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Structural Specification

The Cumberland Lawn Tennis Club

25 Alvenley Gardens
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Index :-

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Revision T1 **Tender Issue 7 December 2015**

D30 PILING

GENERAL REQUIREMENTS

110 SPECIFICATION:

- Comply with the latest edition of the Specification for Piling and Embedded Retaining Walls (hereinafter called the SPERW) unless specified otherwise in this section.
- Ensure that a copy of the SPERW is available at all times during the course of the works.
- Correction of SPERW: In the penultimate line of table 1.2 substitute 4.10 for 4.8.
- For the purpose of this contract, all references to Engineer in the SPERW are to be interpreted as being the Contract Administrator (CA).
- See attached schedule for loadings and cut off levels for the piles for the final design cases.
- The piling mat level is to be designed by the piling firm sand appropriate for their piling rig and the knowledge that the top 1m of ground has been possibly been back filled and there are existing drains that are to remain in operation under the new buildings foot print.

120 INFORMATION TO BE PROVIDED WITH TENDER:
In addition to the information listed in SPERW, table 1.1, submit the following:
Details of:-
Type of rig
Type of piles
Attendance items
Details of piles
Schedule of rates:-

125 DESIGN:

- Design and construct the piles in accordance with SPERW, clause 1.4 Option 1 based on the final loading, cut off levels and pile location information provided by the CA.
- At tender no site investigation report will be available.. Piles to carry a working load indicated on drawing 8872/E01plus any negative skin friction load from the top 3m of assumed heave forces from the clay substrata. (alternative top 3m of piles can be sleeved to eliminate any negative skin friction.
- Reinforcement in piles to project 40 diameters above final cut off level

- Interaction of piles to be considered by the piling contractor and vertical load capacity down rated for the piles whose influence effects the adjacent piles.
- Design details to be submitted to CA 7 working days prior to commencement of piling operations.
- Settlement limit set at 10mm maximum under working load or 10% of the pile diameter under ultimate load.

130 METHOD STATEMENT: Submit a statement for the proposed method of installation to achieve the design parameters including:

- Details of equipment
- Programme showing sequence and resources
- Confirmation that the load settlement behaviour of the piles will better that required in clause 140.

135 PERFORMANCE CRITERIA FOR THE STRUCTURE: to be supported on the piles:

ISOLATED PILES

Minimum factor of safety in permanent situation 3.0
Maximum pile load :- see drawing 88721/E01
Final cut off level :- see drawing 8872/E01 and E04

165 SETTING OUT:

- Site datum: Provided by main contractor
- Site grid: Provided by main contractor

167 COMMENCING SURFACE: [to be agreed with main contractor]

170 CEMENT:
In this specification the following abbreviations apply:
BS 12 Portland cement, Ordinary - PC42.5
BS 12 Portland cement, Rapid Hardening - PC52.5 or PC42.5R
BS 146 Portland blast furnace cement - PBFC
BS 1370 Low heat portland cement - LHPC
BS 4027 Sulfate resisting portland cement - SRPC
BS 4246 High slag blast furnace cement – HSBC

175 REINFORCEMENT GENERALLY: All steel reinforcement specified to comply with BS 4449 and cut and bent to BS 8666 is to be obtained from firm(s) 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).

SERVICES AFFECTED BY PILING

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

192A DRAINS IN USE: Protect drains, manholes, gullies, vent pipes and fittings still in use and ensure that they are kept free of debris at all times. The drainage under the building is used by the existing school and thus must be kept in operation at all times that the school is in operation. Make good any damage arising from piling work and leave clean and in working order at completion.

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

290 PILE HEADS: Cutting down and disposal of cut-off pile heads is the responsibility of the Contractor.

BORED PILES CONSTRUCTED USING CONTINUOUS FLIGHT AUGERS AND CONCRETE OR GROUT INJECTION THROUGH HOLLOW AUGER STEMS

410 DESIGNED CONCRETE MIX:

- Grade: C35
- Nominal maximum size of aggregate: 10mm or 20mm
- Aggregate(s):
  Coarse: to BS 882
  Sand: to BS1047
- Cement: Concrete classification AC-1s with Design Sulphate Class DS-1
- Minimum cement content: Concrete classification AC-1s with Design Sulphate Class DS-1
- Maximum free water/cement ratio: Concrete classification AC-1s with Design Sulphate Class DS-1
- Admixture(s): to appropriate parts of BS 5075 part 1
- Details of concrete mix and supplier to be submitted to CA 7 days prior to commencement of piling works.

415 CEMENT REPLACEMENT MATERIAL: permitted:

- Pulverized-fuel ash (pfa) to BS 3892:Part 1.
- Ground granulated blastfurnace slag (ggbs) to BS 6699.

416 CEMENT REPLACEMENT MATERIAL: is permitted.

420 METHOD OF TESTING CONCRETE WORKABILITY: Use flow testing unless otherwise approved by CA.

425 PLAIN BAR REINFORCEMENT: To BS 4449, Grade 250.

426 DEFORMED BAR REINFORCEMENT: To BS 4449, Grade 460.

430 COVER TO REINFORCEMENT: must comply with BS 8110: Part 1 Section 3.3 and BS 8004 Sections 2.4.3, 7.4.2.3.2, 8.1.24 and 8.1.25 as appropriate.

455A PILE DIMENSIONS: Minimum pile diameter: 300 mm for isolated piles and 400mm maximum

490 EXCAVATED MATERIAL: Disposal is the responsibility of the Contractor.

496 INSTRUMENT FAILURE: Provide a stop watch to be available at all times for manual monitoring in case of instrument failure.

INTEGRITY TESTING OF PILES

810 METHOD(S): Test piles using the system to be agreed with the piling contractor

815 TEST PILES:
- Number: all
- Type: as clause 810
- Locations: all piles
- 28 day and 7 day concrete cubes required for every ten piles

820 PROGRAMME FOR INTEGRITY TESTING: Allow 1 visits plus rate for additional visits

845 PREPARATION OF PILE HEADS FOR TESTING:
- Prepare pile heads to suit the method of testing.
- Note any problems with the pile heads which could inhibit the execution or interpretation of the test and report to CA.

E05 IN SITU CONCRETE CONSTRUCTION GENERALLY

110 ARRANGEMENT OF INFORMATION: The different parts of in situ concrete construction are specified in separate sections as follows:
E10 In situ concrete mixes, casting and curing
E20 Formwork
E30 Reinforcement
E40 Designed joints
E41 Worked finishes/Cutting

210 STRUCTURAL CONCRETE

- Description: Foundations and superstructure
  Drawing reference(s): see schedule of drawings 8827/E01 to E04
- Design the above work in accordance with BS 8110

314A SURFACE REGULARITY

Floor slab

Top surface of concrete, level to datum +/-10 mm

E10 MIXING/CASTING/CURING IN SITU CONCRETE

CONCRETE MIXES

100 DESIGNATED MIX FOR Ground beams.

- Mix C40 to BS 5328.
- The concrete will be reinforced
- Nominal maximum size of aggregate: 20 mm.
- Admixtures: An accelerator or retarder may be used.
  if agreed with the engineer

100A DESIGNATED MIX FOR Mass concrete foundations/blinding

- Mix GEN3 C16/20 to BS 5328.
- The concrete will be normal weight
- Nominal maximum size of aggregate: 20 mm.
- Admixtures: An accelerator or retarder may be used.
  if agreed with the engineer

135 EQUIVALENT GRADE DESIGNED MIX FOR C40

- To the relevant clauses of BS 5328-2, BS 5328-3 and BS 5328-4.
- Equivalent grade as BS 5328-1, clause 8.5: 40 n/sqmm
- Nominal maximum size of aggregate: 20 mm
- Aggregate(s):
  Coarse: To BS 882
  Sand: To BS 882
  Special requirements: (Class 2 sulphate conditions)

- Cement: OPC
- Minimum cement content: 340 kg/m³
- Maximum free water/cement ratio: 0.5
- Admixture(s): Do not use any which provide water reduction.
- Rate of sampling for compressive strength testing: Two sets of cubes for ground beams. Information to be provided by the producer: As BS 5328-3, clause 3.

135A EQUIVALENT GRADE DESIGNED MIX FOR GEN3 C16/20

- To the relevant clauses of BS 5328-2, BS 5328-3 and BS 5328-4.
- Equivalent grade as BS 5328-1, clause 8.5: 15 n/sqmm
- Nominal maximum size of aggregate: 20 mm
- Aggregate(s):
  Coarse: To BS 882
  Sand: To BS 882
  Special requirements: (Class 2 sulphate conditions)
- Cement: OPC
- Minimum cement content: 220 kg/m³
- Maximum free water/cement ratio: not applicable
- Admixture(s): Do not use any which provide water reduction.
- Rate of sampling for compressive strength testing: None
- Information to be provided by the producer: As BS 5328-3, clause 3.

MATERIALS, BATCHING AND MIXING

215 READY-MIXED CONCRETE must be used for all concrete and must be obtained from a plant which holds current certification meeting the requirements of the NACCB, Category 2 for product conformity. Each mix must be obtained from only one source unless otherwise approved. Confirm name and address of depot(s) to CA before any concrete is delivered. Retain all delivery notes for inspection.
Do not add water to concrete on site.

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

255 CEMENTS:

- The following abbreviations apply:
  PC42.5 Portland cement, Class 42.5 (in lieu of OPC)
  PC52.5 Portland cement, Class 52.5 (in lieu of RHPC)
  SRPC Sulfate resisting Portland cement
  PBFC Portland blastfurnace cement
  HSBC High slag blastfurnace cement (in lieu of LHPBC)
  PPFAC Portland pulverised-fuel ash cement
  ggbs Ground granulated blastfurnace slag
  pfa Pulverized fuel ash
- Cements, ggbs and pfa must comply with the relevant British Standards. Portland cements must have cement certification meeting the requirements of

the NACCB, Category 2 for product conformity.

305 NATURAL AGGREGATES FOR DESIGNED/PRESCRIBED MIXES: To give a drying shrinkage of concrete not exceeding 0.075% when tested to BS 812-120.

315 AGGREGATES FOR EXPOSED WORK: To BS 882, of consistent colour, free from absorbent particles which may cause 'popouts', and other particles such as coal and iron sulphide which may be unsightly or cause unacceptable staining. Obtain from one source, and ensure that adequate supplies can be maintained throughout the contract. Provide samples of proposed aggregates on request.

355 RISK OF ALKALI-SILICA REACTION IN DESIGNED/ PRESCRIBED MIXES: Take one of the precautions specified for Designated mixes in BS 5328-2, clause 1.4. Inform CA if this necessitates a change in specification. Submit evidence of compliance to CA before making concrete for use in the Works.

415 ADMIXTURES FOR DESIGNED/PRESCRIBED MIXES:

- To BS EN 934-2, BS 5075-1 and BS 5075-3 as appropriate.
- Use only if specified or approved.
- Do not use admixtures containing calcium chloride.
- Ensure that admixtures are compatible with all other materials, including other admixtures.

460 ENRICHMENT OF MIX: Subject to approval, the aggregate: cement ratio may be reduced by up to 10% for the first layer of concrete in walls and columns.

490 PROPERTIES OF FRESH CONCRETE to be determined by the Contractor in consultation with the concrete supplier to suit the one site circumstances and methods, but in all respects maintaining compliance with this Specification.

TESTING/CERTIFICATION

510 COMPLETE CORRELATED RECORDS must be maintained for each Designed and Prescribed mix including:

- Information in accordance with BS 5328-3, clauses 3.1 and 3.2.
- All sampling, site tests and identification numbers of all specimens tested in the laboratory.
- The location of the part(s) of the structure represented by each sample.
- The location in the structure of the batch from which each sample is taken.

520 TEST LABORATORY: All specified testing of concrete to be carried out by one NAMAS Accredited laboratory. Submit the name of the selected laboratory to CA as soon as possible and in any case before making trial mixes or concrete for use in the works.

530 TEST REPORTS: one copies of reports to be despatched to CA within one

day of completion of each test.
Keep a complete set of reports on site.
Allow for three sets of cubes with three cubes in each set.

550 BROKEN CUBES: Keep separately the pieces of each cube which fails to meet the compliance requirements for individual results. Obtain agreement of CA before discarding.

570 EARLY AGE STRENGTH TESTING: A regime of accelerated or normal curing and early testing which is capable of predicting the 28 day strength of Designed mixes may be used for determining compliance, subject to prior approval. If such a regime is adopted, two additional cubes must be made from each sample and cured normally so that, in the event of noncompliance, they can be tested at 28 days to provide information which will help in deciding the action to be taken.

580 FAILURES:

- If a concrete sample fails to achieve specified criteria or to pass specified tests, inform the CA without delay and submit:
  - Confirmation of the validity of the test results, and/or
  - Proposals for further tests to assess the strength of the concrete in the structure, as set out in BS 6089, and/or
  - Proposals for rectification.
- Obtain approval of all such evidence and proposals before proceeding. The CA may issue instructions for the work to be stopped or delayed until reasons for the failure have been established, possible consequences assessed, and appropriate preventative and remedial measures taken.

PLACING AND COMPACTING

610 CONSTRUCTION/SEQUENCE/TIMING REQUIREMENTS:
None

640 CONSTRUCTION JOINTS:

- Submit details of proposed locations and obtain approval before proceeding.
- Carefully brush and spray surface while concrete is still green to remove surface laitance and expose aggregate finish. Obtain approval for any alternative method.
- Surface to be clean and damp when fresh concrete is placed against it.

650 CLEANING: At time of placing ensure that all surfaces on which concrete is to be placed are clean, with no debris, tying wire clippings, fastenings or free water.

660 INSPECTION: Inform CA before each pour of concrete to allow inspection of reinforcement and surfaces against which concrete is to be placed. Agree with CA the period of notice to be given.

670 TRANSPORTING:

- Avoid contamination, segregation, loss of ingredients, excessive evaporation

and loss of workability. Cover concrete during heavy rain.

- Clean equipment immediately after use and whenever cement or aggregate is changed.
- Use suitable walkways and barrow runs for traffic over reinforcement and freshly placed concrete.

680 PLACING:

- Record time, date and location of all pours.
- Place as soon as practicable after mixing and while sufficiently plastic for full compaction. After discharge from the mixer do not add water or retemper mixes.
- Ensure that temperature of concrete is not more than 30 °C in hot weather and not less than 5 °C in cold weather. Do not place against frozen or frost covered surfaces.
- Place in final position in one continuous operation up to construction joints. Avoid formation of cold joints.
- Do not discharge from an excessive height or through reinforcement or other obstructions in a way which may cause uneven dispersal, segregation or loss of ingredients or adversely affect the formwork or formed finishes. Use suitable chutes or trunking where necessary.
- Place in layers no thicker than can be effectively compacted with the equipment being used, without delay between layers. Merge together by compaction.
- Do not use vibrators 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: Fully compact concrete to full depth (until air bubbles cease to appear on the top surface), especially around reinforcement, cast-in accessories, into corners of formwork and at joints. Ensure amalgamation with previous batches, but do not damage adjacent partly hardened concrete. Use appropriate type(s) of mechanical vibration for all concrete [in reinforced work]

720 VIBRATORS: Inform CA of the number and type of vibrators to be used. Provide standby vibrators. Do not use external vibrators without approval.

730 PLASTIC SETTLEMENT: At the top of deep sections and at significant changes in the depth of concrete sections, closely and continuously inspect the fresh concrete for signs of settlement during the first few hours after placing. While the concrete is still capable of being fluidized by the vibrator, revibrate as necessary to remove settlement cracking which may be forming either on the top surface or against the upper part of the vertical formwork.

CURING AND PROTECTION

810 CURING:

- Prevent surface evaporation from concrete throughout the period(s) specified below by:
  - Retaining formwork in position and, if necessary, covering surfaces immediately after striking, and
  - Covering top surfaces immediately after placing and compacting each bay, removing covering only to permit any finishing operations and replacing immediately thereafter.
- Maintain surface temperature above 5 °C throughout the periods specified below or four days, whichever is the longer
- Maintain detailed records of location and timing of casting of individual batches, removal of formwork and removal of coverings. Keep on site, available for inspection.

820 CURING PERIODS, in days (t = the average number of degrees centigrade air temperature during the curing period):

- Concrete surfaces which in the finished building will be exposed to the elements; concrete wearing surface floors and pavements; watertight concrete:

	Concrete made using PC42.5, PC 52.5 SRPC	Concrete made using PPFAC, PBFC, HSBC, pfa, ggbs
Drying winds or dry, sunny weather	140/(t+10)	180/(t+10)
Intermediate conditions	100/(t+10)	140/(t+10)
Damp weather, protected from sun and wind	100/(t+10)	100/(t+10)

- Other structural concrete surfaces (cements as above):

Drying winds or dry, sunny weather	80/(t+10)	140/(t+10)
Intermediate conditions	60/(t+10)	80/(t+10)
Damp weather, protected from sun and wind	No special requirements	No special requirements

- Obtain prior approval for curing periods for mixes using admixtures or other

types of cement.

840 PROTECTION: Prevent damage to concrete, including:

- Surfaces generally: From rain, indentation and other physical damage.
- Surfaces to be exposed in the finished work: From dirt, staining, rust marks and other disfiguration.
- Immature concrete: From thermal shock, physical shock, overloading, movement and vibration.
- In cold weather: From entrapment of water in pockets, etc. and freezing expansion thereof.

E20 FORMWORK FOR IN SITU CONCRETE

GENERALLY/PREPARATION

110 LOADINGS: Design and construct formwork to withstand the worst combination of:

- Total weight of formwork, reinforcement and concrete.
- Construction loads including dynamic effects of placing, compacting and construction traffic.

170 WORK BELOW GROUND:

- Vertical faces of ground beams may be cast against faces of excavation, provided:
  - Prior approval is obtained.
  - The faces are sufficiently accurate and stable.
  - Supports to faces are withdrawn progressively as concrete is placed.
  - Adequate measures are taken to prevent contamination of concrete.
- Faces of walls must be cast against formwork.

210 STEELWORK: Remove all loose millscale and loose rust before encasing in concrete.

CONSTRUCTION

310 ACCURACY: Construct formwork accurately and robustly with adequate supports to produce finished concrete to the required dimensions. Formed surfaces must be free from twist and bow (other than any required cambers), all intersections, lines and angles being square, plumb and true.

320 JOINTS IN FORMS: Construct formwork, including joints in form linings and between forms and completed work, to prevent loss of grout, using seals when necessary. Secure formwork tight against adjacent concrete to prevent formation of steps.

470 RELEASE AGENTS: Type(s) which are suitable for use with the type(s) of formwork, formed finishes and specified applied finishes. Use the same type and make throughout the entire area of any one finish. Apply evenly to form faces, from top downwards, and to horizontal surfaces last. Use the minimum

amount necessary to obtain a clean release and prevent excessive local collection. Prevent release agent touching the reinforcement, hardened concrete, other materials not part of the form face, and permanent forms.

FORMED FINISHES

610 BASIC FINISH: no particular requirements, except those for tolerances and full compaction.

E30 REINFORCEMENT FOR IN SITU CONCRETE

REINFORCEMENT

110 QUALITY ASSURANCE: All steel reinforcement specified to comply with BS 4449 or BS 4483 and cut and bent to BS 8666 is to be obtained from firm(s) 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).

140 PLAIN BAR REINFORCEMENT: To BS 4449, Grade 250.

150 DEFORMED BAR REINFORCEMENT: To BS 4449, Grade 460.

210A STANDARD FABRIC REINFORCEMENT: To BS 4483.

WORKMANSHIP

310 CUT AND BEND reinforcement to schedules and to BS 8666. Do not bend when below 5°C without approval. Steel may be warmed to not more than 100°C. Do not rebend bars without approval. Tag bundles of reinforcement with labels to BS 8666

317 MECHANICAL DAMAGE: Reinforcement must not be roughly handled, dropped from a height, or subjected to shock loading or mechanical damage.

325 CLEANLINESS: At time of placing concrete, reinforcement to be clean and free of corrosive pitting, loose millscale, loose rust, ice, oil and other substances which may adversely affect the reinforcement, concrete, or bond between the two.

330 ADJUSTMENTS: Provide on site facilities for hand bending to deal with approved minor adjustments.

360 PROJECTING REINFORCEMENT: Grade 250 bars may be bent to radii not less than BS 8666, Table 3. Grade 460 bars must not be bent or straightened without approval

410 LAPS OR SPLICES: Obtain instructions if details are not shown on drawings.

421A LAPS in fabric reinforcement, where not detailed, to be not less than 400 mm. Where necessary seek instructions to avoid a four layer build-up at corners.

434 STRUCTURAL WELDED JOINTS will not be permitted.

444 MECHANICAL JOINTS will not be permitted.

451 FIXING GENERALLY:

- Unless otherwise permitted fix reinforcement in position before placing concrete. In addition to any spacers and chairs shown on drawings or schedules, provide adequate support, tie securely and maintain the specified cover. Comply generally with Concrete Society Report CS 101 'Spacers for reinforced concrete'.
- Unless otherwise specified tie using 16 swg annealed tying wire. Ensure that tying wire does not intrude into the concrete cover. Do not tack weld unless authorised by the CA and recommended by the reinforcement manufacturer.
- Do not fix or place reinforcement in contact with nonferrous metals.

470 TOLERANCES ON COVER:

- Not less than the nominal cover minus 5 mm.
- Where reinforcement is located in a particular direction in relation to only one face of a member, not more than the nominal cover plus:
  5 mm on bars up to and including 12 mm size.
  10 mm on bars over 12 mm up to and including 25 mm size.
  15 mm on bars over 25 mm size.
- Before concreting check thoroughly that the specified cover dimensions have been obtained.

491 SPACERS to formed concrete finishes, if permitted (see section E20) to be approved type(s).

500 DAMAGE: Prevent damage to and disfigurement of forms, form linings and adjacent work.

520 CHECKING COVER: Check the position of the reinforcement in the hardened concrete as soon as practicable after casting using a magnetic induction digital display type cover meter in accordance with manufacturer's recommendations and BS 1881-204. Pay particular attention to columns, beams, cantilevers, soffits of slabs and all faces which will be exposed to the weather in the finished building. Inform CA when such checking is to be carried out, confirm that it has been carried out and that the results were satisfactory.

E40 DESIGNED JOINTS FOR IN SITU CONCRETE

120 CONSTRUCTION/MOVEMENT JOINTS GENERALLY

- Accuracy: Position and form joints accurately, straight, well-aligned and truly vertical with setting out lines of the building.
- Modifications: If necessary to any joint design or location, agree before proceeding.
- Placing concrete:
  - Prevent concrete entering joints or penetrating compressible joint fillers and making movement joints ineffective.
  - Do not place concrete simultaneously on both sides of movement joints.

131 ADDITIONAL CONSTRUCTION JOINTS

- Joints additional to those required by designer: Permitted at locations to be agreed with engineer.

210 FORMED JOINTS:

- Construction: Rigid, grout-tight side forms or stop ends designed to accommodate projecting bars without temporary bending or displacement.

230 CONSTRUCTION JOINT FACES

- Roughening: While concrete is still green, remove laitance without loosening the aggregate to leave a thoroughly roughened, exposed aggregate finish.

E41 WORKED FINISHES TO IN SITU CONCRETE

150 FINISHING GENERALLY

- Timing: Carry out finishing operations at optimum times in relation to the setting and hardening of the concrete.
- Prohibited treatments to concrete surfaces: Wetting to assist working and sprinkling cement.

210 TAMPED FINISH

- Method: Tamp surface with edge of a board or beam to give an even texture of parallel ribs to top of ground beams.
  - Form openings, sinkings and junctions with walls in accordance with precast units manufacturer's recommendations, unless detailed otherwise.
  - Do not cut or drill units except as recommended or agreed by manufacturer.

G10 STRUCTURAL STEEL FRAMING

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GENERAL REQUIREMENTS/INFORMATION

110A DESIGN:

- Design standard: The structural steelwork has been designed to BS 5950 where applicable.
- Steel grades: S275 .
- Completion of design: Design and detail connections to BS 5950.
  - Loading requirements: As specified or otherwise calculable.

120A DRAWINGS AND CALCULATIONS

- Before preparing detailed fabrication drawings, submit:
  - General arrangement drawings with individual steel members clearly identified.
  - Steel fabricator to design all steel connections to forces provided by the structural engineer.

  .

125 SPECIFICATION STANDARD

- Standard: Comply with latest edition of National Structural Steelwork Specification (NSSS).
  - Document availability: Make available during the course of the Works at fabrication shop and on site.

FABRICATION

180 NOTIFICATION OF COMMENCEMENT

- Give notice: Before fabrication is due to start.
  - Period of notice (minimum): 7working days.

190 MARKING:

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

195 HARD STAMPING

- Usage: Not permitted except as indicated on drawings.

210 END CONNECTIONS

- Angle cleats: Project beyond ends of simply supported members.

220 BASE PLATES

- Access/ventilation holes: Make 25 mm diameter holes in base plates larger than 1 m² as necessary for pressure grouting, escape of entrapped air or direct compaction of filling/bedding material.

WELDING

255 SITE WELDING

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

270 ADDITIONAL WELDS

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

290 FINISHING WELDS

- Dressing: Carefully dress welds to remove slag. Do not deform surface of weld.

BOLT ASSEMBLIES

380 ZINC PLATED COATING TO BOLT ASSEMBLIES

- Standard: To BS 7371-3 or BS EN ISO 4042.
- Zinc plating: Applied by fastener manufacturer. Clear passivated if no additional coatings are specified. Nuts tapped after galvanizing.
- Use/location: all

ERECTION

410 PRE-ERECTION CHECKS

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

425 MODIFICATIONS

- Steelwork: Do not modify without approval.
-

440 COLUMN BASES

- Levels: Adjust using steel shims or folding wedges no larger than necessary.
- Location of shims/wedges: Position symmetrically around perimeter of base plate. Do not use a single central pack.
- Give notice: If space beneath any column base is less than, or over 25 mm greater than, the specified dimension.
- Accuracy of erection: Check, and correct errors before filling and bedding beneath bases and carrying out other adjacent work.

441 MORTAR FILLING/BEDDING OF COLUMN BASES

- Bolt pockets: Completely fill with neat cement slurry.
- Spaces beneath base plates: Completely fill as follows:
- use Sikagrout 212 or equivalent

450 FIXING PROFILED SHEET

• Standard: To BS 5950-4.

• Fixing method: shot fired fixings to top of steel to manufacturers recommendations

TESTING

475 PRODUCTS

- Steel: Submit test certificates.

PROTECTIVE COATINGS

521 ALTERNATIVE MANUFACTURERS

- Short list of manufacturers: Obtain coating materials from one only of the following:
  [International Paints or similar].
- Selected manufacturer: Submit details before ordering materials.

535 INSPECTION OF COATING WORK

- Work in progress: Permit coating manufacturer to inspect and take samples of products. Do not comply with directions or requests given by coating manufacturer unless and until confirmed by CA.
- Give notice of dates for:
  - Start of surface preparation and coating.
  - Coated members or components leaving the works.

  Period of notice (minimum): 5 working days.

PROTECTIVE COATING SYSTEMS

620 GALVANIZING TO BLAST CLEANED STEEL

• Use/ location: Columns on grid 1B and 3B

• Preparation: Blast cleaning to BS EN ISO 8501-1, preparation grade Sa 2½ using chilled angular iron grit grade G24 to give a coarse surface profile, followed by chemical cleaning.

• Galvanizing: To BS EN ISO 1461.

- Minimum mean coating thickness: 140 micrometres.

638 SHOP PRIMING FOR steelwork

- Use/location: all steel except columns 1B & 3B
- Shop preparation: Blast clean as NSSS clause 10.2.2 to BS 7079-A1, preparation grade Sa 2.5
- Primer: Two pack epoxy.

- Manufacturer: as clause 521.
- Product reference: Zinc phosphate.
- Dry film thickness: 60

PREPARATION FOR PAINTING

710 OFFSITE PREPARATION AND PAINTING

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

730A PREPARATION FOR SITE WELDING OF SHOP PAINTED STEELWORK

- Methods: Select from the following:
  - 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.
  - Prepare and paint steelwork including weld areas. Grind off to bare steel around each weld area immediately before welding.

  Do not paint surfaces that are to support composite metal decking and shear stud fixings.,

740 BOLTED JOINTS (NONFRICTION GRIP)

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

PAINTING

810 ENVIRONMENTAL CONDITIONS

- Do not coat:
  - surfaces affected by moisture or frost;
  - unless steel temperature is at least 3°C above dew point, with conditions stable or improving;

- unless relative humidity is below 85%;
- when temperature is likely to cause blistering or wrinkling.

815A COATINGS

- Surfaces to be coated: Clean, dust free and suitably dry. Previous coats to be adequately cured. NO NOT PAINT TOP SURFACE OF FIRST BEAMS THAT SUPPORT METAL DECKING
- Multiple coats of same material: Use different tints to assist checking of complete coverage.
- Penultimate coat: Colour recommended by paint manufacturer to suit top coat colour.
- Finish required: Smooth and even, of uniform thickness and colour, free from defects.

820 FILM THICKNESS

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

850 JUNCTIONS WITH CONCRETE

- Exposed steelwork partially embedded or encased in concrete: Apply two coats of bituminous coating locally to the steel/concrete junction.
- Bituminous coating: to BS 6949 type q class A.