

SPECIFICATION

Rev A

(P1-33)

D10 Piling

E10 Insitu concrete mixes, casting and curing

E20 Formwork for insitu concrete

E30 Reinforcement for insitu concrete

E41 Worked finishes to insitu concrete

E60 Precast/Composite concrete floors/roof decks

P31 Holes/Chases/Covers/Supports for services

D10 PILING

GENERAL

- 101 **SCOPE OF WORK:** The Contractor shall design, install and test the piling to meet the performance requirements set out in this Specification, meet Local Building Control requirements, and shall be responsible for ensuring that all piles will safely carry the specified loads.
- 102 **SPECIFICATION:** The design, supply, construction and testing of piles shall be in accordance with the 1988 edition of the 'MODEL SPECIFICATION FOR PILING', published by the Institution of Civil Engineers.
- 103 In so far as any clauses in this Specification may conflict or be inconsistent with any provision of the 'Model Specification for Piling', the clause in this Specification shall be applicable.
- 104 Under Clause 1.1.1 of the 'Model Specification for Piling', the term 'The Engineer' shall mean the Engineer acting as the authorised representative of the CA.

DESIGN REQUIREMENTS

- 201 **DESIGN:** The design of the piles shall be in accordance with the recommendations of BS8004 and the latest amendments of the Building Regulations, and current good practice.
- The Contractor shall submit calculations to the CA for comment a minimum of 28 days in advance of commencement of works on site. No comments made by the CA shall relieve the Contractor from his responsibility for the adequacy of the pile design under this contract.
- 202 **FACTORS OF SAFETY:** The minimum overall factors of safety (Sum of shaft friction and base capacity divided by working load) shall be as follows:-
- | | |
|-----------------|--------------------|
| On calculations | 2.5 3.0 |
| On test results | 2.0 |
- The Contractors design shall comply with Clause 7.3.8 'Factors of Safety' in BS8004 and current good practice.
- 203 Each pile or group of piles shall be designed so that the vertical settlement does not exceed 10mm under the action of the total working loads.
- 204 Piles shall be designed to carry the working loads indicated on the drawings.

TYPE OF PILES

- 205 All piles shall be bored cast in-situ or continuous flight augured concrete piles, ~~or~~ DRIVEN.

The Contractor shall clearly describe the proposed type of pile and method of construction in their tender, and must obtain approval of his type of pile and method of installation from the Local Authority and Environmental Agency.

- 206 The Contractor shall exercise every precaution throughout the whole of the piling operations so that no damage results to any adjoining properties. The Contractor shall bear all costs resulting from any such damage, and is to ensure he has suitable insurance cover for this purpose.

CONSTRUCTION OF PILES

- 230 **PILING MAT:** The Contractor shall provide all necessary piling mats and platforms, to safely install the piles using their chosen method of plant and installation.
- 250 **TEMPORARY CASINGS:** The Contractor shall provide all necessary casings as required for the installation of the piles.
- 260 When boring into hard strata or through obstructions, care shall be taken with CFA piles to avoid the drawing up of materials from the sides of the bore by excessive rotation of the auger without a proportional penetration being achieved. Particular care shall be taken where water bearing granular soils are overlain by cohesive strata.
- 270 The Contractor shall ensure the bottom of all pile borings is sound. In the cases of cfa piles, the auger shall not be retracted before concreting commences.
- 280 All piles shall be bored and concreted in one day.
- 290 The Contractor shall keep an accurate record of the strata revealed in the boring of all piles.

INSTRUMENTATION FOR CONTINUOUS FLIGHT AUGURED PILES

- 300 All continuous flight augured rigs shall be equipped with at least the following instrumentation:-

Depth indicator
Concrete volume gauge
Concrete injection pressure gauge
Auger rotation counter

This instrumentation shall be in good working order at all times. No piles shall be installed if the equipment is faulty.

- 310 The read-out from the instrumentation will be presented in clear view of the operator in such a way that he can ensure that:-

- Positive concrete pressure is maintained during the concreting cycle.
- A continuous check can be made on the concrete supplied at all levels to ensure that a positive excess use above the theoretical is maintained. The excess shall be maintained above an agreed minimum.

DRAWINGS AND SITE INVESTIGATION REPORT

- 350 **DRAWINGS:** The required position of the piles, their final cut off levels and working loads are shown on the structural drawings. *(Final cut off level to be agreed + corroborated by builder)*
- 360 **SITE INVESTIGATION:** A site investigation has not been undertaken to date, a borehole site investigation may be carried out in due course if required to facilitate the pile design.
- 400 Cement used in the construction of piles shall be a blended combination of PC with ggbs or pfa to BS5328. PC shall be to BS12.
- 410 Concrete piles shall be designed for Class 3 sulphate concentrations in accordance with BRE Digest 363.
- 420 The compressive strength of concrete shall be determined by the Contractor, to the approval of the CA.

REINFORCEMENT

- 450 All piles shall be reinforced with a minimum of 6 No. bars, which shall be not less than 6.0m in length. The area of reinforcement provided shall be not less than 0.3% of the gross cross sectional area of the pile.

PILE TRIMMING

- 480 Piles shall be trimmed to their final cut off level using small tools. Large tools or machine mounted breakers shall not be used.

EXCAVATION NEAR PILES

- 490 The Contractor shall exercise due care when working around piles to prevent damage. Hydraulic excavators shall not work closer than 300mm to a pile. Final excavation shall be carried out by hand. Any damage to piles during excavation shall be put right at the Contractors own expense.

PILE TESTS

- 501 **STATIC LOAD TEST:** The Contractor shall carry out 2 No. pile tests by maintained load method outlined in the 'Model Specification for Piling' and BS8004,

to 1.5 times the working load of the piles. The piles to be tested are to be agreed.

The pile will be deemed to have satisfied the test provided the vertical depression at the pile head under working load does not exceed 6.0mm, under 1.5 times the working load does not exceed 12.0mm and if the residual settlement after load removal does not exceed 6.0mm. If the piles are designed for a FoS = 3 then static pile tests will not be required.

- 502 **INTEGRITY TESTING OF PILES:** The Contractor shall integrity test all piles using a sonic echo method of testing, producing a trace of velocity against time or distance. All test results shall be made available to the CA within 7 days of testing.
- 503 **TEST FAILURES:** Should any pile fail to meet the test requirements, the Contractor shall at his own expense carry out additional testing as required by the CA and shall bear all costs associated with the installation of additional piles and modifications to the foundations caused by the failure.

GUARENTEE

- 701 **WARRANTY:** The Contractor shall provide a written design warranty that the piles will carry the loads indicated on the drawings, without such settlement as would adversely affect the stability of the fabric of the building or other adjacent buildings.

E10 IN SITU CONCRETE MIXES, CASTING AND CURING

To be read with Preliminaries/General conditions.

CONCRETE MIXES

100 DESIGNATED MIX FOR INSITU RC GROUND BEAMS

- Mix RC40 to BS 5328.
- The concrete will be designed by supplier
- Nominal maximum size of aggregate: 20 mm.
- Admixtures: An accelerator or retarder may be used.

125 SUBSTITUTION OF STANDARD FOR DESIGNATED MIXES:

- Where appropriate, Standard mix(es) to BS 5328:Part 2, Section 4 will be permitted in substitution for specified Designated mixes in accordance with BS 5328:Part 1, Table 13 and in each case subject to approval.
- If Standard mixes are made on site comply with BS 8000: Section 2.1, Subsections 2, 3 and 4.

130 NORMAL DESIGNED MIX FOR _____

- To the relevant clauses of BS 5328:Parts 2, 3 and 4.
- Grade: _____
- Nominal maximum size of aggregate: _____ mm
- Aggregate(s):
Coarse: To BS 882
Sand: To BS 882
Special requirements: _____
- Cement:
PC, PBFC, HSBC, PPFAC
Combinations to BS 5328 of PC with ggbs or pfa.
- Minimum cement content: _____ kg/cu m
- Maximum free water/cement ratio: _____
- Maximum cement content: _____ kg/cu m
- Admixture(s): _____
- Maximum total percentage of chloride ion by mass of cement: _____ %
- Rate of sampling for compressive strength testing: one sample per _____ cu m or _____ batches whichever represents the lesser volume, but not less than one for each day of use.
- Information to be provided by the producer: As BS 5328: Part 3, clause 3.

135 EQUIVALENT GRADE DESIGNED MIX FOR _____

- To the relevant clauses of BS 5328:Parts 2, 3 and 4.
- Equivalent grade as BS 5328:Part 1, clause 8.5: _____
- Nominal maximum size of aggregate: _____ mm
- Aggregate(s):
Coarse: To BS 882
Sand: To BS 882
Special requirements: _____
- Cement: _____
- Minimum cement content: _____ kg/cu m
- Maximum free water/cement ratio: _____

- Admixture(s): Do not use any which provide water reduction.
-
- Maximum total percentage of chloride ion by mass of cement: %
- Rate of sampling for compressive strength testing: one sample per cu m or batches whichever represents the lesser volume, but not less than one for each day of use.
- Information to be provided by the producer: As BS 5328: Part 3, clause 3.

150 PRESCRIBED MIX FOR

- To the relevant clauses of BS 5328: Parts 2, 3 and 4.
- To be obtained from
- Cement:
- Nominal maximum size of aggregate: mm
- Aggregate(s):
Coarse:
Sand:
Special requirements:
- Mix proportions: Cement: kg
Coarse aggregate: kg
Sand: kg
- Workability: mm slump.
- Admixture:
Dosage:
- Maximum total percentage of chloride ion by mass of cement: %
- Information to be provided by the producer: As BS 5328: Part 3, clause 3.1.

180 MIXES FOR SUNDRY TYPES OF IN SITU WORK are specified in other sections of this specification as follows:

E60 Precast/Composite concrete floors/roof decks
 F30 Accessories/Sundry items for brick/block/stone walling
 F31 Precast concrete sills/lintels/copings/features
 Q10 Kerbs/edgings/channels
 Q40 Fencing
 Q50 Site/street furniture/equipment
 R12 Drainage below ground
 R13 Land drainage

Mixes specified in this section which are equivalent to or better than the above may be used in lieu, subject to approval.

MATERIALS, BATCHING AND MIXING

- 215 READY-MIXED CONCRETE** must be used for ALL GROUND BEAMS 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.

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 Sulphate resisting Portland cement
 PBFC Portland blastfurnace cement

HSBC High slag blastfurnace cement (in lieu of LHPBC)

PPFAC Portland pulverised-fuel ash cement

ggbfs Ground granulated blastfurnace slag

pfa Pulverized fuel ash

- Cements, ggbfs 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:Part 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.
- 325 **EXPOSED CONCRETE:** Obtain approval before altering constituent materials or proportions of concrete which will be exposed in the finished work.
- 355 **RISK OF ALKALI SILICA REACTION IN DESIGNED/PREScribed MIXES:** Take one of the precautions specified for Designated mixes in clause 5.5.7 of BS 5328: Part 2. 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 5075.
 - Use only if specified or approved, and then in accordance with their manufacturer's recommendations.
 - 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 on 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:Part 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 _____ 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:** 2 copies of reports to be despatched to CA within one day of completion of each test.
Keep a complete set of reports on site.
- 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.
- 571 **EARLY AGE STRENGTH TESTING:** Submit for approval a regime of accelerated or normal curing and early testing which is capable of predicting the 28 day strength of Designed mixes and which will be used for determining compliance. Make two additional cubes from each sample and cure 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.
- 581 **FAILURES:** Wherever the specified sampling, testing and compliance procedures show that a concrete mix is not in accordance with the specification (even if the work is eventually accepted), and measures are taken to help in establishing whether or not the work is acceptable, such measures:
- will be at the expense of the Contractor, and
 - will not be considered as grounds for extension of time.

PLACING AND COMPACTING

- 610 **CONSTRUCTION/SEQUENCE/TIMING REQUIREMENTS:**
- _____
- _____

- 620 **TIMING OF WATERTIGHT CONSTRUCTION:** On hot and/or sunny days, either suspend placing of watertight concrete, or carry out placing during the late

afternoon or evening. Other methods of keeping the concrete within an acceptable maximum temperature may be agreed with CA.

- 630 **UNDERLAY:** Before placing structural concrete (not blinding concrete) on hardcore or other absorbent substrates, lay building paper to BS 1521, Class B or polyethylene sheet, 250 micrometres thick. Lap edges 150 mm.
- 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 degC in hot weather and not less than 5 degC 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 _____

- 700 **LIGHTWEIGHT AGGREGATE CONCRETE:** Place and compact so as to prevent flotation of coarse aggregate and formation of excessive blowholes.
- 710 **WOOD WOOL:** Compact concrete in wood wool forms using a vibrator longer than the depth of concrete. Insert vertically at spacings of not more than 600 mm in each direction.
- 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 degC 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.
- 811 **CURING:**
- Coverings for curing may be suitable impervious sheet materials or a suitable curing compound containing a fugitive dye and with an efficiency of at least 75%. (90% for surfaces exposed to abrasion). They:
 - Must be effective in preventing evaporation, particular attention being paid to sealing at edges and junctions.
 - Must not disfigure permanently exposed surfaces.
 - Must not affect the satisfactory bond of subsequent construction and finishes.
 - Curing compounds applied to surfaces which will be exposed in the finished work or which are to receive bonded finishes must be removed by light, even grit blasting.
 - Until the exposed top faces of fresh concrete are in a state suitable to receive sheets in direct contact or a sprayed curing compound as applicable, cover with waterproof sheeting held clear of the surface and well sealed against draughts at edges and junctions.
- 820 **CURING PERIODS, in days** (t = the average number of degrees centigrade air temperature during the curing period):

E10 In situ concrete mixes, casting and curing (continued)

E10

- 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, PC52.5, SRPC	Concrete made using PPFAC, PBFC, HSBC pfa, ggbs
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	$\frac{100}{t+10}$	$\frac{100}{t+10}$

- Other structural concrete surfaces (cements 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

- Obtain prior approval for curing periods for mixes using admixtures or other types of cement.

821 CURING PERIODS, in days:

- 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, PC52.5, SRPC	Concrete made using PPFAC, PBFC, HSBC, Pfa,ggbs
November to April	10	12
May to October	7	10

- Other structural concrete surfaces: No special requirements if in damp weather and protected from sun and wind, otherwise as follows (cements as above):

November to April	6	10
May to October	4	7

- Obtain prior approval for curing periods for mixes using admixtures or other types of cement.

822 CURING PERIODS, not less than:

- Surfaces which in the finished building will be exposed to the elements, and wearing surfaces of floors and pavements, regardless of weather conditions 10 days
- Other structural concrete surfaces 5 days

830 TEMPERATURE OF WATERTIGHT CONCRETE:

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

840 PROTECTION: Prevent damage to concrete, including:

- Surfaces generally: From rain, indentation and other physical damage.
- Surfaces to 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

To be read with Preliminaries/General conditions.

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.
 - Wind and snow loads.
- 120 **DETAILS:** Provide details of forms as follows:
- _____
- _____
- 130 **PROPPING:** Provide adequate propping to prevent deflection and damage to the structure. Carry down such props to bearings strong enough to provide adequate support.
- 140 **PROPPING OF PROFILED STEEL SHEETS:** Provide continuous support along the centre of each span until the concrete has reached an adequate strength as agreed with the CA.
- 150 **BEARINGS:**
- Prop through other decks if construction load on a particular deck exceeds:
 - the design loading, or
 - where less than 28 days have elapsed from casting, a reduced loading agreed with CA.
 - Submit details of proposed prop bearings and through propping to CA. Accept responsibility for cost of checking effects on structure.
- 160 **CAMBERS:**
- Cambers shown on the drawings or specified below relate to the concrete immediately before formwork is struck. Make adequate allowance for deflection of formwork under weight of fresh concrete. Top surfaces of concrete must also be cambered to maintain the required structural depths and profiles.
 - Unless otherwise shown on drawings construct forms to achieve the following upward cambers:
- Slabs: % of span measured at centre:
- _____
- Beams: % of span measured at centre:
- _____
- Cantilever beams: % of cantilever measured at free end:
- _____
- After striking of formwork and removal of props check levels to determine extent of any residual camber and inform CA.

170 WORK BELOW GROUND:

- Vertical faces of strip footings, bases and slabs 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.

180 COLLAPSIBLE BOARD SUBSTRUCTURE FORMWORK:

- Manufacturer and reference: _____
- Thickness: _____
- Where used for foundations, ground beams, etc. carefully wrap each board in 500 gauge polyethylene sheet to protect from ground water.
- Where used for ground slabs, lay boards on a level bed of dry sand, not less than 25 mm thick, then overlay with 500 gauge polyethylene sheet with lapped joints sealed with waterproof tape.
- Protect board from indentation by chairs and spacers by use of plates obtained from the board manufacturer.

181 COMPRESSIBLE BOARD SUBSTRUCTURE FORMWORK:

- Low density expanded polystyrene compressible fill.
- Manufacturer and reference: _____
- Thickness/profile: _____
- Width: _____ mm.
- Where used for foundations, ground beams, etc. lay boards on a flat and even bed. If necessary, blind the bottom of the trench with granular fill or concrete.
- Vertical faces of trenches: Ensure that the boards are fully supported for the total depth and restrain the top edge of boards to prevent uplift during concreting. Fix small pieces securely.
- Piled construction: Cut boards neatly round concrete piles.
- Protect boards from indentation by chairs and spacers using methods recommended by the board manufacturer.

195 VENTILATED SUBSTRUCTURE FORMWORK:

- Manufacturer and reference: _____
- Panel size: _____ mm x _____ mm.
- Overall depth: _____ mm.
- Leg depth: _____ mm.
- Lay panels on level ground on a _____ mm layer of sand blinding.
- Where cutting of panels is necessary use a method recommended by the panel manufacturer.
- Seal joints between panels using _____

200 UNDERSLAB SHEET INSULATION:

- Manufacturer and reference: _____
- Thickness: _____
- Lay sheets on _____
- Seal all joints with tape recommended by manufacturer or by completely overlaying with 500 gauge polyethylene with lapped joints.
- Ensure that insulation is covered with concrete blinding (see section E10) before fixing slab reinforcement.

- 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.
- 330 **INSERTS, HOLES AND CHASES:**
- Confirm positions and details to ensure that alterations to and decisions about their size and location are not made without the knowledge and approval of the CA.
 - Fix inserts or box out as required in correct positions before placing concrete. Form all holes and chases; do not cut hardened concrete without approval.
- 340 **KICKERLESS CONSTRUCTION:** Unless shown otherwise form horizontal construction joints at base of walls and columns without kickers, using one of the methods described in BCA Publication 47.023 'Kickerless construction'. The Contractor must satisfy himself as to the suitability of the chosen method.
- 350 **FORM TIES:** No metal part of any device for securing forms is to remain within the specified concrete cover.
- 351 **FORM TIES:** Do not use in formwork for _____
- 360 **FORM TIES for watertight concrete:**
- Manufacturer and reference: _____
 - Plug the surface holes with semidry 1:3 cement:sand mortar, well rammed in.
- 361 **FORM TIES for watertight concrete:**
- Through bolts which are entirely withdrawn on stripping the formwork.
 - Seal holes with corks coated with adhesive or other approved material well rammed in from the concealed face, and plug the other side with semidry 1:3 cement:sand mortar, well rammed in.
- 380 **EXPANDED PLASTICS** _____
Manufacturer and reference: _____
- 390 **COFFER UNITS:**
Manufacturer and reference: _____
- 400 **TROUGH UNITS:**
Manufacturer and reference: _____
- 410 **EXPANDED STEEL MESH FORMWORK LINING:**
Manufacturer and reference: _____

- 420 **RIBBED STEEL MESH FORMWORK AND REINFORCEMENT:**
Manufacturer and reference: _____
- 430 **PROFILED STEEL SHEET FORMWORK AND REINFORCEMENT:**
Manufacturer and reference: _____
- 440 **WOOD WOOL SLAB PERMANENT FORMWORK:**
- Slabs: to BS 1105, Type B, Thickness _____ mm
 - Fix with permanent shuttering clips, obtained from the woodwool slab manufacturer, inserted into longitudinal joints at 600mm centres, ensuring regular appearance if slabs will be exposed to view.
 - Tightly butt edges and stagger joints in alternate courses.
 - Where slabs are not supplied with a preslurried finish, apply cement:sand slurry to form faces to completely fill the surface.
- 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.
- 480 **SURFACE RETARDERS:** Do not use without approval. Prevent retarder from touching the reinforcement.

STRIKING

- 510 **RESPONSIBILITY:** Strike formwork without disturbing, damaging or overloading structure, and without disturbing props. Notwithstanding other clauses in this specification and any checking or approvals by the CA, the responsibility for safe removal of any part of the formwork and any supports without damaging the structure rests with the Contractor.
- 520 **MINIMUM PERIODS:**
- The following periods (in days) for retaining formwork in position before striking apply to class 42.5 or sulfate- resisting Portland cement concrete with no cement replacement materials or admixtures:

Type of formwork	Average mean of daily minimum and maximum air temperatures during the period		
	16°C	7°C	3°C
Vertical formwork to columns, walls and beams	0.5	75	1
Soffit forms to slabs	4	6	8
Props to slabs and soffit forms to beams	10	15	20

Props to beams 14 21 28

- Submit details of proposed periods for mixes using admixtures or other types of cement.

521 **MINIMUM PERIODS:** Alternative methods of determining minimum periods for retaining formwork in position may be submitted for approval. Accept responsibility for cost of checking of proposals by CA and for any testing.

FORMED FINISHES

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

615 **FINISH TO RECEIVE ASPHALT TANKING:**

- Produce an even finish with a sheet material (e.g. plywood), suitable to receive asphalt, and acceptable to asphalt contractor.
- Avoid excessive use of release agents.
- Abrupt irregularities to be not greater than 3 mm.
Gradual irregularities, expressed as a maximum permissible deviation from a 1 m straight edge, to be not greater than 3 mm.
- Blowholes less than 10 mm in diameter will be permitted but otherwise surface to be free from voids, honeycombing, segregation and other large defects.
- Making good: Projecting fins are to be removed and rubbed down with a carborundum stone but otherwise the finish is to be left as struck. Making good of small defects will normally be permitted after inspection by CA.
- Arrises to be _____
- Formwork tie holes to be filled with mortar.

620 **PLAIN SMOOTH FINISH:**

- Produce an even finish with a sheet material (e.g. plywood), with panels arranged in a regular pattern as a feature of the surface.
- Abrupt irregularities to be not greater than 5 mm. Gradual irregularities, expressed as maximum permissible deviation from a 1 m straight edge, to be not greater than 5 mm.
- Variation in colour resulting from the use of an impermeable form lining will be permitted but the surface to be free from discolouration due to contamination or grout leakage.
- Blowholes less than 10 mm in diameter will be permitted but otherwise surface to be free from voids, honeycombing, segregation and other large defects.
- Making good: Projecting fins are to be removed and rubbed down with a carborundum stone but otherwise the finish is to be left as struck. Making good of small defects will normally be permitted after inspection by CA.
- Arrises to be _____
- Formwork tie holes to be in an approved regular pattern, filled with matching mortar to an approved sample.
- Complete a sample area of the finished work, size _____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.

630 **FINE SMOOTH FINISH:**

- Produce a smooth even finish with an impervious sheet material (e.g. resin film faced plywood), with panels as large as is practicable and arranged in an approved

regular pattern as a feature of the surface. Do not replace parts of formwork panels where this may cause a change of colour in the concrete.

- Abrupt irregularities to be not greater than 3 mm. Gradual irregularities, expressed as maximum permissible deviation from a 1 m straight edge, to be not greater than 3 mm.
- Variation in colour resulting from the use of an impermeable form lining will be permitted but the surface is to be free from discolouration due to contamination or grout leakage.
- Cover spacers: Do not use without approval.
- Blowholes less than 5 mm in diameter will be permitted but otherwise surface to be free from voids, honeycombing, segregation and other defects.
- Making good: Projecting fins are to be removed and rubbed down with a carborundum stone but otherwise the finish is to be left as struck. Making good will not normally be permitted.
- Arrises to be _____
- Formwork tie holes to be in an approved regular pattern, filled with matching mortar to an approved sample.
- A similar type and quality of finish can be seen _____

The required finish differs from the above in that _____

- Complete a sample area of the finished work, size _____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.

640 ROUGH BOARD FINISH:

- Form or form lining to consist of approved _____ mm wide rough textured softwood boards with smooth planed joint faces, seasoned to a moisture content of not more than 25% and not less than 18%.
- Arrange boards of varying textures to give uniform overall effect, with boards running _____
- End joints _____
- Nail heads to be driven flush with the surface.
- Assemble boards to prevent penetration of grout between them. Wet pre-assembled forms with clean water before erecting and keep damp until concrete is placed.
- Making good: The finish is to be left as struck. Making good will not normally be permitted.
- Arrises to be _____
- Formwork tie holes to be in an approved regular pattern, filled with matching mortar to an approved sample.
- A similar type and quality of finish can be seen _____

The required finish differs from the above in that _____

- Complete a sample area of the finished work, size _____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.

650 RIBBED FINISH:

- Form or form lining to consist of ex _____ mm x _____ mm splayed timber battens at _____ mm centres fixed securely to plywood backing with adhesive and screws.
- Battens to have clean, sharp arrises at base stopped with a waterproof filler to prevent penetration of grout behind them and sanded to give a smooth surface.
- Do not use concrete cover spacers without approval.

- Blowholes less than 5 mm in diameter will be permitted but otherwise surface to be free from voids, honey-combing, segregation and other defects.
- Making good: The finish is to be left as struck. Making good will not normally be permitted.
- Margins, arrises and junctions to be _____
- Formwork tie holes to be in an approved regular pattern, filled with matching mortar to an approved sample.
- A similar type and quality of finish can be seen _____

The required finish differs from the above in that _____

- Complete a sample area of the finished work, size ____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.

660 PROPRIETARY FORM LINING FINISH:

- Form lining manufacturer and reference: _____
- Adequately fix lining to support formwork and joint neatly.
- Do not use concrete cover spacers without approval.
- Blowholes less than 5 mm in diameter will be permitted but otherwise surface to be free from voids, honeycombing, segregation and other defects.
- Making good: The finish is to be left as struck. Making good will not normally be permitted.
- Margins, arrises and junctions to be _____
- Formwork tie holes to be in an approved regular pattern, filled with matching mortar to an approved sample.
- A similar type and quality of finish can be seen _____

The required finish differs from the above in that _____

- Complete a sample area of the finished work, size ____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.

665 CONTROLLED PERMEABILITY FORM LINING FINISH:

- Form lining manufacturer and reference: _____
- Tension the lining over the formwork and fix securely in accordance with the manufacturer's recommendations using an approved fixing system.
- Do not use a release agent on the formwork or on the lining.
- Do not use concrete cover spacers without approval.
- Removal of lining: _____
- Do not reuse.
- Making good: The finish is to be left as struck. Making good will not normally be permitted.
- Margins, arrises and junctions to be _____
- Formwork tie holes to be in an approved regular pattern, filled with matching mortar to an approved sample.
- A similar type and quality of finish can be seen _____

The required finish differs from the above in that _____

- Complete a sample area of the finished work, size ____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.

700 FINISH FOR ABRASIVE BLASTING (see section E41):

- Produce an even finish with a sheet material (e.g. plywood), with accurate, true and even joints masked on the face with pressure-sensitive tape such that they will be indistinguishable after blasting.
- Gradual irregularities, expressed as maximum permissible deviation from a 1 m straight edge, to be not greater than 3mm.
- Do not use cover spacers.
- Blowholes less than 10 mm in diameter will be permitted but otherwise surface to be free from voids, honeycombing, segregation and other large defects.
- Arrises to be _____
- Formwork tie holes to be in an approved regular pattern, filled with matching mortar to an approved sample.

710 FINISH FOR TOOLING (see section E41):

- Produce an even finish with a sheet material (e.g. plywood), with accurate, true and even joints masked on the face with pressure-sensitive tape such that they will be indistinguishable after tooling.
- Gradual irregularities, expressed as maximum permissible deviation from a 1 m straight edge, to be not greater than 5mm.
- Do not use cover spacers.
- Blowholes less than 10 mm in diameter will be permitted but otherwise surface to be free from voids, honeycombing, segregation and other large defects.
- Arrises to be _____
- Formwork tie holes to be in an approved regular pattern, filled with matching mortar to an approved sample.

E30 REINFORCEMENT FOR IN SITU CONCRETE

To be read with Preliminaries/General conditions.

REINFORCEMENT

- 110 **QUALITY ASSURANCE:** All steel reinforcement specified to comply with BS 4449 or BS 4483 and cut and bent to BS 4466 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.
- 165 **GALVANIZED REINFORCEMENT:** Type(s) as specified, galvanized to BS 729 after cutting but before bending.
- 170 **STAINLESS STEEL BAR REINFORCEMENT:** To BS 6744, type _____, strength grade _____
- 180 **EPOXY COATED BAR REINFORCEMENT:** To BS 7295:Part 1, bond classification type _____.
- 210 **FABRIC REINFORCEMENT:** To BS 4483.
- 240 **PREFABRICATED SHEAR REINFORCEMENT SYSTEM:**
 - Manufacturer and reference: _____
 - Use shearhoops of the type(s) and size(s) shown on the drawings to provide shear reinforcement at the locations indicated.

Install strictly in accordance with manufacturer's recommendations.

WORKMANSHIP

- 310 **CUT AND BEND** reinforcement to schedules and to BS 4466. Do not bend when below 5 degC without approval. Steel may be warmed to not more than 100 degC. Do not rebend bars without approval. Tag bundles of reinforcement with labels to BS 4466.
- 311 **CUT AND BEND** stainless steel bars to BS 4466 as for high yield bars.
- 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 4466, 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.
- 420 LAPS in nominal bar reinforcement to be not less than 300 mm.
- 421 LAPS in fabric reinforcement, where not detailed, to be not less than 250 mm. Where necessary seek instructions to avoid a four layer build-up at corners.
- 434 **STRUCTURAL WELDED JOINTS** will not be permitted.
- 435 **STRUCTURAL WELDED JOINTS** will be permitted in accordance with BS 7123 if approved by the reinforcement manufacturer and subject to approval by the CA. Submit full details including joint type(s), location(s) and conditions of working. Accept responsibility for cost of checking by the CA and for any supervision and testing.
- 444 **MECHANICAL JOINTS** will not be permitted.
- 445 **MECHANICAL JOINTS** may be substituted for lapped joints subject to approval. Submit full details, including joint type(s) and location(s). Accept responsibility for cost of checking by the CA and for any supervision and testing.
- 446 **MECHANICAL JOINTS** are to be used only in positions shown on the drawings, unless otherwise approved.
Type of coupler: _____
Manufacturer and reference: _____
- 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' 1989.
 - 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.
- 455 **FIX STAINLESS STEEL REINFORCEMENT** as clause 451 using 16 swg annealed stainless steel wire.
- 465 **FIX EPOXY COATED REINFORCEMENT** as clause 451 and BS 7295: Part 1, Appendix E.
- 470 **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.
- 481 GROUND BEARING SLABS: Where these are reinforced with a single layer of fabric in the upper part of the slab, the fabric may be placed in position on top of the first compacted layer of concrete, followed by the top layer of concrete, placed within two hours of the first layer.
- 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.
- 510 RUST STAINING: Prevent rust staining of surfaces of concrete which will be exposed to view in the finished work, caused by, e.g. rust stained formwork or unprotected projecting reinforcement.
- 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:Part 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.
- 521 CHECKING COVER: For _____ period(s) of _____ days, as and when instructed, provide and maintain fully charged, for the sole use of the CA, an approved magnetic induction digital display type cover meter calibrated in accordance with manufacturer's recommendations.

E41 WORKED FINISHES TO IN SITU CONCRETE

To be read with Preliminaries/General conditions.

- 110 **HIGH STRENGTH CONCRETE TOPPING TO _____**
 Thickness: ____ mm
- Mix:
 Cement: Portland Cement, Class 42.5, or Portland blastfurnace cement.
 Fine aggregate: Natural sand of uniform colour, to BS 882, grading limit M.
 Coarse aggregate: To BS 882, 10 mm single sized, mechanical properties as clause 4.4.
 Proportions: 1:1:2.
 - Monolithic construction: Tamp base slab with notched beam. Lay and compact topping within 3 hours of laying base (less in hot weather) but after any bleed water on the surface of the base has disappeared.
 Surface tolerances: Local regularity - as clause E05/310. Maximum permissible deviation of wearing surface level from datum - ± 15 mm.
 - Finish: _____ as clause _____
- 150 **TIMING:** Carry out all finishing operations at optimum times in relation to the setting and hardening of the concrete. Do not wet surfaces of concrete to assist surface working. Do not sprinkle cement on to surface.
- 210 **TAMPED FINISH:** Tamp surface with edge of a board or beam to give an even texture of parallel ribs.
- 220 **SCORED FINISH:**
- Scratch surface with a _____ to give a roughened texture.
 - A similar type and quality of finish can be seen _____
 The required finish differs from the above example in that _____
 - Complete a sample area of the finished work, size ____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.
- 230 **BRUSHED FINISH TO RECEIVE _____**
 Brush surface with a stiff broom or wire brush while still green, to produce a lightly textured surface.
- 240 **WOOD FLOATED FINISH TO RECEIVE BLOCKWORK**
 Use a wood float to give an even slightly coarse texture with no ridges or steps.
- 310 **SMOOTH FLOATED FINISH _____**
 Use a hand float, skip float or power float to give an even surface with no ridges or steps.
- 320 **TROWELLED FINISH to receive _____**
- Float concrete to an even surface with no ridges or steps, then immediately commence curing as specified in section E10.
 - When the concrete is suitably stiff, hand or power trowel to give a uniform smooth but not polished surface, free from trowel marks and other blemishes, and suitable to receive the specified flooring material.
 - Resume specified curing without delay.
 - Protect the surface from construction traffic until flooring material is laid.

- If, because of inadequate finishing or protection, the surface of the concrete is not suitable to receive the specified flooring material, it must be made good by application of a smoothing compound by and to the satisfaction of the flooring subcontractor. Allow for the cost of any such making good.
- 330 TROWELLED FINISH for wearing surfaces:
- Float concrete to an even surface with no ridges or steps, then immediately commence curing as specified in section E10.
 - Successively hand or power trowel at intervals, applying sufficient pressure to close the surface, to give a uniform smooth finish free from trowel marks and other blemishes.
 - Resume specified curing without delay.
 - Complete a sample area of the finished work, size ____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.
- 340 DEWATERED TROWELLED FINISH for wearing surfaces:
- Immediately after compaction of the concrete, apply the vacuum dewatering process in accordance with the equipment manufacturer's recommendations.
 - Without delay, float the surface using a power float to give an even surface with no ridges or steps, then immediately commence curing as specified in section E10.
 - Successively hand or power trowel at intervals, applying sufficient pressure to close the surface, to give a uniform smooth finish free from trowel marks and other blemishes.
 - Resume specified curing without delay.
 - Complete a sample area of the finished work, size ____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.
- 350 NONSLIP TROWELLED FINISH for wearing surfaces:
- Float to an even surface with no ridges or steps, then immediately commence curing as specified in section E10.
 - Successively hand or power trowel at intervals, applying sufficient pressure to close the surface, to give a uniform smooth finish free from trowel marks and other blemishes.
 - Apply silicon carbide or aluminium oxide, graded between BS 410 sieves 1.7 mm and 500 microns, sprinkling evenly at the rate of 1 kg/sq m and trowel into the surface while the concrete is still plastic.
 - Resume specified curing without delay.
 - Complete a sample area of the finished work, size ____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.
- 410 POWER GROUND FINISH for wearing surfaces:
- Float to an even surface with no ridges or steps, then immediately commence curing as specified in section E10.
 - When concrete is sufficiently hard for sand particles not to be torn from the surface, power grind to remove 1-2 mm from surface to give an even glass-paper texture, free from blemishes and trowel marks.
 - Remove all dust and wash down. Resume specified curing without delay.
 - Complete a sample area of the finished work, size ____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.

420 ABRASIVE BLASTED FINISH:

- Produce a formed finish suitable for abrasive blasting, as clause E20/700.
- At a carefully controlled time in relation to the strength of the concrete produce an even _____ blasted finish with an average depth of exposure of ____ mm to expose the _____
- Stop off the blasting to straight masked lines, leaving regular margins _____
- A similar type and quality of finish can be seen _____
The required finish differs from the above example in that _____
- Complete a sample area of the finished work, size ____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.

430 TOOLED FINISH:

- Produce a formed finish suitable for tooling, as clause E20/710.
- Not less than 21 days after casting, tool the surface using a _____ to a _____ texture with indentations not exceeding ____ mm, avoiding the appearance of lines on the finished surface.
- Stop off the blasting to straight masked lines, leaving regular margins _____
- Remove all loose particles and dust by brushing.
- A similar type and quality of finish can be seen _____
The required finish differs from the above example in that _____
- Complete a sample area of the finished work, size ____ sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.

510 SURFACE HARDENER: Not less than three weeks after casting, clean surface of concrete by wetting with soap suds and scrubbing with wire brush and fine steel wool. Mop up and scrub with fibre brush and clean water. Allow to dry thoroughly for several days then apply an approved proprietary chemical surface hardener to manufacturer's recommendations.

520 SURFACE SEALER: Apply an approved resin sealer to concrete wearing surface floors in accordance with manufacturer's recommendations.

E60 PRECAST/COMPOSITE CONCRETE FLOORS/ROOF DECKS

To be read with Preliminaries/General conditions.

PROPRIETARY FLOORS/ROOF DECKS

110 PRECAST BEAM AND BLOCK FLOOR/ROOF DECK:

- Drawing reference(s): TBC
- Beams manufacturer and reference: TBC
- Blocks: Solid rectangular concrete to BS 6073:Part 1.
Work size: 440 x 215 x 100 mm.
Minimum compressive strength: 7 N/sq mm.
Transverse load capacity measured on a 420 mm span: Not less than 3.5 kN/sq mm.
Block density: min 1500kg/m³
- In situ concrete infill: Prior to grouting, fill troughs formed by double beams and other holes with in situ concrete to BS 5328, Designated mix RC35 or equivalent to approval.
- Grouting: Brush floor clean, wet thoroughly and brush in grout, first in direction of joists, then across to fill all joints and surface irregularities.
Grout: 1:6 cement:sharp sand (1:4 if soft sand or in wet weather).
- Other requirements:

120 PRECAST BEAM AND POT FLOOR/ROOF DECK:

- Drawing reference(s):
- Manufacturer and reference:
Depth of beams:
Centres of beams:
- In situ concrete infill: Prior to grouting, fill troughs formed by double beams and other holes with in situ concrete to BS 5328, Designated mix or equivalent to approval.
- Grouting: Brush floor clean, wet thoroughly and brush in grout, first in direction of joists, then across to fill all joints and surface irregularities.
Grout: 1:6 cement:sharp sand (1:4 if soft sand or in wet weather).
- Other requirements:

130 PRECAST PLANK FLOOR/ROOF DECK:

- Drawing reference(s):
- Manufacturer and reference:
Plank depth:
Plank width:
- In situ reinforcement: As section E30.
- In situ concrete infill: To BS 5328, Designated mix or equivalent to approval.
- Other requirements:

140 COMPOSITE FLOOR/ROOF DECK:

- Drawing reference(s):
- Precast elements manufacturer and reference:
- In situ reinforcement: As section E30.
- In situ concrete: To BS 5328, Designated mix or equivalent to approval.
Surface finish:
- Other requirements:

180 PRECAST STAIRS:

- Drawing reference(s): _____
- Manufacturer and reference: _____
- Special requirements: _____

- 190 DETAILING: The floor/roof deck manufacturer or specialist subcontractor is required to prepare location and assembly drawings showing every aspect of the construction, incorporated components and features, trimming for voids, holes for services, and related work by others. Submit to the CA for comment well in advance of construction.

PERFORMANCE SPECIFIED FLOORS/ROOF DECKS

210 PRECAST/COMPOSITE FLOOR:

- Drawing reference(s): _____
- Type of construction: _____
- Overall depth (excluding finishes): _____
- Span: _____
- Self weight: _____
- Distributed dead load of finishes, fixtures, unlocated partitions: _____ kg/sq m
- Concentrated dead load(s): _____
- Distributed imposed load: _____
- Concentrated imposed load(s): _____
- Deflection: not greater than span divided by _____
- Basic fire resistance as clause 280: _____ hours.
- In situ reinforcement: As section E30.
- In situ concrete: _____
- Finish to soffit: _____
- Finish to top surface: _____
- Other requirements for floor: _____
- Precast stairs: _____

220 PRECAST/COMPOSITE ROOF DECK:

- Drawing reference(s): **___REFER TO STRUCTURAL DRAWING S01 rev A**
- Type of construction: **___PRECAST BEAM & BLOCK GROUND FLOOR**
- Overall depth (excluding finishes): 155mm
- Span: **___refer to drawings**
- Self weight: Not more than _____ kg/sq m **FOR LOADS SEE DRAWING S01**
- Distributed dead load _____ kg/sq m
- Concentrated dead load(s): _____
- Wind loading: Calculate in accordance with CP3:Chapter V: Part 2, making due allowance for any internal pressure.
Basic wind speed (V): _____ m/s
Topography factor (S1): _____
Ground roughness, building size and height factor (S2) determined from CP3:Chapter V:Part 2, table 3: _____
Statistical factor (S3):1.
- Other imposed loads: Calculate in accordance with BS 6399:Part 3, assuming a roof _____ access.
Basic snow load: _____ kN/sq m
Altitude of site: _____ m.
- Concentrated imposed load(s): _____

- Deflection: not greater than span divided by _____
- Basic fire resistance as clause 280: _____ hours.
- In situ reinforcement: As section E30.
- In situ concrete: _____
- Finish to soffit: _____
- Other requirements: _____

225 PRECAST/COMPOSITE ROOF DECK:

- Drawing reference(s): _____
- Type of construction: _____
- Overall depth (excluding finishes): _____
- Span: _____
- Self weight: Not more than _____ kg/sq m
- Distributed dead load _____ kg/sq m
- Concentrated dead load(s): _____
- Wind loading: Calculate in accordance with BS 6399:Part 2, Standard Method making due allowance for any internal pressure.
Basic wind speed (V_b): _____ m/s
Altitude factor (S_a): _____
Directional factor (S_d): Determine from BS 6399:Part 2, table 3.
Seasonal factor (S_s): 1
Probability factor (S_p): 1
Terrain and building factor (S_b): Determine from BS 6399:Part 2, table 4.
Size effect factor: Determine from BS 6399:Part 2, figure 4.
- Other imposed loads: Calculate in accordance with BS 6399:Part 3, assuming a roof _____ access.
Basic snow load: _____ kN/sq m
Altitude of site: _____ m.
- Concentrated imposed load(s): _____
- Deflection: not greater than span divided by _____
- Basic fire resistance as clause 280: _____ hours.
- In situ reinforcement: As section E30.
- In situ concrete: _____
- Finish to soffit: _____
- Other requirements: _____

250 DESIGN: Complete the design of the floor(s)/roof deck(s)/stair(s) in accordance with BS 8110 and to meet the requirements of this specification. The floor(s)/roof deck(s)/ stair(s) must withstand the worst combination of dead and imposed loads, both in the finished building and during construction.

260 COMPOSITE CONSTRUCTION: Design to be fully continuous over supports.

280 BASIC FIRE RESISTANCE, as specified elsewhere, must be determined without regard to applied finishes and in accordance with BS 8110:Part 2, section 4 or by testing to BS 476:Part 8 (if assessed prior to 1 January 1988) or BS 476:Part 21.

WORKMANSHIP**310 PRECAST UNITS:**

- Store units clear of the ground on level bearers correctly positioned.
- Lift units at designed lifting points only, using special lifting devices and cradles as necessary.

E60 Precast/Composite concrete floors/roof decks (continued)

E60

- Set on level bearings ensuring not less than the minimum seating recommended by manufacturer.
 - 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.
- 320 CONCRETE INFILL:
- Thoroughly clean and wet surfaces of precast units.
 - Place concrete, avoiding segregation, and compact thoroughly to eliminate voids.
 - Ensure that precast units do not move until concrete has gained sufficient strength.
- 330 COMPOSITE CONSTRUCTION:
- Thoroughly clean and wet surfaces of precast units.
 - Place, compact and cure in situ concrete in accordance with section E10.
 - Ensure that precast units do not move until concrete has gained sufficient strength.
- 340 LATERAL RESTRAINT:
- Ensure that floors/roof decks tightly abut walls.
 - Straps: Manufacturer and reference: BAT _____
Material/finish: galv steel _____
Size: Not less than 30 x 5 mm cross section, not less than _____ mm long, each end cranked 100 mm.
 - Position as shown on drawings at not more than 1.5m centres, with one cranked end in tight contact with cavity face of wall inner leaf, other cranked end grouted into a floor/roof deck joint.
- 350 LEVELS OF FLOORS: As Preliminaries clause A33/370.
- 360 SURFACE REGULARITY OF IN SITU TOPPINGS TO COMPOSITE FLOORS: As section E05, clause 310.

P31 HOLES/CHASES/COVERS/SUPPORTS FOR SERVICES

To be read with Preliminaries/General conditions.

- 110 **CO-ORDINATION:** Liaise with subcontractors to establish locations and dimensions of all holes and chases required for services. Submit details to CA for checking before proceeding with the work.
- 150 **HOLES AND CHASES IN IN SITU CONCRETE** to be cast in. Do not cut hardened concrete or drill holes larger than 10 mm diameter without permission.
- 160 **HOLES AND CHASES IN PRECAST CONCRETE:** Do not cut or drill precast concrete without permission.
- 170 **HOLES IN STRUCTURAL STEELWORK:** Do not cut or drill structural steelwork without permission.
- 185 **HOLES, RECESSES AND CHASES IN MASONRY:**
- Holes, recesses and chases to be in locations which will least affect the strength, stability and sound resistance of the construction, and to be of the smallest practicable size.
 - Holes must not exceed 300 mm square.
 - Do not cut chases in walls of hollow or cellular blocks without approval.
 - In walls of other materials:
 - Vertical chases must be not deeper than one third of the single leaf thickness.
 - Horizontal or raking chases must be not longer than 1 m and not deeper than one sixth of the single leaf thickness.
 - Do not set chases or recesses back to back; offset by a clear distance not less than the wall thickness. Where sockets, etc. are shown on drawings as nominally back to back, obtain instructions.
 - Do not cut until mortar is fully set. Cut carefully and neatly, avoiding spalling, cracking or other damage to surrounding structure. Do not cut chases with mechanical or hand impact tools.
- 220 **PREFORMED HOLES IN MASONRY:** Submit proposals for bridging over holes for ducts, pipes, etc., which exceed _300mm_ in width.
- 230 **NOTCHES AND HOLES IN STRUCTURAL TIMBER:**
- To be avoided wherever possible and to be the minimum sizes needed to accommodate services.
 - Do not position near knots or other defects in the same cross section which would significantly affect strength of timber.
 - Notches and holes in the same joist to be at least 100 mm apart horizontally.
 - Notches in joists to be at the top, located between 0.07 and 0.25 of span from support, not deeper than 0.125 x depth of joist and to be formed by sawing down to a drilled hole.
 - Holes in joists to be on the neutral axis, with diameter not more than 0.25 x depth of joist, spaced at centres not less than 3 x diameter of largest hole and located between 0.25 and 0.4 of span from support.
 - Notches in roof rafters, struts and columns will not be permitted.
 - Holes in struts and columns to be on the neutral axis, with diameters not exceeding 0.25 x minimum width of member, located between 0.25 and 0.4 of length from end and spaced at centres not less than 3 x diameter of largest hole.

- 300 PIPE DUCTS FOR _____
 - Manufacturer and reference: _____
 - Size(s): ____ mm

- 310 PIPE SLEEVES FOR _____
 - Material: _____
 - Sleeves to extend through full thickness of wall/floor and be accurately positioned to give a minimum clearance around service of 20 mm or diameter of service, whichever is the least.
 - Sleeves, whether built in or installed in preformed holes, to be bedded solid.
 - Seal annular space between service and sleeve with _____
 - Where exposed to view, finish bedding and sealing neatly to approval.

- 320 FIRE RESISTING PIPE SLEEVE(S) FOR _____
 - Manufacturer and reference: _____
 - Type(s) and size(s) recommended for the purpose by manufacturer.
 - Fire resistance: ____ hour(s).

- 340 SEALING AROUND SERVICES: Seal around _____ where they pass through _____ with _____ Completely fill the space, leaving no gaps and finish neatly.

- 350 FIRE RESISTING BARRIER(S) FOR _____
 - Manufacturer and reference: _____
 - Type: _____
 - Fire resistance: ____ hour(s).

- 370 ACCESS COVER(S)/GRATING(S) FOR _____
 - Manufacturer and reference: _____
 - Cover(s): _____
 - Size: _____
 - Frame/support/fixing: _____