



Symmetry Park, Cronton - Phase 1 (Unit 2) Earthworks

Civil/Structural Specification

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D20

Excavating and filling

Clauses

2 To be read with preliminaries/general conditions

Generally/the site

110 Site investigation

1. Report: >Tier Environmental - Ground Investigation Report - Symmetry Park Merseyside Huyton - Ref TE 1163 GIR 1.4 (Reserved Matters 2)
>Enabling Works Strategy and Verification Plan Ref TE 1163 EWS 1.0
>Specification for the stabilisation of Shallow Mine Workings Ref TE1163-TE-00-XX-CM-GE-001-V02

145 Variations in ground water level

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

Clearance/excavating

164 Tree roots

1. Protected area: Do not cut roots within an area which is the larger of:
 - 1.1. The branch spread of the tree.
 - 1.2. An area with a radius of half the tree's height, measured from the trunk.
2. Excavation in protected area
 - 2.1. Method: By hand
 - 2.2. Backfill as soon as possible or temporarily line with polyethylene sheet to reduce evaporation.
3. Outside protected area: Give notice of roots exceeding 25 mm and do not cut without approval.
4. Cutting
 - 4.1. Make clean smooth cuts with no ragged edges.
 - 4.2. Pare cut surfaces smooth with a sharp knife.
 - 4.3. Treatment of cut roots: Not required
5. Backfill: As dug material, enriched with phosphate fertilizer

166 Tree root barriers

1. Trench: 1 m deep. Sever all roots.
2. Root barrier: Contractors Choice
3. Cutting roots: As clause 164.
4. Root barrier installation: Full depth of excavation. Fit closely to trench wall nearest the tree.
5. Backfill material: As dug material excavated from trench.
6. Backfilling: Lay and compact thoroughly in layers not more than 300 mm thick.

168 Site clearance

1. Timing: Before topsoil stripping, if any.
2. General: Clear site of rubbish, debris and vegetation. Do not compact topsoil.

3. Treatment: Not required

170 Removing small trees, shrubs, hedges and roots

1. Identification: Clearly mark trees to be removed.
2. Small trees, shrubs and hedges: Cut down
3. Roots: Grub up and dispose of without undue disturbance of soil and adjacent areas
4. Safety: Comply with HSE/ Arboriculture and Forestry Advisory Group Safety Guides.

175 Felling large trees

1. Definition: Girth over 600 mm.
2. Identification: Clearly mark trees to be removed.
3. Safety: Comply with HSE/ Arboriculture and Forestry Advisory Group Safety Guides.
4. Felling: As close to the ground as possible.
5. Stumps: Remove mechanically to a minimum depth of 300 mm below ground level
6. Work near retained trees: Take down trees carefully in small sections to avoid damage to adjacent trees that are to be retained, where tree canopies overlap and in confined spaces generally.

180 Chipping and shredding

1. General: Permitted, spread arisings on site in areas designated

220 Stripping topsoil

1. General: Before beginning general excavation or filling, strip topsoil from areas where there will be regrading, buildings, pavings/ roads and other areas shown on drawings.
2. Depth
 - 2.1. Remove to an average depth of 150 mm.
 - 2.2. Give notice where the depth of topsoil is difficult to determine.
3. Handling: Handle topsoil for reuse or sale in accordance with clause 225.
4. Around trees: Do not remove topsoil from below the spread of trees to be retained.
5. Site storage: Keep separate from excavated sub-soil

221 Treating topsoil

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

222 Existing on site spoil mounds

1. Remove all contaminated and unwanted materials from existing mounds and remove from site
2. Select soils that can be re used into the works and remove from site all unwanted material

225 Handling topsoil

1. Aggressive weeds
 - 1.1. Species: Included in the Weeds Act, section 2 or the Wildlife and Countryside Act, Schedule 9, part II.
 - 1.2. Give notice: Obtain instructions before moving topsoil.
2. Earthmoving equipment: Select and use to minimize disturbance, trafficking and compaction.
3. Contamination: Do not mix topsoil with:
 - 3.1. Subsoil, stone, hardcore, rubbish or material from demolition work.
 - 3.2. Oil, fuel, cement or other substances harmful to plant growth.

3.3. Other grades of topsoil.

4. **Multiple handling:** Keep to a minimum. Use topsoil immediately after stripping.
5. **Wet conditions:** Handle topsoil in the driest condition possible. Do not handle during or after heavy rainfall or when it is wetter than the plastic limit as defined by BS 3882, Annex N2.

240 Adjacent excavations

1. **Proximity:** Where an excavation encroaches below a line drawn at an angle from the nearest formation level of another higher excavation, the lower excavation, all work within it and backfilling thereto must be completed before the higher excavation is made.
2. **Angle of line from horizontal:** 35°

250 Permissible deviations from formation levels

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

260 Inspecting formations

1. **Give notice:** Make advance arrangements for inspection of formations for roads and pavings.
2. **Preparation:** Just before inspection remove the last 150 mm of excavation. Trim to required profiles and levels, and remove loose material.
3. **Seal:** Within 4 hours of inspection, seal formations with blinding concrete.

270 Foundations generally

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

283 Formations for pile supported structures

1. **Excavate:** To the design formation level.
2. **Compact:** As necessary to ensure formation will support weight of concrete without settlement and to ensure that pre auguring is not required. Suggest cbr values between 8 and 12%
3. **Blinding to formation:**

310 Unstable ground

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

320 Recorded features

1. **Recorded foundations, beds, drains, manholes, etc:** Break out and seal drain ends.
2. **Contaminated earth:** Report to Tier Consult and await instructions prior to removal and disposal

330 Unrecorded features

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

350 Existing watercourses

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

360 Excess excavation

1. Excavation taken wider than required
 - 1.1. **Backfill:** As instructed
2. Excavation taken deeper than required
 - 2.1. **Backfill:** With well graded granular material or lean mix concrete

370 Underground structures in landscape areas

1. **Generally:** Remove walls, roads, foundations, disused services, drains, manholes and the like to minimum depth.
2. **Minimum depth below finished levels**
 - 2.1. **Grass, ground cover and perennial planting:** 500 mm.
 - 2.2. **Shrub planting:** 750 mm.
 - 2.3. **Within 2 m of tree planting:** 1000 mm.
3. **Walls and slabs remaining:** In every 10 m² of wall or slab, make a drainage hole at least 600 mm diameter.

Disposal of materials

415 Excavated topsoil removal

1. **General:** Remove from site on to Country Park

421 Topsoil storage heap treatment

1. **Treatment:** Apply a suitable herbicide at appropriate times to prevent seeding of weeds

442 Surplus subsoil

1. Following excavation and cut and fill exercise
2. to be removed from site to a suitable landfill. Waste certificates to be provided
3. . Stockpiling prior to removal to be minimised at all times

450 Water

1. **Generally:** Keep all excavations free from water until:
 - 1.1. Formations are covered.
 - 1.2. Below ground construction are completed.
 - 1.3. Basement structures and retaining walls are able to resist leakage, water pressure and flotation.
2. **Drainage:** Form surfaces of excavations and fill to provide adequate falls.
3. **Removal of water:** Provide temporary drains, sumps and pumping as necessary. Do not pollute watercourses with silt laden water.

454 Ground water level, springs or running water

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

457 Pumping

1. **General:** Do not disturb excavated faces or stability of adjacent ground or structures.
2. **Pumped water:** Discharge without flooding the site or adjoining property.
3. **Sumps:** Construct clear of excavations. Fill on completion.
 - 3.1. **Locations:** To local watercourse subject to temporary EA permit

460 Permanent drainage system

1. **Disposal of water from the excavations through system:** Permitted subject to silt extraction and Environment Agency Permit

Filling

500 Proposed fill materials

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

510 Hazardous, aggressive or unstable materials

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

520 Frost susceptibility

1. **General:** Except as allowed below, fill must be non frost-susceptible as defined in Highways Agency 'Specification for Highway Works', clause 801.17.
2. **Test reports:** If the following fill materials are proposed, submit a laboratory report confirming they are non frost- susceptible:
 - 2.1. Fine grained soil with a plasticity index less than 20%.
 - 2.2. Coarse grained soil or crushed granite with more than 10% retained on a 0.063 mm sieve.
 - 2.3. Crushed chalk.
 - 2.4. Crushed limestone fill with average saturation moisture content in excess of 3%.

2.5. Burnt colliery shale.

3. Frost-susceptible fill: May only be used within the external walls of buildings below spaces that will be heated. Protect from frost during construction.

525 Testing of suitability of fill materials before start of filling

1. Laboratory: UKAS/ NAMAS accredited laboratory.
2. Submit report to: Structural engineer (two copies)
 - 2.1. Timing: 28 days before starting filling.
3. Samples: Deliver to laboratory as required.
 - 3.1. Additional requirements: None
4. Tests: As directed
5. Frequency: Submit with tender proposed rate and frequency of testing to demonstrate continuing compliance of imported or reprocessed fill with specified properties.

530 Placing fill within Borrow Pit Area

1. Excavations and areas to be filled: Free from loose soil, rubbish and standing water.
2. Freezing conditions: Do not place fill on frozen surfaces. Remove material affected by frost. Replace and recompact if not damaged after thawing.
3. Adjacent structures, membranes and buried services
 - 3.1. Do not overload, destabilise or damage.
 - 3.2. Submit proposals for temporary support necessary to ensure stability during filling.
 - 3.3. Allow 14 days (minimum) before backfilling against in situ concrete structures.
4. Layers: Place in maximum 300mm layers so that only one type of material occurs in each layer. Compact in accordance with Highways Specification 600 using 3 tonne vibrating roller with 10 passes. Material to achieve 95% dry density with less than 5% air voids and to achieve cbr value of 5% minimum
5. Earthmoving equipment: Vary route to avoid rutting.

531 Placing fill- Stabalised Material

1. Excavations and areas to be filled: Free from loose soil, rubbish and standing water.
2. Freezing conditions: Do not place fill on frozen surfaces. Remove material affected by frost. Replace and recompact if not damaged after thawing.
3. Adjacent structures, membranes and buried services
 - 3.1. Do not overload, destabilise or damage.
 - 3.2. Submit proposals for temporary support necessary to ensure stability during filling.
 - 3.3. Allow 14 days (minimum) before backfilling against in situ concrete structures.
4. Layers: Place and compact in 150mm layers Place so that only one type of material occurs in each layer. Test layers and achieve CBR value not less than 15% with 95% dry density with less than 5% air voids
5. Earthmoving equipment: Vary route to avoid rutting.

533 Compaction generally

1. General: Compact fill as soon as possible after placing.
2. After compaction: Surface of each layer must be well closed, showing no movement under compaction plant, and without cracks, holes, ridges, loose material and the like.
3. Defective areas: Remove and recompact to full thickness of layer using new material.

540 Benching in fill

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

550 Geotextile sheet if required

1. **Manufacturer:** Contractor's choice if deemed necessary.
 - 1.1. **Product reference:** Submit proposals
2. **Type:** Woven
3. **Polymer type:** Contractor's choice
4. **Jointing:** 300 mm overlap
5. **Preparation of subgrade:** Before laying sheet, remove humps and sharp projections. Fill hollows
6. **Protect from**
 - 6.1. Exposure to light.
 - 6.2. Contaminants.
 - 6.3. Materials listed as potentially deleterious by geotextile manufacturer.
 - 6.4. Wind uplift.

555 Geogrids if required

1. **Manufacturer:** Tensar
 - 1.1. **Product reference:** TX160
2. **Polymer type:** Manufacturers Details
3. **Directional strength:** Manufacturers Details
4. **Tensile strength:** Manufacturers Details
5. **Grid geometry:** Manufacturers Details
 - 5.1. **Direction of grids:** Manufacturers Details
6. **Preparation of subgrade:** Manufacturers Details
7. **Fixing:** Manufacturers Details
 - 7.1. **Centres:** Manufacturers Details
8. **Jointing:** Manufacturers Details

610 Compacted filling for landscape areas

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

617 Type 1 unbound mixture

1. **Fill:** To Highways Agency 'Specification for highway works', clause 803:
 - 1.1. Crushed rock (other than argillaceous rock).
 - 1.2. Crushed concrete.
 - 1.3. Recycled aggregates.
 - 1.4. Crushed non-expansive slag to clause 801.2.
 - 1.5. Well-burned non-plastic colliery shale.
2. **Filling:** To Highways Agency 'Specification for highway works', clauses 801.3 and 802.

618 Type 2 unbound mixture

1. **Fill:** To Highways Agency 'Specification for highway works', clause 804:
 - 1.1. Crushed rock (other than argillaceous rock).
 - 1.2. Crushed concrete.
 - 1.3. Crushed non-expansive slag to clause 801.2.
 - 1.4. Well-burned non-plastic colliery shale.
 - 1.5. Natural gravel.
 - 1.6. Natural sand.
2. **Filling:** To Highways Agency 'Specification for highway works', clauses 801.3 and 802.

620 Subgrade improvement layer (capping)

1. **Fill:** To Highways Agency 'Specification for highway works', Table 6/1, Class 6F1 or 6F2.
2. **Filling:** Place and compact to Highways Agency Specification for highway works, Table 6/1, clause 612 and clause 613.3, 613.9 and 613.10.

626 Compacted general fill

1. **Fill:** Making up levels to North West of site
2. **Excavated material:** Select suitable material and keep separate.
3. **Filling:** Spread and level material in layers. As soon as possible thoroughly compact each layer.
4. **Proposals:** Well in advance of starting work submit details of proposed:
 - 4.1. Materials to be used, including quantities of each type.
 - 4.2. Type of plant.
 - 4.3. Maximum depth of each compacted layer.
 - 4.4. Minimum number of passes per layer.

700 Backfilling around foundations

1. **Under oversite concrete and pavings:** Hardcore as clause 710.
2. **Under grassed or soil areas:** Material excavated from the trench, laid and compacted in 300 mm maximum layers.

710 Hardcore filling

1. **Fill:** Granular material, free from excessive dust, well graded, all pieces less than 75 mm in any direction, minimum 10% fines value of 50 kN when tested in a soaked condition to BS 812-111, and in any one layer only one of the following:
 - 1.1. Crushed rock (other than argillaceous rock) or quarry waste with not more binding material than is required to help hold the stone together.
 - 1.2. Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
 - 1.3. Crushed non-expansive slag.
 - 1.4. Gravel or hoggins with not more clay content than is required to bind the material together, and with no large lumps of clay.
 - 1.5. Well-burned non-plastic colliery shale.
 - 1.6. Natural gravel.
 - 1.7. Natural sand.
2. **Filling:** Spread and level in 150 mm maximum layers. Thoroughly compact each layer.

730 Blinding

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

Bioremediation - Not Used

'specification for highway works: earthworks specification' appendices

900 Appendix 6/1 – Requirements for acceptability and testing, etc. of earthworks materials

905 Appendix 6/2 – Requirements for dealing with class U1B and U2 unacceptable material

910 Appendix 6/3 – Requirements for excavation, deposition, compaction (other than dynamic compaction)

930 Appendix 6/7 – Sub-formation and capping and preparation and surface treatment of formation

935 Appendix 6/8 – Topsoiling

940 Appendix 6/9 – Earthwork environmental bunds, landscape areas, strengthened embankments

960 Appendix 6/13 – Ground improvement

Ω End of Section

E10**Mixing/casting/curing in situ concrete****Clauses****2 To be read with preliminaries/general conditions.**

Concrete**101 Specification**

1. Concrete generally: To BS 8500-2.
 - 1.1. Other requirements: None
2. Exchange of information: Provide concrete producer with information required by BS 8500-1, clauses 4 and 5.

132 Designed concrete

1. Description: For general structural concrete including foundations and suspended floors
2. Embedded metal: Carbon steel reinforcement and Structural steel
3. Compressive strength class (cylinder/ cube minimum): C28/35
4. Target density (oven-dry): Normal
5. Fibres: Not required
6. Aggregates
 - 6.1. Size (maximum): 20 mm
 - 6.2. Type/ Density: Normal weight
 - 6.3. Coarse recycled aggregates: Not permitted
 - 6.4. Additional aggregate requirements: None
7. Design chemical class: As per the site investigation document
8. Limiting values for composition
 - 8.1. Water:cement ratio (maximum): 0.55
 - 8.2. Cement/ combination content (minimum): 300 kg/m³
 - 8.3. Cement/ combination content (maximum): 400 kg/m³
 - 8.4. Air content in situ (minimum): No requirement
9. Consistence class: Contractor's choice
10. Permitted cement/ combinations: Contractor's choice
11. Chloride class: Cl 0.40
12. Admixtures: Concrete producer's choice
13. Colour: Not applicable
14. Additional mix requirements: None

160 Standardized prescribed concrete

1. Description: For kerb beds and haunches
2. Grade: ST3
3. Aggregates
 - 3.1. Size (maximum): 20 mm
 - 3.2. Additional aggregate requirements: None
4. Special requirements for cement/ combinations: None

5. Consistence class: Contractor's choice
6. Site mixing: Not permitted

Materials, batching and mixing

215 Ready-mixed concrete

1. Production plant: Currently certified by a body accredited by UKAS to BS EN 45011 for product conformity certification of ready-mixed concrete .
2. Source of ready-mixed concrete: Obtain from one source if possible . Otherwise, submit proposals .
 - 2.1. Name and address of depot: Submit before any concrete is delivered .
 - 2.2. Delivery notes: Retain for inspection .
3. Declarations of nonconformity from concrete producer: Notify immediately .

221 Information about proposed concretes

1. Submit when requested
 - 1.1. Details listed in BS 8500-1, clause 5.2.
 - 1.2. Additional information: Data concerning the anticipated rate of strength gain

225 Changes to specification

1. Changes to specification of fresh concrete (outside concrete producer's responsibility): Perform identity test for compressive strength on each affected batch

230 Interruption of supply during concreting

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

415 Admixtures

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

490 Properties of fresh concrete

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

Project testing/ certification

505 Project testing of concrete - general

1. Purpose: To ensure concrete has reached specified strengths
2. Testing: To BS EN 206-1, Annex B and BS 8500-1, Annex B.
 - 2.1. Nonconformity: Obtain instructions immediately.
3. Recording: Maintain complete correlated records including:
 - 3.1. Concrete designation.
 - 3.2. Sampling, site tests, and identification numbers of specimens tested in the laboratory.
 - 3.3. Location of the parts of the structure represented by each sample.

- 3.4. Location in the structure of the batch from which each sample is taken.

508 Regular project testing of concrete

1. **Tests:** Compressive strength and Early age compressive strength testing at 7 and 28 days and retain third sample as a backup
2. **Sampling**
 - 2.1. **Point:** At point of placing
 - 2.2. **Rate:** One sample of three cubes per 30m³
3. **Other requirements:** Cubes for early age strength testing to be stored under same conditions as concrete in members

520 Testing laboratory

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

530 Tests results

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

550 Broken cubes from failed strength tests

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

Placing/ compacting/ curing and protecting

610 Construction/ Sequence/ Timing requirements

1. None specified

620 Temperature of concrete

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

630 Premature water loss

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

640 Construction joints

1. **Location of joints:** Submit proposals when not shown on drawings
2. **Preparation of joint surfaces:** Remove surface laitance and expose aggregate by lightly brushing and spraying. Joint surface to be clean and damp immediately before placing fresh concrete

648 Adverse temperature conditions

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

650 Surfaces to receive concrete

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

660 Inspection of surfaces

1. **Notice:** Give notice to allow inspections of reinforcement and surfaces before each pour of concrete.
 - 1.1. **Period of notice:** Obtain instructions.
2. **Timing of inspections:** To be agreed

670 Transporting

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

680 Placing

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

690 Compacting

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

720 Vibrators

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

730 Plastic settlement

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

810 Curing generally

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

811 Coverings for curing

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

812 Preventing early age thermal cracking

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

815 Additional curing requirement - water curing

1. **Commencement of water curing:** As soon as practicable after placing and compacting concrete .
 - 1.1. **Surfaces covered by formwork:** Expose to water curing as soon as practicable .

- 1.2. **Top surfaces:** Cover immediately with impermeable sheeting to prevent evaporation before commencement of water curing .
2. **Water curing:** Wet surfaces continuously throughout curing period .
 - 2.1. Select methods from
 - 2.1.1. Mist spray .
 - 2.1.2. Wet hessian covered with impermeable sheeting .

816 Curing requirement - proprietary system to warehouse floors and service yards

1. Apply Sikafloor Proseal W curing Agent or similar approved to Ground Floor slab surface following surface trowelling.
2. Alternative product allowed subject to Engineers approval
3. **Water curing:** Wet surfaces continuously throughout curing period if deemed necessary; subject to weather conditions and size of pour

820 Curing periods

1. **General:** Curing periods are in days (minimum) .
 - 1.1. **Definition of 't':** The average number of degrees Celsius air temperature during the curing period.
2. **Curing periods for concrete surfaces which, in the finished building, will be exposed to the elements; concrete wearing surface floors and pavements; water resistant concrete:**
 - 2.1. Concrete made
 - 2.2. using CEM1; using cements
 - 2.3. strength class 42.5I indicated in BS
 - 2.4. or 52.5 8500, Table A.16
 - 2.5. SRPC (BS 4027) Except those
 - 2.6. listed in adjacent
 - 2.7. column and
 - 2.8. supersulfated cement
3. **Drying winds or dry,:** 140 180
4. sunny weather t+10 t+10
5. (relative humidity
6. < 50%)
7. **Intermediate:** 100 140
8. conditions t+10 t+10
9. Damp weather,
10. **protected from:** 100 100
11. sun and wind t+10 t+10
12. (relative humidity > 80%)
13. **Curing periods for other structural concrete surfaces (cements/ combinations as above):**
14. **Drying winds or dry,:** 80 140
15. sunny weather t+10 t+10
16. (relative humidity
17. < 50%)
18. **Intermediate:** 60 80
19. conditions t+10 t+10

- 20. Damp weather,
- 21. protected from No special No special
- 22. sun and wind requirements requirements
- 23. (relative humidity
- 24. > 80%)
- 25. Curing periods for concretes using admixtures or other types of cements/ combinations:
- 26. Submit proposals.

840 Protection

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

Ω End of Section

E30

Reinforcement for in situ concrete

Clauses - Not Used

Reinforcement

110 Quality assurance of reinforcement

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

150 Ribbed bar reinforcement

1. Standard: To BS 4449.
 - 1.1. Strength grade: Generally B500B, but B500C where detailed

210 Standard fabric reinforcement

1. Standard: To BS 4483.
2. Grade: Generally grade B500A but wrapping fabric plain wire grade 250.

245 Prefabricated reinforcement

1. Description: To capping beam and pile caps
2. Prefabricated elements: Submit proposals
3. Source: Obtain from a manufacturer holding valid certification of approval for welded fabrications issued by the UK Certification Authority for Reinforcing Steels (CARES).
 - 3.1. Certification required: Achievement of CARES appendix 6 for tack welding and appendix 10 for semi-structural/ structural welding.

Workmanship

310 Cutting and bending reinforcement

1. General: To schedules and to BS 8666.
2. Bending on site, including minor adjustments: Obtain instructions

320 Protection of reinforcement

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

410 Laps or splices

1. Details not shown on drawings: Obtain instructions.

425 Laps not detailed on drawings

1. Laps in bar reinforcement (minimum): Generally 40 x bar diameter
2. Laps in fabric reinforcement (minimum): 40 x bar diameter

2.1. Laps at corners: Avoid four layer build-up.

451 Fixing reinforcement

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

470 Tolerances on cover

1. Definition of nominal cover to BS 8500-1: Minimum cover plus tolerance for fixing.
 - 1.1. Tolerance (maximum): Floor/ roof slabs: 10 mm. Walls: 5 mm..
2. Tolerance (maximum):
3. Checking specified cover dimensions: Before concreting check that cover dimensions will be achieved.

480 Nominal cover to reinforcement

1. Top face: Generally 35 mm but 40 for foundations
2. Formed faces: Generally 35 mm but 75 for surfaces cast against soil

510 Rust staining

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

Ω End of Section

E60**Precast/ composite concrete floors/ roof decks****Clauses - Not Used****Proprietary floors/ roof decks****115 Precast retaining walls**

1. Description: External Retaining Walls to Carpark/Entrance Area
2. .
3. Manufacturer: Submit proposals
 - 3.1. Product reference: Submit proposals
4. Type: Reinforced precast type with smooth even finish without colour blemish
5. : Design Loadings - To suit height and soil conditions: .
6. Where walls are visible provide aris to corners
7. Other requirements: Provide concrete cube results from the manufacturer

116 Precast dock leveller pro wall system N/A

1. Description: .
2. .
3. Manufacturer: Submit proposals
 - 3.1. Product reference: Submit proposals
4. Type: Reinforced precast type with smooth even finish without colour blemish
5. : Design Loadings to accomodate wind loadings and self weight- Contractor to submit calculations: .
6. Where walls are visible provide aris to corners
7. Other requirements: Provide concrete cube results from the manufacturer

180 Precast stairs – N/A

1. Description: To offices and liftshaft
2. Manufacturer: Contractor's choice
 - 2.1. Product reference: Contractor's choice
3. Parameters: Fire Rating 1 hour - Loadings to BS for Offices
4. Finish
 - 4.1. Exposed faces: Suitable for direct decoration
 - 4.2. Treads and risers: Manufacturer's standard
5. Other requirements: None

Performance specified floors/ roof decks - Not Used**General/ performance****240 Detailing of proprietary system**

1. Installation details: Submit 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.

- 1.1. **Purpose:** To allow checking of compatibility with surrounding structure and coordination of services.
2. **Method statement and risk assessment for installation:** Submit.
3. **Programme:** Submit well in advance of construction.

250 Contractor's structural design

1. **Standard:** Complete the design in accordance with BS 8110.
 - 1.1. **Composite construction:** N/A
 - 1.2. **Fully precast construction:** Provide diaphragm and tie action where required

280 Basic fire resistance N/A

1. **Duration:** Loadbearing capacity: 60 minutes
2. **Method of determination:** To BS 8110-2, section 4 or by testing to BS 476-21 or BS EN 1365-2.
 - 2.1. **Finishes:** Determine fire resistance without regard to applied finishes.
 - 2.2. **Data:** Submit certificates, tabulated data or calculations.

Installation

320 Concrete infill

1. **Designated concrete:** To BS 8500-2.
 - 1.1. **Designation:** RC25/30
 - 1.2. **Aggregate size (maximum):** 10 mm generally
2. **Preparation:** Thoroughly clean and wet surfaces of precast units.
3. **Placing:** Avoid segregation and compact thoroughly to eliminate voids.
 - 3.1. **Extent:** Fill troughs and other holes.
 - 3.2. **Finish:** Flush with top of precast units.
4. **Protection:** Prevent movement of units until concrete has gained sufficient strength.

325 Grouting

1. **Mix:** Contractor's choice
2. **Preparation:** Thoroughly clean and wet surfaces
3. **Fill all joints and surface irregularities.**

Ω End of Section



Specification created using NBS Chorus