

The Bungalow, Rochdale

WML Specification

WML Consulting – Structural Specification Based on N.B.S.

10314 The Bungalow, Rochdale

Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared
01	02/03/2022	First issue	A.S

NBS Ref	Description
C20	Demolition
D20	Excavation and Filling
E05-E41	Insitu Concrete / Large Precast Concrete
E05	Insitu Concrete Construction Generally
E10	Mixing/Casting/Curing Insitu Concrete
E20	Formwork for Insitu Concrete
E30	Reinforcement for Insitu Concrete
E40	Designed Joints in Insitu Concrete
E41	Worked Finishes to Insitu Concrete
E60	Precast/Composite Concrete Floors/Roof Decks
F10-F31	Masonry
F10	Brick/Block/Stone Walling
F30	Accessories/Sundry items for Brick/Block/Stone Walling
F31	Precast Concrete Sills/Lintels/Copings/Features
G10	Structural Steel Framing
G12	Isolated Structural Metal Members
G20	Carpentry /Timber Framing/First Fixing
M10	Cement Based Levelling/Wearing Screeds
P31	Holes, Chases Corners and Supports for Services
Q20	Granular Sub-Bases to Road/Pavings
R12	Below Ground Drainage Systems
Z20	Fixings/Adhesives
Z21	Mortars
Z22	Sealants

PROTECTIVE COATING SYSTEM INDEX

Specification	Description
G10	Painting Only
WM 640/3	Internal Maintainable Semi-Decorative. C1 Environment
G10	Specific Conditions
WM 660/3	Steelwork in cavities
WM 660/7	Internal Intumescent Fire Protection. C1/C2 Environment

OTHER

Description
Piling Performance requirement and embedded retaining walls
Cutting & Removal of Reinforced Concrete Floor Slabs or Walls

C20
WML Specification

for

Demolition

C20 Demolition

To be read with Preliminaries/General conditions

GENERAL REQUIREMENTS

110 DESK STUDY/ SURVEY

- **Scope:**
Before starting deconstruction/ demolition work, examine available information, and carry out a survey of: the structure or structures to be deconstructed/ demolished,
 - the site on which the structure or structures stand, and
 - the surrounding area.
- **Report and method statements:** Submit, describing:
 - Form, condition and details of the structure or structures, the site, and the surrounding area.
 - Extent: As indicated on drawings.
 - Type, location and condition of features of historical, archaeological, geological or ecological importance.
 - Type, location and condition of adjoining or surrounding premises that might be adversely affected by removal of the structure or structures, or by noise, vibration and/ or dust generated during deconstruction/ demolition.
 - Identity and location of services above and below ground, including those required for the Contractor's use, and arrangements for their disconnection and removal.
 - Form and location of flammable, toxic or hazardous materials, including lead-based paint, and proposed methods for their removal and disposal.
 - Form and location of materials identified for reuse or recycling, and proposed methods for removal and temporary storage.
 - Proposed programme of work, including sequence and methods of deconstruction/ demolition.
 - Details of specific pre-weakening required.
 - Arrangements for protection of personnel and the general public, including exclusion of unauthorized persons.
 - Arrangements for control of site transport and traffic.
 - Special requirements: None.
- **Format of report:** As directed by CA.

120 EXTENT OF DECONSTRUCTION/ DEMOLITION

- **General:** Subject to retention requirements specified elsewhere, deconstruct/ demolish structures down to As indicated on drawings or agreed with the CA.

130 GROUNDWORKS

- **Old foundations, slabs and the like:** Break out in locations and to the extents stated.
- **Contaminated material:** Remove, and carry out remediation required by the Enforcing Authority.

140 BENCH MARKS

- **Unrecorded bench marks and other survey information:** Give notice when found. Do not remove marks or destroy the fabric on which they are found.

150 FEATURES TO BE RETAINED

- **General:** Keep in place and protect the following: As indicated on drawings.

SERVICES AFFECTED BY DECONSTRUCTION/ DEMOLITION

210 SERVICES REGULATIONS

- **Work carried out to or affecting new and/ or existing services:** Carry out in accordance with the byelaws and/ or regulations of the relevant Statutory Authority.

220 LOCATION OF SERVICES

- **Services affected by deconstruction/ demolition work:** Locate and mark positions.
- **Mains services marking:** Arrange with the appropriate authorities for services to be located and marked.

- Marking standard: In accordance with National Joint Utilities Group 'Guidelines on the positioning and colour coding of underground utilities' apparatus'.

232 SERVICES DISCONNECTION ARRANGED BY EMPLOYER AND CONTRACTOR

- Responsibility: The Employer will arrange with the appropriate authorities for disconnection of services and removal of fittings and equipment owned by those authorities prior to deconstruction/demolition, as follows: As agreed with the CA.
- Disconnection of remaining services: Arrange with the appropriate authorities. Remove fittings and equipment not owned by those authorities.
- Timing: Do not start deconstruction/ demolition until disconnections are completed.

240 DISCONNECTION OF DRAINS

- General: Locate, disconnect and seal disused foul and surface water drains.
- Sealing: Permanent, and within the site.

250 LIVE FOUL AND SURFACE WATER DRAINS

- Drains and associated manholes, inspection chambers, gullies, vent pipes and fittings:
 - Protect; maintain normal flow during deconstruction/ demolition.
 - Make good any damage arising from deconstruction/ demolition work.
 - Leave clean and in working order at completion of deconstruction/ demolition work.
- Other requirements: None unless noted otherwise on drawings.

260 SERVICE BYPASS CONNECTIONS

- General: Provide as necessary to maintain continuity of services to occupied areas of the site on which the deconstruction/ demolition is taking place and to adjoining sites/ properties.
- Minimum notice to adjoining owners and all affected occupiers: 72 hours, if shutdown is necessary during changeover.

270 SERVICES TO BE RETAINED

- Damage to services: Give notice, and notify relevant service authorities and/ or owner/occupier regarding damage arising from deconstruction/ demolition.
- Repairs to services: Complete as directed, and to the satisfaction of the service authority or owner.

DECONSTRUCTION/ DEMOLITION WORK**310 WORKMANSHIP**

- Standard: Demolish structures in accordance with BS 6187.
- Operatives:
 - Appropriately skilled and experienced for the type of work.
 - Holding, or in training to obtain, relevant CITB Certificates of Competence.
- Site staff responsible for supervision and control of work: Experienced in the assessment of risks involved and methods of deconstruction/ demolition to be used.

320 GAS OR VAPOUR RISKS

- Precautions: Prevent fire and/ or explosion caused by gas and/ or vapour from tanks, pipes, etc.

330 DUST CONTROL

- General: Reduce airborne dust by periodically spraying deconstruction/ demolition works with an appropriate wetting agent. Keep public roadways and footpaths clear of mud and debris.
- Lead dust: Submit method statement for control, containment and clean-up regimes.

340 HEALTH HAZARDS

- Precautions: Protect site operatives and general public from hazards associated with vibration, dangerous fumes and dust arising during the course of the Works.

350A ADJOINING PROPERTY

- When demolishing structure(s) against adjoining property, leave adequate temporary support and protection at each stage and arrange for inspection by the CA.
- Temporary support and protection: Provide. Maintain and alter, as necessary, as work proceeds. Do

not leave unnecessary or unstable projections.

- Defects: Report immediately on discovery.
- Damage: Minimize. Repair promptly to ensure safety, stability, weather protection and security.
- Support to foundations: Do not disturb.

360A STRUCTURES TO BE RETAINED

- Extent: As indicated on drawings.
- Parts which are to be kept in place: Protect.
- Interface between retained structures and deconstruction/ demolition: Cut away and strip out with care to minimize making good.
- Prevent debris from overloading any part of the structure which is not to be demolished.

370 PARTLY DEMOLISHED STRUCTURES

- General: Leave in a stable condition, with adequate temporary support at each stage to prevent risk of uncontrolled collapse. Make secure outside working hours.
- Temporary works: Prevent overloading due to debris.
- Access: Prevent access by unauthorized persons.

380 DANGEROUS OPENINGS

- General: Provide guarding at all times, including outside of working hours. Illuminate during hours of darkness.
- Access: Prevent access by unauthorized persons.

390A ASBESTOS-CONTAINING MATERIALS – KNOWN OCCURRENCES

- General: Refer to Asbestos Survey for the location of known asbestos containing materials within structures to be demolished. If not available, seek guidance from the CA.
- Removal: By contractor licensed by the Health and Safety Executive, and prior to other works starting in these locations.

391 ASBESTOS-CONTAINING MATERIALS – UNKNOWN OCCURRENCES

- Discovery: Give notice immediately of suspected asbestos-containing materials when discovered during deconstruction/ demolition work. Avoid disturbing such materials.
- Removal: Submit statutory risk assessments and details of proposed methods for safe removal.

410 UNFORESEEN HAZARDS

- Discovery: Give notice immediately when hazards such as unrecorded voids, tanks, chemicals, are discovered during deconstruction/ demolition.
- Removal: Submit details of proposed methods for filling, removal, etc.

420 OPEN BASEMENTS, ETC

- Temporary support: Leave adequate buttress walls or provide temporary support to basement retaining walls up to ground level.
- Safety: Make remaining sections of retaining and buttress walls safe and secure.
- Water movement: Make holes in basement floors to allow water drainage or penetration (depending on water table). Provide a hole for every 10 m², not less than 600 mm in diameter.

430 FILLING OF BASEMENTS, ETC

- Temporary support: Leave adequate buttress walls or provide temporary support to basement retaining walls up to ground level.
- Water movement: Make holes in basement floors to allow water drainage or penetration (depending on water table). Provide a hole for every 10 m², not less than 600 mm in diameter.
- Filling: Remove organic material and soil from basements and other voids. Fill and consolidate with 6F2 material laid and compacted in accordance with Highways Agency Specification for highway works unless:
 - i) noted otherwise on drawings
 - ii) agreed otherwise with CA prior to filling.

442 SITE SURFACE AT COMPLETION

- Levels: Grade the site to follow the levels of adjacent areas.
- Temporary surface: Cover the site with compacted granular material free from all deleterious materials, unless agreed otherwise with the CA.

450 SITE CONDITION AT COMPLETION

- Debris: Clear away and leave the site in a tidy condition.
- Other requirements: None.

MATERIALS ARISING**510 CONTRACTOR'S PROPERTY**

- Components and materials arising from the deconstruction/ demolition work: Property of the Contractor except where otherwise provided.
- Action: Remove from site as work proceeds where not to be reused or recycled for site use.

511 EMPLOYER'S PROPERTY

- Components and materials to remain the property of the Employer: As advised by the CA.
- Protection: Maintain until these items are removed by the Employer or reused in the Works, or until the end of the Contract.
- Special requirements: None.

520 RECYCLED MATERIALS

- Materials arising from deconstruction/ demolition work: Can be recycled or reused elsewhere in the project, subject to compliance with the appropriate specification and in accordance with any site waste management plan.
- Evidence of compliance: Submit full details and supporting documentation.
- Verification: Allow adequate time in programme for verification of compliance.

D20
WML Specification
for
Excavating and Filling

D20 Excavating and Filling

To be read with Preliminaries/General conditions

GENERALLY/THE SITE

112 SITE INVESTIGATION REPORT

- Confirm as adequate or submit proposals for further investigation as considered necessary.

145 VARIATIONS IN GROUND WATER LEVEL

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

150A EXISTING SERVICES, FEATURES AND STRUCTURES

- Services: Make enquiries as necessary regarding existing services on site.
- Site features and structures to be retained: Before starting work verify with CA which existing structures, fences, gates, walls, roads, paved areas and other site features are to be removed.

CLEARANCE/EXCAVATING

164 TREE ROOTS

- Protected area: Do not cut roots within precautionary protection area.
 - Size of area: Larger of the branch spread of the tree or an area with radius of half the tree's height measured from the trunk.
- Excavation in protected area:
 - Method: In accordance with BS 5837.
 - 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: Seek direction from CA.
- Backfill: If not shown on drawings, seek direction from CA.

166 TREE ROOT BARRIERS

- Trench: Sever all roots.
 - Depth: 1 m.
- Root barrier: Comply with BS 5837.
- 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: Do not use herbicide without approval.

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 leaflets.

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 leaflets.

- Felling: As close to the ground as possible.
- Stumps: Obtain approval before removing by winching. 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: As CA instruction.

220A 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.
- 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: As directed by CA.

221 TREATING TOPSOIL

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

225 HANDLING TOPSOIL

- Standard: To BS 3882.
- 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.
- Contamination: Do not mix topsoil with:
 - Subsoil, stone, hardcore, rubbish or material from demolition work.
 - Other soil or material containing aggressive weeds, sharps, plastics and non soil forming materials and notifiable animal or plant diseases.
 - Oil, fuel, cement or other substances harmful to plant growth.
 - Other classifications of topsoil.
- Multiple handling: Keep to a minimum. Use topsoil immediately after stripping.

240 ADJACENT EXCAVATIONS

- Requirement: Where an excavation encroaches below a line drawn at an angle from the nearest formation level of another higher excavation, the lower excavation, all work within it and backfilling thereto, must be completed before the higher excavation is made.
- Angle of line below horizontal: 45° in stable soils, 30° in wet clay.
- Backfill material: As shown on drawings.

244 EXCAVATIONS ADJACENT TO EXISTING FOUNDATIONS

- Prior to commencing excavation:
 - Excavate trial pits adjacent to existing foundations to determine extent and formation levels.
 - Allow for inspection of trial pits.
 - Allow time for amendment of details if required.
 - Time period: 5 working days.
- Backfill material to new excavation: As shown on drawings.

250 PERMISSIBLE DEVIATIONS FROM FORMATION LEVELS

- Beneath mass concrete foundations: ± 25 mm.
- Beneath ground bearing slabs and r.c. 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: ± 10 mm.
- 260 INSPECTING FORMATIONS
- Give notice: Make advance arrangements for inspection of formations for foundations and filling formations.
 - Notice (minimum): 3 days.
 - Preparation: Just before inspection remove the last 150 mm of excavation.
 - Trim to required profiles and levels.
 - Loose material: Remove.
 - Seal: Within 4 hours of inspection, seal formations with blinding concrete or sub-base.
- 261A EXCAVATION FORMATIONS
- If, after inspection, surfaces become unstable due to water, frost or other causes, excavate further and backfill with approved material all at the expense of the Contractor. Place concrete or other fill material as soon as possible after inspection to prevent deterioration due to water, frost or other causes.
- 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 before commencing excavation.
 - Period of notice: Three working days.
 - Shoring: Where inspection of formation is required, provide localised shoring to suit ground conditions.
 - Concrete fill: Place concrete immediately after inspection and no more than four hours after exposing the formation.
- 290 FOUNDATIONS IN MADE UP GROUND
- Depth: Excavate down to a natural formation of undisturbed subsoil.
 - Discrepancy: Give notice if this is greater or less than depth given.
- 310 UNSTABLE GROUND
- Generally: Ensure that the excavation remains stable at all times.
 - Give notice: Without delay if any newly excavated faces are too unstable to allow earthwork support to be inserted.
 - Take action: If instability is likely to affect adjacent structures or roadways, take appropriate emergency action.
- 311A EARTHWORK SUPPORT
- Use as necessary to support sides of excavations and remove on completion unless otherwise instructed. Take measurements of any supports left in position and inform CA.
- 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.

331A CHANGES IN GROUND CONDITIONS

- The CA's attention shall be drawn to changes in ground conditions when discovered, and in particular when any contaminants, existing structures, or water are met within the excavation. Any claim arising from such items will not be accepted if the CA has not been formally notified within 24 hours.

332A PERMANENT WORK

- Shall be protected from damage during progress of the works. In particular whilst excavating, filling, transporting, etc., care shall be taken not to disturb existing foundations and services. All remedial measures necessary will be at the expense of the Contractor.

333A TEMPORARY WORKS

- The Contractor shall allow for the design and production, if necessary, of working drawings for temporary work and such proposals shall be submitted to the CA for approval at least one week before work is due to be put in hand. The CA's approval given or implied will not relieve the Contractor of his responsibility for the sufficiency and safety of the work.

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 the material specified.
- Excavation taken deeper than required:
 - Backfill: With well graded granular material or lean mix concrete.

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 m² of wall or slab, make a drainage hole at least 600 mm diameter.

DISPOSAL OF MATERIALS**410A SURPLUS EXCAVATED TOPSOIL**

- Spread and level on site, or stockpile, or remove as directed by the CA.

441 SURPLUS SUBSOIL

- Excavated material: Stockpile in temporary storage heaps.
- Retained material: Spread and level surplus subsoil on site.
 - Locations: As directed by the CA.
 - Protected areas: Do not raise soil level within root spread of trees that are to be retained.
- Remaining material: Remove from site.

450 WATER

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

454 GROUND WATER LEVEL, SPRING OR RUNNING WATER

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

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.
 - Locations: Submit proposals.

460 PERMANENT DRAINAGE SYSTEM

- Disposal of water from the excavations through system: Not permitted unless agreed with the CA.

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: Give 7 days notice prior to placing.

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.

520 FROST SUSCEPTIBILITY

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

525 TESTING OF SUITABILITY OF FILL MATERIALS BEFORE START OF FILLING

- Laboratory: UKAS/ NAMAS accredited laboratory.
- Submit report to: CA.
 - Timing: At least 7 days prior to placing.
- Samples: Deliver to laboratory as required.

- Additional requirements: As directed by CA.
- Tests: In accordance with Highways Agency Specification for highway works.
- Frequency: As directed by the CA.

530 PLACING FILL

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

535 COMPACTION GENERALLY

- General: Compact fill not specified to be left loose as soon as possible after placing.
- After compaction: Surface of each layer must be well closed, showing no movement under compaction plant, and without cracks, holes, ridges, loose material and the like.
- Defective areas: Remove and recompact to full thickness of layer using new material.

540 BENCHING IN FILL

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

550 GEOTEXTILE SHEET

- Manufacturer: As indicated on drawings.
- Product reference: As indicated on drawings.
- Type: As indicated on drawings.
- Polymer type: As indicated on drawings.
- Recycled content: As indicated on drawings.
- Jointing: In accordance with manufacturers recommendations.
- Preparation of subgrade: Before laying sheet, remove humps and sharp projections. Fill hollows.
- Protect from:
 - Exposure to light.
 - Contaminants.
 - Materials listed as potentially deleterious by geotextile manufacturer.
 - Wind uplift.

555 GEOGRIDS

- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Polymer type: As indicated on drawings.
- Recycled content: As indicated on drawings.
- Directional strength: As indicated on drawings.
- Tensile strength: As indicated on drawings.
- Grid geometry: As indicated on drawings.
 - Direction of grids: As indicated on drawings.
- Preparation of subgrade: Before laying geogrids, remove humps and sharp projections. Fill hollows.
- Fixing: In accordance with manufacturers recommendations.
 - Centres: In accordance with manufacturers recommendations.
 - Jointing: In accordance with manufacturers recommendations.

610 COMPACTED FILLING FOR LANDSCAPE AREAS

- Fill: Material capable of compaction by light earthmoving plant.

- Filling: Layers not more than 200 mm thick. Lightly compact each layer to produce a stable soil structure.
- 615 LOOSE TIP FILLING FOR LANDSCAPE AREAS
- Filling: Do not firm, consolidate or compact when laying. Tip and grade to approximate levels in one operation with minimum of trafficking by plant.
- 617 HIGHWAYS AGENCY TYPE 1 UNBOUND MIXTURE
- Fill: To Highways Agency 'Specification for highway works', clauses 801 and 803:
 - Crushed rock (other than argillaceous rock).
 - Crushed concrete.
 - Recycled aggregates.
 - Crushed non-expansive slag.
 - Well-burned non-plastic colliery shale.
 - Amendments to requirements in Highways Agency 'Specification for highway works': None.
 - Filling: To Highways Agency 'Specification for highway works', clause 802.
- 618 HIGHWAYS AGENCY TYPE 2 UNBOUND MIXTURE
- Fill: To Highways Agency 'Specification for highway works', clauses 801 and 804:
 - Crushed rock (other than argillaceous rock).
 - Crushed concrete.
 - Crushed non-expansive slag.
 - Well-burned non-plastic colliery shale.
 - Natural gravel.
 - Natural sand.
 - Amendments to requirements in Highways Agency 'Specification for highway works': None.
 - Filling: To Highways Agency 'Specification for highway works', clause 802.
- 620 SUBGRADE IMPROVEMENT LAYER (CAPPING)
- Fill: To Highways Agency 'Specification for highway works', Table 6/1, Class 6F1 or 6F2.
 - Filling: Place and compact to Highways Agency Specification for highway works, Table 6/1, clause 612 and clause 613.3, 613.9 and 613.10.
- 626 COMPACTED GENERAL FILL
- Suitable material: Permissible materials in accordance with Highways Agency Specification for highway works. Table 6/1 are class 1A, 1B, 1C. If general fill is to be deposited in open water then class 6A must be used. Class 3 (chalk) will not be permitted.
 - Excavated material: Select suitable material and keep separate.
 - Filling: Spread and level material in layers. As soon as possible thoroughly compact each layer.
 - Required compaction: In accordance with Highways Agency Specification for highway works.
 - Proposals: Well in advance of starting work submit details of proposed:
 - Materials to be used, including quantities of each type.
 - Type of plant.
 - Maximum depth of each compacted layer.
 - Minimum number of passes per layer.
- 640A STARTER LAYER OF COMPACTED FILLING
- Fill: Suitable hard granular material. Compact thoroughly. Material to be class 6B or 6C in accordance with Table 6/1 of the Highways Agency Specification for highway works.
 - Thickness: 150mm.
- 650 PROTECTION OF COMPACTED FILLING
- Temporary protective filling: Before allowing construction traffic, raise level of compacted cohesive soil filling at least 150 mm above formation level using properly compacted temporary filling.
 - Removal: Remove temporary protective filling from site before permanent construction.
- 700 BACKFILLING AROUND FOUNDATIONS
- Under oversite concrete and pavings: Hardcore as clause 710.

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

710 HARDCORE FILLING

- Fill: Granular material, free from excessive dust, well graded, all pieces less than 75 mm in any direction, 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 hoggins 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.

711A PIPE TRENCHES UNDER FOUNDATIONS

- Backfill with concrete in accordance with section E10.

712A PIPE TRENCHES UNDER FLOOR SLABS

- Backfill with granular material as clause 710 unless noted otherwise on drawings.

713A HARDCORE UNDER CONCRETE SLABS

- To be Highways Agency Type 1 granular filling laid and compacted in accordance with clause 617 unless noted otherwise on drawings. Depth to be not less than 150mm. Excavate extra material as necessary. Increase thickness of hardcore as necessary to make up levels from stripped site levels to underside of slabs.

715 VENTING HARDCORE LAYER

- Fill: Clean granular material, well graded, passing a 75 mm BS sieve but retained on a 20mm 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, closed, smooth surface.
- Sand for blinding: To BS EN 12620, grade 0/4 or 0/2 (MP).
- Permissible deviations on surface level: +0 -25 mm.

HIGHWAYS AGENCY EARTHWORKS SPECIFICATION APPENDICES**850A COMPACTED GENERAL FILLING/ EARTHWORKS**

- Specification: Highways Agency 'Specification for highway works', Earthworks section, clauses 601, 602, 608, 610, 611 and 612, Table 6/1 and additional requirements as clauses 900-960 in this section
- Definition: References to the 'Overseeing Organisation' are deemed to be to the issuer of this specification.

- 900 APPENDIX 6/1 - REQUIREMENTS FOR ACCEPTABILITY AND TESTING, ETC. OF EARTHWORKS MATERIALS
- Unless indicated otherwise on the drawings. The following classes are acceptable for fill to landscape areas: Class 1A, 1B, 1C, 2A, 2B, 2C, 2D. Use of any other material must be agreed in advance with the CA. Material certification to be provided to the CA for approval prior to incorporation.
- 905 APPENDIX 6/2 - REQUIREMENTS FOR DEALING WITH CLASS U1B AND U2 UNACCEPTABLE MATERIAL
- If these materials are encountered on site, notify the CA immediately to seek guidance.
- 910 APPENDIX 6/3 - REQUIREMENTS FOR EXCAVATION, DEPOSITION, COMPACTION (OTHER THAN DYNAMIC COMPACTION)
- For specific requirements refer to drawings. Blasting will not be permitted unless agreed otherwise with the CA.
- 915 APPENDIX 6/4 - REQUIREMENTS FOR CLASS 3 MATERIAL
- Class 3 material will not be permitted for use as fill unless agreed with the CA. If class3 material is encountered during excavation advise the CA and seek guidance.
- 920 APPENDIX 6/5 - GEOTEXTILES USED TO SEPARATE EARTHWORKS MATERIALS
- As indicated on drawings.
- 925 APPENDIX 6/6 - FILL TO STRUCTURES AND FILL ABOVE STRUCTURAL FOUNDATIONS
- Refer to table 6/1 of Highways Agency Specification for highway works for permissible materials. For specific requirements refer to drawings.
- 930 APPENDIX 6/7- SUB-FORMATION AND CAPPING AND PREPARATION AND SURFACE TREATMENT OF FORMATION
- Refer to drawings for specific requirements.
- 935 APPENDIX 6/8 - TOPSOILING
- Refer to drawings for specific requirements. Topsoil stockpiles to be no higher than 2m. Surplus topsoil to be disposed of by the Contractor unless instructed otherwise by the CA. Unless noted otherwise on the drawings the minimum depth of topsoil to be deposited is to be 150mm.
- 940 APPENDIX 6/9 - EARTHWORK ENVIRONMENTAL BUNDS, LANDSCAPE AREAS, STRENGTHENED EMBANKMENTS
- Refer to drawings for specific requirements.
- 945 APPENDIX 6/10 - GROUND ANCHORAGES, CRIB WALLING AND GABIONS
- Refer to drawings for specific requirements.
- 950 APPENDIX 6/11 - SWALLOW HOLES AND OTHER NATURALLY OCCURRING CAVITIES AND DISUSED MINE WORKINGS
- Refer to drawings for specific requirements. If these are encountered notify the CA immediately to seek guidance.
- 955 APPENDIX 6/12 - INSTRUMENTATION AND MONITORING
- Refer to drawings for specific requirements.
- 960 APPENDIX 6/13 - GROUND IMPROVEMENT
- Refer to drawings for specific requirements.

E05 – E41
WML Specification
for
Concrete

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E05 In Situ Concrete Construction Generally

To be read with Preliminaries/General conditions.

101A APPEARANCE AND FIT

- Arrange the setting out, erection juxtaposition of components and application of finishes (working within the practical limits of the design and the specification) to ensure that there is satisfactory fit at junctions and that the finished work has a well aligned, true and regular appearance.
- Wherever satisfactory accuracy, fit and/or appearance of the work are likely to be critical or difficult to achieve obtain approval of proposals or of the appearance of the relevant aspects of the partially finished work as early as possible.
- Construct the works to higher levels of accuracy than specified where necessary to achieve a satisfactory appearance and to ensure that materials, elements and components of the building fit together as designed.

102A CRITICAL DIMENSIONS

- The following are critical and a higher level of accuracy is required; set out and construct the works to ensure a satisfactory fit where all preassembled furniture, fittings, equipment, components and items of joinery are to be fixed subsequently.

103A NON COMPLIANCE

- Work which fails to meet the specified levels of accuracy must not be rectified without permission. Submit proposals for such rectification and meet all costs arising, including effects on other work. Allow for the possibility that permission will not be given, necessitating removal and replacement of the work.

104A SETTING OUT

- Check the levels and dimensions of the site against those shown on the drawings, and record the results on copy of the drawings. Notify C.A. in writing of any discrepancies and obtain instructions before proceeding.

105A SETTING OUT

- Inform C.A. when overall setting out is complete and before commencing construction.

106A INSTRUMENTS

- Provide instruments and assistance for checking the setting out and levels.

107A RECORD DRAWINGS

- Record details of all grid lines, setting out stations, bench marks and profiles on the site

108A ARRANGEMENT OF INFORMATION

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

E10 In situ concrete mixes, casting and curing

E20 Formwork

E30 Reinforcement

E40 Designed joints

E41 Worked finishes/Cutting

E60 Precast/Composite concrete floors/roof decks

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

- 109A SPECIFICATION STANDARD
- Comply with latest edition of National Structural Concrete Specification.
- 110A SETTING OUT PERMISSIBLE DEVIATIONS
- In addition to the requirements of National Structural Concrete Specification, comply with the following.
 1. Master Bench Mark transferred from Ordnance Bench Mark $\pm 10\text{mm}$
 2. Transferred Bench Mark from Master Bench Mark $\pm 3\text{mm}$
 3. Distance in plan at low level between
 - a) Datum point
 - b) Datum point and reference point
 - c) Reference point up to and including $10\text{mm} \pm 3\text{mm}$ over $10\text{mm} \pm 5\text{mm}$
- 225 TEMPERATURE RECORDS
- Requirement: Throughout period of concrete construction record:
 - Daily: Maximum and minimum atmospheric shade temperatures.
 - Under adverse temperature conditions: Temperature at commencement and end of placing.
 - Equipment: Contractor's choice.
 - Location: In the shade, close to the structure.
- 235 OPENINGS, INSERTS AND FIXINGS
- Requirement: Collate all information.
 - Submit: Details where openings, inserts and fixings can only be accommodated by adjustments to reinforcement.
 - Locate reinforcement: To ensure specified minimum cover at openings and inserts and to be clear of fixing positions.
- 310A SURFACE REGULARITY OF CONCRETE FLOORS TO BS 8204 - GENERAL
- Sudden irregularities are not permitted.
 - Standard: To BS 8204-1 or -2.
 - Measurement: From underside of a 2 m straightedge (between points of contact) placed anywhere on surface and using a slip gauge.
 - Variation in gap under the straightedge to be not more than specified in the following clause(s).
- 312A SURFACE REGULARITY OF FLOORS - WEARING SURFACES
- Maximum permissible deviation when measured as clause 310:
 - 3mm under a 3m straightedge.
 - 1mm under a 1m straightedge.
- 313A SURFACE REGULARITY OF FLOORS - SURFACES TO RECEIVE SHEET/TILE FINISHES DIRECTLY BEDDED IN ADHESIVE
- Maximum permissible deviation when measured as clause 310:
 - 3mm under a 3m straightedge.
 - 1mm under a 1m straightedge.
- 314A SURFACE REGULARITY OF FLOORS - SURFACES TO RECEIVE SCREEDS/BEDS
- Maximum permissible deviation when measured as clause 310:
 - Screeds/beds up to 50mm thick: 10mm under a 3m straightedge.
- 316A SURFACE REGULARITY OF FLOORS - SURFACES TO RECEIVE MASTIC ASPHALT
- Maximum permissible deviation when measured as clause 310:
 - Mastic asphalt with levelling coats: 10mm under a 3m straightedge.
 - Mastic asphalt laid direct: To the same surface regularities as defined in the relevant type of flooring clause in section M11.

- 318 SURFACE REGULARITY OF CONCRETE FLOORS TO TR 34 - GENERAL AND TOLERANCE
- Measurement of surface regularity: To Concrete Society Technical Report 34 (TR 34), section 4. Surface deviations: Comply with permissible limits for floor classifications/ locations: as indicated on drawings.
- 420A WATER RESISTANT CONCRETE CONSTRUCTION
- Description: As shown on drawings.
 - Requirement: Construct the work carefully and thoroughly to ensure that it is water resistant when tested in accordance with clause E05/450, 460 or 470 as appropriate.
 - If the work fails to meet the specified test(s):
 - Carry out further tests and investigations, as agreed with the C.A., to help identify the cause or causes of leakage.
 - Carry out remedial work by pressure grouting, waterproof rendering or other approved means necessary to make the work watertight.
 - On completion of the remedial work repeat the specified test for water tightness.
 - Payment for such investigations, remedial work and additional tests may be withheld if and to the extent that the cause of leakage was the Contractor's failure to comply with the specification, drawings or other instructions.
- 435A 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 damp 1:3 cement: sharp sand mix thoroughly rammed in and finished neat and flush.
- 450 INSPECTION OF WATER EXCLUDING STRUCTURES
- Notification: Give not less than seven days warning before inspection.
 - First inspection:
 - Purpose: To identify any defects which may lead to water penetration or damp patches.
 - Timing: As soon as possible after completion of the work and before backfilling.
 - Final inspection:
 - Purpose: To identify any points of water penetration or damp patches.
 - Timing: After backfilling, when the ground water table has returned to normal level.
 - Requirement: Exposed faces of the structure must show no signs of leakage and remain apparently dry.
- 460A TESTING OF WATER RETAINING STRUCTURES
- Timing: To be agreed.
 - Recording: Maintain accurate test records at all stages.
 - Preparation for testing:
 - Fill completed and clean structure to capacity with water at a uniform rate not exceeding 2 m depth in 24 hours.
 - Maintain level by adding more water for an agreed stabilizing period.
 - Filled level: Accurately mark and record.
 - Permissible drop in level after allowing for evaporation and rainfall (maximum): lesser dimension of 1/500th of the average water depth or 10mm.
 - Test period: 7 days.
 - Intervals for recording drop in level: 24 hours.
 - If the drop in level during the first 7 days exceeds the permissible drop, refill and repeat the test for a second period of 7 days.
 - If the permissible drop in level is still exceeded, but the daily drop in level is decreasing, refill and repeat the test for a third and final period of 7 days. In the event of test nonconformity refer to National Structural Concrete Specification.

470 TESTING OF ELEVATED WATER RETAINING STRUCTURES

- Requirements in addition to clause 460: During the test period, the exposed faces of the structure must show no signs of leakage, and must remain apparently dry.

610 SPECIALLY CONSTRUCTED SAMPLE

- Location: To approval.
- Description: As required by CA.
- Placing, compaction and curing of the concrete is identical to that proposed for the element or part of the building.
- Inspection of samples: Give notice.
- Commencement of related parts of the Works: Do not proceed until instructed.

E10 Mixing/Casting/Curing In Situ Concrete

To be read with Preliminaries/General conditions.

CONCRETE

101 SPECIFICATION

- Concrete generally: To BS 8500-2.
- Exchange of information: Provide concrete producer with information required by BS 8500-1, clauses 4 and 5.

102A RATES

- Include in the rates for concrete work for all samples, tests and submissions which are specified but not covered separately by priceable or provisional sum.

103A EQUIPMENT AND MATERIALS

- Provide the following equipment on site and maintain in good condition for use by the C.A.:
 - Thermometer: provide a maximum and minimum thermometer in an approved position on site for measuring atmospheric shade temperature.
 - Thermometer: provide a soil thermometer for measuring concrete and ground temperatures.

104A EQUIPMENT AND MATERIALS

- Provide the following equipment on site and maintain in good condition, unless instructed otherwise by C.A.:
 - Tank: provide a heated tank suitable for maintaining concrete test cubes at a constant temperature of 20°C +/- 2°C.
 - Power bender and cutter: provide a power bender and cutter suitable for on-site bending of reinforcement bars up to 32mm dia. Maintain on site until removal is agreed by C.A.
 - Provide 10% of total reinforcement required for each lift/pour as straight bars to be bent on site, or provide similar quantity as site stock to allow minor adjustments to reinforcement.

105A DESIGNATED CONCRETE Substructures

Designation: RC25/30

Reinforcement/embedded metal: Yes.

Aggregates:

- Size (maximum): 20 mm.
- Coarse recycled aggregates: Not permitted.
- Additional aggregate requirements: None.
- Special requirements for cement/ combinations: BS8500-2.
- Consistence class: S3 or to Contractor's requirement.
- Chloride class: Normal.
- Admixtures: BS8500-2.
- Additional mix requirements: Identity test as clause E10:508A. One sample for every 30m³ used but not less than one sample on each day of use.

Note: The above concrete is suitable where a DC-1 chemical class is required in ground producing ACEC class AC-1 conditions.

106A DESIGNATED CONCRETE Superstructures

- Designation: RC32/40.
- Reinforcement/embedded metal: Yes.
- Aggregates:
 - Size (maximum): 20 mm.
 - Coarse recycled aggregates: Not permitted.
 - Additional aggregate requirements: None.

- Special requirements for cement/ combinations: BS8500-2.
- Consistence class: S3 or to Contractor's requirement.
- Chloride class: Normal.
- Admixtures: BS8500-2.
- Additional mix requirements: Identity test as clause E10:508A. One sample for every 30m³ used but not less than one sample on each day of use.

107A DESIGNATED CONCRETE Suspended floor slabs using profiled steel decking

- Designation: RC28/35.
- Reinforcement/embedded metal: Yes.
- Aggregates:
 - Size (maximum): 20 mm.
 - Coarse recycled aggregates: Not permitted.
 - Additional aggregate requirements: To be suitable for power float finishing.
- Special requirements for cement/ combinations: BS8500-2.
- Consistence class: S3 or to Contractor's requirement.
- Chloride class: Normal.
- Admixtures: BS8500-2.
- Additional mix requirements: Identity test as clause E10:508A. One sample for every 30m³ used but not less than one sample on each day of use.

108A DESIGNATED CONCRETE Infill to steel stair treads

- Designation: RC32/40.
- Reinforcement/embedded metal: Yes.
- Aggregates:
 - Size (maximum): 10 mm.
 - Coarse recycled aggregates: Not permitted.
 - Additional aggregate requirements: None.
- Special requirements for cement/ combinations: BS8500-2.
- Consistence class: S3 or to Contractor's requirement.
- Chloride class: Normal.
- Admixtures: BS8500-2.
- Additional mix requirements: Identity test as clause E10:508A. One sample for every 30m³ used but not less than one sample on each day of use.

109A DESIGNATED CONCRETE Casing to steelwork (above ground), infill to P.C. floors, and infill to masonry walls

- Designation: RC20/25.
- Reinforcement/embedded metal: Yes.
- Aggregates:
 - Size (maximum): 10 mm.
 - Coarse recycled aggregates: Not permitted.
 - Additional aggregate requirements: None.
- Special requirements for cement/ combinations: BS8500-2.
- Consistence class: S3 or to Contractor's requirement.
- Chloride class: Normal.
- Admixtures: BS8500-2.
- Additional mix requirements: None.

111A DESIGNATED CONCRETE Casing to steelwork (below ground)

- Designation: RC25/30
- Reinforcement/embedded metal: Yes.
- Aggregates:
 - Size (maximum): 10 mm.
 - Coarse recycled aggregates: Not permitted.
 - Additional aggregate requirements: None.
- Special requirements for cement/ combinations: BS8500-2.

- Consistence class: S3 or to Contractor's requirement.
- Chloride class: Normal.
- Admixtures: BS8500-2.
- Additional mix requirements: None.

Note: The above concrete is suitable where a DC-1 chemical class is required in ground producing ACEC class AC-1 conditions.

112A DESIGNATED CONCRETE Filling soft spots and blinding

- Designation: RC25/30 unless noted otherwise on drawings.
- Reinforcement/embedded metal: No.
- Aggregates:
 - Size (maximum): 20 mm.
 - Coarse recycled aggregates: Not permitted.
 - Additional aggregate requirements: None.
- Special requirements for cement/ combinations: BS8500-2.
- Consistence class: S3 or to Contractor's requirement.
- Chloride class: Normal.
- Admixtures: BS8500-2.
- Additional mix requirements: None.

Note: The above concrete is suitable where a DC-1 chemical class is required in ground producing ACEC class AC-1 conditions.

113A DESIGNATED CONCRETE Manholes and drainage generally

- Designation: RC25/30 unless noted otherwise on drawings.
- Reinforcement/embedded metal: Manholes - Yes, Generally - No.
- Aggregates:
 - Size (maximum): 20 mm.
 - Coarse recycled aggregates: Not permitted.
 - Additional aggregate requirements: None.
- Special requirements for cement/ combinations: BS8500-2.
- Consistence class: S3 or to Contractor's requirement.
- Chloride class: Normal.
- Admixtures: BS8500-2.
- Additional mix requirements: None.

Note: The above concrete is suitable where a DC-1 chemical class is required in ground producing ACEC class AC-1 conditions. The DC class may be relaxed with CA approval and in accordance with Ground Investigation report recommendations.

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.
- Site mixing: If standardized prescribed concretes are made on site conform to BS8000-2.1.

132A DESIGNED CONCRETE Industrial/Commercial Ground Floor Slabs

- Reinforcement/embedded metal: Yes.
- Compressive strength class (cylinder/ cube minimum): C32/40.
- Target density (oven-dry): Not applicable.
- Aggregates:
 - Size (maximum): 20 mm.
 - Type/ Density: Normal weight, Fine aggregates to table 4 of BS882: 1992. Grading at the coarse end of Grade C or the fine end of Grade F to be avoided. If crushed rock sand is used, the

proportion of combined sand passing a 75 micron sieve is not to exceed 9 %.

- Coarse recycled aggregates: Not permitted.
- Additional aggregate requirements: To be suitable for a power float finish.
- Design chemical class: DC-1.
- Limiting values for composition:
 - Water:cement ratio (maximum): 0.50.
 - Cement/ combination content (minimum): 325 kg/m³.
 - Cement/ combination content (maximum): 400 kg/m³.
 - Air content in situ (minimum): Not applicable.
- Consistence class: S3 or to Contractor's requirement.
- Permitted cement/ combinations: CEM I, CEM II/A-S, CEMII/B-S, P/L, CEMII/A-D, CEMIIA-V, CEMIIB-V, P/LPFA (35% pfa maximum), P/PFA (35% pfa maximum), CEM III/A (50% ggbs maximum), P/B (50% ggbs maximum).
- Chloride class: Cl 0.40.
- Admixtures: BS8500-2.
- Colour: Not applicable.
- Additional mix requirements: Identity test as clause E10:508A. One sample for every 30m³ used but not less than one sample on each day of use.

133A DESIGNED CONCRETE External In-situ Concrete Paving

- Reinforcement/embedded metal: Yes.
- Compressive strength class (cylinder/ cube minimum): C28/35.
- Target density (oven-dry): Not applicable.
- Aggregates:
 - Size (maximum): 20 mm.
 - Type/ Density: Normal weight, Fine aggregates to table 4 of BS882: 1992. Grading at the coarse end of Grade C or the fine end of Grade F to be avoided. If crushed rock sand is used, the proportion of combined sand passing a 75 micron sieve is not to exceed 9 %.
 - Coarse recycled aggregates: Not permitted.
 - Additional aggregate requirements: To be suitable for a brushed finish.
- Design chemical class: DC-1.
- Limiting values for composition:
 - Water:cement ratio (maximum): 0.55.
 - Cement/ combination content (minimum): 320 kg/m³.
 - Cement/ combination content (maximum): 400 kg/m³.
 - Air content in situ (minimum): 3.5%.
- Consistence class: S2 or to Contractor's requirement.
- Permitted cement/ combinations: CEM I, CEM IIA, CEM IIB-S).
- Chloride class: Cl 0.40.
- Admixtures: BS8500-2.
- Colour: Not applicable.
- Additional mix requirements: Identity test as clause E10:508A. One sample for every 30m³ used but not less than one sample on each day of use.

MATERIALS, BATCHING AND MIXING

215 READY-MIXED CONCRETE

- Production plant: Currently certified by a body 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 immediately.

216A CHLORIDE CONTENT OF MIXES

- The total chloride ion content of the constituents of each mix, expressed as a percentage by weight of cement (including GGBS or PFA if used) in the mix, must not exceed the following:
 - Prestressed, pre-tensioned or heat cured concrete: 0.10
 - Concrete made with cement conforming to BS 4027 (SRPC): 0.20
 - Concrete made with Portland cement, Portland blast furnace cement or combinations of GGBS or PFA with ordinary Portland cement and containing embedded metal: 0.40
- Submit calculations demonstrating compliance.

217A SULPHATE CONTENT OF MIXES

- The total sulphate content of the constituents of each mix, expressed as SO₃, must not exceed 4% by weight of the cement in the mix. Submit certification and calculations demonstrating compliance.

221A INFORMATION ABOUT PROPOSED CONCRETES

- Submit to CA for approval before use:
 - Details listed in BS 8500-1, clause 5.2.
 - Additional information: None.

223A INFORMATION ABOUT DELIVERED CONCRETES

- The delivery tickets are to be kept and maintained on site by the Contractor for the duration of the works and submitted to the Structural Engineer if requested.
- At delivery, the producer shall provide the user with a delivery ticket for each load of concrete on which is printed, stamped, or written at least the following information:
 - name of the ready mixed concrete plant;
 - serial number of ticket;
 - date and time of loading, i.e. time of first contact between cement and water;
 - truck number or vehicle identification;
 - name of purchaser;
 - name and location of the site;
 - details or references to specifications, e.g. code number, order number;
 - amount of concrete in cubic meters;
 - declaration of conformity with reference to the specifications and to EN 206-1;
 - name of mark of the certification body if relevant;
 - time at which the concrete arrives at the site;
 - time of the beginning of unloading;
 - time of the end of unloading;
- In addition, the delivery ticket shall give details of the following:
 - strength class;
 - exposure classes;
 - chloride content class;
 - consistence class or target value;
 - limiting values of concrete composition;
 - special properties, if required;
 - maximum nominal upper aggregate size and type;

225 CHANGES TO SPECIFICATION

- Changes to specification of fresh concrete (outside concrete producer's responsibility): Submit to CA for approval before use.

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.

315A AGGREGATES FOR EXPOSED VISUAL CONCRETE

- Limitations on contaminants: Free from absorbent particles which may cause 'popouts', and other particles such as coal and iron sulfide which may be unsightly or cause unacceptable staining.
- Colour: Consistent.
- Supply: From a single source and maintained throughout the contract.
- Samples: Submit on request.
- Marine aggregates (including aggregates from inland sites once covered by the sea): Do not use.
- Mechanical properties of aggregates for concrete pavement wearing surfaces (mix type E10/132A): 10% fines value not less than 100kN or, alternatively, aggregate impact value not more than 30%.

325 MATERIALS FOR EXPOSED VISUAL CONCRETE

- Alterations to sources, types and proportions: Submit proposals.

415 ADMIXTURES

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

425 PROPRIETARY STEEL FIBRES

- Requirement: As indicated on drawings.
- Standard: To BS EN 14889-1.
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Size:
 - Length: As indicated on drawings.
 - Aspect ratio (length ÷ diameter): As indicated on drawings.
- Addition rate (minimum): As indicated on drawings.
 - Increase addition rate if necessary to achieve required properties.
- Dispersion in fresh concrete: Uniform without balling.

429 POLYMER FIBRES

- Requirement: As indicated on drawings.
- Standard: To BS EN 14889-2.
- Material: As indicated on drawings.
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Size: As indicated on drawings.
 - Length: As indicated on drawings.
 - Aspect ratio (length/diameter): As indicated on drawings.
- Addition rate (minimum): As indicated on drawings.
 - Increase addition rate if necessary to achieve required properties.
- Dispersion in fresh concrete: Uniform without balling.

430 PIGMENTS FOR COLOURED CONCRETE

- Standard: To BS EN 12878.
- Manufacturer: Submit for CA approval.
 - Product reference: Submit for CA approval.
 - Colour: Submit for CA approval.

490 PROPERTIES OF FRESH CONCRETE

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

PROJECT TESTING/ CERTIFICATION**505 PROJECT TESTING OF CONCRETE - GENERAL**

- Testing: To BS EN 206-1, Annex B and BS 8500-1, Annex B.
 - Nonconformity: Obtain instructions immediately.

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

508 REGULAR PROJECT TESTING OF CONCRETE

- Tests: Compressive strength to BS EN 12390.
- Sampling:
 - Point: On site, to BS EN 12350.
 - Rate: 6 No. 150 mm cubes from each sample. Test 2 at 7 days, 2 at 28 days. Retain 2 to be tested as instructed by the CA. Identity Criteria as BS EN 206-1 table B1.
- Other requirements: Include for additional samples and testing as necessary to confirm early age strength for striking of formwork.

520 TESTING LABORATORY

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

530 TESTS RESULTS

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

540A CUBE TEST REPORTS

- Test reports must include at least the following:
 - Test laboratory and name of person responsible
 - Title of project
 - Identification mark or number
 - Certificate of sampling
 - Certificate of method of making cubes
 - Curing place and conditions
 - Date of receipt by laboratory
 - Condition on receipt by laboratory
 - Actual or checked nominal dimensions
 - Weight and density
 - Date of test
 - Age when tested
 - Confirmation of testing to BS EN 12390
 - Load at failure
 - Compressible strength
 - Type of fracture
 - Date of dispatch of report to C.A.

550 BROKEN CUBES FROM FAILED STRENGTH TESTS

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

560A NONCONFORMITIES

- If a concrete sample fails to achieve specified criteria or to pass specified tests, inform the CA without delay and submit:
 - Confirmation of the validity of the test results, and/or
 - Proposals for further tests to assess the strength of the concrete in the structure, as set out in BS 6089, and/or
 - Proposals for rectification.
- Obtain approval of all such evidence and proposals before proceeding. The CA may issue instructions for the work to be stopped or delayed until reasons for the failure have been

established; possible consequences assessed and appropriate preventative and remedial measures taken.

- Wherever the specified sampling, testing and compliance procedures show that a concrete mix is not in accordance with the specification (even if the work is eventually accepted), and measures are taken to help in establishing whether or not the work is acceptable, such measures:
 - will be at the expense of the Contractor, and will not be considered as ground for extension of time.

PLACING/ COMPACTING/ CURING AND PROTECTING

610 CONSTRUCTION/ SEQUENCE/ TIMING REQUIREMENTS

- As indicated on the drawings.

620 TEMPERATURE OF CONCRETE

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

630 PREMATURE WATER LOSS

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

640 CONSTRUCTION JOINTS

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

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.
- Timing of inspections: When reinforcement and formwork are ready for concreting.

670 TRANSPORTING

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

680 PLACING

- Records: Maintain for time, date and location of all pours.

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

690 COMPACTING

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

695A KICKERS

- Unless shown otherwise on the drawings, form 75mm high kickers, cast monolithically with the slabs, at the springing of all walls and columns at each floor level. Form 150mm high kickers, cast monolithically, in watertight construction.

700 LIGHTWEIGHT AGGREGATE CONCRETE

- Placing and compacting: Prevent flotation of coarse aggregate and formation of excessive blowholes.

720A VIBRATORS

- General: Maintain sufficient numbers and types of vibrator to suit pouring rate, consistency and location of concrete.
- External vibrators: Obtain approval for use.
- Internal vibrators must be used for all watertight construction

730 PLASTIC SETTLEMENT

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

810 CURING GENERALLY

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

811 COVERINGS FOR CURING

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

812 PREVENTING EARLY AGE THERMAL CRACKING

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

813A CURING WATERTIGHT CONCRETE

- Immediately on completion cover all slab bays with min 500g polythene sheet (laps 300 minimum) held in position with timber frames for seven days in such a way as to prevent funnelling or a current of air induced between the covers and the concrete surface.

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.

820 CURING PERIODS for concrete surfaces which, in the finished building, will be exposed to the elements; concrete wearing surface floors and pavements; water resistant concrete

- General: Curing periods are in days (minimum).
 - Definition of 't': The average surface temperature of concrete in degrees Celsius during the curing period.
- Curing periods for concrete made using CEM1 strength class 42.5 or 52.5, or SRPC class 42.5:
 - Drying winds or dry, sunny weather (relative humidity < 50%): $140/(t+10)$.
 - Intermediate conditions (relative humidity between 50 and 80%): $100/(t+10)$.
 - Damp weather, protected from sun and wind (relative humidity > 80%): $100/(t+10)$.
- Curing periods for concrete made using cements listed in BS8500-1, table A.6 except for those listed above and for supersulfated cement:
 - Drying winds or dry, sunny weather (relative humidity < 50%): $180/(t+10)$.
 - Intermediate conditions (relative humidity between 50 and 80%): $140/(t+10)$.
 - Damp weather, protected from sun and wind (relative humidity > 80%): $100/(t+10)$.
- Curing periods: For concretes using admixtures or other types of cements/ combinations: Submit proposals.
- Other requirements: Increase curing period by any time during which surface temperature of concrete is less than 5°C.

821A CURING PERIODS for other structural concrete surfaces

- General: Curing periods are in days (minimum).
 - Definition of 't': The average surface temperature of concrete in degrees Celsius during the curing period.
- Curing periods for concrete made using CEM1 strength class 42.5 or 52.5, or SRPC class 42.5:
 - Drying winds or dry, sunny weather (relative humidity < 50%): $80/(t+10)$ when surface temperature is between 10°C and 25°C.
 - Intermediate conditions (relative humidity between 50 and 80%): $60/(t+10)$ when surface temperature is between 10°C and 25°C.
 - Damp weather, protected from sun and wind (relative humidity > 80%): No special requirements.
- Curing periods for concrete made using cements listed in BS8500-1, table A.6 except for those listed above and for supersulfated cement:
 - Drying winds or dry, sunny weather (relative humidity < 50%): $140/(t+10)$ when surface temperature is between 10°C and 25°C.
 - Intermediate conditions (relative humidity between 50 and 80%): $80/(t+10)$ when surface temperature is between 10°C and 25°C.
 - Damp weather, protected from sun and wind (relative humidity > 80%): No special requirements.
- Curing periods: For concretes using admixtures or other types of cements/ combinations: Submit proposals.
- Other requirements: Increase curing period by any time during which surface temperature of concrete is less than 5°C.

822A CURING PERIODS

- Curing period not less than:
 - Surfaces which in the finished building will be exposed to the elements, and wearing surfaces of floors and pavements, regardless of weather conditions: 10 days
 - Other structural concrete surfaces: 5 days

825A COLD WEATHER

- Maintain temperature of concrete above 5°C for the appropriate period of hours given below:
 - Specified compressive strength grade 20N/mm² or less: OP Cement concrete 96 hrs, RHP Cement concrete 72 hrs.
 - Specified compressive strength grade 25N/mm²: OP Cement concrete 72 hrs, RHP Cement concrete 48 hrs.
 - Specified compressive strength grade 30N/mm²: OP Cement concrete 54 hrs, RHP Cement concrete 36 hrs.
 - Specified compressive strength grade 35N/mm²: OP Cement concrete 48 hrs, RHP Cement concrete 32 hrs.
 - Specified compressive strength grade 40N/mm²: OP Cement concrete 42 hrs, RHP Cement concrete 28 hrs.
 - Specified compressive strength grade 45N/mm² and over: OP Cement concrete 36 hrs, RHP Cement concrete 24 hrs.

830A TEMPERATURE OF WATERTIGHT CONCRETE

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

840 PROTECTION

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

E20 Formwork for In Situ Concrete

To be read with Preliminaries/ General conditions.

GENERALLY/ PREPARATION

110 LOADINGS

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

120 FORMWORK DETAILS

- Provide the following: Details as requested by CA.

132A PROPPING

- General: Prevent deflection and damage to the structure. Carry down props to bearings strong enough to provide adequate support throughout concreting operations.
- Method statement: Submit proposals for prop bearings and sequence of propping/ repropping and backpropping. Include criteria to be used in determining the time for the striking of formwork and for the removal of backprops.
 - Timing of submission: Not less than 10 working days before commencing construction .

140A TEMPORARY SUPPORTS TO PROFILED STEEL SHEETS

- Location: As determined by formwork designer.
- Removal of temporary supports: Obtain instructions.

150A BEARINGS

- Prop through other decks if construction load in a particular deck exceeds:
 - the design loading, or
 - where less than 28 days have elapsed from casting, a reduced loading agreed with CA.
- Submit details of proposed prop bearings and through propping to CA. Accept responsibility for cost of checking effects on structure.

160A CAMBERS

- Application of specified upward cambers: To the concrete immediately before formwork is struck.
 - Formwork: Allow for deflection under weight of fresh concrete.
 - Top surfaces of concrete: Camber to maintain the required structural depths and profiles.
- Checks after striking of formwork and removal of props: Levels to determine extent of any residual camber. Submit results.
- Upward cambers: Unless otherwise shown on drawings, construct forms to achieve the following:
 - slabs: 0.1% of span measured at centre
 - beams: 0.2% of span measured at centre
 - cantilever beams: 0.2% of cantilever measured at free end
- After striking of formwork and removal of props check levels to determine extent of any residual camber and inform CA.

170A WORK BELOW GROUND

- Casting vertical faces of footings, bases and slabs against faces of excavation:
 - obtain consent
 - increase concrete cover to reinforcement to be not less than 75mm
- Casting walls against faces of excavation:
 - use formwork on both sides

- 180 **COLLAPSIBLE BOARD SUBSTRUCTURE FORMWORK (COLLAPSED BY WETTING)**
- Type: Cellular core collapsed by introduction of water to core following curing of concrete.
 - Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
 - Thickness: As indicated on drawings.
 - Load bearing capacity: As indicated on drawings.
 - Installation generally: Keep dry. Lay tightly butted, fully supported and level on polyethylene sheet, on sand blinding. Overlay with polyethylene sheet to lap with bottom sheet. Joints lapped and sealed with tape.
 - Pipes for introduction of water: Type and spacing as recommended by board manufacturer. Vertical and secure. Do not puncture bottom face of board.
 - Cut boards: Reseal polyethylene bags.
- 185 **COMPRESSIBLE BOARD SUBSTRUCTURE FORMWORK**
- Type: Low density expanded polystyrene (eps).
 - Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
 - Recycled content: As indicated on drawings.
 - Thickness: As indicated on drawings.
- 200 **PROPRIETARY UNDERSLAB INSULATION**
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
 - Recycled content: As indicated on drawings.
 - Thickness:
 - Under slab: As indicated on drawings.
 - To edge of slab: As indicated on drawings.
- 220 **PERMANENT INSULATION FORMWORK (PIF) SYSTEM FOR WALLS**
- System type: As indicated on drawings.
 - Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
 - Wall width (overall): As indicated on drawings.
 - Insulation (eps): To BS 3837-1.
 - Designation: Class E.
 - Density (minimum): As indicated on drawings.
- 225 **PERMANENT FORMWORK FOR SUSPENDED FLOORS**
- Type: Lightweight and compatible with permanent insulation formwork (PIF) system for walls.
 - Manufacturer: As permanent insulation formwork (PIF) system.
 - Product reference: As indicated on drawings.
- 230A **UNDER-SLAB POLYTHENE DAMP PROOF MEMBRANE**
- Manufacturer and reference: Submit details for approval.
 - Minimum thickness: 1200g.
 - Lay membrane on a level bed of sand, not less than 25mm thick.
 - Double lock welt all edges and hold down with adhesive tape.
 - Adequately protect membrane from puncturing, and carefully repair any punctures which do occur.
 - If membrane is to provide protection from ground gasses, refer to drawings for specification.

CONSTRUCTION

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

- 315 SUBSTRUCTURE FORMWORK AND UNDERSLAB INSULATION
- Cutting: Neat and accurate to edges, and around penetrations and downstands.
 - Laying: Tightly butted and fully supported on firm, even substrate.
 - Vertical faces: Stiffen as necessary to act as shutter.
 - Formwork/ insulation surfaces: Protect from indentation by spacers and other items.
 - Joints in formwork/ insulation and with edge structure and penetrations: Seal to prevent penetration of concrete.
 - Concrete placement: Restrain formwork/ insulation against movement.
- 320 JOINTS IN FORMS
- Requirements including joints in form linings and between forms and completed work:
 - Prevent loss of grout, using seals where necessary.
 - Prevent formation of steps. Secure formwork tight against adjacent concrete.
- 330 INSERTS, HOLES AND CHASES
- Positions and details:
 - Dimensioned on drawings provided on behalf of the Employer: Do not change without consent.
 - Undimensioned or from other sources: Submit proposals.
 - Positioning relative to reinforcement: Give notice of any conflicts well in advance of placing concrete.
 - Method of forming: Fix inserts or box out as required. Do not cut hardened concrete without approval.
- 340A KICKERS
- Method statement: Submit proposals including means of achieving quality of concrete consistent with that specified for the column or wall.
 - Kicker height (minimum): 100mm.
 - Watertight construction, kickers to be 150mm, cast monolithically.
- 350 FORM TIES
- Metal associated with form ties/ devices: Prohibited within cover to reinforcement. Compatible with reinforcement metal.
- 360 PROPRIETARY FORM TIES FOR WATER RESISTANT CONCRETE
- Tie manufacturer: Submit for CA approval.
 - Product reference: Submit for CA approval.
 - Sealing mortar manufacturer: Submit for CA approval.
 - Product reference: Submit for CA approval.
 - Making good of holes: Fully fill.
- 361 FORM TIES FOR WATER RESISTANT CONCRETE
- General: Maintain water resistance of construction.
 - Tie type and sealing system: Submit proposals.
- 365A BUILT IN METAL PIPEWORK OR FIXINGS
- Avoid contact with reinforcement.
- 366A CAST-IN PVC PIPES
- Roughen all smooth/shiny surfaces by wire brushing or other approved means. Use approved resin-based bonding agent.
- 430A PROFILED STEEL SHEET FORMWORK
- Manufacturer: as indicated on the drawings.
 - Product reference: as indicated on the drawings.
 - Thickness: as indicated on the drawings.

470A RELEASE AGENTS

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

480 SURFACE RETARDERS

- Use: Obtain approval.
- Reinforcement: Prevent contact with retarder.

STRIKING**510A STRIKING FORMWORK**

- Strike formwork without disturbing, damaging or overloading structure, and without disturbing props.
- Notwithstanding other clauses in this specification and any checking or approvals by the CA, the responsibility for safe removal of any part of the formwork and any supports without damaging the structure rests with the Contractor.

521A MINIMUM PERIOD FOR RETAINING FORMWORK/ TEMPORARY SUPPORTS IN POSITION

- The following periods (in days) for retaining formwork in position before striking apply to Class 42.5 or sulphate-resisting Portland cement concrete with no cement replacement materials or admixtures:

Type of Form Work	Average mean of daily minimum and maximum air temperatures during the period		
	16°C	7°C	3°C
Vertical formwork to columns, walls and beams	1/2	3/4	1
Soffit forms to slabs	4	6	8
Props to slabs and soffit forms to beams	20	10	15
Props to beams	14	21	28

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

530A RECORD OF TEMPERATURES

- Keep on site a maximum and minimum thermometer of approved design, close to the works for measuring atmospheric shade temperature. Record maximum and minimum temperatures daily.

535A STRIKING FORMWORK TO WALLS OF WATERTIGHT CONSTRUCTION

- Unless otherwise agreed with CA formwork to walls must remain in position for the following minimum periods.
 - Steel formwork: 24 hours
 - Timber formwork: 36 hours
- On removal of walls to be covered with polythene sheet for slabs. Unless agreed otherwise with CA, do not apply cold water to surface of walls.

FORMED FINISHES**605A CONTROL SAMPLES (PART OF THE FINISHED WORK)**

- Quality of finish: As directed by CA.

- Location: Obtain instructions.
- Approval of appearance: Obtain before proceeding with remainder of the work.

610A BASIC FINISH

- No particular requirements, except those for tolerances and full compaction.

615 FINISH TO RECEIVE ASPHALT TANKING

- Finish: Even and suitable to receive asphalt.
- Permissible deviation of surfaces:
 - Sudden irregularities (maximum): 3 mm.
 - Gradual irregularities (maximum): 3 mm, when measured from underside of a 1 m straightedge, placed anywhere on surface.
- Surface blemishes:
 - Permitted: Blowholes less than 10 mm in diameter.
 - Not permitted: Voids, honeycombing, segregation and other large defects.
- Projecting fins: Remove.
- Formwork tie holes: Filled with mortar.

620A PLAIN SMOOTH FINISH

- Finish: Even and dense. Arrange formwork panels in a regular pattern as a feature of the surface.
- Permissible deviation of surfaces:
 - Sudden irregularities (maximum): 5 mm.
 - Gradual irregularities (maximum): 5 mm, when measured from the underside of a 1 m straightedge, placed anywhere on surface.
- Variations in colour:
 - Permitted: Those caused by impermeable formwork linings.
 - Not permitted: Those caused by contamination or grout leakage.
- Surface blemishes:
 - Permitted: Blowholes less than 10 mm in diameter and at an agreed frequency.
 - Not permitted: Voids, honeycombing, segregation and other large defects.
- Formwork tie holes: In a regular pattern and filled with matching mortar.

630A FINE SMOOTH FINISH

- Finish: Smooth and even. Formwork panels as large as practicable. Arrange in a regular pattern as a feature of the surface.
Permissible deviation of surfaces:
 - Sudden irregularities (maximum): 3 mm.
 - Gradual irregularities (maximum): 3 mm when measured from the underside of a 1 m straightedge, placed anywhere on surface.
- Variations in colour:
 - Permitted: Those caused by impermeable formwork linings.
 - Not permitted: Those caused by contamination, grout leakage and replacement of formwork panels.
- Cover spacers: Submit proposals and agree with CA.
- Surface blemishes:
 - Permitted: Blowholes less than 5 mm in diameter and at an agreed frequency.
 - Not permitted: Voids, honeycombing, segregation and other defects.
- Formwork tie holes: In a regular pattern and filled with matching mortar.

750A ARRISES, MARGINS AND JUNCTIONS

- Requirements:
 - Arrises generally to have a 20 mm x 20 mm chamfer.
 - Arrises to fair faced, or otherwise exposed surfaces: Seek instruction

E30 Reinforcement for In Situ Concrete

To be read with Preliminaries/ General conditions.

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).

140A PLAIN BAR REINFORCEMENT

- Standard: For sizes up to and including 12mm in coil, plain round wire to BS 4482. For larger sizes, for dowel bar applications, refer to BS EN 10025-1 or BS EN 13877-3.
 - Strength grade: 250.

150 RIBBED BAR REINFORCEMENT

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

160 GALVANIZED STEEL REINFORCEMENT

- Galvanizing: To BS EN ISO 1461 after cutting but before bending.

170 STAINLESS STEEL PLAIN BAR REINFORCEMENT

- Standard: To BS 6744.
 - Designation: As specified on drawings.
 - Strength grade: 200.

180 STAINLESS STEEL RIBBED BAR REINFORCEMENT

- Standard: To BS 6744.
 - Designation: As specified on drawings.
 - Strength grade: 500.

210 STANDARD FABRIC REINFORCEMENT

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

240 PROPRIETARY PREFABRICATED REINFORCEMENT

- Manufacturer: As specified on drawings.
 - Product reference: As specified on drawings.

245 PREFABRICATED REINFORCEMENT

- Prefabricated elements: As shown on drawings.
- Source: Obtain from a manufacturer holding valid certification of approval for welded fabrications issued by the UK Certification Authority for Reinforcing Steels (CARES).
 - Certification required: Achievement of CARES appendix 6 for tack welding and appendix 10 for semi-structural/ structural welding.

250 PROPRIETARY PREFABRICATED CONTINUITY REINFORCEMENT STRIPS

- Manufacturer: As specified on drawings.
 - Product reference: As specified on drawings.

255 PREFABRICATED CONTINUITY REINFORCEMENT STRIPS

- Source: Obtain from a manufacturer holding a valid Technical Product Approval certificate issued by the UK Certification Authority for Reinforcing Steels (CARES) or equivalent.

260 PROPRIETARY MECHANICAL COUPLERS

- Locations: As shown on drawings.
- Manufacturer: As specified on drawings.
 - Product reference: As specified on drawings.

265 MECHANICAL COUPLERS

- Locations: As shown on drawings.
- Source: Obtain from a manufacturer holding a valid Technical Product Approval certificate issued by the UK Certification Authority for Reinforcing Steels (CARES) or equivalent.

WORKMANSHIP**310A CUTTING AND BENDING REINFORCEMENT**

- General: To schedules and to BS 8666.
- Bending at temperatures below 5°C: Obtain instructions.
- Bending at temperatures greater than 100°C: Prohibited.
- Bending on site, including minor adjustments: Obtain instructions.
- Do not bend projecting continuity reinforcement on site unless specifically agreed with CA.

315A ADJUSTMENTS

- Provide on site facilities for hand bending to deal with approved minor adjustments.

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 mill scale, 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): 500mm.
- Laps in fabric reinforcement (minimum): 400mm.
 - Laps at corners: Avoid four layer build-up.

430 WELDING REINFORCEMENT

- Standard: To BS EN ISO 17660-1 or -2 as appropriate and in conjunction with the National Annexes.
- Joint type/ dimensions: As shown on drawings.
 - Location: As shown on drawings.
- Site welding: Not permitted without prior written permission from CA. Prior to notifying CA, obtain approval from reinforcement manufacturer. Submit full details including joint type, location and condition of working. Accept responsibility for cost of checking by the CA and for any supervision and testing.

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.

452A SPACERS

- In addition to supports shown on drawings or schedules, provide spaces and chairs at not more than 1m centres or closer spacing as necessary to support reinforcement in position and maintain the specified cover. Reinforcement must be fixed in position before the concrete is placed. Cover spacers to be not closer than 300mm centres and staggered on adjacent parallel bars.
- Spacers to formed concrete finishes, if permitted (see section E20) to be approved type(s).
- Cover spacers to be type(s) which will adequately support the reinforcement, adequately resist displacement, not cause indentation of the formwork and made from: plastics (perforated to at least 25% of their area) or fibre cement, or concrete (strength and durability to match surrounding concrete).

470A TOLERANCES ON COVER

- Ensure minimum specified cover is achieved at all locations.
- Tolerance (maximum):
 - 5mm on bars upto and including 12mm size
 - 10mm on bars over 12mm
- Checking specified cover dimensions: Before concreting check that cover dimensions will be achieved.

510 RUST STAINING

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

520 COVER METER SURVEY

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

521 COVER METER FOR USE BY OTHERS

- Type of cover meter: Provide a magnetic induction digital display type selected to suit arrangement and type of reinforcement.
- Availability: Calibrate and maintain ready for use by others as instructed.
Periods/ time: Within 24 hours of striking formwork.

E40 Designed Joints in In Situ Concrete

To be read with Preliminaries/General conditions.

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.

125A LOCATION OF MOVEMENT JOINTS IN GROUND FLOOR SLABS

- Where not shown on drawings or specified elsewhere, movement joints in Ground floor non-suspended slabs shall be constructed using long strip casting techniques as recommended in Cement and Concrete Association Publication TR34 'Concrete Ground Floors'. Submit full details of bay layout and obtain approval.

126A LOCATION OF CONSTRUCTION JOINTS

- Where not shown on the drawings submit marked-up copies of drawings showing positions of proposed construction joints in accordance with the following criteria and obtain approval. Retain copies on site for reference.
 - Water-resisting walls: Maximum area 25m², maximum dimension 5m.
 - Water-resisting slabs: Maximum area 100m², maximum dimension 10m.
 - Slabs with major restraint at both ends: Maximum area 100m², maximum dimension 13m.
 - Slabs with major restraint at one end only: Maximum area 250m², maximum dimension 20m.
 - Slabs with little restraint in any direction: Maximum area 500m², maximum dimension 30m.
 - Walls: Maximum area 40m², maximum dimension 10m.
- Ground floor non-suspended slabs not constructed in accordance with E40/125A should comply with the above.

132A ADDITIONAL CONSTRUCTION JOINTS

- Joints additional to those required by designer: Permitted subject to CA approval with exceptions given below.
- Approval of additional joints: Submit proposals.
- Pricing: If additional joints are required, allow accordingly in the rates. Obtain approval of proposals.
- Additional joints to those required by the designer will not be permitted in the following cases:
 - Construction joints in watertight concrete.
 - Construction joints in concrete exposed to view.
 - Construction joints in concrete wearing surface floors.

210 FORMED JOINTS

- Forms/ stop ends generally: Rigid and grout-tight.
- Forms/ stop ends for projecting continuity reinforcement: To accommodate bars or fabric without temporary bending or displacement.

211 FORMED JOINTS IN CONCRETE WEARING SURFACES

- Temporary forms: Square edged with a steel top surface.
- Placing concrete: Compact thoroughly at edges to give level, closely abutted joints with no lipping.

220 PRECAST CONCRETE PERMANENT SIDE FORMS

- Manufacturer: Submit proposals
 - Product reference: 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.
 - Condition of joint surfaces immediately before placing fresh concrete: Clean and damp.
- 240 BOTTOM OF SLAB CRACK INDUCERS
- Type: As indicated on drawings or submit proposals.
 - Depth: As indicated on drawings or submit proposals.
 - Fixing to sub-base: Secure to prevent movement during casting and compacting of concrete.
- 250 INSERTED STRIP CRACK INDUCERS
- Type: As indicated on drawings or submit proposals.
 - Depth: As indicated on drawings or submit proposals.
 - Installation: To accurate line and level with concrete thoroughly compacted at edges and with no lipping.
- 260 SAWN CRACK INDUCING GROOVES
- Groove dimensions:
 - Depth: As indicated on drawings or submit proposals.
 - 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: As indicated on drawings or submit proposals.
- 310 FLEXIBLE WATERSTOPS
- Manufacturer: As indicated on drawings or submit proposals.
 - Product reference: As indicated on drawings or submit proposals.
 - Junctions and angles: Use factory formed junction pieces.
 - Placing concrete: Fully compact concrete around waterstops with no voids or porous areas.
- 320 HYDROPHILIC WATERSTOPS
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
 - Location: As indicated on drawings.
 - Method of fixing: In accordance with manufacturers recommendations.
 - Condition of concrete surface at time of fixing: Clean and free from ponded or running water.
 - Protection: Prevent wetting of exposed sections of waterstop.
- 410 CARBON STEEL TIE BARS
- Standard: To For sizes up to and including 12mm in coil, plain round wire to BS 4482. For larger sizes, for dowel bar applications, refer to BS EN 10025-1 or BS EN 13877-3.
 - Product form: Plain.
 - Strength grade: 250.
 - Cleanliness: Free from corrosive pitting, loose mill scale, loose rust and contaminants which may adversely affect the tie bars, reinforcement, concrete, or bond between the two.
 - Position: Centred on joint.
 - Other requirements: None.
- 415 STAINLESS STEEL TIE BARS
- Standard: To BS 6744.
 - Product form: Plain.
 - Designation: 1.4462.
 - Strength grade 200.
 - Cleanliness: Free from contaminants which may adversely affect the tie bars, concrete, or bond between the two.
 - Position: Centred on joint.

- 420 **FABRIC TIE STRIPS**
- Standard: To BS 4483.
 - Cleanliness: Free from corrosive pitting, loose mill scale, loose rust and contaminants which may adversely affect the fabric, concrete, or bond between the two.
 - Position: Width of the mesh strip centred on the joint.
- 430 **CARBON STEEL DOWEL BARS**
- Standard: To For sizes up to and including 12mm in coil, plain round wire to BS 4482. For larger sizes, for dowel bar applications, refer to BS EN 10025-1 or BS EN 13877-3.
 - Product form: Plain.
 - Strength grade: 250.
 - Properties: Perfectly straight, with sawn (not sheared) ends.
 - Debonding: Achieve effective debonding of each bar
 - Material: Suitable proprietary debonding compound or suitable plastics sleeve.
 - Extent: As indicated on drawings.
 - Position: At right angles to and centred on joint.
 - Other requirements: Fit debonded ends of bars in expansion joints with an approved type of cap incorporating not less than 20 mm of compressible material.
- 435 **STAINLESS STEEL DOWEL BARS**
- Standard: To BS 6744.
 - Designation: 1.4462.
 - Product form: Plain.
 - Strength grade: 200.
 - Properties: Perfectly straight, with sawn (not sheared) ends.
 - Debonding: Achieve effective debonding of each bar using either a suitable proprietary debonding compound or a suitable plastics sleeve.
 - Position: At right angles to and centred on joint.
 - Other requirements: Fit debonded ends of bars in expansion joints with an approved type of cap incorporating not less than 20 mm of compressible material.
- 440 **LOAD TRANSFER SYSTEMS**
- Manufacturer: As specified on drawings or submit proposals
 - Product reference: As specified on drawings or submit proposals
- 510A **SHEET MEMBRANE FOR SLIDING JOINTS**
- 1200 gauge polythene unless noted otherwise on drawings.
- 520 **SHEET JOINT FILLERFOR EXPANSION JOINTS**
- Manufacturer: As indictaed on drawings.
 - Product reference: As indicated on drawings.
 - Joints finished with sealant: Leave sufficient space for sealant by using temporary formers.
- 530 **SEALANTFOR JOINTS IN CONCRETE**
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
 - Colour of surfaces exposed to view: To be agreed with CA.
 - Preparation and application: As section Z22.
- 545 **COMPRESSIBLE SEALING STRIP SYSTEM as specified on drawings**
- Manufacturer: As indicated on drawings or submit proposals.
 - Product reference: As indicated on drawings or submit proposals.
 - Colour: As indicated on drawings or submit proposals.

E41 Worked Finishes to In Situ Concrete

To be read with Preliminaries/ General conditions.

110 MONOLITHIC CONCRETE WEARING SCREED

- Thickness:
 - Minimum: 10 mm.
 - Maximum: 20 mm.
- Abrasion resistance class to BS 8204-2: AR1.
- Mix:
 - Cements/ Combinations: To BS EN 197-1 and BS 8500-2.
 - Fine aggregate: To BS EN 12620.
 - Grading limit: To BS EN 12620.
 - Coarse aggregate: To BS EN 12620.
 - Grading limit: 10 mm single size.
 - Proportions: 1:1:2.
- Construction:
 - Lay and compact within three hours of laying base (less in hot weather).
 - Bleed water on base surface: None.
- Tolerances:
 - Surface regularity: As clause E05/312.
 - Level: Permissible deviation of wearing surface from datum (maximum): ± 15 mm.
- Finish: Trowelled as clause 330.
 - Additional surface treatment: As clause 510.
 - Slip resistance testing: As clause 530.
- Curing: As section E10.

145 CONTROL SAMPLES

- Sample areas that are part of finished work: As required by CA.
- Location: To be agreed.
- Approval of appearance: Obtain before proceeding with remainder of the work.

150 FINISHING

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

210 TAMPED FINISH

- Surface on completion: Even array of parallel ribs.

230 BRUSHED FINISH

- Surface on completion: Light even texture.

240 WOOD FLOATED FINISH

- Surface on completion: Slightly coarse, even texture with no ridges or steps.

310 SMOOTH FLOATED FINISH

- Surface on completion: Even with no ridges or steps.

320 TROWELLED FINISH

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

330 TROWELLED FINISH FOR WEARING SURFACES

- Surface on completion: Uniform and smooth, free from trowel marks and blemishes.

335 DRY SHAKE TROWELLED FINISH FOR WEARING SURFACES

- Dry shake manufacturer: As specified on drawings or submit proposals.
 - Product reference: As specified on drawings or submit proposals.
 - Mix: Manufacturer's standard.
 - Colour: As agreed with CA.
 - Application: Sprinkle evenly at appropriate stages during floating and before trowelling.
 - Application rate: Obtain manufacturers recommendations. Seek guidance from CA.
- Curing agent/ Sealer: As dry shake manufacturer's recommendations.
- Protection: Prevent marking of adjacent surfaces.
- Surface on completion: Uniform and smooth, free from trowel marks and blemishes.

340 DEWATERED TROWELLED FINISH FOR WEARING SURFACES

- Dewatering:
 - Timing: Immediately after compacting concrete.
 - Removing water: Use vacuum process.
- Surface on completion: Uniform and smooth, free from trowel marks and blemishes.

410 POWER GROUND FINISH FOR WEARING SURFACES

- Grinding: Remove 1-2 mm from surface.
 - Timing: When concrete is sufficiently hard for fine aggregate surface particles not to be dislodged.
- Cleaning: Remove dust and wash down.
- Surface on completion: Even glass-paper texture, free from blemishes and trowel marks.

510A SURFACE HARDENER

- Not less than three weeks after casting, clean surface of concrete by wetting with soap suds and scrubbing with wire brush and fine steel wool. Mop up and scrub with fibre brush and clean water. Allow to dry thoroughly for several days then apply an approved proprietary chemical surface hardener to manufacturer's recommendations.
- Solutions and wash water: Do not discharge to drains. Store and dispose of safely.

520 SURFACE SEALER

- Manufacturer: As indicated on drawings or submit proposals.
 - Product reference: As indicated on drawings or submit proposals.
- Substrate:
- Moisture content: As recommended by sealer manufacturer. Test relative humidity to BS 8203, Annex A where required to verify suitability.
 - Condition prior to application: Cured, clean and free from contaminants.
- Primer: As sealer manufacturer's recommendations.
- Application: Evenly to dry surfaces to form an effective seal but without a glossy finish.

530 SLIP RESISTANCE TESTING OF WEARING SURFACES

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

E60

WML Specification

for

Precast/Composite/Roof Decks

E60 Precast/Composite Concrete Floors/ Roof Decks

To be read with Preliminaries/ General conditions.

PROPRIETARY FLOORS/ ROOF DECKS

- 110 PRECAST BEAM AND BLOCK as specified on drawings
- Beams: As specified on drawings or similar approved.
 - Manufacturer: As specified on drawings or similar approved.
 - Product reference: As specified on drawings or similar approved.
 - Type: As specified on drawings or similar approved.
 - Infill blocks: As required by specialist design.
 - Structural concrete topping: As clause E10/107.
 - Other requirements: Refer to drawings.
- 130 PRECAST SLAB as specified on drawings
- Manufacturer: As specified on drawings or similar approved.
 - Product reference: As specified on drawings or similar approved.
 - Slab type: As specified on drawings or similar approved.
 - Slab depth: As specified on drawings.
 - Finish:
 - Soffit: Check with CA to establish if feature quality soffit finish is required.
 - Top surface: Prepared to receive levelling screed as section M10.
 - In situ continuity reinforcement: As specified on drawings.
 - Other requirements: As specified on drawings.
- 140A PRECAST SLAB COMPOSITE as specified on drawings
- Manufacturer: As specified on drawings or similar approved.
 - Product reference: As specified on drawings or similar approved.
 - Slab type: As specified on drawings or similar approved.
 - Slab depth: As specified on drawings.
 - Structural concrete topping: As clause E10/107.
 - Finish:
 - Soffit: Check with CA to establish if feature quality soffit finish is required.
 - Top surface: Prepared to receive specified finish.
 - In situ continuity reinforcement: As required by specialist design.
 - Void formers: As required by specialist design.
 - Other requirements: Refer to drawings.
- 180 PRECAST STAIRS as specified on drawings
- Manufacturer: As specified on drawings or similar approved.
 - Product reference: As specified on drawings or similar approved.
 - Parameters: As shown on drawings.
 - Finish:
 - Exposed faces: As indicated on drawings.
 - Treads and risers: As indicated on drawings.
 - Other requirements: Refer to drawings.

PERFORMANCE SPECIFIED FLOORS/ ROOF DECKS

- 215A COMPOSITE FLOOR/ROOF
- Type of construction: Composite concrete/profiled steel deck.
 - Overall depth (excluding finishes): As indicated on drawings.
 - Span: As indicated on drawings.
 - Self weight: As determined by manufacturer.
 - In situ continuity reinforcement: As indicated on drawings.
 - Void formers: As indicated on drawings.
 - In situ concrete topping to composite construction: E10/107.

- Finish to soffit: As indicated on drawings.
- Other requirements: As indicated on drawings.

GENERAL / PERFORMANCE**240 DETAILING OF PROPRIETARY SYSTEM**

- Installation details: Submit location and assembly drawings showing every aspect of the construction, incorporated components and features, trimming for voids, holes for services, and related work by others.
 - Purpose: To allow checking of compatibility with surrounding structure and coordination of services.
- Method statement and risk assessment for installation: Submit.
- Programme: Submit well in advance of construction.

250 CONTRACTOR'S STRUCTURAL DESIGN

- Design: Complete in accordance with the designated code of practice to satisfy specified performance criteria..
 - Composite construction: Provide partial continuity to control cracking and, where required, diaphragm and tie action.
 - Fully precast construction: Provide diaphragm and tie action where required.

265A STRUCTURAL PERFORMANCE OF FLOOR

- Loads: The floors must safely support the maximum combination of dead and imposed loads both in the finished building and during construction.
- Dead loads:
 - Distributed loads of finishes / fixtures: As specified on drawings.
 - Concentrated loads: As specified on drawings
- Imposed loads:
 - Distributed loads: As specified on drawings.
 - Concentrated loads: As specified on drawings.
- Deflection (maximum): In accordance with BS EN 1992: Part 1-1 Section 7.4, span / 500 under imposed loading or 20mm whichever is the larger.
- Diaphragm / tie action: For upper floors to Class 2B structures as defined in Approved Document Part A Section 5 of the Building Regulations provide ties in accordance with BS EN 1992: Part 1-1: Section 9.10. If structure classification is unclear then seek guidance from CA.

270A STRUCTURAL PERFORMANCE OF ROOF DECK

- Loads: The roof decks must safely support the maximum combination of dead and imposed / wind loads both in the finished building and during construction.
- Dead loads:
 - Distributed load of finishes: As specified on drawings.
 - Concentrated dead loads: As specified on drawings.
- Imposed loads:
 - Distributed loads for access / maintenance: As specified on drawings.
 - Concentrated loads: As specified on drawings.
 - Basic snow load: As specified on drawings.
- Wind loads: Calculate to BS EN 1991: Part 1-4.
 - Basic wind velocity (v_b): To be determined by precast designer. If further information is required seek guidance.
 - Altitude factor (c_a): To be calculated by Specialist Contractor.
 - Direction factor (c_{dir}): To be calculated by Specialist Contractor.
 - Seasonal factor (c_{season}): 1
 - Probability factor (c_{prob}): 1
 - Roughness factor ($c_e(z)$): To be calculated by Specialist Contractor.
 - Size factor: To be calculated by Specialist Contractor.
- Deflection (maximum): In accordance with BS EN 1992: Part 1-1 Section 7.4, span / 500 under imposed loading or 20 mm whichever is the larger.
- Diaphragm / tie action: No special measures unless specified otherwise on drawings.

280A BASIC FIRE RESISTANCE

- Method of determination: To BS EN 1992: Part 1-2 or by testing to BS 476-21 or BS EN 1365-2.
 - Finishes: Determine fire resistance without regard to applied finishes.
 - Data: Submit certificates, tabulated data or calculations.

INSTALLATION**310A GENERAL REQUIREMENTS**

- Lifting: At designed lifting points, using special lifting devices and cradles as necessary.
- Bearings: Set on level bearings ensuring not less than the minimum seating recommended by precast unit manufacturer.
- Site formed openings and sinkings: As precast unit manufacturer's recommendations.
- Cutting / drilling: Do not cut or drill units except as recommended or agreed by manufacturer.

315 INFILLING BEAM BEARINGS

- Type: Concrete as Clause 320.
- Installation: Infill gaps in walling below built in standard flooring blocks.

320A CONCRETE INFILL

- Concrete: As Clause E10/109.
- Preparation: Thoroughly clean and wet surfaces of precast units.
- Placing: Avoid segregation and compact thoroughly to eliminate voids.
 - Extent: Fill troughs and other holes.
 - Finish: Flush with top of precast units.
- Protection: Prevent movement of units until concrete has gained sufficient strength.

325 GROUTING

- Mix: Submit details of proposals.
- Preparation: Submit details of proposals.
- Fill all joints and surface irregularities.

330 EXPANDED POLYSTYRENE VOID FORMERS

- Expanded polystyrene: To BS EN 13163.
- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Compressive strength (minimum): Refer to drawings.
- Size: Refer to drawings.

340 LATERAL RESTRAINT STRAPS

- Preparation: Floors/ roof decks must tightly abut walls.
- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Material: Refer to drawings.
- Size:
 - Section: Minimum 30 x 5 mm cross section.
 - Length: To extend minimum 800 mm from inside face of wall.
- Form: Both ends cranked 100 mm.
- Position: Refer to drawings.
- Build in:
 - External cavity walls: One cranked end in tight contact with cavity face of wall inner leaf, the other cranked end grouted into floor/ roof deck joint.

F10 – F31
WML Specification

for

Masonry

F10 Brick/Block Walling

To be read with Preliminaries/ General conditions.

TYPES OF WALLING

- 111A EXTERNAL LEAF OF CAVITY WALL ABOVE DPC
- Material: Facing brick to Architects approval.
 - Mortar: Group 3 - coloured to Architects approval.
 - Bond: To Architects requirements.
 - Joints: Joint as work proceeds to an approved profile.
- 112A EXTERNAL LEAF OF CAVITY WALL BELOW DPC ABOVE GROUND
- Material: Facing brick to Architects approval.
 - Mortar: Group 1.
 - Bond: To Architects requirements.
 - Joints: Joint as work proceeds to an approved profile.
- 113A EXTERNAL LEAF OF CAVITY WALL BELOW GROUND
- Material: Clay commons to BS 3921, Class 3, durability designation F.L.
 - Mortar: Group 1.
 - Bond: To Architects requirements.
- 351A INTERNAL LEAF OF CAVITY WALL ABOVE DPC ABOVE GROUND
- Material: Solid concrete block to BS 6073.
 - Strength: As shown on drawings.
 - Mortar: Group 3.
 - Bond: Stretching half lap.
- 352A INTERNAL LOADBEARING WALLS
- Material: Solid concrete block to BS 6073.
 - Strength: As shown on drawings.
 - Mortar: Group 3.
 - Bond: Stretching half lap.
- 354A INTERNAL LOADBEARING WALLS AND INTERNAL LEAF OF CAVITY WALL BELOW DPC
- Material: Solid concrete block to BS 6073.
 - Strength: As shown on drawings.
 - Mortar: Group 3.
 - Bond: Stretching half lap.
- 356A INTERNAL PARTITION/NON-LOADBEARING WALLS
- Material: Solid concrete block to BS 6073.
 - Strength: As shown on drawings (3.5 N/mm² minimum).
 - Mortar: Group 4.
 - Bond: Stretching half lap.
- 381A MANHOLES AND BURIED DUCTWORK
- Material: Class B Engineering brick to BS 3921.
 - Mortar: Group 1.
 - Bond: Stretching half lap.
 - Joints: Joint as work proceeds to a flush profile.
- 382A ENGINEERING BRICKWORK AT LOCATIONS SHOWN ON DRAWINGS
- Material: Class B Engineering brick to BS 3921.
 - Mortar: Group 1.
 - Bond: Stretching half lap.

- Joints: Joint as work proceeds to a flush profile.

383A EXTERNAL FACING BRICK TO HIGH RISE BUILDINGS

- Material: FL quality brick to BS 3921.
- Mortar: Group 3 - coloured to Architects approval.
- Bond: Stretching half lap.
- Joints: Joint as work proceeds to an approved profile.

TESTING**410A COMPRESSIVE STRENGTH OF MORTAR FOR EACH WALLING TYPE**

- Testing authority: Submit proposed details of approved independent testing authority to CA for approval.
- Test method: BS 5628-1 Annex A and BS EN 1015-11.
- Preliminary tests procedure: As follows:
 - Specimens:
Number of specimens: 6.
Type: 40 x 40 x 100 mm prisms representative of the proposed site mortar.
Preparation: At least six weeks before walling commences.
 - Specimen testing: Half of specimens at 7 days. Remainder at 28 days.
Retarded mixes: Extend curing periods to include retardation period.
 - Response to result: If mean compressive strength at 28 days is not within the range given below repeat tests with more suitable sand or next higher designation of mortar.
- Site tests procedure: As follows.
 - Number of specimens: Six per 150m² of walling or per storey whichever the more frequent.
 - Specimen types: As preliminary test, but prepared during construction.
 - Specimen testing: Half of specimens at 7 days. Remainder at 28 days.
 - Retarded mixes: Extend curing periods to include retardation period.
- Results: Submit.

WORKMANSHIP GENERALLY**430 CONDITIONING OF CLAY AND CALCIUM SILICATE BRICKS AND CLAY BLOCKS**

- Bricks and blocks delivered warm from manufacturing process: Do not use until cold.
- Absorbent bricks in warm weather: Wet to reduce suction. Do not soak.

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:
1:0–0.25:3 (Portland cement:lime:sand with or without air entraining additive).
1:3 (Portland cement:sand and air entraining additive).
 - Group 2:
1:0.5:4–5 (Portland cement:lime:sand with or without air entraining additive).
1:3 (masonry cement:sand containing Portland cement and lime in approximate ratio 1:1, and an air entraining additive).
1:2.5–3.5 (masonry cement:sand containing Portland cement and inorganic materials other than lime and air entraining additive).
1:3–4 (Portland cement:sand and air entraining additive.)
 - Group 3:
1:1:5–6 (Portland cement:lime:sand with or without air entraining additive).
1:3.5–4 (masonry cement:sand containing Portland cement and lime in approximate ratio 1:1,

and an air entraining additive).

1:4–5 (masonry cement:sand containing Portland cement and inorganic materials other than lime and air entraining additive).

1:5–6 (Portland cement:sand and air entraining additive).

- Group 4:

1:2:8–9 (Portland cement:lime:sand with or without air entraining additive).

1:4.5 (masonry cement:sand containing Portland cement and lime in approximate ratio 1:1, and an air entraining additive).

1:5.5–6.5 (masonry cement:sand containing Portland cement and inorganic materials other than lime and air entraining additive).

1:7–8 (Portland cement:sand and air entraining additive).

- 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.
- AAC block thin mortar adhesive and gypsum block adhesive joints: Fill vertical joints. Lay blocks on a full bed.
- Clay block joints:
 - Thin layer mortar: Lay blocks on a full bed.
 - Interlocking perpend: Butted.
- Bond where not specified: Half lap stretcher.
- Vertical joints in brick and concrete block facework: Even widths. Plumb at every fifth cross joint.

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 5m (brick masonry) ± 11 mm
 - Level of bed joints up to 5m (block masonry) ± 13 mm

535 HEIGHT OF LIFTS IN WALLING USING CEMENT GAUGED OR HYDRAULIC LIME MORTAR

- Quoins and advance work: Rack back.
- Lift height (maximum): 1.2 m above any other part of work at any time.
- Daily lift height (maximum): 1.5 m for any one leaf.

540 HEIGHT OF LIFTS IN WALLING USING THIN JOINT MORTAR GLUE

- Quoins and advance work: Rack back.
- Lift height (maximum): 1.3 m above any other part of work at any time.

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.

560 COURSING BRICKWORK

- Gauge: Four brick courses including bed joints to 300 mm.

- 561 COURSING BRICKWORK WITH EXISTING
- Gauge: Line up with existing brick courses.
- 580 LAYING FROGGED BRICKS
- Single frogged bricks: Frog uppermost.
 - Double frogged bricks: Larger frog uppermost.
 - Frog cavity: Fill with mortar.
- 585 LAYING CELLULAR BRICKS
- Orientation: Cavities downward.
- 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.
- 615 BRICKWORK TO RECEIVE ASPHALT DPC
- Substrate: Mortar bed finished flush, smooth and level.
- 620 BLOCK BONDING NEW WALLS TO EXISTING
- Pocket requirements: Formed as follows:
 - Width: Full thickness of new wall.
 - Depth (minimum): 100 mm.
 - Vertical spacing:
 - Brick to brick: 4 courses high at 8 course centres.
 - Block to block: Every other course.
 - Pocket joints: Fully filled with mortar.
- 635 JOINTING
- Profile: Consistent in appearance.
- 645 ACCESSIBLE JOINTS NOT EXPOSED TO VIEW
- Jointing: Struck flush as work proceeds.
- 665A POINTING
- Where specified, rake out joints to a depth of 15-20 mm as work proceeds; then dust, lightly wet and neatly point in a continuous operation as scaffolding is taken down.
 - Profile of pointing to be as specified for the type of walling.
- 671 FIRE STOPPING
- Avoidance of fire and smoke 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.

Protective Coating System

WM 610/1 GALVANISING

INTERNAL/EXTERNAL – FUNCTIONAL

Corrosivity Category	C3 Minimum life to first major maintenance	40 years
	C4 Minimum life to first major maintenance	20 years
	C5 Minimum life to first major maintenance	10 years
Shop Preparation	Blast clean to Sa 2 ½ to BS EN ISO 8501-1:2007	
Shop Coat	Galvanise to B.S. EN ISO 1461 : 2009 Minimum Thickness : 85 microns	
Bolt Coat	Galvanise to B.S. EN ISO 1461 : 2009 Minimum Thickness : 85 microns	
Site Coats	None unless otherwise specified.	

ADDITIONAL REQUIREMENTS FOR FACEWORK

- 710 THE TERM FACEWORK
- Definition: Applicable in this specification to brick/ block walling finished fair.
 - Painted facework: The only requirement to be waived is that relating to colour.
- 730 BRICK/ CONCRETE BLOCK SAMPLES
- General: Before placing orders with suppliers submit for approval of appearance labelled samples of the following: As directed by CA .
 - Selection of samples: Representative of the range in variation of appearance.
- 740 FINISHED MASONRY WORK REFERENCE PANELS
- General: Before proceeding to construct the following walling types, construct panels as specified. Give notice when panels are dry.
 - Selection of masonry units: As directed by CA .
 - Panel types:
 - Walling type: As directed by CA .
 - Location: As directed by CA .
 - Size: As directed by CA .
 - Other requirements: As directed by CA .
- 745 MASONRY SAMPLE PANELS
- Sampling frequency: A panel for each type and delivery of masonry unit.
 - Selection of masonry units: As directed by CA .
 - Panel types: As clause 740.
- 750 COLOUR CONSISTENCY OF MASONRY UNITS
- Colour range: Submit proposals of methods taken to ensure that units are of consistent and even appearance within deliveries.
 - Conformity: Check each delivery for consistency of appearance with previous deliveries and with approved reference panels; do not use if variation is excessive.
 - Finished work: Free from patches, horizontal stripes and racking back marks.
- 760 APPEARANCE
- Brick/ block selection: Do not use units with damaged faces or arrises.
 - Cut masonry units: Where cut faces or edges are exposed cut with table masonry saw.
 - Quality control: Lay masonry units to match relevant reference panels.
 - Setting out: To produce satisfactory junctions and joints with built-in elements and components.
 - Coursing: Evenly spaced using gauge rods.
 - Lifts: Complete in one operation.
 - Methods of protecting facework: Submit proposals.
- 780 GROUND LEVEL
- Commencement of facework: Not less than 150 mm below finished level of adjoining ground or external works level.
- 790 PUTLOG SCAFFOLDING
- Use: Not permitted in facework.
- 800 TOOTHED BOND
- New and existing facework in same plane: Bond together at every course to achieve continuity.
- 810 FIXING OF BRICK SLIPS
- Adhesive system: Refer to drawings .
 - Concrete substrate:
 - Preparation: Remove laitance and expose aggregate.
 - Substrate surface: Clean and free of loose material.

- Slips:
 - Preparation of slips: Clean and free of loose material.
 - Slips: Fully bonded.
- Movement joints in substrate: Do not bridge.
- Pointing: Allow adhesive bedding to set. Use same mortar as adjacent facework and finish to same profile.

830 CLEANLINESS

- Facework: Keep clean.
- Mortar on facework: Allow to dry before removing with stiff bristled brush.
- Removal of marks and stains: Rubbing not permitted.

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

To be read with Preliminaries/ General conditions.

CAVITIES

110 CONCRETE FILL TO BASE OF CAVITY

- Concrete generally: To BS EN 206-1 and BS 8500-2.
 - Designated concrete: GEN 3.
 - Workability: High.
- 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: Refer to Architects drawings.
 - Product reference: Refer to Architects drawings.
- 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.

150 FULL FILL CAVITY INSULATION

- Insulation: Refer to Architects drawings for specifications.
 - Product certification: Refer to Architects drawings for specifications.
- Manufacturer: Refer to Architects drawings for specifications.
 - Product reference: Refer to Architects drawings for specifications.
- Recycled content: Refer to Architects drawings for specifications.
- Face size (nominal length x width): Refer to Architects drawings for specifications.
- Thickness (nominal): Refer to Architects drawings for specifications.
- Thermal conductivity: Refer to Architects drawings for specifications.
- Reaction to fire class: Refer to Architects drawings for specifications.
- Additional requirements: Refer to Architects drawings for specifications.
- Placement: Continuous and free of mortar and debris.

155 PARTIAL FILL CAVITY INSULATION

- Insulation: Refer to Architects drawings for specifications.
 - Product certification: Refer to Architects drawings for specifications.
- Manufacturer: Refer to Architects drawings for specifications.
 - Product reference: Refer to Architects drawings for specifications.
- Recycled content: Refer to Architects drawings for specifications.
- Face size (length x width): Refer to Architects drawings for specifications.
- Thickness (nominal): Refer to Architects drawings for specifications.

- Thermal conductivity: Refer to Architects drawings for specifications.
- Reaction to fire class: Refer to Architects drawings for specifications.
- Additional requirements: Refer to Architects drawings for specifications.
- Placement: Secure against face of inner leaf.
 - Residual cavity: Clear and unobstructed.
- Joints between boards, at closures and penetrations: No gaps and free from mortar and debris.

160 AIR BRICKS IN EXTERNAL WALLING

- Standard: To BS 493, class 1.
- Manufacturer: Refer to Architect.
 - Product reference: Refer to Architect.
- Apertures: Refer to Architect.
- Work sizes: Refer to Architect.
- Material/ Colour: Refer to Architect.
- Placement: Built in with no gaps at joints.

165 GRATINGS/ VENTILATORS IN INTERNAL WALLING

- Standard: To BS 493, class 2.
Manufacturer: Refer to Architect.
 - Product reference: Refer to Architect.
- Apertures: Refer to Architect.
- Work sizes: Refer to Architect.
- Material/ Colour: Refer to Architect.
- Other requirements: Refer to Architect.
- Placement: Built in with no gaps at joints.

171 VENTILATION DUCTS IN EXTERNAL WALLING

- Manufacturer: Refer to Architect.
 - Product reference: Refer to Architect.
- Placement: Across cavity, sloping away from inner leaf. Full mortar joints to seal cavity.
- Protection from water penetration to inner leaf: Where barrier is not integral to duct, form stepped dpc cavity tray with stop ends above duct, extending 150 mm on each side.

175 CAVITY VENTILATORS

- Manufacturer: Refer to Architect.
 - Product reference: Refer to Architect.
- Material/ colour: Refer to Architect.
- Number and location: Refer to Architect.

180 CAVITY CLOSERS

- Manufacturer: Refer to Architect.
 - Product reference: Refer to Architect.
- Accessories: Refer to Architect.

REINFORCING/ FIXING ACCESSORIES**210 CAVITY WALL TIES** Unless specified otherwise by Architect

- Standard: To BS 1243.
 - Type: Cavities up to 75mm, Double Triangle. Cavities 75mm - 150mm, Vertical Twist (or proprietary equivalent).
- Material/ finish: Stainless steel.
- Sizes: In accordance with BS 1243.

212A WALL TIES For double leaf (collar jointed) walls

- Type: Flat metal 20mm x 3mm - length to suit 50mm min embedment).
- Material/ finish:
 - Internal walls: Galvanised mild steel.
 - Walls with external face or forming part of a cavity wall: Stainless steel.

- 213A PANEL FRAMING CRAMPS FIXED TO STEEL COLUMNS For double leaf (collar jointed) walls
- Type: Flat metal 20mm x 3mm with 100mm embedment fixed in accordance with drawings).
 - Material/ finish:
 - Internal walls: Galvanised mild steel.
 - Walls with external face or forming part of a cavity wall: Stainless steel.
- 225A FIXING TIES IN MASONRY CAVITY WALLS
- Embedment in mortar beds (minimum): 50 mm.
 - Placement: Sloping slightly downwards towards outer leaf, without bending. Drip centred in the cavity and pointing downwards.
 - Spacing: Staggered in alternate courses.
 - Least leaf thickness 65-90mm, cavity width 50-75mm: Horizontally 450mm, Vertically 450mm.
 - Least leaf thickness 90mm or more, cavity width 50-150mm: Horizontally 900mm, Vertically 450mm.
 - Double leaf (collar jointed) walls: Horizontally 450mm, Vertically 450mm.
 - Additional ties: Provide within 225 mm of reveals of unbonded openings, expansion joints and control joints.
 - Spacing: 225mm.
- 236 FIXING TIES IN MASONRY CLADDING TO TIMBER FRAMES
- Fixing ties to timber frame studs through sheathing: Securely with 50 mm x 11 gauge stainless steel annular ringed shank nails.
 - Embedment in mortar beds (minimum): 50 mm.
 - Placement: Slope downwards away from timber frame, without bending.
 - Spacing:
 - Horizontal centres: To suit stud centres.
 - Vertical centres: 450mm maximum.
 - Provision of additional ties: Within 225 mm of reveals of openings and at no more than 300 mm centres vertically.
- 241 WALL STARTERS/ CONNECTORS
- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
 - Material/ finish: Refer to drawings.
 - Sizes: Refer to drawings.
- 245 CHANNEL/ SLOT TIES.
- Standard: Refer to drawings.
 - Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
 - Material/ finish: Refer to drawings.
 - Sizes: Refer to drawings.
 - Channel/ slot fixing: Refer to drawings.
 - End types: Refer to drawings.
 - Design embedment length (minimum): Refer to drawings.
 - Additional requirements: Refer to drawings.
- 250 SLIDING ANCHOR RESTRAINT SLIP TIES.
- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
 - Material/ finish: Refer to drawings.
 - Sizes: Refer to drawings.
- 251 WALL HEAD RESTRAINT SLIP TIES
- Standard: To BS EN 845-1.
 - Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.

- Material/ finish: Refer to drawings.
- Sizes: Refer to drawings.
- Shear load capacity: Refer to drawings.
- End types: Refer to drawings.
- Stem length: Refer to drawings.
- Design embedment length (minimum): Refer to drawings.
- Allowable joint thickness (minimum): Refer to drawings.
- Additional requirements: Refer to drawings.

255 WIND POSTS

- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Material: Refer to drawings.
- Sizes: Refer to drawings.
- Fixings (complete with washers and shims): Refer to drawings.

260 ANGLE SUPPORTS

- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Material: Refer to drawings.
- Size: Refer to drawings.
- Fixings (complete with washers and shims): Refer to drawings.

265 SUPPORT SYSTEM

- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Material: Refer to drawings.
- Components, arrangement and dimensions: As shown on drawings.

270 MESHWORK JOINT REINFORCEMENT

- Standard: Refer to drawings.
- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Type: Refer to drawings.
- Material: Refer to drawings.
- Width: Approximately 40-50 mm less in width than wall or leaf.
- Placement: Lay on an even bed of mortar in a continuous strip with full laps at angles. Keep back 20 mm from face of external work, 12 mm back from face of internal work and finish joint to normal thickness.
 - Lap length (minimum): Refer to drawings.

280 LATERAL RESTRAINT NONPROPRIETARY SLIP TIES FOR MOVEMENT JOINTS

- Ties: Refer to drawings.
- Debonding arrangement: Polyethylene sheet wrapping to one half length of tie.
- Fixing centres: Refer to drawings.

281 LATERAL RESTRAINT PROPRIETARY SLIP TIES FOR MOVEMENT JOINTS

- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Material/ finish: Refer to drawings.
- Fixing centres: Refer to drawings.

291 SPECIAL FIXINGS

- Type: Submit proposals.
- Material: To BS 5628-3 clause 4.5.
- Performance: Of type, size, strength and number necessary to resist loads likely to occur during the life of the building, and prevent lateral displacement or pulling apart of construction.

- Fill pockets with bedding mortar finished flush where exposed to view.

FLEXIBLE DAMP PROOF COURSES/ CAVITY TRAYS

- 330 DAMP PROOF COURSE -
- Manufacturer: Refer to Architects drawings / CA.
 - Product reference: Refer to Architects drawings / CA.
- 345 SITE FORMED FLEXIBLE SHEET CAVITY TRAYS
- Material: Refer to Architects drawings / CA.
 - Manufacturer: Refer to Architects drawings / CA.
 - Product reference: Refer to Architects drawings / CA.
- 360 GAS RESISTANT DPCS/ CAVITY TRAYS
- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- 370 PREFORMED CAVITY TRAYS
- Manufacturer: Refer to Architects drawings / CA.
 - Product references and locations: Refer to Architects drawings / CA.
 - Placement: To provide a free draining and watertight installation.
- 380 PREFORMED DPC/ CAVITY TRAY JUNCTION CLOAKS/ STOP ENDS
- Manufacturer: Refer to Architects drawings / CA.
 - Product references and locations: Refer to Architects drawings / CA.
 - Placement: To provide a free draining and watertight installation. Seal laps with dpcs and/ or cavity trays.
- 385 PREFORMED DPC/ CAVITY TRAY JUNCTION CLOAKS/ STOP ENDS
- Manufacturer: Refer to Architects drawings / CA.
 - Product references and locations: As shown on drawings.
 - Placement: Seal laps with dpcs and/ or cavity trays.
- 390 SITE FORMED DPC/ CAVITY TRAY JUNCTIONS/ STOP ENDS
- Three dimensional changes in shape: Form to provide a free draining and watertight installation. Seal laps.
 - Alternative use of preformed junction cloaks/ stop ends: Submit proposals.

INSTALLATION OF DPCS/ CAVITY TRAYS

- 415 HORIZONTAL DPCS
- Placement: In continuous lengths on full even bed of fresh mortar, with 100 mm laps at joints and full laps at angles.
 - Width: At least full width of leaf unless otherwise specified. Edges of dpc not covered with mortar or projecting into cavity.
 - Overlying construction: Immediately cover with full even bed of mortar to receive next masonry course.
 - Overall finished joint thickness: As close to normal as practicable.
- 425 GROUND LEVEL DPCS
- Joint with damp proof membrane: Continuous and effectively sealed.
- 435 STEPPED DPCS IN EXTERNAL WALLS
- External walls on sloping ground: Install dpcs not less than 150 mm above adjoining finished ground level.

- 445 SILL DPCS
- Form and placement: In one piece and turned up at back when sill is in contact with inner leaf.
- 455 COPING/ CAPPING DPCS
- Placement: Bed in one operation to ensure maximum bond between masonry units, mortar and dpc.
 - Dpcs crossing cavity: Provide rigid support to prevent sagging.
- 475 SITE FORMED CAVITY TRAYS
- Requirements to prevent downward ingress of water:
 - Profiles: To match those shown on drawings. Firmly secured.
 - Joint treatment: Use unjointed wherever possible, otherwise lap at least 100 mm and seal to produce a free draining and watertight installation.
 - Horizontal cavity trays: Support using cavity closer.
 - Sloping cavity trays: Prevent sagging.
 - Cleanliness: Free from debris and mortar droppings.
- 485 CAVITY TRAYS OVER OPENINGS AND OTHER CAVITY BRIDGINGS
- Length: To extend not less than 150 mm beyond ends of lintels/ bridgings.
- 495 GAS RESISTANT DPCS/ CAVITY TRAYS
- Joint treatment: Use unjointed wherever possible, otherwise lap at least 150 mm and seal to form a gas and watertight installation.
 - Joint with damp proof membrane: Overlap dpc/ cavity tray not less than 150 mm.
- 515 DPC/ CAVITY TRAY LEADING EDGE IN FACEWORK - FLUSH
- Treatment at face of masonry: Finish flush and clear of mortar at the following locations: Refer to Architects drawings.
- 525 DPC/ CAVITY TRAY LEADING EDGE IN FACEWORK - SET BACK
- Treatment at face of masonry: Set back 5 mm from face of wall with recessed mortar joint to expose edge at the following locations: Refer to Architects drawings.
- 535 DPC/ CAVITY TRAY LEADING EDGE IN FACEWORK - PROJECTING
- Treatment at face of masonry: Projecting 5 mm from face of wall at the following locations: Refer to Architects drawings.
- 560 VERTICAL DPCS GENERALLY
- Form: In one piece wherever possible.
 - Joints: Upper part overlapping lower not less than 100 mm.
- 570 JAMB DPCS AT OPENINGS
- Joint with cavity tray/ lintel at head: Full underlap.
 - Joint with sill/ horizontal dpc at base: Full overlap.
 - Projection into cavity: Not less than 25 mm.
 - Relationship with frame: In full contact.
- 580 JAMB DPCS TO BUILT IN TIMBER FRAMES
- Fixing: Securely fastened to back of frame.
 - Fasteners: Galvanized clout nails or staples.

JOINTS

- 611A EXPANSION JOINTS
- Build in an approved flexible cellular polyethylene, cellular polyurethane or foam rubber joint filler as the work proceeds ensuring no projections into cavities.
 - In joints to be pointed with sealant, position filler accurately at the recommended distance from face of wall.

- Prepare joints and apply sealant as section Z22.

612A CONTRACTION JOINTS IN FACEWORK

- Build in an approved fibreboard or cork joint filler as the work proceeds ensuring no projections into cavities, rake out joints to a depth of 20mm as the work proceeds.
- In joints to be pointed with sealant, position filler accurately at the recommended distance from face of wall.
- Leave joint open for as long as possible before sealing.
- Prepare joint and apply sealants as Section Z22.

630 UNEXPOSED CONTRACTION JOINTS

- Formation: Close butt as work proceeds.

631A CONTRACTION JOINTS

- Form in concrete blockwork with ties across joint in alternate courses:
 - At all junctions except corners.
 - Where shown on drawings.

650 POINTING IN FLASHINGS

- Joint preparation: Free of debris and lightly wetted.
- Pointing mortar: As for adjacent walling.
- Placement: Fill joint and finish flush.

655 POINTING IN ASPHALT SKIRTINGS

- Joint preparation: Free of debris and lightly wetted.
- Pointing mortar: 1:4 cement: sand incorporating a bonding agent.
 - Colour: Match adjacent work.
- Placement: Fill joint and finish flush.

660 PINNING UP TO SOFFITS

- Top joint of loadbearing walls: Fill and consolidate with mortar.

670 TOPS OF NONLOADBEARING WALLS

- Restraints: Refer to drawings.
 - Fixing: Secure to soffit.
- Joint filler: Refer to drawings.
 - Placement: Full, no gaps.

PROPRIETARY SILLS/ LINTELS/ COPINGS/ DRESSINGS**720 SILLS**

- Standard: To BS 5642-1.
- Material: Refer to Architects drawings / CA.
- Manufacturer: Refer to Architects drawings / CA.
 - Product reference: Refer to Architects drawings / CA.
- Dimensions: As shown on drawings .
- Finish: Refer to Architects drawings / CA.
- Mortar for bedding/ jointing: Cement gauged as section Z21.
 - Standard: Refer to Architects drawings / CA.
 - Mix: Refer to Architects drawings / CA.
 - Additional requirements: Refer to Architects drawings / CA.
- Joints: Flush.
- Bedding one piece sills: Leave bed joints open except under end bearings and masonry mullions. On completion, point to match adjacent work.

721 NATURAL STONE SILLS LAID IN HYDRAULIC LIME:SAND MORTAR

- Standard: To BS 5642-1.
- Manufacturer: Refer to Architects drawings / CA.

- Product reference: Refer to Architects drawings / CA.
- Dimensions: As shown on drawings.
- Finish: Refer to Architects drawings / CA.
- Mortar for bedding/ jointing: Hydraulic lime:sand as section Z21.
 - Hydraulic lime: Refer to Architects drawings / CA.
 - Sand source/ type: Refer to Architects drawings / CA.
 - Mix: Refer to Architects drawings / CA.
- Joints: Flush.
- Bedding one piece sills: Leave bed joints open except under end bearings and masonry mullions. On completion, point to match adjacent work.

725 CAST STONE SILLS LAID IN CEMENT GAUGED MORTAR

- Standard: To BS 1217.
- Manufacturer: Refer to Architects drawings / CA.
 - Product reference: Refer to Architects drawings / CA.
- Dimensions: As shown on drawings.
- Finish/ colour: Refer to Architects drawings / CA.
- Mortar for bedding/ jointing: Cement gauged as section Z21.
 - Standard: Refer to Architects drawings / CA.
 - Mix: Refer to Architects drawings / CA.
 - Additional requirements: Refer to Architects drawings / CA.
- Joints: Flush.
- Bedding one piece sills: Leave bed joints open except under end bearings and masonry mullions. On completion, point to match adjacent work.

726 CAST STONE SILLS LAID IN HYDRAULIC LIME:SAND MORTAR

- Standard: To BS 1217.
- Manufacturer: Refer to Architects drawings / CA.
 - Product reference: Refer to Architects drawings / CA.
- Dimensions: As shown on drawings.
- Finish/ colour: Refer to Architects drawings / CA.
- Mortar for bedding/ jointing: Hydraulic lime:sand as section Z21.
 - Hydraulic lime: Refer to Architects drawings / CA.
 - Sand: Graded crushed stone.
Colour: To match sill.
Source/ type: Refer to Architects drawings / CA.
 - Mix: Refer to Architects drawings / CA.
- Joints: Flush.
- Bedding one piece sills: Leave bed joints open except under end bearings and masonry mullions. On completion, point to match adjacent work.

735 PRECAST CONCRETE LINTELS

- Standard: To BS EN 845-2.
- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Types: Refer to drawings.
- Sizes: Refer to drawings.
- Additional requirements: None.
- Placement: Bed on mortar used for adjacent work.
 - Bearing length (minimum): 150 mm.

745 PRESTRESSED CONCRETE LINTELS

- Standard: To BS EN 845-2.
- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Types: Refer to drawings.
- Sizes: Refer to drawings.
- Additional requirements: None.

- Placement: Bed on mortar used for adjacent work. Prop at not more than 1.2 m centres to prevent displacement during construction. Retain props in position for not less than 14 days or until mortar has matured, whichever is longer. Bearing length (minimum): 150 mm.

755 PREFABRICATED STEEL LINTELS

- Standard: To BS EN 845-2.
- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Types: Refer to drawings.
- Material/ finish: Refer to drawings.
- Sizes: Refer to drawings.
- Additional requirements: Refer to drawings.
- Placement: Bed on mortar used for adjacent work.
 - Bearing length (minimum): 150 mm.

760 COPING UNITS

- Standard: To BS 5642-2.
- Material: Refer to Architects drawings / CA.
- Manufacturer: Refer to Architects drawings / CA.
 - Product reference: Refer to Architects drawings / CA.
- Dimensions: As shown on drawings.
- Finish: Refer to Architects drawings / CA.
- Mortar for bedding/ jointing: Cement gauged as section Z21.
 - Standard: Refer to Architects drawings / CA.
 - Mix: Refer to Architects drawings / CA.
 - Additional requirements: Refer to Architects drawings / CA.
- Joints: Full and finished flush.
- Placement: Lay on a full bed of mortar to line and level.

761 NATURAL STONE COPING UNITS LAID IN HYDRAULIC LIME:SAND MORTAR

- Standard: To BS 5642-2.
- Manufacturer: Refer to Architects drawings / CA.
 - Product reference: Refer to Architects drawings / CA.
- Dimensions: As shown on drawings.
- Finish: Refer to Architects drawings / CA.
- Mortar for bedding/ jointing: Hydraulic lime:sand as section Z21.
 - Hydraulic lime: Refer to Architects drawings / CA.
 - Sand source/ type: Refer to Architects drawings / CA.
 - Mix: Refer to Architects drawings / CA.
- Joints: Full and finished flush.
- Placement: Lay on a full bed of mortar to line and level.

765 CAST STONE COPING UNITS LAID IN CEMENT GAUGED MORTAR

- Standard: To BS 1217.
- Manufacturer: Refer to Architects drawings / CA.
 - Product reference: Refer to Architects drawings / CA.
- Dimensions: As shown on drawings.
- Finish/ colour: Refer to Architects drawings / CA.
- Mortar for bedding/ jointing: Cement gauged as section Z21.
 - Standard: Refer to Architects drawings / CA.
 - Mix: Refer to Architects drawings / CA.
 - Additional requirements: Refer to Architects drawings / CA.
- Joints: Full and finished flush.
- Placement: Lay on a full bed of mortar to line and level.

766 CAST STONE COPING UNITS LAID IN HYDRAULIC LIME:SAND MORTAR

- Standard: To BS 1217.

- Manufacturer: Refer to Architects drawings / CA.
 - Product reference: Refer to Architects drawings / CA.
- Dimensions: As shown on drawings.
- Finish/ colour: Refer to Architects drawings / CA.
- Mortar for bedding/ jointing: Hydraulic lime:sand as section Z21.
 - Hydraulic lime: Refer to Architects drawings / CA.
 - Sand: Graded crushed stone.
Colour: To match coping.
Source/ type: Refer to Architects drawings / CA.
 - Mix: Refer to Architects drawings / CA.
- Joints: Full and finished flush.
- Placement: Lay on a full bed of mortar to line and level.

770 CAST STONE DRESSINGS LAID IN CEMENT GAUGED MORTAR

- Standard: To BS 1217.
- Manufacturer: Refer to Architects drawings / CA.
 - Product reference: Refer to Architects drawings / CA.
- Components: Refer to Architects drawings / CA.
- Finish/ colour: Refer to Architects drawings / CA.
- Mortar for bedding/ jointing: Cement gauged as section Z21.
 - Standard: Refer to Architects drawings / CA.
 - Mix: Refer to Architects drawings / CA.
 - Additional requirements: Refer to Architects drawings / CA.
- Joints: Full and finished flush.
- Placement: Lay on a full bed of mortar.
- Bed joints under one piece sills/ thresholds: Leave open except under end bearings and masonry mullions. On completion, point with mortar to match adjacent work.

771 CAST STONE DRESSINGS LAID IN HYDRAULIC LIME:SAND MORTAR

- Standard: To BS 1217.
- Manufacturer: Refer to Architects drawings / CA.
 - Product reference: Refer to Architects drawings / CA.
- Components: Refer to Architects drawings / CA.
- Finish/ colour: Refer to Architects drawings / CA.
- Mortar for bedding/ jointing: Hydraulic lime:sand as section Z21.
 - Hydraulic lime: Refer to Architects drawings / CA.
 - Sand: Graded crushed stone.
Colour: To match component.
Source/ type: Refer to Architects drawings / CA.
 - Mix: Refer to Architects drawings / CA.
- Joints: Full and finished flush.
- Placement: Lay on a full bed of mortar.
- Bed joints under one piece sills/ thresholds: Leave open except under end bearings and masonry mullions. On completion, point with mortar to match adjacent work.

780 COPING SYSTEM

- Manufacturer: Refer to Architects drawings / CA.
 - Product reference: Refer to Architects drawings / CA.
- Material/ finish: Refer to Architects drawings / CA.

MISCELLANEOUS ITEMS**830 BUILDING IN FRAMES**

- Preparation: Remove horns and provide support.
- Fixing cramps: Fully bed in mortar.

840 OPENINGS FOR FRAMES

- Formation: Use accurate, rigid templates to required size.

850 WALL PLATES

- Placement: On full bed of mortar to correct horizontal level.

F31 Precast Concrete Sills/Lintels/Copings/Features

To be read with Preliminaries/ General conditions.

TYPES OF COMPONENT

130 CONCEALED PRECAST LINTELS

- Standard: To BS EN 845-2.
 - Verification of performance: Submit calculations or test certificates.

140 CONCEALED PRECAST LINTELS

- Concrete: Designated to BS 8500-2: Minimum RC30.
 - Aggregate size (maximum): 20 mm.
- Configuration:
 - Clear span up to 900 mm:
Section: 140 mm deep x width of wall.
Bearing: 150 mm at both ends.
Reinforcement: One 12 mm carbon steel bar for each 105 mm of wall thickness.
 - Clear span 900 mm to 1800 mm:
Section: 215 mm deep x width of wall.
Bearing: 225 mm at both ends.
Reinforcement: One 16 mm carbon steel bar for each 105 mm of wall thickness.
- Cover to reinforcement (nominal): 20 mm minimum.

GENERAL REQUIREMENTS

210 MOULDS

- Permissible fabrication and operating tolerances: Length 0 to +6 mm, other dimensions ± 3 mm.

220 CONCRETE GENERALLY

- Specification: To BS 8500-2 and BS EN 206-1.
- Producer: Currently certified by a body accredited by UKAS to BS EN 45011 for product conformity certification of ready-mixed concrete.
- Chloride class of concrete:
 - Excluding SRPC: C1 0.40.
 - Using SRPC: C1 0.20.
 - Reinforced and heat cured: C1 0.10.
 - Prestressed: C1 0.10.
- Admixtures containing calcium chloride: Not allowed.

250 REINFORCEMENT

- Carbon steel reinforcement: As appropriate to BS 4449, BS 4482 and BS 4483.
 - Cutting and bending: To BS 8666.
- Galvanized reinforcement: Galvanized to BS EN ISO 1461 after cutting. Chromate treated.
- Stainless steel reinforcement: To BS 6744.
 - Designation 1.4301.
 - Cutting and bending: To BS 8666.
- Non structural reinforcement: Include to resist shrinkage and handling stresses.
- Bimetallic corrosion and staining: Prevent by appropriate selection and use of materials.
- Condition at time of placement: Clean, free of corrosive pitting, loose materials and substances that adversely affect reinforcement, concrete, or bond between the two.
- Fixing: Accurate and secure.
 - Method: Wire tying, approved steel clips or tack welding if permitted.
 - Concrete cover: Maintain free of all tying wire or clips.

255 QUALITY ASSURANCE OF REINFORCEMENT

- Reinforcement to BS 4449, BS 4483, BS 6744: Obtain valid certificates of approval for product conformity issued by the
- UK Certification Authority for Reinforcing Steels.

260 CASTING AND CURING

- Placing of concrete: Thoroughly compact.
- Protection against drying out: Methods and duration to BS EN 13369 clause 4.2.1.3.
- Immature components: Avoid movement, vibration, overloading, physical shock, rapid cooling and thermal shock.
- Delivery to site: Minimum 14 days after casting.

261 CUTTING

- Cutting of precast concrete components: Not permitted.

262 RECORDS

- Records for each type of component: Maintain details including:
 - Unique identification number.
 - Identification of the producer.
 - Identification of the place of production.
 - Correlation with records of mixes, including batch numbers.
 - Date of each stage of manufacture.
 - Dates and results of all tests, checks and inspections.
 - Dimensions related to specified levels of accuracy.
 - Specific location in the finished work.
 - Weight of the unit.
 - Damage and making good.
 - Any other pertinent data, e.g. if unit is a production control unit.
- Availability of records for inspection: On request.

FAIR FACED COMPONENTS**310 CONTROL SAMPLES**

- Required samples: After finalization of design, one each of the following components:
- As directed by CA.
- Approval of appearance: Obtain before manufacture of remaining units.
- Identification and storage location: Clearly label and retain at factory for comparison with production units.

320 DETAILS OF SAMPLES

- Submittals after approval of appearance and before manufacture of production units:
 - Aggregates: Confirm type, maximum size, grading and source.
- Conformity of designed concrete: Evidence of compliance for compressive strength class and limiting values of composition.

330 MIXES FOR VISIBLE FACED COMPONENTS

- Constituent materials and mix design for each finish type: To remain constant.
- Colour and appearance of each finish type: To remain constant.
- Aggregates: To BS EN 12620.
 - Origin: Single source for each finish type, having sufficient quantity for whole contract.

341 CONDITIONS FOR SEPARATE FACING AND BACKING MIXES

- Difference in cement content: Not greater than 80 kg/m³.
- Thickness of facing mix: 10 mm greater than maximum aggregate size, minimum 25 mm.
- Location of reinforcement: Minimum 20 mm away from the interface between mixes.
- Compaction of facing and backing mix: Carry out to create monolithic construction.

350 QUALITY OF FINISHES

- Appearance standard: As established by samples.

365 COVER ON EXPOSED AGGREGATE FACES

- Nominal cover: Exclusive of aggregate projection.

370 COVER ON VISIBLE FACES

- Spacers: Not permitted.
- Proposed method statement: Submit.

380 CONSISTENCY OF PRODUCTION METHODS

- Production methods: To remain consistent for each matching type of finish.
 - Finish appearance: To remain within the range of variation indicated by the samples submitted.
- Changes to production methods: If variations are proposed for components of the same finish, submit evidence that there will be no difference in appearance.

390 INSPECTION

- Completed components: Give notice when ready to be inspected at factory.

INSTALLATION**420 LAYING**

- Mortar for bedding and jointing: As section Z21.
 - Type: Submit proposal.
 - Mix: Group 3.
 - Packing: If required use slate.
- Bedding components: On full bed of mortar.
- Removal of marks, stains and extraneous mortar on visible faces: Rubbing not permitted.

430 SUPPORT OF EXISTING WORK OVER NEW LINTELS

- Joint above lintels: Fully fill and compact with semidry mortar.

440 ONE PIECE SILLS/ THRESHOLDS

- Bed joints: Leave clear of mortar except at end bearings and beneath masonry mullions.
 - On completion: Point with mortar to match adjacent work.

G10
WML Specification
for
Structural Steelwork

G10 Structural Steel Framing

To be read with Preliminaries/ General conditions.

GENERAL REQUIREMENTS/ INFORMATION

110A DESIGN

- Design standard: The structural steelwork has been designed to BS EN 1993 where applicable.
- Steel grades: Refer to clauses 130 – 135 inclusive.
- Completion of design: Design and detail connections to BS EN 1993.
- Loading requirements: As specified or otherwise calculable.
- Design parameters: as noted on drawings.
- Dead and imposed loads: BS EN 1991-1-1 & BS EN 1991-1-3.
- Wind loading: BS EN 1991-1-4.
- Design of shear studs for composite action: BS EN 1994.

113A CONTRACTOR REQUIREMENTS

- Design all joints, fabrication and erection details, the preparation of shop drawings and the supply, delivery and erection at the site of the Structural Steelwork, shown on the Structural Engineers drawings all in accordance with latest edition of NSSS.

115 DESIGN CONSTRAINTS - GENERAL

- Members forming bracing systems or girders of lattice construction: Unless detailed or instructed otherwise, position so that their lines of action intersect at a point.
- Bolts:
 - Diameter (minimum): 16 mm unless noted otherwise on drawings.
 - Number per connection (minimum): Two, unless otherwise indicated.
 - Other requirements: Minimum Grade 8.8 unless noted otherwise on drawings.
- Punching of bolt holes: Refer to G10/337.
- Welds: 6mm CFW minimum unless noted on drawings.
- Other constraints: None.

120A DRAWINGS AND CALCULATIONS

- Requirement: Before preparing detailed fabrication drawings, submit:
 - General arrangement drawings with individual steel members clearly identified.
 - Calculations for major connections.

125A SPECIFICATION STANDARD

- Standard: Comply with latest edition of National Structural Steelwork Specification (NSSS).
 - Document availability: For the duration of the work, at fabrication shop and on site.
- References to Engineer in NSSS: For the purpose of this contract, interpret such references as being to the person named in section A10 as Consulting Structural Engineer.
Exceptions: None.

126A APPEARANCE AND FIT

- Arrange the setting out, erection juxtaposition of components and application of finishes (working within the practical limits of the design and the specification) to ensure that there is satisfactory fit at junctions and that the finished work has a well aligned, true and regular appearance.
- Wherever satisfactory accuracy, fit and/or appearance of the work are likely to be critical or difficult to achieve, obtain approval of proposals or of the appearance of the relevant aspects of the partially finished work as early as possible.
- Construct the works to higher levels of accuracy than specified where necessary to achieve a satisfactory appearance and to ensure that materials, elements and components of the building fit together as designed.

127A CRITICAL DIMENSIONS

- The following are critical and a higher level of accuracy is required; set out and construct the works to ensure a satisfactory fit where all preassembled furniture, fittings, equipment, components and

items of joinery are to be fixed subsequently.

128A NON COMPLIANCE

- Work which fails to meet the specified levels of accuracy must not be rectified without permission. Submit proposals for such rectification and meet all costs arising, including effects on other work. Allow for the possibility that permission will not be given, necessitating removal and replacement of the work.

129A SETTING OUT

- Check the levels and dimensions of the site against those shown on the drawings, and record the results on a copy of the drawing. Notify C.A. in writing of any discrepancies and obtain instructions before proceeding
- Inform C.A. when overall setting out is complete and before commencing construction.

130A GENERAL STEEL SECTIONS AND PLATES

- Standard: To BS EN 10025-2.
- Grade: S355JR unless specified otherwise on drawings.
Source: Obtain steel from a source accredited to a national or internationally accepted quality standard.

135A HOLLOW STEEL SECTIONS

- Standard: To BS EN 10210.
- Grade: S355J0 unless specified otherwise on drawings.
Source: Obtain steel from a source accredited to a national or internationally accepted quality standard.

136A STAINLESS STEEL

- Submit for approval the specification of any stainless steel.
- Use austenitic stainless steels.

137A INSTRUMENTS

- Provide instruments and assistance for checking the setting out and levels.

138A RECORD DRAWINGS

- Record details of all grid lines, setting-out stations, bench marks and profiles on the site setting-out drawing. Retain on site throughout the Contract and hand to C.A. on completion.

139A APPROVED FIRMS

- All work in connection with Structural Steelwork is to be carried out by an approved firm.
- Submit name of sub-contractor to C.A. for approval.
- Liaise with the C.A., Consultants, Main Contractor and others as necessary to help ensure coordination of the work with related building elements and services.
- Provide fabrication drawings and other information showing complete details of the work.
- Submit sufficient copies of drawings etc., including four copies for the C.A. and Consultants, to the Main Contractor (or C.A. if the Main Contractor has not been appointed) in time to meet the programme. The Main contractor will check the drawings, etc. and submit to C.A. for comment.
- Make any necessary amendments in accordance with any comments of the C.A. and without delay. Unless and until it is required it is confirmed that re-submission is not required, re-submit for further checking and comment, and incorporate any necessary further amendments all as before.
- Submit sufficient copies of the final version of drawings etc., including eight copies for the C.A. and Consultants, to the Main Contractor for distribution to all affected parties. Any proposed departure from the requirements of the tender/subcontractor document must be clearly indicated and supported by all relevant information.
- Should any amendment to drawings etc, required by the C.A. of any discrepancy or divergence that he may be considered to involve or be a variation, notify the C.A. without delay and in any case within 7 days and do not proceed with ordering, fabrication, erection or installation until subsequently instructed. Claims for the extra cost of such work, if made after it has been carried out, may not be allowed.

140A DRAWINGS ETC

- Allow the C.A. 14 days in which to make comments on the first submission of drawings and 7 days on each re-submission.

141A PROPOSALS FOR ERECTION

- At least 14 days before starting erection of steelwork, submit details of:
 - Method and sequence of erection.
 - Type of craneage.
 - Temporary guys and bracing proposed for use during erection.

142A DESIGN

- The aesthetic qualities of joints to exposed steelwork are of prime importance. Do not vary details from those shown on the drawings without detailed agreement of the C.A.

143A DETAILING

- Details for gantry cranes and other lifting devices are to be in accordance with BS 2573.
- Detailed castellated beams to be symmetrical about mid-span.
- End connection of simply supported beams and girders which do not have full lateral restraint of compression flanges within their length to be fully restrained against torsion.
- Unless specified otherwise:
 - Minimum fillet weld size to be 6mm.
 - Minimum holding down bolt diameter 20mm with minimum 100 x 100 x 10 thick square washer plates.
 - State the slip factor uses for the design of h.s.f.g bolted joints.
 - Electrically insulate dissimilar metals from each other with suitable neoprene gaskets, washers and bushes or with other materials approved by the C.A.

144A GALVANISED HOLLOW SECTIONS

- Agree with C.A. location and size of vent holes.

145A VARIATIONS

- For purpose of measuring variations:
 - Weight of steel to be 7850kg/m³
 - Weight of a section to be that quoted by manufacturer, ignoring rolling tolerances
 - Weight of welds and deductions for holes to be ignored.

FRAME SYSTEMS**150A STEEL FRAMING SYSTEM**

- Manufacturer: As indicated on drawings.
System reference: As indicated on drawings.

COLD FORMED MATERIALS**170 COLD-FORMED GALVANIZED STEEL**

- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Material: Galvanized steel sheet to BS EN 10326.
 - Thickness: As indicated on drawings.
 - Designation: As indicated on drawings.

176 PROFILED SHEET FOR SHUTTERING/ COMPOSITE FLOOR SLABS

- Nature of permanent supports: As indicated on drawings
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Material: Galvanized steel sheet to BS EN 10326.
 - Thickness: As indicated on drawings.
 - Designation: S350GD+Z275 N-A-C.

- Metal accessories: Provided by sheet manufacturer unless otherwise indicated: As indicated on drawings.
 - Finish: As for sheet.
- Seam stitching:
 - Fixings/ centres: As indicated on drawings.
 - Coating applied by manufacturer: As indicated on drawings.

177A PROFILED SHEET FOR ROOF DECKING

- Nature of permanent supports: As indicated on drawings
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Material: Galvanized steel sheet to BS EN 10326.
 - Thickness: As indicated on drawings.
 - Designation: S280GD+Z275 N-A-C.

FABRICATION**180 NOTIFICATION OF COMMENCEMENT**

- Notice: Give notice before fabrication is due to start.
 - Period of notice (minimum): Five working days.

181A GENERAL REQUIREMENTS

- Do not fabricate steelwork for which the drawings have not been checked by CA.
- Before fabricating, ensure that surface condition of steel which is to be coated complies with requirements for cleaning given elsewhere in this specification.
- Ensure that fabrication processes do not cause changes in properties of materials resulting in non compliance with specified requirements.

182A STORAGE AND HANDLING

- Store fabricated steelwork clear of the ground and keeps clean.
- Handle and store carefully to avoid damage to steelwork and any protective coatings.
- Identification marks to be visible when members are stacked.

190 MARKING

- Identifying and recording materials and components: Submit details of proposed methods.
- Location of marks:
 - Generally: Visible for checking after erection.
 - Weathering steel: On surfaces not exposed to open view in the completed work.
- Steel to be blast cleaned, pickled, metal sprayed or galvanized: Marked so that subsequent treatment cannot obliterate the marking.

195 HARD STAMPING

- Usage: Not permitted except as indicated on drawings.

196A STRAIGHTENING AND FLATTENING

- Do not hammer.
- Heating to not more than 650° may be used.
- Do not use accelerated cooling without approval.

200 FAYING SURFACES FOR FRICTION GRIP CONNECTIONS

- Location: As noted on drawings.
- Steel 25 mm thick or over: Check faying surfaces for deformities that may reduce slip factor to below design limit.
 - Remedial measures: Submit proposals.
- Preparation/ treatment: Submit proposals.

205A COMPRESSION MEMBERS

- Prepare ends of compression members at splices, caps or bases which are dependent on contact for transmission of compressive stress so that the butting faces are in full contact over an area sufficient to transmit the full load without exceeding the permitted stress in bearing. Where not in full contact the gap must not exceed 0.25mm.

210 END CONNECTIONS

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

215 HOLLOW SECTIONS

- Insides of sections: Debris and moisture removed before sealing ends and openings.

216A GALVANISED HOLLOW SECTIONS

- Plug all holes in galvanised hollow sections which will be exposed to the weather.
- Ensure vent holes are clear in galvanised hollow sections used internally.

220 ACCESS/ VENTILATION HOLES IN BASE PLATES

- Base plates larger than 1 m²: Make 25 mm diameter holes as necessary for pressure grouting, escape of entrapped air or direct compaction of filling/ bedding material.

222A FINISHING

- Remove burrs and sharp edges by grinding.
- Carefully dress welds to remove slag by light hammering, wire brushing or other methods that do not deform the surface of the weld.

225 STEELWORK TO BE GALVANIZED

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

235 SHOP INSPECTION

- Give notice: Before fabricating those members that will be visible in the final structure.
 - Period of notice (minimum): Two working days.

240 TRIAL SHOP ASSEMBLY

- Component: Any primary component as instructed by CA.
- Give notice: Before commencing trial assembly.
 - Period of notice (minimum): Two working days.

WELDING**255 SITE WELDING**

- Usage: Permitted only where indicated on drawings.
- Working conditions: Suitable and safe. Do not weld when surfaces are wet or when ambient temperature is below 0°C.

270 ADDITIONAL WELDS

- Welds (including tack welds) not indicated on drawings: Not permitted without approval.

271A BUTT WELDS

- Use run on and run off plates to ensure full throat thickness at ends of butt welds as follows:
 - Material for plates to be of same grade as material being welded.
 - Prepare plates in same manner as parts being joined.
 - After completion of welding, remove plates by cutting and grind smooth the surfaces where they were attached.
 - Retain and identify plates for inspection.

272A HARDENED STEEL

- Modify welding process for Grade S355 steel which has been hardened by flame cutting.
- Obtain approval of proposals.

273A WEATHER

- During welding operations protect the work from rain, snow, high winds and other inclement weather.
- Do not weld when the temperature of the air or metal is below zero degrees centigrade and maintain a suitable thermometer when outdoor welding is in progress during winter conditions.

285A PROPRIETARY SHEAR CONNECTORS

- Studs: A proprietary type with characteristic yield strength of 350N/mm² and minimum ultimate tensile strength of 450N/mm². Welders to be certified by the equipment manufacturer or other recognised authority as competent for the work. Top surface of beam flange to be free from millscale, rust, grease, oil, paint and other substances detrimental to welding. Ensure that flange is cleaned prior to laying decking.
- Trial welding: Before starting, demonstrate suitability of materials, equipment and welding system proposed for welding of studs. Fix not less than ten studs for testing. During the work, at the beginning of each shift, each welder is to fix not less than two studs for testing.
- Testing trial welds: Visually inspect; each trial weld is to exhibit full 360° 'flash'. Subject each trial stud to a 30° bend test; welds must show no sign of cracking. Production welds; to be visually free from cracks and lack of fusion and capable of developing at least the normal ultimate strength of the studs.

290A FINISHED WELDS

- Finished welds: Carefully dressed to remove slag without deforming surface of weld.
- Where a flush feature quality finish is required, the weld shall be first reinforced and then ground flush to a smooth finish free from scouring marks.

BOLT ASSEMBLIES**312A BLACK BOLTS, SCREWS AND NUTS**

- Dimensions: to BS 4190
- Steel for Grade 4.6 bolts: to BS 4190
- Steel for Grade 8.8 bolts: to BS 3692
- Finish (applied by manufacturer):
 - Protected: - zinc plated and painting
 - Exposed: - galvanised

313A BLACK CUP AND COUNTERSUNK HEAD BOLTS, SCREWS AND NUTS to BS 4933, Grade 4.6

- Finish (applied by manufacturer):
 - Protected: - zinc plated + painting.
 - Exposed: - galvanised

314A PRECISION BOLTS, SCREWS AND NUTS to BS 3692, Grade 8.8

- Finish (applied by manufacturer):
 - Protected: - zinc plated + painting.
 - Exposed: - galvanised.

315A WASHERS to BS 4320

- Finish:
 - Protected: - zinc plated + painting.
 - Exposed: - galvanised.

316A HSFG BOLTS, NUTS AND WASHERS to BS EN 14399

- Finish (applied by manufacturer):
 - Protected: - zinc plated + painting.
 - Exposed: - galvanised

- 317A LOAD INDICATING WASHER to BS EN 14399
- Finish:
 - Protected: - zinc plated + painting
 - Exposed: - galvanised
- 318A HOLDING DOWN BOLTS
- To BS 4190, Grade 8.8 bolts, nut and washer with washer plate.
 - Finish where exposed to be galvanised (applied by manufacturer).
- 319A LOCK NUTS
- Lock nuts shall be in accordance with BS 4929 Part 1.
- 325 DIRECT TENSION INDICATORS
- Standard: To BS EN 14399-9.
 - Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
 - Grade: Appropriate for grade of bolt and nut assembly.
 - Finish: As indicated on drawings.
 - Ancillary components: Washers to BS EN 14399.
 - 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
- Standard: To BS 4464.
- 336A DRIFTS
- Align holes carefully to prevent distortion or enlargement when using drifts.
 - Report any misalignment of holes to C.A. If faulty member is not rejected, ream hole to correct position.
- 337A HOLES
- Drill holes and remove burrs except that holes for black bolts of strength grades below 8.8 may be punched full size through steel not exceeding 16mm thick.
- 338A TAPERED WASHERS
- In addition to the requirements of the latest edition of NSSS, use suitably tapered washers under bolt heads and nuts which bear on sloping surface.
 - Prevent from turning when tightening.
- 339A HSFG BOLTS
- Use in accordance with relevant part of BS EN 1993-1-8.
 - Place a washer under part to be turned. Obtain required tension using an appropriate method of tightening.
- 340A WASHERS
- Place under heads and nuts of all bolts connecting metal coated steel.
- 370 GALVANIZED COATING TO BOLT ASSEMBLIES
- Standard: To BS 7371-6.
 - Galvanizing: Applied by fastener manufacturer. Passivated and lubricated if no additional coatings are specified. Nuts tapped after galvanizing.
 - Use/location: For fixings to steelwork specified on drawings as galvanised.
- 375A SHERARDIZED COATING TO BOLT ASSEMBLIES
- Standard: To BS 7371-8.
 - Class: S1.
 - Sherardizing: Applied by fastener manufacturer and passivated.
 - Use/location: As indicated on drawings.

380A ZINC PLATED FINISH TO BOLT ASSEMBLIES

- Standard: To BS EN ISO 4042.
- Zinc plating: Applied by fastener manufacturer. Clear passivated if no additional coatings are specified. Nuts tapped after plating.
- Use/ location: All locations other than indicated otherwise on drawings.

390 SEALED HOLLOW SECTIONS

- Holes: Sealed to prevent access of moisture.
- Method of sealing: If method of sealing is not specified, submit proposals for approval.

ERECTION**410 PRE-ERECTION CHECKS**

- Scope: At least 7 days before proposed erection start date, check the following:
 - Foundations and other structures to which steelwork will be attached: Accuracy of setting out.
 - Holding down bolts: Position, protruding length, slackness and condition.
- Inaccuracies and defects: Report without delay.
- Permission to commence erection: Obtain.

415A ERECTING STEELWORK

- Set out and erect to latest edition of NSSS.
- Provide all temporary erection bracing necessary to ensure stability of the building during erection. Remove when it is safe to do so, timing to be agreed with the Main Contractor.
- Do not distort steelwork and do not exceed stress limited during erection unless otherwise approved.

420A SETTING OUT

- Permissible deviations: In addition to the requirements of the NSSS, comply with the following:
- Tolerances for bench marks, datum and reference points to be:
 - Master bench mark transferred from ordnance bench mark: ± 10 mm.
 - Transferred bench mark from master bench mark: ± 3 mm.
 - Distance in plan at low level between:
 - a) Datum point
 - b) Datum point and reference point
 - c) Any reference point up to and including 10m: ± 3 , over 10m: ± 5 mm.

425A MODIFICATIONS

- Steelwork: Do not modify without approval.

427A FOUNDATIONS

- Unless shown otherwise, cast holding down bolts in mild steel, 300mm long, 60.3 diameter plus 3.2mm tolerance tubes with 120 x 120 x 10 thick mild steel washer plates.
- Do not grout up holding down bolts until the steelwork has been finally lined, levelled and plumbed and errors corrected.

432 TEMPORARY SUPPORT

- Permanent bracing system:
 - Vertical: As indicated on drawings.
 - Horizontal: As indicated on drawings.
- Temporary bracing/ restraints: Provide as necessary until permanent bracing system is complete and sufficiently mature to carry loads and all connections have been made to the permanent system.
- Elements to be supported: As indicated on drawings.
- Forces and moments in temporary supports: As indicated on drawings.

440A COLUMN BASES

- Levels: Adjust using steel shims or folding wedges no larger than necessary.
- Location of shims/ wedges: Position symmetrically around perimeter of base plate. Do not use a single central pack.

- Give notice: If space beneath any column base is less than, or over 25mm greater than, the specified dimension.
- Accuracy of erection: Check, and correct errors before filling and bedding beneath bases and carrying out other adjacent work.

441 MORTAR FILLING/ BEDDING OF COLUMN BASES

- Bedding thickness range: As indicated on drawings.
- 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: Submit proposals.

442 FINE CONCRETE FILLING/ BEDDING OF COLUMN BASES

- Bedding thickness range: As indicated on drawings.
- Bolt pockets: Completely filled with neat cement slurry.
- Spaces beneath base plates:
 - Spaces 0-25 mm deep: Obtain instructions.
 - Spaces greater than 25 mm: Completely filled with a 1:1.25:2 cement:sand:fine aggregate mix, 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).
- Aggregate size (maximum): 10 mm.
- Additives: Submit proposals.

443 PROPRIETARY FILLING/ BEDDING OF COLUMN BASES

Bedding thickness range: As indicated on drawings.

- Preparation: Concrete surfaces scarified to provide a good mechanical key.
- Bolt pockets and spaces beneath base plates: Completely filled with as indicated on drawings.

445 MOVEMENT JOINTS

- Joint type: Sliding bearing surfaces coated with molybdenum disulfide grease.
 - Requirements: As indicated on drawings.
- Appearance and fit: Bolts centred in slotted holes unless otherwise indicated. Joints free to move.

447 BONDED ANCHORS

- Holes: Clean and free from dust at time of installing anchor.
- Permeable sleeves: Use in conditions where otherwise the loss of bonding agent would be unacceptably high.
- Other requirements: As indicated on drawings.

448A 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.
- Immediately after erection inspect coatings and make good in accordance with paint manufacturer's recommendations.

TESTING**465A TESTING**

- Arrange for the following testing to be carried out. Prepare any necessary test pieces. Submit 2 copies of all test and examination results to C.A. immediately they are available. A provisional sum

for other tests is included elsewhere.

- Test: Ultrasonic testing of full penetration butt welds.
- Frequency/Number: 100%
- Level of acceptability: Category A Table 18 BS 5135 1984.
- Test: Random MPI testing of fillet welds.
- Frequency/Number: As agreed with C.A. up to a maximum of 10% total.
- Level of acceptability: Category B Table 19 BS 5135 1984.

466A TESTING AUTHORITY

- Submit the name of the proposed testing authority to the C.A. for approval.

475 PRODUCTS

- Steel: Submit test certificates.

477A NON COMPLIANCE

- Check and inform C.A. and Sub-contractor if steelwork does not comply with specification.
- Do not grout column bases or carry out any building operations adjacent to steelwork until errors have been corrected.

479A ACCEPTANCE

- Issue a certificate of Acceptance to C.A. with copy to Sub-contractor, when steelwork complies with drawings and specification.

PROTECTIVE COATINGS

510A SURFACES NOT TO BE COATED

- Location:
 - All steelwork encased in concrete unless otherwise specified.
 - Flange of all steel beams with through deck studs unless otherwise specified.
 - Underside of column baseplates.

515A APPROVED FIRMS

- The work specified in this section is to be carried out by an approved Sub-Contractor or the steelwork fabricator.

525A CONTAINERS

- Coating materials to be delivered in sealed containers, clearly labelled with the following information:
 - Type of material
 - Brand name, if any
 - Intended use
 - Manufacturer's batch numbers
 - Relevant safety precautions

526A MANUFACTURER'S RECOMMENDATIONS

- Store, prepare and apply coating materials to manufacturer's recommendations.

527A CODE OF PRACTICE

- Surface preparation, application of protective coatings, working conditions, handling transport and storage to comply with BS EN ISO12944 where not in conflict with manufacturer's recommendation and the specification.

530A GALVANISING

- All cutting, welding and drilling must be completed beforehand.
- Provide all necessary vents and drain holes in approved locations and seal to approval after galvanising.

531A GALVANISED SURFACES

- Wash with white spirit to remove all dirt and grease. If metal coating is defective obtain instruction before proceeding.

535 INSPECTION OF COATING WORK

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

540A HANDLING AND STORING COATED STEELWORK

- Use methods and equipment which will minimise chafing, chipping and other damage to coated components.
- Ensure an adequate drying/curing period for each coat before handling.
- Use suitable packings, lashings, lifting harnesses, nylon slings, rubber protected chains and chocks, etc.
- Stack coated components clear of the ground, separated by timber chocks, and so that ponding does not occur.

545A PROTECTION

- Protect freshly applied surface coatings from damage.
- Exhibit 'wet paint' signs and provide protective barriers where necessary.
- Adequately protect surfaces adjacent to those being covered.

555A REMEDIAL WORK

- Early degradation of coatings by blistering, peeling, flaking, cracking, lack of adhesion, etc. must be made good by complete removal, preparation and reapplication of all coats, as instructed.
- Inadequate dry film thickness or surface defects due to inclement weather may, depending on the type of paint, be remedied by rubbing down and applying further coat(s), as instructed.
- Mechanical damage to coatings must be made good by local cutting back of coatings, preparation and reapplication of all coats to leave a neat, continuous and flat finish.
- Where damage to coatings or subsequent surface preparation has exposed bare metal, it must be thoroughly cleaned and primed within two hours.

PROTECTIVE COATING SYSTEMS**605A SPECIFICATION**

- For specifications of protective coating systems refer to separate sheets appended to this specification.

PREPARATION FOR PAINTING**710 OFFSITE PREPARATION AND PAINTING**

- Working area: Covered and properly lit, heated and ventilated.
- Sequence of working: Select from the following and submit proposals:
 - Fabricate, blast clean, prime.
 - Blast clean, fabricate, remove flash rust with a light overall sweep blast, prime.
 - Blast clean, apply weldable prefabrication primer, fabricate, prime.
- 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.

715A CONTROL SAMPLE(S)

- Provide sample(s) of the following; size 75mm x 75mm showing surface penetration and each successive coat and obtain approval before starting work.

716A PROGRAMME

- Notify C.A. of projected date(s) for start of surface preparation of coating.

717A BLAST CLEANING FOR PAINTING

- Ensure that steel complies with BS EN ISO 8501-1 at time of blasting as follows:
 - Dry blasting: Initial rust grade A or B
 - Wet blasting: Initial rust grade A, B or C
- Thoroughly degrease by washing with water and emulsion cleaner.
- Remove millscale by chipping, grinding and/or heat treatment.
- Blast clean to the specified BS EN ISO 8501-1 quality, and control quality of preparation in accordance with BS EN 12944-4.
- Use chilled iron abrasives to BS EN ISO 11124-3 and BS EN ISO 11124-4 free from contamination by dust, water and oil.
- Remove oil surface defects likely to be detrimental to the protective painting system, including:
 - Defects in the steel, including cracks, surface laminations, shelling and deep pitting as required.
 - Defects resulting from fabrication, including fins at cuts, burrs, sharp edges and weld spatter.
 - Rogue peaks remaining after blasting.

718A BLAST CLEANING OF RUST PITTED STEEL

- After blast cleaning tests shall be carried out for the presence of unacceptable levels of soluble iron corrosion products in accordance with BS 7079. If present wash surfaces with clean water to Engineer approval. Repeat test and washing as necessary until unacceptable levels of soluble corrosion are removed.
- Obtain approval before proceeding with painting.
- Blast cleaning abrasives to be in accordance with BS 7079.

725 MANUAL CLEANING OF NEW STEELWORK

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

730 PREPARATION FOR SITE WELDING OF SHOP PAINTED STEELWORK

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

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.

736 TREATMENT OF SITE WELDED JOINTS IN GALVANIZED 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.
- Coating: Reinstate using one of the methods given in BS EN ISO 1461, clause 6.3.

740 BOLTED JOINTS (OTHER THAN FRICTION GRIP JOINTS)

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

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.
 - Paint systems comprising 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.

760 GALVANIZED FASTENERS

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

765 SITE PREPARATION OF SHOP PAINTED STEELWORK

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

770 SITE PREPARATION OF GALVANIZED SURFACES FOR PAINTING

- Preparation: Thoroughly degrease. Remove white corrosion products. Wash off and allow to dry before applying etching wash or primer.

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.

816A PREPARATION OF MATERIALS

- Do not intermix different coating materials.
- Do not thin without permission of C.A.
- Stir to attain an even consistency before use unless otherwise recommended by manufacturers.

817A CONTAMINATION AND CLEANLINESS

- Ensure that brushes and spraying equipment are free from deleterious solvents, thinners and cleaning agents.
- Keep all brushes, tools and equipment clean.
- Brush down all surfaces immediately before coating and drying.

818A BRUSHING

- Work coatings into all recesses, edgers, intersections and over surfaces generally, to obtain a uniform and continuous film.

819A SPRAY PAINTING

- Apply with a gun recommended by the paint manufacturer to give a uniform and continuous film covering all recesses, edgers, intersections and surfaces generally.
- Spray painting will be employed unless approval for brushing has been obtained from the CA.

820 FILM THICKNESS

- Wet film thickness: During application, check thickness of each coat with a wheel or comb gauge used in accordance with BS EN ISO 2808.
- Accumulated dry film thickness: After each coat has dried, check total accumulated film thickness.
 - Method: Magnetic or electromagnetic meter.
 - Number and position of measurements: As directed.
 - Validation: Measurements to be independently witnessed.
 - Meter calibration: Check against standard shims and recalibrate regularly against a smooth steel reference plate.
- Average dry film thickness:
 - At least specified thickness over any square metre.
 - No reading to be less than 75% of specified thickness.
- Top coat dry film thickness: Sufficient to give an even, solid, opaque appearance.

825A STRIPE COAT

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

850A JUNCTIONS WITH CONCRETE

- Exposed steelwork partially embedded or encased in concrete: Apply two coats of bituminous coating locally to the steel/concrete junction.
- Bituminous coating: LAC by RIW or similar approved.
- Dry film thickness: 75 microns each coat.

G12

WML Specification

for

Isolated Structural Metal Members

G12 Isolated Structural Metal Members

To be read with Preliminaries/ General conditions.

SPECIFICATION

125A SPECIFICATION STANDARD

- Standard: Comply with latest edition of National Structural Steelwork Specification (NSSS).
- Design all joints, fabrication and erection details, the preparation of shop drawings and the supply, delivery and erection at the site of the Structural Steelwork, shown on the Structural Engineer drawings, all in accordance with the latest edition of NSSS.

PRODUCTS

320 STEEL

- Steel: To BS EN 10025-2.
 - Grade: S275JR unless noted otherwise.
 - Section properties and dimensions: To BS 4-1, BS EN 10055, BS EN 10056 or BS EN 10210-2, as appropriate.
 - Surface condition: Free from heavy pitting and rust, burrs, sharp edges and flame cutting dross.

330 PROPRIETARY Structural members

- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Loading: Refer to drawings.
- Finish as delivered: Refer to drawings.
- Other requirements: Refer to drawings.

340 BOLT ASSEMBLIES

- Designation: Black bolts to BS 4190, grade 8.8 unless noted otherwise on drawings.
- Size: As shown on drawings.
- Nuts and washers: Material grade and finish to suit bolts.
- Coating applied by manufacturer:
 - Protected: Zinc plated and painted with W & J Leight & Co. Metaguard K570 or similar approved.
 - Exposed: Galvanised to BS EN ISO 1461:1999.
- Other requirements: Diameter of washers in contact with timber faces to be minimum 3 times bolt diameter, with a thickness not less than 0.25 times bolt diameter.

350 PROPRIETARY ANCHORS TO CONCRETE OR MASONRY

- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Anchor type: Refer to drawings.
- Material: Carbon steel
- Coating applied by manufacturer:
 - Protected: Zinc plated and painted with W & J Leight & Co. Metaguard K570 or similar approved.
 - Exposed: Galvanised to BS EN ISO 1461:1999.

FABRICATION

510 FABRICATION OF STEEL MEMBERS

- Cuts and holes: Accurate and neat.
- Welding: Metal arc method to BS EN 1011-2.
 - Welded joints: Fully fused, with mechanical properties not less than those of the parent metal.
 - Site welding: Obtain approval.
- Joints: Location and layout of fastenings as drawing.

EXECUTION**610 INSTALLATION**

- Accuracy: Members positioned true to line and level using, if necessary, steel packs of sufficient area to allow full transfer of loads to bearing surfaces.
- Fixing: Use washers under bolt heads and nuts.
 - Tapered washers: Provide under bolt heads and nuts bearing on sloping surfaces. Match taper to slope angle and align correctly.

620A BONDED ANCHORS

- Holes: Clean and free from dust at time of installing anchor.
- Permeable sleeves: Use in conditions where otherwise the loss of bonding agent would be unacceptably high.

640 PREPARATION AND PRIMING

- Sequence of working: Fabricate, prepare, prime.
- Surfaces inaccessible after assembly: Apply full treatment and coating system including, if necessary, local application of site coatings.
- Galvanized/ sheradized fasteners: After steelwork erection and before applying site coatings, thoroughly degrease and clean. Etch prime.

650 SHOP PRIMING to all isolated structural metal members unless noted otherwise on drawings.

- Preparation: To BS EN ISO 12944-4. Remove fins, burrs, sharp edges and weld spatter and clean out crevices.
 - Surface finish: Blast cleaned to BS EN ISO 8501-1, grade Sa 2½.
 - Prepared surfaces: Keep in a dry atmosphere and apply first coating without delay.
- Priming:
 - Primer: Epoxy Zinc Phosphate, W & J Leigh & Co. Epigrid C400 V3 or similar approved.
 - Number of coats: One.
 - Dry film thickness (minimum): 75 microns.
 - Application: To BS EN ISO 12944-7.
- Other requirements: Overcoat ends of beams built into solid external walls with high build bituminous paint. Extend coating 100mm from face of wall onto exposed steelwork.

G20

WML Specification

for

Carpentry/ Timber Framing/ First Fixing

G20 Carpentry/Timber Framing/First Fixing

To be read with Preliminaries/ General conditions.

ACCURACY/SETTING OUT

51A TOLERANCES

- Unless specified otherwise construct the works to levels of accuracy so that in relation to BS 5606, Tables 2 and 3:
 - All achieved sizes fall within the permissible deviations, and
 - Approximately two thirds of achieved sizes fall within one third of the permissible deviation.

52A APPEARANCE AND FIT

- Arrange the setting-out, erection juxtaposition of components and application of finishes (working within the practical limits of the design and the specification) to ensure that there is satisfactory fit at junctions and that the finished work has a well aligned, true and regular appearance.
- Wherever satisfactory accuracy, fit and/or appearance of the work are likely to be critical or difficult to achieve obtain approval of proposals or of the appearance of the relevant aspects of the partially finished work as early as possible.
- Construct the works to higher levels of accuracy than specified where necessary to achieve a satisfactory appearance and to ensure that materials, elements, and components of the building fit together as designed.

53A CRITICAL DIMENSIONS

- The following are critical and a higher level of accuracy is required; set out and construct the works to ensure a satisfactory fit where all preassembled furniture, fittings, equipment, components and items of joinery are to be fixed subsequently.

54A NON COMPLIANCE

- Work which fails to meet the specified levels of accuracy must not be rectified without permission. Submit proposals for such rectification and meet all costs arising, including effects on other work. Allow for the possibility that permission will not be given, necessitating removal and replacement of the work.

55A SETTING OUT

- Check the levels and dimensions of the site against those shown on the drawings, and record the results on a copy of the drawing. Notify CA in writing of any discrepancies and obtain instructions before proceeding.

56A SETTING OUT

- Inform CA when overall setting out is complete and before commencing construction.

57A INSTRUMENTS

- Provide instruments and assistance for checking and setting out and levels.

58A RECORD DRAWINGS

- Record details of all grid lines, setting-out stations, bench marks and profiles on the site setting-out drawing.
- Retain on site throughout the contract and hand to CA on completion.

TRUSSED RAFTERS**71A DEFINITIONS**

- 'System Owner': an established roof truss designer, manufacturer with patent or other rights to a particular design of connector plate.
- 'Fabricator': a supplier or licensee, approved or appointed by a particular trussed rafter designer.
- System Owner: the manufacture of components in accordance with designs of that system, who is to be responsible for supplying the trussed rafters for the Contract.

72A TRUSS RAFTERS

- To be fabricated by a firm approved by the S.O.
- Submit name and address of proposed Fabricator with Tender.

73A SCOPE OF WORK

- The fabricator shall provide design drawings and calculations for manufacture and supply of trussed rafter roof components, including all bracing, for the roof layout shown on the drawings.

74A RESPONSIBILITY

- The System Owner shall prepare designs, specifying timber sizes, species and grades along with joint plating requirements and in so doing accepts design responsibility for the trussed rafters.
- Any design carried out by the Fabricator independently of the System Owner shall be the responsibility of the Fabricator.

75A CALCULATIONS & DRAWINGS

- The System Owner or Fabricator shall provide calculations, drawings or any other information to confirm the structural adequacy of his design.

COMPOSITE ENGINEERED TIMBER JOISTS**76WML DEFINITIONS**

- 'System Owner': an established engineered joist designer, manufacturer with patent or other rights to a particular design.
- 'Fabricator': a supplier or licensee, approved or appointed by a particular engineered joist designer.
- 'Component System Owner': the manufacturer of components in accordance with designs of that system, who is responsible for supplying the engineered joists for the Contract.

77WML COMPOSITE ENGINEERED TIMBER JOISTS

- To be fabricated by a firm approved by the S.O.
- Submit name and address of proposed Fabricator with Tender.

78WML SCOPE OF WORK

- The Fabricator shall provide design drawings and calculations for manufacture and supply of engineered joist roof components, including all bracing, for the roof / floor layout shown on the drawings.

79WML RESPONSIBILITY

- The System Owner shall prepare designs, specifying timber and strand board / metal web component sizes and thicknesses, species and grades along with joint plating requirements and in so doing accepts design responsibility for the engineered joists.
- Any design carried out by the Fabricator independently of the System Owner shall be the responsibility of the Fabricator.

80WML CALCULATIONS & DRAWINGS

- The System Owner or Fabricator shall provide calculations, drawings or any other information to confirm the structural adequacy of his design.

STRUCTURAL TIMBER GENERALLY including TRUSSED RAFTERS AND COMPOSITE ENGINEERED TIMBER JOISTS**81A PROGRAMME**

- Fabricator shall agree programme with Main Contractor in accordance with main building programme.

82A ACCESS TO WORKS

- The Fabricator shall allow the Client or C.A. all reasonable access to his works during fabrication.

83A DESIGN AND CO-ORDINATION

- The Fabricator must:
 - Complete the design and detailing of the work, liaising with the C.A., Main Contractor and others as necessary to help ensure co-ordination of the work with related building elements and services.
 - Provide design/fabrication/installation drawings and other information showing complete details of the work.
 - Submit sufficient copies of drawings, etc., including 2 copies for the C.A. and consultants, to Main Contractor (or C.A. if Main Contractor has not been appointed) in time to meet the programme. The Main Contractor will check the drawings, etc. and submit to C.A. for comment. Allow ten working days for CA comment.
 - Make any necessary amendments in accordance with any comments of the C.A. and without delay. Unless and until it is confirmed that re-submission is not required, re-submit for further amendments all as before.
 - Submit sufficient copies of final version of drawings, etc., including 2 copies for the C.A. and consultants, to Main Contractor for distribution to all affected parties. Allow further 5 working days for C.A. comment.
- Any proposed departure from the requirements of the tender/subcontract documents must be clearly indicated and supported by all relevant information.
- Should any amendment to drawings, etc. required by the C.A. or any discrepancy or divergence that he may find is considered to involve or be a variation, notify the C.A. without delay and in any case within 7 days, and do not proceed with ordering, fabrication, erection or installation until subsequently instructed. Claims for the extra cost of such work, if made after it has been carried out may not be allowed.

GENERAL**105 TIMBER PROCUREMENT**

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

110A BASIS OF DESIGN

- The structural timber work shown on the drawings and described in this specification has been designed to BS EN 1995 where applicable, unless stated otherwise.
- The Subcontractor/Supplier must complete the design and detailing of the work to BS EN 1995 to satisfy loading requirements specified or otherwise calculable from the information given.
- The following design parameters have been assumed:
 - Dead and Imposed Loading to BS EN 1991-1-1 and BS EN 1991-1-3.
 - Wind Loading to BS EN 1991-1-4.

- Finishes as indicated on the Drawings.
- Weight of Building Materials to BS EN 1991-1-1.

112A DRAWINGS, ETC

- Drawings etc must show:
 - Geometry of structure.
 - Timber species, sizes and grades or strength classes.
 - Target/finished sizes of all structural timber sections.
 - All joints not detailed on Engineer's drawings, their locations, and evidence as to their structural adequacy.

114A QUALITY OF WORK

- Machine and accurately assemble all structural timber to BS EN 1995.
- Use proprietary products to manufacturer's recommendations.

150 STRENGTH GRADING OF TIMBER

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

160 GRADING AND MARKING OF SOFTWOOD

- Timber of a target/ finished thickness less than 100mm 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**210A STRUCTURAL SOFTWOOD (GRADED DIRECT TO STRENGTH CLASS) FOR STRUCTURAL USE GENERALLY**

- Grading standard: To BS 4978, BS EN 14081-1, or other national equivalent and so marked.
- Strength class to BS EN 338: Refer to drawings.
- Treatment: As clause 312.

310A STRUCTURAL PLYWOOD GENERALLY

- Standard: To the relevant national standards and quality control procedures specified in BS 5268-2, and so marked.
- Type: To be approved.
- Grade: As indicated on drawings.
- Nominal thickness/ number of plies: As shown on drawing.
- Finish: As specified by Architect.
- Treatment: As clause 312.

312A PRESERVATIVE TREATMENT for all structural timber

- Standard: British Wood Preserving and Damp-proofing Association Commodity Specification.
- Preservative: Protim AC500 or similar approved applied after machining.
- Application: Vacuum impregnated in accordance with Manufacturer's instructions. Provide a certificate of assurance that treatment has been carried out as specified.
- Liberally apply the preservative to all new surfaces exposed by minor cutting.

350**WML TRUSSED RAFTERS AND COMPOSITE ENGINEERED TIMBER TRUSSES**

- Design and fabrication: To BS EN 1995-1 and BS EN 14250.
- Manufacturer: A firm currently registered under a third party quality assurance scheme.
- Truss system: As shown on drawings.

- Ancillary components to be supplied by the truss fabricator: As indicated on drawings.
- Treatment: As clause 312.

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.

420 WARPING OF TIMBER

- Bow, spring, twist and cup: Not greater than the limits set down in BS 4978 or BS EN 14081-1 for softwood, or BS 5756 for hardwood.

430 SELECTION AND USE OF TIMBER

- Timber members damaged, crushed or split beyond the limits permitted by their grading: Do not use.

435 NOTCHES, HOLES AND JOINTS IN TIMBER

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

440 PROCESSING TREATED TIMBER

- Cutting and machining: Carry out as much as possible before treatment.
- Extensively processed timber: Retreat timber sawn lengthways, thickened, planed, ploughed, etc.
- Surfaces exposed by minor cutting/ drilling: Treat with two flood coats of a solution recommended by main treatment solution manufacturer.

450A 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%.
- Moisture content to be maintained until completion within 5% of the expected equilibrium moisture content of the building in use.

451 MOISTURE CONTENT TESTING

- Procedure: When instructed, test timber sections with an approved electrical moisture meter.
- Test sample: Test 5% but not less than 10 lengths of each cross-section in the centre of the length.
- Test results: 90% of values obtained to be within the specified range. Provide records of all tests.

510A 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.
- Arrange sequence of construction and cover timber as necessary during and after erection to ensure that specified moisture content is not exceeded.
- Trussed rafters: Keep vertical during handling and storage.

511A HANDLING AND ERECTION INSTRUCTIONS

- Shall be provided by the Fabricator if requested.

- 512A OFF-LOADING, ON-SITE HANDLING AND STORAGE
- Responsibility of the Contractor.
- 513A ERECTION, FIXING AND BRACING OF TRUSSED RAFTERS AND COMPOSITE ENGINEERED JOISTS
- Responsibility of the Contractor.
- 514A STABILITY BRACING
- The Fabricator shall supply all necessary information for temporary and permanent bracing in sufficient detail, as to ensure the work may be correctly carried out by the Contractor.
- 520 EXPOSED END GRAIN
- Components: Seal exposed end grain of the following before delivery to site: External/structural timber.
 - Sealer: Clear end grain sealer.
- 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.
- 551A MINIMUM THICKNESS
- All general Structural Timber to be 50mm unless indicated otherwise on drawings.
 - Trussed rafters to be 50mm.
- 552A FABRICATION
- Tolerances on all timber dimensions and cut components, assembly details, plate embedment and positioning shall be in accordance with the instructions supplied by the System Owner regarding component positions, timber and strand board / metal web component sizes and thicknesses, grades and species and all other relevant design and fabrication requirements.
 - Where appropriate fabrication shall be in accordance with the T.R.A.D.A. Quality Assurance Scheme.
- 553A JOINT FABRICATION
- Press connector plates vertically and both sides simultaneously or where a rolled plate is used by rolling in of plates previously secured by keeper nails.
- 554A RESPONSIBILITY FOR FABRICATION
- The Fabricator shall be responsible for providing trusses / engineered joists within the required tolerances, including gaps at joints, plate positions, timber sizes, and quality and plate embedment.
- 555A CONTACT SURFACES
- Finish mating and bearing surfaces to ensure close contact over their whole area.
- 556A SEPARATE NAIL TYPE FASTENERS
- Fix plates so that they do not project beyond edge of timber sections.
- 557A END JOINTS
- Do not use without approval.

558A CUTTING FOR SERVICES

- To be avoided wherever possible and to be the minimum sizes needed to accommodate the services.
- Notches and holes must not be so positioned in a member that the remainder of the cross section contains a knot or other defect which would significantly affect its strength.
- Notches in joists to be at the top, located between 0.1 and 0.25 of the span from the support and not deeper than 0.125 x depth of joist.
- Holes in joists to be through the neutral axis, with diameters not more than 0.25 x depth of joist and not less than 3 diameters apart.
- Obtain approval in writing from the designer for any cutting for services in fabricated structures or primary members e.g. beams or trimmers.

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: As stated on drawings.
 - Product reference: As stated on drawings.
- Material/ finish: As indicated on drawings.
- 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.

590 METAL PLATE FASTENERS/GUSSETS

- Manufacturer: As stated on drawings.
 - Product reference: As stated on drawings.

591A PLATING OF JOINTS

- In accordance with the I.T.P.A. recommendations.
- Designs shall allow for a 5mm plate positioning tolerance in one or both of the plate axes to give the worst combination of effect of all plates independently.

615 BOLT / SCREW ASSEMBLIES BLACK BOLTS AND NUTS

- Designation: Black bolts to BS EN ISO 898-1, grade 8.8.
- Size: As shown on drawings.
- Coating applied by manufacturer: Galvanised internally as clause 670.
- Nuts and washers: Material grade and finish to suit bolts.
- Washer dimensions: Diameter/ side length of washers in contact with timber faces to be minimum 3 times bolt diameter, with a thickness not less than 0.25 times bolt diameter.

616A BOLT/ SCREW ASSEMBLIES BLACK CUP AND COUNTERSUNK HEAD BOLTS AND NUTS

- Designation: Black cup and countersunk head bolts to BS 4933.
- Size: As shown on drawings.
- Coating applied by manufacturer: Galvanised internally as clause 670.
- Nuts and washers: Material grade and finish to suit bolts.
- Washer dimensions: Diameter / side length of washers in contact with timber faces to be minimum 3 times bolt diameter, with a thickness not less than 0.25 times bolt diameter.

617A BOLT / SCREW ASSEMBLIES STAINLESS STEEL BOLTS, NUTS AND WASHERS

- Designation: Stainless steel bolts to BS EN ISO 3506, grade as indicated on drawings with washers of matching material.
- Size: As shown on drawings.
- Nuts and washers: Material grade and finish to suit bolts.
- Washer dimensions: As indicated on drawings.

630A BOLTED JOINTS

- Bolt spacings (minimum): To BS EN 1995-1-1, table 8.4.
- 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.

635A NAILS

- Steel nails: To BS 1202.
- Material/finish: Mild steel/galvanised used internally.

637A WOOD SCREWS

- Wood screws: To BS 1210.
- Material/finish: Mild steel/galvanised used internally, stainless steel used externally.

650A GLUED JOINTS

- Adhesive: To BS EN 301, type to be approved.
 - Compatibility: Where relevant, obtain manufacturer's confirmation that adhesive is compatible with preservative / fire retardant treatment.
- Glued structural components: Fabricated to BS 6446 in clean, controlled workshop conditions.

655A MOISTURE CONTENT

- Timber which is to be glued: Moisture content to be not more than 15% at time of gluing.

657A TOLERANCES

- Members used in conjunction with connector plates shall have minimum thickness of 50mm measured at 20% moisture content with allowable variation of +/- 0.5mm.
- Variation in thickness between abutting members shall not exceed 1.0mm.

670 ANTI-CORROSION FINISHES FOR FASTENERS

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

ERECTION AND INSTALLATION**710A PROPOSALS FOR ERECTING STRUCTURAL TIMBER (INCLUDING TRUSSED RAFTERS AND COMPOSITE ENGINEERED TIMBER JOISTS)**

- Proposals: Submit details of:
 - Method and sequence of erection.
 - Type of craneage.
 - Temporary guys and bracing proposed for use during erection.
- Latest date for submission: At least 5 working days before starting erecting of timber structure.

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.

741A ACCURACY

- Unless specified otherwise erect structural timber to levels of accuracy so that in relation to BS5606, Tables 2 and 3:
 - All achieved dimensions fall within the permissible deviations.
 - Approximately two thirds of achieved dimensions fall within one third of the permissible deviations.

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.

751A DAMAGE

- Do not make good or replace defective members or joints without prior approval.

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 sheets materials, and wall / floor / ceiling mounted appliances, fixtures, etc. shown on drawings
- Material properties: Additional studs, noggings and battens to be of adequate size and have the same treatment, if any, as adjacent timber supports.

775 BEARINGS

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

780 WALL PLATES

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

784 JOISTS GENERALLY

- Centres: Equal, and not exceeding designed spacing.
- Bowed joists: Installed with positive camber.
- End joists: Positioned approximately 50mm 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 6mm 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.

791 PROPRIETARY JOIST HANGERS.

- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Material / finish: Galvanized.
- Size: To suit joist, design load and crushing strength of supporting construction.

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: With truss clips. 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.

801

WML ENGINEERED JOIST INSTALLATION

- Erection: In accordance with manufacturer's requirements and procedures.
- Engineered joists generally: Do not modify without approval.
- Damaged engineered joists: Do not use.
- Fixing: With wall hangers and straps. Bottom flange of engineered joists to be bearing fully on wall plates.

805 TRUSS CLIPS

- Manufacturer: As shown on drawings.
 - Product reference: As shown on drawings.
- Material / finish: Galvanised steel.
- Fasteners: 32 x 3.5mm galvanized or sherardized square twisted nails in every hole.

810 PERMANENT BRACING OF TRUSSED RAFTERS

- Bracing and binders:
 - Size: As determined by S.O.
 - Method of fixing: To every rafter, strut or tie with not less than two fasteners.
- Fasteners: 75 x 3.35mm galvanized round wire nails.
- Lap joints: Extended over and nailed to at least two truss members.

820 VERTICAL RESTRAINT STRAPS

- Type: As shown on drawings.
- Manufacturer: As shown on drawings.
 - Product reference: As shown on drawings.
- Material / finish: Refer to drawings.
- Size:
 - Cross section: Not less than: 30 x 5mm.
 - Length: As shown on drawings.
- Centres: Not more than 1.2m.
- Fixing:
 - To timber members with not less than two 30 x 3.5mm galvanized square twist.
 - To masonry with not less than six 50mm x 12 gauge sherardized screws evenly spaced, with at least one screw located within 150mm of the bottom end of each strap.

821A TIE-DOWN STRAPS

- Fix to both ends of each truss / roof joist.

830 LATERAL RESTRAINT STRAPS

- Manufacturer: As shown on drawings.
 - Product reference: As shown on drawings.
- Material/ finish: Refer to drawings.
- Size: Not less than 30 x 5mm cross section, 150mm cranked end and length as shown on drawings.
- Fixing: To top of joists / rafters / ties at not more than 1.2m 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/ rafter / 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 38mm thick.
 - Notching: Notch joists so that straps fit flush with surface. Do not notch rafters / ties.
- Fasteners: Not less than four 50mm x 8 gauge sherardized countersunk screws per strap, evenly spread.

831A STRAPS GENERALLY

- Fix to timber sections / components and brick / blockwork with the type and number of fixings recommended by the strap manufacturer.

832A HANGERS/ANCHORS

- Fix to timber with 30 x 3mm sherardized square twisted nails or other approved fastenings in each hole.

840 STRUTTING TO FLOOR JOISTS

- Type: One of the following:
 - Herringbone strutting: At least 38 x 38mm softwood.
 - Solid strutting: At least 38mm thick softwood and at least three quarters of joist depth.
 - Proprietary metal strutting: Submit details.
- Fixing: Between joists as follows:
 - Joist spans of 2.5 to 4.5m: One row at centre span.
 - Joist spans over 4.5m: 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 JOINTS INSPECTION

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

M10
WML Specification

for

Cement Based Levelling/ Wearing Screeds

M10 Cement Based Levelling / Wearing Screeds

To be read with Preliminaries/General conditions.

TYPES OF SCREED

- 115 CEMENT:SAND LEVELLING SCREEDS TO PRECAST FLOORS/INSITU SLABS
- Substrate: Precast floor units / insitu slabs at location shown on drawing.
 - Screed construction: Bonded.
 - Reinforcement for crack control: A142.
 - Thickness:
 - Nominal: As shown on drawings.
 - Minimum: 50 mm.
 - Mix:
 - Proportions (cement:sand): 1:3-4.5.
 - In situ crushing resistance (ISCR) category: A (3 mm maximum indentation).
 - Mass of test weight: 4 kg.
 - Flatness/ Surface regularity class: SR2.
 - Finish: To suit applied finish – Refer to Architects drawings.
 - To receive: Refer to drawings.
 - Other requirements: Refer to drawings.

GENERALLY / PREPARATION

- 205 DESIGN LIFE OF SCREEDS
- Duration: If not shown on drawings seek guidance from CA.
 - Subject to reasonable wear and tear.
 - Location: Refer to drawings.
 - Condition of use: Subject to correct loading and traffic usage throughout duration.
- 210 SUITABILITY OF SUBSTRATES
- General:
 - Suitable for specified levels and flatness/ regularity of finished surfaces. Consider permissible minimum and maximum thicknesses of screeds.
 - Sound and free from significant cracks and gaps.
 - Concrete strength: In accordance with BS 8204-1, Table 2.
 - Cleanliness: Remove plaster, debris and dirt.
 - Moisture content: To suit screed type. New concrete slabs to receive fully or partially bonded construction must be dried out by exposure to the air for minimum six weeks.
- 215 SURFACE HARDNESS OF SUBSTRATES TO RECEIVE POLYMER MODIFIED WEARING SCREEDS
- General: Substrates must restrain stresses that occur during setting and hardening of wearing screeds.
 - Test for surface hardness: To BS EN 12504-2 using a rebound hammer with compliance values selected from the following:
- | Screed thickness | Rebound hammer value |
|--------------------|----------------------|
| 15 mm or less | Greater than 25 |
| Greater than 15 mm | Greater than 30 |
- Report: Submit details of areas where substrates surface hardness does not comply with these values.
- 220 PROPRIETARY LEVELLING/ WEARING SCREEDS
- General: Materials, mix proportions, mixing methods, minimum/ maximum thicknesses and workmanship must be in accordance with recommendations of screed manufacturer.
 - Standard: To BS 8204-3.

230 CONTROL SAMPLES

- General: Complete areas of finished work and obtain approval of appearance before proceeding.
- Screed type: As required by CA.
 - Location/ Size: As required by CA.

251 CONDUITS CAST INTO OR UNDER SCREEDS

- Reinforcement: Overlay with reinforcement selected from:
 - 500 mm wide strip of steel fabric to BS 4483, reference D49, or
 - Welded mesh manufactured in rolls from mild steel wire minimum 1.5 mm diameter to BS 1052, mesh size 50 x 50 mm.
- Placing reinforcement: Mid depth between top of conduit and the screed surface.
 - Width of reinforcement (minimum): 300 mm.
- Screed cover over conduit (minimum): 25 mm.

255 PIPE DUCTS/ TRUNKING

- Preformed access ducts: Before laying screed, fix securely to substrates and level accurately in relation to finished floor surface.

260 FULLY BONDED CONSTRUCTION

- Preparation: Generally in accordance with BS 8204-1.
- Removing mortar matrix: Shortly before laying screed, expose coarse aggregate over entire area of hardened substrate.
- Texture of surface: Suitable to accept screed and achieve a full bond over complete area.
- Bonding coat: To CA approval.

270 PARTIALLY BONDED CONSTRUCTION

- Preparation: Generally in accordance with BS 8204-1.
- Substrate surface: Brushed finish with no surface laitance.
 - Texture of surface: Suitable to accept screed and achieve a bond over complete area.
- Bonding coat: To CA approval.

275 CEMENT SLURRY BONDING

- Slurry type: To CA approval.
- Application: Shortly before laying screed, thoroughly wash clean the surface and keep well wetted for several hours. Remove free water then brush in cement slurry bonding coat of creamy consistency.
- Screeding: While slurry is still wet.

BATCHING/ MIXING**302 CEMENTS**

- Cement types: In accordance with BS 8204-1, clause 5.1.3.

305 AGGREGATES

- Sand: To BS EN 13139.
 - Grading limits: In accordance with BS 8204-1, Table B.1.
- Coarse aggregates for fine concrete levelling screeds:
 - Standard: To BS EN 12620.
 - Designation: 4/10.
- Lightweight aggregates: In accordance with BS 8204-1, Annex A.

307 ADMIXTURES

- Standard: In accordance with BS 8204-1, Table 1.
- Calcium chloride: Do not use in admixtures.

310 BATCHING WITH DENSE AGGREGATES

- Mix proportions: Specified by weight.
- Batching: Select from:

- Batch by weight.
- Batch by volume: Permitted on the basis of previously established weight:volume relationships of the particular materials. Use accurate gauge boxes. Allow for bulking of damp sand.

311 BATCHING WITH LIGHTWEIGHT AGGREGATES

- Standard: In accordance with BS 8204-1, Annex A.
- Mix proportions: Specified by volume.
- Batching: Use accurate gauge boxes.

330 MIXING

- Water content: Minimum necessary to achieve full compaction, low enough to prevent excessive water being brought to surface during compaction.
- Mixing: Mix materials thoroughly to uniform consistency. Mixes other than no-fines must be mixed in a suitable forced action mechanical mixer. Do not use a free fall drum type mixer.
- Consistency: Use while sufficiently plastic for full compaction.
- Ready-mixed retarded screed mortar: Use within working time and site temperatures recommended by manufacturer. Do not retemper.

335 IN SITU CRUSHING RESISTANCE (ISCR)

- Standards and category: In accordance with BS 8204-1, table 4.
 - Testing of bonded and unbonded screeds: To Annex D.
 - Testing of floating levelling screeds: To Annex E.

340 ADVERSE WEATHER

- Screeds surface temperature: Maintain above 5°C for a minimum of four days after laying.
- Hot weather: Prevent premature setting or drying out.

LAYING**345 LEVEL OF SCREED SURFACES**

- Permissible deviation: (allowing for thickness of coverings) ± 10 mm from datum.

350 SCREEDING TO FALLS

- Minimum screed cover: Maintain at the lowest point.
- Falls: Gradual and consistent.
Gradient (minimum): Refer to drawings.

355 FLATNESS/ SURFACE REGULARITY OF FLOOR SCREEDS

- Standard: In accordance with BS 8204-1, Table 5.
- Test: In accordance with BS 8204-1, Annex C.
- Sudden irregularities: Not permitted.

365 FLATNESS/SURFACE REGULARITY OF ROOF SCREEDS

- Sudden irregularities: Not permitted.
- Deviation of surface: Measure from underside of a 2 m straightedge (between points of contact), placed anywhere on surface.
 - Permissible deviation (maximum): 6 mm.

375 COMPACTION OF SCREEDS

- General: Compact thoroughly over entire area.
- Screeds over 50 mm thick: Lay in two layers of approximately equal thickness. Roughen surface of compacted lower layer then immediately lay upper layer.

392 GENERAL REINFORCEMENT

- Steel fabric: To BS 4483.
 - Type: Refer to drawings.
- Installation: In accordance with BS 8204-1.

395 STRIP REINFORCEMENT

- Location: Over beam / wall bearings and at day joint position.
- Steel fabric: To BS 4483.
 - Type A142 mesh.
 - Width of strips: 400 mm.
- Installation: In accordance with BS 8204-1.

405 JOINTS IN LEVELLING SCREEDS GENERALLY

- Laying screeds: Lay continuously using 'wet screeds' between strips or bays. Minimize defined joints.
- Daywork joints: Form with vertical edge.

FINISHING/CURING**510 FINISHING GENERALLY**

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

520 WOOD FLOATED FINISH

- Finish: Slightly coarse, even texture with no ridges or steps.

530 SMOOTH FLOATED FINISH

Finish: Even texture with no ridges or steps.

540 TROWELLED FINISH TO LEVELLING SCREEDS

- Floating: To an even texture with no ridges or steps.
- Trowelling: To a uniform, smooth but not polished surface, free from trowel marks and other blemishes, and suitable to receive specified flooring material.

550 TROWELLED FINISH TO WEARING SCREEDS

- Floating: To an even texture with no ridges or steps.
- Trowelling: Successively trowel at intervals, applying sufficient pressure to close surface and give a uniform smooth finish free from trowel marks and other blemishes.

560 DEWATERED TROWELLED FINISH TO WEARING SCREEDS

- Dewatering: Immediately after compaction of wearing screeds, remove water using a vacuum process.
- Floating: Without delay, power float to an even texture with no ridges or steps.
- Trowelling: Successively trowel at intervals, applying sufficient pressure to close surface and give a uniform smooth finish free from trowel marks and other blemishes.

600 POWER GROUND FINISH TO WEARING SCREEDS

- Floating: To an even surface with no ridges or steps. Immediately commence curing.
- Grinding: When concrete is sufficiently hard for sand particles not to be torn from surface, remove 1 - 2 mm from surface to give an even glass-paper texture, free from blemishes and trowel marks.
- Cleaning: Remove dust and wash down. Resume curing without delay.

650 CURING

- General: Prevent premature drying. Immediately after laying, protect surface from wind, draughts and strong sunlight. As soon as screed has set sufficiently, closely cover with polyethylene sheeting.
- Curing period (minimum): Keep polyethylene sheeting in position for: seven days.
- Drying after curing: Allow screeds to dry gradually. Do not subject screeds to artificial drying conditions that will cause cracking or other shrinkage related problems.

670 ROOF SCREEDS

- Protection: Cover screeds during wet weather. When weathertight coverings are laid, screeds must be as dry as practicable.

P31

WML Specification

for

Holes/ Chases/ Covers/ Supports for Services

P31 Holes, Chases, Covers and Supports for Services

To be read with Preliminaries/ General conditions.

EXECUTION

610 COORDINATION

- Locations and dimensions of holes and chases for services: Submit details to CA for checking before proceeding with the work

620 HOLES AND CHASES IN IN SITU CONCRETE

- Cast in: Holes larger than 10 mm diameter and chases.
- Cutting and drilling:
 - Permitted for holes not larger than 10 mm diameter.
 - Not permitted for holes larger than 10 mm diameter except as indicated on drawings.

630 HOLES AND CHASES IN PRECAST CONCRETE

- Cutting and drilling: Not permitted except as indicated on drawings.

640 HOLES IN STRUCTURAL STEELWORK

- Cutting and drilling: Not permitted except as indicated on drawings.

650 HOLES, RECESSES AND CHASES IN MASONRY

- Locations: To maintain integrity of strength, stability and sound resistance of construction.
- Sizes: Minimum needed to accommodate services.
 - Holes (maximum): 300 x 300 mm.
- Walls of hollow or cellular blocks: Do not chase.
- Walls of other materials:
 - Vertical chases: No deeper than one third of single leaf thickness, excluding finishes.
 - Horizontal or raking chases: No longer than 1 m. No deeper than one sixth of the single leaf thickness, excluding finishes.
- Chases and recesses: Do not set back to back. Offset by a clear distance at least equal to the wall thickness.
- Cutting: Do not cut until mortar is fully set. Cut carefully and neatly. Avoid spalling, cracking and other damage to surrounding structure.

655A CHASES AND HOLES IN MASONRY

- Obtain approval for the position of all holes and chases.
- No horizontal or diagonal chasing will be permitted in any blockwork.
- No vertical chasing will be permitted in hollow or cellular blockwork.

670 NOTCHES AND HOLES IN STRUCTURAL TIMBER

- General: Avoid if possible.
- Sizes: Minimum needed to accommodate services.
- Position: Do not locate near knots or other defects.
- Notches and holes in same joist: Minimum 100 mm apart horizontally.
- Notches in joists: Locate at top. Form by sawing down to a drilled hole.
 - Depth (maximum): 0.125 x joist depth.
 - Distance from supports: Between 0.07 and 0.25 x span.
- Holes in joists: Locate on neutral axis.
 - Diameter (maximum): 0.25 x joist depth.
 - Centres (minimum): 3 x diameter of largest hole.
 - Distance from supports: Between 0.25 and 0.4 of span.
- Notches in roof rafters, struts and truss members: Not permitted.
- Holes in struts and columns: Locate on neutral axis.
 - Diameter (maximum): 0.25 x minimum width of member.
 - Centres (minimum): 3 x diameter of largest hole.
 - Distance from ends: Between 0.25 and 0.4 of span

Q20

WML Specification

for

Granular Sub-Bases To Roads/ Pavings

Q20 Granular Sub-bases to Roads/Pavings

To be read with Preliminaries/ General conditions.

110 THICKNESSES OF SUB-BASE/ SUBGRADE IMPROVEMENT LAYERS

- Thicknesses: See sections:
 - Q22 Coated macadam/asphalt roads/pavings and Q24 Interlocking brick/block roads/pavings.

120A CHECKING OF SUBGRADES

- Subgrade variation: If material appears to vary from that stated in the site investigation report, or if there are extensive soft spots, test subgrade CBR to BS 1377-4 or BS 1377-9.
- Submit results and obtain instructions before proceeding.

130 HERBICIDES

- Type: If not specified on drawings seek guidance from CA.
- Application: To subgrade of – if not specified on drawings seek guidance from CA.

140 EXCAVATION OF SUBGRADES

- Final excavation to formation or subformation level: Carry out immediately before compaction of subgrade.
- Soft spots and voids: Give notice.
- Old drainage and service trenches: Excavate to remove soft or damaged material, then backfill with specified granular sub-base material and compact..
- Wet conditions: Do not excavate or compact when the subgrade may be damaged or destabilized.

145 PREPARATION AND COMPACTION OF SUBGRADES

- Timing: Immediately before placing sub-base.
- Soft or damaged areas: Bring to the attention of the CA.
- Compaction: Thoroughly, by roller or other suitable means, adequate to resist subsidence or deformation of the subgrade during construction and of the completed roads/ pavings when in use. Take particular care to compact fully at intrusions, perimeters and where local excavation and backfilling has taken place.

150 SUBGRADES FOR VEHICULAR AREAS

- Preparation and treatment: To Highways Agency 'Specification for highway works', clauses 616 and 617.

170 GEOTEXTILE FILTER/ SEPARATOR MEMBRANE

- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Jointing: In accordance with manufacturers instructions.
- Protect from:
 - Exposure to light, except during laying (maximum five hours).
 - Contaminants.
 - Materials listed as potentially deleterious by geotextile manufacturer.
 - Damage, until fully covered by fill.
 - Wind uplift, by laying not more than 15 m before covering with fill.
- Preparation: Remove humps and sharp projections and fill hollows before laying.

175 IMPERMEABLE MEMBRANE

- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Jointing: In accordance with manufacturers instructions.
- Protect from: .
 - Exposure to light, except during laying (maximum five hours).
 - Contaminants.
 - Materials listed as potentially deleterious by geotextile manufacturer.
 - Damage, until fully covered by fill.

- Wind uplift, by laying not more than 15 m before covering with fill.
 - Preparation: Remove humps and sharp projections and fill hollows before laying.
 - Other requirements: Refer to drawings.
- 200 SUBGRADE IMPROVEMENT LAYER (CAPPING)
- Material: To Highways Agency 'Specification for highway works', table 6/1, Class 6F1, 6F2 or 6F3.
 - Standard: Placed and compacted to Highways Agency 'Specification for highway works', table 6/1, clauses 612 and 613.3, 613.8, 613.9, 613.10 and 613.13.
- 210 HIGHWAYS AGENCY TYPE 1 UNBOUND MIXTURE FOR SUB-BASE
- Material: Type 1 unbound mixture to Highways Agency 'Specification for highway works', clauses 801 and 803.
 - Recycled aggregate: If not specified on drawings seek guidance from CA.
- 211 GRANULAR MATERIAL
- Quality: Of a known suitability for use in sub-bases, free from excessive dust, well graded, all pieces less than 75mm in any direction, minimum 10% fines value of 50 kN when tested in a soaked condition to BS 812-111 or a resistance to fragmentation of LA50 for the Los Angeles test to BS EN 1097-2, 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.
 - Gravel or hoggin with not more clay content than is required to bind the material together, and with no large lumps of clay.
 - Natural gravel.
 - Natural sand.
 - Filling: Spread and levelled in 150 mm maximum layers, each layer thoroughly compacted.
- 215 COARSE GRADED AGGREGATE FOR PERMEABLE PAVING.
- Material: Refer to drawings.
 - Standard: To BS EN 13242 and paving manufacturers recommendations.
 - Aggregate size: Refer to drawings.
 - Grading: Refer to drawings.
 - Other properties: Refer to drawings.
 - Testing:
 - Materials: Refer to drawings.
 - Sub-base: Refer to drawings.
 - Laying: Refer to drawings.
 - Protection: Prevent damage by traffic and contamination by mud and soil.
- 220 FROST SUSCEPTIBLE GRANULAR MATERIAL
- Definition (non frost susceptible material): To Highways Agency 'Specification for highway works' clause 801.8.
 - Depth of frost susceptible material below final surface of paving (minimum): 450 mm.
 - Testing: Test materials used if required and supply certificates.
- 230 PLACING GRANULAR MATERIAL GENERALLY
- Preparation: Loose soil, rubbish and standing water removed.
 - Structures, membranes and buried services: Ensure stability and avoid damage.
- 240 LAYING GRANULAR SUB-BASES FOR VEHICULAR AREAS
- General: Spread and levelled in layers. As soon as possible thereafter compact each layer.
 - Standard: To Highways Agency 'Specification for highway works' clause 802.
 - At drainage fittings, inspection covers, perimeters and where local excavation and backfilling has taken place: Take particular care to compact fully.
- 250 LAYING GRANULAR SUB-BASES FOR PEDESTRIAN AREAS
- General: Spread and levelled.
 - Compaction:

- Timing: As soon as possible after laying.
- Method: By roller or other suitable means, adequate to resist subsidence or deformation of the sub-base during construction and of the completed paving when in use. Take particular care to compact fully at intrusions, perimeters and where local excavation and backfilling has taken place.

310 ACCURACY

- Permissible deviation from required levels, falls and cambers (maximum):
 - Subgrades:
Roads and parking areas: +20 -30 mm.
Footways and recreation areas: ± 20 mm.
 - Sub-bases:
Roads and parking areas: +10 -30 mm.
Footways and recreation areas: ± 12 mm .

320A SURFACES TO RECEIVE SAND BEDDING FOR PAVING TO SECTIONS Q24 and Q25.

- Blind surface: As necessary before compaction to ensure that surface is tight and dense enough to prevent laying course sand being lost into it during construction or use.
- Material: Sand, fine gravel or PFA.
- Finish: Close, smooth, compacted surface.

330 COLD WEATHER WORKING

- Frozen materials: Do not use.
- Freezing conditions: Do not place fill on frozen surfaces. Remove material affected by frost. Replace and recompact if not damaged after thawing.

340 PROTECTION

- Sub-bases: As soon as practicable, cover with subsequent layers, specified elsewhere.
- Subgrades and sub-bases: Prevent degradation by construction traffic, construction operations and inclement weather.

R12

WML Specification

for

Below Ground Drainage Systems

R12 Below Ground Drainage Systems

To be read with Preliminaries/ General conditions.

GENERAL

- 110 BELOW GROUND DRAINAGE SYSTEMS
- Surface water and rainwater drainage sources: As indicated on drawings.
 - Foul drainage sources: As indicated on drawings.
 - Land drainage sources: As indicated on drawings.
 - Pressure relief drainage sources: As indicated on drawings.
 - Pipes, bends and junctions: As indicated on drawings.
 - Accessories: As indicated on drawings.
 - Manholes, inspection chambers, traps, and separators: As indicated on drawings.
 - Accessories: As indicated on drawings.
 - Disposal: As indicated on drawings.
 - Accessories – general: As indicated on drawings.
- 120 SOAKAWAY SYSTEMS – PRECAST CONCRETE As indicated on drawings
- Rainwater drainage sources: As indicated on drawings.
 - Foul drainage sources: As indicated on drawings.
 - Soakaway units: As indicated on drawings.
 - Accessories: As indicated on drawings.
- 122 SOAKAWAY SYSTEMS – PLASTICS UNITS As indicated on drawings
- Rainwater drainage sources: As indicated on drawings.
 - Foul drainage sources: As indicated on drawings.
 - Soakaway units: As indicated on drawings.
 - Accessories: As indicated on drawings.
 - Pipes, bends and junctions: As indicated on drawings.
- 124 SOAKAWAY SYSTEMS – GRANULAR FILL As indicated on drawings
- Rainwater drainage sources: As indicated on drawings.
 - Foul drainage sources: As indicated on drawings.
 - Soakaways:
 - Geotextile: As indicated on drawings.
 - Granular fill – rubble: As indicated on drawings.
 - Accessories: As indicated on drawings.
 - Pipes, bends and junctions: As indicated on drawings.
- 127 PRIVATE PACKAGED SEPTIC TANK SYSTEMS As indicated on drawings
- Foul drainage sources: Below ground pipelines.
 - Private packaged septic tank units: As indicated on drawings.
 - Accessories: As indicated on drawings.
 - Disposal: As indicated on drawings.
 - Accessories: As indicated on drawings.
- 130 PRIVATE PACKAGED SEWAGE TREATMENT SYSTEMS As indicated on drawings
- Foul drainage sources: Below ground gravity pipelines.
 - Private packaged sewage treatment units: As indicated on drawings.
 - Control panel arrangements:
 - Accessories: As indicated on drawings.
 - Disposal: As indicated on drawings.
- 135 PRIVATE PACKAGED PUMPING STATIONS AND PRESSURE PIPELINE SYSTEMS As indicated on drawings
- Foul drainage sources: Below ground pipelines.
 - Private packaged pumping stations: As indicated on drawings.

- Control panel type: As indicated on drawings.
- Location: As indicated on drawings.
- Distance from tank: As indicated on drawings.
- Accessories: As indicated on drawings.
- Pressure pipes, bends and junctions: As indicated on drawings.
 - Accessories: As indicated on drawings.
- Disposal: As indicated on drawings.

PRODUCTS

311 ADAPTORS TO CLAY DRAINAGE

- Material and standard: Polypropylene to BS EN 295-1 and Kitemark certified.
- Type: As indicated on drawings.
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.

312 ADAPTORS TO PLASTICS DRAINAGE

- Material and standard: Plastics to BS 4660 and Kitemark certified or to BS EN 1401-1 and Kitemark certified.
- Type: As indicated on drawings.
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.

315 ONE PIECE GULLIES AND COVERS

- Standards: To BS EN 1253-1, -2, -3, -4 and -5; or
 - Cast iron: To BS 437 and Kitemark certified, or Agrément certified.
 - Clay: To BS EN 295-1 and Kitemark certified, or Agrément certified.
 - Concrete: To BS 5911-6 and Kitemark certified, or Agrément certified.
 - Plastics: To BS 4660 and Kitemark certified, or Agrément certified.
 - Polypropylene: To BS EN 1852-1.
- Material: Clay.
- Manufacturer: Hepworth or similar approved.
 - Product reference: As indicated on drawings.
- Sizes: As indicated on drawings.
- Outlet sizes: As indicated on drawings.
- Covers: As indicated on drawings.
 - Product reference: As indicated on drawings.
 - Type: As indicated on drawings.
 - Material: As indicated on drawings.
 - Sizes: As indicated on drawings.
 - Loading grades to BS EN 124: As indicated on drawings.
- Silt buckets: As indicated on drawings.
 - Product reference: As indicated on drawings.

327 RAINWATER FILTER AND COLLECTOR UNITS

- Material: Plastics.
- Manufacturer: Hepworth or similar approved.
 - Product reference: As indicated on drawings.

329 PIPES, BENDS AND JUNCTIONS - SUPPLY

- Pipes and fittings: From same manufacturer for each pipeline.

336 PIPES, BENDS AND JUNCTIONS - CLAY - FLEXIBLE JOINTS

- Material and standard: Vitrified clay to BS EN 295-1, Kitemark certified.
- Manufacturer: Hepworth or similar approved.
 - Product reference: As indicated on drawings.
- Sizes:
 - DN 100;

- DN 150; and
- DN 225.
- Crushing strength (minimum): 40kN/m for 100ø and 45kN/m for 225ø.
- Jointing type: Flexible.

342 PIPES, BENDS AND JUNCTIONS - CONCRETE

- Standards: To BS 5911-1 and BS EN 1916, with flexible joints.
- Manufacturer: Stanton Bonner or similar approved.
 - Product reference: As indicated on drawings.
- Sizes: DN 300 and above.
- Shapes: Circular.
- Cement type and content: To BS 5911-1 and BS EN 1916.
- Accessories: As indicated on drawings.

352 ACCESS POINTS - PLASTICS

- Standard: To BS 4660 and Kitemark certified, to BS EN 13589-1, or Agrément certified.
- Manufacturer: Hepworth or similar approved.
- Nominal diameter: As indicated on drawings.
- Bases:
 - Product reference: As indicated on drawings.
- Raising pieces:
 - Product reference: As indicated on drawings.
 - Heights: Provide as required to suit depth to invert level.
- Access covers and frames:
 - Product reference: As indicated on drawings.
 - Loading grades to BS EN 124: As indicated on drawings.

355 ANTIFLOOD VALVES

- Manufacturer: Hepworth or similar approved.
 - Product reference: Stav fix anti-flood valve for 100/150 diameter pipes unless indicated otherwise on drawings. For larger pipes seek guidance from CA if not specified on drawings.

357 CONNECTORS - SADDLE

- Standards:
 - Cast iron: To BS 437 and Kitemark certified, or Agrément certified.
 - Clay: To BS EN 295-1 and Kitemark certified, or Agrément certified.
 - Concrete: To BS 5911-6 and Kitemark certified, or Agrément certified.
 - Plastics: To BS 4660 and Kitemark certified, or Agrément certified.
- Material: Clay.
- Manufacturer: Hepworth or similar approved.
 - Product reference: As required from product range to suit layout.
- Sizes: As indicated on drawings.

359 FLEXIBLE COUPLINGS

- Standard: To BS EN 295-4 or WIS 04-41-01 and Kitemark certified, or Agrément certified.
- Manufacturer: Hepworth or similar approved.
 - Product reference: As required from product range to suit pipes.

367 RAT BARRIERS

- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.

371 RODDING POINTS

- Standards:
 - Cast iron: To BS 437 and Kitemark certified, or Agrément certified.
 - Clay: To BS EN 295-1 and Kitemark certified, or Agrément certified.
 - Concrete: To BS 5911-6 and Kitemark certified, or Agrément certified.
 - Plastics: To BS 4660 and Kitemark certified, or Agrément certified.

- Material: Clay.
- Manufacturer: Hepworth or similar approved.
 - Product reference: As indicated on drawings.
- Sizes: As indicated on drawings.

373 ROOT BARRIERS

- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.

375 SEALED ACCESS FITTINGS

- Standards:
 - Cast iron: To BS 437 and Kitemark certified, or Agrément certified.
 - Clay: To BS EN 295-1 and Kitemark certified, or Agrément certified.
 - Plastics: To BS 4660 and Kitemark certified, or Agrément certified.
 - Polypropylene: To BS EN 1852-1.
- Material: As indicated on drawings.
- Manufacturer: As indicated on drawings.
- Bends:
 - Product reference: As indicated on drawings.
- Branches:
 - Product reference: As indicated on drawings.
- Straights:
 - Product reference: As indicated on drawings.
- Raising pieces:
 - Product reference: As indicated on drawings.
 - Heights: As indicated on drawings.
- Covers:
 - Product reference: As indicated on drawings.

401 INSPECTION CHAMBERS - PLASTICS

- Standard: To BS 7158 or BS EN 13598-1, or Agrément certified.
- Diameter: As indicated on drawings.
- Manufacturer: Hepworth or similar approved.
- Bases:
 - Product reference: As indicated on drawings.
- Shaft units:
 - Product reference: As indicated on drawings.
- Access covers and frames:
 - Product reference: As indicated on drawings.
 - Loading grades to BS EN 124: As indicated on drawings.

407 MANHOLES AND INSPECTION CHAMBERS - CONCRETE

- Standards:
 - To BS 5911-3 and BS EN 1917 and Kitemark certified; or
 - To BS 5911-4 and BS EN 1917.
- Manufacturer: As indicated on drawings.
- Shape: As indicated on drawings.
- Sizes: As indicated on drawings.
- Cement type and content: As indicated on drawings.
- Chamber sections:
 - Product reference: As indicated on drawings.
 - Jointing type: As indicated on drawings.
- Cover slabs:
 - Product reference: As indicated on drawings.
 - Thickness: As indicated on drawings.
 - Loading grades to BS EN 124: As indicated on drawings.
 - Openings: To suit access covers.
- Steps: As indicated on drawings.

- Vortex flow control unit: Required only if indicated on drawings.

409 MANHOLES - CONCRETE - ADDITIONAL COMPONENTS FOR DEEP MANHOLES

- Standards:
 - To BS 5911-3 and BS EN 1917 and Kitemark certified; or
 - To BS 5911-4 and BS EN 1917.
- Manufacturer: As indicated on drawings.
- Cement type and content: As indicated on drawings.
- Landing slabs:
 - Product reference: As indicated on drawings.
 - Sizes: As indicated on drawings.
- Reducing slabs:
 - Product reference: As indicated on drawings.
 - Sizes: As indicated on drawings.
- Straight backed tapers:
 - Product reference: As indicated on drawings.
 - Nominal sizes: As indicated on drawings.
- Shaft sections:
 - Product reference: As indicated on drawings.
 - Sizes: As indicated on drawings.

419 GREASE TRAPS AND CONVERTERS

- Standards: In accordance with BS EN 1825-1 and to
- BS EN 1825-2, and Kitemark or Agrément certified.
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Material: As indicated on drawings.
- Capacity: As indicated on drawings.
- Inlet pipe size: As indicated on drawings.
- Outlet pipe size: As indicated on drawings.
- Accessories: As indicated on drawings.

421 OIL AND PETROL SEPARATOR UNITS - PLASTICS

- Standards: To Environment Agency PPG 3 and BS EN 858-1, with oil level alarm.
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Type: As indicated on drawings.
- Size: As indicated on drawings.
- Inlet pipe size: As indicated on drawings.
- Outlet pipe size: As indicated on drawings.
- Accessories: As indicated on drawings.

433 MANHOLE CHANNELS AND BRANCHES - CONVENTIONAL

- Material: As indicated on drawings.
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.

435 MANHOLE CHANNELS AND BRANCHES - PREFORMED PLASTICS

- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.

437 VORTEX FLOW CONTROL UNITS.

- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Material: As indicated on drawings.
- Drain down secondary outlet pipe: As indicated on drawings.
 - Control type: As indicated on drawings.
 - Operation: From surface.

439 MANHOLE STEPS

- Standard: To BS EN 13101.
- Type: As indicated on drawings.
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Material: As indicated on drawings.

460 STORAGE TANKS

- Material: As indicated on drawings.
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Capacity (minimum): As indicated on drawings.
- Internal arrangements: As indicated on drawings.
- Access shaft extension: As indicated on drawings.
- Access arrangements: As indicated on drawings
- Inlet pipes: As indicated on drawings.
 - Sizes: As indicated on drawings.
 - Invert depth below ground level: As indicated on drawings.
- Outlet pipes: As indicated on drawings.
 - Sizes: As indicated on drawings.
 - Invert depth below ground level: As indicated on drawings.
 - Connected to: As indicated on drawings.
- Vent pipes: As indicated on drawings.
 - Sizes: As indicated on drawings.
- Accessories: As indicated on drawings.

462 STORAGE TANKS - FOUL WATER

- Standard: To BS EN 12566-1.
- Material: As indicated on drawings.
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Capacity (minimum): As indicated on drawings.
- Internal arrangements: As indicated on drawings.
- Access shaft extension: As indicated on drawings.
- Access arrangements: As indicated on drawings.
- Inlet pipes: As indicated on drawings.
 - Size: As indicated on drawings.
 - Invert depth below ground level: As indicated on drawings.
- Vent pipes: As indicated on drawings.
 - Size: As indicated on drawings.
- Accessories: As indicated on drawings.

464 MODULAR STORMWATER ATTENUATION UNITS.

- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Unit size: As indicated on drawings.
- Tank capacity/ size (minimum): As indicated on drawings.

468 PRECAST CONCRETE COVER SLABS

- Standard: To BS 5911-3 and BS EN 1917 and Kitemark certified.
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Size: As indicated on drawings.
- Openings: As indicated on drawings.

471 ACCESS COVERS AND FRAMES

- Standard: To BS EN 124.
- Types: As indicated on drawings.

- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Materials: As indicated on drawings.
- Finishes: As indicated on drawings.
- Sizes: As indicated on drawings.
- Loading grades to BS EN 124: As indicated on drawings.
- Edging trims: As indicated on drawings.
- Accessories: As indicated on drawings.

475 ACCESS LADDERS

- Standard: To BS 4211.
- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.
- Finish: Galvanized to BS EN ISO 1461.
- Accessories: As indicated on drawings.

485 CONCRETE (STRUCTURAL)

- Standard: To BS 8500-2.
- Concrete: Refer to E10/113.

487 CONCRETE (ADOPTABLE MANHOLE BENCHINGS AND SURROUNDS)

- Standard:
 - England and Wales, Northern Ireland: To WRc 'Sewers for Adoption'.
 - Scotland: To WRc 'Sewers for Scotland'.
- Concrete: In situ.

489 CONCRETE (ADOPTABLE MANHOLE BENCHING TOPPING)

- Standard:
 - England and Wales, Northern Ireland: To WRc 'Sewers for Adoption'.
 - Scotland: To WRc 'Sewers for Scotland'.
- Concrete: High strength.

492 GEOTEXTILE MEMBRANES - FILTER

- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.

494 GEOTEXTILE MEMBRANES - IMPERVIOUS

- Manufacturer: As indicated on drawings.
 - Product reference: As indicated on drawings.

496 GRANULAR MATERIAL – NATURAL

- Standard: To BS EN 12620.
- Recycled content: As directed by CA.
- Size: Dependent on location – see Execution clauses in this section, and in sections R16, R17 and R18, if used.

498 GRANULAR SUB-BASE MATERIAL

- Standard: To Highways Agency Volume 1, 'Specification for Highway Works', Type 1 Unbound mixtures for sub-base.
- Recycled content: As directed by CA.

FABRICATION**510 VERMIN GRATINGS FOR OUTFALLS AND OUTLET HEADWALLS**

- Construction: Mild steel frame extending 75 mm beyond pipe opening all around, with 25 mm maximum opening steel mesh grille. Top hinged on built-in fish-tail straps and with bottom pin lock.
- Finish: Galvanized to BS EN ISO 1461 after fabrication.
- Submit: Shop drawings.
 - Timing: Before manufacture.

EXECUTION

- 610 STRIPPING OUT
- Extent of stripping out: As indicated on drawings.
 - Exposed ends of existing drainage to be abandoned: Seal with concrete (general).
- 611 EXISTING DRAINS
- Setting out: Before starting work, check invert levels and positions of existing drains, sewers, inspection chambers and manholes against drawings. Report discrepancies.
 - Protection: Protect existing drains to be retained and maintain normal operation if in use.
- 613 EXCAVATED MATERIAL
- Turf, topsoil, hardcore, etc: Set aside for use in reinstatement.
- 616 SELECTED FILL FOR BACKFILLING
- Selected fill: As-dug material, free from vegetable matter, rubbish, frozen soil and material retained on a 40 mm sieve.
 - Compaction: By hand in 100 mm layers.
- 623 LOWER PART OF TRENCH – GENERAL
- Trench up to 300 mm above crown of pipe: Vertical sides, width as small as practicable.
 - Width (minimum): External diameter of pipe plus 300 mm.
- 625 LOWER PART OF TRENCH - TRANSITION DEPTH
- Trench widths up to 300 mm above crown of pipe (maximum):
 - DN 100 pipelines more than 6.0 m deep: 600 mm.
 - DN 150 pipelines more than 5.4 m deep: 700 mm.
 - DN 225 pipelines more than 4.0 m deep: 800 mm.
 - DN 300 pipelines more than 2.9 m deep: 900 mm.
- 631 TYPE OF SUBSOIL
- General: Where type of subsoil at level of crown of pipe differs from that stated for the type of bedding, surround or support, give notice.
- 635 FORMATION FOR BEDDINGS
- Timing: Excavate to formation immediately before laying beddings or pipes.
 - Mud, rock projections, boulders and hard spots: Remove. Replace with consolidated bedding material.
 - Local soft spots: Harden by tamping in bedding material.
 - Inspection of excavated formations: Give notice.
- 641 PIPES AT DIFFERENT LEVELS IN COMMON TRENCH
- Subtrench: Permissible provided soil of step is stable and unlikely to break away.
 - Subtrench not permissible: Trench depth as required for lower pipe. Increase thickness of bedding to upper pipe as necessary.
 - Lower pipe: Backfill with compacted granular material to at least half way up higher pipe.
 - Clear horizontal distance between pipes (minimum):
 - Pipes up to DN 700: 350 mm.
 - Pipes exceeding DN 700: 500 mm.
- 642A TRENCH SUPPORTS
- Remove trench supports and other obstacles sufficiently to permit compacted filling of all spaces.
- 643A BACKFILLING TO PIPELINES GENERALLY
- Unless specified otherwise, backfill from top of specified surround or protective cushion with material excavated from the trench, compacted in layers not exceeding 300 mm thick.
 - Do not use heavy compactors before there is 600 mm of material over pipes.

644A BACKFILLING UNDER ROADS AND PAVINGS

- Unless specified otherwise, backfill from top of specified surround or protective cushion up to formation level with Granular Sub-base Material Type 1 to HA Specification for Highway Works, Clause 803, laid and compacted in 150 mm layers.

645A BACKFILLING OVER CONCRETE

- Do not start backfilling within 24 hours of placing concrete.
- Do not use heavy compactor and prevent imposition of traffic loads within 72 hours of placing concrete.

646A INSTALLATION GENERALLY

- Obtain pipes and fittings for each pipeline from the same manufacturer unless otherwise specified. Joint differing pipes and fittings with adapters recommended by pipe manufacturer.
- Transport, store, bed and joint pipes, fittings and components in accordance with manufacturer's recommendations.
- Inspect all pipes and fittings carefully before laying and reject any which are defective. In particular ensure that spigots, sockets, couplings and rings are not chipped, damaged or dirty.
- Lay pipes singly, straight to line and true to gradient on an even bed for the full length of the barrel with sockets (if any) facing up the gradient.
- Joint using recommended lubricants, leaving recommended gaps at ends of spigots to allow for movement.
- Adequately protect pipelines from damage and ingress of debris. Seal all exposed ends of pipelines during construction.
- Arrange the work so as to minimise time between laying and testing. Carefully backfill immediately after successful testing.

651A CLASS A SUPPORT CONCRETE CRADLE

- Pipes:
 - Temporary support: Two-layer pads of bituminous dpc or equivalent, on precast concrete cradles.
 - Clearance under pipes (minimum): 100 mm.
 - Adjust pipes to line and gradient.
- Bed:
 - Material: Concrete E10/113.
 - Compact thoroughly.
 - Thickness: From top of blinding to pipe invert.
 - Width (minimum): External diameter of pipe plus 200 mm. Shutter vertical sides of concrete or extend concrete across full width of trench.
- Initial testing before placing support: Required.
- Support:
 - Material: Concrete E10/113.
 - Compact thoroughly.
 - Height: Halfway up each side of pipe.
 - Width: Full width of concrete bed or full width of trench.
- Backfilling:
 - Material: Protective cushion of selected fill.
 - Depth: To 150 mm (250 mm for adoptable sewers) above crown of pipe.
 - Compaction: By hand in 100 mm layers.

653A CLASS B SUPPORT GRANULAR HAUNCH

- Granular material: Single sized or graded aggregate to BS EN 12620.
 - Pipe sizes DN 100 and DN 150: Size 4/10.
 - Pipe sizes DN 225 and DN 300: Size 4/10, 10/20 or 4/20.
 - Pipe sizes DN 375-500: Size 10/20 or 4/20.
 - Pipe sizes DN 600 and above: Size 10/20, 20/40, 4/20 or 4/40.
- Bedding:
 - Material: Granular, compacted over full width of trench.
 - Thickness (minimum): 50 mm for sleeve jointed pipes, 100 mm for socket jointed pipes. If

trench bottom is uneven, increase thickness by 100 mm.

- Pipes: Dig slightly into bedding, rest uniformly on barrels and adjust to line and gradient.
- Initial testing before placing support: Required.
- Support:
 - Material: Granular.
 - Depth: Halfway up each side of pipe.
 - Compaction: By hand.
- Backfilling:
 - Material: Protective cushion of selected fill.
 - Depth: To 150 mm (250 mm for adoptable sewers) above crown of pipe.
 - Compaction: By hand in 100 mm layers.

655A CLASS D BED NATURAL

- Trench: Excavate slightly shallower than final levels.
 - Trimming: By hand to accurate gradients. Replace overdig with compacted soil.
- Pipes: Rest uniformly on barrels, adjust to line and gradient. Do not use hard packings under pipes.
- Initial testing before backfilling: Required.
- Backfilling:
 - Material: Protective cushion of selected fill.
 - Depth: 150 mm (250 mm for adoptable sewers) above crown of pipe.
 - Compaction: By hand in 100 mm layers.

657A CLASS F BEDDING GRANULAR BED

- Granular material: To BS EN 12620.
 - Pipe sizes DN 100 and DN 150: Size 4/10.
 - Pipe sizes DN 225 and DN 300: Size 4/10 or 10/20.
 - Pipe sizes DN 375-500: Size 10/20.
 - Pipe sizes DN 600 and above: Size 10/20 or 20/40.
- Bedding:
 - Material: Granular, compacted over full width of trench.
 - Thickness (minimum): 50 mm for sleeve jointed pipes, 100 mm for socket jointed pipes. Where trench bottom is uneven, increase thickness by 100 mm.
- Pipes: Dig slightly into bedding, rest uniformly on barrels and adjust to line and gradient.
- Initial testing before backfilling: Required.
- Backfilling:
 - Material: Protective cushion of selected fill.
 - Depth: 150 mm (250 mm for adoptable sewers) above crown of pipe.
 - Compaction: By hand in 100 mm layers.

659A CLASS N BEDDING AS DUG MATERIAL

- Granular material: To BS EN 12620.
 - Size: 0/4 or 0/10.
- Bedding:
 - Material: As-dug, compaction fraction not more than 0.3, or granular.
 - Compaction: Over full width of trench.
 - Thickness (minimum): 50 mm for sleeve jointed pipes, 100 mm for socket jointed pipes. Where trench bottom is uneven, increase thickness by 100 mm.
- Pipes: Dig slightly into bedding, rest uniformly on barrels and adjust to line and gradient.
- Initial testing before backfilling: Required.
- Backfilling:
 - Material: Protective cushion of selected fill.
 - Depth: 150 mm (250 mm for adoptable sewers) above crown of pipe.
 - Compaction: By hand in 100 mm layers.

661A CLASS O SUPPORT FULL DEPTH GRANULAR

- Granular material: To BS EN 12620.
 - Pipe sizes DN 100 and DN 150: Size 4/10.
 - Pipe sizes DN 225 and DN 300: Size 4/10 or 10/20.

- Bedding:
 - Material: Granular, compacted over full width of trench.
 - Thickness (minimum): 100 mm.
- Pipes: Dig slightly into bedding, rest uniformly on barrels and adjust to line and gradient.
- Initial testing before placing support: Required.
- Support:
 - Material: Granular.
 - Depth: To slightly above crown of pipe.
 - Compaction: By hand.
- Backfilling:
 - Material and depth:
Protective cushion of selected fill to 300 mm above crown of pipe; or
Additional granular material, to 100 mm above crown of pipe.
 - Compaction: By hand in 100 mm layers.

663A CLASS P SUPPORTFULL DEPTH GRANULAR

- Granular material: To BS EN 12620.
 - Pipe sizes DN 100 and DN 150: Size 4/10.
 - Pipe sizes DN 225 and DN 300: Size 4/10, 10/20 or 4/20.
- Bedding:
 - Material: Granular, compacted over full width of trench.
 - Thickness (minimum): 100 mm.
- Pipes: Dig slightly into bedding, rest uniformly on barrels and adjust to line and gradient.
- Initial testing before placing support: Required.
- Support:
 - Material: Granular.
 - Depth: To slightly above crown of pipe.
 - Compaction: By hand.
- Backfilling:
 - Material and depth:
Protective cushion of selected fill to 300 mm above crown of pipe; or
Additional granular material, to 100 mm above crown of pipe.
 - Compaction: By hand in 100 mm layers.

665A CLASS Q SURROUNDGRANULAR WITH PROTECTION

- Granular material: To BS EN 12620.
 - Pipe sizes DN 100 and DN 150: Size 4/10.
 - Pipe sizes DN 225 and DN 300: Size 4/10, 10/20 or 4/20.
- Bedding:
 - Material: Granular, compacted over full width of trench.
 - Thickness (minimum): 100 mm.
- Pipes: Dig slightly into bedding, rest uniformly on barrels and adjust to line and gradient.
- Initial testing before placing support: Required.
- Surround:
 - Material: Granular.
 - Depth (minimum): To 75 mm above crown of pipe.
 - Compaction: By hand.
- Flexible filler:
 - Material: As indicated on drawings.
 - Laying: Continuously over completed surround before laying protection slabs.
- Protection slabs:
 - Material: Precast concrete paving flags to BS7263, 450 mm wide and butted together (if necessary increasing the width of the upper part of the trench).
 - Backfilling: Soil or topsoil, as appropriate.

667A CLASS S SURROUNDGRANULAR

- Trench width up to 300 mm above crown of pipe (maximum):
 - DN 100 nominal pipe size: 600 mm.

- DN 150 nominal pipe size: 700 mm.
- DN 225 nominal pipe size: 800 mm.
- DN 300 nominal pipe size: 900 mm.
- Granular material: Single sized or graded aggregate to BS EN 12620.
 - Pipe sizes DN 100 and DN 150: Size 4/10.
 - Pipe sizes DN 225 and DN 300: Size 4/10, 10/20 or 4/20.
 - Pipe sizes DN 375-500: Size 10/20 or 4/20.
 - Pipe sizes DN 600 and above: Size 10/20, 20/40, 4/20 or 4/40.
- Bedding:
 - Material: Granular, compacted over full width of trench.
 - Thickness (minimum): 50 mm for sleeve jointed pipes, 100 mm for socket jointed pipes. Where trench bottom is uneven, increase depth by 100 mm.
- Pipes: Dig slightly into bedding, rest uniformly on barrels and adjust to line and gradient.
- Initial testing before placing surround: Required.
- Surround:
 - Material: Granular.
 - Depth: To 50 mm above crown of pipe.
 - Compaction: By hand in 100 mm layers.
- Backfilling:
 - Material: Protective cushion of selected fill.
 - Depth: 150 mm (250 mm for adoptable sewers) above crown of pipe.
 - Compaction: By hand in 100 mm layers.

673A CLASS W SURROUND GRANULAR

- Timing: Excavate trench after hardcore has been laid and compacted.
- Granular material: To BS EN 12620.
 - Pipe sizes DN 100 and DN 150: Size 4/10.
 - Pipe sizes DN 225 and DN 300: Size 4/10 or 10/20.
- Bedding:
 - Material: Granular, compacted over full width of trench.
 - Thickness (minimum): 100 mm.
- Pipes: Dig slightly into bedding, rest uniformly on barrels and adjust to line and gradient.
- Initial testing before placing surround: Required.
- Surround:
 - Material: Granular.
 - Depth: To 100 mm above crown of pipe.
 - Compaction: By hand.
- Backfilling:
 - Material: Hardcore as section D20, or granular.
 - Depth: Up to slab formation.
 - Compaction: In 300 mm (maximum) thick layers.

676A CLASS Y SURROUND SHALLOW PIPES UNDER BUILDINGS

- Timing: Excavate trench after hardcore has been laid and compacted.
- Blinding:
 - Material: Concrete (general).
 - Thickness (minimum): 25 mm.
 - Width: Full width of trench.
 - Allow to set before proceeding.
- Pipes:
 - Temporary support: Folding wedges of compressible board. Prevent flotation.
 - Clearance under pipes (minimum): 100 mm.
 - Adjust pipes to line and gradient.
- Initial testing before placing surround: Required.
- Surround, cast integrally with slab:
 - Material: Concrete of same mix as slab.
 - Width (minimum): External diameter of pipe plus 150 mm.
- Extent of surround: To within 150 mm of nearest flexible joint.

678A CLASS Z SURROUND CONCRETE

- Blinding:
 - Material: Concrete (general).
 - Thickness (minimum): 25 mm.
 - Width: Full width of trench.
 - Allow to set before proceeding.
- Pipes:
 - Temporary support: Folding wedges of compressible board. Prevent flotation.
 - Clearance under pipes (minimum): 100 mm.
 - Adjust pipes to line and gradient.
- Initial testing before placing surround: Required.
- Surround:
 - Material: Concrete E10/113.
 - Depth: To 150 mm above crown of pipe.
 - Width: Full width of trench.
- Vertical construction joints:
 - Location: At face of flexible pipe joints.
 - Material: 18 mm thick compressible board precut to profile of pipe.
 - Socketed pipes: Fill gaps between spigots and sockets with resilient material to prevent entry of concrete.

680 CONCRETE SURROUND FOR PIPE RUNS NEAR FOUNDATIONS

- Class Z surround: Provide in locations where bottom of trench is lower than bottom of foundation and as follows (horizontal clear distance between nearest edges of foundations and pipe trenches):
 - Trenches less than 1 m from foundations: Top of concrete surround not lower than bottom of foundation.
 - Trenches more than 1 m from foundations: Top of concrete surround not lower than Dmm below bottom of foundation, where D mm is horizontal distance of trench from foundation, less 150 mm.

683 LAYING PIPELINES

- Laying pipes: To true line and regular gradient on even bed for full length of barrel with sockets (if any) facing up the gradient.
- Ingress of debris: Seal exposed ends during construction.
- Timing: Minimize time between laying and testing.

685 JOINTING PIPELINES

- Connections: Durable, effective and free from leakage.
- Junctions, including to differing pipework systems: With adaptors intended for the purpose.
- Cut ends of pipes: Clean and square. Remove burrs and swarf. Chamfer pipe ends before inserting into ring seal sockets.
- Jointing or mating surfaces: Clean and, where necessary, lubricate immediately before assembly.
- Allowance for movement: Provide and maintain appropriate clearance at ends of spigots as fixing and jointing proceeds.
- Jointing material: Do not allow to project into bore of pipes and fittings.

687 CONCRETE SURROUND FOR CROSSOVERS

- Class Z surround: Provide where two pipelines (other than plastics pipes) cross with less than 300 mm separation.
 - Extent, on both pipes: 1 m centred on the crossing point, and beyond as necessary to come within 150 mm of nearest flexible joints.

689 PIPELINES PASSING THROUGH STRUCTURES

- Pipelines that must be cast in or fixed to structures (including manholes, catchpits and inspection chambers): Provide 600 mm long rocker pipes adjacent to the external face of the structure (or both faces where appropriate, e.g. walls to footings), with flexible joints at both ends.
 - Distance to rocker pipe from structure (maximum): 150 mm.
- Provision for movement for pipelines that need not be cast in or fixed to structures (e.g. walls to

footings):

- Rocker pipes as specified above; or
- Openings in the structures to give 50 mm minimum clearance around the pipeline. Closely fit a rigid sheet to each side of opening to prevent ingress of fill or vermin.

690A DIFFERENTIAL SETTLEMENT

- Comply with Local Authorities requirements in respect of arrangement, flexible jointing, bedding and surround of pipes at junctions with manholes, foundation walls and other points where differential settlement could occur.

691 BENDS AT BASE OF SOIL STACKS

- Type: As indicated on drawings.
 - Radius to centreline of pipe (minimum): As indicated on drawings.
- Height of invert of horizontal drain at base of stack below centreline of lowest branch pipe (minimum): As indicated on drawings.
- Bedding: Do not impair flexibility of pipe couplings.
 - Material: Concrete (general).

693 DIRECT CONNECTION OF GROUND FLOOR WCS TO DRAINS

- Drop from crown of WC trap to invert of drain (maximum): 1.3 m.
- Horizontal distance from the drop to a ventilated drain (maximum): 6 m.

695 BACKDROP PIPES OUTSIDE MANHOLE WALLS

- Excavation beneath backdrop pipe: Backfill.
 - Material: Concrete (structural).
- Pipe encasement:
 - Material: Concrete (structural).
 - Thickness (minimum): 150 mm.

697 INSTALLING FLEXIBLE COUPLINGS

- Ends of pipes to be joined: Cut cleanly and square.
- Outer surfaces of pipes to be joined: Clean and smooth. Where necessary, e.g. on concrete or iron pipes, smooth out mould lines and/ or apply a cement grout over the sealing area.
- Clamping bands: Tighten carefully to make gastight and watertight seals.

699 CONNECTIONS TO SEWERS

- General: Connect new pipework to existing adopted sewers to the requirements of the adopting authority or its agent.

705 INITIAL TESTING OF PIPELINES

- Before testing:
 - Cement mortar jointing: Leave 24 h.
 - Solvent welded pipelines: Leave 1 h.
- Method: Block open ends of pipelines to be tested and pressurise. Air test short lengths to BS EN 1610.

711 TRENCH SUPPORTS

- Removal of trench supports and other obstacles: Sufficient to permit compacted filling of all spaces.

713 INSTALLING ROOT BARRIERS

- Root barrier installation: Full depth of excavation. Fit closely to trench wall nearest tree.

715 BACKFILLING TO PIPELINES

- Backfilling above top of surround or protective cushion: Material excavated from trench, compacted in layers 300 mm (maximum) thick.
- Heavy compactors: Do not use before there is 600 mm (total) of material over pipes.

- 718 BACKFILLING OVER CONCRETE
- Minimum times from placing concrete:
 - Backfilling generally: 24 h.
 - Heavy compactors and traffic loads: 72 h.
- 720 BACKFILLING UNDER ROADS AND PAVINGS
- Backfilling from top of surround or protective cushion up to formation level: Granular sub-base material, laid and compacted in 150 mm layers.
- 722 PUBLIC ROADS AND PAVINGS – E&W, SCOT
- Excavating and backfilling of trenches: To Department for Transport 'Specification for the reinstatement of openings in highways'.
- 724 PUBLIC ROADS AND PAVINGS - NI
- Excavating and backfilling of trenches: To Northern Ireland Road Authority and Utilities Committee 'Specification for the reinstatement of openings in highways'.
- 726 FOAMED CONCRETE BACKFILL
- Preparation: Seal off openings in, and ends of, abandoned pipelines and ducts. Seal off cavities in or next to the excavation which are not to be filled.
 - Backfilling: To British Cement Association 'Foamed concrete - specification for use in the reinstatement of openings in highways'.
- 728 LAYING WARNING MARKER TAPES
- Installation: During backfilling, lay continuously over pipelines.
 - Depth: 300-400 mm.
 - Pipelines deeper than 2 m: Lay an additional tape 600 mm above the top of the pipeline.
- 732 TEMPORARY BRIDGES
- Trench bridges: As necessary to prevent construction traffic damaging pipes after backfilling.
- 734 INSTALLING ACCESS POINTS AND GULLIES
- Bedding:
 - Material: As indicated on drawings.
 - Thickness (minimum): As indicated on drawings.
 - Surround:
 - Material: As indicated on drawings.
 - Thickness (minimum): As indicated on drawings.
 - Height: As indicated on drawings.
 - Backfilling: As indicated on drawings.
 - Material: As indicated on drawings.
 - Compaction: By hand in 100 mm layers.
 - Setting out relative to adjacent construction features: Square and tightly jointed.
 - Permissible deviation in level of external covers and gratings: +0 to -6 mm.
 - Raising pieces (clay and concrete units): Joint with 1:3 cement:sand mortar.
 - Exposed openings: Fit purpose made temporary caps. Protect from traffic.
- 736 INSTALLING RODDING POINTS
- Bedding and surround:
 - Material: Concrete (general).
 - Thickness (minimum): 100 mm.
 - Permissible deviation in level of external covers and gratings: +0 to -6 mm.
- 741 INSTALLING INSPECTION CHAMBERS - PLASTICS
- Bedding:
 - Material: As indicated on drawings.
 - Thickness (minimum): As indicated on drawings.
 - Surround:
 - Material: As indicated on drawings.

- Thickness (minimum): As indicated on drawings.
- Backfilling: As indicated on drawings.
 - Compaction: By hand in 100 mm layers.
- Concrete collar:
 - Material: As indicated on drawings.
 - Thickness (minimum): As indicated on drawings.
 - Width (minimum): As indicated on drawings.
- Seating: As indicated on drawings.

743 INSTALLING CONCRETE MANHOLES

- Bases:
 - Material: As indicated on drawings.
 - Thickness (minimum): As indicated on drawings.
- surround:
 - Material: As indicated on drawings.
 - Thickness (minimum): As indicated on drawings.
 - Height: As indicated on drawings.
- Backfilling:
 - Material: As indicated on drawings.
 - Compaction: By hand in 100 mm layers.

745 INSTALLING GREASE TRAPS AND CONVERTERS

- Base:
 - Material: Concrete (general).
 - Thickness (minimum): As indicated on drawings.
- Surround: As indicated on drawings.
 - Material: As indicated on drawings.
 - Thickness (minimum): As indicated on drawings.
- Backfilling: As indicated on drawings.
 - Compaction: By hand in 100 mm layers.

747 INSTALLING OIL AND PETROL SEPARATOR UNITS

- Base:
 - Material: Concrete (general).
 - Thickness (minimum): As indicated on drawings.
- Surround:
 - Material: As indicated on drawings.
 - Thickness (minimum): As indicated on drawings.
- Backfilling: As indicated on drawings.
 - Compaction: By hand in 100 mm layers.
- Installation: Fill tank with water then encase tank and access shafts with concrete to fully support tank.
- Vent pipe termination: As indicated on drawings.

750 INSTALLING VORTEX FLOW CONTROL UNITS

- Benching:
 - Material: As indicated on drawings.
 - Profile: Rise from manhole base to a level not lower than soffit of outlet pipe, then slope upwards at 10% towards soffit of inlet pipe.
 - Topping:
 - Material: As indicated on drawings.
 - Application: Before benching concrete has set, and with dense smooth uniform finish.
- Vortex flow control mounting block (cast in situ):
 - Material: As indicated on drawings.
 - Profile: Rise from manhole base vertically to provide plane surface for attachment of unit.
- Outlet pipe: Build in.
- Drain down secondary outlet pipe: As indicated on drawings.

- 753 **FIXING MANHOLE STEPS**
- Fixing: Bed in joints.
 - Positioning: 300 mm vertical centres staggered 300 mm horizontally, with lowest step 300 mm (maximum) above benching and top step 450 mm (maximum) below top of cover.
- 755 **JOINTING CONCRETE MANHOLE CHAMBER SECTIONS**
- Jointing and sealing: As indicated on drawings.
 - Inner joint surface: Trim surplus jointing material extruded into chamber and point neatly.
- 757 **LAYING CONVENTIONAL CHANNELS, BRANCHES AND BENCHING**
- Main channel: Bed solid in 1:3 cement:sand mortar.
 - Branches: Connect to channel, preferably at half pipe level, so that discharge flows smoothly in direction of main flow.
 - Branches greater than nominal size 150 mm: Connect the branch soffit level with the main drain soffit.
 - Connecting angles more than 45° to direction of flow: Use three-quarter section channel bends.
 - Benching:
 - Material: As indicated on drawings.
 - Profile: Rise vertically from top of main channel to a level not lower than soffit of outlet pipe, then slope upwards at 10% to walls.
 - Topping:
 - Material: As indicated on drawings.
 - Application: Before benching concrete has set, and with dense smooth uniform finish.
- 759 **LAYING PREFORMED PLASTICS CHANNELS, BRANCHES AND BENCHING**
- Main channel: Bed solid in 1:3 cement:sand mortar.
 - Branches: Connect to channel, preferably at half pipe level, so that discharge flows smoothly in direction of main flow.
 - Connecting angles more than 45° to direction of flow: Use three-quarter section channel bends.
 - Bedding: 1:3 cement:sand mortar. Use clips or ensure adequate mechanical key.
 - Benching:
 - Material: Concrete (general).
 - Profile: Rise vertically from top of main channel to a level not lower than soffit of outlet pipe, then slope upwards at 10% to walls.
 - Topping:
 - Material: As indicated on drawings.
 - Application: Before benching concrete has set, and with dense smooth uniform finish.
- 761 **LAYING SEALED ACCESS FITTINGS, BRANCHES AND BENCHING**
- Unused branches: Fit caps.
 - Bedding: 1:3 cement:sand mortar.
 - Benching:
 - Material: Concrete (general).
 - Profile: 10% fall from manhole walls to component rim.
 - Topping:
 - Material: As indicated on drawings.
 - Application: Before benching concrete has set, and with dense smooth uniform finish.
- 766 **INSTALLING UNDERGROUND STORAGE TANK UNITS**
- Base:
 - Material: As indicated on drawings.
 - Thickness (minimum): As indicated on drawings.
 - Stabilizing: Before placing surround, fill with water to as indicated on drawings.
 - Surround:
 - Material: As indicated on drawings.
 - Thickness (minimum): As indicated on drawings.
 - Height above top of base: As indicated on drawings.
 - Backfilling to upper part of tank: As indicated on drawings.
 - Compaction: By hand in 100 mm layers.

771 INSTALLING OUTFALLS

- Pipe outflow invert (minimum): Seasonal peak level or 150 mm above normal water level, whichever is the higher.
- Pipe surround and backfill to the last 2 m run of drain: Excavated subsoil, rammed home.

773 INSTALLING ACCESS COVERS AND FRAMES

- Seating: As indicated on drawings.
- Bedding and haunching of frames: Continuously.
 - Material: As indicated on drawings.
 - Top of haunching: 30 mm below surrounding surfaces.
- Horizontal positioning of frames:
 - Centred over openings.
 - Square with joints in surrounding paving.
- Vertical positioning of frames:
 - Level; or
 - Marry in with levels of surrounding paving.
- Permissible deviation in level of external covers and frames: +0 to -6 mm.

776 EXPOSED OPENINGS IN INSPECTION CHAMBERS, ACCESS POINTS, FITTINGS AND EQUIPMENT

- General: Fit purpose made temporary caps. Protect from site traffic.

COMPLETION**901 REMOVAL OF DEBRIS AND CLEANING**

- Preparation: Lift covers to manholes, inspection chambers and access points. Remove mortar droppings, debris and loose wrappings.
 - Timing: Before cleaning, final testing, CCTV inspection if specified, and immediately before handover.
- Cleaning: Thoroughly flush pipelines with water to remove silt and check for blockages.
- Rod pipelines between access points if there is any indication that they may be obstructed.
- Washings and detritus: Do not discharge into sewers or watercourses.
- Covers: Securely replace after cleaning and testing.

903 TEMPORARY MEASURES

- Water used to stabilize tanks and the like during installation: Drain.

911 TESTING AND INSPECTION

- Dates for testing and inspection: Give notice.
 - Period of notice: 7 days.

921 FINAL TESTING OF PRIVATE GRAVITY DRAINS AND SEWERS UP TO DN 300

- Before testing:
 - Cement mortar jointing: Leave 24 h.
 - Solvent welded pipelines: Leave 1 h.
- Standard: To Building Regulations.
- Method: Water.

931 FINAL TESTING OF ADOPTABLE AND LARGE PRIVATE SEWERS

- Standard (sewers up to and including size DN 750):
 - England, Wales and Northern Ireland: To WRc 'Sewers for adoption'.
 - Scotland: To WRc 'Sewers for Scotland'.
- Method: Water.

941 WATER TESTING OF MANHOLES AND INSPECTION CHAMBERS

- Timing: Before backfilling.
- Standard:
 - Exfiltration: To BS EN 1610.
 - Method: Testing with water (method W).

- Infiltration: No identifiable flow of water penetrating the chamber.

971 CCTV INSPECTION OF PRIVATE PIPELINES

- General: Carry out and record internal inspection using CCTV equipment.
 - Locations to be inspected: All main pipe runs. Exact survey to be agreed with CA.
- Illumination: Of adequate intensity.
- Recording: Provide continuous position recording, still photographs and stopping of the camera at any point.
 - Copy of videotape recording: Submit.

976 CCTV INSPECTION OF ADOPTABLE PIPELINES

- General: Permit the Adopting Authority or its agent to carry out and record internal CCTV inspection of pipelines and associated manholes after completion.
 - Locations to be inspected: To be agreed with CA.
- Pipelines under highways: Complete construction, except for laying of wearing course, before inspection.

978 LIFTING KEYS

- Lifting keys: Supply suitable keys for each type of access cover.
Timing: At completion.

Z20

WML Specification

for

Fixings / Adhesives

Z20 Fixings and Adhesives

To be read with Preliminaries/General conditions.

PRODUCTS

310 FASTENERS GENERALLY

- Materials: To have:
 - Bimetallic corrosion resistance appropriate to items being fixed.
 - Atmospheric corrosion resistance appropriate to fixing location.
- Appearance: Submit samples on request.

320 PACKINGS

- Materials: Noncompressible, corrosion proof.
- Area of packings: Sufficient to transfer loads.

330 NAILED TIMBER FASTENERS

- Nails:
 - Steel: To BS 1202-1 or BS EN 10230-1.
 - Copper: To BS EN 1202-2.
 - Aluminium: To BS 1202-3.

340 MASONRY FIXINGS

- Light duty: Plugs and screws.
- Heavy duty: Expansion anchors or chemical anchors.

350 PLUGS

- Type: Proprietary types to suit substrate, loads to be supported and conditions expected in use.

360 ANCHORS

- Types:
 - Expansion: For use in substrate strong enough to resist forces generated by expansion of anchor.
 - Adhesive or chemical:
 - For use in substrate where expansion of anchor would fracture substrate.
 - For use in irregular substrate where expansion anchors cannot transfer load on anchor.
 - Cavity: For use where the anchor is retained by toggles of the plug locking onto the inside face of the cavity.

370 WOOD SCREWS

- Type:
 - Wood screws (traditional pattern).
 - Standard: To BS 1210.
 - Wood screws.
 - Pattern: Parallel, fully threaded shank or twin thread types.
- Washers and screw cups: Where required are to be of same material as screw.

380 MISCELLANEOUS SCREWS

- Type: To suit the fixing requirement of the components and substrate.
 - Pattern: Self-tapping, metallic drive screws, or power driven screws.
- Washers and screw cups: Where required to be of same material as screw.

390 ADHESIVES GENERALLY

- Standards:
 - Hot-setting phenolic and aminoplastic: To BS 1203.
 - Thermosetting wood adhesives: To BS EN 12765.
 - Thermoplastic adhesives: To BS EN 204.

410 POWDER ACTUATED FIXING SYSTEMS

- Types of fastener, accessories and consumables: As recommended by tool manufacturer.

EXECUTION**610 FIXING GENERALLY**

- Integrity of supported components: Select types, sizes, quantities and spacings of fixings, fasteners and packings to retain supported components without distortion or loss of support.
- Components, substrates, fixings and fasteners of dissimilar metals: Isolate with washers/ sleeves to avoid bimetallic corrosion.
- Appearance: Fixings to be in straight lines at regular centres.

620 FIXING THROUGH FINISHES

- Penetration of fasteners and plugs into substrate: To achieve a secure fixing.

630 FIXING PACKINGS

- Function: To take up tolerances and prevent distortion of materials and components.
- Limits: Do not use packings beyond thicknesses recommended by fixings and fasteners manufacturer.
- Locations: Not within zones to be filled with sealant.

640 FIXING CRAMPS

- Cramp positions: Maximum 150 mm from each end of frame sections and at 600 mm maximum centres.
- Fasteners: Fix cramps to frames with screws of same material as cramps.
- Fixings in masonry work: Fully bed in mortar.

650 NAILED TIMBER FIXING

- Penetration: Drive fully in without splitting or crushing timber.
- Surfaces visible in completed work: Punch nail heads below wrot surfaces.
- Nailed timber joints: Two nails per joint (minimum), opposed skew driven.

660 SCREW FIXING

- Finished level of countersunk screw heads:
 - Exposed: Flush with timber surface.
 - Concealed (holes filled or stopped): Sink minimum 2 mm below surface.

670 PELLEDED COUNTERSUNK SCREW FIXING

- Finished level of countersunk screw heads: Minimum 6 mm below timber surface.
- Pellets: Cut from matching timber, match grain and glue in to full depth of hole.
- Finished level of pellets: Flush with surface.

680 PLUGGED COUNTERSUNK SCREW FIXING

- Finished level of countersunk screw heads: Minimum 6 mm below timber surface.
- Plugs: Glue in to full depth of hole.
- Finished level of plugs: Projecting above surface.

690A USING POWDER ACTUATED FIXING SYSTEMS

- Powder actuated fixing tools: To BS 4078-2 and Kitemark certified.
- Operatives: Trained and certified as competent by tool manufacturer.
- Protective coating to exposed fasteners used externally or in other locations subject to dampness: Zinc rich primer to fastener heads.

700 APPLYING ADHESIVES

- Surfaces: Clean. Adjust regularity and texture to suit bonding and gap filling characteristics of adhesive.
- Support and clamping during setting: Provide as necessary. Do not mark surfaces of or distort components being fixed.
- Finished adhesive joints: Fully bonded. Free of surplus adhesive.

Z21
WML Specification
for
Mortars

Z21 Mortars

To be read with Preliminaries/ General conditions.
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 MORTAR
- 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.
- LIME:SAND MORTARS**
- 310 LIME:SAND MORTAR MIXES
- Specification: Proportions and additional requirements for mortar materials are specified elsewhere.
- 320 SAND FOR LIME:SAND MASONRY MORTARS
- Type: Sharp, well graded.
 - Quality, sampling and testing: To BS EN 13139.
 - Grading/ Source: As specified elsewhere in relevant mortar mix items.
- 330 READY PREPARED LIME PUTTY
- Type: Slaked directly from CL 90 quicklime to BS 890, using an excess of water.
 - Maturation: In pits/ containers that allow excess water to drain away.
 - Density of matured lime putty: 1.3 - 1.4 kg/litre.
 - Maturation period before use (minimum): In accordance with manufacturer's recommendations.
- 335 READY PREPARED LIME PUTTY
- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
 - Maturation period before use (minimum): In accordance with manufacturer's recommendations.
- 340 POZZOLANIC ADDITIVES FOR NONHYDRAULIC LIME:SAND MORTARS
- Manufacturer/ Supplier: Refer to drawings.
 - Product reference: Refer to drawings.
 - Mixing: Mix thoroughly into mortar during knocking up.
- 345 ADMIXTURES FOR HYDRAULIC LIME:SAND MORTARS
- Air entraining (plasticizing) admixtures: To BS EN 934-3 and compatible with other mortar constituents.
 - Prohibited admixtures: Calcium chloride, ethylene glycol and any admixture containing calcium chloride.
- 350 STORAGE OF LIME:SAND MORTAR MATERIALS
- Sands and aggregates: Keep different types/ grades in separate stockpiles on hard, clean, free-

draining bases.

- Ready prepared nonhydraulic lime putty: Prevent drying out and protect from frost.
- Nonhydraulic lime:sand mortar: Store on clean bases or in clean containers that allow free drainage. Prevent drying out or wetting and protect from frost.
- Bagged hydrated hydraulic lime: Store off the ground in dry conditions.

360 MAKING LIME:SAND MORTARS GENERALLY

- Batching: By volume. Use clean and accurate gauge boxes or buckets.
- Mixing: Mix materials thoroughly to uniform consistency, free from lumps.
- Contamination: Prevent intermixing with other materials, including cement.

370 SITE PREPARED NONHYDRAULIC LIME:SAND MORTARS

- Mixing: Mix materials thoroughly by compressing, beating and chopping. Do not add water.
 - Equipment: Roller pan mixer or submit proposals.
- Maturation period before use (maximum): Refer to drawings.

380 READY TO USE NONHYDRAULIC LIME:SAND MORTARS

- Manufacturer: Refer to drawings.
 - Product reference: Refer to drawings.
- Materials: Select from:
 - Lime putty slaked directly from quicklime to BS EN 459-1 and mixed thoroughly with sand.
 - Quicklime to BS EN 459-1 slaked directly with sand.
- Maturation period before use (maximum): In accordance with manufacturer's recommendations.

390 KNOCKING UP NONHYDRAULIC LIME:SAND MORTARS

- Knocking up before and during use: Achieve and maintain a workable consistency by compressing, beating and chopping. Do not add water.
 - Equipment: Roller pan mixer or submit proposals.

400 MAKING HYDRAULIC LIME:SAND MORTARS

- Mixing hydrated hydraulic lime:sand: Follow the lime manufacturer's recommendations for each stage of the mix.
 - Water quantity: Only sufficient to produce a workable mix.
- Working time: Within limits recommended by the hydraulic lime manufacturer.

Z22
WML Specification
for
Sealants

Z22 Sealants

To be read with Preliminaries/General conditions.

PRODUCTS

- 310 JOINTS Refer to drawings for locations
- Primer, backing strip, bond breaker: Types recommended by sealant manufacturer.

EXECUTION

- 610 SUITABILITY OF JOINTS
- Presealing checks:
 - Joint dimensions: Within limits specified for the sealant.
 - Substrate quality: Surfaces regular, undamaged and stable.
 - Joints not fit to receive sealant: Submit proposals for rectification.
- 620 PREPARING JOINTS
- Surfaces to which sealant must adhere:
 - Remove temporary coatings, tapes, loosely adhering material, dust, oil, grease, surface water and contaminants that may affect bond.
 - Clean using materials and methods recommended by sealant manufacturer.
 - Vulnerable surfaces adjacent to joints: Mask to prevent staining or smearing with primer or sealant.
 - Backing strip and/ or bond breaker installation: Insert into joint to correct depth, without stretching or twisting, leaving no gaps.
 - Protection: Keep joints clean and protect from damage until sealant is applied.
- 630 APPLYING SEALANTS
- Substrate: Dry (unless recommended otherwise) and unaffected by frost, ice or snow.
 - Environmental conditions: Do not dry or raise temperature of joints by heating.
 - Sealant application: Fill joints completely and neatly, ensuring firm adhesion to substrates.
 - Sealant profiles:
 - Butt and lap joints: Slightly concave.
 - Fillet joints: Flat or slightly convex.
 - Protection: Protect finished joints from contamination or damage until sealant has cured.

Protective Coating System

WM 640/3 **INTERNAL MAINTAINABLE SEMI-DECORATIVE**

Corrosivity Category	C1	Life to first major maintenance	20 years
Shop Preparation:	Blast clean to Sa 2 ½ to BS EN ISO 8501-1:2007		
Shop Coat:	Epoxy Zinc Phosphate Primer Sherwin Williams Macropoxy C400V3 Dry Film Thickness : 75 microns		
Bolt Preparation:	Remove any contamination and degrease with Sherwin Williams Degreaser W500. Thoroughly dry.		
Bolt Coat:	As main steel paint spec above		

Protective Coating System

WM 660/3 STEELWORK IN CAVITIES

Note: Steelwork should be offset 40mm min from any permeable outer leaf.

Shop Preparation: Blast clean to Sa 2 ½ to BS EN ISO 8501-1:2007

Shop Coat: Epoxy Zinc Phosphate Primer
Sherwin Williams Macropoxy C400V3
Dry Film Thickness : 75 microns

Bolt Preparation: Remove any contamination and degrease with Sherwin Williams Degreaser W500.
Thoroughly dry.

Bolt Coat: As main steel paint spec above

Site Treatment: Heavy Duty High Build Bitumen
Dry Film Thickness: 150 microns

Protective Coating System

WM 660/7 **INTERNAL – INTUMESCENT FIRE PROTECTION**

Corrosivity Category: C1 Life of Building
C2 Life to first major maintenance 20 years

Shop Preparation: Blast clean to Sa2 ½ to BS EN ISO 8501-1:2001

Shop Coat (1): Epoxy Zinc Phosphate Primer
Sherwin-Williams Macropoxy C400 V3 Primer/Buildcoat
Dry Film Thickness: 75 microns

Bolt Preparation: Remove any contamination and degrease with Sherwin Williams Degreaser W500.
Thoroughly dry.
For C2 environments, mechanically prepare to St3.

Bolt coat: Epoxy Zinc Phosphate Primer
Sherwin-Williams Macropoxy C400 V3 Primer/Buildcoat
Dry Film Thickness: 75 microns

Option 1 – Site Applied:

Site Coat (1): Thin Film Intumescent
Sherwin-Williams FIRETEX FX1003 (site applied) Solvent Based Intumescent.
Dry Film Thickness: At Required

Site Coat (2): Sealercoat
Sherwin-Williams FIRETEX M71 Sealercoat
Dry Film Thickness: 50 microns
Colour to architect's details.

Bolt Coats: As Site Coat (1) and (2).

Option 2 – Shop Applied:

Shop Coat (2): Thin Film Intumescent
Sherwin-Williams FIRETEX FX2003 (shop applied) Solvent Based Intumescent.
Dry Film Thickness: At Required D.F.T.

Shop Coat (3) Sealercoat
Sherwin-Williams FIRETEX M71 Sealercoat
Dry Film Thickness: 50 microns
Colour to architect's details.

Bolt Coats: As Shop Coat (2) and (3).

NB Dry Film Thickness of FIRETEX Intumescent is to be determined by the paint manufacturer based on the Hp/A of each individual section to achieve the required fire resistance period.

To obtain optimum decorative appearance the FIRETEX materials should be applied by airless spray.

WML Specification

for

Piling and Embedded Retaining Walls

Specification Requirements for Piling and Embedded Retaining Walls

To be read with Preliminaries / General Conditions.

- 100 PILING GENERALLY: To be in accordance with the ICE Specification for Piling and Embedded Retaining Walls.
- 300WM PERFORMANCE CRITERIA: The works should comply with the following performance criteria:
- Pile type to be chosen and designed by the specialist to suit the design loading and ground conditions as detailed in the site investigation report.
 - Any concrete below ground is to be determined by the Piling Contractor to suit the ground conditions identified in the site investigation report in accordance with BRE Special Digest 1:2005.
 - Concrete generally to be in accordance with Sections E05, E10 and E30 of the Specification.
 - Design of piling by the piling specialist.
 - Ground Investigation Report: A copy of the ground investigation report is included in the tender documentation.
 - Existing and Proposed levels as shown on the Architect / CA's drawings.
 - Total design Dead plus Live and Wind (Working, i.e. un-factored) loads applied to each pile type are as noted on drawings.
 - Unless otherwise specified, total settlement to be less than 20mm and differential settlement to be less than 10mm.
- 400 TENDER INFORMATION TO BE SUBMITTED BY THE PILING CONTRACTOR
To be generally in accordance with the information in the ICE Specification for Piling and Embedded Walls and should include (but not restricted to) the following:
- Details of proposed piles and design loadings.
 - Anticipated lengths of piles to be supplied and installed.
 - Method(s) of testing piles.
 - Proposed programme for the works.
 - Detailed schedule of costs showing a build up of the tender sum.
- 500WM DESIGN: The piling specialists attention is specifically drawn to the fact that he will be required to enter into an agreement with the client for the design, supply and installation of the piling works and that they will be solely responsible for ensuring that all piling designs and installations are to the approval of the Local Authority Building Control Department.
- B1.2 Project Specification
- (a) Role of the Engineer**
As stated in the contract documents.
- (b) Location and description of the site**
Refer to contract documents and Architects drawings.
- (c) Nature of the Works**
Refer to contract documents and Architects drawings.
- (d) Working area**
As stated in the contract documents.
- (e) Sequence of the Works and other works proceeding at the same time**
Sequence as stated in the contract documents. Pile probing is to be carried out by Main Contractor before the Works commence.
No other activities on site when the Works are being carried out.
- (f) Contract drawings**
Refer to drawings.

(g) Office and other facilities for the Engineer

As stated in the contract documents.

(h) Submission of information (in addition to Table B1.1)

The information which shall be submitted at the stated stages of the Works Contract is listed in Table B1.1 of the Piling Specification.

In addition, the Tenderer shall submit the following details with his tender:

Refer to Clause 400.

(i) Responsibility for design, including any division of this responsibility

Option – 2 Contractor design of piles is specified, see Clause B1.4 of the Piling Specification.

Design responsibility	Engineer	Contractor
1. Design of foundation scheme	x	
2. Choice of piling or walling method		x
3. Design of piles or wall elements to carry Specified loadings		x

(j) Pile / Wall design life

Unless stated otherwise in contract documents or drawings the pile design life is to be 50 years.

(k) Constraints on design

None.

(l) Working platform and commencing surface level

Refer to drawings.

(m) A schedule of Specified working loads or Representative actions

Refer to drawings.

(n) Pile or wall element dimensions

All pile sizes acceptable unless noted otherwise on drawings.

(o) Preliminary piles and trial bores / drives / panels

To be determined by Contractor.

(p) Unless otherwise specified performance criteria for the structure to be supported on the piles or by the wall

The design of the superstructure assumes that the settlement of any part of the structure at working load will not exceed 20 mm and that the differential settlement between adjacent columns at working load will not exceed 10 mm.

(q) Performance criteria for piles under test or wall elements during service

The Contractor will determine if pile tests will be carried out on the site to comply with his design. Refer to drawings for performance Criteria of piles.

(r) Sampling and testing of materials (other than concrete)

Concrete strength and consistence shall be measured as chapter B.19 of the Piling Specification.

(s) Permissible damage criteria for existing critical structures or services

No damage is to be caused to neighbouring structures or services. If the Contractor is of the opinion that by any means arising from the Works neighbouring property may be damaged this shall be stated in his tender and the extent and nature of the necessary protective or other temporary works described therein.

(t) Additional temporary works plant and duration of loading for which the working platform should be designed

The working platform shall be designed by the contractor for loadings from piling plant as supplied by the Contractor, for the duration of the Works.

The working platform is also to be designed by the contractor for all handling cranes, mobile cranes and other ancillary plant for loadings supplied by the Contractor.

(u) Site datum and site grid

As stated in the contract documents.

(v) Restrictions on permissible working hours

As stated in the contract documents.

(w) Restrictions on noise and vibration levels

As stated in the contract documents.

(x) Site Investigation including geotechnical and geo-environmental information, and the need for further Site Investigation

A copy of the Ground Investigation report is included in the tender documentation.

Unless stated otherwise on drawings or within Contract Documents no further site investigation is planned.

(y) Disposal of excavated material and trimmed excess pile and wall material

Spoil generated from the site will require disposal in accordance with the current and relevant legislation and regulations and any other statutory instrument and guidance.

(z) Other particular technical requirements

As stated in the contract documents. The Contractor is required to work to a Quality Management system established in accordance with BS EN ISO 9001:2008. Details shall be provided prior to commencement of work on site.

WML Specification

for

Cutting and Removal of Reinforced Concrete Floor Slabs and Walls

Specification for Cutting and Removal of Reinforced Concrete Floor Slabs and Walls

1.0 Removal of Reinforced Concrete Slabs and Walls

- 1.1 The removal of the existing concrete elements where indicated on the drawings, is to be carried out with extreme care. Only diamond drilling and sawing methods will be permitted. Percussive methods cannot be used.
- 1.2 The corners of the cut sections are to be formed using diamond cores of suitable size in order to eliminate the possibility of overcutting.
- 1.3 The Contractor is to include for all temporary supports, restraints and protective measures for the demolition and the removal of the demolished concrete from the building.
- 1.4 No forces other than the permitted uniformly distributed loadings, may be imposed on the structural elements that are to remain.

2.0 Chasing of Reinforced Concrete Walls

- 2.1 The cutting of chases in the existing concrete walls is to be carried out using sawing and light percussive systems only. The structure that is to remain is not to be damaged.
- 2.2 When chasing reinforced concrete elements, the existing reinforcement is not to be cut, without the prior written authority of the Engineer.

3.0 Exposed Concrete Faces

- 3.1 All faces of concrete exposed by chasing or cutting, are to be painted with two coats of an approved proprietary anti carbonation coating (SikaTop Armatec – 110 EpoCem by Sika or similar approved).