SPECIFICATION FOR CONCRETE

BLACKPOOL & THE FYLDE COLLEGE
FIRE FIGHTING GROUND

PROJECT 6748

REVISION S1

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E05 IN SITU CONCRETE CONSTRUCTION GENERALLY

To be read with Preliminaries/General conditions.

110 ARRANGEMENT OF INFORMATION: The different parts of in situ concrete construction are specified in separate sections as follows:
E10 In situ concrete mixes, casting and curing
E20 Formwork
E30 Reinforcement
E40 Designed joints
E41 Worked finishes/Cutting
E60 Precast/Composite concrete floors/roof decks
Clauses dealing with particular aspects of certain types of construction may thus be dispersed over several sections.

300 LEVELS OF STRUCTURAL CONCRETE FLOORS: As Preliminaries clause A33/370.

310 SURFACE REGULARITY OF CONCRETE STRUCTURAL FLOORS: Sudden irregularities not permitted. When measured with a slip gauge to BS 8204:Part 1 or 2, Figure 3 or equivalent, the variation in gap under a straightedge (with feet) placed anywhere on the surface to be not more than the following:

- Floors which are to be self-finished, and floors to receive sheet or tile finishes directly bedded in adhesive:
  5 mm under a 3 m straightedge
  2 mm under a 1 m straightedge
- Floors to receive screeds/toppings/beds up to 50 mm thick:
  10 mm under a 3 m straightedge.
- Floors to receive mastic asphalt flooring or underlay laid over mastic asphalt levelling coat(s): 10 mm under a 3 m straightedge.
- Floors to receive mastic asphalt flooring or underlay laid direct: To the same surface regularities as defined in clause M11/760.

E10 IN SITU CONCRETE MIXING, CASTING AND CURING

To be read with Preliminaries/General conditions.

CONCRETE MIXES

100 DESIGNATED MIX FOR BLINDING AND KERB BEDDING
- Mix ST2 to BS 8500-1:2002.
- The concrete will be Unreinforced
- Nominal maximum size of aggregate: 20 mm.
- Admixtures: None.

125 SUBSTITUTION OF STANDARD FOR DESIGNATED MIXES:
- Where appropriate, Standard mix(es) to BS 8005:Part 1, will be permitted in substitution for specified Designated mixes
- If Standard mixes are made on site comply with BS 8000: Section 2.1, Subsections 2, 3 and 4.

132 NORMAL DESIGNED MIX FOR REINFORCED CONCRETE FOUNDATIONS
- To the relevant clauses of BS 8500:2002.
- Grade: C28/35
- Nominal maximum size of aggregate: 20 mm
- Aggregate(s):
  Coarse: To BS 882
  Sand: To BS 882
  Special requirements: None
- Cement:
  PC, PBFC, HSBC, PPFAC
  Combinations to BS 8005 of PC with ggbs or pfa.
- Minimum cement content: 330 kg/cu m
- Maximum free water/cement ratio: 0.50
- Maximum cement content: 450 kg/cu m
- Admixture(s): None
- Maximum total percentage of chloride ion by mass of cement: 0.4%
- Rate of sampling for compressive strength testing: one sample per 20 cu m or 10 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 8005 Part 1.

133 NORMAL DESIGNED MIX FOR REINFORCED CONCRETE WALLS AND WATER RETAINING CONCRETE CONSTRUCTION
- To the relevant clauses of BS 8005:Parts 1.
- Grade: C28/35
- Nominal maximum size of aggregate: 20 mm
- Aggregate(s):
  Coarse: To BS 882
  Sand: To BS 882
  Special requirements: Water absorbtion not greater than 3%
- Cement:
  PC, PBFC

Combinations to BS 8005 of PC with ggbs or pfa.
- Minimum cement content: 325 kg/cu m
- Maximum free water/cement ratio: 0.50
- Maximum cement content: 400 kg/cu m
- Admixture(s): None
- Maximum total percentage of chloride ion by mass of cement: 0.4%
- Rate of sampling for compressive strength testing: one sample per 20 cu m or 10 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 8005 Part 1

136 NORMAL DESIGNED MIX FOR REINFORCED CONCRETE EXTERNAL ROAD AND SERVICE YARD SLABS
- To the relevant clauses of BS 8005:Parts 1
- Grade: C32/40
- Nominal maximum size of aggregate: 20 mm
- Aggregate(s):
  Coarse: To BS 882
  Sand: To BS 882
  Special requirements: : Water absorbtion not greater than 3%
- Cement:
  PC, PBFC
  Combinations to BS 8005 of PC with ggbs or pfa.
- Minimum cement content: 325 kg/cu m
- Maximum free water/cement ratio: 0.55
- Maximum cement content: 450 kg/cu m
- Admixture(s): Air entraining agent to provide air content of 5% by volume
- Maximum total percentage of chloride ion by mass of cement: 0.4%
- Rate of sampling for compressive strength testing: one sample per 20 cu m or 10 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 8005: Part 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 mass concrete and reinforced concrete works 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
  ggbs Ground granulated blastfurnace slag
  pfa Pulverized fuel ash
- Cements, ggbs and pfa must comply with the relevant British Standards. Portland cements must have cement certification meeting the requirements of the NACCB, Category 2 for product conformity.

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

520A TEST LABORATORY: All specified testing including compressive testing of concrete cubes 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.

511A COMPRESSIVE STRENGTH TESTING: Compressive strength testing is to be carried out on 150 mm concrete cubes taken from each sample of concrete incorporated in the works. The rate of sampling is to be as specified for each grade of concrete in section E10. Six cubes are to be taken from each sample. Two to be tested at 7 days and two at 28 days. The target strength for each concrete mix is to be confirmed by the supplier prior commencement of the works.

530 TEST REPORTS: 2 copies of reports to be dispatched 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 28 day compressive cube strength 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

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.

710A WOOD WOOL: Wood Wool formwork must not be used. for any purpose in connection with structural concrete works.

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.

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.

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.

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.

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.

360 FORM TIES for watertight concrete:
- -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.

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		
	16xºC	7xºC	3xºC
Vertical formwork to columns, walls and beams	1	1	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.

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 square
- 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 10 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 chamfered 15 x 15 mm

- 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 10 sq m, in advance of the remainder, in an approved location, and obtain approval of appearance before proceeding.

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 500.

210 FABRIC REINFORCEMENT: To BS 4483.

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 500 bars must not be bent or straightened without approval.

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

420A LAPS in nominal bar reinforcement to be not less than 300 mm or 35 x bar diameter.

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

434 STRUCTURAL WELDED JOINTS will not be permitted.

444 MECHANICAL JOINTS will not be permitted.

451 FIXING GENERALLY:
- Unless otherwise permitted fix reinforcement in position before placing concrete. In addition to any spacers and chairs shown on drawings or schedules, provide adequate support, tie securely and maintain the specified cover. Comply generally with Concrete Society Report CS 101 'Spacers for reinforced concrete' 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.
- Chairs are not generally detailed on drawings or schedules. The contractor is to allow for the provision of all chair reinforcement necessary to support reinforcement during construction and to maintain the covers indicated on the drawings.

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 5 period(s) of 2 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.

E40 DESIGNED JOINTS IN IN-SITU CONCRETE

To be read with Preliminaries/General conditions.

110 ACCURACY: All joints to be accurately located, straight and well-aligned, and truly vertical or horizontal or parallel with the setting out lines of the building.

120 CONSTRUCTION/MOVEMENT JOINTS:
- Form joints accurately to detail and in locations shown on the drawings.
- If modifications to any joint design or location are necessary on site, agree revisions with CA before proceeding.
- Do not allow concrete to enter any gaps or voids in the formwork or to render the movement joints ineffective.
- Do not allow concrete to impregnate or penetrate any materials used as compressible joint fillers.
- Do not place concrete simultaneously on both sides of movement joints.

140 CONSTRUCTION JOINTS IN CONCRETE EXPOSED TO VIEW, additional to joints required by the designer, will not be permitted.

150 CONSTRUCTION JOINTS IN CONCRETE WEARING SURFACE FLOORS, additional to joints required by the designer, will not be permitted.

210 FORMED JOINTS: Construct using rigid, grout-tight side forms or stop ends designed to accommodate projecting bars or fabric without temporary bending or displacement.

211 FORMED JOINTS in concrete wearing surface floors:
- Forms to be square edged with a steel top surface and in good condition.
- Compact thoroughly at edges to give level, closely abutted joints with no lipping.

230 ROUGHENING OF CONSTRUCTION JOINT FACES: Brush and spray surface of construction joints while concrete is still green to leave a thoroughly roughened exposed aggregate finish.

260 CRACK INDUCING GROOVES:
- Depth 1/3 x depth of slab, width 5 mm
- Form grooves by inserting temporary strips into the fully compacted concrete, recompact and relevel the slab, and remove strips.
  Alternatively, if the type of aggregate used so permits, cut grooves with a saw sufficiently early to prevent random cracking (within 24 hours of casting the slab).
- Seal grooves as clause 530.

410 TIE BARS:
- To BS 4449, Grade 250, clean and free from loose millscale, loose rust, ice, oil and other deleterious substances.
- Fix securely at the stated centres, at the required depth and centred on the joints.

420 MESH TIE STRIPS:
- To BS 4483, clean and free from loose millscale, loose rust, ice, oil and other deleterious substances.

- Fix securely at the required depth with the width of the mesh strip centred on the joint.

430 DOWEL BARS:
- To BS 4449, Grade 250, perfectly straight, with sawn (not sheared) ends.
- Coat half of each bar with a suitable proprietary debonding compound or fit with a suitable plastics sleeve.
- Fix bars securely at the required depth, perfectly level, at right angles to and centred on the joint.
- At expansion joints fit an approved type of cap incorporating not less than 20 mm of compressible material to debonded ends of all bars.

520 SHEET JOINT FILLER for expansion joints:
- Manufacturer and reference: Servicised Aerofil
- Fix accurately in position. Ensure that sufficient space is left for sealant by using temporary formers.

530 SEALANT FOR JOINTS IN CONCRETE WALLS AND FLOORS
- Walls Servicised Vertiseal
  Floors Servicised Paraseal (Note sealant to external service yard slabs or vehicle areas to be Paraseal OR grade)
- Prepare joints and apply sealant as section Z22.

E41 WORKED FINISHES TO IN SITU CONCRETE

To be read with Preliminaries/General conditions.

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.

230 WIRE BRUSHED FINISH WITH STEEL TROWELLED MARGINS
Brush surface with a stiff wire brush while still green, to produce a lightly textured surface of parallel grooves. Edges of bays to be finished with a steel float to give a smooth even margin with no ridges or steps..

240 WOOD FLOATED FINISH TO RECEIVE TANKING OR OTHER WATERPROOFING SYSTEMS
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 carpet or vinyl floor finish
- 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.
  Allow for provision of sealer to upper surface of slab in the event that the moisture content of the slab exceeds acceptable threshold in accordance with the recommendations of the specified floor finish supplier.

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 20 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 10 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.