LKA.structures

Engineers Specification

Thame Cricket Club

Job Number 077

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Revisions
Revisions are highlighted in the text

Rev.	Date	Deleted	Clauses Amended	Added	Notes
A	17.06.21			D30 added	

D20 Excavating and Filling

To be read with Preliminaries/General conditions.

NOTEWhere changes have been made to the standard NBS clauses these are identified in **bold** type.

Generally/The site

112 SITE INVESTIGATION: A site investigation has been carried out and a report prepared by **Geoprobe Environmental Ltd** reference **tbc** is included in the tender documents (Note Report to follow during tender period)

122 The Contractor is expected to visit the site and note the visible conditions.

123 In planning the works the Contractor should take account of the nature of the site and should allow for maintaining the ground at the required levels and in a suitable condition to receive the final works, including any landscaping. Any parts of the site that are allowed to deteriorate through heavy traffic will be consolidated or brought up to level as necessary at the Contractor's expense.

124 Prices for excavation must include for excavation in whatever type of soil is encountered or in hardcore, rubble etc and for removing small roots, disused drains and small isolated obstructions.

143 GROUND WATER LEVEL: Such information as is available regarding ground water level is given in the site investigation report. Make all necessary additional enquiries concerning ground water level and allow for variations from this level when working on any part of the site. No claim for cost associated with measures to control groundwater will be allowed.

145 VARIATIONS IN GROUND WATER LEVEL
Give notice: If levels encountered are significantly different from levels in the site investigation report, stated as assumed, or previously measured.

150 EXISTING SERVICES/ FEATURES/ STRUCTURES
- Services: See section A12 for locations.
- Site features to be retained: See section A12 for details.
- Structures: See section A34 for details of protection.

151 EXISTING SERVICES: The Contractor is entirely responsible for locating the positions of all services, including mains, cables, pipes, sewers and drains. Allow for carrying out excavation in roads, and elsewhere where services are present, by hand digging so as to ensure that no damage is caused to services.

The Contractor is to make good, at his own expense, any damage whatsoever to existing services to the complete satisfaction of and in accordance with the instructions of the Statutory Authority concerned, and is to keep the employer indemnified at all times from claims in connection with the damage. All services which are encountered in the course of excavation are to be adequately supported and protected from damage to the satisfaction of the Statutory Authority or person in whom they may be vested. Allowance must be made in the excavation rates for the cost of providing such support and protection.

No drain or pipe of any description is to be disturbed until it has been inspected by the CA.

Clearance/Excavating

161 TEMPORARY WORKS DESIGNER / CO-ORDINATOR

- Confirm details of the person responsible for all temporary works design when returning the tender
- Full design details (drawings and calculations) are required for comment by the CA for all temporary support systems
- Three copies of all details for comment are to be issued and 10 working days are to be allowed for preparation of comments by the CA.

164 TREE ROOTS

- Protected area: Do not cut roots within an area, which is the larger of:
  - The branch spread of the tree.
  - An area with a radius of half the tree's height, measured from the trunk.
- Excavation in protected area:
  - Method: Agree in writing with the CA at least 3days before starting work.
  - Backfill as soon as possible or temporarily line with polyethylene sheet to reduce evaporation.
- Outside protected area: Give notice of roots exceeding 25 mm and do not cut without approval.
- Cutting:
  - Make clean smooth cuts with no ragged edges.
  - Pare cut surfaces smooth with a sharp knife.
  - Treatment of cut roots:.
- Backfill: as dug material enriched with phosphate fertiliser.

166 TREE ROOT BARRIER

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

168 SITE CLEARANCE

- Timing: Before topsoil stripping, if any.
- General: Clear site of rubbish, debris and vegetation. Do not compact topsoil.
- Treatment: Apply a suitable residual herbicide to areas to receive gravel surfacing

170 REMOVING SMALL TREES, SHRUBS, HEDGES AND ROOTS

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

175 FELLING LARGE TREES

- Definition: Girth over 600 mm.
- Identification: Clearly mark trees to be removed.
- Safety: Comply with HSE/ Arboriculture and Forestry Advisory Group Safety Guides.
- Felling: As close to the ground as possible.

- Stumps: Obtain approval from CA before removing stumps by winching and do not use other trees as supports or anchors.
- 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
- General: To be agreed.

205 BASIC WORKMANSHIP FOR EXCAVATING: Comply with BS 8000:Part 1, sections 3.1, 3.2 and 3.3.

210 MATERIALS ARISING
Ownership: Excavated materials, including topsoil, surplus to requirements for filling remain the property of the Employer unless the Contractor:
- Is instructed to remove them from the site, or
- Purchases them at a price to be agreed.

220 STRIPPING TOPSOIL
- 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.
- Depth:
  - Remove to an average depth of 200mm.
  - Give notice where the depth of topsoil is difficult to determine.
- Handling: Handle topsoil for reuse or sale in accordance with clause 225.
- Around trees: Do not remove topsoil from below the spread of trees to be retained.
- Site storage: Should be used whenever possible – Agree location with CA

221 TREATING TOPSOIL
- Treatment: Apply a suitable translocated nonresidual herbicide.
- Timing: Not less than two weeks before excavating topsoil.

225 HANDLING TOPSOIL
- Aggressive weeds:
  - Species: Included in the Weeds Act, section 2 or the Wildlife and Countryside Act, Schedule 9, part II.
  - Give notice: Obtain instructions before moving topsoil.
- Earthmoving equipment: Select and use to minimize disturbance, trafficking and compaction.
- Contamination: Do not mix topsoil with:
  - Subsoil, stone, hardcore, rubbish or material from demolition work.
  - Oil, fuel, cement or other substances harmful to plant growth.
  - Other grades of topsoil.
- Multiple handling: Keep to a minimum. Use topsoil immediately after stripping.
- 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.

230 BENCHING
- Surfaces of excavations with a gradient greater than 1:5 (20%) and which are to receive filling: Provide horizontal benches cut to match the depths of compacted layers of filling.

240 ADJACENT EXCAVATIONS

- 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.
- Angle of line from horizontal: 30□□unless otherwise agreed with the CA.

243 ADJACENT EXISTING FOUNDATIONS: No excavation within 3m of an existing foundation is to be taken below the level of the existing foundation unless a method statement has been agreed in writing with the CA.

250 PERMISSIBLE DEVIATIONS FROM FORMATION LEVELS
- Beneath mass concrete foundations: ±25 mm.
- Beneath ground bearing slabs and reinforced concrete foundations: ±15 mm.
- Embankments and cuttings: ±50 mm.
- Ground abutting external walls: ±50 mm, but such as to ensure that finished level is not less than 150 mm below dpc.

255 ACCURACY - LINEAR DIMENSIONS
- Permissible deviations from linear dimensions generally: +/- 25mm.

260 INSPECTING FORMATIONS
- Notice: Make advance arrangements for inspection of formations for all foundations and sub-bases.
- Preparation: Just before inspection remove the last 150 mm of excavation. Trim to required profiles and levels, and remove loose material.
- Seal: Within 4 hours of inspection, seal formations with concrete□

265 INSPECTING FORMATIONS IN SAND AND GRAVEL
- Notice for inspection (minimum): 2 days
- Preparation: Just before inspection remove the last 150 mm of excavation. Trim to required profiles and levels and mechanically compact formation.
- Seal: Within 4 hours of inspection, seal formations with concrete

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

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

290 FOUNDATIONS IN MADE UP GROUND
- Depth: Excavate down to a natural formation of undisturbed subsoil.
- Discrepancy: Give notice if this is greater or lesser than depth given.

300 EARTHWORK SUPPORT: Use as necessary to support the sides of excavations and remove on completion unless otherwise instructed. Take measurements of any supports that are left in position and inform the CA.

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

320 RECORDED FEATURES
- Recorded foundations, beds, drains, manholes, etc: Break out and seal drain ends.
- Contaminated earth: Remove and disinfect as required by local authority.

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

335 NEW FOUNDATIONS CROSSING OLD FOUNDATIONS OR WALLS
- Break out: The old foundation/ wall where it crosses the new foundation/ wall:
  - Length of breaking out: Width of the new foundation/ wall plus 500mm
  - Depth of breaking out: to underside of existing foundation
- Disturbed/ softened soil: When the formation for the old foundation/ wall is deeper than the formation of the new foundation.
  - Excavate: Soil that has been disturbed and/ or softened on either side of the old wall/ foundation, and for 500mm
- Step up: The formation for the new foundation as necessary on either side of the old foundation/ wall until the formation is at its design level.
  - Size of steps: tbc
- Backfilling beneath design formation level: to be agreed with Engineer on site.

337 OLD FOUNDATIONS OR WALLS BENEATH NEW GROUND SUPPORTED SLAB
- Break out: The old foundation/ wall to a depth below the slab formation level of at least 500mm
  - Excavate: Soil that has softened on either side of the old wall/ foundation.
- Backfill: Obtain instructions if depth of fill will be greater than 600 mm, otherwise backfill with compacted hardcore.

341 WATERWAYS: Temporarily divert as necessary all field drains and other waterways not shown on the drawings and encountered during excavations, and provide any pumps which may be necessary to achieve this:
- If possible reinstate on completion.
- If not possible to reinstate, obtain instructions.

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

360 EXCESS EXCAVATION
- Excavation taken wider than required: Backfill with hardcore as clause 710.
- Excavation taken deeper than required: Backfill with concrete grade GEN3

365 FROST PROTECTION: The ground to be excavated must be protected with insulating material to prevent freezing. Excavations are to be protected from freezing.

370 UNDERGROUND STRUCTURES IN LANDSCAPE AREAS

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

Disposal of Materials

410 EXCAVATED TOPSOIL
- Storage: Stockpile in temporary spoil heaps on site – to be agreed with Client.

415 EXCAVATED TOPSOIL
- Generally: Remove from site.

450 WATER
- Generally: Keep all excavations free from water until:
  - Formations are covered.
  - Below ground construction are completed.
  - Basement structures and retaining walls are able to resist leakage, water pressure and flotation.
- Drainage: Form surfaces of excavations and fill to provide adequate falls.
- Removal of water: Provide temporary drains, sumps and pumping as necessary.

452 WATER: Notify the CA as soon as water percolation or waterlogging becomes apparent and obtain the written permission of the CA before carrying out any continuous pumping or other method of removal of water. The position of any sumps, other than shown on drawings, which the Contractor may wish to construct to remove water are to be approved by the CA. Should it be found that pumping appears to result in disturbance or "boiling of the ground" notify the Engineer. Implement instructions without delay.

454 GROUND WATER LEVEL
- Give notice: If it is considered that the excavations are below water table.

457 PUMPING
- General: Do not disturb excavated faces or stability of adjacent ground or structures.
- Pumped water: Discharge without flooding the site, or adjoining property.
- Sumps: Construct clear of excavations. Fill on completion.

460 PERMANENT DRAINAGE SYSTEM
- Disposal of water from the excavations through system: permitted subject to contractor obtaining consent from all relevant authorities. Make good any drainage or disturbance caused to drainage systems by discharging water.

Filling

500 PROPOSED FILL MATERIALS
- Details: Submit full details of proposed fill materials to demonstrate compliance with specification, including:
  - Type and source of imported fill.
  - Proposals for processing and reuse of material excavated on site.

- Test reports as required elsewhere.
- Timing: **at least 20 working days before starting filling.**

510 HAZARDOUS, AGGRESSIVE OR UNSTABLE MATERIALS

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

512 SOLUBLE SULFATE CONTENT

- **Soluble sulfate content (SO_3) of materials for filling under concrete slabs or within 1 m of substructures when tested to BS 1377-3, clause 5 using a 2:1 water-soil extract (maximum): 1g/litre.**

520 FROST SUSCEPTIBILITY

- General: Except as allowed below, fill must be non frost-susceptible as defined in Transport Research Laboratory Report SR 829 'Specification for the TRRL frost-heave test'.
- Test reports: If the following fill materials are proposed, submit a laboratory report confirming they are non frost- susceptible:
  - Fine grained soil with a plasticity index less than 20%.
  - Coarse grained soil or crushed granite with more than 10% retained on a 0.063 mm sieve.
  - Crushed chalk.
  - Crushed limestone fill with average saturation moisture content in excess of 3%.
  - Burnt colliery shale.
- Frost-susceptible fill: May only be used within the external walls of buildings below spaces that will be heated. Protect from frost during construction.

530 PLACING FILL

- Excavations and areas to be filled: Free from loose soil, rubbish and standing water.
- Freezing conditions: Do not place fill on frozen surfaces. Remove material affected by frost. Replace and recompact if not damaged after thawing.
- Adjacent structures, membranes and buried services:
  - Do not overload, destabilise or damage.
  - Submit proposals for temporary support necessary to ensure stability during filling.
- Layers: Place so that only one type of material occurs in each layer.

535 COMPACTION

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

538 FILL PLACED AGAINST STRUCTURES

- Permissible plant: Use only the following types of compaction plant for fill within 2 m of a structure:
  - Vibratory roller, mass per metre width of roll not exceeding 1300 kg and total mass not exceeding 1000 kg.
  - Vibrating plate compactor, mass not exceeding 1000 kg.
  - Vibro-tamper, mass not exceeding 75 kg.

540 BENCHING IN FILL

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

610 GENERAL LANDSCAPE SUBSOIL FILLING:

- Materials arising from the excavations or imported, capable of compaction by light earthmoving plant to form free draining ground, and excluding the following:
  - Material from marshes or bogs.
  - Peat, logs, stumps, slurry, mud and perishable material.
  - Material susceptible to spontaneous combustion.
  - Material in a frozen condition.
  - Clay of liquid limit exceeding 80 and/or plasticity index exceeding 55.
  - Material with excessive moisture content.
  - Material likely to erode or decay and cause voids.
  - Unacceptable material class U2 as defined in clause 601 of the Highways Agency ‘Specification for highway works’
- Lay in layers not more than 200 mm thick and lightly compact each layer with the earthmoving plant to produce a stable soil structure.

615 LOOSE TIP LANDSCAPE FILLING:

- Materials arising from the excavations or imported and excluding the following:
  - Material from marshes or bogs
  - Peat, logs, stumps, slurry, mud and perishable material
  - Material susceptible to spontaneous combustion
  - Material in a frozen condition
  - Clay of liquid limit exceeding 80 and/or plasticity index exceeding 55
  - Material with excessive moisture content
  - Material likely to erode or decay and cause voids
  - Unacceptable material class U2 as defined in clause 601 of the Highways Agency 'Specification for highway works'.
- Do not firm, consolidate or compact when laying. Tip and grade to approximate levels in one operation with minimum of trafficking by plant. Do not traverse the freshly laid surface unless unavoidable.

617 HIGHWAYS AGENCY TYPE 1 GRANULAR FILLING

- Fill: To Highways Agency 'Specification for highway works', clause 803:
  - Crushed rock (other than argillaceous rock).
  - Crushed concrete.
  - Crushed non-expansive slag to clause 801.2.
  - Well-burned non-plastic colliery shale.
- Filling: To Highways Agency 'Specification for highway works', clauses 801.3 and 802.

618 HIGHWAYS AGENCY TYPE 2 GRANULAR FILLING

- Fill: To Highways Agency 'Specification for highway works', clause 804:
  - Crushed rock (other than argillaceous rock).
  - Crushed concrete.

- Crushed non-expansive slag to clause 801.2.
- Well-burned non-plastic colliery shale.
- Natural gravel.
- Natural sand.

- Filling: To Highways Agency 'Specification for highway works', clauses 801.3 and 802.

630 COMPACTED SUBSOIL FILLING:

Materials arising from the excavations (or, where instructed, imported) complying with Group 1 or Group 2 as defined below. If both suitable and unsuitable material is excavated, select and keep separate sufficient suitable material. If there is insufficient suitable excavated material provide CA with details and obtain instructions regarding the importation of material.

Group 1: Cohesive materials:

Clays and marls containing up to 20% of gravel and having a moisture content not less than the value of the plastic limit minus 4 (determined in accordance with BS 1377:Part 2, clause 5).

Chalk having a saturation moisture content of 20% or greater.

Group 2: Well graded granular and dry cohesive materials:

Clays and marls containing more than 20% of gravel and/or having a moisture content less than the value of the plastic limit minus 4 (determined in accordance with BS 1377:Part 2, clause 5).

Chalk having a saturation moisture content within the range 15-20%.

Well graded sands and gravels with a uniformity coefficient of more than 10.

Crushed hard rock or quarry waste (other than chalk).

Crushed concrete, crushed brick or tile, free from plaster, wood, organic material and rubbish.

Sound blastfurnace slag (other than from steelmaking foundries).

Well burnt nonplastic shale.

Lay and compact in layers using suitable plant as in the table below. The figures given alongside each type of plant and for each material group are the maximum depth of compacted layer in mm and (in parentheses) the minimum number of passes.

Types of plant (alternatives)	Group 1 Materials	Group 2 Materials
Smooth wheeled roller: Tonnes per m width of roll		
2.1-2.7	125(8)	125(10)
2.7-5.4	125(6)	125(8)
Over 5.4	150(4)	150(8)
Vibrating roller: Static load in tonnes per m width of roller		
0.7-1.3	100(12)	125(12)
1.3-1.8	125(8)	150(8)
1.8-2.3	150(4)	150(4)
2.3-3.6	175(4)	175(4)
Over 3.6	225(4)	225(4)
Vibrating plate compactor: Static load in tonnes per m^2 of base plate		
1.2-1.4	-	75(6)
1.4-1.8	100(6)	125(6)
Over 1.8	150(6)	150(5)
Vibro-tamper: Static load in kg		
50-75	100(3)	100(3)
Over 75	200(3)	150(3)
Power rammer: Static load in kg		
Over 100	150(4)	150(6)

635 COMPACTED GRANULAR FILLING:

- Well graded granular material, as defined below, arising from the excavations or imported. If both suitable and unsuitable material is excavated, select and keep separate sufficient suitable material. If there is insufficient suitable excavated material provide CA with details and obtain instructions regarding the importation of material.

- Well graded sands and gravels with a uniformity coefficient of more than 10.
- Crushed hard rock or quarry waste (other than chalk).
- Crushed concrete, crushed brick or tile, free from plaster, wood, organic material and rubbish.
- Sound blastfurnace slag (other than from steelmaking foundries).
- Well burnt nonplastic shale.
- Lay and compact in layers using suitable plant as in the table below. The figures given alongside each type of plant and for each material group are the maximum depth of compacted layer in mm and (in parentheses) the minimum number of passes.

Smooth wheeled roller:	
Tonnes per m width of roll	
2.1-2.7	125(10)
2.7-5.4	125(8)
Over 5.4	150(8)
Vibrating roller: Static load in tonnes per m width of roller	
0.7-1.3	125(12)
1.3-1.8	150(8)
1.8-2.3	150(4)
2.3-3.6	175(4)
Over 3.6	225(4)
Vibrating plate compactor: Static load in tonnes per m^2 of base plate	
1.2-1.4	75(6)
1.4-1.8	125(6)
Over 1.8	150(5)
Vibro-tamper: Static load in kg	
50-75	100(3)
Over 75	150(3)
Power rammer: Static load in kg	
Over 100	150(6)

640 FIRST LAYER OF COMPACTED FILLING
- Fill: Suitable hard granular material. Compact thoroughly.
- Thickness: 200mm.

650 PROTECTION OF COMPACTED FILLING
- Temporary protective filling: Before allowing construction traffic raise level of compacted cohesive soil filling at least 150 mm above formation level using properly compacted temporary filling.
- Removal: Remove temporary protective filling from site before permanent construction.

700 BACKFILLING TO FOUNDATIONS:
- Under oversite concrete and pavings: Hardcore as clause 710.
- Under grassed or landscaped areas: Material excavated from the trench, laid and compacted in layers not exceeding 300 mm thick.

710 HARDCORE FILLING
- 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:
  - Crushed rock (other than argillaceous rock) or quarry waste with not more binding material than is required to help hold the stone together.
  - Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
  - Crushed non-expansive slag.
  - Gravel or hoggin with not more clay content than is required to bind the material together, and with no large lumps of clay.
  - Well-burned non-plastic colliery shale.

    - Natural gravel.
    - Natural sand.
- Filling: Spread and level in 150 mm maximum layers. Thoroughly compact each layer.

715 VENTING HARDCORE LAYER

- Fill: Clean granular material, well graded, passing a 75 mm BS sieve but retained on a 20 mm BS sieve. In each layer only one of the following:
    - Crushed hard rock.
    - Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
    - Gravel.
- Filling: Spread and level in 150 mm maximum layers. Thoroughly compact each layer whilst maintaining enough voids to allow efficient venting.

730 BLINDING

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

D30 Piling

To be read with Preliminaries/ General conditions.

NOTE Where changes have been made to the standard NBS clauses these are identified in **bold** type.

005 PROJECT DESCRIPTION
Site Location: Thame Cricket Club
The Works comprise: Approximately 56 Piles
Working area: Cricket Club Grounds
Sequence of the works and other works proceeding at the same time: Main Contractor to confirm.

010 INFORMATION TO BE PROVIDED WITH TENDER
- Submit:
  - Information listed in SPERW, table B1.1.
  - Other information:
  - Choice of piling type in accordance with this specification and appropriate details as listed in standard NBS clauses 140-180. To include confirmation of the pile size/diameter.
  - Three copies of Piling design calculations for use in a submission for Building Regulations approval.

020 INFORMATION TO BE PROVIDED BEFORE WORK STARTS
Submit as listed in SPERW, table B1.1 and as required by this specification, at least 5 working days before piling starts; if no other time limit is stated in the SPERW.
- Integrity Test results:
  Initial test results: Submit after each test within 24 hours.
  Full report: Submit after completion of each phase of testing within 5 working days.

General

110 PILING SPECIFICATION
- Standard: Comply with the current edition of 'Specification for piling and embedded retaining walls' (SPERW).
- Substitution of British Standard for SPERW requirements: none.
- References to Engineer in SPERW: For the purpose of this contract, interpret such references as being to the person named in section A10 as administering the contract on behalf of the Employer.
- Design working life category: **4-50years**

130 PILES
- Standard: To SPERW, sections B2–B6, as appropriate to the pile type.
- Permitted types: **Contractor's Choice**
- **SPERW section B1.2 Project Specification information is given as follows; submit proposals as indicated in the relevant clauses:**

(a) Role of the Engineer	See clause 110 and Contract Documents
(b) Location and description of the site	See clause 005
(c) Nature of the works	See clause 005
(d) Working area	See clause 005
(e) Sequence of the works and other works proceeding at the same time	See clause 005

(f) Contract drawings	See clause 210
(g) Office and other facilities for the Engineer	See the Contract Documents
(h) Submission of information (in addition to Table B1.1)	See clause 010
(i) Responsibility for design, including any division of responsibility	See clause 210
(j) Design standards and criteria for the piles or walls including design life	See clauses 110 & 210
(k) Constraints on design	None
(l) Working platform and commencing surface level	See clause 300
(m) Schedule of Specified Working Loads or Representative Actions	See pile schedule on drawings as noted in clause 210
(n) Pile or wall element dimensions	Nominal pile sizes are shown on the drawings & see clause 130
(o) Preliminary piles and trial bores/drives/panels	To be determined by the Contractor see clause 665
(p) Performance criteria for the structure to be supported on the piles or by the wall	See clause 250
(q) Performance criteria for piles under test or wall elements during service	See clause 280
(r) Sampling and testing of materials (other than concrete)	Not required
(s) Permissible damage criteria for existing critical structures or services	See clause 285
(t) Additional temporary works plant and duration of loading for which the working platform should be designed	See clause 300. Provide the temporary works co-ordinator with equipments loads proposed
(u) Site datum and site grid	See clause 290
(v) Restrictions on permissible working hours	See the Contract Documents
(w) Restrictions on noise and vibration levels	See the Contract Documents
(x) Site Investigation including geotechnical and geo-environmental information, and the need for further Site Investigation	See clauses 210 & 230
(y) Disposal of excavated material and trimmed excess pile and wall material	See clauses 655 & 685
(z) Other particular technical requirements	The Contractor is required to work to a Quality Management system established in accordance with BS EN ISO 9001:2000. Details shall be provided prior to commencement of work on site.
	[Insert any other Requirements]

System Performance

210 CONTRACTOR DESIGN
- Standard: To **8004.**
- Design responsibility:

- Piles: Complete design in accordance with SPERW, clause B1.4, option 2.
- Other:
- Pile layout: as drawing LKA SK 12
- Site investigation: Confirm as adequate or propose further investigation as considered necessary with tender submission.
  - Performance criteria for piles:
  - Minimum factor of safety: 3
    : For test piles see clause 280
- Other requirements:

222 EUROCODES
- National Annexes: Reference to a Eurocode shall be deemed to include the appropriate United Kingdom National Annex, and nationally determined parameters shall apply.
- Substitution of alternative design rules for Application Rules:

230 GROUND INVESTIGATION
- Report: Prepared by Geoprobe Environmental Ltd reference tbc to follow as tender amendment.

250 PERFORMANCE CRITERIA FOR STRUCTURE TO BE SUPPORTED ON THE PILES
- Permitted settlement at working load (maximum): Settlement of any part of the structure at working load is not to exceed 10mm.
  Differential settlement between adjacent columns at working load is not to exceed 5mm.
  Lateral movement at the base of the structure shall not exceed 10mm in any direction.

260 SPECIFIED WORKING LOADS FOR PILES
- See pile schedule on drawing LKA SK 12

290 SETTING OUT PILES
- Agree site datums and basic grid with main contractor and CA.
- The piles are set out from the drawn grid on the drawings. The piles are located on the drawings dimensioned from the gridlines.

300 COMMENCING SURFACE AND PILING MAT
- The piling mat is be designed by the site temporary works co-ordinator. The Principal Contractor will provide the piling subcontractor with a Working Platform Certificate to suit the proposed piling equipment.

320 PILE LENGTH – TOE LEVEL
- Pile cut-off level: generally 75mm above pilecap formation level – see drawings.
- Depth of pile toe beneath site datum (minimum):
- Other requirements:

Products

400 GENERALLY
The contractor is to provide the CA with details of any special products proposed for use in accordance with clause 20 and any requirement given in clauses 410 to 460.

410 HEAD PREPARATION
- Minimum requirement for strengthening pile head prior to driving:
- Amendment to design: Submit proposals for changes if found necessary to prevent damage to pile heads.

470 CONCRETE GENERALLY
- Standards: To BS 8500-2 and SPERW, section B19.
- Project compressive strength testing of concrete:
- Exchange of information: Provide concrete producer with information required by BS 8500-1, clauses 4 and 5.

475 DESIGNATED CONCRETE FOR PILES
- Designated concrete: Grade RC 35 tbc by Piling contractor
- Reinforcement/ embedded metal: Yes.
- Aggregates:
  - Size (maximum): 20mm.
  - Recycled coarse aggregates: Permitted to 20% mass fraction.
  - Other requirements: None.
- Other requirements for cement and combinations: tbc following site investigation
- Consistence class: Minimum S3.
- Chloride class: Cl0.40.
- Other requirements for admixtures: Details of proposed admixtures to be give to the CA allowing two weeks for comment by the CA before their use in the concrete.
- Other requirements:

530 REINFORCEMENT GENERALLY
- Steel reinforcement: To BS 4449.
  - Type/ Grade: 500B.
- Cutting and bending: To BS 8666.
- Supplier: Obtain from companies holding valid certificates of approval for product conformity issued by the UK Certification Authority for Reinforcing Steels (CARES).

540 COVER TO REINFORCEMENT
- Cover (nominal): 50mm.
- Method of ensuring correct cover: Submit details.

550 LAPS IN REINFORCEMENT
- Length (minimum): 40 x diameter mm.

570 SONIC LOGGING DUCTS
- Material: Contractors' choice.

Execution

612 PILE TRIMMING
Method of cutting down top of piles: this must minimise the use of hand held tools.

615 RECORDS AND SUBMISSION OF INFORMATION DURING THE WORKS
- Generally: As required in SPERW, tables B1.1, B1.6 and elsewhere, as appropriate for the pile types, materials and tests specified.
  - - Amendments to requirements: none.

620 WELDING PROCEDURE
- Requirements additional to SPERW, section B6: none.

625 NON-DESTRUCTIVE TESTING OF WELDS

- Requirements: To SPERW, clause B6.6. Contractor to agree method and scope of testing with CA before piling starts.

650 PERFORMANCE OF WORKING PILES
- Substandard performance: Give notice if the performance of any pile will be less than that of a similar pile whose test behaviour has been accepted.

655 TESTING EXCAVATED MATERIAL
- The contractor is to carry out testing as required by the Local authority to ensure material can be classified as inert or non-hazardous whenever possible. See clause 685.

680 PROHIBITION OF SUPPORT FLUID
- Usage: Not permitted.

685 EXCAVATED MATERIAL
- Disposal: Contractors' responsibility to remove from site.

690 DISPOSAL OF PILE HEADS
- Cutting down and disposal: Contractor's responsibility.

700 PLACING CONCRETE IN DRY BORINGS AND CASINGS
- Requirements SPERW, clause B3.5.2.3. The contractor is to demonstrate their proposals for placing concrete ensure the requirements of the SPERW are met.

705 MONITORING CONSTRUCTION OF AUGURED PILES
- Requirements additional to SPERW, clause B4.4.9 and B4.5:
  - Monitor the following and record with pile records: [Insert Requirements]

710 INSTRUMENT FAILURE
- Manual monitoring: Use a stop watch.

720 PREPARATORY PREBORING FOR LOW FRICTION SLEEVING OR SURROUND
- Requirement: Carry out to base of low friction treatment.
- Preboring diameter: to suit sleeving.

725 SUPPORT TO PREBORED HOLE FOR LOW FRICTION SLEEVING OR SURROUND
- Method of achieving temporary stability: submit proposals before piling starts.
- Depth: To suit sleeving length and ground conditions.

745 TESTING MORTAR AND CEMENT GROUT
- Standard:
  - Exceptions: Strength test using 100 mm cubes.
- Preliminary tests:
- Frequency of compliance testing:

755 PREPARATION OF PILE HEADS FOR INTEGRITY TESTING
- Preparation: To suit test method.
- Inconsistencies: Submit report on inconsistencies which could inhibit execution or interpretation of test.

760 INTEGRITY TESTING – GENERAL
- Method: Contractors' choice.
  - Satisfactory evidence in support of proposals: Submit.
- Period between casting and testing (minimum): 3days.
- Piles to be tested: All CFA piles

- Programme: To be agreed, submit proposals as clause 20.

810 TIMING OF PILE LOAD TESTING
- Period between installation and load testing (minimum):

825 WORK TO PILE HEADS AFTER TESTING
- Preliminary/ anchor piles: Cut down below substructure.
- Working piles: Make good as required or cut down to working level.

Completion

910 HEALTH AND SAFETY FILE
- Requirement: Collate and submit a full set of pile records for inclusion in the health and safety file.
- Content:
  - Record drawings: With each pile numbered and giving the 'as built' location of each pile relative to the site grid.
  - Records: Copy of each record submitted during the progress of the work.
- Latest date for submission: 15 working days after the completion of the piling work.

920 PILING GUARANTEE
- Type: Insurance backed. Administered by an independent insurance protection company.
  - Guarantee period (minimum): 12 years.
  - Documentation: Provide certificates/ guarantees at completion of piling works.

E05 In Situ Concrete Construction Generally

To be read with Preliminaries/ General conditions.

NOTE Where changes have been made to the standard NBS clauses these are identified in **bold** type.

General

110 ARRANGEMENT OF INFORMATION

The different parts of insitu concrete construction are specified in separate sections as follows:

E10	Mixing/casting/curing in situ concrete
E30	Reinforcement
E40	Designed Joints

Clauses dealing with particular aspects of certain types of construction may thus be dispersed over several sections.

115 TEMPORARY WORKS DESIGNER / CO-ORDINATOR

Confirm details of the person responsible for all temporary works design (called the 'temporary works designer / co-ordinator') when returning the tender.

Full design details (drawings and calculations) are required for comment by the Engineer for all temporary support systems.

Three paper copies of all details for comment are to be issued allowing ten working days for preparation of comments by the Engineer.

200 SETTING OUT AND TOLERANCES

- The contractor is to carry out a survey of completed work at each level and report to the CA any deviations from the datum level and the horizontal reference grid.
- Angles including right angles to be set out correct within 1 minute of arc.
- Members are to be set out from the references and constructed or erected so that the dimension between any point as built and any reference agrees with the required dimension, whether shown on or calculable from the drawings, within the degree of accuracy indicated in the following Table:-

POSITION/RELATIVE POSITION, PLUMB/SIZE/CONFORMITY

- The figures given in the table apply as follows:

1 Position in plan at any point from the nearest major grid for in situ work
2 Plumb, relative to the height from the nearest datum level below, with a maximum of 6mm in any storey height up to 4.6m.
3 Cross Section and any linear dimensions of member. These limits must contain any errors under 5,6,7.
4 Clear dimensions between members and between parts of a member. In the latter case dimensions to which tolerances apply will be defined on the drawings.
5 Squareness: deviation measured at right angles to the shorter side and relative to its length. Where applied to the cross sections of a member this deviation cannot be added to the permitted twist on any face.
6 Bow and camber, other than design camber.
7 Twist, the distance of any corner from the plane containing the other three corners, related to the shorter side. (see 5).

Deviations apply +/- except in case 2

TABLE OF PERMISSIBLE DEVIATIONS

	Distance in meters				
	Up to 0.5	0.5 to 3.0	3.0 to 10.0	10.0 to 20.0	Greater than 20.0
In situ concrete and as built	3mm	6mm	10mm	15mm	0.075%
Foundations	10mm	15mm	20mm	25mm	0.125%

LEVELS

With respect to the nearest datum:

- Slab tops to be within +/- 6mm of correct level before de-propping.
- Tops of other in situ members, including any bearing or bedding surfaces or foundations to be at correct level within +/- 6mm.
- Soffit level of beams and slabs to be within +/- 6mm of correct level or specified camber before de-propping.

STRAIGHTNESS

- Deviation from straight line or plane related to the length of the member. Lesser tolerances apply within any part of the length of a longer member.

0	to	0.5m	1mm
0.5	to	1.0m	1mm varying to 2mm linearly
1.0	to	3.0m	2mm varying to 4mm linearly

220 DESIGN OF STRUCTURAL CONCRETE

- The design has been carried out in accordance with BS8110 and the reinforcement schedules have been prepared in accordance with BS8666.
- Finished product: To comply with the requirements of design standard.

225 TEMPERATURE RECORDS

Throughout the period of concrete construction the contractor is to maintain adequate records of the temperature to ensure concrete is placed in accordance with the specification. These records shall be available for inspection on site.

235 OPENINGS, INSERTS AND FIXINGS

- The contractor is to collate all information on inserts and fixings to be cast into the concrete.
- The contractor is to prepare fully dimensioned buiderswork drawings showing all holes, inserts, fixings etc. The contractor is to ensure that drawings are submitted for comment in time so that the approval period complies with the programme. A period of 10 working days, after receipt of drawings, must be allowed for preparation of comments by the CA.
- The contractor is to give the CA 24 hours notice before any concrete pour where there is a clash between openings, inserts and fixings and agree any alterations to the fixing and any adjustments needed to reinforcement.
- Locate reinforcement: To ensure specified minimum cover at openings and inserts and to be clear of fixing positions.

300 LEVELS OF STRUCTURAL CONCRETE FLOORS
- Tolerances and level: See Preliminaries section A33.

310 SURFACE REGULARITY OF CONCRETE FLOORS TO BS 8204 - GENERAL
- Standard: To BS 8204-1 or -2.
- Measurement: From underside of a 2m straightedge (between points of contact) placed anywhere on surface and using a slip gauge.

315 SURFACE REGULARITY OF CONCRETE FLOORS TO BS 8204 - TOLERANCE CLASS SR3
- Location: All Floors.
- Abrupt changes: 2mm maximum.

430 SURFACE CRACKING - generally
- Critical crack width: 0.3mm.
- Action: Should cracks occur that are wider than the critical crack width:
  - Survey: Frequency and extent of such cracks and investigate cause.
- Report: Findings together with recommendations for rectification

440 PRESSURE GROUTING, if required:
- To be carried out by an approved specialist firm.
- Drill grouting holes in carefully selected locations. If drill hits reinforcement, stop drilling immediately and relocate hole.
- On completion make good to holes with a damp 1:3 cement: sharp sand mix thoroughly rammed in and finished neat and flush.

615 ALTERATIONS TO CAST CONCRETE
No alterations to cast concrete, cutting holes or chases etc. is permitted without the consent of the CA. The contractor is to give at least five working days notice of any proposed cutting.

E10 Mixing/Casting/Curing in Situ Concrete

To be read with Preliminaries/General conditions.

NOTE Where changes have been made to the standard NBS clauses these are identified in **bold** type.

Concretes

101 SPECIFICATION
- Concrete generally: To BS 8500-2.
- **The contractor is to send to the CA a copy of the information he gives the producer (i.e. the specification as defined by BS8500). The contractor is to ensure that the producer has all the information they require.**

105 DESIGNATED CONCRETE **For foundations**
- Designated concrete: Grade GEN 3
- Reinforcement/ embedded metal: **No**
- Fibres: **N/A**
- Aggregates:
  - Size (maximum):20mm.
  - Coarse recycled concrete aggregates: **Permitted to 20% mass fraction.**
  - Other requirements: **None.**
- Other requirements for cement and combinations:
- Consistence class: **S3.**
- Chloride class: **Cl0.40.**
- Other requirements for admixtures: **Details of proposed admixtures to be give to the CA allowing two weeks for comment by the CA before their use in the concrete.**
- Other requirements:

106 DESIGNATED CONCRETE **For use generally Ground floor Slab**
- Designated concrete: Grade RC30
- Reinforcement/ embedded metal: **Ye**s.
- Fibres: N/A
- Aggregates:
  - Size (maximum):20mm.
  - Coarse recycled concrete aggregates: **Permitted to 20% mass fraction.**
  - Other requirements: **None.**
- Other requirements for cement and combinations: **Cement to be CIIIA.**
- Consistence class: **S3.**
  Chloride class: **Cl0.40.**
- Other requirements for admixtures: **Details of proposed admixtures to be give to the CA allowing two weeks for comment by the CA before their use in the concrete.**
- Other requirements:

125 SUBSTITUTION OF STANDARDIZED PRESCRIBED CONCRETE FOR DESIGNATED CONCRETE
- General: Conform to BS 8500-2, clause 9.
- Substitution: In accordance with BS 8500-1, table A.13.
  - Proposals: Submit for each substitution, stating reasons.
- **Mixing: If standardized prescribed concretes are made on site conform to BS 8000-2.1, subsections 2, 3 and 4.**

Materials, Batching and Mixing

215 READY-MIXED CONCRETE
- Production plant: Currently certified by QSRMC (accredited by UKAS to BS EN 45011 for product conformity certification of ready-mixed concrete).
- Source of ready-mixed concrete: Obtain from one source if possible. Otherwise, submit proposals.
  - Name and address of depot: Submit before any concrete is delivered.
  - Delivery notes: Retain for inspection.
- Declarations of nonconformity from concrete producer: Notify CA immediately.

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

305 DRYING SHRINKAGE
- Drying shrinkage of concrete (maximum): 0.075%.
- Test method: To BS EN 1367-4.

415 ADMIXTURES
- Calcium chloride and admixtures containing calcium chloride: Do not use.
- Use only if specified or approved, and then in accordance with their manufacturer's recommendations.
- Ensure that admixtures are compatible with all other materials, including other admixtures.

490 PROPERTIES OF FRESH CONCRETE
- Adjustments to suit construction process: Determine with concrete producer. Maintain conformity to the specification.

Identity Testing/Certification

505 IDENTITY TESTING OF FRESH CONCRETE
- Testing: To BS EN 206-1, annex B and BS 8500-1, annexe B. Required whenever water is added to ready-mix concrete on site.
  - Nonconformity: Obtain instructions immediately.
- Recording: Maintain complete correlated records including:
  - Sampling, site tests, and identification numbers of specimens tested in the laboratory.
  - Location of the parts of the structure represented by each sample.
  - Location in the structure of the batch from which each sample is taken.

520 IDENTITY TESTING LABORATORY
- Laboratory: Accredited by UKAS or other national equivalent.
  - Name and UKAS reference number: Submit well in advance of using concrete in the works.

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

550 BROKEN CUBES FROM FAILED IDENTITY TESTS
- Nonconformity: Keep separately the pieces of each cube, which fail to meet the conformity requirements for individual results.
- Period for keeping cubes: Obtain instructions.

560 FAILURES
- Where a producer non-conformity is reported to the CA (see clause 215) provide additional information to confirm to the satisfaction of the CA that the concrete is acceptable for use or submit alternative proposals to rectify the problem within one week of the non-conformity being reported.

581 FAILURES
Wherever the specified sampling and testing procedures show that a concrete 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/Compacting/Curing and Protection

610 CONSTRUCTION/ SEQUENCE/ TIMING REQUIREMENTS
- TBC by contractor

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

640 CONSTRUCTION JOINTS
- Locations of construction joints: Submit proposals where not shown on drawings.
- Preparation of joint surfaces: Select from:
  - Brushing and spraying: Remove surface laitance and expose aggregate finish while concrete is still green.
  - Other methods: Submit proposals, at least one week in advance for comment by the CA.
- Condition of joint surfaces immediately before placing fresh concrete: Clean and damp.

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

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

660 INSPECTION OF SURFACES

- Notice: Give notice to allow inspections of reinforcement and surfaces before each pour of concrete.
- Period of notice: Obtain instructions but not less than 24 hours.
- Timing of inspections to be agreed.

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

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

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

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

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

810 CURING GENERALLY
- Evaporation from surfaces of concrete: Prevent, including from perimeters and abutments, throughout curing period.
  - Surfaces covered by formwork: Retain formwork in position and, where necessary to satisfy curing period, cover surfaces immediately after striking.

- Top surfaces: Cover immediately after placing and compacting. If covering is removed for finishing operations, replace it immediately afterwards.
- Surface temperature: Maintain above 5°C throughout the specified curing period or four days, whichever is longer.
- Records: Maintain details of location and timing of casting of individual batches, removal of formwork and removal of coverings. Keep records on site, available for inspection.

811 COVERINGS FOR CURING

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

812 PREVENTING EARLY AGE THERMAL CRACKING

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

815 ADDITIONAL CURING REQUIREMENT - WATER CURING

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

822 CURING PERIODS

- General: Curing periods are in days (minimum).
- 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

840 PROTECTION

- Prevent damage to concrete, including:
  - Surfaces generally: From rain, indentation and other physical damage.
  - Surfaces to exposed visual concrete: From dirt, staining, rust marks and other disfiguration.
  - Immature concrete: From thermal shock, physical shock, overloading, movement and vibration.

- In cold weather: From entrapment and freezing expansion of water in pockets, etc.

E30 Reinforcement for In Situ Concrete

To be read with Preliminaries/ General conditions.

NOTE Where changes have been made to the standard NBS clauses these are identified in **bold** type.

Reinforcement

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

140 PLAIN BAR REINFORCEMENT
- Standard: To BS 4482.
  - Strength grade: 250.
  -

150 RIBBED BAR REINFORCEMENT
- Standard: To BS 4449.
  - **Strength grade: 500 . Reinforcement in accordance with BS4449 scheduled as class H shall be ductility class A for bars up to and including 12mm diameter and ductility class B for larger bars.**

210 FABRIC REINFORCEMENT
- Standard: To BS 4483.
- Grade: **460**

Workmanship

305 REINFORCEMENT DRAWINGS & BAR BENDING SCHEDULES
Reinforcement bending schedules will be provided a maximum of 3 weeks before the programmed date for casting each part of the work on the contractors written request. Before the bars are cut to length, the Contractor must check that each schedule includes the correct quantity of reinforcement of the correct grade and to the correct size length and shape as shown on the drawings to which it relates. The CA is to be notified of any errors disclosed by these checks.

310 CUTTING AND BENDING REINFORCEMENT
- General: To schedules and to BS 8666.
- **Tag bundles of reinforcement with labels to BS 8666.**
- **Restrictions on bending steel:**
  - **Rebending including minor adjustments: Obtain instructions.**
  - **Temperatures below 5°C: Prohibited.**
  - **Temperatures greater than 100°C: Prohibited.**

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

410 LAPS OR SPLICES
- Details not shown on drawings: Obtain instructions.

425 LAPS NOT DETAILED ON DRAWINGS
- Laps in bar reinforcement (minimum): 40xdia of smallest bar in lap
- Laps in fabric reinforcement (minimum): 250 mm.
- Laps at corners: Avoid four layer build-up.

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

470 TOLERANCES ON COVER

The cover noted on drawings is nominal cover. The allowable tolerances are:
- Not less than the nominal cover minus 10 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, either:
- Lay fabric on top of the first compacted layer of concrete, followed by the top layer of concrete, placed within two hours of the first layer, or
- Fully support the fabric on suitable proprietary supports/chairs.

500 DAMAGE

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

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

E40 Designed Joints in In Situ Concrete

To be read with Preliminaries/ General conditions.

NOTE Where changes have been made to the standard NBS clauses these are identified in **bold** type.

General Requirements

120 CONSTRUCTION/ MOVEMENT JOINTS GENERALLY
- Accuracy: Position and form joints accurately, straight, well-aligned and truly vertical or horizontal or parallel with setting out lines of the building.
- Modifications to joint design or location: Submit proposals.
- Placing concrete to form movement joints:
  - Maintain effectiveness of joints. Prevent concrete entering joints or penetrating or impregnating compressible joint fillers.
  - Do not place concrete simultaneously on both sides of movement joints.

132 ADDITIONAL CONSTRUCTION JOINTS
- Joints additional to those required by the designer **in concrete exposed to view will not be permitted.**
- Approval of additional joints: Submit proposals.

230 PREPARATION OF CONSTRUCTION JOINTS
- Roughening of joint surfaces: Select from:
  - Brushing and spraying: Remove surface laitance and expose aggregate finish while concrete is still green.
  - Other methods: Submit proposals. **Mechanical methods (e.g. scabbling will not be acceptable)**
- Condition of joint surfaces immediately before placing fresh concrete: Clean and damp.

260 SAWN CRACK INDUCING GROOVES
- Groove dimensions:
  - Depth: **40mm**
  - Width: As narrow as practicable.
- Sawing: Sufficiently early to prevent random cracking (within 24 hours of casting slab) and to produce strong, well defined arrises.
- Groove filling:

F10 Brick/Block Walling

To be read with Preliminaries/ General conditions.

NOTE Where changes have been made to the standard NBS clauses these are identified in **bold** type.

Workmanship Generally

440 CONDITIONING OF CONCRETE BRICKS/ BLOCKS
- Autoclaved concrete bricks/ blocks delivered warm from manufacturing process: Do not use.
- Age of nonautoclaved concrete bricks/ blocks: Do not use until at least four weeks old.
- Avoidance of suction in concrete bricks/ blocks: Do not wet.
  - Use of water retaining mortar admixture: Submit details.

460 MORTAR GROUPS
- Mix proportions: For a specified group select a mix design from the following:

Group	1	2	3	4
PC*:lime:sand with or without air entraining additive	1:0-0.25:3	1:0.5-4.5	1:1:5-6	1:2:8-9
Masonry cement:sand containing PC* and lime in approx ratio 1:1, and an air entraining additive	-	1:3	1:3.5-4	1:4.5
Masonry cement:sand containing PC* and inorganic materials other than lime and air entraining additive	-	1:2.5-3.5	1:4-5	1:5.5-6.5
PC*:sand and air entraining additive	1:3	1:3-4	1:5-6	1:7-8

PC* = Portland cement
- Batching: Mix proportions by volume.
- Mortar type: Continuous throughout any one type of masonry work.

500 LAYING GENERALLY
- Mortar joints: Fill vertical joints. Lay bricks, solid and cellular blocks on a full bed.
- Thin mortar adhesive and gypsum block adhesive joints: Fill vertical joints. Lay blocks on a full bed.
- Bond where not specified: Half lap stretcher.
- Vertical joints in brick and concrete block facework: Even widths. Plumb at every fifth cross joint.

511 **OVERHAND LAYING: will be permitted subject to compliance with this specification and approval of samples and methods of carrying out the work.**

520 ACCURACY
- Courses: Level and true to line.
- Faces, angles and features: Plumb.

- Permissible deviations:
  - Position in plan of any point in relation to the specified building reference line and/ or point at the same level ± 10 mm.
  - Straightness in any 5 m length ± 5 mm.
  - Verticality up to 3 m height ± 10 mm.
  - Verticality up to 7 m height ± 14 mm.
  - Overall thickness of walls ± 10 mm.
  - Level of bed joints up to 5 m (brick masonry) ± 11 mm.
  - Level of bed joints up to 5 m (block masonry) ± 13 mm.

545 LEVELLING OF SEPARATE LEAVES
- Locations for equal levelling of cavity wall leaves: As follows:
  - Every course containing vertical twist type ties or other rigid ties.
  - Every third tie course for double triangle/ butterfly ties.
  - Courses in which lintels are to be bedded.

595 LINTELS
- Bearing: Ensure full length masonry units occur immediately under lintel ends.

610 SUPPORT OF EXISTING WORK
- Joint above inserted lintel or masonry: Fully consolidated with semidry mortar to support existing structure.

635 JOINTING
- Profile: Consistent in appearance.

645 ACCESSIBLE JOINTS NOT EXPOSED TO VIEW
- Jointing: Struck flush as work proceeds.

671 FIRE STOPPING
- Avoidance of fire and smoked penetration: Fit tightly between cavity barriers and masonry. Leave no gaps.

690 ADVERSE WEATHER
- General: Do not use frozen materials or lay on frozen surfaces.
- Air temperature requirements: Do not lay bricks/ blocks:
  - In cement gauged mortars when at or below 3°C and falling or unless it is at least 1°C and rising.
  - In hydraulic lime:sand mortars when at or below 5°C and falling or below 3°C and rising.
  - In thin joint mortar glue when outside the limits set by the mortar manufacturer.
- Temperature of walling during curing: Above freezing until hardened.
- Newly erected walling: Protect at all times from:
  - Rain and snow.
  - Drying out too rapidly in hot conditions and in drying winds.

F30 Accessories/ Sundry Items for Brick/ Block/ Stone Walling

To be read with Preliminaries/General conditions.

NOTE Where changes have been made to the standard NBS clauses these are identified in **bold** type.

Cavities

110 CONCRETE FILL TO BASE OF CAVITY
- Concrete generally: To BS EN 206-1 and BS 8500-2.
  - Designated concrete: **GEN3.**
    Consistence class **S3**.
- Extent: Maintain 75 mm between top of fill and external ground level and a minimum of 225 mm between top of fill and ground level dpc.
- Placement: Compact to eliminate voids.

120 CLEANLINESS
- Cavity base and faces, ties, insulation and exposed dpcs: Free from mortar and debris.

130 PERPEND JOINT WEEP HOLES
- Form: Open perpend joint.
- Locations: Through outer leaf immediately above base of cavity, at cavity trays, stepped dpcs and external openings. 75 mm above top of cavity fill at base of cavity.
- Provision: At not greater than 1000 mm centres and not less than two over each opening.

131 BED JOINT WEEP HOLES
- Form: Open 10 mm diameter hole.
- Locations: Through outer leaf immediately above base of cavity at cavity trays, stepped dpcs and external openings. 75 mm above top of cavity fill at base of cavity.
- Provision: At not greater than 1000 mm centres and not less than two over each opening.

132 PERPEND JOINT PLASTICS WEEP HOLES
- Manufacturer:
  - Product reference:
- Locations: Through outer leaf immediately above base of cavity, at cavity trays, stepped dpcs and external openings. 75 mm above top of cavity fill at base of cavity.
- Provision: At not greater than 1000 mm centres and not less than two over each opening.

Reinforcing/ Fixing Accessories

255 WIND POSTS
- Manufacturer: **Ancon or similar approved**
  - Product reference: **WP2 – refer to drawings.**
- Material:
- Sizes: **Refer to LKA drawings**
- Fixings (complete with washers and shims): **to manufacturers detaisl.**

281 LATERAL RESTRAINT PROPRIETARY SLIP TIES FOR MOVEMENT JOINTS **At blockwork movement joints.**
- Manufacturer: **Ancon or similar approved.**
  - Product reference: **pps with debonding sleeve**
- Material/ finish:
- Fixing centres: **450mm c/c vertically**

G10 Structural Steel Framing

To be read with Preliminaries/General conditions and the latest edition of the National Structural Steelwork Specification (hereinafter called the NSSS) for Building Construction.

NOTE Where changes have been made to the standard NBS clauses these are identified in **bold** type.

General Requirements/ Information

106 PROJECT DESCRIPTION
- **The structure is a two storey cricket club pavilion with prefabricated timber truss roof and load bearing ground floor walls. Several large openings require new beams to support the trussed roof and first floor.**
- **The site is Thame Cricket Club.**
- **Temporary works are to be designed by the contractor.**
- **Details of connection design forces are given on drawings tbc.**

107 SUBMISSIONS
- **Calculations for all connections as required by NSSS 3.6.2(ii) shall be submitted to an agreed programme allowing 10 working days for comments by the Engineer.**
- **Detailing of holding down bolts and production of a foundation plan drawing is to be done by the steel fabricator.**
- **Confirm details of the person responsible for all temporary works design (called the 'temporary works designer / co-ordinator') when returning the tender.**

110 DESIGN
- Design concept: **New beams to allow for openings at ground floor level.**
- Design standard: The structural steelwork has been designed to BS 5950 where applicable.
  - Supplementary requirements:
- Completion of design: Design and detail connections to BS 5950; complete detailed design for all cold formed elements shown on the design drawings.
  - Loading requirements: **As specified on tbc or otherwise calculable.**
- Design parameters assumed:.
- Fixings to foundations/ walls: **As shown on LKA drawings.**

113 VARIATIONS: **No variation to the specification or drawings may be made without approval. The Contractor is to submit details of and reasons for any proposed variations from:**
- **This specification**
- **The drawings**
- **The CA's written or drawn instructions**

115 DESIGN CONSTRAINTS- GENERAL
- Members forming bracing systems or girders of lattice construction: Unless detailed or instructed otherwise, position so that their lines of action intersect at a point.
- Bolts/ Screws:
  - Diameter (minimum): **16.**
  - Number per connection (minimum): Two, unless otherwise indicated.
  - Other requirements: **none.**
- Punching of bolt holes: **permitted.**
- **Welds: 6mm fillet unless otherwise shown or appropriate to the location..**
  - - Other constraints:.

- 118 PROGRAMME INFORMATION

Construction issue of design drawings for the project will be on tbc .
The date the site will be handed over to the steelwork contractor is to be agreed with the Principal Contractor.
The Programme for steel erecting and its co-ordination with other site activities is to be agreed with the Principal Contractor.

120 DRAWING AND CALCULATIONS SUBMISSION PROCEDURE:
Before preparing detailed fabrication drawings, submit two copies of calculations for all major connections for comment by the structural engineer, and general arrangement drawings with individual steel members clearly identified.

- Submit 4 copies of drawings (2 copies each for the CA and structural engineer). Drawing submitted for comment will be received by the CA and assigned one of the categories as NSSS clause 3.6.4.
- The contractor is to ensure that drawings are submitted for comment in time so that the approval period complies with the programme. A period of 10 working days, after receipt of drawings, must be allowed for preparation of comments by the CA.
- Approval shall not in any way relieve the Contractor of his responsibility for any errors which his drawings or calculations may contain.

123 FABRICATION, DESPATCH: The Contractor shall give the Engineer 7 working days notice of intended dates of despatch to site of steelwork and accessories in such a way that inspection can take place prior to despatch.

124 DRAWINGS & DIMENSIONS:

- The definition of Design Drawings given in NSSS is revised as follows:
  Fully dimensioned drawings will not be provided by the Engineer. Basic dimensions and setting out will be provided by [Insert name]and [Insert name]. Any other dimensions calculable from this information are to be worked out by the contractor as necessary
- All site dimensions are to be measured and checked on site prior to fabrication, or as necessary to progress design and production of fabrication drawings. All dimensions between new and existing structure are to be checked and setting out confirmed relative to existing structure. (Existing structure includes any structure on site whether new or existing which may influence the dimension of a piece of steelwork.) Copies of all information to be provided to the CA. The cost of this work is to be borne by the contractor.

125 SPECIFICATION STANDARD

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

130 GENERAL STEEL SECTIONS AND PLATES

- Standard: BS EN 10025-2
- Grade: S275JR
  - Options:
- Source: Obtain steel from a source accredited to a national or internationally accepted quality standard.
  - Other requirements:

135 HOLLOW STEEL SECTIONS

- Standard: BS EN 10210-1
- Grade: 355
  - Options:

- Source: Obtain steel from a source accredited to a national or internationally accepted quality standard.
- Other requirements:

Fabrication Generally

180 NOTIFICATION OF COMMENCEMENT
- Give notice: Before fabrication is due to start.
- Period of notice (minimum): Ten working days.

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

215 HOLLOW SECTIONS
- Insides of sections: Remove debris and moisture before sealing ends and openings.

220 ACCESS/ VENTILATION HOLES IN BASE PLATES
- Base plates larger than 1 m^2: Make 25 mm diameter holes as necessary for pressure grouting, escape of entrapped air or direct compaction of filling/ bedding material.

225 STEELWORK TO BE GALVANIZED
- Cutting, drilling and shop welding: Completed before galvanizing.
- Vent and drain holes: Provided as necessary.
  - Locations: Submit proposals.
  - Sealing: required, submit proposals

Welding

255 WELDING ON SITE: Do not weld when surfaces are wet or when the ambient temperature is below 0 °C. Procedures for site welding, including details of protection to the working area, shall be agreed with the CA at least 5 working days before site welding starts.

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

Bolt Assemblies

302 NON-PRELOADED BOLT/ SCREW ASSEMBLIES
- Designation: grade 8.8.
- Nuts and washers: To suit grade of bolt, as NSSS, clause 2.7.
- Coating applied by manufacturer: sheradized.

303 PRELOADED BOLT ASSEMBLIES
- Designation: General Grade HSFG to BS 4395-1.
- Coating applied by manufacturer: sheradized.

306 EXPANDING BOLTS:
- Where not indicated on drawings, type and manufacturer to be agreed in writing in advance with the Engineer at least 3 working days before intended date of placing order.
- Stud anchors including the following examples are NOT acceptable:
  Hilti HST or HSA
  Parabolt Through Bolt

Rawl Throughbolt
Spit Fix

308 SPACING and distance to edge of concrete or masonry for all expanding bolts to comply with fixing manufacturer's recommendations for maximum safe static load.

325 DIRECT TENSION INDICATORS
- Standard: To BS 7644-1.
- Manufacturer: [Insert Requirements]
  - Product reference: [Insert Requirements]
- Grade: Appropriate for grade of bolt and nut assembly.
- Finish: [Insert Requirements]
- Ancillary components: Washers to BS 7644-2. Used as recommended in BS 7644-1, Annex A.
- Post installation and inspection treatment: Where no further protective coating is specified, apply a butyl rubber sealing compound to seal measuring gap around indicators.

335 SPRING WASHERS: To BS 4464.

351 VIBRATION: Whenever there is a risk of nuts becoming loose due to vibration or alternation of stresses, they shall be securely locked. The method of achieving locking shall be submitted for approval. Damaging the thread on the bolt shank to achieve locking will not be permitted.

375 SHERARDIZED COATING TO BOLT ASSEMBLIES
- Standard: To BS 7371-8.
- Class: S2.
- Sherardizing: Applied by fastener manufacturer and passivated.
- Post treatment: not required.
- Use/location: all bolts.

390 SEALED HOLLOW SECTIONS
- Bolt holes: Seal to prevent access of moisture.
- Method of sealing: to be agreed with CA allowing at least 10 working days for comment on proposals by CA.

Erection

405 GENERAL INFORMATION
- Details of site services: [Insert details].
- For details of limiting component dimensions and specific design constraints see the general description in clause 110/111/112
- For details of existing site services etc. refer to the Health & Safety Plan
- Details of work to be co-ordinated with others is to be agreed with the Principal Contractor.
- Erection shall comply with the guidance given in BS 5531.
- Erection shall not start until the steelwork contractor has received a Safe Site Handover Certificate from the Principal Contractor.
- Other information: .

410 PRE-ERECTION CHECKS
When using a mobile crane comply with the requirements of the Precast Flooring Federation (PFF) and British Constructional Steelwork Association (BCSA) Mobile Crane Planning Safety Bulletin.
- Scope: At least 7 days before proposed erection start date, check the following:

  - Foundations and other structures to which steelwork will be attached: Accuracy of setting out.
  - Holding down bolts: Position, protruding length, slackness and condition.
- Inaccuracies and defects: Report without delay.
- Permission to commence erection: Obtain.

420 SETTING OUT
- Permissible deviations: In addition to the requirements of the NSSS, comply with the following:

Type of dimension and location	PD
For all lift and hoist shafts	10mm maximum in any direction

425 MODIFICATIONS
- Steelwork: Do not modify without approval.
- Obtain approval for methods of rectification before starting modification or remedial work.
- Temporary fabrication/ erection attachments: remove.

441 MORTAR FILLING/ BEDDING OF COLUMN BASES
- Bedding thickness range: 25-50mm.
- Bolt pockets: Completely filled with neat cement slurry.
- Spaces beneath base plates: Completely filled as follows:
  - Spaces 0-25 mm deep: Obtain instructions.
  - Spaces 25-50 mm deep: 1:1 cement:sand mortar, just fluid enough to pour. Tamped well as filling proceeds. Provide temporary shuttering as necessary.
  - Spaces 50-80 mm deep: 1:2 cement:sand mortar, just damp, tamped well against properly fixed supports as filling proceeds.
- Cement: Portland cement BS EN 197-1 - CEM I 42.5 or 52.5.
- Sand: To BS EN 12620, grade 0/4 or 0/2 (MP).
- Additives: Not required

Inspection/ Testing of Steelwork

460 INSPECTION: Permit the CA, and/or an independent inspection authority appointed by him, to inspect the work at all reasonable times and at all places where it is being carried out. Provide all facilities, hand tools, lighting, etc. as necessary to ensure adequate inspection.

462 The Examiner or Examining Body used by the steelwork fabricator to carry out checks on welding and welding procedures shall be UKAS accredited. Details of the UKAS accreditation are to be provided to the CA on request.

468 TESTING AUTHORITY: All tests to be carried out by a NAMAS accredited Laboratory.

480 DEFECTIVE WORK: As soon as possible after any part of the work or any materials are known or suspected to be defective, submit proposals to CA for further testing, inspection or replacement and obtain instructions.

General Requirements for Protective Coating Work

510 SURFACES NOT REQUIRING COATING:
Steelwork which is to be cased in concrete
Top flange surface of composite beams supporting a concrete flooring system.
Interfaces of members to be site welded.
All faying surfaces for friction grip joints.

521 ALTERNATIVE MANUFACTURERS: Coating materials to be obtained from one only of the following manufacturers unless specified otherwise. Inform CA of selected manufacturer at an early date.
- Leighs Paints (telephone 012 0452 1771)
- International Protective Coatings Ltd (Akzo Nobel) (telephone 020 7479 6135)
- Tikkurila Coatings (telephone 016 1764 6017)

522 REPAIR OF DAMAGED COATINGS
The steel sub-contractor is responsible for making good any coats damaged during transport and erection.

535 INSPECTION OF COATING WORK
Work in progress: Permit coating manufacturer to inspect and take samples of products. Do not comply with directions or requests given by coating manufacturer unless and until confirmed by CA.
- Give notice of dates for: [Insert details]
- Start of surface preparation and coating.
- Coated members or components leaving the works.
  Period of notice (minimum): 7 working days.

Protective Coating System(s)

640 SHOP PAINTING WITH PRIMER FOR INTERNAL STEELWORK.
- Corrosivity Category: C1
- Use/location: Dry internal steelwork concealed from view
- Paint manufacturer: Leighs Paints
- Shop preparation: Blast clean as NSSS clause 10.2 to BS EN ISO 8501-1, preparation grade Sa2½.
- Shop primer: EPIGRIP C400V3 Zinc Phosphate Primer/Buildcoat
  Dry film thickness: 75 micrometres.
  Colour: Light Grey (subject to confirmation by the Architect)
  On site: Prepare surface as clause 765 and touch up in shop coat.
- Special requirements: If steel is to be blast cleaned prior to fabrication a compatible Pre-fabrication Primer must be used.
- Durability Range: High

641 SHOP PAINTING WITH PRIMER FOR EXTERNAL OR STEELWORK IN CAVITIES.
- Corrosivity Category: C3
- Use/location: External steelwork
- Paint manufacturer: Leighs Paints
- Shop preparation: Blast clean as NSSS clause 10.2 to BS EN ISO 8501-1, preparation grade Sa2½.
- Shop primer: EPIGRIP C400V3 Zinc Phosphate Primer/Buildcoat
  Dry film thickness: 250 micrometres.

Colour: Light Grey (subject to confirmation by the Architect)
On site: Prepare surface as clause 765 and touch up in shop coat.
- Special requirements: If steel is to be blast cleaned prior to fabrication a compatible Pre-fabrication Primer must be used.
- Durability Range: High

Preparation for Painting

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

715 INACCESSIBLE SURFACES: The sequence of working must be such as to ensure that surfaces inaccessible after assembly receive the full specified treatment and coating system including, if necessary, local shop application of site coatings.

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

730 PREPARATION FOR SITE WELDING OF SHOP PAINTED STEELWORK
- Methods: Select from the following:
- Mask weld areas immediately after blast cleaning and before coating steelwork. If paint system comprises more than one coat, step each coat 30 mm back from edge of preceding coat and away from masked areas. Remove masking immediately before welding.
- Prepare and paint steelwork including weld areas. Grind off to bare steel around each weld area immediately before welding.

735 TREATMENT OF SITE WELDED JOINTS IN PAINTED STEELWORK
- Preparation: After welding, and without delay, remove scale and weld spatter from weld areas. Remove traces of rust. Wash with clean water and allow to dry. Prime without delay.
- Protective/Decorative coatings: Apply to weld areas to match surrounding painted areas.

740 BOLTED JOINTS (NONFRICTION GRIP)
- Steelwork to be shop painted: Apply full shop specification to joint faces.
- Steelwork to be erected with mill finish then site painted: Before erection, prepare and prime joint faces and allow to dry.
- Bolted joints in externally exposed steelwork:
- Immediately before assembling, apply a further coat of primer and bring surfaces together while still wet.

- After assembling and before applying site coatings, seal crevices to bolts and joint perimeters with a compatible sealant.

745 FAYING SURFACES OF FRICTION GRIP JOINTS
- Protection: Immediately after blast cleaning and before coating surrounding areas, mask faying surfaces to protect from contamination and deterioration.
- If paint system comprises more than one coat, step each coat 30 mm back from edge of preceding coat and away from masked areas.
- Removal of protection: Immediately before bolting, remove masking. Check faying surfaces are free from adhesive. Clean with solvent if necessary.

750 FRICTION GRIP JOINTS IN SHOP PAINTED STEELWORK
Post assembly treatment of bolts and surrounding areas: After final tightening of bolts and inspection of joints:
- Thoroughly degrease and clean uncoated areas including bolts.
- Prime without delay.
- Apply full shop coating specification.
- Direct tension indicators: Seal measuring gap to prevent ingress of moisture.

755 UNCOATED FASTENERS
- Treatment: After steelwork erection and before applying site coatings, thoroughly degrease and clean. Without delay, coat to match adjacent shop painted areas.

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

Painting

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

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

820 FILM THICKNESS
- Wet film thickness: During application, check thickness of each coat with a wheel or comb gauge used in accordance with BS EN ISO 2808. Accumulated dry film thickness: After each coat has dried, check total accumulated film thickness.
- Method: Magnetic or electromagnetic meter.
- Number and position of measurements: As directed by CA.
- Validation: Take all measurements in presence of CA.

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

825 STRIPE COATS: Where specified, brush apply an additional stripe coat to all external angles, nuts and bolt heads, rough weld seams, and areas that are difficult to coat.

850 JUNCTIONS WITH CONCRETE:
Exposed steelwork partially embedded or encased in concrete: Apply two coats of epoxy coating locally to the steel/concrete junction.

- Epoxy coating: Leighs Paints 'Epigrip L524' or equal approved.

860 STEELWORK IN CAVITY WALLS
Unless otherwise noted all concealed steelwork within cavity walls is to be painted with two coats of Leighs Paints 'Epigrip L524' epoxy coating or equal approved.

G20 Carpentry/ Timber Framing/ First Fixing

To be read with Preliminaries/General conditions.

NOTE Where changes have been made to the standard NBS clauses these are identified in **bold** type.

General

105 TIMBER PROCUREMENT

Timber (including timber for wood based products): obtained from well-managed forests and/or plantations in accordance with:

- The laws governing forest management in the producer country or countries.
- International agreements such as the Convention on International Trade in Endangered Species of wild fauna and flora (CITES).

Documentation: provide either:

- Documentary evidence (which has been or can be independently verified) regarding the provenance of all timber supplied. **This should be a Forest Stewardship Council (FSC) 'Chain of Custody Certificate' unless otherwise agreed.**
- Evidence that suppliers have adopted and are implementing a formal environmental purchasing policy for timber and wood based products.

115 CONTRACTOR DESIGNED STRUCTURAL COMPONENTS

- Design standard: To BS 5268-2.
- Completion of design: Design and detail members and connections to satisfy loading requirements specified or otherwise calculable from the information given.
- Design parameters:
- Drawings:
  - Content: Drawings must show:
    Geometry of structure.
    Wood species and grades/ strength classes.
    Target/ Finished sizes of all timber sections.
    Joints not detailed on Engineer's drawings, their locations, and evidence as to their structural adequacy.
  - Submission: **The contractor is to ensure that drawings are submitted for comment in time so that the approval period complies with the programme. A period of 10 working days, after receipt of drawings, must be allowed for preparation of comments by the CA.**
    Copies: **Three.**
- Compliance with design standard: Demonstrate by calculation or by prototype load testing in accordance with BS 5268-2, Section 8.

150 STRENGTH GRADING OF TIMBER

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

160 GRADING AND MARKING OF SOFTWOOD

- Timber of a target/ finished thickness less than 100 mm and not specified for wet exposure: Graded at an average moisture content not exceeding 20% with no reading being in excess of 24% and clearly marked as 'DRY' or 'KD' (kiln dried).
- Timber graded undried (green) and specified for installation at higher moisture contents: Clearly marked as 'WET' or 'GRN'.
- Structural timber members cut from large graded sections: Regraded to approval and marked accordingly.

Products

210 STRUCTURAL SOFTWOOD (GRADED DIRECT TO STRENGTH CLASS)
- Grading standard: To BS 4978 or BS EN 519 or other national equivalent and so marked.
- Strength class to BS EN 338:
- Treatment: As section Z12, and in accordance with British Wood Preserving and Damp-proofing Association (BWPDA) Manual.

250 STRUCTURAL HARDWOOD (GRADED DIRECT TO STRENGTH CLASS)
- Grading standard: To BS 5756 and so mrked.
- Strength class to BS EN 338: D40
- Surface finish:
- Treatment: As section Z12, and in accordance with British Wood Preserving and Damp-proofing Association (BWPDA) Manual.

350 TRUSSED RAFTERS
- Design and fabrication: To BS 5268-3.
- Manufacturer: A firm currently registered under a third party quality assurance scheme.
- Truss system: tbc
- Ancillary components to be supplied by the truss fabricator:
- Treatment: As section Z12, and in accordance with British Wood Preserving and Damp-proofing Association (BWPDA) Manual.

Workmanship Generally

401 CROSS SECTION DIMENSIONS OF STRUCTURAL SOFTWOOD AND HARDWOOD
- Dimensions: Dimensions in this specification and shown on drawings are target sizes as defined in BS EN 336.
- Tolerances: The tolerance indicators (T1) and (T2) specify the maximum permitted deviations from target sizes as stated in
  BS EN 336, clause 4.3:
  - Tolerance class 1 (T1) for sawn surfaces.
  - Tolerance class 2 (T2) for further processed surfaces.

402 CROSS SECTION DIMENSIONS OF NONSTRUCTURAL SOFTWOOD
- Dimensions: Dimensions in this specification and shown on drawings are finished sizes.
- Maximum permitted deviations from finished sizes: As stated in BS EN 1313-1:
  - Clause 6 for sawn sections.
  - Clause NA.2 for further processed sections.

403 CROSS SECTION DIMENSIONS OF NONSTRUCTURAL HARDWOOD
- Dimensions: Dimensions in this specification and shown on drawings are finished sizes.
- Maximum permitted deviations from finished sizes: As stated in BS EN 1313-2:
  - Clause 6 for sawn sections.
  - Clause NA.3 for further processed sections.

420 WARPING OF TIMBER
- Bow, spring, twist and cup: Not greater than the limits set down in BS 4978 or BS EN 519 for softwood, or BS 5756 for hardwood.

430 SELECTION AND USE OF TIMBER
- Timber members damaged, crushed or split beyond the limits permitted by their grading: Do not use.

- Notches and holes: Position in relation to knots or other defects such that the strength of members will not be reduced.
- Scarf joints, finger joints and splice plates: Do not use without approval.

440 PROCESSING TREATED TIMBER
- Cutting and machining: As much as possible before treatment.
- Extensively processed timber: Retreat timber sawn lengthways, thicknessed, planed, ploughed, etc.
- Surfaces exposed by minor cutting and/ or drilling: Treat with two flood coats of a solution recommended by main treatment solution manufacturer.

450 MOISTURE CONTENT
- Moisture content of wood and wood based products at time of installation: Not more than:
  - Covered in generally unheated spaces: 24%.
  - Covered in generally heated spaces: 20%.
  - Internal in continuously heated spaces: 20%.

480 TRUSSED RAFTER TESTING
- Standard: To BS EN 595.
- Number/ timing of tests:
- Purpose of testing:
- Test reports: Submit as soon as available.

510 PROTECTION
- Generally: Keep timber dry and do not overstress, distort or disfigure sections or components during transit, storage, lifting, erection or fixing.
- Timber and components: Store under cover, clear of the ground and with good ventilation. Support on regularly spaced, level bearers on a dry, firm base. Open pile to ensure free movement of air through the stack.
- Trussed rafters: Keep vertical during handling and storage.

530 PAINTED FINISHES
- Structural timber to be painted: Primed as specified before delivery to site.

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

550 EXPOSED TIMBER
- Planed structural timber exposed to view in completed work: Prevent damage to and marking of surfaces and arrises.

Jointing Timber

570 JOINTING/ FIXING GENERALLY
- Generally: Where not specified precisely, select methods of jointing and fixing and types, sizes and spacings of fasteners in compliance with section Z20.

580 FRAMING ANCHORS
- Manufacturer and product reference: As shown on the drawings or alternative agreed with the CA.
- Material/ finish: galvanized steel.
- Fasteners: Galvanized or sherardized square twist nails.
  - Size: Not less than size recommended by anchor manufacturer.

- Fixing: Secure using not less than the number of nails recommended by anchor manufacturer.

620 WASHERS
- Standard: Plain to BS 4320, spring to BS 4464.
- Material and finish: To match bolts.
- Dimensions when seated directly on timber surfaces: Unless specified otherwise:
  - Diameter/ side length: Not less than 3 times bolt diameter.
  - Thickness: Not less than 0.25 times bolt diameter.

630 BOLTED JOINTS
- Bolt spacings (minimum): To BS 5268-2, table 81.
- Holes for bolts: Located accurately and drilled to diameters as close as practical to the nominal bolt diameter and not more than 2 mm larger.
- Washers: Placed under bolt heads and nuts that would otherwise bear directly on timber. Use spring washers in locations which will be hidden or inaccessible in the completed building.
- Bolt tightening: So that washers just bite the surface of the timber. Ensure that at least one complete thread protrudes from the nut.
  - Checking: At agreed regular intervals up to Completion. Tighten as necessary.

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

Erection and Installation

710 PROPOSALS FOR ERECTING STRUCTURAL TIMBER
- Proposals: Submit details of:
  - Method and sequence of erection.
  - Type of craneage.
  - Temporary guys and bracing proposed for use during erection.
  - The person responsible for all temporary works design (called the 'temporary works designer / co-ordinator') when returning the tender.
- Latest date for submission: To allow at least 10 working days for comment by the CA.

711 LOADING TIMBER FLOORS
Timber floors, supported by joist hangers, are not to be loaded, or used, until at least 900mm of masonry has been completed for 1day above the level of the hangers.

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

750 MODIFICATIONS/ REPAIRS
- Defects due to detailing or fabrication errors: Report without delay.

- Methods of rectification: Obtain approval of proposals before starting modification or remedial work.
- Defective/ damaged components: Timber members/ components may be rejected if the nature and/ or number of defects would result in an excessive amount of site repair.

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

770 ADDITIONAL SUPPORTS
- Provision: Position and fix additional studs, noggings and/ or battens to support edges of sheet materials, and wall/ floor/ ceiling mounted appliances, fixtures, etc. shown on drawings.
- Material properties: Additional studs, noggings and battens to be of adequate size and have the same treatment, if any, as adjacent timber supports.

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

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

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

786 JOISTS ON HANGERS
- Hangers: Bedded directly on and hard against supporting construction. Do not use packs or bed on mortar.
- Joists: Cut to leave not more than 6 mm gap between ends of joists and back of hanger. Rebated to lie flush with underside of hangers.
- Fixing to hangers: A nail in every hole.

790 STANDARD JOIST HANGERS GENERALLY
- Standard: To BS EN 845-1.
- Size and type: To suit joist, design load and crushing strength of supporting construction.
- Material/ finish: galvanized steel.

791 PROPRIETARY JOIST HANGERS GENERALLY
- Manufacturer and product reference: As shown on the drawings or alternative agreed with the CA.
- Material/ finish: galvanized steel.
- Size: To suit joist, design load and crushing strength of supporting construction.

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

800 TRUSSED RAFTER INSTALLATION
- Erection: To BS 5268-3, clause 9.3 and TRA site installation guide.
- Trusses generally: Do not modify without approval.
- Damaged trusses: Do not use.
- Fixing: Truss clips and bottom chords of standard trusses and rafters of raised tie trusses bearing fully on wall plates.
  - Bottom chords of standard trusses: Do not fix to internal walls until roofing is complete and cisterns are installed and filled.

805 TRUSS CLIPS
- Manufacturer and product reference: As shown on the drawings or alternative agreed with the CA.
- Material/ finish: galvanized steel.
- Fasteners: 32 x 3.5 mm galvanized or sherardized square twisted nails in every hole.

810 PERMANENT BRACING OF TRUSSED RAFTERS
- Bracing and binders:
  - Size: tbc by Timber frame contractor
  - Method of fixing: To every rafter, strut or tie with not less than two fasteners.
  - Fasteners: to be confirmed by Timber Frame contractor.
- Lap joints: Extended over and nailed to at least two truss members.

820 VERTICAL RESTRAINT STRAPS GENERALLY
- Manufacturer and product reference: As shown on the drawings or alternative agreed with the CA.
- Material/ finish: galvanized steel.
- Size:
  - Cross section: Not less than 30x2.5.
  - Length: As shown on drawings or 1200 if not shown.
- Centres: Not more than 1200
- Fixing:
  - To timber members with not less than two 75 long 3.8 diameter nails.
  - To masonry with not less than four No12, 75 long screws evenly spaced, with at least one screw located within 150 mm of the bottom end of each strap.

830 LATERAL RESTRAINT STRAPS GENERALLY
- Manufacturer and product reference: As shown on the drawings or alternative agreed with the CA.
- Material/ finish: galvanized steel.
- Size: Not less than 30x5.
- Fixing: To top of joists/ rafters/ ties at not more than 400mm centres and as shown on drawings.
  - Ensure that cranked end is in tight contact with cavity face of wall inner leaf and is not pointing upwards.
- Straps spanning joists/ rafters/ ties running parallel to wall: Fix noggings and packs tightly beneath straps.
  - Size of noggings and packs: Not less than three quarters of joist/ rafter/ tie depth and not less than 38 mm thick.
  - Notching: Notch joists so that straps fit flush with surface. Do not notch rafters/ ties.
- Fasteners: 75 long 3.8 diameter nails or as noted on details.

840 STRUTTING TO FLOOR JOISTS
- Type: One of the following:
  - Herringbone strutting: At least 38 x 38 mm softwood.

  - Solid strutting: At least 38 mm thick softwood and at least three quarters of joist depth.
  - Proprietary metal strutting: As shown on the drawings or alternative agreed with the CA.
- Fixing: Between joists as follows:
  - Joist spans of 2.5 to 4.5 m: One row at centre span.
  - Joist spans over 4.5 m: Two rows equally spaced.
  - Strutting must not project beyond top and bottom edges of joists.
- Outer joists: Blocked solidly to perimeter walls.

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

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

870 ANCHOR TESTING
- Standard: To BS 5080-1 and -2.
- Preliminary tests: [Insert Requirements]
- Proof tests: [Insert Requirements]
- Test reports: Submit as soon as available.

Z21 Mortars

To be read with Preliminaries/General conditions.

NOTE Where changes have been made to the standard NBS clauses these are identified in **bold** type.

Cement Gauged Mortars

110 CEMENT GAUGED MORTAR MIXES
- Specification: Proportions and additional requirements for mortar materials are specified elsewhere.

120 SAND FOR SITE MADE CEMENT GAUGED MASONRY MORTARS
- Standard: To BS EN 13139.
- Grading: 0/2 (FP or MP).
  - Fines content where the proportion of sand in a mortar mix is specified as a range (e.g. 1:1: 5-6):
    Lower proportion of sand: Use category 3 fines.
    Higher proportion of sand: Use category 2 fines.
- Sand for facework mortar: Maintain consistent colour and texture. Obtain from one source.

131 READY-MIXED LIME:SAND FOR CEMENT GAUGED MASONRY MORTARS
- Standard: To BS EN 998-2.
- Lime: Nonhydraulic to BS EN 459-1.
  - Type: CL 90S.
- Pigments for coloured mortars: To BS EN 12878.

135 SITE MADE LIME:SAND FOR CEMENT GAUGED MASONRY MORTARS
- Permitted use: Where a special colour is not required and in lieu of factory made ready-mixed material.
- Lime: Nonhydraulic to BS EN 459-1.
  - Type: CL 90S.
- Mixing: Thoroughly mix lime with sand, in the dry state. Add water and mix again. Allow to stand, without drying out, for at least 16 hours before using.

160 CEMENTS FOR MORTARS
- Cement: To BS EN 197-1 and CE marked.
  - Types: Portland cement, CEM I.
    Portland limestone cement, CEM II/A-L or CEM II/A-LL.
    Portland slag cement, CEM II/B-S.
    Portland fly ash cement, CEM II/B-V.
  - Strength class: 32.5, 42.5 or 52.5.
- White cement: To BS EN 197-1 and CE marked.
  - Type: Portland cement, CEM I.
  - Strength class: 52.5.
- Sulfate resisting Portland cement:
  - Types: To BS 4027 and Kitemarked.
    To BS EN 197-1 fly ash cement, CEM II/B-V and CE marked.
  - Strength class: 32.5, 42.5 or 52.5.
- Masonry cement: To BS EN 413-1 and CE marked.
  - Class: MC 12.5.

180 ADMIXTURES FOR SITE MADE CEMENT GAUGED MORTARS

- Air entraining (plasticizing) admixtures: To BS EN 934-3 and compatible with other mortar constituents.
- Other admixtures: Submit proposals.
- Prohibited admixtures: Calcium chloride, ethylene glycol and any admixture containing calcium chloride.

190 RETARDED READY TO USE CEMENT GAUGED MASONRY MORTARS
- Standard: To BS EN 998-2.
- Lime for cement:lime:sand mortars: Nonhydraulic to BS EN 459-1.
  - Type: CL 90S.
- Pigments for coloured mortars: To BS EN 12878.
- Time and temperature limitations: Use within limits prescribed by mortar manufacturer.
  - Retempering: Restore workability with water only within prescribed time limits.

200 STORAGE OF CEMENT GAUGED MORTAR MATERIALS
- Sands and aggregates: Keep different types/ grades in separate stockpiles on hard, clean, free-draining bases.
- Factory made ready-mixed lime:sand/ ready to use retarded mortars: Keep in covered containers to prevent drying out or wetting.
- Bagged cement/ hydrated lime: Store off the ground in dry conditions.

210 MAKING CEMENT GAUGED MORTARS
- Batching: By volume. Use clean and accurate gauge boxes or buckets.
  - Mix proportions: Based on dry sand. Allow for bulking of damp sand.
- Mixing: Mix materials thoroughly to uniform consistency, free from lumps.
  - Mortars containing air entraining admixtures: Mix mechanically. Do not overmix.
- Working time (maximum): Two hours at normal temperatures
- Contamination: Prevent intermixing with other materials.