

MNP Movement Monitoring and Surveys Specification

215115 16a Lyndhurst Gardens

July 2015

D25

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D25 Movement Monitoring and Surveys

170 MONITORING SURVEY POINTS

Establish and agree number and location of survey points as indicated on MNP drawing, alternately MNP CIA Section 5.

Record initial positions of survey points and datum positions ensuring retro targets are positioned on stable buildings and locations where there is no risk of disruption or displacement. Base readings on front and rear elevations to be taken prior to demolition.

180 MONITORING GENERALLY

Ground and wall movements:

- Period of monitoring. Monitoring to start prior to groundworks and demolition and to conclude when all temporary propping has been removed.
- Frequency of monitoring:
 - Visual monitoring on a daily basis.
 - Base readings prior to demolition.
 - Movement monitoring on completion of superstructure demolition (approximately 2 weeks)
 - Movement monitoring during underpinning - fortnightly.
 - Movement monitoring during ground levelling and piling operation - fortnightly
 - Movement monitoring during excavation and until temporary propping removed - weekly
 - Monitoring frequency to be increased in the event trigger levels are exceeded.
- Reporting: Provide results for horizontal and vertical movement in a Microsoft excel spreadsheet, showing initial, subsequent readings, date and weather conditions. Report is to include trigger data. Monitoring company to notify MNP immediately if movements exceed trigger levels.

190 MOVEMENT MONITORING

Method: measured survey using established bench marks and levels or other approved.
Accuracy of reading <2mm.

Precautions: take action as follows if movements reach critical values:

-Trigger: immediately notify MNP Engineer to arrange site inspection. Site team to review situation, assess possible causes and submit proposals. Increase monitoring to daily.

-Action: Implement action plan. Stop work, inform the Engineer immediately and revise working procedures to limit further movements. Increase monitoring to daily.

210 LATERAL WALL MOVEMENT DURING EXCAVATION AND CONSTRUCTION

Trigger values (GREEN): 5mm with 2mm separation between adjacent targets

Action : Continue monitoring - movement as predicted.

215 LATERAL WALL MOVEMENT DURING EXCAVATION AND CONSTRUCTION

Trigger values (AMBER 1): 6mm with 2mm separation between adjacent targets

Action : Continue monitoring - review data for movement trends. Boundary of damage 0 and 1 category.

- 220 LATERAL WALL MOVEMENT DURING EXCAVATION AND CONSTRUCTION
 Trigger values (AMBER 2): 10mm with 3mm separation between adjacent targets
 Action : Continue monitoring - review data for movement trends. If increasing then review active propping measures. 80% through damage 1 category.
- 225 LATERAL WALL MOVEMENT DURING EXCAVATION AND CONSTRUCTION
 Trigger values (RED): 15mm with 5mm separation between adjacent targets
 Action : Construction pause. Implement active propping. Boundary of damage category 1 and 2.
- 230 LIKELY DAMAGE WHEN CRITICAL LEVELS REACHED.
 Refer to Ciria C580, table 3 for likely damage due to critical levels being reached:-

Table 3: Classification of damage visible to walls (reproduction of Table 2.5, CIRIA C580)

Category	Description
0 (Negligible)	Negligible – hairline cracks
1 (Very slight)	Fine cracks that can easily be treated during normal decoration (crack width <1mm)
2 (Slight)	Cracks easily filled, redecoration probably required. Some repointing may be required externally (crack width <5mm).
3 (Moderate)	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced (crack width 5 to 15mm or a number of cracks > 3mm).
4 (Severe)	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows (crack width 15mm to 25mm but also depends on number of cracks).
5 (Very Severe)	This requires a major repair involving partial or complete re-building (crack width usually >25mm but depends on number of cracks).

MNP Specification for Piling and Embedded Retaining Walls

215115 16A Lyndhurst Gardens, Hampstead, NW3 5NR

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1. SPECIFICATION FOR PILING AND EMBEDDED RETAINING WALLS

The Standard Specification shall be the specification section only of the ICE Specification for Piling and Embedded Retaining Walls 2nd Edition, published by Thomas Telford Services Ltd in 2007, with information, amendments and particular requirements as set out in this document. Where there is conflict between the Standard Specification and this Particular Specification, the requirements of the Particular Specification shall take precedence over other requirements.

The following sections of the Standard Specification are pertinent:

Part A General Requirements

Part B1 Specification requirements for piling and embedded retaining walls

Part B3 Bored cast-in-place piles

Part B4 Piles constructed using continuous flight augers or displacement augers

Part B9 Secant pile walls

Part B10 Contiguous pile walls

Part B13 Integrity testing

Part B17 Instrumentation for piles and embedded retaining walls

Part B19 General requirements for concrete and steel reinforcement

2 PART A - GENERAL REQUIREMENTS

(Refer to ICE Specification for Piling and Embedded Retaining Walls 2nd Edition.)

Pile Trimming Reference Clause A3.1.5

The Piling Contractor is to include for debonding the pile bars to reduce 'hand-arm vibration' (HAV) and 'whole body vibration' (WBV).

Pile Setting Out

Piles will be set out on site by the Piling Contractor in a timely manner to suit the piling programme and in accordance with the approved design information.

Pile Retaining Wall Reinforcement

Pile reinforcement layout and reinforcement alignment between adjacent piles to be consistent such that it coordinates with the longitudinal capping beam reinforcement. Appropriate care needs to be given with the reinforcement placement to ensure that it is installed within tolerance.

Attendances

The removal of pile risings will be by others and the lifting of pile reinforcement cages will be carried out by the Piling Contractor in a timely manner to suit the piling programme.

3 PART B - PARTICULAR REQUIREMENTS

- 3.1 Specification Requirements for piling and embedded retaining walls
 - 3.1.1 Standards - refer to ICE Specification
 - 3.1.2 Project Specification

Further information on the site and the site history is contained in the Enquiry Documents including, but not limited to:

Camden Council planning permission conditions and S106 requirements for the property.

The Piling Works on site comprise the following:

The construction of a suitable perimeter piled retaining wall to form a basement.
The construction of tension piles within the basement extent, considering groundwater and ground heave uplift.

- a. Working Area

As stated on the drawings

- b. Sequence of the Works and Other Works Proceeding at the Same Time

Refer to G&F programme.

- c. Contract Drawings

Refer to the issue sheet. Construction status Pile Layout drawings & Pile Schedule will be issued prior to works commencing on site.

- d. Office and Other Facilities for the Engineer

Refer to G&F

- e. Submission of Information (in addition to Table B1.1 in the ICE Specification)

The information which shall be submitted at the stated stages of the Works Contract is listed in Table B1.1 of the ICE Specification for Piling and Embedded Retaining Wall, 2nd Edition. In addition, the Tenderer shall submit the following details with their tender:- None.

g. Responsibility for Design, Including any Division of this Responsibility

Option 1 - Engineer design of piles and walls - not applicable, see option 2.

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
4. Design of Piling Mat		X

h. Design Standards and Criteria for the Piles or Walls Including Design Life

All design materials and workmanship shall be in accordance with the appropriate British Standards, Codes of Practice and other specified standards current at the date of tender except where the requirements of these Standards or Codes of Practice are in conflict with this specification, in which case the requirements of this specification shall take precedence. Pile design life to be at least 60 years.

i. Constraints on Design:-

As stated in the Enquiry documents and on the drawings. Note the requirements for sequencing of the excavation, propping, and allowable movement criteria to satisfy the Party Wall, Planning (CWG), Section 106 and the Network Rail (tunnel unloading) requirements.

- Propping to the piled wall to be provided at two levels around the site during staged excavation, until the permanent stiff slab structure can provide support. Pre-stressed props to be used adjacent to the neighbouring buildings to reduce movements.
- A limit to the lateral deflection of the perimeter retaining walls to 0.25% of the retained height, or a maximum of 15mm.
- The movement limit of the perimeter retaining wall must satisfy the party wall agreements between the Client and the neighbouring properties such that damage to the neighbouring properties is reduced, in accordance with the planning conditions.
- A monitoring system for the movements & vibrations during construction of all retaining walls is to be agreed to the satisfaction of the London Borough of Camden as well as the Project Engineer and Employer. This must incorporate a 'traffic light' system for monitoring-trigger-levels as described in the TRL Report 228 'Movement trigger limits when applying the Observational Method to embedded retaining wall construction on highway schemes' and the CIRIA Report 185 'The Observational Method in ground engineering'. Refer to MNP specification and drawings sk-lm-front and rear.

- The completion of the Lower Ground Floor and Basement structure within six months of the start of bulk excavations.
- Note any other relevant items in the party wall arrangements, once they are agreed.

j. Working Platform and Commencing Surface Level

Working platform and commencing surface level will be agreed on site. Pile cut off levels will be indicated on the Pile Schedule (in metres AOD). The setting out and coordinates of the Piles will be provided as the design is finalised (coordinates will be added to the Pile Schedule). Note that the site slopes down towards the Downshire Hill Road.

k. A Schedule of Specified Working Loads

The design loads are included in the Pile Schedule. The design loads may develop as the design progresses, and the latest revision of the Pile Schedule & Pile Drawings should be referred to.

l. Pile or Wall Element Dimensions

Pile types and dimensions are indicated on the drawings. Any alternatives to these which are proposed by the Contractor must fully satisfy all the sequence, propping, movement and monitoring recommendations in the Arup Report, as well as this Specification.

m. Pile Installation Tolerances

The piles are to be installed to the following minimum tolerances;

- Pile centreline: +/- 25mm
- Pile Verticality: 1:75

n. Preliminary Piles and Trial Bores/Drives/Panels

One Preliminary test pile is required for every 500 piles plus 1% of working piles. Trial bores, etc to be determined by Contractor.

o. 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 20mm and that the differential settlement between adjacent columns at working load will not exceed 10mm. Also refer to criteria stated on the general notes drawing.

p. Performance Criteria for Piles under Test or Wall Elements During Service (See Tables B1.2)

The Contractor will determine if pile tests will be carried out on this site to comply with his design. The following minimum test requirements apply:

FOS	Integrity Test	Working Test	Destructive Test
3	All	0	0
2.5	All	Load;1.5 x design load 1 in 100 piles	Test pile with SI
2.0	All		One test pile required per 100 piles to be tested to destruction.

Table B1.2 states the performance criteria expected of the piles and retaining walls carrying vertical loads.

Pile Ref.	Permitted Type(s) – Performance Specification Section Number	Specified Working Load - SWL <u>NOTE: All vertical loads given at Basement slab level</u> (Unfactored) (kN/m for piled walls U.N.O.)	Nominal Moment Demand (kNm per pile) (Unfactored)	Nominal Shear Demand (kN/pile) (Unfactored)	Minimum Factor of Safety	Pile Designation
Basement Retaining Wall - Central	B9, B10	Down = 400 Up = 100 Surcharge = 10kPa	To be determined for ground profile but no less than 50	To be determined for ground profile	3	To be confirmed
Basement Retaining Wall - Front	B9, B10	Down = 350 Up = 100 Surcharge = 10kPa	To be determined for ground profile but no less than 50	To be determined for ground profile	3	To be confirmed
Basement Retaining Wall - Rear	B9, B10	Down = 200 Up = 100 Surcharge = 10kPa	To be determined for ground profile but no less than 50	To be determined for ground profile	3	To be confirmed
Basement Tension Piles	B3, B4	Down = 500 kN Up = 850 kN	50	30	3	To be confirmed

Table B1.2 Performance Specification Criteria for Piles.

q. Sampling and Testing of Materials

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

r. Permissible Damage

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 their tender and the extent and nature of the necessary protective or other temporary works described therein.

Also refer to the criteria stated on the drawings and the information in the Arup Report

- s. Additional Temporary Works Plant and Duration of Loading for which the Platform should be Designed

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

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

- t. Site Datum and Site Grid

As stated in the Enquiry documents.

- u. Restrictions on Permissible Working Hours

As stated in the Enquiry documents and the council planning conditions.

- v. Restrictions on Noise and Vibration Levels

As stated in the Enquiry documents and the council planning conditions.

- w. During the Detailed Design phase the planting scheme should be finalised by others and the effect of the existing and new trees on the excavation and expected 'heave' considered fully.

- x. Disposal of Excavated Material and Trimmed Excess Pile and Wall Material

Spoil generated from the site will require disposal in accordance with the Environmental Protection.

Act 1990, the Landfill (England and Wales) Regulations 2002, the Waste Management Licensing.

Regulations 1994 and any other relevant statutory instrument and guidance.

- y. Other Particular Technical Requirements

As stated in the Enquiry documents, the Contractor is required to work to a Quality Management system established in accordance with BS EN ISO 9001:2000. Details shall be provided prior to commencement of work on site.

MNP GENERAL STRUCTURAL REQUIREMENTS

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B50 General structural requirements

TENDERING

10 INFORMATION TO BE PROVIDED WITH TENDER FOR BUILDING STRUCTURES

- Submit the following:
 - Drawings: Typical plans, section and elevations.
 - Calculations: Sample calculations demonstrating compliance with specification.
 - Technical information: Reports/ certification demonstrating compliance with specification of proposed incorporated products and finishes.
 - Proposals: Describe and give reasons for any proposals for:
 - Additional support or other changes the supporting structure.
 - Changes the specification.
 - Changes the adjacent building fabric.
 - Quality plan: Provide details of the experience of personnel/ subcontractor proposed for the execution of this work.
 - Builders work, special provisions and special attendance by others: Confirm that full provision has been made in the tender price.

GENERAL

110 EUROCODES

- National Annexes: Reference to a Eurocode, or to an execution or a material standard referenced therein, is deemed to include the appropriate United Kingdom National Annex, to the Eurocode or referenced standard. Nationally determined parameters shall apply. Non-contradictory complementary information: Applies when referenced in the National Annex.
- Substitution of alternative design rules for Eurocode Application Rules: Permitted. Demonstrate that the alternative rule is in accordance with the relevant principles and that structural safety, serviceability and durability of the resulting structure will be at least that required by the Eurocode .

120 STRUCTURAL WORK

- Designated codes of practice: To the Eurocodes appropriate to the nature of the structure. Design working life: Category 4 to BS EN 1990. Completed structure generally: To comply with the requirements of the designated codes of practice and the standards referenced therein. Deflections and other structural movements at serviceability limit state to be compatible with requirements of the building fabric, movement joints and weather tightness.
- Special requirements: None.

130 CONTRACTOR'S DESIGN

- Engineer responsible for overall stability of structure: Submit proposal, including details of qualifications and experience.
- Design supervision/ checking organisation: Persons not involved in preparing the design.
- Design requirements: None additional.
- Design quality control: Submit proposals if not certified as compliant with BS EN ISO 9001.
- Maintenance: Make provision for and submit details of requirements to ensure the safety and serviceability of the structure, including:
 - Critical parts that should be regularly inspected, with recommendations for the frequency of inspection.
 - Elements susceptible to corrosion, mechanical wear or fatigue that may need to be reconstructed or replaced during the design working life of the structure.
 - Means of safe access for maintenance and repair.

- 140 CONTRACTOR'S DESIGN - ADDITIONAL REQUIREMENTS FOR GEOTECHNICAL WORK
- General requirements for design and supervision: Foundations Category 2 to BS EN 1997-1 and retaining walls Category 1.
 - Existing subsoil conditions:
 - Soil strength and density: As ground investigation.
 - Ground water conditions: As ground investigation.
- 150 GROUND INVESTIGATION REPORT
- Requirement: Consider adequacy of data provided and submit proposals if additional investigation will be necessary to justify design.
 - Datum for borehole logs: Existing ground level.
 - Obstructions and voids: None known.
- 160 GEOTECHNICAL DESIGN REPORT
- Standard: To BS EN 1997-1.
 - Requirement: Consider the preliminary report and prepare a full report covering all aspects of the geotechnical work.
 - Procedures to be adopted to achieve the design requirements: None applicable.
 - Checking: Keep a copy of the report on site during the execution of the geotechnical work. Consider the ground conditions revealed during execution and the results of monitoring. When necessary, update the geotechnical design report.
 - Modification of geotechnical design: Before implementing, submit details and reasons.
 - Monitoring:
 - Assumed ground conditions: Consider adequacy of proposals for identifying differences between actual ground conditions with those assumed in the geotechnical design and submit proposals for extending these proposals to cover Contractor's design.
 - Performance criteria to justify adequacy of work: Submit proposals for demonstrating the adequacy of the geotechnical work.
 - Existing buildings/ below ground services: Confirm that execution of work will not damage existing structures/ services.

PERFORMANCE

- 210 CONSEQUENCE FOR LOCALISED FAILURE FROM AN UNSPECIFIED CAUSE
- Standard: To Building Regulations (E & W) Approved Document A, Section 5.
 - Consequence class: 2A.
 - Design requirements: Notwithstanding BS EN 1992-1-1, clause 9.10.2.5, provide vertical ties in columns and walls .
- 310 DAMAGE TO EXISTING STRUCTURES AND SERVICES
- Permissible damage criteria:
 - Structures: Not applicable.
 - Services: Refer to service's engineers drawings and specifications.
- 320 LOADS/ ACTIONS
- Generally: Specified loads/ actions are characteristic values unless otherwise described.
- 330 DESIGN LOADS GENERALLY.
- Source: To be provided by Structural Engineer.

- 340A PERMANENT AND IMPOSED LOADS FOR FLOOR.
- Standard: To BS EN 1991-1-1.
 - Permanent loads not discernible from drawings: None.
 - Imposed loads:
 - Generally: The more adverse of a uniformly distributed load of $1.5 + 1 \text{ kN/m}^2$ or a concentrated load of 1.4 kN
 - Exceptions: None.
 - Allowance for future changes: None.
- 350 DEAD AND IMPOSED LOADS GENERALLY.
- Standard: To BS EN 1991-1-1.
 - Permanent loads not discernible from drawings: None.
 - Imposed loads:
 - Generally: For roof with access.
 - Exceptions: Areas of roof with green roof and photovoltaic panels.
 - Allowance for future changes: None.
- 360 LOADING FOR MECHANICAL AND ELECTRICAL SERVICES
- Generally: Submit proposals.
 - Locally: Submit proposals.
 - Heavy equipment: Submit proposals.
 - Allowance for future changes: None .
- 390 IMPOSED LOADS ON PARAPETS AND BARRIERS GENERALLY.
- Standard: To BS EN 1991-1-1.
 - Horizontal loading: As for occupancy/ use.
 - Height of application: As Standard.
 - Vertical loading: As standard.
 - Location of posts: As drawing.
- 430 SNOW LOADS - CONTRACTOR DETERMINED
- Standard: To BS EN 1991-1-3.
- Features affecting loads: None in addition to those shown on drawings.
- 440 ICE LOADS/ ACTIONS
- Standard: To BS 8100-1.
- 460 WIND LOADS/ ACTIONS FOR WALL AND ROOF CLADDING.
- Standard: To BS EN 1991-1-4.
 - Criteria: Dynamic pressure.
 - Wind direction and value: to be advised.
 - External pressure coefficient: Appropriate to element under consideration.
 - Internal pressure coefficient:
 - Normal: The more critical of +0.2 and -0.3.
 - Accidental: Not applicable.
 - Features affecting loads: None other than those shown on drawings.
 - Special requirements: None.

EXECUTION

700 EXECUTION GENERALLY

- Standard: Report conflict between specification and the designated codes of practice and the standards referenced therein before ordering affected materials or executing affected work.
- Inspection levels: Submit proposals.
 - Special requirements: None.
- Quality control: Submit proposals if not certified as compliant with BS EN ISO 9001.
- Tolerances: Notwithstanding tolerances specified elsewhere, do not exceed requirements for compliance with the designated code.

710 GEOTECHNICAL WORK

- Geotechnical design report: Keep a copy on site during the execution of the geotechnical work.
- Requirements for testing and monitoring: As geotechnical design report.
- Assumed ground conditions: As geotechnical design report.

740 CONDITION SURVEY OF EXISTING BUILDINGS AND STRUCTURES

- Application: Cornwall House.
- Before starting work: Survey structure. Record and take photographs of damaged or defective areas.
 - Items to be recorded: Location, extent and magnitude of cracks, spalling, indications of movement, previous repairs, modifications and other irregularities of the fabric.
 - Additional investigations: None.
- Information supplied: None.
- Report: Submit for comment.
 - Include recommendations: For repair or monitoring of defects that could adversely affect structural adequacy of façade while temporally supported.

MNP Ground Works and Filling Specification

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D20 Excavating and filling

- 4 SITE INVESTIGATION
- Report: Provided; Ref. Ground Investigation by SLR and Terra Spec. plus Michael Chester & Partners 'Interpretation' (June 2012), Ground related Risk Assessment by Michael Chester & Partners (June 2012), Lankelma CPT Report Ref; 10590381 (26th June 2014) and the Ground Movement Report by Donaldson Associates (In relation to the Thameslink Belsize Rail tunnel) (July 2014)
- 10 PREPARATORY WORK
- Trees, shrubs and hedges to be removed: Cut down, grub up main roots and fill voids.
 - Larger trees: As advised by arboriculturalist.
 - Trees to be retained: Protect area around the trunk and do not use for building purposes or material storage.
 - Size of area: As advised by arboriculturalist.
 - Clear site of rubbish and vegetation. Grub up large roots.
 - Arisings: Remove from site.
- 20 STRIPPING TOPSOIL
- General: Excavate from areas where there will be re-grading or construction work.
 - Depth of removal: to be advised.
- 23 EXCAVATIONS AND BACKFILLING
- 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.
 - Requirement: Where excavations are close; complete all work including backfilling to the lower excavation before the higher excavation is made.
 - Backfill material:
 - Up to higher excavations formation level: Lean mix concrete.
 - Above higher excavations formation level: Hardcore as clause D65.
- 25 INSPECTING FORMATIONS
- Notice: Make advance arrangements for inspection of formations for foundations and filling and roads and pavings.
- 30 OBSTRUCTIONS
- Recorded foundations, beds, drains, etc: Break out and seal off drain ends. Remove contaminated earth.
 - Unrecorded foundations, beds, basements, filling, tanks, service pipes, drains, etc: Give notice.
- 33 NEW FOUNDATIONS CROSSING OLD FOUNDATIONS OR WALLS
- New foundation/ wall:
 - Break out: The old foundation/ wall.
 - Length of breaking out: Width of the new foundation/ wall, plus 300mm on either side of new foundation.
 - Depth of breaking out: As necessary to permit the construction of the new foundation to its design cross section.
 - New ground supported slabs:
 - Break out: The old foundation/ wall to a depth below the slab formation level of at least As shown on drawing.
 - Backfill: Obtain instructions if depth of fill will be greater than 600 mm, otherwise backfill with compacted hardcore.

- 35 EXCESS EXCAVATIONS
- Excavation taken wider than required: Backfill as clause 60.
 - Excavation taken deeper than required: Backfill with lean mix concrete.
- 40 SURPLUS EXCAVATED MATERIAL
- Topsoil: Spread and level on site.
 - Remaining material: Remove from site.
- 50 HAZARDOUS, AGGRESSIVE OR UNSTABLE MATERIALS
- Generally: Do not import or use fill materials which would, either in themselves or in combination with other material or ground water, give rise to a health hazard, damage to building structures or instability in the filling.
- 53 WATER
- General: Keep excavations free from water until foundations and below ground constructions are completed.
- 55 PLACING FILL GENERALLY
- Excavations and areas to be filled: Free from loose soil, rubbish and standing water.
 - Freezing conditions: Do not use frozen materials or materials containing ice. Do not place fill on frozen surfaces.
 - Fill against structures, membranes or buried services: Place and compact in a sequence and manner which will ensure stability and avoid damage.
- 58 GEOSYNTHETIC SHEET
- Type: Geotextile.
 - Recycled content: 90% (minimum) to BS EN ISO 14021.
 - Jointing: 300 mm overlap.
 - 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.
- 60 BACKFILLING AROUND FOUNDATIONS
- Under oversite concrete and pavings: Hardcore.
 - Under grassed or landscaped areas: Material excavated from the trench, laid and compacted in 300 mm layers.
- 62 FROST SUSCEPTIBILITY
- General: Except as allowed below, fill must be non frost-susceptible as defined in Highways Agency 'Specification for Highway Works', clause 801.17.
 - Frost-susceptible fill: Use only within the external walls of buildings below spaces that will be heated. Protect from frost during construction.

65 **HARDCORE**

- Fill: Granular material, free from harmful matter and excessive dust or clay, well graded, all pieces less than 75 mm in any direction, and in any one layer only one of the following:
 - Crushed hard rock or quarry waste.
 - Crushed concrete, brick or tile, free from plaster.
 - Gravel or hoggin.
- Filling: Spread and level both backfilling and general filling in layers not exceeding 150 mm. Thoroughly compact each layer.

75 **BLINDING TO HARDCORE**

- 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 provide a closed smooth surface.
- Permissible deviation on surface level: +0 -25 mm.

D50 Underpinning

10 UNDERPINNING DESIGN

- Purpose: To found the building below the level of future ground movements.
- Extent: As noted on drawing.
- Standards: Mass concrete underpinning to BS EN 1997-1.
- Assumed bearing strata: As drawing/site investigation report.
- Give notice if:
 - The bearing formation is not as assumed.
 - The formation contains hard or soft spots or highly variable material.

25 CONTINUOUS MASS CONCRETE UNDERPINNING

- Underpinning blocks:
 - Depth: As noted on drawings.
 - Length (maximum): 1.2 m.
 - Width on either side of wall centre line (minimum): As noted on drawings.
 - Depth of hard pack: 75 mm.
- Materials:
 - Concrete: Designated as section E10.
 - Hard packing: 1:3 cement:sharp sand mortar.
Water content: Sufficient only to ensure that packing binds together.
- Sequence: As noted on drawings.
- Curing periods (minimum):
 - Between casting underpinning block and pinning up: 24 hours.
 - Between completion of pinning up and commencement of excavation for the next sequence of underpinning: 24 hours.
Extend curing periods to allow for inclement weather.
- Shear connection between underpinning blocks: As noted on drawings.
- Features: Heave protection as noted on drawings.

50 HEAVE PROTECTION Inside face of underpinning

- Location: As noted on drawings.
- Type: Compressible board. Manufacturer: Cordek. Product reference: Claymaster.
- Thickness: As noted on drawings.
- Features: Commencing 500 mm above formation level and extending to top of foundation.

55 MAKING CONCRETE GENERALLY

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

60 DESIGNATED CONCRETE For mass concrete underpinning

- Designation: GEN1.
- Aggregates:
 - Size (maximum): 20 mm.
 - Coarse recycled concrete aggregates (RCA): No special requirements.
- Consistence class: Contractor's choice.
- Chloride class: Cl 1.0.
- Admixtures: Concrete producer's choice.
- Additional mix requirements: Temperature limitations for concrete; 30°C (maximum) and 5°C (minimum). Do not place against frozen or frost covered surfaces.

70 REPAIR OF MASONRY

- Timing: At least seven days before commencement of underpinning operations if damaged, otherwise after completion of underpinning works.

75 CONSTRUCTION OF MASS CONCRETE UNDERPINNING

- Block and working space: Excavate together.
- Formation:
 - Preparation: Remove or compact loose material.
 - Protection: Cover with 50 mm thickness of concrete if there will be a delay of more than four hours between completion of excavation and casting of concrete underpinning.
- Split sleeves: Provide around drain/ service passing through underpinning. Closely fit a rigid sheet to each side of opening to prevent ingress of fill or vermin.
 - Clearance around drain/ service (minimum): 100 mm.
- Dowels/ Shear key/ Front shutter: Provide where required.
- Casting underpinning: In one lift, leaving a gap for packing up beneath existing foundation.
- Packing: On completion of concrete curing period, hard pack gap between underpinning block and existing foundation. Allow packing to cure before commencing excavation for the next sequence of underpinning.