

JOB NUMBER: 16240



SCHOOL EXTENSION,  
CARN GWAVAL,  
ISLES OF SCILLY.

**STRUCTURAL SPECIFICATIONS:**

D20 Excavating and Filling  
E05 In Situ Concrete Construction Generally  
E10 Mixing/Casting/Curing In Situ Concrete  
E20 Formwork for In Situ Concrete  
E30 Reinforcement For In Situ Concrete  
E41 Worked Finishes To In Situ Concrete  
E42 Accessories Casting into In Situ Concrete  
G10 Structural Steel Framing  
G20 Carpentry/Timber Framing/First Fixing

**STATUS: Building Regulations**

**REVISION: D**

Revisions noted by enclosing box.

**NOVEMBER 2017**

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## **D20 EXCAVATING AND FILLING**

To be read with Preliminaries/ General conditions.

### **GENERALLY/ THE SITE**

#### **110 SITE INVESTIGATION**

- Refer to:  
Ian Farmers Associates: IOS School Letter, September 2017.

#### **145 VARIATIONS IN GROUND WATER LEVEL**

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

#### **150 EXISTING SERVICES, FEATURES AND STRUCTURES**

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

### **CLEARANCE/ EXCAVATING**

#### **240 ADJACENT EXCAVATIONS**

- 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.
- Angle of line below horizontal: 30 degrees.
- Backfill material: As clause 248, subject to approval by CA.

#### **242 EXCAVATIONS ADJACENT TO EXISTING BACKFILLED TRENCHES**

- Proximity: When width of undisturbed ground between the two excavations will be less than 2000mm.
- Action: Assume that the ground between the trenches is unstable and provide side support accordingly.

#### **244 EXCAVATIONS ADJACENT TO EXISTING FOUNDATIONS**

- Prior to commencing excavation:
  - Excavate trial pits adjacent to existing foundations to determine extent and formation levels.
  - Allow for inspection of trial pits.
  - Allow time for amendment of details if required.  
Time period: 7 days.
- Backfill material to new excavation: Any backfill required on site must be confirmed by MBA before commencing.

#### **248 BACKFILL TO EXCAVATIONS LOWER THAN FOUNDATION FORMATION LEVEL**

- Critical level:
  - Distance between near faces of foundation and lower excavation less than 1 m:  
Not to be undertaken by contractor before MBA are consulted.
  - Otherwise: N/A.
- Backfill material:
  - Below critical level: Concrete as E10.
  - Above critical level: Compacted general filling as clause 710.

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250 PERMISSIBLE DEVIATIONS FROM FORMATION LEVELS

- Beneath mass concrete foundations:  $\pm 25$  mm.
- Beneath ground bearing slabs and r.c. foundations:  $\pm 15$  mm.
- Embankments and cuttings:  $\pm 50$  mm.
- Ground abutting external walls:  $\pm 50$  mm, but such as to ensure that finished level is not less than 150 mm below dpc.

255 ACCURACY - LINEAR DIMENSIONS

- Permissible deviations from linear dimensions generally: 10mm.

270 FOUNDATIONS GENERALLY

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

275 FOUNDATION BEARING

- Requirement: Foundations are designed to bear on:
  - Strata: Brown and orange brown clayey sandy sub-angular medium GRAVEL of granite. Refer to IFA letter report for anticipated levels / further information.
  - Safe bearing capacity (minimum): 150kPa.
- Give notice: If the material at the design depth of the foundation does not comply with this description, or contains soft or hard spots or highly variable material.

280 TRENCH FILL FOUNDATIONS

- Excavation: Form trench down to formation in one operation.
- Safety: Prepare formation from ground level.
- Inspection of formations: Give notice before commencing excavation.
  - Period of notice: 28 days.
- Shoring: Where inspection of formation is required, provide localised shoring to suit ground conditions.
- Concrete fill: Place concrete immediately after inspection and no more than four hours after exposing the formation.

290 FOUNDATIONS IN MADE UP GROUND

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

310 UNSTABLE GROUND

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

320 RECORDED FEATURES

- Recorded foundations, beds, drains, manholes, etc.
- Contaminated earth: Remove and disinfect as required by local authority.

330 UNRECORDED FEATURES

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

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**350 EXISTING WATERCOURSES**

- Diverted watercourses which are to be filled: Before filling, remove vegetable growths and soft deposits.

**DISPOSAL OF MATERIALS**

**410 EXCAVATED TOPSOIL STORAGE**

- Storage: Stockpile in temporary storage heaps to be confirmed by on-site contractor.

**415 EXCAVATED TOPSOIL REMOVAL**

- General: Remove from site.

**450 WATER**

- Generally: Keep all excavations free from water until:
  - Formations are covered.
  - Below ground constructions are completed.
  - Basement structures and retaining walls are able to resist leakage, water pressure and flotation.
- Drainage: Form surfaces of excavations and fill to provide adequate falls.
- 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**

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

**FILLING**

**500 PROPOSED FILL MATERIALS**

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

**510 HAZARDOUS, AGGRESSIVE OR UNSTABLE MATERIALS**

- 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:
  - Frozen or containing ice.
  - Organic.
  - Contaminated or noxious.
  - Susceptible to spontaneous combustion.
  - Likely to erode or decay and cause voids.
  - With excessive moisture content, slurry, mud or from marshes or bogs.
  - Clay of liquid limit exceeding 80 and/or plasticity index exceeding 55.
  - Unacceptable, class U2 as defined in the Highways Agency 'Specification for highway works', clause 601.

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#### 520 FROST SUSCEPTIBILITY

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

#### 530 PLACING FILL

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

#### 535 COMPACTION GENERALLY

- General: Compact fill not specified to be left loose as soon as possible after placing.
- 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.
- Defective areas: Remove and recompact to full thickness of layer using new material.

#### 540 BENCHING IN FILL

- 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.
- New filling: Spread and compact to ensure maximum continuity with previous filling.

#### 610 COMPACTED FILLING FOR LANDSCAPE AREAS

- Fill: Material capable of compaction by light earthmoving plant.
- Filling: Layers not more than 200 mm thick. Lightly compact each layer to produce a stable soil structure.

#### 615 LOOSE TIP FILLING FOR LANDSCAPE AREAS

- Filling: Do not firm, consolidate or compact when laying. Tip and grade to approximate levels in one operation with minimum of trafficking by plant.

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650 PROTECTION OF COMPACTED FILLING

- 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.
- Removal: Remove temporary protective filling from site before permanent construction.

700 BACKFILLING AROUND FOUNDATIONS

- Under oversite concrete and pavings: Hardcore.
- Under grassed or soil areas: Material excavated from the trench, laid and compacted in 300 mm maximum layers.

710 HARDCORE FILLING

- Fill: Granular material, free from excessive dust, well graded, all pieces less than 75 mm in any direction:
  - Test requirements:
    - Minimum 10% fines value tested in a soaked condition to BS 812-111.
    - Impact value SZ tested to BS EN 1097-2.
  - In any one layer only one of the following:
    - Crushed rock (other than argillaceous rock) or quarry waste with not more binding material than is required to help hold the stone together.
    - Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
    - Crushed non-expansive slag.
    - Gravel or hoggin with not more clay content than is required to bind the material together, and with no large lumps of clay.
    - Well-burned non-plastic colliery shale.
    - Natural gravel.
    - Natural sand.
- Filling: Spread and level in 150 mm maximum layers. Thoroughly compact each layer.

730 BLINDING

- Surfaces to receive sheet overlays or concrete:
- Blind with:
  - Concrete where shown on drawings; or
  - 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.
- Sand for blinding: To BS EN 12620, grade 0/4 or 0/2 (MP).
- Permissible deviations on surface level: +0 -25 mm.

## **E05 IN SITU CONCRETE CONSTRUCTION GENERALLY**

To be read with Preliminaries/ General conditions.

### **220 STRUCTURAL DESIGN PROVIDED**

- Description: Refer to MBA drawings.
- Requirements:
  - Generally: As section B50.
  - Additional requirements: None.
- Production/ execution records: In accordance with codes of practice.

### **225 TEMPERATURE RECORDS**

- Requirement: Throughout period of concrete construction record:
  - Daily: Minimum and maximum atmospheric shade temperatures.
  - Under adverse temperature conditions: Temperature at commencement and end of placing.
- Equipment: Calibrated thermometer or electronic monitoring device.
  - Location: In the shade, close to the structure.

### **235 OPENINGS, INSERTS AND FIXINGS**

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

### **290 ACCURACY OF CONSTRUCTION**

- Setting out: To BS 5964-1.
- Geometrical tolerances: Class 1 to BS EN 13670.
  - Conflicts: Notwithstanding tolerances specified elsewhere, do not exceed requirements for compliance with the designated code of practice.
  - 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 on all concrete works above foundation level.

### **300 LEVELS OF STRUCTURAL CONCRETE FLOORS**

- Tolerances (maximum):
  - Level of floor: Refer to Architects drawings.
  - Steps in floor level: None.

### **310 SURFACE REGULARITY OF CONCRETE FLOORS TO BS 8204 - GENERAL**

- Standard: To BS 8204-1 or -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 BS8204 – TOLERANCE CLASS: SR2.**

- Location: Ground Floor Slab.
- Abrupt changes: Not permitted.

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- 410 IN SITU CONCRETE CONSTRUCTION - SUPERVISION/ CHECKING  
- Standard: Execution class 2.

## **E10 MIXING/ CASTING/ CURING IN SITU CONCRETE**

To be read with Preliminaries/ General conditions.

### **CONCRETE**

- 101 SPECIFICATION  
- Concrete generally: To BS 8500-2.  
- Exchange of information: Provide concrete producer with information required by BS 8500-1, clauses 4 and 5.
- 132 DESIGNATED CONCRETE FOR MASS CONCRETE FOUNDATIONS  
- Designation: GEN3  
- Fibres: Not required.  
- Aggregates:  
- Size (maximum): 20mm.  
- Coarse recycled aggregates: Permitted with additional requirements for RA as Clause 310.  
- Additional aggregate requirements: None.  
- Special requirements for cement/ combinations: None.  
- Consistence class: To suit method of placement.  
- Chloride class: Normal.  
- Admixtures: Concrete Producer's Choice. Proposals to be submitted to MBA with mix design for comment.  
- Additional mix requirements: None.
- 133 DESIGNED CONCRETE FOR GROUND BEARING SLAB  
- Embedded metal: A252 mesh – Refer to relevant MBA drawings.  
- Compressive strength class (cylinder/ cube minimum): C28/35.  
- Target density (oven-dry): Normal.  
- Fibres: Not required.  
- Aggregates:  
- Size (maximum): 20mm.  
- Type/ Density: Normal weight.  
- Coarse recycled aggregates: Not permitted.  
- Additional aggregate requirements: None.  
- Design chemical class: DC1.  
- Limiting values for composition:  
- Water:cement ratio (maximum): 0.60.  
- Cement/ combination content (minimum): 320kg/m<sup>3</sup>  
- Cement/ combination content (maximum): 420kg/m<sup>3</sup>  
- Air content in situ (minimum): N/A.  
- Consistence class: To suit placement method.  
- Permitted cement/ combinations: All in BS8500-1, Table A. 6.  
- Design chemical class: DS-1 (Design Sulphate Class) / AC-1 (ACEC Class)  
- Admixtures: Concrete Producers Choice.  
- Colour: None required.  
- Additional mix requirements: None.

## **MATERIALS, BATCHING AND MIXING**

### **215 READY-MIXED CONCRETE**

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

### **221 INFORMATION ABOUT PROPOSED CONCRETES**

- Submit when requested:
  - Details listed in BS 8500-1, clause 5.2.
  - Additional information: None required.

### **225 CHANGES TO SPECIFICATION**

- Changes to specification of fresh concrete (outside concrete producer's responsibility): None permitted.

### **230 INTERRUPTION OF SUPPLY DURING CONCRETING**

- Elements without joints: Where elements are detailed to be cast in a single pour without joints, make prior arrangements for a back-up supply of concrete.
- Elsewhere:
  - Preparation: Manage pour to have a full face, and have materials available to form an emergency construction joint while concrete can still be worked.
  - Before pour is completed: Submit location and details of joint, make proposals for joint preparation.

### **415 ADMIXTURES**

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

### **490 PROPERTIES OF FRESH CONCRETE**

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

## **PROJECT TESTING/ CERTIFICATION**

### **505 PROJECT TESTING OF CONCRETE – GENERAL**

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

### **508 REGULAR PROJECT TESTING OF CONCRETE OF CONCRETE CUBES**

- Tests: Compressive strength.
- Sampling:
  - Point: At point of discharge from delivery truck.
  - Rate: One sample to be taken from every 12m<sup>3</sup> of concrete placed but not less than 1 sample for every day of concreting. 1 sample to constitute 2 No

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Cubes minimum. Contactor may increase number of cubes as required.

- Other requirements: Cubes for early age strength testing to be stored under the Same conditions as the concrete in the members.

520 TESTING LABORATORY

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

530 TESTS RESULTS

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

550 BROKEN CUBES FROM FAILED STRENGTH TESTS

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

**PLACING/ COMPACTING/ CURING AND PROTECTING**

610 CONSTRUCTION/ SEQUENCE/ TIMING REQUIREMENTS

- No bearing structure to be constructed until associated concrete has reached its 28 day strength.
- No items of plant or materials to be stored on slabs without MBA approval - refer to slab drawings for confirmation of maximum loadings that can be applied to slabs during construction phase, back-propping to be provided in accordance with MBA drawings.

620 TEMPERATURE OF CONCRETE

- Application: All.
- Objective: Limit maximum temperature of concrete to minimize cracking during placing, compaction and curing. Take account of:
  - 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.
  - Rapid changes in temperature: Prevent during the first seven days after casting.
- Proposals for meeting objective: Submit.

630 PREMATURE WATER LOSS

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

648 ADVERSE TEMPERATURE CONDITIONS

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

650 SURFACES TO RECEIVE CONCRETE

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

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#### 660 INSPECTION OF SURFACES

- Notice: Give notice to allow inspections of reinforcement and surfaces before each pour of concrete.
  - Period of notice: Obtain instructions.
- Timing of inspections: To be agreed with contractor, typically when fixing of reinforcement is complete.

#### 670 TRANSPORTING

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

#### 680 PLACING

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

#### 690 COMPACTING

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

#### 720 VIBRATORS

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

#### 730 PLASTIC SETTLEMENT

- Settlement cracking: Inspect fresh concrete closely and continuously wherever cracking is likely to occur, including the top of deep sections and at significant changes in the depth of concrete sections.
  - Timing: During the first few hours after placing and whilst concrete is still capable of being fluidized by the vibrator.
- Removal of cracks: Revibrate concrete.

#### 810 CURING GENERALLY

- Requirement: Keep surface layers of concrete moist throughout curing period, including perimeters and abutments, by either restricting evaporation or continuously wetting surfaces of concrete.

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

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

#### 812 PREVENTING EARLY AGE THERMAL CRACKING

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

#### 815 ADDITIONAL CURING REQUIREMENT – WATER CURING

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

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820 CURING PERIODS

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

	Concrete made using CEM1; SRPC (BS 4027); IIA	Concrete made using IIB; IIIA; IIIB; IVB
Drying winds or dry, sunny weather	$\frac{140}{t+10}$	$\frac{180}{t+10}$
Intermediate conditions	$\frac{100}{t+10}$	$\frac{140}{t+10}$
Damp weather, protected from sun and wind	$\frac{100}{t+10}$	$\frac{100}{t+10}$

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

Drying winds or dry, sunny weather	$\frac{80}{t+10}$	$\frac{140}{t+10}$
Intermediate conditions	$\frac{60}{t+10}$	$\frac{80}{t+10}$
Damp weather, protected from sun and wind	No special requirements	No special requirements

- Curing periods for concretes using admixtures or other types of cements/ combinations: Submit proposals.

840 PROTECTION

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

## **E20 FORMWORK FOR IN SITU CONCRETE**

To be read with Preliminaries/ General conditions.

### **GENERALLY/ PREPARATION**

#### **110 LOADINGS**

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

#### **120 FORMWORK DETAILS**

- Provide the following: Layout and nature of formwork including self-weight of formwork and falsework. – To be forwarded to both MBA and CA for comment 28 days prior to commencing work.

#### **145 PERMANENT FORMWORK**

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

#### **170 WORK BELOW GROUND FOR MASS CONCRETE FOUNDATIONS**

- Casting vertical faces against faces of excavation: Permitted provided face of excavation is stable.
- Requirements: None.

### **CONSTRUCTION**

#### **310 ACCURACY**

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

#### **315 SUBSTRUCTURE FORMWORK AND UNDERSLAB INSULATION**

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

#### **320 JOINTS IN FORMS**

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

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D20, E05, E10, E20, E30, E40, E41, E42, G10, G20

470 RELEASE AGENTS

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

**STRIKING**

510 STRIKING FORMWORK

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

521 MINIMUM PERIOD FOR RETAINING FORMWORK/ TEMPORARY SUPPORTS IN POSITION

- Concrete strength at time of formwork removal (minimum): 28 days strength for beams and slabs.
- Assumptions: To be confirmed upon receipt of contractors proposals.
  - Before removing formwork: Submit proposals if assumptions will not be realised.
- Method to be used in assessing early age strength of concrete: Contractor to submit proposals for MBA approval.

**FORMED FINISHES**

613 ORDINARY FINISH

- Location: All.
- Finish: Faces fully compacted. Formed surfaces free from major blemishes and honeycombing. Steps at joints to be less than 5 mm.

**E30 REINFORCEMENT FOR IN SITU CONCRETE**

To be read with Preliminaries/ General conditions.

**General Notes:**

- The Contractor is responsible for the supply all necessary chairs and spacers required for reinforcement installation - these will not be detailed by MBA.

**REINFORCEMENT**

110 QUALITY ASSURANCE OF REINFORCEMENT

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

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D20, E05, E10, E20, E30, E40, E41, E42, G10, G20

150 RIBBED BAR REINFORCEMENT

- Standard: To BS 4449.
- Strength grade: B500B.

210 STANDARD FABRIC REINFORCEMENT

- Standard: To BS 4483.
- Strength grade: B500B.

**WORKMANSHIP**

310 CUTTING AND BENDING REINFORCEMENT

- General: To schedules and to BS 8666.
- Bending on site, including minor adjustments: Not permitted.

320 PROTECTION OF REINFORCEMENT

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

410 LAPS OR SPLICES

- Details not shown on drawings: Obtain instructions.

425 LAPS NOT DETAILED ON DRAWINGS

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

427 LAPS IN FABRIC REINFORCEMENT

- Terms: As defined in BCA publication 97.321.
- Laps: Unless detailed otherwise on MBA Drawings, use sheets with flying ends or 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 to bars in, each sheet.
- Other requirements: Stagger laps in fabric to each face and stagger end laps.

451 FIXING REINFORCEMENT

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

470 TOLERANCES ON COVER

- Tolerance (maximum): 10mm.
- Checking specified cover dimensions: Before concreting check that cover dimensions will be achieved.

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480 NOMINAL COVER TO REINFORCEMENT

- Top face: As MBA drawings.
- Formed faces: As MBA drawings.

510 RUST STAINING

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

520 COVER METER SURVEY

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

**E40 DESIGNED JOINTS IN IN SITU CONCRETE**

To be read with Preliminaries/ General Conditions.

260 SAWN CRACK INDUCING GROOVES

- Groove Dimensions:
  - Depth: 50mm.
  - Width: 12mm.
- Sawing: Sufficiently early to prevent random cracking (within 24 hours of casting slab) and to produce strong, well defined arrises.
- Groove Filling: As detailed on MBA Drawing 16240-30.

520 SHEET JOINT FILLER

- Manufacturer: Grace
  - Product reference: Aerofil 2
- Joints finished with sealant: Leave sufficient space for sealant by using temporary formers.

530 SEALANT

- Manufacturer: Grace
  - Product reference: Paraseal
  - Colour of surfaces exposed to view: N/A.
- Preparation and application: As section Z22.
- Guarantee: Contractor to obtain, for MBA confirmation.
  - Period: \_\_\_\_\_ .
  - Requirements: \_\_\_\_\_ .

## **E41 WORKED FINISHES TO IN SITU CONCRETE**

To be read with Preliminaries/ General conditions.

### **145 CONTROL SAMPLES**

- Sample areas that are part of finished work: Capping slab.
- Location: Capping slab.
- Approval of appearance: Obtain before proceeding with remainder of the work.

### **150 FINISHING**

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

### **320 TROWELLED FINISH**

- Surface on completion: Uniform, smooth but not polished, free from trowel marks and blemishes, and suitable to receive specified flooring material.

### **530 SLIP RESISTANCE TESTING OF WEARING SURFACES**

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

## **E42 ACCESSORIES CAST INTO IN SITU CONCRETE**

To be read with Preliminaries/ General conditions.

### **GENERAL**

### **110 ACCESSORIES SPECIFIED ELSEWHERE**

- Item/ location: Refer to MBA drawings.

### **PRODUCTS**

### **330 ANCHOR BOLTS**

- Material: Refer to MBA drawings.
  - Designation: Refer to MBA drawings.
  - Coating or treatment: Refer to MBA drawings.
- Manufacturer: Refer to MBA drawings.
  - Product reference: Refer to MBA drawings.

### **390 GALVANIZED COATINGS**

- Standard: To all holding down bolts / resin fixings.
- Galvanizing: Applied and passivated by component manufacturer. Threaded items tapped after galvanizing.

## **EXECUTION**

### **620 TEMPORARY SUPPORTS**

- Location: Provide to hold accessories for casting into unshuttered surface of concrete, set at a level that will not adversely affect finish of concrete surface remote from accessory.
- Position: Hold securely to prevent lateral movement or rotation of accessory during concreting.

### **630 PROTECTIVE COATINGS**

- Inspect: Immediately prior to casting concrete.
- Damage to coatings:
  - Minor: Submit proposals for coating repair.
  - Significant: Replace accessory.

### **640 INSTALLATION**

- Cleanliness: At time of casting, surfaces in contact with concrete to be free from contaminants which may adversely affect accessory, reinforcement, concrete, or bond between accessory and concrete.
- Position: Hold accessory firmly in position, preventing displacement during concreting.
- Other requirements: As specified by manufacturer.

## **G10 STRUCTURAL STEEL FRAMING**

To be read with Preliminaries/ General conditions.

## **GENERAL REQUIREMENTS/ INFORMATION**

### **110 CONTRACTOR'S DESIGN OF JOINTS OF ALL STEEL FRAMING.**

- Design concept: Beams generally designed as simply supported under dead and imposed loads unless additional moment connection forces are provided.
- Design Standard: Structural steelwork has been designed to BS5950 where applicable.
- 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.
  - Other responsibilities: None.
- Structural requirements:
  - Generally: As section B50. All UB and UC sections to be Hot rolled S355.  
Modifications: If the fabricator proposes to substitute any hot rolled elements for cold rolled, this is not to be carried out 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 design check. Without exception all cold rolled product used is to be the Corus S355 Hybox product – not the Corus S235 Strongbox product.
  - Design: Complete in accordance with the designated code of practice to satisfy specified performance criteria.
  - Connections: Design and detail joints to designated codes of practice.
  - Fixings to foundations and walls: As detailed on MBA Drawings.

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- 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.
- Design and production information: Method Statements and Quality Plan.

#### 115 DESIGN CONSTRAINTS – GENERAL

- Members forming bracing systems or girders of lattice construction: Unless detailed or instructed otherwise, position so that their lines of action intersect at a point.
- Bolts:
  - Diameter (minimum): M16.
  - Number per connection (minimum): Two, unless otherwise indicated.
  - Other requirements: All bolts to be minimum Grade 8.8.
- Punching of bolt holes: Fabricator to submit proposal outlining locations where punching is preferable for review by MBA.
- Welds: Minimum 6mm fillet welds, unless noted otherwise on drawings or as required in fabricator's connection design.
- Other constraints: All beams bearing on pad stones to have min. 1No M10 resin fixed anchor through 8mm thick "Tang" plate (where necessary to ensure 50mm edge distance.) Further requirements as outlined in MBA drawings

#### 116 DESIGN CONSTRAINTS – STEELWORK TO BE GALVANIZED

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

#### 120 DRAWINGS AND CALCULATIONS

- Information required: Calculations for all structural connections / Detailed fabrication drawings.
- Requirement: Before preparing detailed fabrication drawings, submit:
  - General arrangement drawings with individual steel members clearly identified.
  - Calculations/ selected standard joint detail for major connections.
  - Fabrication is not to commence until MBA (and wider design team) have made formal final comment on drawings.
  - 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.
  - 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.
  - The contractor is to propose all splice locations for MBA comment.

#### 125 SPECIFICATION STANDARD

- Standard: Comply with latest edition of National Structural Steelwork Specification (NSSS and NSSS CE Marking version).
  - Additional requirements: None.
  - Document availability: For the duration of the work, at fabrication shop and on site.
- References to Engineer in NSSS and NSSS CE Marking version: For the purpose of this contract, interpret such references as being to MBA.

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- Exceptions: None.

131 GENERAL STEEL SECTIONS AND PLATES FOR ALL STEELWORK

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

**FABRICATION**

180 NOTIFICATION OF COMMENCEMENT

- Notice: Give notice before fabrication is due to start.
  - Period of notice (minimum): 28 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: Marked so that subsequent treatment cannot obliterate the marking.

195 HARD STAMPING

- Usage: Not permitted except as indicated on drawings.

210 END CONNECTIONS

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

225 STEELWORK TO BE GALVANIZED

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

**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.

**BOLT ASSEMBLIES**

302 NON-PRELOADED BOLT ASSEMBLIES

- Designation: As required by Fabricator's connection design.
  - Threading: Part length.

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D20, E05, E10, E20, E30, E40, E41, E42, G10, G20

- Nuts and washers: To suit grade of bolt, as NSSS, clause 2.3.2 and NSSS CE Marking version, clause 2.4.3.
- Coating applied by manufacturer: Galvanised, to suit site exposure.
- Other requirements: None.

#### 310 ANCHORAGES TO CONCRETE

- Design standard: As the designated code of practice.
- Anchor type: Refer to MBA drawings.
- Material: Refer to MBA drawings.
  - Coating applied by manufacturer: Refer to MBA drawings.
- Concrete:
  - Grade: Refer to MBA drawings.
  - Condition: Cracked.
- Fixing in concrete: Refer to MBA drawings.

#### 335 SPRING WASHERS

- Standard: To BS 4464.

### **ERECTION**

#### 410 PRE-ERECTION CHECKS

- Scope: 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.
- Inaccuracies and defects: Report without delay.
- Permission to commence erection: Obtain.

#### 425 MODIFICATIONS

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

#### 432 TEMPORARY SUPPORT

- Permanent bracing system:
  - Vertical: Steel columns tied into timber frame structure.
  - Horizontal: Diaphragm action provided by sheathed roof structure.
- Temporary bracing/ restraints: Provide as necessary until the timber frame walls and roof joists are complete and sheathed in their entirety.
- Elements to be supported: Columns and beams during installation, lateral frame stability prior to completion of the timber frame structure.
- Forces and moments in temporary supports: Make an independent assessment.

#### 440 COLUMN BASES

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

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D20, E05, E10, E20, E30, E40, E41, E42, G10, G20

**443 PROPRIETARY FILLING/ BEDDING OF COLUMN BASES**

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

**447 BONDED ANCHORS**

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

**TESTING**

**465 TESTING**

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

**470 SITE TESTING OF ANCHORS TO MASONRY**

- Standard: To BS 5080.
- Preliminary tests: 5 No. tests for tensile loading to failure in locations that will be hidden in completed structure.
- Proof tests: Test 10% of working fixings to 1.5 times the working load.
- Test results: Report failures and seek instructions.

**475 PRODUCTS**

- Steel: Submit test certificates.

**PROTECTIVE COATINGS**

**535 INSPECTION OF COATING WORK**

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

**535 INSPECTION OF COATING WORK**

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

**550 POST-GALVANIZING INSPECTION**

- Inspector: Submit, on request, evidence of training and competence in visual inspection for liquid metal assisted cracking.

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- Components for which visual inspection is not required (procedure PGI-0): Not applicable.
- Components requiring additional inspection:
  - Procedure PGI-2A: None.
  - Procedure PGI-2B: None.
- Timing: Before erection of steelwork or application of other coatings.
- Action in event of non-compliance:
  - Submit: Full records of all post-galvanising inspections, drawing attention to any erected components that are required to be quarantined.
  - Procedure PGI-3: Carry out on all quarantined components, and submit report.
  - 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.
  - Remedial actions: Submit proposals.

## **PROTECTIVE COATING SYSTEMS**

### **620 GALVANIZING TO BLAST CLEANED STEEL**

- Use/ location: All elements of external structure and any steelwork located in the outer leaf of cavity wall construction
- 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.
- Galvanizing: To BS EN ISO 1461.
  - Minimum mean coating thickness: 140 micrometres.

### **638 SHOP PRIMING FOR INTERNAL STEELWORK**

- Use/ location: Internal locations where steelwork is not subject high humidity/corrosive environment.
- Shop preparation:
  - Generally: Blast cleaning to BS EN ISO 8501-1, preparation grade Sa2 1/2
  - Welds/ edges/ areas with surface imperfections: To BS EN ISO 8501-3, preparation grade P2
- Primer: Two pack Epoxy, see clause 523.
  - Manufacturer: To be advised by Contractor
  - Product reference: To be advised by Contractor
  - Dry film thickness: 85 microns.
  - Special requirements:
    - All steel exposed within cavity walling; and where steel is embedded within concrete, to be over-coated with 2 coats high build Bitumen paint, 1 brown and 1 black. To meet requirements of clause 523.
    - Architect must ensure compatibility of proposed primer with intumescent coating specification.
    - Primer to be suitable for short term exposure to coastal environment during Construction.

## **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.

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- 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.

#### 725 MANUAL CLEANING OF NEW STEELWORK

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

#### 730 PREPARATION FOR SITE WELDING OF SHOP PAINTED STEELWORK

- Method: 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.

#### 740 BOLTED JOINTS (OTHER THAN FRICTION GRIP JOINTS)

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

#### 760 GALVANIZED FASTENERS

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

#### 765 SITE PREPARATION OF SHOP PAINTED STEELWORK

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

### **PAINTING**

#### 810 ENVIRONMENTAL CONDITIONS

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

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#### 815 COATINGS

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

#### 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.
  - Validation: Measurements to be independently witnessed.
  - Meter calibration: Check against standard shims and recalibrate regularly against a smooth steel reference plate.
- Average dry film thickness:
  - At least specified thickness over any square metre.
  - No reading to be less than 75% of specified thickness.
- Top coat dry film thickness: Sufficient to give an even, solid, opaque appearance.

#### 825 STRIPE COAT

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

## **G20 CARPENTRY/ TIMBER FRAMING/ FIRST FIXING**

To be read with Preliminaries/ General conditions.

### **GENERAL**

#### **105 TIMBER PROCUREMENT**

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

#### **120 STRUCTURAL DESIGN PROVIDED**

- Description: As detailed on MBA Drawings.
- Requirements:
  - Generally: As section B50/B51.
  - Additional Requirements: None.

#### **150 STRENGTH GRADING OF TIMBER**

- Grader: A company currently registered under a third party quality assurance scheme operated by a certification body approved by the UK Timber Grading Committee.

#### **160 GRADING AND MARKING OF SOFTWOOD**

- 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 'DRY' or 'KD' (kiln dried).
- Timber graded undried (green) and specified for installation at higher moisture contents: Clearly marked as 'WET' or 'GRN'.
- Structural timber members cut from large graded sections: Regraded to approval and marked accordingly.

### **PRODUCTS**

#### **210 STRUCTURAL SOFTWOOD (GRADED DIRECT TO STRENGTH CLASS) TO ALL STRUCTURAL ELEMENTS**

- Grading standard: To BS 4978, BS EN 14081-1, or other national equivalent and so marked.
- Strength class to BS EN 338: As noted on MBA Drawings.
- Treatment:
  - Preservative treatment: Required to Architects specification.  
Design service life: 30 years minimum, Contractor to notify Client of any deviations from this or ongoing maintenance requirements, required to achieve this.
  - Fire retardant treatment: To Architects specification

## **WORKMANSHIP GENERALLY**

- 401 CROSS SECTION DIMENSIONS OF STRUCTURAL SOFTWOOD AND HARDWOOD
- Dimensions: Dimensions in this specification and shown on drawings are target sizes as defined in BS EN 336.
  - Tolerances: The tolerance indicators (T1) and (T2) specify the maximum permitted deviations from target sizes as stated in BS EN 336, clause 4.3:
    - Tolerance class 1 (T1) for sawn surfaces.
    - Tolerance class 2 (T2) for further processed surfaces.
- 402 CROSS SECTION DIMENSIONS OF NON-STRUCTURAL SOFTWOOD
- Dimensions: Dimensions in this specification and shown on drawings are finished sizes.
  - Maximum permitted deviations from finished sizes: As stated in BS EN 1313-1:
    - Clause 6 for sawn sections.
    - Clause NA.2 for further processed sections.
- 420 WARPING OF TIMBER
- Bow, spring, twist and cup: Not greater than the limits set down in BS 4978 or BS EN 14081-1 for softwood, or BS 5756 for hardwood.
- 430 SELECTION AND USE OF TIMBER
- Timber members damaged, crushed or split beyond the limits permitted by their grading: Do not use.
- 435 NOTCHES, HOLES AND JOINTS IN TIMBER
- Notches and holes: Position in relation to knots or other defects such that the strength of members will not be reduced.
  - Scarf joints, finger joints and splice plates: Do not use without approval.
- 440 PROCESSING TREATED TIMBER
- Cutting and machining: Carry out as much as possible before treatment.
  - Extensively processed timber: Retreat timber sawn lengthways, thickened, planed, ploughed, etc.
  - Surfaces exposed by minor cutting/ drilling: Treat with two flood coats of a solution recommended by main treatment solution manufacturer.
- 450 MOISTURE CONTENT
- Moisture content of wood and wood based products at time of installation: Not more than:
    - Covered in generally unheated spaces: 24%.
    - Covered in generally heated spaces: 20%.
    - Internal in continuously heated spaces: 20%.
- 451 MOISTURE CONTENT TESTING
- Procedure: When instructed, test timber sections with an approved electrical moisture meter.
  - Test sample: Test 5% but not less than 10 lengths of each cross-section in the centre of the length.
  - Test results: 90% of values obtained to be within the specified range. Provide records of all tests.

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#### 510 PROTECTION

- Generally: Keep timber dry and do not overstress, distort or disfigure sections or components during transit, storage, lifting, erection or fixing.
- 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.
- Trussed rafters: Keep vertical during handling and storage.

#### 520 EXPOSED END GRAIN

- Components: Seal exposed end grain of the following before delivery to site:  
Proposed extension to ground floor balcony.
- Sealer: Clear end grain sealer.

#### 540 CLEAR FINISHES

- Structural timber to be clear finished: Keep clean and apply first coat of specified finish before delivery to site.

#### 550 EXPOSED TIMBER

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

### **JOINTING TIMBER**

#### 570 JOINTING/ FIXING GENERALLY

- Generally: Where not specified precisely, select methods of jointing and fixing and types, sizes and spacing's of fasteners in compliance with section Z20.

#### 630 BOLTED JOINTS

- Bolt spacing's (minimum): To BS 5268-2, table 81.
- 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.
- 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.
- Bolt tightening: So that washers just bite the surface of the timber. Ensure that at least one complete thread protrudes from the nut.
  - Checking: At agreed regular intervals up to Completion. Tighten as necessary.

#### 670 ANTI-CORROSION FINISHES FOR FASTENERS

- Galvanizing: To BS 7371-6, with internal threads tapped and lightly oiled following treatment.
- Sherardizing: To BS 7371-8, Class 1.
- Zinc plating: To BS EN ISO 4042 and passivated.

### **ERECTION AND INSTALLATION**

#### 715 BONDED ANCHORS (Soleplate fixings / etc.)

- Manufacturer: As specified on MBA Drawings or similar approved by MBA.
  - Product reference: As specified on MBA Drawings or similar approved by MBA
- Size: As detailed on MBA Drawings.
- Material/Finish: Generally as detailed on MBA Drawings. If not explicitly stated:
  - Zinc Plated: Internal use only.
  - Hot dipped galvanised: External Use in Non-Coastal areas.

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Stainless Steel: External Use in Coastal areas.

- Spacing/edge distance (minimum): As per MBA Drawings.
  - Obtain instructions if specified spacing or edge distance cannot be achieved.
- Installation holes: Drilled to diameter and depth recommended by manufacturer. Clean and free from dust.
- Permeable sleeves: Use in conditions where otherwise loss of bonding agent would be unacceptably high.
- Installation/tightening: To manufacturer's instructions.

#### 740 PRE-ERECTION CHECKING

- Timing: Not less than 10 days before proposed erection start date.
- Checklist:
  - Foundations and other structures to which timber structure will be attached: Check for accuracy of setting out.
  - Holding down bolts: Check for position, protruding length, condition and slackness.
- Inaccuracies and defects: Report without delay.
- Erection: Obtain permission to commence.

#### 750 MODIFICATIONS/ REPAIRS

- Defects due to detailing or fabrication errors: Report without delay.
- Methods of rectification: Obtain approval of proposals before starting modification or remedial work.
- 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

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

#### 770 ADDITIONAL SUPPORTS

- Provision: Position and fix additional studs, noggings and/ or battens to support edges of sheet materials, and wall/ floor/ ceiling mounted appliances, fixtures, etc. shown on drawings.
- 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

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

#### 780 WALL PLATES

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

#### 784 JOISTS GENERALLY

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

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786 JOISTS ON HANGERS

- Hangers: Bedded directly on and hard against supporting construction. Do not use packs or bed on mortar.
- 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.
- Fixing to hangers: A nail in every hole.

790 STANDARD JOIST HANGERS IN ALL LOCATIONS REQUIRED

- Standard: To BS EN 845-1.
- Size and type: To suit joist, design load and crushing strength of supporting construction.
- Material/ finish: Stainless steel.

795 TRIMMING OPENINGS

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

850 INSPECTION GENERALLY

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

860 BOLTED JOINT INSPECTION

- Timing: Inspect all accessible bolts at the end of the Defects Liability Period and tighten if necessary.