TR1 3BN

01872 260 962

info@mbatruro.co.uk

CONTROL SHEET

ISSUE DETAILS

Revision	Author	Checked by	Date
TENDER	GM	DS	27.09.2024

REVISION DESCRIPTION

Revision	Details
TENDER	Third issue

QUALIFICATIONS

Initials	Full Name	Qualifications
GM	George MURPHY	B.Eng.
DS	David STANFORTH	B.Eng., C.Eng., M.IStructE.

CONTENTS

B50
GENERAL STRUCTURAL REQUIREMENTS

TENDERING

15 INFORMATION TO BE PROVIDED AT TIME OF TENDER

1. Submit the following
   1.1. Technical information: Certification demonstrating compliance with specification of proposed incorporated products and finishes
   1.2. Proposals: Describe and give reasons for any proposals for:
      1.2.1. Additional support or other changes to the supporting structure.
      1.2.2. Changes to the specification.
      1.2.3. Changes to the adjacent building fabric.

GENERAL

120 STRUCTURAL WORK

1. Designated codes of practice: To the Eurocodes or British Standards appropriate to the nature of the structure
2. Design working life: Category 4 to BS EN 1990 Category 4 to BS EN 1990
3. Completed structure generally: To comply with the requirements of the designated codes of practice and the standards referenced therein. Deflections and other structural movements at serviceability limit state to be compatible with requirements of the building fabric, movement joints and weathertightness.
4. Special requirements: See AS.

130 CONTRACTOR'S DESIGN

1. Engineer responsible for overall stability of structure: Submit proposal, including details of qualifications and experience
2. Design supervision/ checking levels: Person who has prepared the design
3. Design requirements: Submissions required for any key assumptions that have been left to the decision of the contractor, e.g. actions.
4. Design quality control: To BS EN ISO 9001
5. Maintenance: Make provision for and submit details of requirements to ensure the safety and serviceability of the structure, including:
   5.1. Critical parts that should be regularly inspected, with recommendations for the frequency of inspection.
   5.2. Elements susceptible to corrosion, mechanical wear or fatigue that may need to be reconstructed or replaced during the design working life of the structure.
   5.3. Means of safe access for maintenance and repair.

150 GROUND INVESTIGATION REPORT

1. Requirement: Consider adequacy of data provided and submit proposals if additional investigation will be necessary to justify design
2. Datum for borehole logs: To be agreed between MBA and Contractor
3. Obstructions and voids: As described in the ground investigation report

PERFORMANCE

220 EXPOSURE TO FIRE

1. Building purpose group: See Architects Specification
   1.1. Height of top floor above ground: As Architects drawing
2. Loadbearing capacity, integrity and insulation: Demonstrate adequacy of the structure to Building Regulations.
   2.1. Criteria: to meet the requirement of the Building Regulations.
3. Reaction to fire of structural elements: To Building Regulations.
   3.1. Requirements (minimum): to meet the requirement of the Building Regulations.

250 LIMITS ON MOVEMENT GENERATED BY CONSTRUCTION

1. Definition of critical values
   1.1. Threshold value: The value beyond which further movement will be of significant concern.
   1.2. Action value: The value at which execution must cease.
2. Precautions: Take as follows if movements reach critical values:
   2.1. Threshold: Review situation, assess possible causes and submit proposals to ensure that action values are not exceeded.
   2.2. Action: Stop work, report and revise working procedures to prevent further movements.

310 DAMAGE TO EXISTING STRUCTURES AND SERVICES

1. Permissible damage criteria
   1.1. Structures: No damage permitted
   1.2. Services: No damage permitted No damage permitted

320 LOADS/ ACTIONS

1. Generally: Specified loads/ actions are characteristic values unless otherwise described.

330 DESIGN LOADS FOR PILES

1. Source: MBA Drawings 24060-11,12,30

430 SNOW LOADS – CONTRACTOR DETERMINED

1. Standard: To BS EN 1991-1-3.
2. Features affecting loads: None in addition to those shown on drawings

470 WIND LOADS/ ACTIONS – CONTRACTOR DETERMINED

1. Standard: To BS 6399-3
   1.1. Factors and coefficients: Appropriate to location, exposure, altitude, building shape and size, and taking account of existing and known future adjacent and/ or attached buildings.
2. Shelter from upwind obstacles: Do not consider
3. Normal design condition of doors and windows: Windows closed, but doors open.
4. Features affecting loads: None other than those shown on the drawings.
5. Special requirements: None.

EXECUTION

700 EXECUTION GENERALLY

1. Standard: Report conflict between specification and the designated codes of practice and the standards referenced therein before ordering affected materials or executing affected work.
2. Inspection levels: To BS EN 1990, Table B5, level IL2.
   2.1. Special requirements: Contractors Designers to identify any special requirements for key elements arising from design.
3. Quality control: To BS EN ISO 9001
4. Tolerances: Notwithstanding tolerances specified elsewhere, do not exceed requirements for compliance with the designated code.

705 CONNECTIONS AND ANCHORAGES

1. End and edge distances and spacing (minimum): Unless otherwise specified or detailed, as required by the designated code of practice for fixings/ anchorages carrying maximum load.
2. Report locations where
   2.1. Type and number of fixings cannot be accommodated.
   2.2. Size or position of members prevents correct positioning.

720 STABILITY DURING EXECUTION

1. Permanent bracing system:
   1.1. Vertical: Braced bays provided along the new frames inside the the building and new portal frames.
   1.2. Horizontal: Diagonal roof bracing transfers lateral forces back to braced bays and frames.
2. Temporary bracing/ restraints: Provide as necessary until permanent bracing system is complete and sufficiently mature to carry loads and all connections have been made to the permanent system.
   2.1. Special requirements: None
3. Design loads: Structure has been designed for the completed state.
   3.1. Magnitude: Request details as necessary
4. Before loading structure: Take into account:
   4.1. Reduction in strength due to immaturity of elements.
   4.2. Reduction in loadbearing capacity due to partial completion of continuous elements.

740 CONDITION SURVEY OF EXISTING BUILDINGS AND STRUCTURES

1. Before starting work: Survey structure. Record and take photographs of damaged or defective areas.
   1.1. Items to be recorded: Location, extent and magnitude of cracks, spalling, indications of movement, previous repairs, modifications and other irregularities of the fabric.
   1.2. Additional investigations: Depth, thickness and extent of existing foundations adjacent to the proposed works to be confirmed on site by contractor. Trial pits to also expose the underside of the existing foundations.
2. Report: Submit for comment.
   2.1. Include recommendations: For repair or monitoring of defects that could adversely affect the proposed works.

760 MONITORING OF EXISTING BUILDINGS/ STRUCTURES

1. Requirement: Visually inspect buildings/ structures for signs of movement, cracking or other indications of distress.
2. Period of inspection: for the duration of the works.
3. Frequency of inspection: Weekly.
4. Record: Date and time of inspections.
5. Action: If movement cracking or other signs of distress are noted stop work, investigate and report.

D20
EXCAVATING AND FILLING

GENERALLY/THE SITE

110 SITE INVESTIGATION

1. Report: Refer to Karn Geoservices Ltd's Ground Investigation Report (ref. 24093, dated July 2024).

145 VARIATIONS IN GROUND WATER LEVEL

1. Give notice: If levels encountered are significantly different from levels in the site investigation report or previously measured.

150 EXISTING SERVICES, FEATURES AND STRUCTURES

1. Services: See section A12 for locations.
2. Site features to be retained: See section A12 for details.
3. Structures: See section A34 for details of protection.

CLEARANCE/EXCAVATING

220 STRIPPING TOPSOIL

1. General: Before beginning general excavation or filling, strip topsoil from areas where there will be regrading, buildings, pavings/ roads and other areas shown on drawings.
2. Depth
    2.1. Remove to an average depth of 300 mm.
    2.2. Give notice where the depth of topsoil is difficult to determine.
3. Handling: Handle topsoil for reuse or sale in accordance with clause 225.
4. Around trees: Do not remove topsoil from below the spread of trees to be retained.
5. Site storage: To be confirmed by on-site contractor.

221 TREATING TOPSOIL

1. Treatment: Apply a suitable translocated nonresidual herbicide.
2. Timing: Not less than two weeks before excavating topsoil.

225 HANDLING TOPSOIL

1. Standard: To BS 3882.
2. Aggressive weeds
   2.1. Species: Notify the presence of species included in the Weeds Act, section 2, or the appropriate Wildlife and Countryside Act for the relevant jurisdiction.
   2.2. Give notice: Obtain instructions before moving topsoil.
3. Contamination: Do not mix topsoil with:
   3.1. Subsoil, stone, hardcore, rubbish or material from demolition work.
   3.2. Other soil or material containing aggressive weeds, sharps, plastics and non soil forming materials and notifiable animal or plant diseases.
   3.3. Oil, fuel, cement or other substances harmful to plant growth.
   3.4. Other classifications of topsoil.
4. Multiple handling: Keep to a minimum. Use topsoil immediately after stripping.

240 ADJACENT EXCAVATIONS

1. Requirement: Where an excavation encroaches below a line drawn at an angle from the nearest formation level of another higher excavation, the lower excavation, all work within it and backfilling thereto, must be completed before the higher excavation is made.
2. Angle of line below horizontal: 30 degrees.
3. Backfill material: As Clause 248 subject to approval by the CA.

242 EXCAVATIONS ADJACENT TO EXISTING BACKFILLED TRENCHES

1. Proximity: When width of undisturbed ground between the two excavations will be less than 1000mm.
2. Action: Assume that the ground between the trenches is unstable and provide side support accordingly.

244 EXCAVATIONS ADJACENT TO EXISTING FOUNDATIONS

1. Prior to commencing excavation
   1.1. Excavate trial pits adjacent to existing foundations to determine extent and formation levels.
   1.2. Allow for inspection of trial pits.
   1.3. Allow time for amendment of details if required.
      1.3.1. Time period: 14 days before final detail required.
2. Backfill material to new excavation: As clause 248.

246 EXCAVATIONS ADJACENT TO PILE SUPPORTED STRUCTURES

1. Proximity: When the formation level of an excavation will be lower than the pile cut off level and the distance between the near faces of the pile cap/ ground beam and the excavation is less than the difference in depth between the pile cap and the excavation formations.
   1.1. Complete all work within the excavation and backfilling before casting the pile cap/ ground beam, or
   1.2. Delay the adjacent excavation until 3 days after casting the pile cap/ ground beam.

248 BACKFILL TO EXCAVATIONS LOWER THAN FOUNDATION FORMATION LEVEL

1. Critical level
   1.1. Distance between near faces of foundation and lower excavation less than 1 m: Not to be undertaken by contractor before MBA are consulted.
   1.2. Otherwise: N/A
2. Backfill material
   2.1. Below critical level: Mass concrete as E10:105.
   2.2. Above critical level: As D20:617.

250 PERMISSIBLE DEVIATIONS FROM FORMATION LEVELS

1. Beneath mass concrete foundations: ±25 mm.
2. Beneath ground bearing slabs and r.c. foundations: ±15 mm.
3. Ground abutting external walls: ±50 mm, but such as to ensure that finished level is not less than 150 mm below dpc.

255 ACCURACY – LINEAR DIMENSIONS

1. Permissible deviations from linear dimensions generally: To be confirmed by Contractor prior to work commencing.

260 INSPECTING FORMATIONS

1. Give notice: Make advance arrangements for inspection of formations for all foundations by Building Control and Geo-technical Engineers.
   1.1. Notice (minimum): To be confirmed by inspecting parties.
2. Preparation: Just before inspection remove the last 150 mm of excavation. Trim to required profiles and levels.
   2.1. Loose material: Remove.
3. Seal: Within 4 hours of inspection, seal formations with minimum 50mm of blinding concrete.
4. Adverse ground conditions of mining features: If identified, report to CA and MBA and await instruction.

265 INSPECTING FORMATIONS IN SAND AND GRAVEL

1. Notice for inspection (minimum): 14 days.
2. Preparation: Just before inspection remove the last 150 mm of excavation. Trim to required profiles and levels and mechanically compact formation.
3. Seal: Within 4 hours of inspection, seal formations with minimum 50mm of blinding concrete.

270 FOUNDATIONS GENERALLY

1. Give notice if
   1.1. A natural bearing formation of undisturbed subsoil is not obtained at the depth shown on the drawings.
   1.2. The formation contains soft or hard spots or highly variable material.

275 FOUNDATION BEARING

1. Requirement: Foundations are designed to bear on:
   1.1. Strata: see geotechnical report.
   1.2. Safe bearing capacity (minimum): see geotechnical report.
2. Give notice: If the material at the design depth of the foundation contains soft or hard spots or highly variable material.

283 FORMATIONS FOR PILE SUPPORTED STRUCTURES

1. Excavate: To the design formation level.
2. Compact: As necessary to ensure formation will support weight of concrete without settlement.
3. Blinding to formation: Lean mix concrete 50mm thick.

285 STEPS IN FOUNDATION FORMATIONS

1. Depth of formation below ground level (minimum)
   1.1. Existing ground level: Refer to Site Investigation Report.
   1.2. Finished ground level: Refer to relevant Architectural and MBA drawings.
2. Step dimensions
   2.1. Distance between steps (minimum): Refer to MBA drawings.
   2.2. Height of step (maximum): Refer to MBA drawings.
   2.3. Length of overlap (minimum): Refer to MBA drawings.

290 FOUNDATIONS IN MADE UP GROUND

1. Depth: Excavate down to a natural formation of undisturbed subsoil.
2. Discrepancy: Give notice if this is greater or less than depth given.

310 UNSTABLE GROUND

1. Generally: Ensure that the excavation remains stable at all times.
2. Give notice: Without delay if any newly excavated faces are too unstable to allow earthwork support to be inserted.
3. Take action: If instability is likely to affect adjacent structures or roadways, take appropriate emergency action.

320 RECORDED FEATURES

1. Recorded foundations, beds, drains, manholes, etc.: to be treated in accordance with NORMS reports and removed where necessary, break out and seal drain ends.
2. Contaminated earth: Remove and disinfect as required by Local Authority.

330 UNRECORDED FEATURES

1. Give notice: If unrecorded foundations, beds, voids, basements, filling, tanks, pipes, cables, drains, manholes, watercourses, ditches, etc. not shown on the drawings are encountered.

337 OLD FOUNDATIONS OR WALLS BENEATH NEW GROUND SUPPORTED SLAB

1. Break out: The old foundation/ wall to a depth below the slab formation level of at least 300mm.
   1.1. Excavate: Soil that has softened on either side of the old wall/ foundation.
2. Backfill: Obtain instructions if depth of fill will be greater than 600 mm, otherwise backfill with compacted hardcore.

360 EXCESS EXCAVATION

1. Excavation taken wider than required
   1.1. Backfill: With type 1 fill as clause D20:617.
2. Excavation taken deeper than required
   2.1. Backfill: With mass concrete as E10:105.

DISPOSAL OF MATERIALS

441 SURPLUS SUBSOIL

1. Excavated material: Stockpile in temporary storage heaps.
2. Retained material: Spread and level surplus subsoil on site.
   2.1. Locations: As indicated on the tender drawings.
3. Remaining material: Remove from site.

450 WATER

1. Generally: Keep all excavations free from water until:
   1.1. Formations are covered.
   1.2. Below ground constructions are completed.
2. Drainage: Form surfaces of excavations and fill to provide adequate falls.
3. Removal of water: Provide temporary drains, sumps and pumping as necessary. Do not pollute watercourses with silt laden water.

454 GROUND WATER LEVEL, SPRINGS OR RUNNING WATER

1. Give notice: If it is considered that the excavations are below the water table.
2. Springs/ Running water: Give notice immediately if encountered.

457 PUMPING

1. General: Do not disturb excavated faces or stability of adjacent ground or structures.
2. Pumped water: Discharge without flooding the site or adjoining property.
3. Sumps: Construct clear of excavations. Fill on completion.
   3.1. Locations: To be confirmed by the contractor and approved by CA.

460 PERMANENT DRAINAGE SYSTEM

1. Disposal of water from the excavations through system: Not permitted

FILLING

500 PROPOSED FILL MATERIALS

1. Details: Submit full details of proposed fill materials to demonstrate compliance with specification, including:
   1.1. Type and source of imported fill.
   1.2. Proposals for processing and reuse of material excavated on site.
   1.3. Test reports as required elsewhere.
2. Timing: 28 days before commencing work.

510 HAZARDOUS, AGGRESSIVE OR UNSTABLE MATERIALS

1. General: Do not use fill materials which would, either in themselves or in combination with other materials or ground water, give rise to a health hazard, damage to building structures or instability in the filling, including material that is:
    1.1. Frozen or containing ice.
    1.2. Organic.
    1.3. Contaminated or noxious.
    1.4. Susceptible to spontaneous combustion.
    1.5. Likely to erode or decay and cause voids.
    1.6. With excessive moisture content, slurry, mud or from marshes or bogs.
    1.7. Clay of liquid limit exceeding 80 and/or plasticity index exceeding 55.
    1.8. Unacceptable, class U2 as defined in the 'Specification for highway works', clause 601.

512 LIMITATION OF SULFATE CONTENT IN FILL MATERIALS

1. Test specification: To be confirmed by contractor to alert Cornwall County Highways requirements and to prevent damage to structures and services.
2. Sulfate content: Expressed as to be confirmed by contractor to alert Cornwall County Highways requirements and to prevent damage to structures and services.
    2.1. Water soluble sulfate (maximum): To be confirmed by contractor to alert Cornwall County Highways requirements and to prevent damage to structures and services.
    2.2. Total potential sulfate (maximum): To be confirmed by contractor to alert Cornwall County Highways requirements and to prevent damage to structures and services.
    2.3. Oxidizable sulfides (maximum): To be confirmed by contractor to alert Cornwall County Highways requirements and to prevent damage to structures and services.
3. Certificates of test result: Submit.

520 FROST SUSCEPTIBILITY

1. General: Except as allowed below, fill must be non frost-susceptible as defined in the 'Specification for highway works', clause 801.8.
2. Test reports: If the following fill materials are proposed, submit a laboratory report confirming they are non frost- susceptible:
    2.1. Fine grained soil with a plasticity index less than 20%.
    2.2. Coarse grained soil or crushed granite with more than 10% retained on a 0.063 mm sieve.
    2.3. Crushed chalk.
    2.4. Crushed limestone fill with average saturation moisture content in excess of 3%.
    2.5. Burnt colliery shale.
3. Frost-susceptible fill: May only be used:
    3.1. At depths below the finished ground surface greater than: 450mm.
    3.2. Within the external walls of buildings below spaces that will be heated. Protect from frost during construction.
    3.3. Where frost heave will not affect structural elements.

525 TESTING OF SUITABILITY OF FILL MATERIALS BEFORE START OF FILLING

1. Laboratory: UKAS/NAMAS approved laboratory.
2. Submit report to: CA
   2.1. Timing: 28 days before ordering materials.
3. Samples: Deliver to laboratory as required.
   3.1. Additional requirements: None.
4. Tests: To be confirmed by contractor to confirm suitability of fill and to meet Cornwall County Highways requirements.
5. Frequency: To be confirmed by contractor to confirm suitability of fill and to meet Cornwall County Highways requirements.

530 PLACING FILL

1. Surfaces of excavations and areas to be filled: Free from loose soil, topsoil, organic material, rubbish and standing water.
2. Freezing conditions: Do not place fill on frozen surfaces. Remove material affected by frost. Replace and recompact if not damaged after thawing.
3. Adjacent structures, membranes and buried services
   3.1. Do not overload, destabilise or damage.
   3.2. Submit proposals for temporary support necessary to ensure stability during filling.
   3.3. Allow 14 days (minimum) before backfilling against in situ concrete structures.
4. Layers: Place so that only one type of material occurs in each layer.
5. Earthmoving equipment: Vary route to avoid rutting.

535 COMPACTION GENERALLY

1. General: Compact fill not specified to be left loose as soon as possible after placing.
2. After compaction: Surface of each layer must be well closed, showing no movement under compaction plant, and without cracks, holes, ridges, loose material and the like.
3. Defective areas: Remove and recompact to full thickness of layer using new material.

540 BENCHING IN FILL

1. Adjacent areas: If, during filling the difference in level between adjacent areas of filling exceeds 600 mm, cut into edge of higher filling to form benches 600 mm minimum width and height equivalent to depth of a layer of compacted filling.
2. New filling: Spread and compact to ensure maximum continuity with previous filling.

617 TYPE 1 UNBOUND MIXTURE

1. Fill: To 'Specification for highway works', clauses 801 and 803:
   1.1. Crushed rock (other than argillaceous rock).
   1.2. Coarse crushed concrete aggregate.
   1.3. Recycled aggregates.
   1.4. Crushed non-expansive slag to clause 801.2.
   1.5. Well-burned non-plastic colliery shale.
2. Amendments to requirements in the 'Specification for highway works': to meet Cornwall County Highways requirements.
3. Filling: To 'Specification for highway works', clause 802.

620 SUBGRADE IMPROVEMENT LAYER (CAPPING)

1. Fill: To 'Specification for highway works', Table 6/1, Class 6F1 or 6F2.
2. Filling: Place and compact to MCHW Volume 1: 'Specification for highway works' (SHW), Table 6/1, clause 612 and clause 613.3, 613.9 and 613.10.

626 COMPACTED GENERAL FILL

1. Suitable material: To Highways Agency 'Specification for highway works', Table 6/1, Class 6F1 or 6F2.
   Suitable selected free draining site won material.
2. Excavated material: Select suitable material and keep separate.
3. Filling: Spread and level material in layers. As soon as possible thoroughly compact each layer.
4. Proposals: Well in advance of starting work submit details of proposed:
   4.1. Materials to be used, including quantities of each type.
   4.2. Type of plant.
   4.3. Maximum depth of each compacted layer.
   4.4. Minimum number of passes per layer.

640 STARTER LAYER OF COMPACTED FILLING

1. Fill: Suitable hard granular material. Compact thoroughly.
2. Thickness: 150mm.

650 PROTECTION OF COMPACTED FILLING

1. Temporary protective filling: Before allowing construction traffic, raise level of compacted cohesive soil filling at least 150 mm above formation level using properly compacted temporary filling.
2. Removal: Remove temporary protective filling from site before permanent construction.

700 BACKFILLING AROUND FOUNDATIONS

1. Under oversite concrete and pavings: Hardcore as clause 710.

710 HARDCORE FILLING

1. Fill: Granular material, free from excessive dust, well graded, all pieces less than 75 mm in any direction:
   1.1. Test requirements
      1.1.1. Minimum 10% fines value tested in a soaked condition to BS 812-111 50 kN.
2. Material
   2.1. Permitted materials in any one layer
      2.1.1. Crushed rock (other than argillaceous rock) or quarry waste with not more binding material than is required to help hold the stone together.
      2.1.2. Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
      2.1.3. Crushed non-expansive slag.
      2.1.4. Gravel or hoggin with not more clay content than is required to bind the material together, and with no large lumps of clay.
      2.1.5. Well-burned non-plastic colliery shale.
      2.1.6. Natural gravel.
      2.1.7. Natural sand.
3. Filling: Spread and level in 150 mm maximum layers. Thoroughly compact each layer.

715 VENTING HARDCORE LAYER

1. Fill: Clean granular material, well graded, passing a 75 mm BS sieve but retained on a 20 mm BS sieve. In each layer only one of the following:
   1.1. Crushed hard rock.
   1.2. Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
   1.3. Gravel.
2. Filling: Spread and level in 150 mm maximum layers. Thoroughly compact each layer whilst maintaining enough voids to allow efficient venting.

730 BLINDING

1. Surfaces to receive sheet overlays or concrete:
2. Blind with
   2.1. Concrete where shown on drawings; or
3. Sand, fine gravel, or other approved fine material applied to fill interstices. Moisten as necessary before final rolling to provide a flat, closed, smooth surface.
4. Sand for blinding: To BS EN 12620, grade 0/4 or 0/2 (MP).
5. Permissible deviations on surface level: +0, -25mm.

D30
PILING

GENERAL

110 PILING SPECIFICATION

1. Standard: Comply with the current edition of 'Specification for piling and embedded retaining walls' (SPERW).
2. Substitution of British Standard for SPERW requirements by the proposed substitutions to be submitted to the CA for comment.
3. References to Engineer in SPERW: For the purpose of this contract, interpret such references as being to the person named in section A10 as administering the Contract on behalf of the Employer.

130 PILES

1. Standard: To SPERW, sections B2-B9, as appropriate to the pile type.
2. Permitted types: It is anticipated that a rotary bored cast -in place ODEX casing piling system will be best suited to the works. This comprises a sacrificial casing being installed through the soil zone (to ensure stability of the hole as recommended by the geotechnical engineer) and the piles filled with reinforced cement grout.
3. Project specification: Submit proposals to cover the SPERW requirements in clause B1.2 and listed under this heading for the chosen pile type.
4. Other requirements:
    1. Contractor/specialist supplier is responsible for the design and installation of the temporary piling mat to accommodate the piling rig required for their installation.
    2. The piling works are to be based on an all risk price.
    3. The piling contractor is to review MBA scheme and advise of any locations where piles cannot be installed on site due to geometrical restrictions associated with the drilling machinery being used. MBA to be notified of potential issues as part of Contractor's tender submission.
    4. The contractor should be aware of the spatial restrictions within the building and provide a suitable proposal to facilitate the piling installation.

195 PROTECTION AGAINST AGGRESSIVE GROUND/ GROUND WATER

1. Purpose: To protect buried concrete
2. Piles to be treated: All
3. Aggressive strata/ source of attack: see Geotechnical Engineers report
4. Extent of treatment: Full length of pile

SYSTEM PERFORMANCE

210 CONTRACTOR DESIGN

1. Structural requirements
   1.1. Generally: As section B50.
   1.2. Modifications: None
2. Design responsibility
   2.1. Piles: Complete design of piles in accordance with SPERW, clause B1.4, option 2
   2.2. Other: None
3. Pile layout: As identified on MBA Drawings
4. Pile design criteria: As clauses 130 and to suit the chosen pile type
5. Other requirements: None
6. Submission of information: As required by SPERW, table B1.1 and elsewhere, as appropriate for the pile type, materials and tests specified.
   6.1. Amendments to requirements specified in SPERW for information required
      6.1.1. Prior to commencing design: None
      6.1.2. Prior to commencing the works: None

240 ADDITIONAL GROUND INVESTIGATION

1. The Contractor is to allow for any additional site investigation considered necessary to complete the pile design.
2. Information required: To be confirmed by the Contractor
3. Extent of investigation
   3.1. Piles: To be advised by the Contractor
      3.1.1. Frequency of sampling/ testing: To be confirmed by the Contractor

270 FOUNDATION WORKING LOADS

1. Load magnitude: Refer to MBA drawings for dead, imposed and combined loads.
2. Required factor of safety (minimum): submit proposals
3. Requirements for load testing
   3.1. Preliminary test: Submit proposals
   3.2. Proof test: Submit proposals
4. Performance criteria for piles: Complete and submit SPERW, table B1.2

290 BASIS FOR SETTING OUT

1. Site datum: Ordnance datum
2. Site grid: As drawings

300 COMMENCING SURFACE

1. Level: To be confirmed by Contractor based on design information provided

310 PILE LENGTH – PENETRATION

1. Pile group designation:
2. Pile cut-off level: As per MBA drawings
   2.1. Stratum: As identified in Geotechnical Report
   2.2. Penetration of pile into stratum (minimum): As required from Contractor Design
   2.3. Other requirements: None

340 INSTALLATION TOLERANCES FOR PILES

1. Requirement: Substitute the following for the standard installation tolerances given in SPERW, table B1.4: No substitutions.
2. Application/ reason: None

PRODUCTS

440 PERMANENT CASING

1. Reasons for use: Ground support
2. Casing
   2.1. Material: Contractor's choice
   2.2. Diameter: to suit contractor design
   2.3. Thickness: to suit contractor design
   2.4. Length: for extent of fill/made ground and gravel layers down to competent bedrock suitable for commencement of rock socket
   2.5. Coating: Not required
   2.6. Joints: Butt-welded
3. Method of installation: to suit contractor installation procedure
4. Backfilling of annulus
   4.1. Between casing and ground: Not required
   4.2. Between casing and pile: Not applicable

470 CONCRETE GENERALLY

1. Standards: To BS 8500-2 and SPERW, section B21.
2. Project compressive strength testing of concrete: Required as SPERW, clause B21.8
3. Exchange of information: Provide concrete producer with information required by BS 8500-1, clauses 4 and 5.

480 DESIGNED CONCRETE

1. Description: To all Piles
2. Embedded metal: as required to contractor design
3. Compression strength class (cylinder/ cube minimum): as required to contractor design
4. Target density (oven-dry): Normal.
5. Fibres: contractor to submit proposals
6. Aggregates
   - 6.1. Size (maximum): as required to contractor design
   - 6.2. Type/ Density: Normal weight.
   - 6.3. Coarse crushed concrete aggregates (CCA): as required to contractor design
   - 6.4. Additional aggregate requirements: as required to contractor design
7. Design chemical class: As ground investigation report
8. Limiting values for composition
   - 8.1. Water:cement ratio (maximum): to be determined by contractor
   - 8.2. Cement/ Combination content (minimum): to be determined by contractor
   - 8.3. Cement/ Combination content (maximum): to be determined by contractor
   - 8.4. Air content in situ (minimum): No requirement
9. Consistence class: to be determined by contractor
10. Permitted cement/ combinations: to be determined by contractor
11. Chloride class: to be determined by contractor
12. Admixtures: to be determined by contractor
13. Additional requirements: to be determined by contractor

510 CEMENT GROUT

1. Standard: To SPERW, section B21.
2. Compressive strength: to suit contractors design
3. Cement: to suit contractors design
4. Limiting values for composition
   - 4.1. Water:cement ratio (maximum): to suit contractors design
5. Admixtures: to suit contractors design
6. Properties of fresh grout: to suit contractors design
7. Temperature at grouting: to suit contractors design
8. Other requirements: to suit contractors design

530 REINFORCEMENT GENERALLY

1. Steel reinforcement: To BS 4449.
   - 1.1. Type/ Strength grade: to be confirmed by contractor
2. Cutting and bending: To BS 8666.
3. Lap lengths (minimum): to be confirmed by contractor
4. Supplier: Firm holding a valid certificate of approval issued under a product certification scheme operated by a third-party certification body with appropriate Category 2 accreditation from the United Kingdom Accreditation Service (UKAS).
5. Other requirements: Debond reinforcement required above cut-off level, and clean off debonding agent when pile has been trimmed

540 COVER TO REINFORCEMENT

1. Cover (nominal): to contractors specification to suit exposure class and required longevity.
2. Method of ensuring correct cover: Submit details.

550 LAPS IN REINFORCEMENT

1. Length (minimum): 40 x bar diameter unless achieved by other means (i.e. couplers). Contractor to submit proposals.

EXECUTION

610 METHOD STATEMENT

1. Requirement: Submit proposed method of installation to achieve the design parameters, including:
   1.1. Details of equipment.
   1.2. Programme showing sequence and resources.
   1.3. Confirmation that performance requirements for load and settlement will be achieved.

615 RECORDS AND SUBMISSION OF INFORMATION DURING THE WORKS

1. Generally: As required in SPERW, tables B1.1, B1.6 and elsewhere, as appropriate for the pile types, materials and tests specified.
2. Amendments to requirements: None

617 ADDITIONAL SAMPLING AND TESTING OF MATERIALS

1. Material: to be confirmed by Contractor
   1.1. Requirements: to be confirmed by Contractor
   1.2. Acceptance criteria: to be confirmed by Contractor
   1.3. Frequency of sampling/ testing: to be confirmed by Contractor
2. Reporting: to be confirmed by Contractor

620 WELDING PROCEDURE

1. Requirements additional to SPERW, section B8: None.

625 NON-DESTRUCTIVE TESTING OF WELDS

1. Requirements: To SPERW, clause B8.6.
   1.1. Erratum: Substitute BS EN ISO 5817 for BS EN 5817.
   1.2. Additional requirements: None
2. Exceptions to requirements of BS EN 12063, table 1: None

650 PERFORMANCE OF WORKING PILES

1. Substandard performance: Give notice if the performance of any pile is likely to be less than that of a similar pile when its test behaviour has been accepted

685 EXCAVATED MATERIAL

1. Disposal: Stockpile in temporary spoil heaps on-site, according to soil type. Contractor's responsibility

690 DISPOSAL OF PILE HEADS

1. Cutting down and disposal: Contractor's responsibility.

770 DYNAMIC/ RAPID TESTING OF PILES

1. Type of test: Contractor's choice
2. Pile group designation: All
   - 2.1. Number of piles to be tested: Allowance to be made for testing 25% of all piles distributed across the site. If, upon receipt of the installation logs, the pile lengths follow a consistent profile across the site and there are no anomalies, MBA may permit a reduction in test percentage. Any reduction in testing percentage is to be agreed in writing with MBA.
   - 2.2. Locations: Distributed across the site and to target any pile anomalies. Installation logs to be issued to MBA for review, then test locations agreed with contractor.
   - 2.3. Pile construction: As working pile
   - 2.4. Test procedure/ standards: As per recognized guidance for type of test.
     - 2.4.1. Energy imparted to pile: to be advised by contractor
     - 2.4.2. Number of tests per pile (minimum): to be submitted to MBA
3. Programme: to be advised by contractor to suit type of test selected.
4. Results: To be submitted to MBA
5. Other requirements: None.

785 AXIAL MAINTAINED LOAD PROOF TESTING OF WORKING PILES

1. Type of test: to be advised by contractor
2. Pile group designation: All
   - 2.1. Number of tests: as 770
   - 2.2. Test pile construction: as general
   - 2.3. Test load (maximum): refer to MBA drawings
3. Special requirements: None

810 TIMING OF PILE LOAD TESTING

1. Period between installation and load testing (minimum): Adequate to allow grout/concrete to reach specified 28 day strength.
2. Dynamic and rapid load testing:

815 REMOVAL OF TEMPORARY WORKS USED FOR TESTING

1. Period between completion of piles and removal of temporary works: to be removed upon completion

825 WORK TO PILE HEADS AFTER TESTING

1. Working Piles: Any damage to head caused by the tests to be made good or top of pile cut down to permit the connection of starter bars - dependent on levels.

COMPLETION

910 HEALTH AND SAFETY FILE

1. Piling completion report: Collate and submit a full set of pile records for inclusion in the health and safety file.

2. Content and date for submission: As SPERW, clause B1.12.2.
   2.1. Record plan: Give the number of each pile and its final location relative to nearest grid line.
   2.2. Additional requirements: None

920 PILING GUARANTEE

1. Type: Insurance backed. Administered by an independent insurance protection company.
   1.1. Guarantee period (minimum): 12 years from completion
   1.2. Documentation: Provide certificates/ guarantees at completion of piling works.

E05
IN SITU CONCRETE CONSTRUCTION GENERALLY

TO BE READ WITH GENERAL CONDITIONS.

220 STRUCTURAL DESIGN PROVIDED

1. Description: Refer to MBA drawings
2. Requirements
   2.1. Generally: As section B50.
   2.2. Additional requirements: MBA to inspect all reinforcement prior to pouring concrete. Contractor to confirm reinforcement inspection dates / times to MBA at least 5 working days in advance. Contractor to allow enough time between inspection and proposed concrete pour date to allow for nay issues identified to be rectified.
3. Production/ execution records: In accordance with the designated code of practice

225 TEMPERATURE RECORDS

1. Requirement: Throughout period of concrete construction record:
   1.1. Daily: Maximum and minimum atmospheric shade temperatures
   1.2. Under adverse temperature conditions: Temperature at commencement and end of placing.
2. Equipment: Submit Proposals
   2.1. Location: In the shade, close to the structure.

235 OPENINGS, INSERTS AND FIXINGS

1. Requirement: Collate all information.
2. Submit: Details where openings, inserts and fixings can only be accommodated by adjustments to reinforcement.
3. Locate reinforcement: To ensure specified minimum cover at openings and inserts and to be clear of fixing positions.

290 ACCURACY OF CONSTRUCTION

1. Setting out: To BS 5964-1.
2. Geometrical tolerances: To BS EN 13670, Tolerance Class 1
   2.1. Conflicts: Notwithstanding tolerances specified elsewhere, do not exceed requirements for compliance with the designated code of practice.
   2.2. Substitution of alternative requirements: In addition, the requirements of the National Structural Concrete Specification (Third Edition, 2004) are to be met. Contractor to achieve or exceed all requirements of Section 7 (Construction accuracy) of this publication. In conjunction with meeting the requirements of this document - a maximum deviation of +/- 7.5mm on any formed concrete face from its intended position is to be achieved at all concrete works above foundation level.

300 LEVELS OF STRUCTURAL CONCRETE FLOORS

1. Tolerances (maximum)
   1.1. Level of floor: +/- 5mm.
   1.2. Steps in floor level: Subject to approval.

310 SURFACE REGULARITY OF CONCRETE FLOORS TO BS 8204 - GENERAL

1. Standard: To BS 8204-1 or -2.
2. Measurement: From underside of a 2 m straightedge (between points of contact) placed anywhere on surface and using a slip gauge.

315 SURFACE REGULARITY OF CONCRETE FLOORS TO BS 8204 - TOLERANCE CLASS

1. Location: All concrete floors.
2. Abrupt changes: Not permitted

410 IN SITU CONCRETE CONSTRUCTION - SUPERVISION/ CHECKING

1. Standard: To BS EN 13670, Execution Class 2

430 SURFACE CRACKING

1. Method of measurement: Graduated magnifying device or feeler gauges
2. Maximum crack width: 0.3 mm
3. Action: Should cracks occur that are wider than the maximum crack width:
   3.1. Survey: Frequency and extent of such cracks and investigate cause.
   3.2. Report: Findings together with recommendations for rectification.

E10
MIXING/CASTING/CURING IN SITU CONCRETE

CONCRETE

101 SPECIFICATION

1. Concrete generally: To BS 8500-2.
2. Exchange of information: Provide concrete producer with information required by BS 8500-1, clauses 4 and 5.

105 DESIGNATED CONCRETE FOR MASS CONCRETE AND BLINDING

1. Designation: GEN 1
2. Fibres: Not Required
3. Aggregates
   - 3.1. Size (maximum): 20mm
   - 3.2. Coarse recycled aggregates: Permitted
   - 3.3. Additional aggregate requirements: None
4. Special requirements for cement/ combinations: None
5. Consistence class: To suit placement
6. Chloride class: Normal
7. Admixtures: N/R
8. Additional mix requirements: None

132 DESIGNED CONCRETE FOR ALL REINFORCED CONCRETE WORKS.

1. Embedded metal: As MBA Drawings
2. Compressive strength class (cylinder/ cube minimum): Refer to MBA Drawings
3. Target density (oven-dry): Normal
4. Fibres: Not required.
5. Aggregates
   - 5.1. Size (maximum): 20mm
   - 5.2. Type/ Density: Normal weight
   - 5.3. Coarse recycled aggregates: Permitted
   - 5.4. Additional aggregate requirements: None
6. Design chemical class: DC-1
7. Limiting values for composition
   - 7.1. Water:cement ratio (maximum): 0.45
   - 7.2. Cement/ combination content (minimum): 380 kg/m³
   - 7.3. Cement/ combination content (maximum): 420 kg/m³
   - 7.4. Air content in situ (minimum): No requirement
8. Consistence class: To suit method of placement
9. Permitted cement/ combinations: IIIB, IVB-P, IVB-Q, IVB-V
10. Chloride class: CL0.3
11. Admixtures: N/R
12. Colour: N/R

13. Additional mix requirements: None

MATERIALS, BATCHING AND MIXING

215 READY-MIXED CONCRETE

1. Production plant: Currently certified by a body accredited by UKAS to BS EN ISO/IEC 17065 for product conformity certification of ready-mixed concrete.
2. Source of ready-mixed concrete: Obtain from one source if possible . Otherwise, submit proposals.
   2.1. Name and address of depot: Submit before any concrete is delivered.
   2.2. Delivery notes: Retain for inspection.
3. Declarations of nonconformity from concrete producer: Notify immediately.

221 INFORMATION ABOUT PROPOSED CONCRETES

1. Submit when requested
   1.1. Details listed in BS 8500-1, clause 5.2.
   1.2. Additional information: N/R

225 CHANGES TO SPECIFICATION

1. Changes to specification of fresh concrete (outside concrete producer's responsibility): Not permitted

230 INTERRUPTION OF SUPPLY DURING CONCRETING

1. 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.
2. Elsewhere
   2.1. Preparation: Manage pour to have a full face, and have materials available to form an emergency construction joint while concrete can still be worked.
   2.2. Before pour is completed: Submit location and details of joint, make proposals for joint preparation.

415 ADMIXTURES

1. Calcium chloride and admixtures containing calcium chloride: Do not use.

490 PROPERTIES OF FRESH CONCRETE

1. Adjustments to suit construction process: Determine with concrete producer . Maintain conformity to the specification.

PROJECT TESTING/ CERTIFICATION

505 PROJECT TESTING OF CONCRETE - GENERAL

1. Testing: Concrete cube strengths
   1.1. Nonconformity: Obtain instructions immediately.
2. Recording: Maintain complete correlated records including:
   2.1. Concrete designation.
   2.2. Sampling, site tests, and identification numbers of specimens tested in the laboratory.
   2.3. Location of the parts of the structure represented by each sample.
   2.4. Location in the structure of the batch from which each sample is taken.

508 REGULAR PROJECT TESTING OF CONCRETE

1. Tests: Compressive strength
2. Sampling
   2.1. Point: At point of discharge from delivery truck
   2.2. Rate: One sample to be taken from every 12 m³ of concrete placed but not less than 1 sample for every day of concreting. 1 sample to constitute 2No cubes minimum. Contractor may increase number of cubes as required.
3. Other requirements: None

520 TESTING LABORATORY

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

530 TESTS RESULTS

1. Submission of reports: Within one day of completion of each test.
   1.1. Number of copies: 2
2. Reports on site: A complete set, available for inspection.

550 BROKEN CUBES FROM FAILED STRENGTH TESTS

1. Nonconformity: Keep separately the pieces of each cube which fail to meet the conformity requirements for individual results.
2. Period for keeping cubes: Obtain instructions.

PLACING/ COMPACTING/ CURING AND PROTECTING

610 CONSTRUCTION/ SEQUENCE/ TIMING REQUIREMENTS

1. No items of plant or materials to be stored on slabs without MBA approval .

620 TEMPERATURE OF CONCRETE

1. Application: All structural concrete.
2. Objective: Limit maximum temperature of concrete to minimize cracking during placing, compaction and curing. Take account of:
   2.1. High temperatures and steep temperature gradients: Prevent build-up during first 24 hours after casting. Prevent coincidence of maximum heat gain from cement hydration with high air temperature and/ or solar gain.
   2.2. Rapid changes in temperature: Prevent during the first seven days after casting.
3. Proposals for meeting objective: Submit.

630 PREMATURE WATER LOSS

1. Requirement: Prevent water loss from concrete laid on absorbent substrates.
   1.1. Underlay: Select from:
      1.1.1. Polyethylene sheet: 250 micrometres thick.
      1.1.2. Building paper: To BS 1521, grade B1F.
   1.2. Installation: Lap edges 150 mm.

640 CONSTRUCTION JOINTS

1. Location of joints: To be proposed by Contractor at Tender stage, for MBA comment and approval.
2. Preparation of joint surfaces: As section E40

648 ADVERSE TEMPERATURE CONDITIONS

1. Requirement: Submit proposals for protecting concrete when predicted ambient temperatures indicate risk of concrete freezing or overheating.

650 SURFACES TO RECEIVE CONCRETE

1. Cleanliness of surfaces immediately before placing concrete: Clean with no debris, tying wire clippings, fastenings or free water.

660 INSPECTION OF SURFACES

1. Notice: Give notice to allow inspections of reinforcement and surfaces before each pour of concrete.
   1.1. Period of notice: Obtain instructions.
2. Timing of inspections: When reinforcement and formwork are ready for concreting but in advance of pouring to enable reinforcement to be corrected if required.

670 TRANSPORTING

1. General: Avoid contamination, segregation, loss of ingredients, excessive evaporation and loss of workability. Protect from heavy rain.
2. Entrained air: Anticipate effects of transport and placing methods in order to achieve specified air content.

680 PLACING

1. Records: Maintain for time, date and location of all pours.
2. Timing: Place as soon as practicable after mixing and while sufficiently plastic for full compaction.
3. Temperature limitations for concrete: 30°C (maximum) and 5°C (minimum), unless otherwise specified. Do not place against frozen or frost covered surfaces.
4. Continuity of pours: Place in final position in one continuous operation up to construction joints. Avoid formation of cold joints.
5. Discharging concrete: Prevent uneven dispersal, segregation or loss of ingredients or any adverse effect on the formwork or formed finishes.
6. Thickness of layers: To suit methods of compaction and achieve efficient amalgamation during compaction.
7. 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

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

700 LIGHTWEIGHT AGGREGATE CONCRETE

1. Placing and compacting: Prevent flotation of coarse aggregate and formation of excessive blowholes.

720 VIBRATORS

1. General: Maintain sufficient numbers and types of vibrator to suit pouring rate, consistency and location of concrete.
2. External vibrators: Obtain approval for use.

730 PLASTIC SETTLEMENT

1. 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.
    1.1. Timing: During the first few hours after placing and whilst concrete is still capable of being fluidized by the vibrator.
2. Removal of cracks: Revibrate concrete.

810 CURING GENERALLY

1. Requirement: Keep surface layers of concrete moist throughout curing period, including perimeters and abutments, by either restricting evaporation or continuously wetting surfaces of concrete.
    1.1. Surfaces covered by formwork: Retain formwork in position and, where necessary to satisfy curing period, cover surfaces immediately after striking.
    1.2. Top surfaces: Cover immediately after placing and compacting. If covering is removed for finishing operations, replace it immediately afterwards.
2. Surface temperature: Maintain above 5°C throughout the specified curing period or four days, whichever is longer.
3. Records: Maintain details of location and timing of casting of individual batches, removal of formwork and removal of coverings. Keep records on site, available for inspection.

811 COVERINGS FOR CURING

1. Sheet coverings: Suitable impervious material.
2. Curing compounds: Selection criteria:
    2.1. Curing efficiency: Not less than 75% or for surfaces exposed to abrasion 90%.
    2.2. Colouring: Fugitive dye.
    2.3. Application to concrete exposed in the finished work: Readily removable without disfiguring the surface.
    2.4. Application to concrete to receive bonded construction/ finish: No impediment to subsequent bonding.
3. 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

1. Deep lifts or large volume pours: Submit proposals for curing to prevent early age thermal cracking, taking account of:
    1.1. Temperature differentials across sections.
    1.2. Coefficient of thermal expansion of the concrete.
    1.3. Strain capacity of the concrete mix (aggregate dependent).
    1.4. Restraint.

820 CURING PERIODS

1. General: Curing periods are in days (minimum) .
   1.1. Definition of 't': The average surface temperature of concrete in degrees Celsius during the curing period.
2. Curing periods for concrete made using CEM1 strength class 42.5 or 52.5, or SRPC class 42.5
   2.1. Drying winds or dry, sunny weather (relative humidity < 50%): 140/(t+10)
   2.2. Intermediate conditions (relative humidity between 50 and 80%): 100/(t+10)
   2.3. Damp weather, protected from sun and wind (relative humidity > 80%): 100/(t+10)
3. Curing periods for concrete made using cements listed in BS8500-1, Table A.6 except for those listed above and for supersulfated cement
   3.1. Drying winds or dry, sunny weather (relative humidity < 50%): 180/(t+10)
   3.2. Intermediate conditions (relative humidity between 50 and 80%): 140/(t+10)
   3.3. Damp weather, protected from sun and wind (relative humidity > 80%): 100/(t+10)
4. Curing periods: For concretes using admixtures or other types of cements/ combinations: Submit proposals.
5. Other requirements: None

840 PROTECTION

1. Prevent damage to concrete, including
   1.1. Surfaces generally: From rain, indentation and other physical damage.
   1.2. Surfaces to exposed visual concrete: From dirt, staining, rust marks and other disfiguration.
   1.3. Immature concrete: From thermal shock, physical shock, overloading, movement and vibration.
   1.4. In cold weather: From entrapment and freezing expansion of water in pockets, etc.

E20
FORMWORK FOR IN SITU CONCRETE

GENERALLY/ PREPARATION

110 LOADINGS

1. Requirement: Design and construct formwork to withstand the worst combination of the following:
   1.1. Total weight of formwork, reinforcement and concrete.
   1.2. Construction loads including dynamic effects of placing, compacting and construction traffic.
   1.3. Wind and snow loads.

132 PROPPING

1. General: Prevent deflection and damage to the structure. Carry down props to bearings strong enough to provide adequate support throughout concreting operations.
2. Method statement: Submit proposals for prop bearings and sequence of propping/ repropping and backpropping.
   2.1. Timing of submission: 28 days before commencing concrete works.

145 PERMANENT FORMWORK

1. Location and materials: Submit proposals.
2. Standard: Design profiled steel shuttering as permanent formwork in accordance with BS EN 1993-1-3.

170 WORK BELOW GROUND FOR GROUND BEAMS

1. Casting vertical faces against faces of excavation: Contractor to submit proposals
   1.1. Requirements: Cover to suit method of placement

CONSTRUCTION

310 ACCURACY

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

315 SUBSTRUCTURE FORMWORK AND UNDERSLAB INSULATION

1. Cutting: Neat and accurate to edges, and around penetrations and downstands.
2. Laying: Tightly butted and fully supported on firm, even substrate.
3. Vertical faces: Stiffen as necessary to act as shutter.
4. Formwork/ insulation surfaces: Protect from indentation by spacers and other items.
5. Joints in formwork/ insulation and with edge structure and penetrations: Seal to prevent penetration of concrete.
6. Concrete placement: Restrain formwork/ insulation against movement.

320 JOINTS IN FORMS

1. Requirements including joints in form linings and between forms and completed work
   1.1. Prevent loss of grout, using seals where necessary.
   1.2. Prevent formation of steps. Secure formwork tight against adjacent concrete.

330 INSERTS, HOLES AND CHASES

1. Positions and details
   1.1. Dimensioned on drawings provided on behalf of the Employer: Do not change without consent.
   1.2. Undimensioned or from other sources: Submit proposals.
2. Positioning relative to reinforcement: Give notice of any conflicts well in advance of placing concrete.
3. Method of forming: Fix inserts or box out as required. Do not cut hardened concrete without approval.

340 KICKERS

1. Method statement: Submit proposals including means of achieving quality of concrete consistent with that specified for the column or wall.
   1.1. Kicker height: 100 mm

350 FORM TIES

1. Metal associated with form ties/ devices: Prohibited within cover to reinforcement. Compatible with reinforcement metal.

470 RELEASE AGENTS

1. General: Achieve a clean release of forms without disfiguring the concrete surface.
2. 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.
3. Protection: Prevent contact with reinforcement, hardened concrete, other materials not part of the form face, and permanent forms.

480 SURFACE RETARDERS

1. Use: Obtain approval.
2. Reinforcement: Prevent contact with retarder.

STRIKING

510 STRIKING FORMWORK

1. Timing: Prevent any disturbance, damage or overloading of the permanent structure.

521 MINIMUM PERIOD FOR RETAINING FORMWORK/ TEMPORARY SUPPORTS IN POSITION

1. Concrete strength at time of formwork removal (minimum): Contractor to submit proposals
2. Assumptions: Contractor to submit proposals
   2.1. Before removing formwork: Submit proposals if assumptions will not be realised.
3. Method to be used in assessing early age strength of concrete: Contractor to submit proposals

FORMED FINISHES

610 BASIC FINISH

1. Location: Faces below ground level
2. Finish: Faces fully compacted and cover to reinforcement provided.

620 PLAIN FINISH

1. Location: Surfaces to be tool finished
2. Finish: Even and dense. Arrange formwork panels in a regular pattern as a feature of the surface.
3. Permissible deviation of surfaces
   3.1. Sudden irregularities (maximum): 3 mm.
   3.2. Gradual irregularities (maximum): 6 mm, when measured from the underside of a 3 m straightedge, placed anywhere on surface.
4. Variations in colour
   4.1. Permitted: Those caused by impermeable formwork linings.
   4.2. Not permitted: Those caused by contamination or grout leakage.
5. Surface blemishes
   5.1. Permitted: Blowholes less than 10 mm in diameter and at an agreed frequency.
   5.2. Not permitted: Voids, honeycombing, segregation and other large defects.
6. Formwork tie holes: In a regular pattern and filled with matching mortar.

710 FINISH FOR TOOLING

1. Finish: Even with accurate, true and even joints.
2. Permissible deviation of surfaces
   2.1. Gradual irregularities when measured from the underside of a 1 m straightedge, placed anywhere on surface (maximum): 5 mm.
3. Cover spacers: Submit proposals
4. Surface blemishes
   4.1. Permitted: Blowholes less than 10 mm in diameter and at an agreed frequency.
   4.2. Not permitted: Voids, honeycombing, segregation and other large defects.
5. Formwork tie holes: In a regular pattern and filled with matching mortar.

E30
REINFORCEMENT FOR IN SITU CONCRETE

REINFORCEMENT

110 QUALITY ASSURANCE OF REINFORCEMENT

1. Standards
   1.1. Reinforcement: To BS 4449, BS 4482, BS 4483 or BS 6744.
   1.2. Cutting and bending: To BS 8666.
2. Source of reinforcement: Companies holding valid certificates of approval for product conformity issued by the UK Certification Authority for Reinforcing Steels (CARES).

140 PLAIN BAR REINFORCEMENT FOR DOWEL BARS ONLY (IF SPECIFIED)

1. Standard: to BS 4482
   1.1. Strength grade: B500B

150 RIBBED BAR REINFORCEMENT

1. Standard: To BS 4449.
   1.1. Strength grade: B500B

160 GALVANIZED STEEL REINFORCEMENT

1. Galvanizing: To BS EN ISO 1461 after cutting but before bending.

210 STANDARD FABRIC REINFORCEMENT

1. Standard: To BS 4483.
2. Strength grade: B500B

245 PREFABRICATED REINFORCEMENT

1. Prefabricated elements: Groundbeam cages etc, Contractor to submit proposals for approval.
2. Source: Obtain from a manufacturer holding valid certification of approval for welded fabrications issued by the UK Certification Authority for Reinforcing Steels (CARES).
   2.1. Certification required: Achievement of CARES appendix 6 for tack welding and appendix 10 for semi-structural/ structural welding.

255 PREFABRICATED CONTINUITY REINFORCEMENT STRIPS

1. Source: Obtain from a manufacturer holding a valid Technical Product Approval certificate issued by the UK Certification Authority for Reinforcing Steels (CARES) or equivalent.

265 MECHANICAL COUPLERS

1. Locations: Contractor to advise for approval.
2. Source: Obtain from a manufacturer holding a valid Technical Product Approval certificate issued by the UK Certification Authority for Reinforcing Steels (CARES) or equivalent.

WORKMANSHIP

310 CUTTING AND BENDING REINFORCEMENT

1. General: To schedules and to BS 8666.
2. Bending on site, including minor adjustments: Only permitted where properties of reinforcement is unaffected.
3. Restrictions on bending steel:
   3.1. Rebending including minor adjustments: Obtain instructions.
   3.2. Temperatures: below 5oC: Obtain instructions
   3.3. Temperatures: above 100oC: Prohibited.

320 PROTECTION OF REINFORCEMENT

1. Dropping from height, mechanical damage and shock loading: Prevent.
2. Cleanliness of reinforcement at time of pouring concrete: Free from corrosive pitting, loose mill scale, loose rust and contaminants which may adversely affect the reinforcement, concrete, or bond between the two.

410 LAPS OR SPLICES

1. Details not shown on drawings: Obtain instructions.

425 LAPS NOT DETAILED ON DRAWINGS

1. Laps in bar reinforcement (minimum): 40 x bar diameter
2. Laps in fabric reinforcement (minimum): 40 x bar diameter
   2.1. Laps at corners: Avoid four layer build-up.

427 LAPS IN FABRIC REINFORCEMENT

1. Terms: As defined in BCA publication 97.321.
2. Lap type
   2.1. Long edge of fabric: Butt end bars in adjacent fabric sheets and provide loose bars of the same diameter and type as the fabric bars tied to and with a full lap with the bars in each sheet OR use mesh sheets with flying ends.
   2.2. Short edge of fabric: Butt end bars in adjacent fabric sheets and provide loose bars of the same diameter and type as the fabric bars, tied to and with a full lap with the bars in each sheet OR use mesh sheets with flying ends.
3. Other requirements: Stagger laps in fabric to each face and stagger end laps.

451 FIXING REINFORCEMENT

1. Standard: To BS 7973-1 and -2.
2. Installation: In addition to any spacers and chairs shown on drawings or schedules, provide adequate support, tie securely and maintain the specified cover.
3. Tying
   3.1. Wire type: 16 gauge black annealed. Use stainless steel wire for stainless steel reinforcement.
4. Ends of tying wire: Prevent intrusion into the concrete cover. Remove loose ends.
5. Compatibility of metals: Prevent contact between ordinary carbon steel and stainless or galvanized reinforcement.

470 TOLERANCES ON COVER

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

480 NOMINAL COVER TO REINFORCEMENT

1. Nominal cover: Refer to MBA RC Drawings.

510 RUST STAINING

1. Staining of surfaces of concrete which will be exposed to view in the finished work: Prevent.

520 COVER METER SURVEY

1. Purpose of survey: To check positions of reinforcement and that the specified cover has been achieved.
2. Type of cover meter: A magnetic induction digital display type selected to suit arrangement and type of reinforcement.
   2.1. Use: In accordance with recommendations of BS 1881-204 and manufacturer as appropriate to yield accurate results.
   2.2. Surveyor: Experienced with cover meter surveys.
   2.3. Calibration: At the outset and thereafter regularly at 45 minute (maximum) intervals.
3. Locations for checking: Include columns, beams, cantilevers, slab soffits and all faces exposed to the weather in the finished structure.
4. Timing: As soon as practicable after casting.
   4.1. Notification: Give adequate notice.
5. Results: Submit. Notify immediately where specified cover has not been achieved.

E40
DESIGNED JOINTS IN IN SITU CONCRETE

TO BE READ WITH GENERAL CONDITIONS.

120 CONSTRUCTION/ MOVEMENT JOINTS GENERALLY

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

132 ADDITIONAL REQUIREMENTS FOR CONSTRUCTION JOINTS

1. Limitations: To be minimised in areas exposed to view. Contractor to submit proposals

210 FORMED JOINTS

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

211 FORMED JOINTS IN CONCRETE WEARING SURFACES

1. Temporary forms: Square edged with a steel top surface.
2. Placing concrete: Compact thoroughly at edges to give level, closely abutted joints with no lipping.

225 PREFABRICATED STEEL PERMANENT JOINT FORMERS

1. Manufacturer: Permaban
   - 1.1. Product reference: TBC
2. Certification: Provide European Technical Assessment (ETA) with UKCA/ UKNI/ CE marking and a Declaration of Performance (DoP)
3. Depth: TBC
4. Installation: To accurate line and level with concrete thoroughly compacted at edges and with no lipping.

230 PREPARATION OF CONSTRUCTION JOINTS

1. Roughening of joint surfaces: Select from:
   - 1.1. Brushing and spraying: Remove surface laitance and expose aggregate finish while concrete is still green.
   - 1.2. Other methods: Submit proposals.
2. Condition of joint surfaces immediately before placing fresh concrete: Clean and damp.

235 ARRIS ARMOURING

1. Manufacturer: Permaban
   1.1. Product reference: TBC
2. Certification: Provide European Technical Assessment (ETA) with UKCA/ UKNI/ CE marking and a Declaration of Performance (DoP)
3. Installation: To accurate line and level with concrete thoroughly compacted at edges and with no lipping.
4. Other requirements: None.

260 SAWN CRACK INDUCING GROOVES

1. Groove dimensions
   1.1. Depth: TBC
   1.2. Width: As narrow as practicable.
2. Sawing: Sufficiently early to prevent random cracking (within 24 hours of casting slab) and to produce strong, well defined arrises.
3. Groove filling: Joint filler and sealant. GCP Aerofil 1 joint filler + GCP Paraseal 15mm thick

420 FABRIC TIE STRIPS

1. Standard: To BS 4483.
2. Cleanliness: Free from corrosive pitting, loose millscale, loose rust and contaminants which may adversely affect the fabric, concrete, or bond between the two.
3. Position: Width of the mesh strip centred on the joint. Use same mesh as in top of slab. Stop top mesh 50mm short of joint on both sides.

520 SHEET JOINT FILLER

1. Manufacturer: GCP APPLIED TECHNOLOGIES
   1.1. Product reference: Aerofil 1
2. Joints finished with sealant: Leave sufficient space for sealant by using temporary formers.

530 SEALANT FOR JOINTS

1. Manufacturer: GCP APPLIED TECHNOLOGIES
   1.1. Product reference: PARASEAL
   1.2. Colour of surfaces exposed to view: To be advised by the Architect
2. Preparation and application: As section Z22.

590 INSPECTION OF TIED AND PARTIALLY TIED JOINTS

1. Purpose: To determine whether shrinkage is concentrated at occasional joints.
2. Timing: At intervals from one month after casting of slab for duration of works.
3. Joints that have opened significantly more than the average: Submit proposals for grouting.

E41
WORKED FINISHES TO IN SITU CONCRETE

TO BE READ WITH GENERAL CONDITIONS.

145 CONTROL SAMPLES

1. Sample areas that are part of finished work: Workshop Floor Slab
2. Location: To be proposed by Contractor
3. Approval of appearance: Obtain before proceeding with remainder of the work.

150 FINISHING

1. Timing: Carry out at optimum times in relation to setting and hardening of concrete.
2. Prohibited treatments to concrete surfaces
   2.1. Wetting to assist surface working.
   2.2. Sprinkling cement.

310 SMOOTH FLOATED FINISH

1. Surface on completion: Even with no ridges or steps.

330 TROWELLED FINISH FOR WEARING SURFACES

1. Surface on completion: Uniform and smooth, free from trowel marks and blemishes.

510 SURFACE HARDENER

1. Manufacturer: Fosroc
   1.1. Product reference: Nitoflor Luthurin
2. Condition of substrate prior to application: Cured, clean and free from surface contaminants.
3. Application: Evenly to dry surfaces. After absorption, wash surface immediately with clean water.
   3.1. Additional applications: As necessary
4. Solutions and wash water: Do not discharge to drains. Store and dispose of safely.
5. Contractor is to ensure that this product is compatible with any further proposed surface finishes to the top of the slab. If it is not compatible, Contractor to propose suitable alternative.

530 SLIP RESISTANCE TESTING OF WEARING SURFACES

1. Test: To BS 7976-2 using a Transport Research Laboratory (TRL) Pendulum.
   1.1. Timing: Give adequate notice.
   1.2. Test results: Submit, inclusive of slip resistance values (pendulum test value [PTV]), in the wet and dry states.

G10
STRUCTURAL STEEL FRAMING

GENERAL REQUIREMENTS/ INFORMATION

110 SUB-CONTRACTOR'S DESIGN OF CONNECTIONS OF ALL STEEL FRAMING.

1. Design concept: Beams designed as simply supported under dead, imposed and wind loads to be designed for shear and axial forces where shown on MBA drawings.
2. Design Standard: Structural steelwork has been designed to BS5950 where applicable.
3. Design responsibility: Design connections and detail steelwork and connections in accordance with BS5950. Calculations to be submitted to MBA for comment based on loadings provided or otherwise calculable on MBA drawings.
   3.1. Other responsibilities: None.
4. Structural requirements
   4.1. Generally: As section B50.
      4.1.1. Modifications: If the fabricator proposes to substitute any hot rolled elements for cold rolled, this is not to be carried our without prior written agreement from MBA Consulting. Note that the fabricator may be subject to a possible design fee from MBA for checking the design suitability of the material change - to be agreed with MBA prior to carrying out the design check. Without exception all cold rolled product used is to be the Corus S355 Hybox product - not the Corus S235 Strongbox product.
   4.2. Design: Complete in accordance with the designated code of practice to satisfy specified performance criteria.
   4.3. Connections: Design and details joints to designated codes of practice.
   4.4. Fixings to foundations and walls: As detailed on MBA Drawings.
   4.5. Additional requirements: Cut-outs, Holes or Fixings required to suit service penetrations. Position, size and number of penetrations to be agreed with MBA prior to commencement of fabrication works.

115 DESIGN CONSTRAINTS – GENERAL

1. 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.
2. Bolts
   2.1. Diameter (minimum): 16 mm
   2.2. Number per connection (minimum): Two, unless otherwise indicated.
   2.3. Other requirements: All bolts to be minimum Grade 8.8.
3. Punching of bolt holes: Fabricator to submit proposal outlining locations where punching is preferable for review by MBA.
4. Welds: Minimum 6mm fillet welds, unless noted otherwise on drawings or as required in fabricator's connection design.
5. Other constraints: None.

116 DESIGN CONSTRAINTS – STEELWORK TO BE GALVANIZED

1. Steel grades: Do not use steel downgraded from a higher specification.
2. Detail design: Avoid details that will increase the risk of initiating liquid metal assisted cracking (LMAC).
   2.1. Particular restrictions: Use bolted cleat connections
3. Other requirements: All steelwork post-galvanising is to be visually inspected for cracking. MBA advice to be sought regarding remedial works required if defects encountered.

120 DRAWINGS AND CALCULATIONS

1. Information required: Calculations for all structural connections / Detailed fabrication drawings.
2. Requirement: Before preparing detailed fabrication drawings, submit:
   2.1. General arrangement drawings with individual steel members clearly identified.
   2.2. Calculations for major connections.
   2.3. Fabrication is not to commence until MBA (and wider design team) have made formal final comment on drawings.
   2.4. Fabricator to provide full and final fabrication drawings a minimum of 3 weeks prior to proposed commencement of fabrication works, an allowance of 3 weeks is to be provided by fabricator for MBA to make comment on the drawings. The Contractor is to make MBA aware in writing of any instances where this time period for comment will be reduced - to be provided in a timely manner.
   2.5. Dates of the proposed commencement of different packages of fabrication works are to be confirmed as part of Contractor's proposed programme, to be issued for design team comment at the commencement of the project.
   2.6. The contractor is to propose all splice locations for MBA comment.

125 SPECIFICATION STANDARD

1. Standard: Comply with latest edition of National Structural Steelwork Specification (NSSS).
   1.1. Additional requirements: None.
   1.2. Document availability: For the duration of the work, at fabrication shop and on site.
2. References to Engineer in NSSS: For the purpose of this contract, interpret such references as being to a suitably experienced and Chartered Civil / Structural Engineer appointed to fulfil this function by the Contractor and to report approvals and agreements directly to the CA.
   2.1. Exceptions: None.

130 GENERAL STEEL SECTIONS AND PLATES FOR INTERNAL STEELWORK.

1. Standard: To BS EN 10025-2
2. Grade: S275JR or S355JR unless noted otherwise on MBA Drawings.
   2.1. Options: None.
3. Source: Obtain steel from a source accredited to a national or internationally accepted quality standard.
4. Other requirements: None.

131 GENERAL STEEL SECTIONS AND PLATES FOR EXTERNAL STEELWORK.

1. Standard: To BS EN 10025-2
2. Grade: S275J0 or S355J0 unless noted otherwise on MBA Drawings.
   2.1. Options: None.
3. Source: Obtain steel from a source accredited to a national or internationally accepted quality standard.
4. Other requirements: Steel to be galvanised to have a carbon equivalent value not exceeding 0.44.

135 HOLLOW STEEL SECTIONS FOR INTERNAL STEELWORK.

1. Standard: BE EN 10210-1 (i.e. Hot rolled)
2. Grade: S355JR unless noted otherwise on MBA Drawings.
   2.1. Options: Substitution for Hybox cold rolled sections may be permitted with the agreement of MBA. The substitution with a Strongbox cold rolled section will not be permitted.
3. Source: Obtain steel from a source accredited to a national or internationally accepted quality standard.
4. Other requirements: None.

136 HOLLOW STEEL SECTIONS FOR EXTERNAL STEELWORK.

1. Standard: BE EN 10210-1 (i.e. Hot rolled)
2. Grade: S355J0 unless noted otherwise on MBA Drawings.
   2.1. Options: Substitution for Hybox cold rolled sections may be permitted with the agreement of MBA. The substitution with a Strongbox cold rolled section will not be permitted.
3. Source: Obtain steel from a source accredited to a national or internationally accepted quality standard.
4. Other requirements: Steel to be galvanised to have a carbon equivalent value not exceeding 0.44.

FABRICATION

180 NOTIFICATION OF COMMENCEMENT

1. Notice: Give notice before fabrication is due to start.
   1.1. Period of notice (minimum): 28 days.

190 MARKING

1. Identifying and recording materials and components: Submit details of proposed methods.
2. Location of marks
   2.1. Generally: Visible for checking after erection.
   2.2. Weathering steel: On surfaces not exposed to open view in the completed work.
3. Steel to be blast cleaned, pickled, metal sprayed or galvanized: Marked so that subsequent treatment cannot obliterate the marking.

195 HARD STAMPING

1. Usage: Not permitted except as indicated on drawings.

210 END CONNECTIONS

1. Angle web cleats: Project 10 mm beyond ends of simply supported members.

215 HOLLOW SECTIONS

1. Insides of sections: Debris and moisture removed before sealing ends and openings.

220 ACCESS/ VENTILATION HOLES IN BASE PLATES

1. 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.

225 STEELWORK TO BE GALVANIZED

1. Cutting, drilling and shop welding: Complete before galvanizing.
2. Vent and drain holes: Provide as necessary.
   2.1. Locations: Submit proposals.
   2.2. Sealing: Required, submit proposals.

235 SHOP INSPECTION

1. Give notice: Before fabricating steelwork which is to be exposed in the final condition.
   1.1. Period of notice (minimum): 14 days

WELDING

250 WELDING PROCEDURES

1. Quality management systems: To BS EN ISO 3834-3.
2. Certification of welders:
   2.1. Third party certification: To BS EN ISO 9606-1.
   2.2. Verification of welding procedures: Submit.
   2.3. Welding procedure qualification records: To BS EN ISO 15614-1.

255 SITE WELDING

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

270 ADDITIONAL WELDS

1. Welds (including tack welds) not indicated on drawings: Not permitted without approval.

BOLT ASSEMBLIES

302 NON-PRELOADED BOLT ASSEMBLIES

1. Designation: Submit proposals
   1.1. Threading: Submit proposals
2. Nuts and washers: To suit property class of bolt, as NSSS, clause 2.4.4.
3. Coating applied by manufacturer: Galvanised, to suit site exposure.
4. Other requirements: None.

370 GALVANIZED COATING TO BOLT ASSEMBLIES

1. Standard: To BS 7371-6.
2. Galvanizing: Applied by fastener manufacturer. Passivated and lubricated if no additional coatings are specified. Nuts tapped after galvanizing.
3. Use/location: In all locations.

390 SEALED HOLLOW SECTIONS

1. Holes: Sealed to prevent access of moisture.
    1.1. Method of sealing: To fabricator's proposal.

ERECTION

405 OUTLINE METHOD OF ERECTION

1. The contractor is to provide a proposed erection sequence and method statement which should reference the design proposals and the designer's guidance. This should include details of all temporary support work required during erection.

410 PRE-ERECTION CHECKS

1. Scope: At least 7 days before proposed erection start date, check the following:
    1.1. Foundations and other structures to which steelwork will be attached: Accuracy of setting out.
    1.2. Holding down bolts: Position, protruding length, slackness and condition.
2. Inaccuracies and defects: Report without delay.
3. Permission to commence erection: Obtain.

420 SETTING OUT

1. Permissible deviations: In addition to the requirements of the NSSS, add permissible deviations for different types of dimension and locations, as necessary.

425 MODIFICATIONS

1. Steelwork: Do not modify without approval.
2. Temporary fabrication/ erection attachments: Remove and make good surface coating.

432 TEMPORARY SUPPORT

1. Permanent bracing system
    1.1. Vertical: See B50
    1.2. Horizontal: See B50
2. Temporary bracing/ restraints: Provide as necessary until permanent bracing system is complete and sufficiently mature to carry loads and all connections have been made to the permanent system.
3. Elements to be supported: Columns and beams during installation, existing frame stability prior to completion of proposed steelwork.
4. Forces and moments in temporary supports: Contractor to make an independent assessment.

440 COLUMN BASES

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

443 PROPRIETARY FILLING/ BEDDING OF COLUMN BASES

1. Bedding thickness range: 5 to 50mm.
2. Preparation: Concrete surfaces scarified to provide a good mechanical key.
3. Bolt pockets and spaces beneath base plates: Completely filled with Conbextra HF high strength, non-shrink grout.

447 BONDED ANCHORS

1. Holes: Clean and free from dust at time of installing anchor.
2. Permeable sleeves: Use in conditions where otherwise the loss of bonding agent would be unacceptably high.
3. Other requirements: None.

TESTING

465 TESTING

1. Testing: Arrange the following tests. Prepare test pieces as necessary.
2. Test: Dye penetrate testing of fillet welds.
    2.1. Testing authority: NAMAS approved laboratory.
    2.2. Frequency/ Number: 10% of fillet welds.
    2.3. Level of acceptability: 100%.
    2.4. Other requirements: None.
3. Test and examination results: Submit 2 copies immediately they are available.

475 PRODUCTS

1. Steel: Submit test certificates.

PROTECTIVE COATINGS

523 COMPATIBILITY OF SHOP PRIMER WITH SITE APPLIED INTUMESCENT COATING

1. Intumescent coating: M61/ see Architect's specification for details of intumescent coating, its locations and specification.
2. Primer: Compatible with coating under general and fire conditions.
3. Manufacturer's recommendations and test evidence: Submit before priming. Include fire test data to BS 476-20 and -21, or BS EN 1363-1 and BS EN 1365-2, -3 and/or -4 as appropriate.

535 INSPECTION OF COATING WORK

1. Work in progress: Permit coating manufacturer to inspect and take samples of products.
2. Notice: Give notice of dates for:
   2.1. Start of surface preparation and coating.
   2.2. Coated members or components leaving the works.
   2.3. Period of notice (minimum): 5 working days.

550 POST-GALVANIZING INSPECTION

1. Inspector: Submit, on request, evidence of training and competence in visual inspection for liquid metal assisted cracking.
2. Components for which visual inspection is not required (procedure PGI-0): Not applicable.
3. Components requiring additional inspection
   3.1. Procedure PGI-2A: None.
   3.2. Procedure PGI-2B: None.
4. Timing: Before erection of steelwork or application of other coatings.
5. Action in event of non-compliance
   5.1. Submit: Full records of all post-galvanizing inspections, drawing attention to any erected components that are required to be quarantined.
   5.2. Procedure PGI-3: Carry out on all quarantined components, and submit report.
   5.3. Sites of suspected defects: Remove zinc coating by grinding back to bright metal for a distance of not less than 50 mm around each defect and from a similar area on opposite face of member and inspect.
   5.4. Remedial actions: Submit proposals.

PROTECTIVE COATING SYSTEMS

620 GALVANIZING TO BLAST CLEANED STEEL

1. Use/ location: All galvanised steelwork
2. Preparation: Blast cleaning to BS EN ISO 8501-1, preparation grade Sa2½ using chilled angular iron grit grade G24 to give a coarse surface profile, followed by chemical cleaning.
3. Galvanizing: To BS EN ISO 1461.
   3.1. Minimum mean coating thickness: 140 micrometres.

PREPARATION FOR PAINTING

710 OFFSITE PREPARATION AND PAINTING

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

725 MANUAL CLEANING OF NEW STEELWORK

1. Preparation: Remove fins, burrs, sharp edges, weld spatter, loose rust and loose scale.
2. Surface finish: Clean but unpolished to BS EN ISO 8501-1, grade St 2.
3. Finishing: Thoroughly degrease and clean down. Remove any consequent rusting back to grade St 2. Prime without delay.

730 PREPARATION FOR SITE WELDING OF SHOP PAINTED STEELWORK

1. Method: Select from the following:
   1.1. Mask weld areas immediately after blast cleaning and before coating steelwork. If paint system comprises more than one coat, step each coat 30 mm back from edge of preceding coat and away from masked areas. Remove masking immediately before welding.
   1.2. Prepare and paint steelwork including weld areas. Grind off to bare steel around each weld area immediately before welding.

735 TREATMENT OF SITE WELDED JOINTS IN PAINTED STEELWORK

1. Preparation: After welding, and without delay, remove scale and weld spatter from weld areas. Remove traces of rust. Wash with clean water and allow to dry. Prime without delay.
2. Protective/ Decorative coatings: Apply to weld areas to match surrounding painted areas.

736 TREATMENT OF SITE WELDED JOINTS IN GALVANIZED STEELWORK

1. Preparation: After welding, and without delay, remove scale and weld spatter from weld areas. Remove traces of rust. Wash with clean water and allow to dry.
2. Coating: Reinstate using one of the methods given in BS EN ISO 1461, clause 6.3.

740 BOLTED JOINTS (OTHER THAN PRELOADED JOINTS)

1. Steelwork to be shop painted: Apply full shop specification to joint faces.
2. Steelwork to be erected with mill finish then site painted: Before erection, prepare and prime joint faces and allow to dry.
3. Bolted joints in externally exposed steelwork
   3.1. Immediately before assembling, apply a further coat of primer and bring surfaces together while still wet.
   3.2. After assembling and before applying site coatings, seal crevices to bolts and joint perimeters with a compatible sealant.

760 GALVANIZED FASTENERS

1. Treatment: After steelwork erection and before applying site coatings, thoroughly degrease and clean. Etch prime.

770 SITE PREPARATION OF GALVANIZED SURFACES FOR PAINTING

1. Preparation: Thoroughly degrease. Remove white corrosion products. Wash off and allow to dry before applying etching wash or primer.

PAINTING

810 ENVIRONMENTAL CONDITIONS

1. General requirements prior to starting coating work
   1.1. Surfaces: Unaffected by moisture or frost.
   1.2. 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.
   1.3. Relative humidity: Below 85%.

815 COATINGS

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

820 FILM THICKNESS

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

825 STRIPE COAT

1. External angles, nuts, bolt heads, rough weld seams, and areas difficult to coat: Apply an additional stripe coat of primer .

850 JUNCTIONS WITH CONCRETE

1. Exposed steelwork partially embedded or encased in concrete: Apply two coats of bituminous coating locally to the steel/concrete junction.
2. Bituminous coating: High build Bitumen paint, 1 coat brown, 1 coat black.

G20
CARPENTRY/ TIMBER-FRAMING/ FIRST FIXING

GENERAL

105 TIMBER PROCUREMENT

1. Timber (including timber for wood-based products): Obtained from well-managed forests/ plantations in accordance with:
   1.1. The laws governing forest management in the producer country or countries.
   1.2. International agreements such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
2. Documentation: Provide either in accordance with chain of custody certification scheme requirements:
   2.1. Documentary evidence (which has been or can be independently verified) regarding the provenance of all timber supplied. or
   2.2. Evidence that suppliers have adopted and are implementing a formal environmental purchasing policy for timber and wood-based products.

120 STRUCTURAL DESIGN PROVIDED

1. Description: Refer to MBA drawings for type and extent of timber elemements.
2. Requirements
   2.1. Generally: As section B50/B51.
   2.2. Additional requirements: None

160 GRADING AND MARKING OF SOFTWOOD

1. Timber of a target/ finished thickness less than 100 mm and not specified for wet exposure: Graded at an average moisture content not exceeding 20% with no reading being in excess of 24% and clearly marked as 'DG' (dry-graded).
2. Timber wet-graded and specified for installation at higher moisture contents: graded at an average moisture content above 20% and unmarked.
3. Structural timber members cut from large graded sections: Regraded to approval and marked accordingly.

PRODUCTS

210 STRUCTURAL SOFTWOOD (GRADED DIRECT TO STRENGTH CLASS)

1. Grading standard: To BS EN 14081-1 and BS 4978, or other suitable national equivalent, and so marked.
2. Strength class to BS EN 338: Varies as note on MBA drawings.
3. Treatment
   3.1. Preservative treatment: Required to Architects specification.
      3.1.1. Design service life: 30 years minimum, Contractor to notify Client of any deviations from this or ongoing maintenance requirements required to achieve this.
   3.2. Flame-retardant treatment: To Architect's specification.

310 STRUCTURAL PLYWOOD

1. Standard: To the relevant national standards and quality control procedures specified in BS 5268-2, and so marked.
2. Service class to BS EN 1995-1-1: To suit exposure, if in doubt ask.
3. Use class to BS EN 335: To suit exposure, if in doubt ask.
4. Load duration class to BS EN 12369-2: Medium Term for roofs.
5. Characteristic strength class to BS EN 12369-2: As MBA Drawings
6. Characteristic modulus class to BS EN 12369-2: As MBA Drawings
7. Appearance class to BS EN 635: Refer to Architects specification
8. Bonding quality to BS EN 314-2: To suit exposure, if in doubt ask.
9. Nominal thickness: As per MBA and Architect's drawings.
10. Finish: As Architects specification
11. Treatment:
    11.1. Preservative treatment: Required to Architects specification.
        11.1.1. Design service life: 30 years minimum, Contractor to notify Client of any deviations from this or ongoing maintenance requirements required to achieve this.
    11.2. Flame-retardant treatment: To Architect's specification.

WORKMANSHIP GENERALLY

401 CROSS SECTION DIMENSIONS OF STRUCTURAL SOFTWOOD AND HARDWOOD

1. Dimensions: Dimensions in this specification and shown on drawings are target sizes as defined in BS EN 336.
2. Tolerances: The tolerance indicators (T1 and T2) specify the maximum permitted deviations from target sizes as stated in BS EN 336, clause 4.3:
    2.1. Tolerance Class 1 (T1) for sawn surfaces.
    2.2. Tolerance Class 2 (T2) for further processed surfaces.

430 SELECTION AND USE OF TIMBER

1. Timber members damaged, crushed or split beyond the limits permitted by their grading: Do not use.

435 NOTCHES, HOLES AND JOINTS IN TIMBER

1. Notches and holes
    1.1. General: Avoid if possible.
    1.2. Sizes: Minimum needed to accommodate services.
    1.3. Position: Do not locate near knots or other defects.
    1.4. In same joist: Minimum of 100 mm apart horizontally.
    1.5. Notches in joists
        1.5.1. Position: Locate at top. Form by sawing down to a drilled hole.
        1.5.2. Depth (maximum): 0.15 x joist depth.
        1.5.3. Distance from supports: Between 0.1 and 0.2 x span.
    1.6. Holes in joists
        1.6.1. Position: Locate on neutral axis.
        1.6.2. Diameter (maximum): 0.25 x joist depth.
        1.6.3. Centres (minimum): Three x diameter of largest hole.
        1.6.4. Distance from supports: Between 0.25 and 0.4 of span.
    1.7. Notches in roof rafters, struts and truss members: Not permitted.
    1.8. Holes in struts and columns: Locate on neutral axis.
        1.8.1. Diameter (maximum): 0.25 x minimum width of member.
        1.8.2. Centres (minimum): Three x diameter of largest hole.
        1.8.3. Distance from ends: Between 0.25 and 0.4 of span.
2. Scarf joints, finger joints and splice plates: Do not use without approval.

440 PROCESSING TREATED TIMBER

1. Cutting and machining: Carry out as much as possible before treatment.
2. Extensively processed timber: Retreat timber sawn lengthways, thicknessed, planed, ploughed, etc.
3. Surfaces exposed by minor cutting/ drilling: Treat with two flood coats of a solution recommended by main treatment solution manufacturer.

450 MOISTURE CONTENT

1. Moisture content of wood and wood-based products at time of installation: Not more than:
    1.1. Covered in generally unheated spaces: 24%.
    1.2. Covered in generally heated spaces: 20%.
    1.3. Internal in continuously heated spaces: 20%.

451 MOISTURE CONTENT TESTING

1. Procedure: When instructed, test timber sections with an approved electrical moisture meter.
2. Test sample: Test 5%, but not less than ten lengths of each cross section in the centre of the length.
3. Test results: 90% of values obtained to be within the specified range. Provide records of all tests.

510 PROTECTION

1. Generally: Keep timber dry and do not overstress, distort or disfigure sections or components during transit, storage, lifting, erection or fixing.
2. Timber and components: Store under cover, clear of the ground and with good ventilation. Support on regularly spaced, level bearers on a dry, firm base. Open pile to ensure free movement of air through the stack.
3. Trussed rafters: Keep vertical during handling and storage.

550 EXPOSED TIMBER

1. Planed structural timber exposed to view in completed work: Prevent damage to and marking of surfaces and arrises.

JOINTING TIMBER

570 JOINTING/ FIXING GENERALLY

1. Generally: Where not specified precisely, select methods of jointing and fixing and types, sizes and spacings of fasteners in compliance with section Z20.

630 BOLTED JOINTS

1. Bolt spacings (minimum): To BS EN 1995-1-1, section 8.5.
2. Holes for bolts: Located accurately and drilled to diameters as close as practical to the nominal bolt diameter, and not more than 2 mm larger.
3. Washers: Placed under bolt heads and nuts that would otherwise bear directly on timber. Use spring washers in locations which will be hidden or inaccessible in the completed building.
4. Bolt tightening: So that washers just bite the surface of the timber. Ensure that at least one complete thread protrudes from the nut.
   4.1. Checking: At agreed regular intervals up to completion. Tighten as necessary.

670 ANTI-CORROSION FINISHES FOR FASTENERS

1. Galvanizing: To BS 7371-6, with internal threads tapped and lightly oiled following treatment.
2. Sherardizing: To BS 7371-8, Class 1.
3. Zinc plating: To BS EN ISO 4042 and passivated.
4. Design service life: 30 years minimum, Contractor to notify Client of any deviations from this or ongoing maintenance requirement to achieve this.

ERECTION AND INSTALLATION

710 PROPOSALS FOR ERECTING STRUCTURAL TIMBER

1. Proposals: Submit details of:
   1.1. Method and sequence of erection.
   1.2. Type of craneage.
   1.3. Temporary guys and bracing proposed for use during erection.
2. Latest date for submission: 14 days before commencing

740 PRE-ERECTION CHECKING

1. Timing: Not less than ten days before proposed erection start date.
2. Checklist
   2.1. Foundations and other structures to which timber structure will be attached: Check for accuracy of setting out.
   2.2. Holding down bolts: Check for position, protruding length, condition and slackness.
3. Inaccuracies and defects: Report without delay.
4. Erection: Obtain permission to commence.

750 MODIFICATIONS/ REPAIRS

1. Defects due to detailing or fabrication errors: Report without delay.
2. Methods of rectification: Obtain approval of proposals before starting modification or remedial work.
3. Defective/damaged components: Timber members/ components may be rejected if the nature and/or number of defects would result in an excessive amount of site repair.

760 TEMPORARY BRACING

1. Provision: As necessary to maintain structural timber components in position and to ensure complete stability during construction.

770 ADDITIONAL SUPPORTS

1. Provision: Position and fix additional studs, noggings and/ or battens to support edges of sheets materials, and wall/ floor/ ceiling-mounted appliances, fixtures, etc. shown on drawings
2. Material properties: Additional studs, noggings and battens to be of adequate size and have the same treatment, if any, as adjacent timber supports.

775 BEARINGS

1. Timber surfaces which are to transmit loads: Finished to ensure close contact over the whole of the designed bearing area.
2. Packings: Where provided, to cover the whole of the designed bearing area.
   2.1. Crushing strength: Not less than timber being supported.
   2.2. In external or inaccessible locations: Rot and corrosion proof.

780 WALL PLATES

1. Position and alignment: To give the correct span and level for trusses, joists, etc.
2. Bedding: Fully in fresh mortar.
3. Joints: At corners and elsewhere where joints are unavoidable use nailed half-lap joints. Do not use short lengths of timber.

784 JOISTS GENERALLY

1. Centres: Equal, and not exceeding designed spacing.
2. Bowed joists: Installed with positive camber.
3. End joists: Positioned approximately 50 mm from masonry walls.

786 JOISTS ON HANGERS

1. Hangers: Bedded directly on and hard against supporting construction. Do not use packs or bed on mortar.
2. Joists: Cut to leave not more than 6 mm gap between ends of joists and back of hanger. Rebated to lie flush with underside of hangers.
3. Fixing to hangers: A nail in every hole.
4. Design service lift: 30 years minimum, Contractor to notify Client of any deviations from this or ongoing maintenance required to achieve this.
5. Joist hangers - general requirements:
    5.1. Joist hangers to be BS EN 845-1:2013, hanger type and centers to be as noted in this specification or project drawings. Joist hangers to be fully nailed to manufacturer's specification to develop manufacturer's maximum quoted working capacity.
    5.2. Where joist hangers are supported via a flange bearing onto blockwork, floor joists are to be supported with specialist designed temporary propping if the floor deck is to be accessed, until such time as 675mm of dense blockwork has been constructed (and the mortar cured) above the hanger flange. The joist restraint flange must have a level seating onto masonry.
    5.3. Joists must be accurately cut to length (max gap to back plate to be 5mm as BS8000-5).

795 TRIMMING OPENINGS

1. Trimmers and trimming joists: When not specified otherwise, not less than 25 mm wider than general joists.

850 INSPECTION GENERALLY

1. Structural timber-work: Give reasonable notice before covering up.

860 BOLTED JOINT INSPECTION

1. Timing: Inspect all accessible bolts at the end of the defects liability period and tighten if necessary.