

**General Specification for Building**  
**2012 Edition (Incorporating Corrigendum No. GS 2012-02)**

The 2012 edition (incorporating Corrigendum No. GS 2012-02) of the General Specification for Building has incorporated updates and revisions to the 2012 edition (incorporating Corrigendum No. GS 2012-01). Please refer to the summary of major changes for the revisions.

Electronic version of this 2012 edition (incorporating Corrigendum No. GS 2012-02) can be viewed on the ArchSD Internet homepage.

In view of the revisions and new additions, there will be an introductory period of about 2 months in preparation for full implementation of this 2012 edition (incorporating Corrigendum No. GS 2012-02) as contract document by 1 August 2016. In summary,

- For tenders to be invited on or after 1 August 2016, this 2012 edition (incorporating Corrigendum No. GS 2012-02) shall be used.
- Existing contracts (including contracts using previous editions tendered before 1 August 2016) will not be affected.

**ARCHITECTURAL SERVICES DEPARTMENT**

**GENERAL SPECIFICATION FOR BUILDING**

2012 EDITION

Corrigendum No. GS 2012 – 02

(Effective from 1 August 2016)

The follow clauses and indexes are amended in the above edition of General Specification for Building.

Amendments to Section 1

<b>Quality generally</b>	<b>1.46</b>	Materials and workmanship shall generally be consistent with good building practice in Hong Kong and shall comply with the Regulations and the relevant BS, BS EN or CP unless otherwise specified and/or approved.
<b>Tests</b>	<b>1.56</b>	<p>Make tests on materials and workmanship as specified or as instructed by the SO.</p> <p>Provide test samples under the supervision of the SO and carry out tests by the Public Works Laboratories (PWL) or when required, by an independent body accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) (hereinafter referred to as the “Accredited Laboratory”).</p> <p>Submit sampling and analysis methodology, including name of the laboratory to be appointed and procedures from collection of test samples to submission of test results, for the SO’s approval prior to conducting any tests. Declare in writing that the Accredited Laboratory appointed has no affiliation as a legal entity to the Contractor and its sub-contractors.</p> <p>Appropriately mark and keep selected samples under the charge of the SO securely under lock before delivery to the laboratory.</p> <p>With the approval of the SO or the SO’s Representative either to:</p> <ul style="list-style-type: none"><li>(i) appoint representative(s) from the Accredited Laboratory or through collection service operated by the Public Works Laboratories (PWL) to collect test samples on site; or</li><li>(ii) arrange the Contractor’s representative(s) to collect test samples on site under the escort of the SO or the SO’s Representative.</li></ul> <p>Ensure that the agreed representative(s) has strictly followed all the procedures stated in the approved methodology. Test samples collected shall be kept in sealed container inaccessible to unauthorized persons at all times.</p> <p>Test results shall be submitted directly from the laboratory to the SO in sealed envelopes, not via the Contractor.</p> <p>Submit samples of materials, carry out tests and obtain approval before the materials are used in the Works.</p>
<b>Conducting of compliance tests and surveys on site</b>	<b>1.67</b>	Compliance tests conducted on site on structural works shall be carried out by the Public Works Laboratories (PWL) or when required, by an Accredited Laboratory.

Surveys conducted on site shall be carried out by a Surveyor with recognized expertise subject to the prior approval of the SO.

The Accredited Laboratory / Surveyor shall not be a holding company, an associated company, a subsidiary company or a related party of the Contractor and / or the piling Specialist Sub-contractor and shall not have any financial stake in the Works to be tested or surveyed.

Test and survey reports shall be submitted directly from the laboratory / Surveyor to the SO in sealed envelopes, not via the Contractor.

#### Amendments to Section 3

### **Definitions**

#### **3.01**

- (i) (a) "Top soil" is soil capable of supporting vegetative growth.
- (b) "Inert construction and demolition material" shall mean rock, rubble, earth, soil, concrete, asphalt, brick, tile and masonry generated from construction and demolition works.
- (ii) "Suitable material" shall consist of naturally occurring or processed material, or inert construction and demolition material, which at the time of deposition is capable of being compacted in accordance with the specified requirements to form stable areas of fill. The soluble sulphate content of the suitable material placed within 500 mm of concrete, cement bound material or cementitious material shall not exceed 1.9 grams of sulphate, expressed as SO<sub>3</sub>, per litre. The total sulphate content, expressed as SO<sub>3</sub>, of the suitable material placed within 500 mm of metal work shall not exceed 0.5% by mass.  

The method of testing of the total sulphate content shall be in accordance with **Geospec 3** - Model Specification for Soil Testing issued by the Geotechnical Engineering Office.
- (iii) "Unsuitable material" is material other than suitable material or containing any of the following:
  - (a) Material susceptible to volume change, including marine mud, soil with a liquid limit exceeding 65% or a plasticity index exceeding 35%, swelling clays and collapsible soils.
  - (b) Peat, vegetation, timber, organic, soluble or perishable material.
  - (c) Dangerous or toxic material or material susceptible to combustion.
  - (d) Metal, rubber, plastic or synthetic material.
- (iv) "Rock" is hard material which in the opinion of the SO can only be removed by the use of blasting, wedges or pneumatic drills and shall include individual boulders or other masses exceeding 0.20 m<sup>3</sup> in size.
- (v) (a) "Rock fill" shall consist of pieces of concrete or hard and durable rock of which the maximum size shall not be greater than three times the minimum dimension of individual pieces and in the opinion of the SO not more than 30% by mass is discolored or shows other evidence of

decomposition. Masonry, brick and similar materials shall not be used instead of rock unless permitted by the SO. No individual pieces shall exceed 400 mm in size. The rock fill shall be suitably graded for deposition and compaction in accordance with Clause 3.20.

- (b) "Recycled rock filling material" (Grade 200) shall be recycled rock or inert construction and demolition material which is hard and durable, and free from cracks, veins, and other evidence of decomposition.
- (vi) "Hardcore" shall comprise the following with no material exceeding 150 mm in size:
  - (a) Rock fill.
  - (b) Broken stone, hard brick, concrete or other comparable hard, inert, approved material. The material shall be free from dust, rubbish or deleterious foreign matter.
- (vii) "General filling material" shall be "suitable material". It may contain up to 25% rock distributed evenly throughout the whole mass of the material. General filling material shall contain no material exceeding 200 mm in size.
- (viii) "Fine filling material" shall be "suitable material" capable of passing through a 75 mm BS sieve.
- (ix) "Special filling material" shall be "suitable material" capable of passing through a 75 mm BS sieve. The special filling material shall be sampled and tested according to **Geospec 3**. The special filling material shall have the following characteristics:
  - (a) Liquid limit shall not exceed 45%.
  - (b) Plasticity index shall not exceed 20%.
  - (c) Coefficient of uniformity shall be greater than 50
  - (d) The percentage passing a 63 µm BS sieve shall be less than 45% by mass.
- (x) "Embankment", "filling area" or "area of fill" means an area on the Site other than a foreshore or sea-bed where the ground level shall be raised by filling in layers as part of the Works.
- (xi) "Trench excavation" means excavating from ground level not exceeding 5000 mm in width at surface.
- (xii) "Bulk excavation" means excavation in the open other than trench excavation.
- (xiii) Well-graded material shall consist of material that has a coefficient of uniformity exceeding 10.
- (xiv) Uniform-graded material shall consist of material that has a coefficient of uniformity of 10 or less.

Note: The definitions of trench excavation and bulk excavation stated in sub-clauses (xi) and (xii) are for the purposes of the GS only and do not apply to the measurement of excavation in Bills of Quantities which are measured in accordance with the current edition of the Standard Method of Measurement of Building Works for use in Hong Kong.

**Temporary Works for earthworks**

**3.04**

Design the Temporary Works associated with earthworks, including temporary slopes, stockpiles and drainage, such that the risk of failure is not more than that which would be adopted if the Temporary Works were to be permanent. Allowance may be made in the design of the Temporary Works for the shorter design life and for the risk to persons and property and the surface water and groundwater conditions which may occur during construction.

The Contractor shall provide details to SO to demonstrate that the design of Temporary Works has been considered and incorporated measures, which minimise excavation of materials.

**Generally**

**3.08**

- (i) Adequate support shall be used to maintain excavations in a stable condition and to prevent settlement of structures or utilities due to excavation or dewatering. Construction plant or other vehicles shall not be operated or parked adjacent to excavations and earthworks materials or other materials shall not be placed adjacent to excavations unless this has been allowed for in the design of the Temporary Works for the support of the excavation.
- (ii) Keep excavation free of water in accordance with Clause 3.05.
- (iii) Neatly trim the face of excavation.
- (iv) Carry out excavation to the lines, levels, dimensions and slopes specified.
- (v) Carefully level the bottom of excavation and step or bench horizontally as specified. Remove any pockets of soft material or loose rock in the bottoms of pits and trenches and fill the resulting cavities and any large fissures with Grade 10 or higher grade concrete. Do not trim the side faces of excavations for at least 24 hours after placing any blinding concrete required by the Contract.
- (vi) Backfill in accordance with the GS and at no extra cost "over-excavated" areas where the Contractor's proposed method of excavation, if approved, involves excavation in excess of that specified in certain areas.
- (vii) Maintain excavated surfaces to be used for construction traffic at a level of 300 mm minimum above formation level unless in rock. Make good any damage to the surface arising from such use with material having the same characteristics as the material which has been damaged.
- (viii) Ensure that no construction traffic uses an area once trimming to final formation level has commenced, with the exception of plant necessary for such trimming, and ensure that no damage is caused to the surface by this plant.

- (ix) Make good, at no extra cost, surfaces which, after excavation, have deteriorated to a condition that makes compaction of backfilling impracticable, either by carrying out additional excavation and filling in accordance with this GS or, by waiting until the condition of the exposed material is, in the opinion of the SO, fit to receive the approved backfill.
- (x) Excavate in such a manner that suitable material is kept separate and store in temporary spoil heaps to the satisfaction of the SO, where required for use in the Works without contamination by unsuitable material or deterioration. Where, in the opinion of the SO, suitable material has become contaminated by unsuitable material or has deteriorated, this material shall be removed from Site and replaced with suitable imported material at the Contractor's expense.
- (xi) Take necessary precautions to prevent damage to existing drains and services encountered in and around the excavation. Should any damage occur, notify the SO and the relevant authorities concerned immediately and make good at no extra cost. Temporarily divert ditches, land drains or other waterways encountered in the excavation and subsequently reinstate at the Contractor's expense.
- (xii) Take necessary precautions to prevent damage to tops of piles during excavation.
- (xiii) Bottoms of excavation shall be approved before any new work is laid. Inform the SO when excavation is ready for inspection. Do not trim and blind the bottom of excavation without approval.

**Surface preparation for filling material**

**3.16**

Clear all soft spots, loose boulders, grass, top soil, bushes, trees, roots and other vegetation or rubbish in natural ground or surface over which filling is to be placed. Do not place filling material until water-courses have been diverted or underdrained. Do not place filling material on sloping ground until benches or trenches as described in Clause 3.17 have been completed.

**Filling**

**3.17**

- (i) Unless otherwise specified, filling material shall consist of general filling material obtained from excavation on Site, borrow areas or other approved sources.
- (ii) Provide for the SO's approval a method statement showing the sources of fill for each fill area, the construction plant to be used for placing filling material and the method of compaction.
- (iii) Commence filling works only when sufficient compaction plant is in operation at the place of deposition to ensure compliance with the requirements of Clauses 3.19 or 3.20.
- (iv) Filling material shall be deposited in layers of a thickness appropriate to the compaction method to be used. In deposition of filling material, ensure that a good bond is achieved between layers of fill, and unless otherwise directed by the SO, no material shall be placed on previously compacted layers unless the surface has been scarified or otherwise broken up and, if necessary, watered.
- (v) Blind the top surface of hardcore with fine filling material.

- (vi) Cut benches or trenches as shown on the drawings and as directed by the SO where filling shall be formed on sloping ground and provide any necessary under-draining of the affected part of the Site.
- (vii) Keep the fill area free of water in accordance with Clause 3.05.
- (viii) Obtain approval from the SO before commencing filling and before any fill layer is covered.
- (ix) Do not use "end tipping" in filling
- (x) Leave surfaces with no area that can retain water at the end of each day's work and, if necessary, cut ditches to achieve this.
- (xi) Stop work when the state of the weather is such that, in the opinion of the SO, it will adversely affect the placing of compacted fill.
- (xii) Adopt one of the following procedures when material placed and compacted, or awaiting compaction, reaches a condition which, in the opinion of the SO, does not comply with the GS or has been damaged either by weather or in any other way:
  - (a) Remove the material from Site, replacing it with equivalent suitable material.
  - (b) Remove the material to stockpile until it is in a suitable condition for reuse.
  - (c) Make good the material by mechanical or chemical means.
  - (d) Cease work on the material until it is in a suitable physical condition for reuse.

Obtain approval from the SO before any of these options are adopted.

Remove, and adopt option (a) or (b) above for any material not complying with the GS that has been overlaid by more recently placed material.

- (xiii) Make good to the satisfaction of the SO settlement in filling and backfilling and any consequential damage that may occur up to the end of the Maintenance Period.

**Compaction by performance specification**

**3.19**

- (i) Agree with the SO the thickness of each layer which shall be compatible with the particular filling material and the specific compaction plant to be used. Carry out carefully control tests to determine the optimum placing thickness for the particular filling material and the number of passes to achieve the required density with the specific compaction plant to be provided. No permanent fill shall be placed until such compaction procedure and control tests results have been agreed with the SO. Earth moving plant will not be accepted as compaction equipment under this clause. Spread material in layers of uniform thickness and compact as soon as practicable after deposition.

- (ii) Test the material to be compacted in accordance with Clause 3.21 to determine its maximum dry density and moisture content.
- (iii) Not used.
- (iv) Carry out in-situ field density tests to determine the relative compaction in accordance with Clause 3.21 after compaction with the following arrangement:
  - (a) Test each layer and obtain approval from the SO prior to placing of the next layer, or
  - (b) Subject to the approval from the SO, tests for each layer may be performed after filling material in not more than 2 layers above have been deposited and compacted. If the results of any tests at lower layers do not comply with the specified requirements for relative compaction, the soil layer and all the layers above shall be re-compacted and tested with additional tests for relative compaction. The number of additional tests shall refer to Table 3.5. Further deposition of filling shall not be allowed unless all the underlying soil layer(s) have satisfied all the test requirements. No claim in respect of re-compaction and additional tests of the soil layer due to non-compliance of the soil underneath will be entertained.
- (v) The relative compaction (RC) of filling material shall be determined in accordance with the following equation:

$$RC = \text{IDD}/\text{MDD} \times 100\%$$

where:

- IDD is the in-situ dry density determined in accordance with Clause 3.21
  - MDD is the maximum dry density determined in accordance with Clause 3.21
- (vi) Unless otherwise specified filling material shall be compacted to obtain the following relative compaction (RC):
    - (a) Fill within the 1.5 metres thick top surface zone of the platforms and fill within the 2.5 metres thick top surface zone of the peripheral slopes measured at right angles to the batter - RC of at least 95%.
    - (b) Interior of large fill platforms which do not or will not support structures - RC of at least 90%.
    - (c) Interior of large fill platforms supporting structures - RC of at least 95%.
    - (d) Fill immediately below road formation level - RC of at least 98% for a depth of 200 mm.
    - (e) Backfill to foundation pits or underneath suspended ground slab - RC of at least 90% or as agreed by the SO.



**Compaction by method specification**

3.20

Adoption of the method specification for controlling compaction to be carried out only with prior approval of the SO. Submit to the SO for approval a method statement covering particulars of the filling material, compaction layer thickness, specific compaction plant to be used, compaction procedure and the site control measures. Allow for control tests on the proposed method statement as required by the SO.

- (i) Spread and level each layer of rock fill or hardcore and systematically compact by at least 12 passes of a towed vibratory roller with a minimum static load per 100 mm width of roller of 1.75 kN or a grid roller with a minimum load per 100 mm width of roller of 7.8 kN or other plant approved by the SO.
- (ii) General filling material of which less than 90% passes a 20 mm BS test sieve shall be compacted to the following requirements:
  - (a) Spread and level each layer of general filling material with a thickness not less 1.5 times of the maximum size of the general filling material and not exceeding the maximum depth of compacted layer in accordance with Table 3.3. If there is a presence of over-sized coarse material in the filling material, the over-sized coarse material shall be removed or broken down to sizes acceptable to the SO. Each layer shall be systematically compacted by an approved vibratory roller with the stipulated minimum number of passes corresponding to the minimum static load per 100 mm width of the roller. Blind the surface of rock fill or hardcore when specified with approved fine filling material.

TABLE 3.3

Compaction requirement for general filling material with a large portion of coarse material

Force per 100 mm width (kN)	Well-graded material		Uniform-grade material	
	Maximum depth of compacted layer (mm)	Minimum no. of passes	Maximum depth of compacted layer (mm)	Minimum no. of passes
0.25 – 0.45			150	16
0.46 – 0.70			150	12
0.71 – 1.25	125	12	150	10
1.26 – 1.75	150	8	200	10
1.76 – 2.30	150	4	225	10
2.31 – 2.80	175	4	250	10
2.81 – 3.50	200	4	275	8
3.51 – 4.20	225	4	300	8
4.21 – 4.90	250	4	300	8

**Test for determining the degree of compaction of compacted fill**

3.21

Arrange for tests specified below to be carried out by the Public Works Laboratories (PWL).

- (i) Compaction tests shall be carried out on Site unless approved otherwise.
- (ii) Determine the maximum dry density and optimum moisture content

in accordance with Geospec 3.

Test each soil type when first used and thereafter at the same time as every set of field density tests is carried out or whenever the SO may direct. Unless otherwise specified, the number of tests required shall be as stated in Table 3.4. Keep the records identifying the soil type and the location within the works.

- (iii) Determine the in-situ field density and moisture content in accordance with Geospec 3 as directed by the SO to determine the relative compaction achieved.

Unless otherwise stated in the Contract, the number of tests required shall be as stated in Table 3.5. Keep records identifying the soil type and location in the Works and showing the following information for each series of tests:

- (a) Dry density of soil tested.
  - (b) Moisture content.
  - (c) Relative compaction achieved (%).
- (iv) Determine moisture content in accordance with moisture content tests under **Geospec 3** by means of a drying oven.

**Embankments 3.23**

- (i) Form embankments of special filling material unless otherwise specified.
- (ii) Deposit and compact all earthwork material for filling as soon as practicable after excavation. Build up embankments evenly over the full width. Control and direct construction traffic during the construction of embankments uniformly over their full width. Form sloping faces of embankments and other fill areas by 1 m overfilling unless otherwise directed by the SO and cutting back to the desired profile. Make good damage to compacted layers caused by construction traffic.
- (iii) Compact embankments in accordance with Clauses 3.19 or 3.20.
- (iv) Adopt one of the following procedures at no extra cost when material deposited as fill subsequently reaches a condition such that it cannot be compacted in accordance with the GS.
  - (a) Make good by removing the material from the embankment to tip or elsewhere until it is in a suitable physical condition for reuse and replace it with suitable material.
  - (b) Make good the material by approved mechanical or chemical means to improve its stability.
  - (c) Cease work on the material until its physical condition is suitable such that it can be compacted in accordance with the GS.
- (v) Rock used in rock fill embankments shall, except for any specified external cover to slopes or near formation level, be of a size such that it can be deposited in horizontal layers each not exceeding 450 mm

thick before compaction, extending over the full width of the embankment. Spread and level the material by a crawler tractor weighing not less than 15 tonnes and compact in accordance with Clause 3.20. Each layer shall consist of reasonably graded rock and all surface voids shall be filled with broken fragments before the next layer is placed. Blind the top surface and side slopes of embankments so formed with approved fine filling material to seal the surface. On side slopes and verges, such material may be topsoil as defined in Clause 3.01.

- (vi) Isolated boulders each within the range 0.015 m<sup>3</sup> to 0.10 m<sup>3</sup> in size may be incorporated in embankments not of rock fill at the discretion of the SO provided that the specified compaction requirements are met. Boulders exceeding 0.015 m<sup>3</sup> shall be placed a minimum of 2 metres below formation level of carriageways or hard-shoulders.
- (vii) Form embankments equally on both sides of culverts or drain pipes and the like.
- (viii) Where surfaces of embankment are required for use by construction traffic, build up and maintain at minimum 300 mm above formation level the area between the extremities of carriageways, including any central reserve and hard shoulders before subsequently trimming to formation level. Make good surface damage at no extra cost. Ensure that no construction traffic uses an area once trimming to final formation level has commenced, with the exception of plant necessary for such trimming and ensure that no damage is caused to the surface by such plant.

**Deposition of soil-cement fill**

**3.29**

- (i) Place soil-cement fill in its final position and compact within 30 minutes of the cement being added to the mix.
- (ii) Submit to the SO for prior approval a method statement covering the soil-cement filling material, method of mixing, specific compaction plant to be used, compaction procedure and site control measures.

Amendments to Section 5

**General**

**5.01**

- (i) Piles shall be Contractor designed unless otherwise specified.
- (ii) The approved types of piles that may be adopted by the Contractor unless otherwise specified are:
  - (a) Precast concrete piles.
  - (b) Precast prestressed tubular piles.
  - (c) Percussion cast in-situ concrete piles.
  - (d) Steel 'H' piles.
  - (e) Non-percussion cast in-situ concrete piles.
  - (f) Large diameter bored piles.
  - (g) Hand-dug caissons.

- (h) Mini piles.
  - (i) Rock-socketed Steel H-piles.
  - (j) Barrette piles.
  - (k) Any other piling systems approved by the Development Bureau.
- (iii) Support all loadings as specified with piles. Unless otherwise stated, all loads are acting at the geometric centres of columns and walls.
- (iv) In addition to the loads given in the loading schedule, the weight of pile caps or backfill over the pile caps and the imposed load over the plan area of the pile caps, which shall be taken as 7.5 kN/m<sup>2</sup> unless specified otherwise, shall be included in the pile loading.
- (v) Design piles for the most critical loading generally produced from the following combinations:
- (a) Dead load + imposed load + soil and water load.
  - (b) Dead load + imposed load + soil and water load + wind load.
- NOTE: The theoretical safe loading capacity of piles in this case may be increased to 1.25 times the appropriate values as given in Clause 5.04.
- (c) Minimum dead load + wind load + adverse soil + water load (uplift) due to the highest anticipated groundwater table.
- (vi) Piles shall not be positioned directly under any wall opening as indicated on the drawing.
- (vii) No piles or portions of pile caps outside the Site boundary shall be permitted.
- (viii) The use of tension piles shall not be permitted unless otherwise stated.
- (ix) Carry out piling work in accordance with **Code of Practice for Foundations** published by Buildings Department.
- (x) The piling work shall be executed by a Contractor on the List of Approved Suppliers of Materials and Specialist Contractors for Public Works - Land Piling.
- (xi) The following works specified in the Contract shall be carried out by an independent Ground Investigation Contractor from Group I or Group II of the List of Approved Suppliers of Materials and Specialist Contractors for Public Works – Ground Investigation Field Work Category:
- (a) site borings to pre-determine the piles founding levels in accordance with Clause 5.19;
  - (b) pre-drilling for determination of pile length or to establish bedrock level;

- (c) core drilling;
- (d) proof drilling;
- (e) other works as instructed by the SO.

**Percussion  
piles**

**5.14**

- (i) Assess the safe loading capacity of the pile according to an approved dynamic formula, e.g. Hiley Formula. For the purpose of design calculation, the design factor of safety shall not be less than two.
- (ii) The design final penetration shall generally not be taken as less than 2.5 mm per blow. The set penetration of at least 10 blows shall be recorded on the Site during set. Where it can be demonstrated by PDA analysis that the driving stress at final set is greater than  $0.6 f_y$  for steel H-piles, the design final penetration may be taken as not less than 1.0 mm per blow. The pile shall not be considered to have attained the theoretical safe loading capacity should the penetration of any blow recorded be in excess of the design final penetration.
- (iii) If the Hiley Formula is used to calculate the loading capacity of a pile, the temporary compression of the pile and hammer cushions ( $C_c$ ) shall be taken as not less than 7.5 mm when the thickness of the hard wood packings at the pile head is 50 mm or less and the plastic hammer cushion is 200 mm thick or less (refer to Clause 5.18 for steel 'H' pile).
- (iv) The efficiency of the hammer ( $E_h$ ) and the coefficient of restitution of the hammer cushion ( $e$ ) shall be determined from/verified by carrying out Dynamic Pile Test (PDA) and CAPWAP analysis on trial piles (at least 5 piles for each hammer – pile size – drop height combination). For steel H-piles, the measured driving stress of all trial piles in PDA tests shall be greater than  $0.6f_y$  (where  $f_y$  is the minimum yield stress of the steel H-piles) as demonstrated with PDA tests, and the 90% CAPWAP capacity of each trial pile shall not be less than twice the theoretical safe loading capacity of the pile. The combination of  $E_h$  and  $e$  shall be so chosen such that when these values are substituted into the Hiley Formula, the average of the predicted bearing capacity of the trial piles is not higher than 90% of the average CAPWAP capacity. If the measured driving stress at final set or 90% CAPWAP capacity requirements of each pile are not satisfied, the theoretical safe load capacity of the piles shall be reduced and submitted for SO's approval.
- (v) If reasonable values of design final set (not less than 2.5 mm or 1.0 mm per blow as the case may be) cannot be obtained from the Hiley Formula with  $E_h$  and  $e$  so chosen and subject to the approval of the SO, all the piles falling into this category shall be subject to Dynamic Pile Test (PDA) and the theoretical safe loading capacity of the piles shall be assessed by CAPWAP analysis. For steel H-piles, the measured driving stress of the piles in PDA tests shall be greater than  $0.6f_y$  as demonstrated with PDA tests. The pile shall not be considered to have attained the theoretical safe loading capacity should the 90% CAPWAP capacity is less than twice the theoretical safe loading capacity. In addition to the loading test requirements in GS Clause 5.28, the SO shall select 1% of nos. of piles (minimum one number) for each batch of piles proposed by the Contractor for phased completion to be load tested for acceptance. All the time and

cost incurred from the PDA Tests, CAPWAP analyses and the additional loading tests shall be borne by the Contractor. Employ an Accredited Laboratory to carry out and interpret the PDA Tests, CAPWAP analyses and the additional loading tests. The Accredited Laboratory shall submit HOKLAS endorsed test reports directly to the SO in sealed envelopes within 14 days of the completion of the testing.

- (vi) Drop hammer shall not be used for final set measurement. All final sets shall be taken with the hydraulic hammer.
- (vii) Driving of the last segment of pile shall normally be in one operation and final set taken accordingly. If, for some reasons, this cannot be done, the rate of penetration of the pile shall be recorded before stopping. When pile driving is resumed, it shall be driven to attain at least the previous rate of penetration before final set is taken.
- (viii) If the protruding length of the pile above ground is more than 3m during the final set measurement, the temporary compression of pile above ground level ( $C_p+C_q$ ) in the approved final set table shall be increased by 1mm per each metre increase beyond 3m. However, in all cases, the length of the protruding part of the pile above ground level shall not exceed 6m during the measurement of final set.
- (ix) The piles selected for PDA tests shall be tested under the same driving conditions as in the final set measurement, i.e. same hammer, same hammer drop height and total length of pile not less than that at final set measurement. The set penetration of at least 10 blows shall be recorded during the PDA tests. If the measured final set values of the piles during the PDA tests are more than that during the final set measurement, the theoretical safe loading capacity of these piles shall be assessed by CAPWAP analysis. All the time and cost incurred from CAPWAP analysis shall be borne by the Contractor.

## Steel 'H' piles

### 5.18

- (i) Steel sections must comply with the requirement of **BS EN 10025** Grade S275, S355JR or S450J0.
- (ii) Use steel sections with flange and web thicknesses not less than 20 mm.
- (iii) For every one hundred segments or part thereof of each section of same thickness from the same cast, one segment shall be selected at random on site by the SO for testing. Provide two test specimens taken at both ends of each of the chosen segment. For the purpose of this clause, "same thickness" means similar sections with a variation in thickness not exceeding + 5 mm, and "segment" means every length of pile as rolled.

Prepare the test specimens to BS EN 10002-1 as directed and appropriately mark and deliver them to the Public Works Laboratories (PWL), as directed by the SO.

- (iv) The energy of the hammer should be so chosen such that the pile will not be damaged during driving. As a minimum requirement, the Contractor shall demonstrate with PDA analysis that driving stresses would not exceed 0.9  $f_y$ .

- (v) Carry out splicing to increase the length of steel "H" piles in accordance with the details shown at Annex "B". Unless agreed by the SO, the minimum length of each steel H-pile section shall be 10m except the uppermost section. Construct joints to maintain the true alignment of the pile section. Welds shall be subject to the following examination:
  - a) All welds shall be visually inspected to BS EN 970.
  - b) 10% of the welded joints shall be subject to ultrasonic examination to BS EN 1714 Level B and magnetic particle inspection to BS EN 1290.

There is no limit on hold time for the examination, except that the initial 2 butt welded joints shall be examined by non-destructive tests after 40 hours. Joints to be tested shall be selected by the SO. The standard of acceptance for welds shall be in accordance with Table 14.3b in the Code of Practice for the Structural Use of Steel issued by the Buildings Department.

Employ an Accredited Laboratory to carry out and interpret the inspection and testing of welds, and provide any necessary labour and attendance. The Accredited Laboratory shall submit test reports directly to the SO in sealed envelopes within 3 days of the completion of the testing. Tests revealing discontinuity shall be reported separately from the subsequent repair and re-test.

- (vi) Provide capping plates and dowel bars in accordance with the details shown at Annex "C".
- (vii) Pile of same size but of different grades shall not be used in the same site.
- (viii) If Hiley Formula is used to calculate the loading capacity of steel "H" pile, the temporary compression of the hammer cushion ( Cc) shall be taken as not less than 5 mm when plastic cushion of 200 mm thickness or less is used.

**Large diameter bored piles      5.19**

- (i) Large diameter bored piles are those of a diameter exceeding 750 mm formed by boring, chiselling or grabbing, plus filling with concrete.

Provide reinforcement and adequate ties in accordance with details shown at Annex "D".

- (ii) Site borings to pre-determine the level of oversite bedrock shall be carried out by an independent Ground Investigation Contractor from Group I and Group II of the List of Approved Suppliers of Materials and Specialist Contractors for Public Works – Ground Investigation Field Work Category. One drill hole shall be sunk at each bored pile position, whereas 2 drill holes are required for pile diameter exceeding 2500mm. For this purpose, at least 5 m of continuous rock core samples of N size (61 mm diameter) shall be taken for inspection. Two copies of the drill hole logs shall be submitted directly to the SO by the Ground Investigation Contractor.

- (iii) Found pile on bedrock with a minimum embedment depth of 600 mm.
- (iv) Bedrock is defined as rock mass of at least 5 m thick and being Grade III/IV or better rock (as defined in GEOGUIDE 3, “Guide to Rock and Soil Descriptions” prepared by Geotechnical Engineering Office and published by GIS, Hong Kong).

For design purposes, the maximum bearing pressure of piles on bedrock shall not exceed the following:

- (a) 3 MPa for Grade III/ IV or better rock with total core recovery greater than 75%
- (b) 5 MPa for Grade III or better rock with total core recovery greater than 85%
- (c) 7.5 MPa for Grade II or better rock with total core recovery greater than 95%
- (v) Do not use piles with enlarged bases unless specified otherwise. Where so permitted, the size of the enlarged base shall not exceed 1.5 times the shaft diameter with a gradient not exceeding 30 degree from vertical, and the enlarged base shall only be formed by under-reaming with reverse circulation drill. The relevant technique shall have been approved by the Development Bureau.
- (vi) The requirements of Clause 5.17 (ii) apply equally to large diameter bored piles.
- (vii) Where the water level is higher than the bedrock level, carry out concreting with a tremie pipe. Clean the pile base by air lift before commencing concreting. Ensure the tremie pipe always penetrates well below the top level of the concrete being poured.
- (viii) Supply concrete in sufficient quantities to ensure that concreting of each pile proceeds without interruption. The concrete shall have a minimum cement content of 400 kg/m<sup>3</sup> and a minimum slump of 150 mm.
- (ix) Where the water level is higher than the bedrock level, the concrete used shall have grade strength 25% higher than the design grade strength.
- (x) Where a pile is founded on a stratum which deviates from the predicted depth by more than 4 m, carry out additional borings to satisfy the SO that the pile is acceptable.
- (xi) When defects such as voids, unbound sediment or segregation of concrete are observed at the base of the pile, the Contractor shall carry out remedial works to rectify such defects.

The Contractor shall first submit a method statement for approval. Remedial works shall, inter alia, consist of further drilling to determine the extent of the defects, cleaning by high pressure jetting and subsequent pressure grouting. After completion, the Contractor shall carry out verification coring to prove all defects are properly filled with grout.



- (xii) Where steep bedrock profile is identified, the founding levels of adjacent piles shall not differ by more than the clear distance between the pile bases unless the stability of rock under the piles are checked by recognized engineering principles, taking into account the existence of any adverse joints.
- (xiii) For large diameter bored piles with diameters greater than 2000 mm, reversed circulation drill (RCD) must be used to set the pile shaft in rock and smooth out the rock surface. Should a similar machine and equipment that achieves equivalent results and of equal performance to that of the RCD be proposed, the contractor shall demonstrate to the satisfaction of the SO before submitting for approval.

**Pile caps tie beams 5.25  
and  
dowel bars**

- (i) Unless otherwise specified, pile caps are part of the Works.
- (ii) (a) All pile caps and strap beams shall be designed by the Contractor to **Code of Practice for Structural Use of Concrete**, for the worst combination of load cases. The design shall be certified by a Registered Structural Engineer.

Where specified, design tie beams to tie all columns in both directions to take care of moments due to eccentricities between load centre and centroid of pile or pile group underneath. The eccentricities shall not be taken as less than 75 mm in any case.

- (b) All concrete works for pile caps and strap beams shall be to Section 6 of General Specification. Structural concrete shall come from a supplier registered under the Quality Scheme for the production and supply of concrete.
- (c) PFA or GGBS concrete shall be used in all pile caps and substructure construction where the concrete structural elements bear a least dimension over 750 mm. The proportion of PFA or GGBS of the total cementitious content in such concrete shall be in accordance with Clause 6.30.
- (d) A 50 mm blinding layer of grade 10/20 concrete shall be laid prior to casting of pile caps and strap beams.
- (e) Steel bars shall be plain steel reinforcing bars (denoted by R), Grade 500B or 500C ribbed steel reinforcing bars (denoted by T) to Hong Kong SAR Construction Standard CS 2. All reinforcement shall be cut or bent to comply with **BS 8666** unless otherwise specified.
- (f) Cover to all bars including links and stirrups shall be 50 mm.
- (g) If large concrete rafts are to be constructed:
  - (i) Allow sufficient chairs to support top reinforcement in rafts.
  - (ii) The positions and method of forming construction joints including sample treatment are to be submitted for approval prior to work on site.

- (iii) For concrete in large pile caps and piled rafts, measures should be taken in temperature curing to minimize temperature differential occurring in the concrete sections. The side formwork shall not be removed during the curing and as soon as the concrete is cast and bleeding water disappears, the surface shall be cured for a minimum of 4 days by either:

Covering the concrete with a layer of fine aggregate, minimum 25 mm thick, and keep it constantly wet, or

Covering the surface with one layer of 50 mm thick polystyrene boards secured with canvas on top.

- (h) Where specified in the Contract, the Particular Specification for Reinforced Massive Concrete Structures shall apply.

- (iii) Provide dowel bars as specified.
- (iv) Thoroughly wire brush the dowel bars to remove all rust, scale, adhered mud and the like, and prepare and apply a thick protective coat of approved cement grout on all exposed areas of the dowel bars.

**Non-destructive integrity testing**      **5.32**

Non-destructive integrity tests shall be carried out by a Testing Firm appointed by the Employer. The Contractor shall, in addition to those items listed in Clause 1.42, provide attendance and other preparatory works as required.

The Contractor shall notify the SO 5 working days in advance for carrying out the non-destructive integrity tests of piles on site.

**Preparation for piles for Sonic Logging**      **5.35**

Prepare piles for Sonic Logging

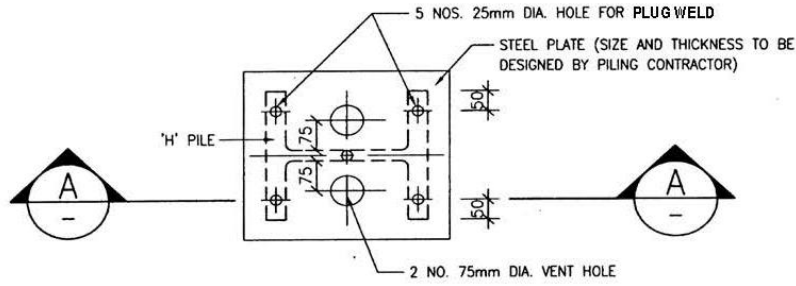
- (i) Place in all large diameter bored piles, barrettes and diaphragm wall panels, tubes of mild steel not less than 42 mm internal diameter which shall be regular and free from defects, so as to permit the free and unobstructed passage of the testing probes. Tubes shall be watertight, free from corrosion with clean internal and external faces.
- (ii) The tubes shall be fitted with a screw-on steel watertight shoe and shall be securely fixed to the interior of the reinforcement cage or fixed by other methods approved by the SO. The tubes shall be parallel to each other and to the axis of the pile. Where sections of tubing are required to be spliced, joints shall be made watertight.
- (iii) The tubes shall be plugged or capped before concreting. The tubes shall extend the full depth of the pile, barrette or diaphragm wall panel, and stop at about 300 mm above the top of the concrete cast.
- (iv) Install tubes in the number tabulated below and at spaces as directed by the SO:
  - (a) Large diameter                      - 3 No./pile  
bored piles, 700 -  
900 mm diameter

- (b) Large diameter bored piles, exceeding 900 mm diameter - 4 No./pile
- (c) Barrettes up to - 4 No./barrette
- (d) Barrettes over 3.0 m long and diaphragm wall panels - Sets of 2 No. at 3.0 m centres/barrette or diaphragm wall panel
- (v) Before testing, fill up the tube with water to provide the necessary acoustic coupling and refill with water prior to testing as necessary. A plan shall be provided to the Testing Firm showing the layout and the constructed length of the structural elements to be tested.
- (vi) All tubes shall be cut off flush with the concrete and filled up by pressure grouting with cement and sand (1:3) grout at completion of all testing.
- (vii) Notwithstanding Clause 5.35 (i), for barrettes and large diameter bored piles with diameter up to 2500 mm, one of the mild steel tubes shall be replaced with a larger tube of 100 to 150 mm internal diameter. For large diameter bored piles exceeding 2500 mm diameter, two numbers of the mild steel tubes shall be replaced with a larger tube of 100 to 150 mm internal diameter. Size of tube shall be big enough to obtain a core of N size. The bottom of the larger steel tube should be fitted with a mild steel cap, at about 700 mm above the founding level of the pile.

**Toe Coring**

**5.35.1**

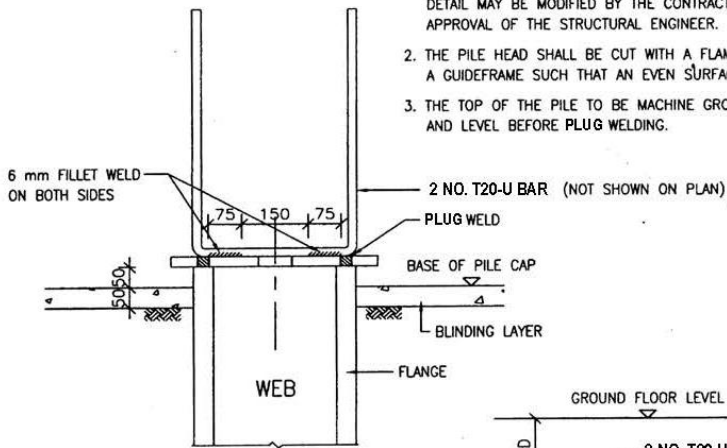
Toe coring to obtain a core of N size to examine the interface between pile and bedrock without coring through the entire length of pile shall be carried out. One number of toe coring shall be carried out for each barrette and large diameter bored pile with diameter up to 2500 mm and two numbers of toe coring shall be carried out for each large diameter bored pile with diameter exceeding 2500 mm. The toe coring length shall be more than 1400 mm of which at least 700 mm shall be into bedrock



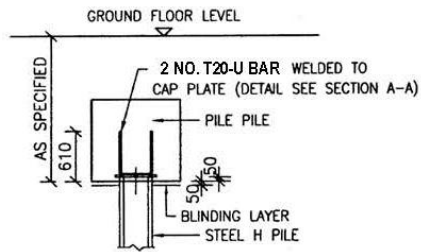
PLAN

NOTES :

1. THE CAPPING DETAIL IS CONSIDERED AS MINIMUM PROVISION. IF THIS ARRANGEMENT IS CONSIDERED AS INSUFFICIENT, THE DETAIL MAY BE MODIFIED BY THE CONTRACTOR WITH THE APPROVAL OF THE STRUCTURAL ENGINEER.
2. THE PILE HEAD SHALL BE CUT WITH A FLAME CUTTER MOUNTED ON A GUIDEFRAME SUCH THAT AN EVEN SURFACE IS ACHIEVED.
3. THE TOP OF THE PILE TO BE MACHINE GROUND SMOOTH AND LEVEL BEFORE PLUG WELDING.

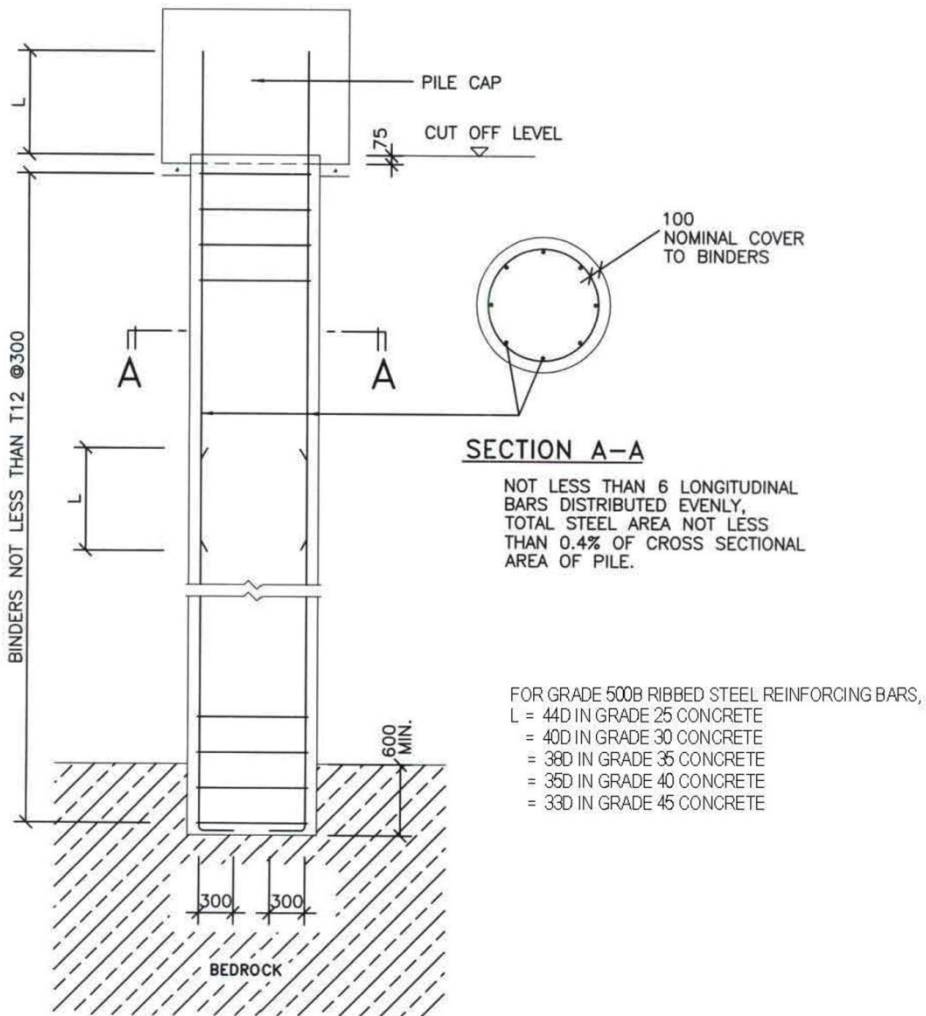


SECTION A-A



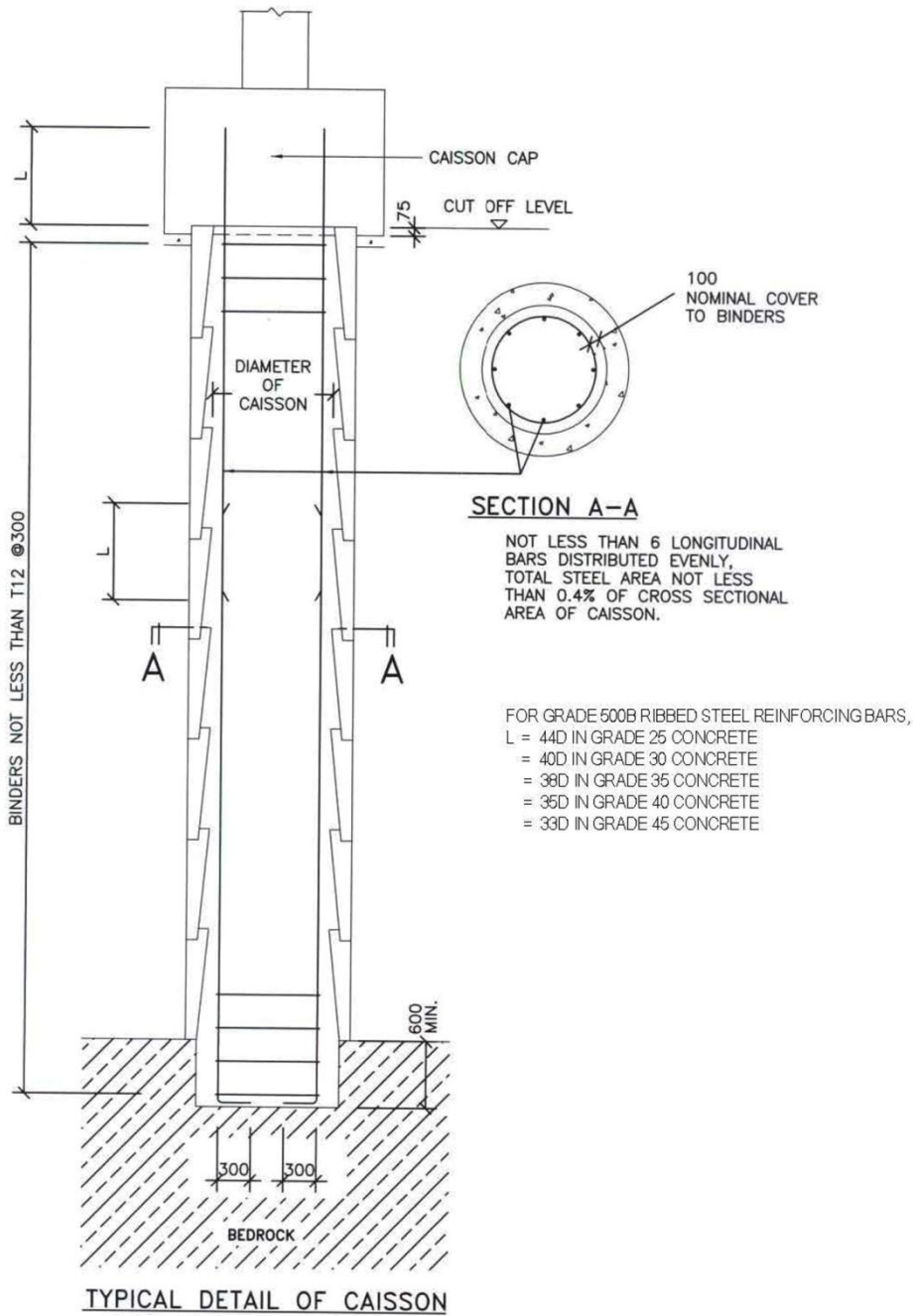
DETAIL SHOWING STEEL H PILE HEAD

ANNEX C



TYPICAL DETAIL OF LARGE DIAMETER BORED PILE

ANNEX D



ANNEX E

Amendments to Section 6

**Steel reinforcement**      **6.14**      Steel reinforcement shall be plain steel reinforcing bars or ribbed steel reinforcing bars to **CS2** or steel fabric to **BS 4483**. Cold reduced steel wire used for the manufacture of steel fabric shall be to **BS 4482**.

- Test specimens**      **6.17**
- (i) Provide and cut test specimens from each batch of steel reinforcement as directed by the SO. All test specimens shall be appropriately marked and delivered to the Public Works Laboratories (PWL) for testing. No claim in respect of steel suffering from damage or rod lengths being reduced due to the taking of testing specimens will be entertained.
  - (ii) Alternatively the Contractor may deliver test specimens to the independent laboratories approved by the SO.
  - (iii) Test certificates shall be sent to the SO directly from these independent laboratories.
  - (iv) Allow sufficient time for the testing of specimens. Do not use steel reinforcement until the relevant test specimens have successfully passed all tests. Remove unsatisfactory material off the Site when instructed by the SO.
  - (v) For steel reinforcing bars, determination of mass per metre, tensile test, rebend test, chemical analysis and test on bond property based on surface geometry shall be carried out on test specimens for each batch of steel reinforcing bars delivered to site in accordance with **CS2**.
  - (vi) For fabric reinforcement, provide samples from each batch as follows:

Sampling rate of fabric reinforcement	
Size of batch	No. of samples per batch
0 – 50 tonnes	1
Each additional 50 tonnes or part of 50 tonnes	1

- (vii) Each sample shall comprise three 1.2 m long x 1.2 m wide test specimens taken from different sheets in the batch. Each test specimen shall contain at least three wires in each direction.
- (viii) Each sample of fabric reinforcement shall be tested to determine the yield stress, tensile strength, elongation, weld shear strength, rebend performance, unit mass and pitch dimension.
- (ix) The method of testing shall be in accordance with the following:

Cold reduced steel wire      : **BS 4482**

Steel fabric : **BS 4483**

- (x) The number of tests on each sample of fabric reinforcement shall be as follows:

Description	Type and number of tests				
	Tensile	Rebend	Unit Mass	Weld Shear Stress	Pitch Dimension
Steel fabric					
- fabric sheet	-	-	3	1	-
- longitudinal wire	3	1	-	-	1
- transverse wire	3	1	-	-	1

- (xi) A batch of fabric reinforcement is considered as not complying with the specified requirements for characteristic strength if the yield stress in any tensile test carried out on any sample taken from the batch is less than 93% of the specified characteristic strength. The non-complying batch of fabric reinforcement shall be removed from the Site.
- (xii) If the yield stress of fabric reinforcement in any tensile test is less than the specified characteristic strength but equal to or greater than 93% of the specified characteristic strength, additional samples shall be provided from the same batch and additional tests for yield stress shall be carried out. The number of additional samples shall be as stated in Clause 6.17(vi).
- (xiii) If the result of any test for yield stress, tensile strength, elongation, weld shear strength, rebend, unit mass or pitch dimension does not comply with the specified requirements for the property, additional samples shall be provided from the same batch and additional tests for the property shall be carried out. The number of additional samples shall be as stated in Clause 6.17(vi).
- (xiv) Each additional sample shall comprise six 1.2 m long x 1.2 m wide test specimens taken from different sheets in the batch. Each test specimen shall contain at least three wires in each direction. The number of tests shall be as follows:



Description	Type and number of tests				
	Tensile	Rebend	Unit Mass	Weld Shear Stress	Pitch Dimension
Steel fabric					
- fabric sheet	-	-	6	2	-
- longitudinal wire	6	2	-	-	2
- transverse wire	6	2	-	-	2

- (xv) The batch of fabric reinforcement is considered as not complying with the specified requirements for any particular property if the result of any additional test does not comply with the specified requirements for that property.

## Aggregates

### 6.33

Aggregates shall be obtained from a source approved by the SO. Aggregates from marine source and all-in aggregates shall not be used.

Coarse aggregate shall consist of clean, hard and durable crushed rock complying with **CS3**.

Fine aggregate shall consist of clean, hard and durable crushed rock complying with **CS3**. Natural sand shall not be used in production of concrete unless otherwise agreed by the SO.

The flakiness index when determined to **CS3** shall not exceed 40 for aggregate of 40 mm size or larger, or 35 for sizes of 10 to 28 mm.

The potential alkali-reactivity category of coarse aggregate and fine aggregate shall be determined from the results of tests on potential alkali-reactivity of aggregates using the test method given in CS1. Aggregates in the "Reactive" category shall not be used unless with the prior approval of the SO.

Unless otherwise specified in the Contract, Sub-section 4.2.1 of **CS3** on Los Angeles value shall not be required for aggregates.

## Grading of aggregate

### 6.34

The grading of the combined fine and coarse aggregates shall be such as to produce a dense concrete of suitable workability, using the specified proportions of cement and water.

Aggregates shall be subjected to sieve analysis to **CS3**. The SO may require further analysis to be made if there is any alteration in the type of aggregate.

**Water**

**6.35**

Water for concreting shall be clean and uncontaminated potable water from Government main supply or any other approved source. If taken from a source other than Government main supply, it shall be tested in accordance with **BS EN1008** when required by the SO.

Wash water from concrete mixer washing operations (recycled water) may be used for mixing concrete of grade strength not exceeding 35 MPa provided that :

- (i) The density of the combined water comprising tap water and recycled water does not exceed 1030 kg/m<sup>3</sup>.
- (ii) The 28 days strength of test cubes with combined water shall not fall below 90% of control test cubes made with tap water.
- (iii) The chemical limits of the combined water shall not exceed those in Table 6.15.
- (iv) Tests shall be conducted in accordance with Table 6.15.

TABLE 6.15

Chemical Limits for Combined Water (Recycled water and tap water) for each batching plant

Description	Limits	Test method	Test frequency
Physical test			
(a) Density test for recycled water	≤ 1030 kg/m <sup>3</sup>	Note 1	At least once per day
(b) Initial setting time of cement with recycled water (time of set, deviation from control, h:min)	From 1:00 earlier to 1:30 later	<b>BS EN 196-3</b>	Once every 3 months for the first year and thereafter at half-yearly intervals
Chemical test for recycled water			For all tests:
(a) Chloride content (as Cl <sup>-</sup> ):			(i) Once per week for the first 2 months
- prestressed concrete	500 ppm	<b>APHA 4500-C1-B</b>	(ii) Once per month for the next 12 months thereafter
- steam-cured structural concrete			(iii) In case of a weekly or monthly test indicates that the limits are exceeded, the water shall immediately be suspended for use in concrete mixing until two sets of consecutive test results taken from the same source are satisfactory. In such case, the testing frequency shall be maintained at or reverted back to once per week until two sets of consecutive test results are satisfactory.
- concrete with reinforcement or other embedded metal	1,000 ppm	<b>APHA 4500-Cl-B</b>	(iv) The testing frequency shall be subject to review after the 12-month period for the monthly test.
(b) Sulphate content (as SO <sub>4</sub> )	3,000 ppm	<b>APHA 4500-SO42-C</b>	
(c) Acid-soluble alkali content	600 ppm	<b>BS EN 1008</b>	

- Notes:
1. Test method to be proposed by the Contractor for the acceptance of the SO.
  2. Accredited Laboratory for the relevant tests shall be used, if available, in which case results shall be issued on HOKLAS endorsed test reports.
  3. Where ppm means part per million by mass

**Standard mixes 6.41**

If it is not proposed to use designed mixes, the standard mix proportions shown in Tables 6.6 and 6.7 shall be used.

Compliance testing shall be in accordance with Clauses 6.55, 6.56 and 6.57. Notwithstanding the provisions of these clauses the SO may reduce the frequency of sampling and testing if he is satisfied with the Contractor's quality control.

Admixtures may be used subject to the provisions of Clause 6.36.

**TABLE 6.7**  
Percentage by mass of fine aggregate to total aggregate for standard mix concrete

Grade strength (MPa)	Grading of the aggregate	Nominal maximum aggregate size (mm)	40	20	10
10	C, M or F	Percentage by mass of fine aggregate to total aggregate (%)	30 - 45	35 - 50	-
20, 25 or 30	C		30 - 40	35 - 45	45 - 55
	M		25 - 35	30 - 40	40 - 50
	F		25 - 30	25 - 35	35 - 45

Note : Grading C, M and F refer to those given in **CS3**

**20% recycled coarse aggregates 6.42.3**

When specified, concrete with 20% recycled coarse aggregates shall be used in designed mix concrete of 25 to 35 MPa grade strength except in water retaining structures, subject to the following :

- (i) Either Type CEM I of Portland cement to **BS EN 197-1** or Type CEM I Portland cement in combination with PFA can be used in accordance with Clause 6.30.
- (ii) Coarse aggregates shall consist of 80% natural rock aggregates as defined in the GS and 20% recycled coarse aggregates.
- (iii) Recycled coarse aggregates shall be produced by crushing old concrete and shall meet the requirements in Table 6.16.
- (iv) Tests on recycled aggregates from a particular source, with the exception of Government sources, shall be carried out by the aggregates producer at weekly intervals in compliance with Table 6.16.
- (v) Fine aggregates shall be as defined in the GS.
- (vi) Fine aggregates recycled from old concrete shall not be used.

- (vii) The grading of the coarse aggregates shall comply with the limits as defined in the GS for single-sized 20 mm and 10 mm aggregates.
- (viii) Recycled coarse aggregates shall be thoroughly wetted before being used.
- (ix) The concrete shall have a minimum slump of 75 mm when it is ready to be compacted to its final position.
- (x) Before any concrete is produced for use in the works, trial mixes shall be performed in accordance with the GS.
- (xi) Compliance criteria in cube strength shall be as defined in the GS.
- (xii) Recycled aggregates shall be stored in separate stockpiles or silos to prevent inadvertent mixing with natural aggregates.
- (xiii) A separate compartment shall be provided for recycled aggregates in the batching plant.
- (xiv) Natural aggregates shall be used in lieu of the recycled aggregates in case of supply shortage of recycled aggregates.

TABLE 6.16

Recycled coarse aggregate

Mandatory Requirements	Limits	Testing Method
Minimum dry particle density (kg/m <sup>3</sup> )	2000	Section 17 of CS3
Maximum water absorption	10%	<b>Section 17 of CS3</b>
Maximum content of wood and other materials less dense than water	0.5%	Manual sorting in accordance with: BRE Digest 433
Maximum content of other foreign materials (e.g. metals, plastics, clay lumps, asphalt and tar, glass etc.)	1%	
Maximum content of fines	4%	<b>Section 10 of CS3</b>
Maximum content of sulphate (% m/m)	1%	<b>Section 21 of CS3</b>
Flakiness index	40%	<b>Section 11 of CS3</b>
10% fines test	100 kN	<b>Section 16 of CS3</b>
Grading	Table 3.1 of <b>CS3</b>	
Maximum chloride content	Table 5.1 of <b>CS3</b> – 0.05% by mass of acid soluble chloride ion of combined aggregates	

**Equivalent sodium oxide (Na<sub>2</sub>O) content**

**6.47.2**

- (i) The equivalent sodium oxide (Na<sub>2</sub>O) content of the concrete shall be calculated from the following expression:

$$\text{Equivalent Na}_2\text{O} = A + B + C$$

Where

A is the sum of the acid-soluble alkali content (expressed as equivalent Na<sub>2</sub>O) of cement, admixtures and water;

B is equal to 1/6 the total alkali content of PFA (expressed as equivalent Na<sub>2</sub>O) or 1/2 of the total alkali content of GGBS (expressed as equivalent Na<sub>2</sub>O). If the proportion of PFA is less than 20% or that of GGBS is less than 25% of the total cementitious content, the value of B shall be equal to the total alkali content of PFA or GGBS expressed as equivalent Na<sub>2</sub>O; and

C is equal to 0.76 times the chloride ion (Cl<sup>-</sup>) of the aggregate.

- (ii) The acid-soluble alkali content of the cement shall be determined in accordance with **BS EN 196-2** and shall be taken as the average of the latest 25 daily determinations of equivalent sodium oxide plus twice the standard deviation of the results.
- (iii) The acid-soluble alkali content of admixtures shall be determined in accordance with BS 1881-124.
- (iv) The acid-soluble alkali content of water shall be determined in accordance with BS EN 1008.
- (v) The total alkali content of the PFA or GGBS shall be determined in accordance with BS EN 196-2 and shall be taken as the average of 25 weekly determinations plus twice the standard deviation of the results.
- (vi) The chloride ion content of the coarse and fine aggregates shall be measured in accordance with CS3.

**Lintels**

**6.68**

Cast lintels in concrete Grade 20/20 either precast or cast in-situ, and construct as shown in Table 6.14.

Provide 25 mm minimum concrete cover between steel bar reinforcement and soffit.

Allow bearing of 150 mm (minimum) at each end.

TABLE 6.14

## Lintels

Clear span (m)	Depth of lintel (mm)	No. and diameter of steel reinforcing bars per 105 mm (or part) in width
0 - 1	150	One 12 mm
1 - 2	225	One 16 mm
2 - 3	300	One 20 mm

Amendments to Section 8**Aggregate****8.04**

Provide coarse aggregate of 20 mm nominal maximum size with grading within limits as defined in **CS3** and fine aggregate with grading lying within the limits of Grading C or M. Natural sand shall not be used in production of concrete unless otherwise agreed by the SO.

Aggregates, if so instructed by the SO, shall be subjected to sieve analyses to **CS3**.

Amendments to Section 13**Timber for external use****13.01.1**

(i) Species : Timber shall be either hardwood or softwood suitable for external use.

Approved softwood may be Radiata Pine, and Red or White Pine or those cited in Table NA.1 of **BS EN 942**. Approved temperate hardwoods may be Beech or Oak or those cited in Table NA.2 of **BS EN 942**. Submit the species to be used to the SO for approval.

(ii) Source of Supply : Obtain timber either softwood or hardwood from a responsibly managed forest or plantation that is preferably Forest Stewardship Council (FSC) certified; where this is not available, ensure that the timber is at a minimum from a Known Licensed Source.

Submit FSC certificates and invoice copies that clearly show the FSC chain of custody number against the purchase product. Where FSC is not available, submit certificates, invoice copies and other paperwork from other systems that shows the product is either Known Licensed Source or Source in Progress to Creditable Certification.

(iii) Seasoning : Moisture content to be in accordance with Clause 13.03. Maintain the specified moisture content of the

timber until preservative treatment described below is applied.

- (iv) Preservative : Preservatives shall be environmentally friendly, healthy and safe, acceptable preservatives include Alkaline copper quaternary (ACQ) preservatives to American Wood Protection Association (AWPA) Standards or other suitably approved preservatives. Chromate copper arsenic (CCA) is not allowed to be used subject to approval by the SO.
- (v) Tropical hardwoods : Tropical hardwoods, which include species such as Meranti, Iroko, Sapele, Angre, Mahogany, Teak and Ramin, should not be used unless they originate preferably from a forest that is Forest Stewardship Council (FSC) certified or where this is not available, from a forest participating in a system designed to progress that forest towards FSC certification or equivalent authorized certification.

**Softwood**                    **13.05**                    Softwood for carpentry to be Pine, Cedar, Spruce or China fir or other species approved by the SO. All timber shall be appropriately stamped or marked to identify origin and grade. All timber shall be kiln dried and treated according to Clause 13.01.1 (iv), or as directed otherwise by the SO.

All softwood and softwood products shall be from a verifiable sustainable forest and shall be accredited with a certificate from the Forest Stewardship Council (FSC) or other Approved Authority. While a certificate from FSC is preferable, certificates, invoice copies and other paperwork from other systems that shows the product is either Known Licensed Source or Source in Progress to Creditable Certification are considered as acceptable certificates from Approved Authority.

**Wood block flooring**                    **13.09**                    Wood block flooring shall be approved high density resin bonded fibreboard flooring or other approved hardwood as specified. Resin shall conform to Class E1 under BSEN 13986. Finished thickness shall be 20 mm (minimum). Blocks shall be 300 mm x 50 mm in size and colour matched.

**Plywood**                    **13.12**                    Plywood shall be of the following grades, as specified:

- (i) "Grade 1 veneer" - hardwood faced, as specified, for natural finish.
- (ii) "Grade 2 veneer" - lauan faced for painting.

Generally the bonding adhesive between veneers shall be resin adhesive classified as moisture and weather resistant (M.R.) in **BS 1203**. Adhesive shall conform to the requirement in Clause 13.29.

Nominal standard thicknesses of plywood shall be 3, 4, 5, 6, 9, 12, 15, 18 and 25 mm.

Plywood containing hardwoods of unknown species or from unidentified sources are expressly prohibited from use. Use only plywood and plywood products made from softwoods or temperate hardwoods that originate from the Forest Stewardship Council (FSC) certified forests or other Approved Authority.

While a certificate from FSC is preferable, certificates, invoice copies and other paperwork from other systems that shows the product is either Known Licensed Source or Source in Progress to Creditable Certification are considered as acceptable certificates from Approved Authority.

**Acoustic tiles**      **13.22**

Acoustic tiles shall be of an approved proprietary brand meeting the requirements of **BS EN 13964** manufactured from the following materials:

- (i) Wood or other organic fibre insulating board to **BS EN 622**, 12 mm (Minimum) thick for 300 mm x 300 mm tiles and 15 mm (minimum) thick for 400 mm x 400 mm tiles.
- (ii) Mineral fibre or wool insulating board 12 mm (minimum) thick for 300 mm x 300 mm tiles and 15 mm (minimum) thick for 400 mm x 400 mm tiles.
- (iii) Approved multi-purpose, dimensionally stable building board 6 mm (minimum) thick.

Tiles shall have a plain, perforated or fissured surface with a factory applied decorative finish. The edges shall be square, bevelled, or bevelled and grooved to suit the suspension system.

Provide a certificate from the manufacturer confirming that the tiles are asbestos free.

Tiles shall be manufactured with low emission materials conforming to European E1 emission standard.

**Nails**                      **13.24**

Nails shall be steel nails to **BS 1202**:Pt. 1, with "bright" finish, unless otherwise specified. The nail and its coating shall not contain Arsenic, Cadmium, Copper, Lead or Mercury.

Nail lengths shall be not more than the total thickness of sections to be joined less 5 mm, or not less than twice the thickness of section through which nails are driven.

Where the thickness of the outer section through which nails are being driven is less than half that of the section to which nailing is being done, the depth of penetration of the nails into the latter shall be not less than 10 diameters of the nails being used.

**Screws**                      **13.25**

Wood screws shall be brass, stainless steel, alloy or other non-corroding metal to **BS 1476** with countersunk heads, unless otherwise specified. Steel screws shall only be used for temporary work. The proper dedicated screws shall be used for all Particle-board fixing.

Screw lengths shall be not more than the total thickness of sections to be joined, less 5 mm, or not less than one and a half times the thickness of section through which screws are driven.



Where the thickness of the outer section being screwed is less than half that of the section to which screwing is being done, the depth of penetration of the screwing into the latter shall be not less than the thickness of the outer section.

Screw cups shall be brass cups or stainless steel and to **BS 1494**.

**Adhesive 13.29**

Adhesive for wood shall be as follows:

- (a) For internal use; synthetic resin adhesive classified as moisture resistant and moderately weather-resistant (M.R.) in **BS EN 204** and **BS EN 301**.
- (b) For external use or internal use under very damp conditions; synthetic resin adhesive classified as Type I in **BS EN 301** and tested according to **BS EN 302**.
- (c) Formaldehyde Emission shall be of Class E1 under BSEN 13986.

Adhesive for fixing laminated plastic sheet shall be synthetic resin adhesive classified as type I in **BS EN 301**.

Where the temperature exceeds 25 degree C, a "warm-setting" grade of adhesive shall be used.

The use of animal glues shall not be permitted.

**Resin for MDF panels 13.29.1**

All urea formaldehyde bonded MDF panels and MUF mouldings shall be manufactured with low emission resins conforming to European E1 of BSEN 13986 emission standard.

**Wood preservative to external timber 13.30.1**

Wood preservative to external timber shall be applied as follow:

- (i) Preparation : Timber shall be free from dirt and surface moisture.
- (ii) Application of Preservative : Apply by pressure impregnation in accordance with **BS 8417**.

Apply preservative in a manner that is not hazardous to health. Adhere strictly to the manufacturer's instructions.

- (iii) Cutting and Machining : Whenever possible, all cutting, planning, boring, drilling, notching or any other machining or manual operation shall be completed prior to preservative treatment.

- (iv) Incising : For certain timbers such as Douglas Fir which are difficult to impregnate, make 20 mm deep incisions coverage of 650 per m<sup>2</sup> in the direction of the grain all in accordance with **BS 144**. This method shall only be used on timber

sections exceeding 80 mm thickness.

- (v) Creosote Application : For timber where impregnation is not suitable and a paint finish is not required, when approved apply 2 coats of creosote in accordance with the manufacturer's instructions.
- (vi) Guarantee : Obtain a guarantee of 30 years for timber components against rot, insect attack and fungal decay.
- (vii) The product shall not contain any heavy metals or their compounds as listed below:
  - Arsenic
  - Cadmium
  - Copper
  - Lead
  - Mercury

**Acoustic tiles**      **13.45**      Fix acoustic tiles and the like to timber battens or direct to sub-base by means of an approved adhesive used in accordance with the requirements of Clause 13.29 and manufacturer's recommendations.

**Wood block flooring**      **13.50**      Ensure that the base is clean and dry. Fix blocks to screed with an approved cold bitumen/rubber emulsion adhesive as in Clause 13.29. Lay to herringbone or basket pattern, as specified, with straight border two blocks (minimum) wide.

Provide 5 mm expansion gap at perimeter of areas of wood block flooring, and fill with one of the following:

- (a) Cork strip
- (b) Foam rubber strip

Sand surface of wood block flooring with an electric surfacing machine using sequentially graded abrasive paper to obtain a smooth surface ready to receive sealer or polish.

Machine shall be fitted with dust bag to control the release of dust.

**Fire resisting timber door**      **13.61**      Fire resisting timber doors should be flush door as described above, including frames, hinges door closers and any other hardware and shall comply with **BS 476**: Part 20-23.

Proprietary fire doors should be tested in accordance with **BS 476** and to the approval of the SO. Test report shall be provided to indicate that the material, product or construction is capable of resisting the action of fire for the specified period. The test shall be carried out and the test report shall be prepared by an Accredited Laboratory.

### Amendments to Section 15

<b>Materials for grouting of base plates and end plates</b>	<b>15.15</b>	<p>Unless specified otherwise, grout around foundation bolts, under column base plates and behind connection end plates shall be one of the following types:</p> <p>(a) Fluid cement mortar not leaner than 1:1 cement to fine aggregate by volume and be mixed as thickly as possible consistent with fluidity. The minimum amount of water is to be added to provide a viscosity suitable for the voids to be filled without bleeding or segregation of the fresh grout mix; or</p> <p>(b) An approved proprietary non-shrink polymer modified cementitious or resin based grout.</p> <p>Grout shall have at least the same grade strength as the surrounding concrete.</p>
<b>Testing of sections and plates</b>	<b>15.17</b>	<p>Provide one test specimen for every 40 tonnes or part thereof of each section or plate of same thickness from the same cast. For the purpose of this clause "same thickness" means similar sections with a variation in thickness not exceeding + 5 mm. Test specimens shall be taken from sections selected at random on Site by the SO.</p> <p>Prepare the test specimens to BS EN 10002-1 as directed and appropriately mark and deliver them to Public Works Laboratories, as directed by the SO. Unless specified otherwise, the test specimens shall be subjected to tensile test in accordance with BS EN 10002-1.</p> <p>For proprietary structural steel products (e.g. playground equipment, lamp posts), subject to the approval of the SO, manufacturer's certificates may be accepted as proof of quality in lieu of sampling on site when all steel sections are prefabricated by the manufacturer prior to shipment.</p>
<b>Through thickness properties</b>	<b>15.18</b>	<p>Ensure that where appropriate the steel material has adequate through thickness properties to satisfy the design, the method of fabrication, welding procedures and non-destructive inspection regime such that the material at, or adjacent to, welds is free of laminations, centreline segregation or other crack like indications on completion of welding.</p> <p>Any material, which is specified or proposed by the Contractor to have enhanced through thickness properties, shall comply with the requirements of <b>BS EN 10164</b>. The Contractor shall, not less than three weeks prior to ordering the steel, submit a report to the SO which documents the strategy that will be adopted (in terms of material selection, weld procedure, procedure trials, weld sequence, shrinkage control and inspection regime) to ensure that the above criteria are satisfied.</p> <p>If valid test reports issued by the manufacturer are not available, carry out the following additional tests by Public Works Laboratories or an Accredited Laboratory:</p> <p>(a) Ultrasonic grading to <b>BS EN 10160</b> Class S1 and <b>BS EN 10306</b> Table 2 Class 2.3 for flat products and sections respectively; and</p> <p>(b) Through-thickness tensile tests to <b>BS EN 10164</b>.</p>

**Installation and testing of drill anchor bolts**      **15.31**

All drill anchor bolts shall be coordinated such that they do not clash with any reinforcing steel bars of the concrete structure. Any deviation from the specified positions shall be reported to the SO before installation.

Installation of drill anchor bolts shall strictly follow the manufacturer's specifications. Any installation procedures or details that deviate from the manufacturer's specifications shall be appended by a written statement from the manufacturer to confirm strength of the anchors.

Where specified, carry out loading test of drill anchor bolts in accordance with **BS 5080**: Pt. 1 and 2 at a sampling rate of at least 1% of the anchors or 5 numbers, whichever is more, of each type and size of the anchors installed. Each sample anchor shall be tested for tensile load by pull-out test and/or shear load by shear load test, as appropriate, to not less than 1.5 times the recommended working load of the anchor as specified by the manufacturer and with a minimum holding time of 60 minutes under maximum test load. The sample anchor shall not show any signs of separation, plastic deformation or deleterious effect, and shall have at least 80% recovery of the total deformation upon removal of the test load. If the loading test of any sample anchor fails, the failure mode shall be recorded and the cause shall be determined and reported to the SO. Propose remedial measures, including justification calculations for any alternate design and method statement, for agreement with the SO prior to carrying out any remedial works. The sample anchor shall not be used for permanent work unless agreed by the SO.

Employ an Accredited Laboratory to carry out the testing of drill anchor bolts, and provide any necessary labour and attendance. The Accredited Laboratory shall submit test reports directly to SO in sealed envelopes within 3 days after the testing.

**Method statement**      **15.34**

Prepare and submit details of the proposed method of erection for approval. Details submitted shall include type of plant and equipment to be used and, if necessary, drawings and calculations of any temporary work. Approval shall not in any way relieve the Contractor of his responsibility for safe erection of permanent work, or the safe erection and subsequent dismantling of temporary work. Design, construct and dismantle falsework to **BS 5531** when specified.

Method statement for grouting under column base plates and connection end plates shall be submitted for approval. Grouting trial shall be conducted on site to verify the proposed method statement under site conditions before approval.

**Packings and grouting**      **15.37**

Bed column bases and connection end plates or grout anchor bolts only after the steelwork has been plumbed, levelled, aligned, adequately braced.

Steel packings and wedges of sufficient strength and stiffness shall be used to plumb and level columns before grouting, and shall be of sufficient size to avoid local crushing of the concrete. They shall be placed so that they do not prevent subsequent grouting to completely fill all spaces directly under the column base plates or behind connection end plates. Grout shall be applied under a suitable head and tamped or vibrated to remove air pockets.

Where packings are to be left in position and subsequently grouted, they are to be placed such that they will be totally embedded in the grout with

adequate cover.

Immediately before grouting, the space under column base plates or behind connection end plates shall be clean and free of all extraneous matter.

Material for sealing the perimeters around the column base plates or connection end plates for grouting shall be removed after grout has been cured to expose the grout surface for inspection.

If grouting were carried out without approved method statement or without agreement by the SO, demonstrate to the satisfaction of the SO that approved grouting materials have been used and the grouted space is free from void pocket.

**Qualification testing of welding procedure**      **15.47**

Carry out qualification testing of approved pWPS by Welding Procedure test to **BS EN ISO 15607** and **BS EN ISO 15614-1** strictly in accordance with the approved pWPS and using representative samples of the materials. The qualification testing including welding and testing shall be examined by an Accredited Laboratory approved by the SO. Allow for the SO's inspection of the qualification testing.

Subject to the approval of the SO, qualification testing of pWPS need not be carried out if the same procedures have been tested and approved by the Accredited Laboratory.

Strictly follow the qualified WPS for the works. Carry out further qualification tests if either the material or procedure changes.

Based on the qualified WPS, prepare appropriate work instructions for all sizes of butt welds and fillet weld where leg length equals to or exceeds 10mm. Submit the work instructions for SO's approval prior to the commencement of welding. Work instructions shall include cross-reference to the qualified WPS upon which they are based, and shall indicate clearly all essential information including their acceptable range for the specific weld size.

**Welding consumables**      **15.48**

Consumables shall be to **BS EN 499**, **BS EN 440**, **BS EN 756** or **BS EN 758** as appropriate and strictly in accordance with the manufacturer's recommendations.

Submit delivery notes of welding consumables to the SO. Maintain a log book for welding consumables on site which shall contain the date, types and quantities of welding consumables delivered on site, and the updated balance. Submit daily record to the SO on the names of welders engaged, welding joints under preparation, types and quantity of welding consumables used.

**Acceptance of welds**      **15.58**

Employ an Accredited Laboratory to carry out and interpret the inspection and testing of welds, and provide any necessary labour and attendance. Submit evidence proving that operators carrying out the inspection and testing have been trained and assessed for competence in the inspection and testing of welds. In addition, submit certificates of competence from a recognised authority for operators carrying out ultrasonic examination. Arrange for the Accredited Laboratory to submit a testing programme for the approval of the SO. Any welds that shall be rendered inaccessible by subsequent work shall be examined prior to the loss of access.

Visually inspect all welds in accordance with **BS EN 970**, and after visual inspection, carry out non-destructive testing in accordance with Table 15.6:

TABLE 15.6

<b>Weld Type</b>	<b>Frequency of Non-destructive Testing</b>
<b>All types of butt welds</b>	100% ultrasonic examination and magnetic particle inspection
<b>Fillet welds with leg length exceeding and including 10 mm</b>	20% ultrasonic examination and magnetic particle inspection
<b>Fillet welds with leg length not exceeding 10 mm</b>	20% magnetic particle inspection
<b>Secondary attachment welds, e.g. for fixing purlins, side rails</b>	5% of attachments by magnetic particle inspection and ultrasonic examination if leg length exceeds and includes 10 mm

The standard of acceptance for welds shall be in accordance with Table 14.3b in the Code of Practice for the Structural Use of Steel issued by the Buildings Department.

Carry out surface flaw detection by magnetic particle inspection (MPI) in accordance with BS EN 1290. If MPI is impractical, dye penetration inspection (DPI) may be used, subject to the approval of the SO, in accordance with BS EN 571.

Carry out ultrasonic examination in accordance with BS EN 1714 Level B. Make printout results available during ultrasonic examination on site at 3 specified locations per weld (such as at both ends and in the middle of the weld) and at positions in question.

The Accredited Laboratory shall submit test reports directly to the SO in sealed envelopes within 3 days of the completion of the testing. Tests revealing discontinuity shall be reported separately from the subsequent repair and re-test.

Unless approved otherwise by the SO, carry out all non-destructive testing not less than 16 hours from the time of completion of the weld to be inspected, or not less than 40 hours in case of butt welds thicker than 40 mm or any welds to S450J0 steel. Should test results indicate that welds are below the standard of acceptance, carry out at the Contractor's own expense approved remedial measures and further acceptance tests.

**Generally**            **15.66**            Fire protection system shall comply with the requirements of the **Code of Practice for Fire Safety in Buildings** including its latest amendments and revisions issued by the Buildings Department and shall provide the structural steelworks with the required Fire Resistance Rating (FRR) as specified in the Contract or as required by the **Code of Practice for Fire Safety in Buildings**. In case that specified proprietary products are used, they shall still comply with the requirements in Clauses 15.66 – 15.72.

**Fire protection system**    **15.67**            When specified, provide fire protection to structural steel by one of the following materials or system:

- (i) Sprayed mineral coating to **BS 8202**: Pt. 1;
- (ii) Intumescent coating system to **BS 8202**: Pt. 2; or
- (iii) Proprietary fire protection board.

The fire protection system including its construction shall have been tested and assessed to the requirements of **BS 476**: Pt. 20 and Pt. 21 as being capable of resisting the action of fire for the specified periods. The tests and assessment shall be carried out by an Accredited Laboratory, or one of the assessing organizations listed in **APP-118** issued by the Buildings Department. The assessment report shall be within its validity period.

Details of application of the materials such as surface preparation, application of primer, fixing details etc. shall be strictly in accordance with the approved tests and assessment report; no deviation can be made except for specific situations where some minor variations may be necessary. Such variations must be tested or assessed by an Accredited Laboratory.

**Submittals**            **15.68**            The proposed fire protection system shall meet the design intent, the required performance criteria and other requirements specified in the Contract. The fire protection system must be approved by the SO before use. Submit to the SO for approval all relevant information including but not be limited to the following:

- i. Product data: Data identifying performance characteristics and properties of the fire protection material.
- ii. Tests and assessment report prepared by an Accredited Laboratory as specified in Clause 15.67 above, together with job references and information of whether the product has been accepted by the Buildings Department, Association for Specialist Fire Protection (ASFP), Underwriters Laboratories Inc. or other international recognized organizations.
- iii. Details of the fire protection system including the thickness of coating/board to be applied for each structural steel with calculation on section factor (  $H_p/A$  or  $A/V$  ) to substantiate that the required fire rating can be achieved.
- iv. Details of the surface preparation requirements and application technique including fixing details of the material.
- v. Certification from the fire protection coating manufacturer on the compatibility of the coatings with the corrosion protection coating/paints.

- vi. Name of installation contractor qualified for the works and acceptable to the fire protection coating/board manufacturer.
- vii. Samples of the materials.
- viii. Quality control and field test procedures.
- ix. Installation, safety and protection procedures including those for repair work.

Amendments to Section 17

<b>Fire resisting shutters</b>	<b>17.42</b>	<p>The construction and installation of the fire resisting shutter shall comply with the requirements of the <b>Code of Practice for Fire Safety in Buildings</b>, Buildings Department. The activation devices shall be constructed according to the requirements of Fire Services Department. The operation of the fire shutter and the activation devices shall be tested according to the requirements of the Codes of Practice for Minimum Fire Services Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment, Fire Services Department and the Building Services Branch Testing and Commissioning Procedure No. 3 for Fire Service Installation in Government Buildings, Architectural Services Department.</p> <p>The fire rated period of the fire resisting shutters shall satisfy the criterion of integrity relating to the method of exposure on each side separately when tested in accordance with <b>BS 476</b>:parts 20 to 24.</p> <p>A test report prepared by an Accredited Laboratory or Building Authority shall be provided to certify that the fire resisting shutter is capable of resisting the action of fire for the specified period.</p> <p>The fire resisting shutters shall be provided with smoke detector(s) and manual control devise(s) on both side of the wall openings for automatic and manual operation respectively. The detectors installed shall comply with the requirements of the General Specification for Fire Service Installation in Government Buildings of the Hong Kong Special Administrative Region, Architectural Services Department.</p>
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Amendments to Section 18

<b>Vinyl tiles</b>	<b>18.131</b>	Unbacked flexible PVC (vinyl) tiles shall be to <b>BS EN 649</b> , size 225 x 225 or 300 x 300 and 2 mm thick.
<b>Unbacked flexible PVC vinyl sheet</b>	<b>18.132</b>	Unbacked flexible PVC (vinyl) sheet shall be to <b>BS EN 649</b> , 2.0 mm thick to floors and 1.2 mm thick to walls.
<b>Foam backed vinyl sheet</b>	<b>18.133</b>	Foam backed PVC (vinyl) sheet shall be to <b>BS EN 651</b> and 3 mm thick overall. The wearing layer shall be PVC (vinyl) sheet to <b>BS EN 649</b> and 1.5 mm thick.



Amendments to Section 25

**Topsoil**

**25.02**

- (a) Topsoil: evenly textured, fertile, dark brown or black, free draining, sandy loam with the following properties:
- (i) The top 300 mm fertile layer immediately below undisturbed vegetation, and not derived from recent paddy field cultivations;
  - (ii) Containing not less than 7.5% organic matter;
  - (iii) Having a pH value between 5.5 and 7.0;
  - (iv) Free from all kinds of pests, pernicious and/or perennial weeds and roots, grass, clay lumps, non-soil material, brick, cement, concrete and other building materials, foreign matter and contamination;
  - (v) Maximum stone content % (m/m) as tested under **BS 1377-2**  
Stone size in any direction:   > 2 mm       30  
  > 20 mm       10  
  > 25 mm       0  
If used in playing field or planting areas within and/or in close proximity to recreational activities areas (such as children playground and fitness station), the top 150mm shall be free from stones exceeding 20 mm and not sharp-edged in any direction.
  - (vi) Exchangeable sodium percentage (ESP) %:   <15.

The source proposal of the Topsoil shall be submitted for the approval by the SO at least 14 days before the relevant work starts.

**Fabricated Soil Mix**

- (b) Fabricated Soil Mix shall consist of friable, completely decomposed granite (or volcanics) and manufactured soil conditioner in the proportions of 3:1 by volume. The mix shall be mixed evenly and shall be free from grass or weed growth, sticky clay, salt, chemical contamination, and any other deleterious materials and stones as Clause 25.02(a)(v) , and possess the following characteristics as tested under BS 3882 and BS 1377-2
- (i) pH value between 5.5 and 7.0;
  - (ii) Organic matter more than 10% (m/m);
  - (iii) Nitrogen content more than 0.2% (m/m);
  - (iv) Extractable phosphorous (P) content more than 25mg/l of the mix;
  - (v) Extractable potassium (K) content more than 240 mg/l of the mix;
  - (vi) Extractable magnesium (Mg) content more than 50mg/l of the mix;

- (vii) Soil texture content:
  - Sand (0.06 - 2.0 mm): at the range of 40% - 75%;
  - Silt (0.002 - 0.06 mm): at the range of < 40%;
  - Clay (less than 0.002 mm): at the range of < 20%
- (viii) Maximum stone content % (m/m) as Clause 25.02(a)(v);
- (ix) Exchangeable sodium percentage (ESP) %: <15.

**Manufactured soil conditioner**

- (c) Manufactured soil conditioner shall comprise properly composted organic material with the following characteristics:
  - (i) Fine, free flowing consistency;
  - (ii) In stable condition;
  - (iii) Not capable of raising the temperature of the treated soil more than 5°C above the temperature of the untreated soil;
  - (iv) Free from impurities and not made with materials that are known to contain pathogens or other toxic materials injurious to plants, humans, or animals;
  - (v) Giving off neither toxic nor obnoxious fumes/odour;
  - (vi) With a pH value between 6.5 and 7.5;
  - (vii) With a moisture content when saturated between 30-50% (moisture weight as a proportion of overall weight);
  - (viii) With an organic matter content of not less than 85% (dry weight);
  - (ix) With a carbon nitrogen ratio between 20 and 30;
  - (x) No weed growth, other foreign matter or contamination.

**Test for manufactured soil conditioner**

- (d) Certification: prior to first use and for every 300 m<sup>3</sup> delivered to Site, produce certificates of analysis of the soil conditioner from an approved laboratory within 14 calendar days of taking the samples. An approved laboratory shall mean one of the Employer's laboratories or an Accredited Laboratory. Tests shall be carried out according to **BS 3882** and **BS 1377**. Test report shall be in the format as per the typical declaration of analysis under **BS 3882**. Each certificate shall state the results of test for the following properties stipulated for compliance in Clause 25.02(c):
  - (i) pH (H<sub>2</sub>O) value;
  - (ii) Organic matter content (dry weight);
  - (iii) Organic carbon content (using loss of ignition "Ashing" method of testing);
  - (iv) Nitrogen content: ("Kjeldahl" Method);
  - (v) Carbon: nitrogen ratio;

- (vi) Moisture content (calculated as the loss in weight between the dry weight and the overall weight as a percentage of the overall weight).
- Sand**
- (e) Sand shall be clean, sharp graded agricultural or horticultural sand 4 mm down to dust and not collected in brackish water marine environment.
- Lightweight Soil Mix**
- (f) Lightweight Soil Mix shall consist of 2 parts of decomposed granite as Clause 25.01(d), 1 part soil conditioner as Clause 25.02(c) and 1 part vermiculite pellets or volcanic pellets with a particle size of 5 – 10 mm. Maximum stone content % (m/m) shall comply with Clause 25.02(a)(v).
- Alginate**
- (g) Alginate shall be organic, derived from seaweed as soil improver, to be incorporated into the top 300 mm of soil during cultivation, when directed by the SO.
- Soil stabilizer**
- (h) Soil stabilizer shall be an approved proprietary type of binding medium applied in an aqueous suspension by spraying onto the surface of the soil to prevent short term erosion and to condition the soil. The binding agent shall not be injurious to plant growth.
- Stone chips**
- (i) Stone chips shall be clean, sharp graded suitable for horticultural use 4 – 2 mm, with no weed growth, free of other foreign matter or contamination, and not collected in brackish water marine environment.
- Test for Topsoil**
- (j) Certification: prior to first use of any Topsoil from each approved source and for every 300 m<sup>3</sup> delivered to Site, produce certificates of analysis of Topsoil from an approved laboratory within 14 calendar days of taking the samples. An approved laboratory shall mean one of the Employer’s laboratories or an Accredited Laboratory. Tests shall be carried out according to **BS 3882** and **BS 1377**. Each certificate shall state the results of test for the properties stipulated for compliance in Clauses 25.02(a).
- Test for Fabricated Soil Mix**
- (k) Certification: after mixing operation but prior to first use in any planting and/or grassing works and for every 300 m<sup>3</sup> of the mix, produce certificates of analysis of Fabricated Soil Mix from an approved laboratory within 14 calendar days of taking the samples. An approved laboratory shall mean one of the Employer’s laboratories or an Accredited Laboratory. Tests shall be carried out according to BS 3882 and BS 1377. Each certificate shall state the results of test for the following properties stipulated for compliance in Clause 25.02(b):
    - (i) pH (H<sub>2</sub>O) value;
    - (ii) Organic matter content (dry weight) expressed in %;
    - (iii) Organic carbon content (using loss of ignition “Ashing” method of testing)
    - (iv) Nitrogen content: (“Kjeldahl” Method) expressed in %;
    - (v) Extractable phosphorous (P) content per litre of the sample;

- (vi) Extractable potassium (K) content per litre of the sample;
- (vii) Extractable magnesium (Mg) content per litre of the sample;
- (viii) Soil texture content expressed in percentage of the following categorization of soil particles sizes:  
sand (0.06 - 2.0 mm), silt (0.002 - 0.06 mm) and clay (less than 0.002 mm)
- (ix) Stone content % (m/m) as tested under BS 1377-2;
- (x) Soil salinity;
- (xi) Moisture content (calculated as the loss in weight between the dry weight and the overall weight as a percentage of the overall weight);
- (xii) Carbon: nitrogen ratio;
- (xiii) Exchangeable sodium percentage (ESP) %.

**Limestone**                      **25.19**                      Limestone may be used to reduce the acidity of the soil. It shall be ground limestone, containing a minimum of 90% calcium and magnesium carbonates and capable of passing through a 10 mm mesh sieve. Prior to use, take samples and produce a certificate of analysis of the limestone from an approved laboratory within 14 calendar days of taking the sample. An approved laboratory shall mean one of the Employer's laboratories or an Accredited Laboratory. Each certificate to state calcium and magnesium carbonate content and the particle size.

**Seed**                                      **25.40**                      An approved laboratory shall mean one of the Employer's laboratories or an Accredited Laboratory.

- (a) All seed shall be true to species and laboratory tested. No seed shall be used unless covered by an appropriately numbered seed analysis report or certificate. The numbered reports or certificates shall always refer to the number on the seed containers. The origin of all seed and the name of the supplier shall be stated on the seed containers.

The quality of grass seed shall be gauged by purity, germination percentage and freedom from weeds. The total weed seed content shall not exceed 0.5% by mass and the total content of other crop seed shall not exceed 1% by mass.

**Certificates of seed**                                      (b) Provide a certificate of testing for each species of seed from an approved laboratory or supplier, stating:

- (i) Grass species and variety using botanical names;
- (ii) Date of testing (should not be more than 6 months before the date of use of the seeds);
- (iii) Test result on the percentage germination of pure seed in a fixed time under standard laboratory conditions; and
- (iv) Test result on the percentage composition by weight, including details of purity.

<b>Samples of materials</b>	(c) Samples of the following proposed materials shall be submitted to the SO at the same time as particulars of the material are submitted: <ul style="list-style-type: none"> <li>(i) Each seed mixture;</li> <li>(ii) Turf (according to Clause 25.46(d) and 25.46(g)); and</li> <li>(iii) Sprigs (according to Clause 25.46(g)).</li> </ul>
<b>Germination</b>	(d) The germination capacity of each constituent of a grass seed mix over a seven-day test period shall be at least 80%.
<b>Purity</b>	(e) The purity of each constituent of the grass seed mix shall be greater than 90%. Total pernicious weed seed content shall be less than 0.5% and total content of other crop seeds shall be less than 1.0%.
<b>Storage of grass seed</b>	(f) Store seed in sealed bags off the ground, in a clean, dry, well ventilated place free from vermin. Prolonged storage shall be carried out under controlled conditions of temperature and humidity.
<b>Pre-seeding fertilizer</b>	(g) Pre-seeding fertilizer shall be a quick release fertilizer.
<b>Artificial plants 25.66</b>	(a) Artificial plants shall be obtained from an approved supplier. Samples of each plant for species and size shall be approved prior to purchase from the supplier. (b) Artificial plants shall have the following properties: <ul style="list-style-type: none"> <li>(i) Man-made, densely leaved with flowers and foliage of colour-fast silk or polyester with realistic appearance in terms of general form, colour, texture and habit resembling the life-like version of the plant species;</li> <li>(ii) All preserved or dried components of the artificial plants shall be free from rotting, insect and/or fungus infestation; ;</li> <li>(iii) Multi-stemmed when appropriate to the species;</li> <li>(iv) With all leaves, flowers, stems, trunks, branches etc. securely fixed;</li> <li>(v) Set in appropriate size pots entirely filled with dark brown coloured concrete or by an approved method without leaving a protruding lip.</li> <li>(vi) Leaf to be strongly bonded to plastic backing, single bond between leaf and stem is not acceptable;</li> <li>(vii) All silk sprays and bushes shall be treated with fire retardant chemicals and accompanied by a test certificate from an Accredited Laboratory;</li> <li>(viii) No rough silk threads on the edge of leaves;</li> </ul>

- (ix) All silk sprays and bushes should be firmly secured into styrofoam support base, covered with decorative Sphagnum green moss, decorative stones/pebbles or other approved materials; and
  - (x) Wire strengtheners in stem must be sufficiently strong to support the bush in its natural shape.
- (c) Submittals for SO's approval prior to ordering:
- (i) Detailed layout plans with sections, elevations to demonstrate design proposal.
  - (ii) Color photographs and job reference shall be submitted for each proposed plant.
  - (iii) Mock up of full size sample for each type of proposed silk tree or preserved palms, and major group of silk bushes, for approval.
  - (iv) Sample of all other materials such as container, decorative moss / pebbles, etc. shall be submitted for approval.
  - (v) Proof or guarantees from manufacturer on fire retardant or preservatives treatment, as detailed above.

Amendments to Section 26

- |                 |              |   |
|-----------------|--------------|---|
| <b>Material</b> | <b>26.34</b> | <ul style="list-style-type: none"> <li>(a) Soil nail bars shall be of high yield deformed bars and comply with <b>CS2</b>. All steel components for soil nails shall be galvanized to <b>BS EN ISO 1461</b>.</li> <li>(b) Steel reinforcement for soil nail heads shall be Grade 500B ribbed steel reinforcing bars to <b>CS2</b>.</li> <li>(c) Nuts shall be of Grade 4 steel and comply with <b>BS 4190</b>.</li> <li>(d) Reinforcement connectors shall comply with Clause 6.24.</li> <li>(e) Bearing plates shall be of Grade S275 steel plate and comply with BS EN 10025. Steel plates for pull-out and performance tests shall be square with length not less than 300mm and ratio of length to thickness not larger than 10. Holes in steel plates for soil nail heads shall be drilled perpendicular to the face of the steel plate and centre of the hole shall be at a position of within 2mm from the centroid of the plate. The clearance between the steel bar and the hole of the steel plate shall not be more than 2mm.</li> <li>(f) Concrete for soil nail heads shall be grade 30/20 or 30 MPa sprayed concrete and shall comply with Clauses 26.47-57 and Clauses 26.12-28 respectively.</li> <li>(g) Soil nails shall have non-corrodible centralizers capable of ensuring an even annulus of grout around the steel bar. The nominal diameter of the centralizers shall not differ from the specified diameter of the drillhole by more than 10 mm. Wires and ties for fixing and anchoring packers, centralizers and grout pipes etc. shall</li> </ul> |
|-----------------|--------------|---|

be made of non-corrodible materials. Determine the spacing of the centralizers and the suitability of the method of fixing the centralizers, grout pipes and corrugated sheathing where required by carrying out trials on site until no damage, deformation and displacement of the centralizers, grout pipes and corrugated sheathing are observed on completion of assembling all components, during inserting and withdrawing the soil nails. Once approval is given, no change to the type, method and arrangement of fixing of the centralizers, grout pipe and corrugated sheathing shall be made without the prior approval of the SO.

(h) For soil nails using threaded type reinforcement connectors but without galvanized coating on either the threads inside the connectors or the threads at the ends of reinforcement bars, use heat-shrinkable sleeve of a proprietary type as approved by the SO as an alternative to galvanization as a corrosion protection measure to the connections. Clean thoroughly any rust on the threads of reinforcement bars and connectors before being connected together.

(i) A typical layout and design of soil nails is as shown in Appendix 4.

**Granular filter      26.60**

(a) Granular filter shall consist of durable, inert, natural material free from clay, organic material and other impurities. Design granular filter materials in accordance with the design criteria stated in **GEO Publication 1/93** and current amendments.

(b) Submit the following particulars of the proposed materials and methods of construction for granular filters to the SO:

(i) Whether granular filter material is to be supplied ready mixed or is to be mixed on the Site,

(ii) Source of supply, including name of supplier of ready mixed material,

(iii) Quantity of each constituent if the material is to be mixed on the Site,

(iv) Constructional plant and methods of mixing for material mixed on the Site,

(v) Method of storage and location of storage areas on the Site,

(vi) Methods of deposition and compaction of material,

(vii) Results of three tests for particle size distribution of the fill material against which the granular filter is to be placed, and

(viii) Details of filter design including calculations and grading envelopes.

(c) Submit the particulars to the SO for approval at least 14 days before deposition of granular filter material starts.

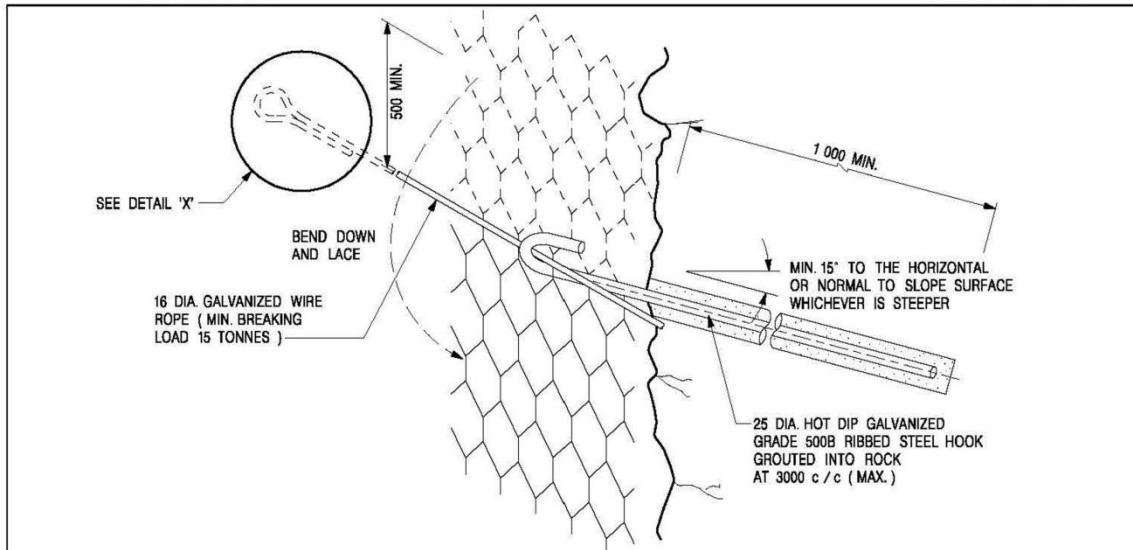
(d) Submit samples to the SO for approval of the source and type of each material at the same time as particulars of the material are submitted.

- (e) Do not handle or store granular filter material in a manner which will result in mixing of the different types and sizes or in segregation, contamination, deterioration or erosion of the material.
- (f) Place stockpiles of granular filter material on well-drained, prepared areas, and separate them by dividing walls of sufficient height to keep the different materials separate.
- (g) Mix thoroughly granular filter material by the method approved by the SO, and remix material which has been stockpiled before deposition.
- (h) Compact granular filter materials in accordance with the requirements for rock fill materials as stated in Clause 3.20.
- (i) Deposit granular filter material in a manner which will not result in segregation or contamination of the material.
- (j) Deposit granular filter material in such a manner that a continuous free draining zone is formed. Clean and scarify the surface of each layer before the next layer is deposited unless otherwise permitted by the SO.
- (k) A batch of granular filter material is any quantity of granular filter material of the same type and grading delivered to the Site at any one time
- (l)
  - (i) Provide one sample of granular filter material from each 500m<sup>3</sup> or part thereof of the material delivered to the Site.
  - (ii) Unless otherwise permitted by the SO, provide one sample of granular material from each 500m<sup>3</sup> or part thereof of granular filter material which has been deposited and compacted.
  - (iii) The size of each sample taken as stated in Clause 26.60(1)(i) shall be 10 kg. The method of sampling shall be in accordance with CS3.
  - (iv) Samples taken as stated in Clause 26.60(1)(ii) shall consist of material excavated from the compacted layer to form a flat bottomed, steep sided hole of approximately 0.13 m<sup>2</sup> to the complete depth of the compacted layer. A template shall be used to fix the edges of the hole if necessary. The sides and bottom of the hole shall be at least 50mm from other types of fill material.
- (m)
  - (i) Test each sample of granular filter material to determine the particle size distribution.
  - (ii) The method of testing shall be in accordance with the wet sieving method stated in Geospec 3, Test Method 8.2.
- (n)
  - (i) If the result of any test for particle size distribution on a sample of granular filter material taken as stated in Clause 26.60(1)(i) does not comply with the specified requirements for particle size distribution, provide additional samples

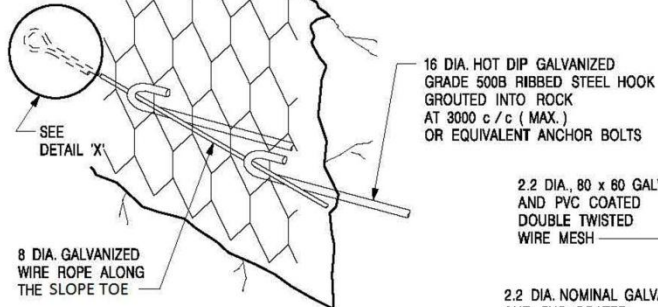
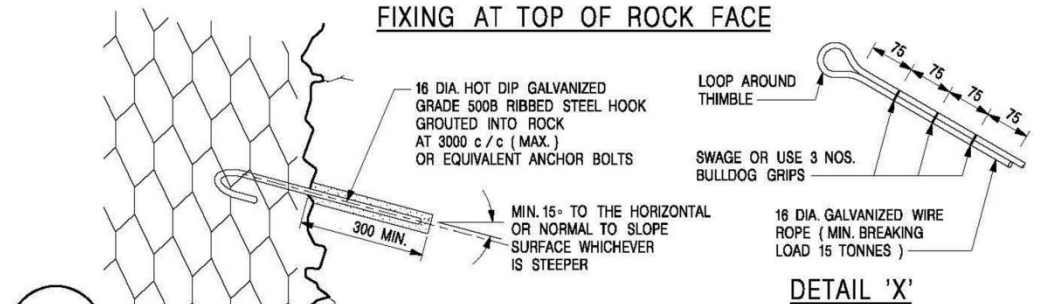


from the same batch and carry out additional tests for particle size distribution.

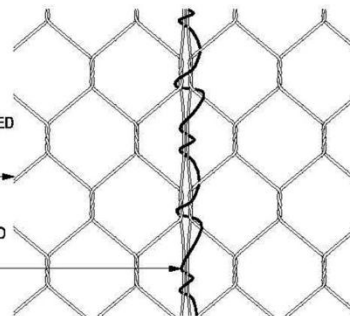
- (ii) The batch shall be considered as not complying with the specified requirements for particle size distribution if the result of any additional test for particle size distribution does not comply with the specified requirements for particle size distribution.
  - (iii) If the result of any test for particle size distribution on a sample of granular filter material taken as stated in Clause 26.60(1)(ii) does not comply with the specified requirements for particle size distribution, provide additional samples from the same batch and carry out additional tests for particle size distribution. The number of additional samples shall be as stated in Clause 26.60(1)(ii).
  - (iv) The batch shall be considered as not complying with the specified requirements for particle size distribution if the result of any additional test for particle size distribution does not comply with the specified requirements for particle size distribution
- (o) Typical details of filter blanket for fill slope are as shown in the Standard Drawing in Appendix 7.



**FIXING AT TOP OF ROCK FACE**



**FIXING MESH TO ROCK FACE AND AT BOTTOM OF ROCK FACE**



**LACING OF ADJACENT MESH SHEETS**

**NOTES:**

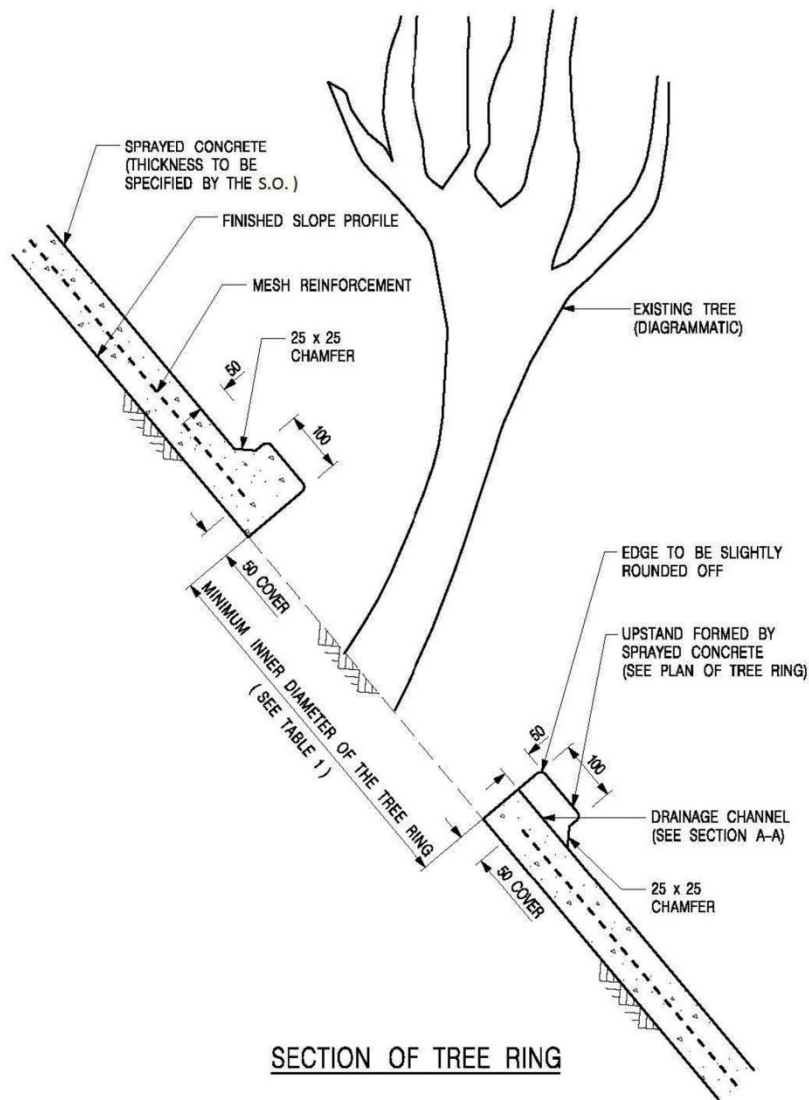
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. PVC THICKNESS SHALL BE 0.4mm MINIMUM.
3. SPACING OF THE STEEL HOOKS OR EQUIVALENT ANCHOR BOLTS SHALL BE REDUCED WHERE APPROPRIATE TO ENSURE THAT THE WIRE MESH CLOSELY FOLLOWS THE ROCK SLOPE PROFILE PARTICULARLY ON RUGGED ROCK SURFACE.  
( MODIFIED FROM CEDD STANDARD DRAWING NO. C2205/F )

**FIXING OF WIRE MESH TO ROCK FACE**



ARCHITECTURAL SERVICE DEPARTMENT

SCALE	DIAGRAMMATIC	DRAWING NO.
DATE	JULY 2015	C2205




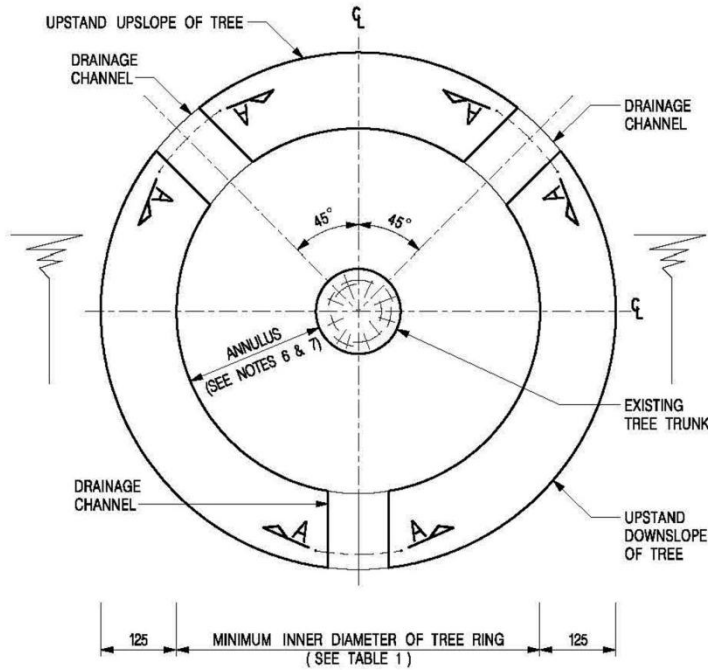
**SECTION OF TREE RING**

**TABLE 1 : MINIMUM INNER DIAMETER OF TREE RING**

TREE SIZE (SEE NOTE 8)	TREE RING INNER DIAMETER (mm)
SMALL	TREE TRUNK DIAMETER AT GROUND LEVEL PLUS 800
MEDIUM	TREE TRUNK DIAMETER AT GROUND LEVEL PLUS 800
LARGE	TREE TRUNK DIAMETER AT GROUND LEVEL PLUS 1000

( MODIFIED FROM CEDD STANDARD DRAWING NO. C2104/1 )

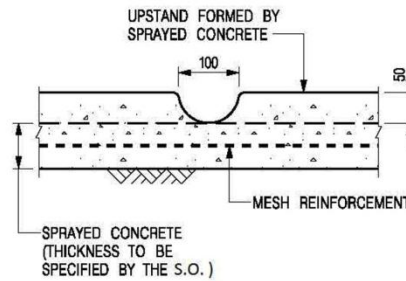
<b>TREE RING</b> ( SHEET 1 OF 2 )	 ARCHITECTURAL SERVICE DEPARTMENT	
	SCALE	DIAGRAMMATIC
	DATE	JULY 2015
		DRAWING NO. C2104/1



**PLAN OF TREE RING**

**NOTES:**

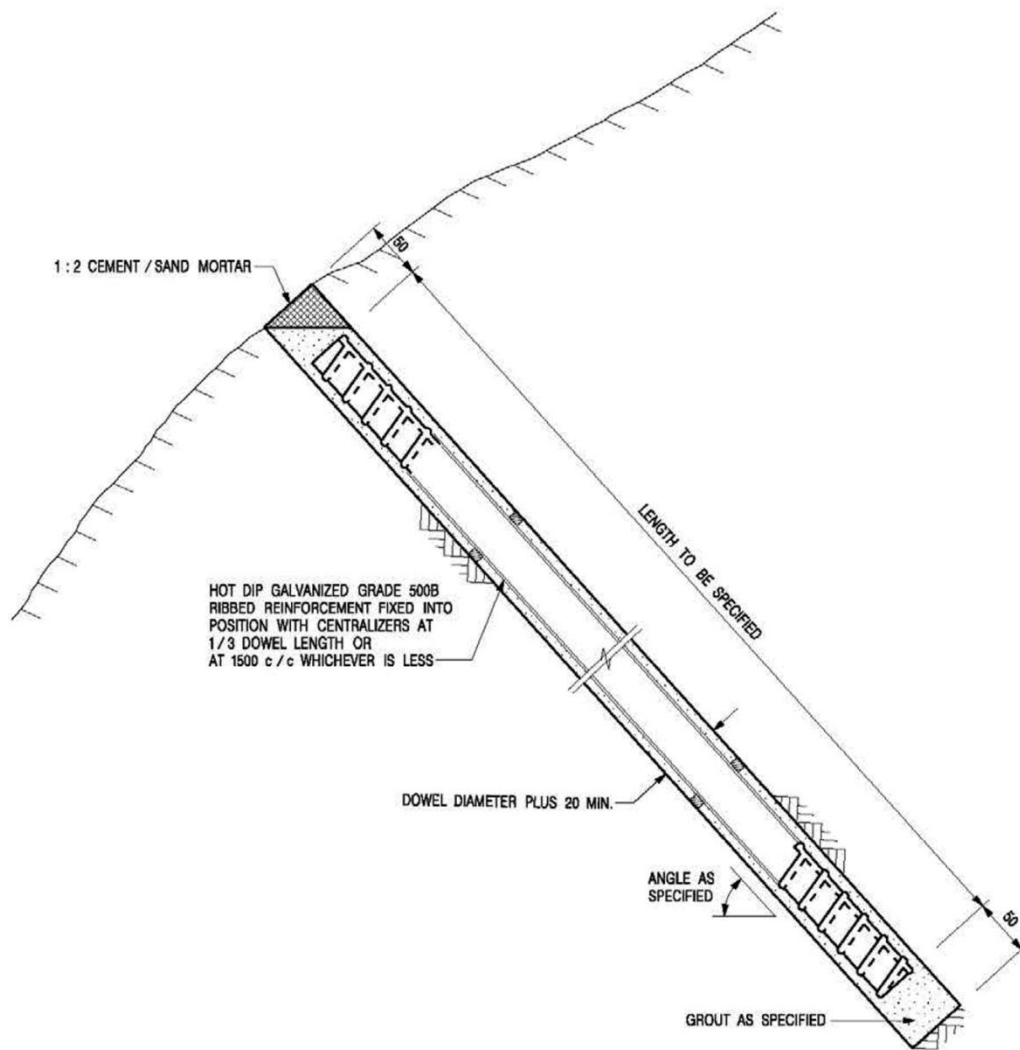
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. SURFACE FINISHES OF TREE RING SHALL BE U1, F2.
3. THE TREE RING SHALL BE POSITIONED SUCH THAT THE TREE IS AT THE CENTRE OF THE TREE RING OR AS DETERMINED ON SITE BY THE S.O.)
4. CIRCULAR TREE RING WITH A CONSTANT TREE RING ANNULUS DIMENSION SHOULD BE ADOPTED IN GENERAL.
5. A MINIMUM ANNULUS OF 300mm SHALL BE PROVIDED FOR TREE TRUNK OR EXPOSED ROOT FLARE.
6. THE ANNULUS PROVIDED FOR TREE TRUNK OR ROOT FLARE SHALL NOT BE LARGER THAN 500mm TO AVOID SOIL EROSION WITHIN THE TREE RING.
7. FOR GROUPS OF TREES LOCATED CLOSE TOGETHER, THE GEOMETRY OF THE TREE RING SHALL BE DETERMINED ON SITE BY THE S.O.)
8. DEFINITION OF TREE SIZE AND SIZE OF COMMON TREE SPECIES SHALL BE REFERRED TO APPENDIX E OF GEO PUBLICATION NO. 1/2011 AND THE GUIDING PRINCIPLES ON THE USE OF NATIVE PLANT SPECIES IN PUBLIC WORKS PROJECTS ISSUED BY THE DEVELOPMENT BUREAU IN 2010.
9. USE OF EROSION CONTROL MAT / WIRE MESH WITHIN A TREE RING SHALL BE AVOIDED.



**SECTION A-A**

( MODIFIED FROM CEDD STANDARD DRAWING NO. C2104/2 )

<p><b>TREE RING</b> ( SHEET 2 OF 2 )</p>	<p>ARCHITECTURAL SERVICE DEPARTMENT</p>	
	<p>SCALE    DIAGRAMMATIC</p>	<p>DRAWING NO.</p>
<p>DATE            JULY 2015</p>		<p>C2104/2</p>



NOTES:

ALL DIMENSIONS ARE IN MILLIMETRES.

( MODIFIED FROM CEDD STANDARD DRAWING NO. C2202D )

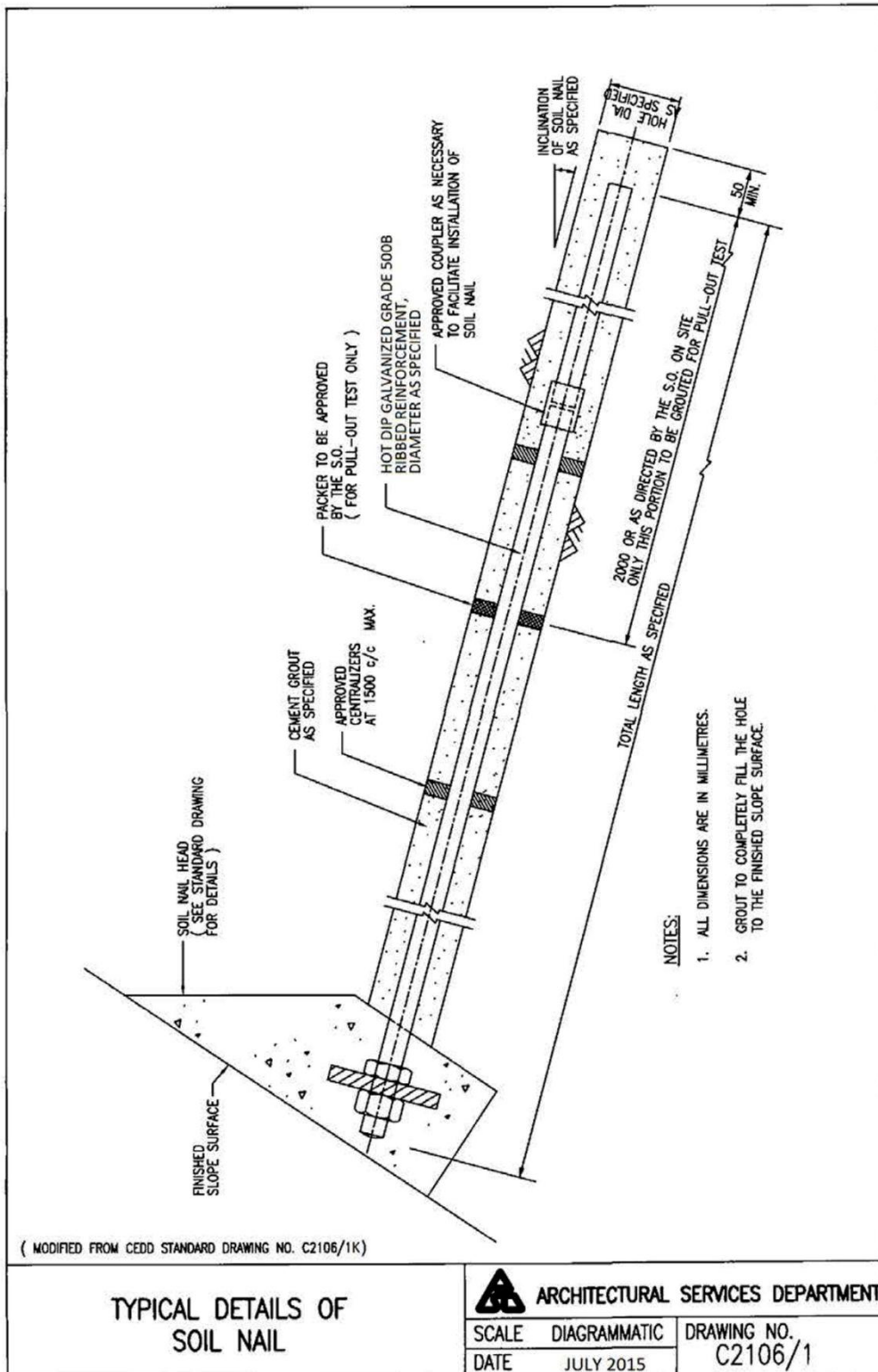
**TYPICAL ARRANGEMENT OF  
ROCK DOWEL**

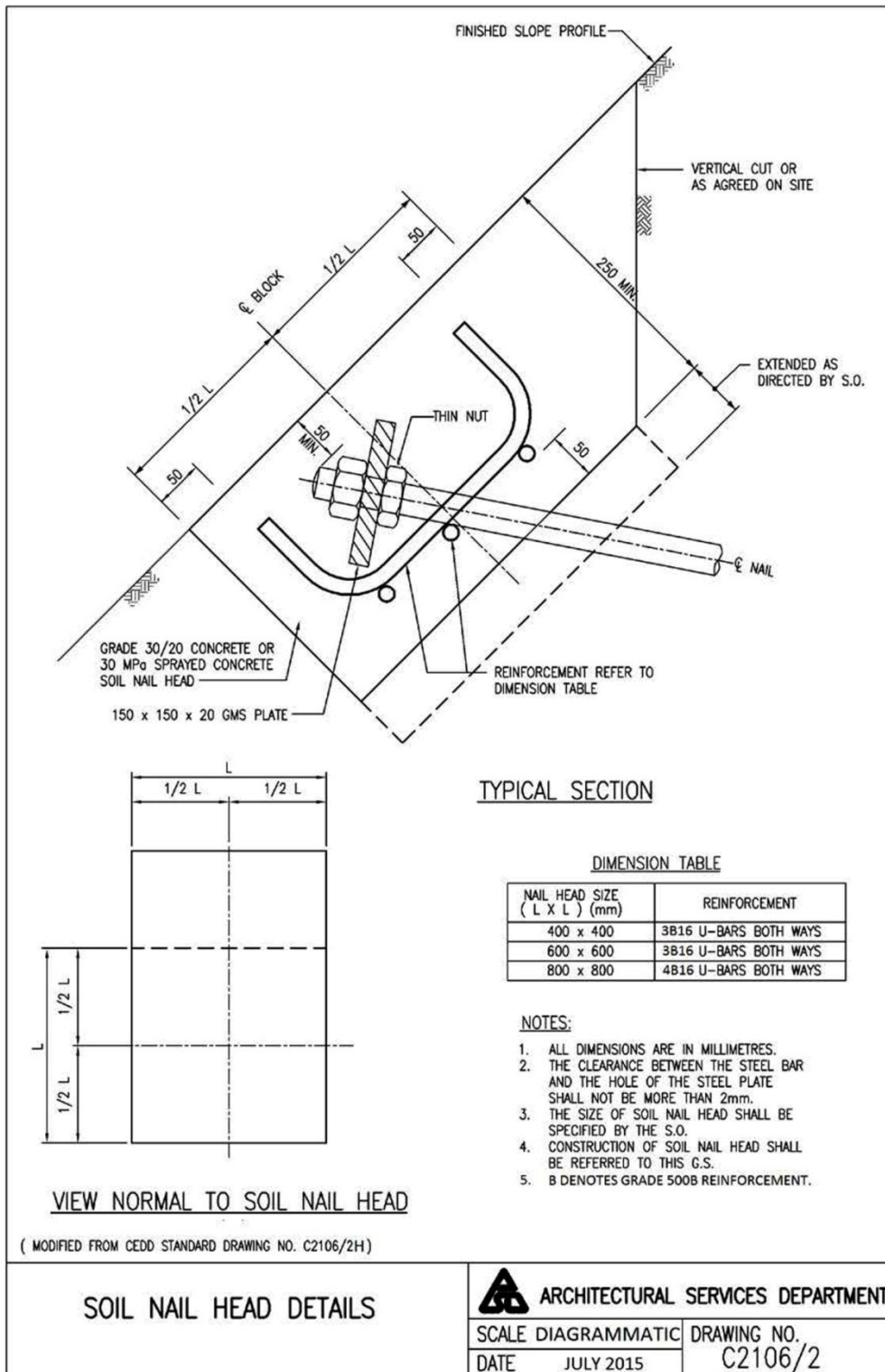


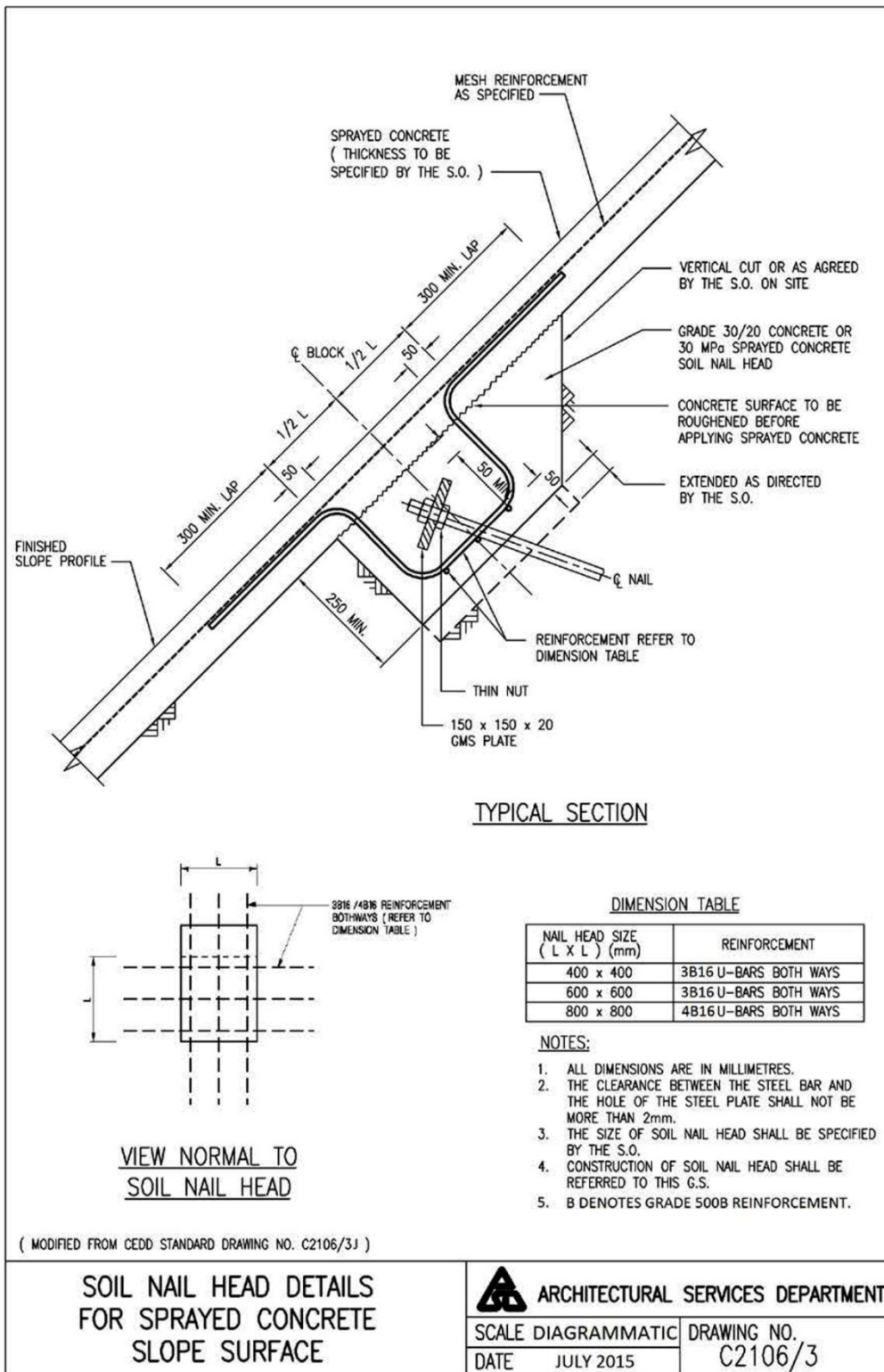
ARCHITECTURAL SERVICE DEPARTMENT

SCALE DIAGRAMMATIC  
DATE JULY 2015

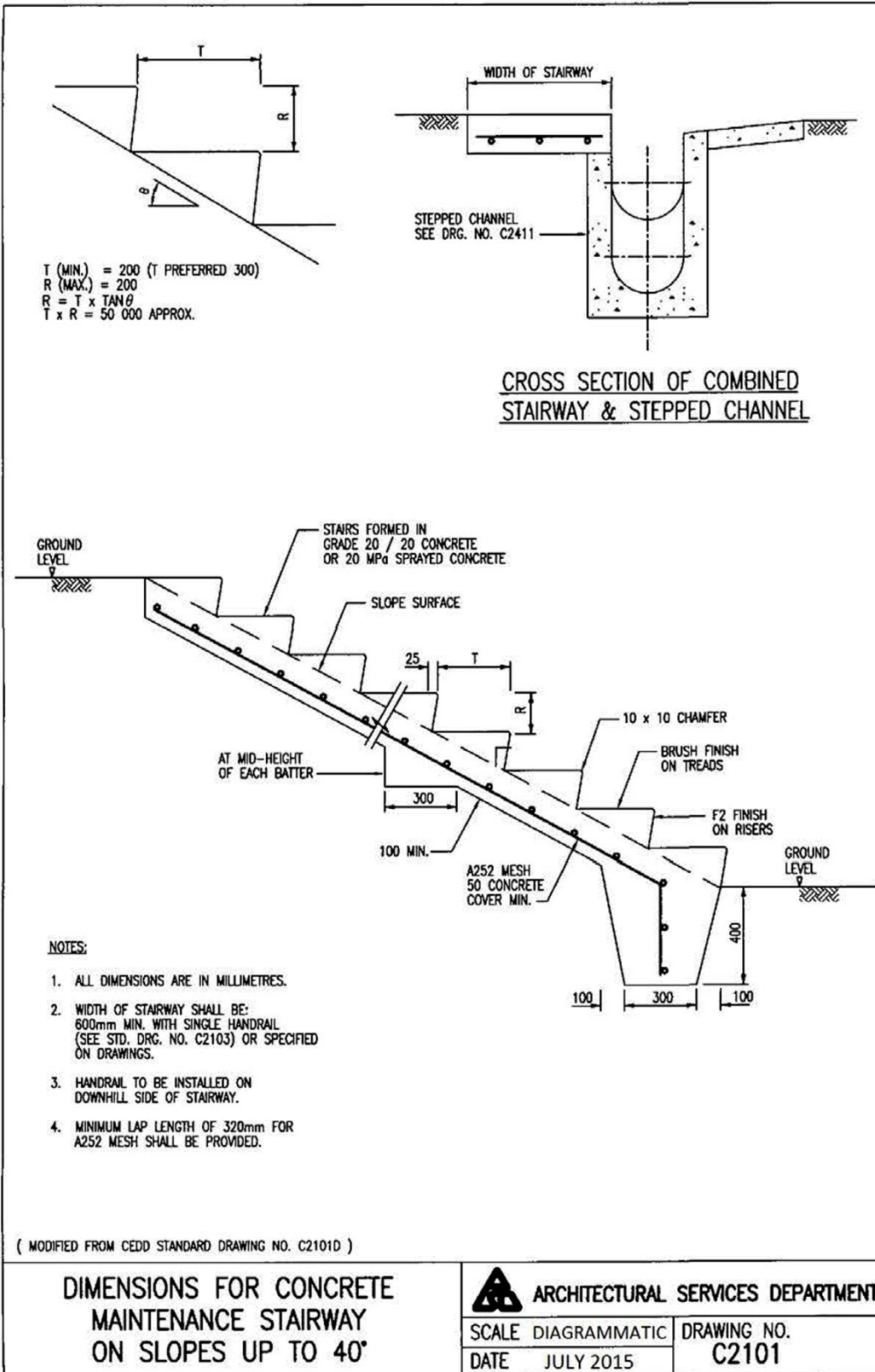
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C2202





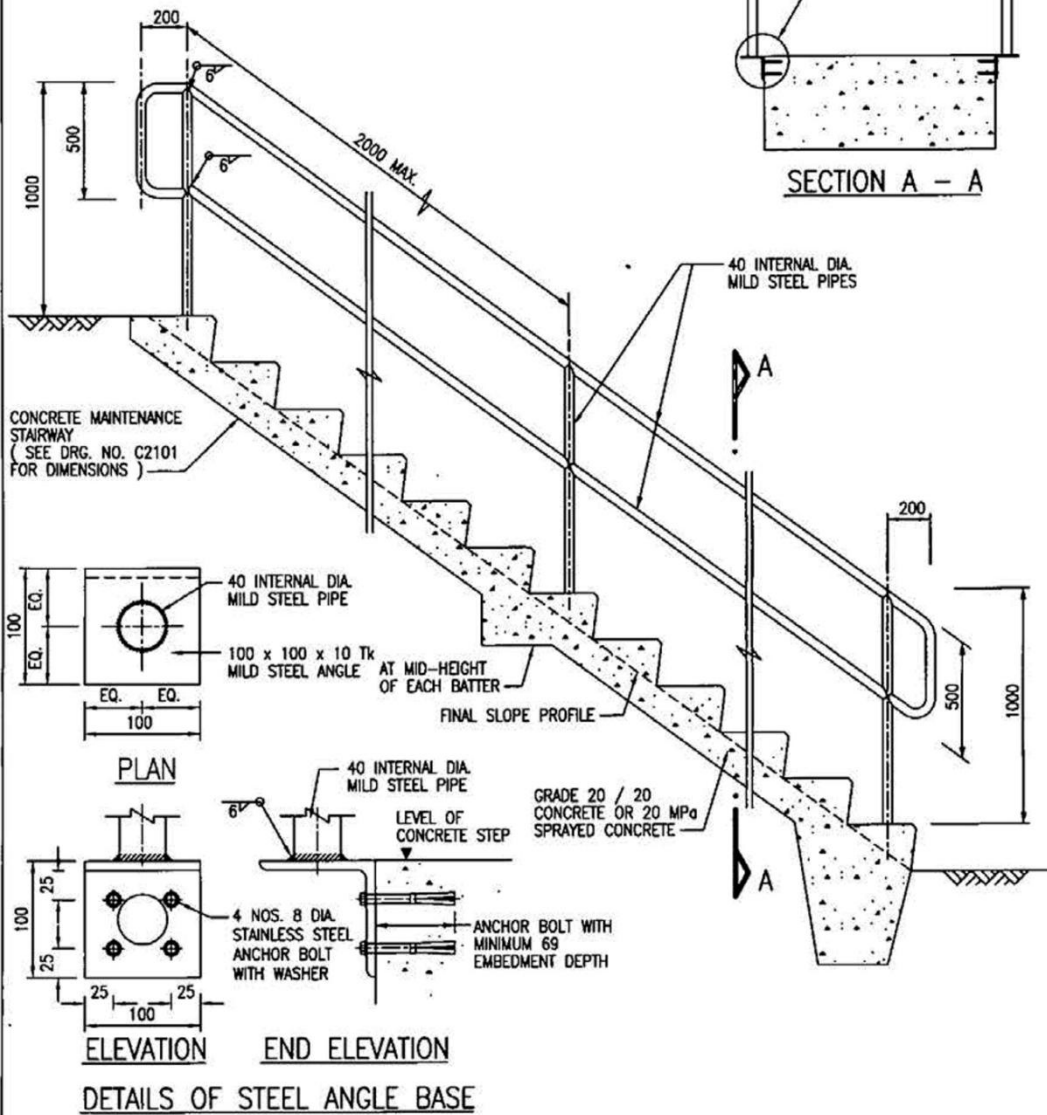
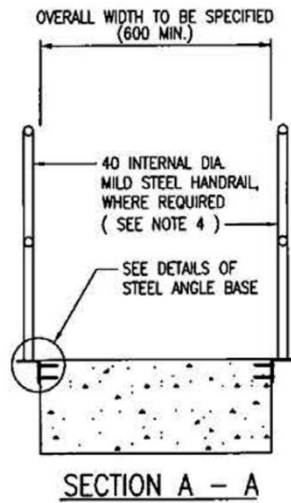






**NOTES :**

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ALL WELDS SHALL BE CHIPPED AND GROUND SMOOTH AND BRUSHED TO REMOVE SLAG.
3. ALL STEELWORK SHALL BE HOT DIP GALVANIZED.
4. IF A PERSON IS LIABLE TO FALL OVER 2m, HANDRAIL SHALL BE PROVIDED TO THE SIDE(S) WHERE FALLING OVER 2m MIGHT OCCUR.
5. ALL STEEL PIPES SHALL COMPLY WITH BS EN 10255 ( MEDIUM SERIES ).
6. ALL STEEL ANGLES SHALL COMPLY WITH BS EN 10025 AND BS EN 10056.
7. CONCRETE TO BE PAINTED AS SPECIFIED.
8. ALL EXPOSED STEELWORK SURFACES SHALL BE TREATED AND PAINTED IN ACCORDANCE WITH THE GENERAL SPECIFICATION.



( MODIFIED FROM CEDD STANDARD DRAWING NO. C2103J )

**HANDRAILING TO MAINTENANCE STAIRWAY ON SLOPE**



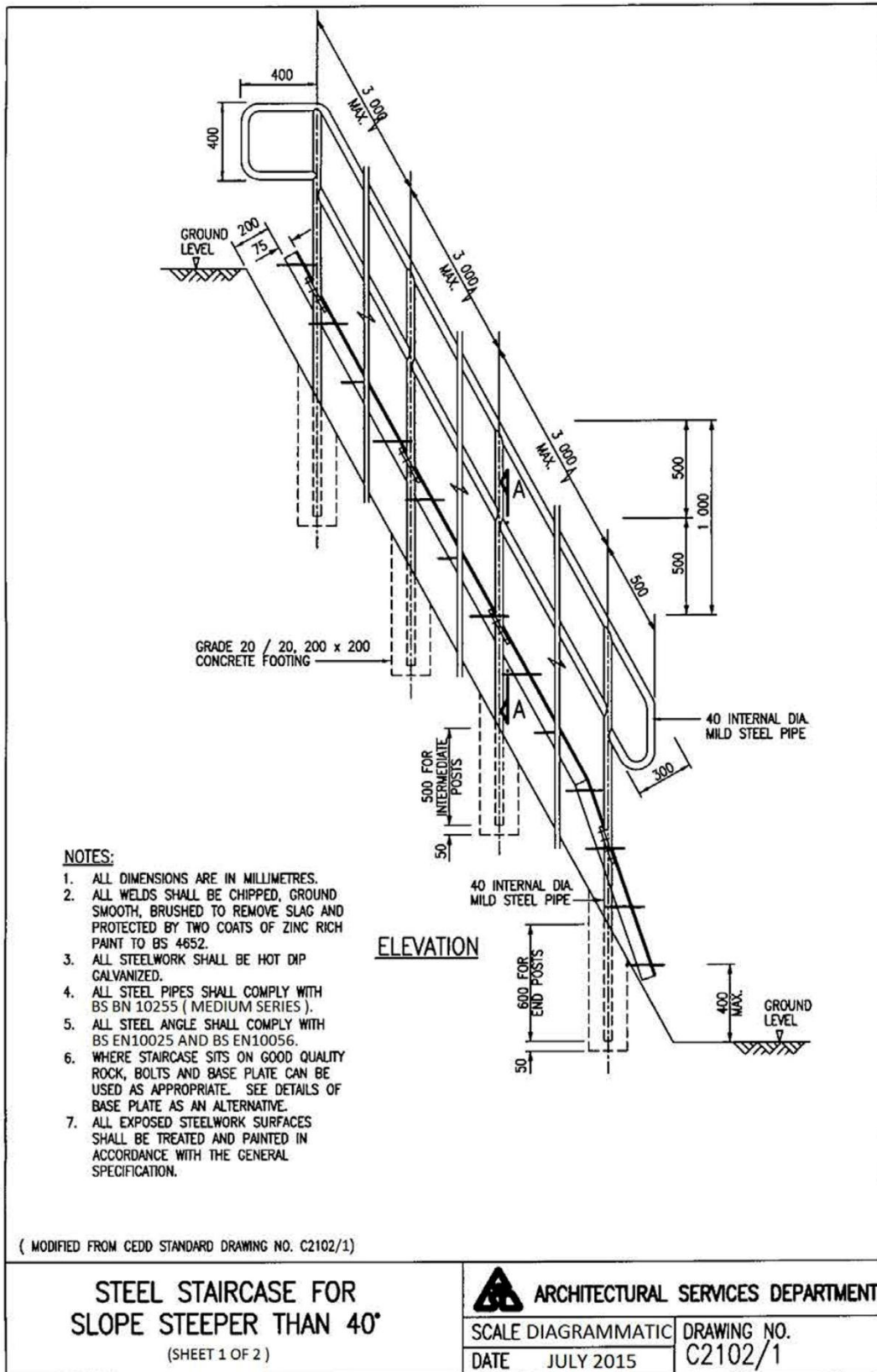
**ARCHITECTURAL SERVICES DEPARTMENT**

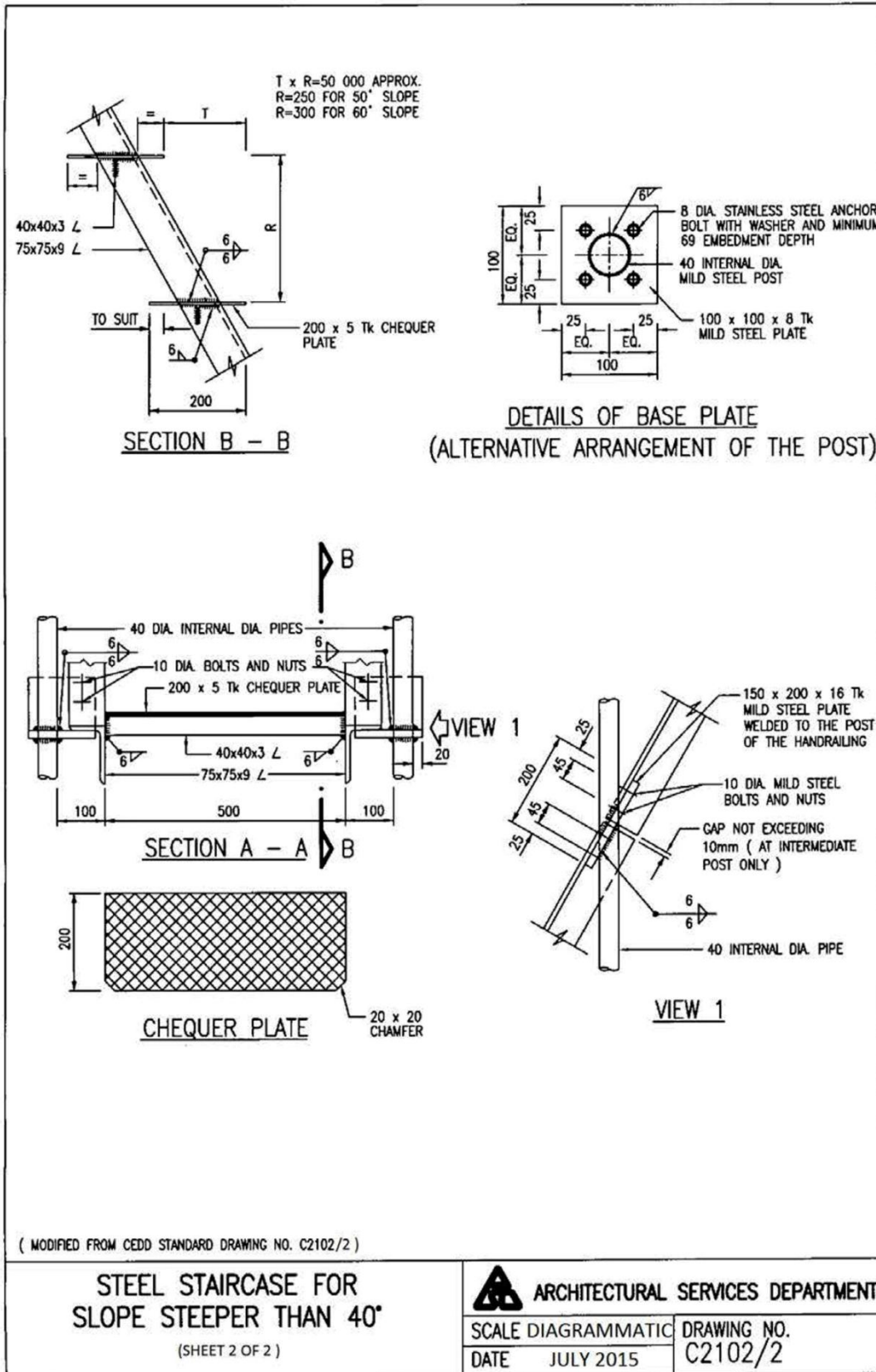
SCALE DIAGRAMMATIC

DRAWING NO.

DATE JULY 2015

C2103





**GENERAL SPECIFICATION FOR BUILDING 2012 EDITION**

**Major Changes from Corrigendum No. GS 2012-01 (November, 2014) to Corrigendum No. GS 2012-02 (August, 2016)**

Clause No.	Sub-heading of Clause	Major Changes
<b>Section 1 - Preliminaries</b>		
<b>1.46</b>	<b>Quality generally</b>	Add “Regulations and the” after “Materials and workmanship shall generally be consistent with good building practice in Hong Kong and shall comply with the”.
<b>1.56</b>	<b>Tests</b>	<p>In the 2<sup>nd</sup> paragraph, replace “when required, submit samples to an approved Laboratory. Mark samples and clearly indicate on test records the location or delivery from which the test sample was taken. Submit copies of test certificates to the SO and keep all test records on the Site.” with “carry out tests by the Public Works Laboratories (PWL) or by an independent body accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) (hereinafter referred to as the “Accredited Laboratory”).</p> <p>Add the following paragraphs between the 2<sup>nd</sup> and the 3<sup>rd</sup> paragraph:</p> <p>Submit sampling and analysis methodology, including name of the laboratory to be appointed and procedures from collection of test samples to submission of test results, for the SO’s approval prior to conducting any tests. Declare in writing that the Accredited Laboratory appointed has no affiliation as a legal entity to the Contractor and its sub-contractors.</p> <p>Appropriately mark and keep selected samples under the charge of the SO securely under lock before delivery to the laboratory.</p> <p>With the approval of the SO or the SO’s Representative either to:</p> <ul style="list-style-type: none"> <li>(i) appoint representative(s) from the Accredited Laboratory or through collection service operated by the Public Works Laboratories (PWL) to collect test samples on site; or</li> <li>(ii) arrange the Contractor’s representative(s) to collect test samples on site under the escort of the SO or the SO’s Representative.</li> </ul> <p>Ensure that the agreed representative(s) has strictly followed all the procedures stated in the approved methodology. Test samples collected shall be kept in sealed container inaccessible to unauthorized persons at all times.</p> <p>Test results shall be submitted directly from the laboratory to the SO in sealed envelopes, not via the Contractor.”</p>
<b>1.67</b>	<b>Conducting of compliance tests and surveys on site</b>	<p>In the 1<sup>st</sup> paragraph, replace “approved independent testing firm with the prior approval of the SO.” with “Accredited Laboratory.”</p> <p>In the 3<sup>rd</sup> paragraph, replace “independent testing firm” with “Accredited Laboratory”</p> <p>In the 4<sup>th</sup> paragraph, insert “from the laboratory / Surveyor“ after “Test and survey reports shall be submitted directly” and insert “, not via the Contractor.” after “to the SO in sealed envelopes”.</p>

Clause No.	Sub-heading of Clause	Major Changes
<b>Section 3 – Excavation and Earthwork</b>		
<b>3.01</b>	<b>Definitions</b>	<p>Replace sub-clause (i)(b) “title” with “tile”.</p> <p>Replace sub-clause (ii) “material” with “suitable material”, delete “be approved and to”.</p> <p>Add to end of sub-clause (iii) “any of”.</p> <p>At the end of sub-clauses (iii)(a) &amp; (iii)(b), replace “,” with “.”</p> <p>At the end of sub-clauses (iii)(c), replace “, or” with “.”</p> <p>Add to sub-clause (v)(a) “and durable rock of which the maximum size shall not be greater than three times the minimum dimension of individual pieces and” and replace “particle shall exceed 0.1m<sup>3</sup>” to “pieces shall exceed 400mm” and delete “or the thickness of the filling whichever is the least”.</p> <p>Replace sub-clause (v)(b) “fill” with “filling”.</p> <p>Replace sub-clause (vi) “Hardcore shall comprise the following material to pass rings varying from 28 to 150mm (from 28 to 200mm for recycled rock fill), or else, single sized hardcore may be used:” with “Hardcore shall comprise the following with no material exceeding 150mm in size”.</p> <p>Insert sub-clause (viii) “Fine filling material shall be suitable material capable of passing through a 75mm BS sieve.”</p> <p>Re-number sub-clause (viii) – (xiii) to (ix) – (xiv).</p> <p>Replace sub-clause (ix) “general filling” with “suitable” and “material” with “special filling material”.</p> <p>Replace sub-clause (ix) (d) “weight” with “mass”.</p>
<b>3.04</b>	<b>Temporary works for earthworks</b>	Add “The Contractor shall provide details to SO to demonstrate that the design of Temporary Works has been considered and incorporated measures, which minimise excavation of materials.”
<b>3.08</b>	<b>Generally</b>	Delete sub-clause (i) “Carry out and” and replace “Constructional Plant” with “Construction plant”.
<b>3.16</b>	<b>Surface preparation for filling material</b>	Add “all soft spots, loose boulders, grass, top soil, bushes, trees, roots and other vegetation or rubbish in” and delete “of all soft sports, loose boulders, grass top soil bushes, trees, roots and other vegetation or rubbish” and replace “fill material” with “filling material”.
<b>3.17</b>	<b>Filling</b>	<p>Replace sub-clause (i) “filling including backfilling” with “filling material”.</p> <p>Replace sub-clause (ii) “Constructional Plant” with “construction plant” and add “filling material”.</p> <p>Replace sub-clause (iv) “fill” with “filling”.</p> <p>Delete sub-clause (v) “graded”.</p>
<b>3.19</b>	<b>Compaction by performance specification</b>	<p>Replace sub-clause (i) “fill” with “filling”.</p> <p>Replace sub-clause (ii) “each class of” with “the”.</p>
<b>3.20</b>	<b>Compaction by method specification</b>	<p>Delete sub-clause 3.20 (i) “in accordance with Clause 3.23(v)”.</p> <p>Replace sub-clause 3.20(ii) “fill” with “filling”.</p>

Clause No.	Sub-heading of Clause	Major Changes
		<p>Replace sub-clause 3.20(ii) (a) “fill” with “filling” and “general fill” with “filling material” and “graded” with “filling”.</p> <p>Replace table 3.3 “fill” with “filling” and “150” with “250”.</p>
3.21	<b>Test for determining the degree of compaction of compacted fill</b>	Delete “the personnel of” and “or if PWL not available by an approved independent testing firm when the prior approval of the SO has been obtained, using their own equipment and provide such labour and assistance as may be required.”
3.23	<b>Embankments</b>	Replace sub-clause 3.23 (v) “graded” with “filling”.
3.29	<b>Deposition of soil-cement fill</b>	Replace sub-clause 3.29 (ii) “fill materials” with “filling materials”.
<b>Section 5 – Piling Work</b>		
5.01	<b>General</b>	In sub-clause (v)(c), replace “2/3 Dead load + Wind load + water uplift” with “Minimum dead load + wind load + adverse soil + water load (uplift) due to the highest anticipated groundwater table.”
5.14	<b>Percussion piles</b>	<p>In sub-clause (ii), replace “Where it is evident from ground investigation records that piles are founded on rock, or it can be demonstrated with PDA analysis that the driving stress at final set is greater than 0.65 <math>f_y</math> for steel H-piles,” with “Where it can be demonstrated by PDA analysis that the driving stress at final set is greater than 0.6 <math>f_y</math> for steel H-piles,”.</p> <p>Sub-clauses (iv) and (v) general revised.</p> <p>Sub-clauses (viii) and (ix) added.</p>
5.18	<b>Steel 'H' piles</b>	<p>Add a new paragraph in sub-clause (v) as follows:-</p> <p>“Employ an Accredited Laboratory to carry out and interpret the inspection and testing of welds, and provide any necessary labour and attendance. The Accredited Laboratory shall submit test reports directly to the SO in sealed envelopes within 3 days of the completion of the testing. Tests revealing discontinuity shall be reported separately from the subsequent repair and re-test.”</p>
5.19	<b>Large diameter bored piles</b>	<p>In sub-clause (ii), replace “One drill hole shall be sunk at each bored pile position.” with “One drill hole shall be sunk at each bored pile position, whereas 2 drill holes are required for pile diameter exceeding 2500mm.” and replace “Two copies of the drill hole logs have to be submitted to the SO.” with “Two copies of the drill hole logs shall be submitted directly to the SO by the Ground Investigation Contractor.”</p> <p>Sub-clause (xiii) added.</p>
5.25	<b>Pile caps tie beams and dowel bars</b>	<p>Replace sub-clause (i) with “Unless otherwise specified, pile caps are part of the Works.”.</p> <p>In sub-clause (ii)(c), replace “PFA” with “PFA or GGBS” and replace the last sentence “The PFA content must constitute between 25% and 35% of the total cementitious content in such concrete.” with “The proportion of PFA or GGBS of the total cementitious content in such concrete shall be in accordance with Clause 6.30.”</p> <p>In sub-clause (ii)(e), replace “Steel bars shall be hot rolled plain round bars (denoted by R) or deformed high yield bars (denoted by T) to Hong Kong SAR Construction Standard CS 2:1995.” with “Steel bars shall be plain steel reinforcing bars (denoted by R), Grade 500B or 500C ribbed steel reinforcing bars (denoted by T) to Hong Kong SAR Construction Standard CS 2.”</p>

Clause No.	Sub-heading of Clause	Major Changes
5.32	Non-destructive integrity testing	Add a new paragraph as follows:- “The Contractor shall notify the SO 5 working days in advance for carrying out the non-destructive integrity tests of piles on site.”
5.35	Preparation for piles for Sonic Logging	In sub-clause (vii), move “Toe coring to obtain a core of N size to examine the interface between pile and bedrock without coring through the entire length of pile shall be carried out. One number of toe coring shall be carried out for each barrette and large diameter bored pile with diameter up to 2500 mm and two numbers of toe coring shall be carried out for each large diameter bored pile with diameter exceeding 2500 mm. The toe coring length shall be more than 1400 mm of which at least 700 mm shall be into bedrock.” to a new sub-clause 5.35.1 with heading “Toe Coring”.
Annex C	Capping Plates and Dowel Bars Details of Steel H Pile	Replace “5 nos. 25mm dia. hole for tack weld” with “5 nos. 25mm dia. hole for plug weld”.  Replace “2 no. R20-U bar” with “2 no. T20-U bar”.  Replace “Tack Weld” with “Plug Weld”.
Annex D	Reinforcement and Ties Details of Large diameter bored pile	Replace “For Grade 460 reinforcement deformed Type 2 bars” with “For Grade 500B ribbed steel reinforcing bars”.  Reinforcement lap lengths “L” for various concrete grades revised.
Annex E	Typical Detail of Caisson	Replace “For Grade 460 reinforcement deformed Type 2 bars” with “For Grade 500B ribbed steel reinforcing bars”.  Reinforcement lap lengths “L” for various concrete grades revised.
<b>Section 6 – Structural Concrete Works</b>		
6.14	Steel reinforcement	Replace “Steel reinforcement shall be plain round steel or deformed high yield steel bars to <b>CS2</b> ...” with “Steel reinforcement shall be plain steel reinforcing bars or ribbed steel reinforcing bars to <b>CS2</b> ...”.
6.17	Test specimens	Replace sub-clause (v) “For steel bars, tensile, bend and rebend tests shall be carried out on test specimens as required by <b>CS2</b> ” with “For steel reinforcing bars, determination of mass per metre, tensile test, rebend test, chemical analysis and test on bond property based on surface geometry shall be carried out on test specimens for each batch of steel reinforcing bars delivered to site in accordance with <b>CS2</b> ”.
6.33	Aggregates	Replace 2nd paragraph “Coarse aggregate for concrete shall consist of clean, hard, durable crushed rock to <b>BS 882</b> . The grading shall lie within the limits given for the appropriate nominal size in Table 6.3 unless otherwise agreed by the SO” with “Coarse aggregate shall consist of clean, hard and durable crushed rock complying with <b>CS3</b> ”.  In 3 <sup>rd</sup> paragraph, replace “Fine aggregate shall consist of crushed rock as for coarse aggregate or clean sand. The grading shall lie within the limits of one of the grading C, M or F of Table 6.4, or for crushed stone fines only, the limits as shown in Table 6.5” with “Fine aggregate shall consist of clean, hard and durable crushed rock complying with <b>CS3</b> ”.  In 4 <sup>th</sup> paragraph, replace “ <b>BS 812-105.1</b> ” with “ <b>CS3</b> ”.  Add a new paragraph as follows “Unless otherwise specified in the Contract, Sub-section 4.2.1 of <b>CS3</b> on Los Angeles value shall not be required for aggregates”.  Tables 6.3, 6.4 and 6.5 are deleted.



Clause No.	Sub-heading of Clause	Major Changes
6.34	Grading of aggregate	In 2 <sup>nd</sup> paragraph, replace "...BS 812-103.1, and the limits of acceptance are as shown in Table 6.3, 6.4 and 6.5" with "CS3".  Tables 6.3, 6.4 and 6.5 are deleted.
6.35	Water	In Notes no. 2 of the Table 6.15, replace "Laboratories accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS)" with "Accredited Laboratory".
6.41	Standard mixes	Table 6.7 is revised to delete "BS 882: Table 5" and "Table 6.5".  Footnote of Table 6.7 is revised to "Grading C, M and F refer to those given in CS3".
6.47.2	Equivalent sodium oxide (Na <sub>2</sub> O) content	Replace "BS812-117" with "CS3" in Sub-clause (vi).
Table 6.16 of 6.42.3	20% recycled coarse aggregates	Table 6.16 is revised to replace "BS 812" and "BS882" with "CS3" as follows: BS 812: Part 2 to Section 17 of CS3 BS 812 103.1 to Section 10 of CS3 BS 812 118 to Section 21 of CS3 BS 812 105.1 to Section 11 of CS3 BS 812 111 to Section 26 of CS3 Table 3 of BS 882 to Table 3.1 of CS3 Table 7 of BS 882 to Table 5.1 of CS3 Maximum content of sand (<4 mm) (% m/m) is deleted
6.68	Lintels	Table 6.14 is revised to replace "steel bars" with "steel reinforcing bars".
<b>Section 8 – Concrete for minor and Non-Structural Works</b>		
8.04	Aggregate	In 1 <sup>st</sup> paragraph, replace "...in the GS and fine aggregate with grading lying within the limits of Grading C or M of Table 6.4 or for crushed stone fines in accordance with Table 6.5" with "... in CS3 and fine aggregate with grading lying within the limits of Grading C or M".  In last paragraph, replace "BS 812"-103.1 with "CS3".
<b>Section 13- Carpentry and Joinery</b>		
13.01.1 (iv)	Preservative	Delete "Clear colourless", replace "to BS 4072 may" with "is not allowed to" and delete ", provided that adequate precautions are taken to avoid injurious to health."
13.05	Softwood	In the 1 <sup>st</sup> paragraph, replace "vacuum impregnated to New Zealand Standard H3, or equivalent, with Copper Chrome Arsenate" with "treated according to Clause 13.01.1 (iv)".
13.09	Wood block flooring	Add "Resin shall conform to Class E1 under BS EN 13986."
13.12	Plywood	In the 2 <sup>nd</sup> paragraph, add "Adhesive shall conform to the requirement in Clause 13.29."
13.22	Acoustic tiles	After the last paragraph, add a new paragraph "Tiles shall be manufactured with low emission materials conforming to European E1 emission standard."
13.24	Nails	In the 1 <sup>st</sup> paragraph, add "The nail and its coating shall not contain Arsenic, Cadmium, Copper, Lead or Mercury."
13.25	Screws	In the 1 <sup>st</sup> paragraph, replace "AS 1476" with "BS 1476".
13.29	Adhesive	Add sub-clause "(c) Formaldehyde Emission shall be of Class E1 under

Clause No.	Sub-heading of Clause	Major Changes
		EN13986.”.
13.29.1	Resin for MDF panels	Provide the clause no. 13.29.1, insert “of BS EN 13986” and delete “9mg/100g (minimum)”.
13.30.1	Wood preservative to external timber	Add sub-clause “(vii) The product shall not contain any heavy metals or their compounds as listed below: - Arsenic - Cadmium - Copper - Lead - Mercury” after “(vi).
13.45	Acoustic tiles	Add “requirements of Clause 13.29 and”.
13.50	Wood block flooring	In the 1 <sup>st</sup> paragraph, add “as in clause 13.29”.
13.61	Fire resisting timber door	In the 2 <sup>nd</sup> paragraph, replace “a laboratory recognized by the Hong Kong Laboratory Accreditation Scheme” with “Accredited Laboratory”.
<b>Section 15 – Structural Steel Work</b>		
15.15	Materials for grouting of base plates and end plates	Add “and end plates” to the end of sub-heading.  In the 1 <sup>st</sup> paragraph, replace “grout around foundation bolts and under column base plates” with “grout around foundation bolts, under column base plates and behind connection end plates”.
15.17	Testing of sections and plates	Replace the last paragraph with “For proprietary structural steel products (e.g. playground equipment, lamp posts), subject to the approval of the SO, manufacturer’s certificates may be accepted as proof of quality in lieu of sampling on site when all steel sections are prefabricated by the manufacturer prior to shipment.”.
15.18	Through thickness properties	In the 3 <sup>rd</sup> paragraph, replace “approved independent HOKLAS accredited laboratory” with “Accredited Laboratory”.
15.31	Installation and testing of drill anchor bolts	Add a new paragraph as follows:- “Employ an Accredited Laboratory to carry out the testing of drill anchor bolts, and provide any necessary labour and attendance. The Accredited Laboratory shall submit test reports directly to SO in sealed envelopes within 3 days after the testing.”
15.34	Method statement	Add a new paragraph as follows:- “Method statement for grouting under column base plates and connection end plates shall be submitted for approval. Grouting trial shall be conducted on site to verify the proposed method statement under site conditions before approval.”
15.37	Packings and grouting	In the 1 <sup>st</sup> paragraph, replace “column bases or grout anchor bolts” with “column bases and connection end plates or grout anchor bolts”.  In the 2 <sup>nd</sup> paragraph, replace “... base plates. Grout shall be poured ...” with “...column base plates or behind connection end plates. Grout shall be applied ...”.  In the 4 <sup>th</sup> paragraph, replace “column base plates” with “column base plates or behind connection end plates”.  Add two new paragraphs as follows:- “Material for sealing the perimeters around the column base plates or connection

Clause No.	Sub-heading of Clause	Major Changes
		end plates for grouting shall be removed after grout has been cured to expose the grout surface for inspection.  If grouting were carried out without approved method statement or without agreement by the SO, demonstrate to the satisfaction of the SO that approved grouting materials have been used and the grouted space is free from void pocket.”
15.47	Qualification testing of welding procedure	In the 1 <sup>st</sup> paragraph, replace “HOLAS accredited independent firm approved by the SO” with “Accredited Laboratory”.  In the 2 <sup>nd</sup> paragraph, replace “an HOKLAS accredited firm acceptable to the SO” with “the Accredited Laboratory”.
15.48	Welding consumables	Add a new paragraph as follows:- “Submit delivery notes of welding consumables to the SO. Maintain a log book for welding consumables on site which shall contain the date, types and quantities of welding consumables delivered on site, and the updated balance. Submit daily record to the SO on the names of welders engaged, welding joints under preparation, types and quantity of welding consumables used.”
15.58	Acceptance of welds	In the 1 <sup>st</sup> paragraph, replace “approved independent HOKLAS accredited testing firm” with “Accredited Laboratory”.  In the 2 <sup>nd</sup> paragraph and the 2 <sup>nd</sup> last paragraph, replace “independent testing firm” with “Accredited Laboratory”.
15.66	Generally	Replace “fire resistance period (FRP)” with “Fire Resistance Rating (FRR)”.
15.67	Fire protection system	In the 2 <sup>nd</sup> paragraph, replace “a HOKLAS accredited laboratory or other laboratories recognized under mutual recognition agreement/arrangement with HOKLAS” with “an Accredited Laboratory”.  In the 3 <sup>rd</sup> paragraph, replace “a HOKLAS accredited laboratory/organization” with “an Accredited Laboratory”.
15.68	Submittals	In sub-clause ii., replace “accredited laboratory/organization” with “Accredited Laboratory”.
<b>Section 17- Metalwork</b>		
17.42	Fire resisting shutters	In the 3 <sup>rd</sup> paragraph, replace “a laboratory accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS)” with “an Accredited Laboratory”.
<b>Section 18- Finishes</b>		
18.131	Vinyl tiles	Delete “Type B”.
18.132	Unbacked flexible PVC vinyl sheet	Delete “Type A”.
18.133	Foam backed vinyl sheet	Delete “Type A” and insert “and”.
<b>Section 25- Landscape Work</b>		
25.02(d)	Test for manufactured soil conditioner	Replace “a laboratory accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for the relevant tests in which case the laboratory shall have no affiliation as a legal entity to the Contractor or its sub-contractors. Particulars of the laboratory proposed by the Contractor shall be submitted to SO for approval” with “an Accredited Laboratory”.

Clause No.	Sub-heading of Clause	Major Changes
25.02(j)	Test for Topsoil	Replace “a laboratory accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for the relevant tests in which case the laboratory shall have no affiliation as a legal entity to the Contractor or its sub-contractors. Particulars of the laboratory proposed by the Contractor shall be submitted to SO for approval” with “an Accredited Laboratory”.
25.02(k)	Test for Fabricated Soil Mix	Replace “a laboratory accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for the relevant tests in which case the laboratory shall have no affiliation as a legal entity to the Contractor or its sub-contractors. Particulars of the laboratory proposed by the Contractor shall be submitted to SO for approval” with “an Accredited Laboratory”.
25.19	Limestone	Replace “a laboratory accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for the relevant tests in which case the laboratory shall have no affiliation as a legal entity to the Contractor or its sub-contractors. Particulars of the laboratory proposed by the Contractor shall be submitted to SO for approval” with “an Accredited Laboratory”.
25.40	Seed	In the 1 <sup>st</sup> paragraph, replace “a laboratory accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for the relevant tests in which case the laboratory shall have no affiliation as a legal entity to the Contractor or its sub-contractors. Particulars of the laboratory proposed by the Contractor shall be submitted to SO for approval” with “an Accredited Laboratory”.
25.66(b)(vii)	Artificial plants	Replace “accredited laboratory” with “Accredited Laboratory”.
<b>Section 26 – Geotechnical Works on Soil and Rock Slopes</b>		
26.34	Material	Replace sub-clause (b) “Steel reinforcement for soil nail heads shall be of grade 460 deformed high yield bars to CS2.” with “Steel reinforcement for soil nail heads shall be Grade 500B ribbed steel reinforcing bars to CS2.”.
26.60	Granular filter	In sub-clause (1)(iii), replace “BS 812:Part 102” with “CS3”.
Appendix 1	Drawing No. C2205	Replace “Type 2 High Yield Steel” with “Grade 500B Ribbed Steel”. Add note no. 3.
Appendix 2	Drawing No. C2104	Split into 2 sheets of Drawing Nos. C2104/1 & C2104/2.  Add plan of tree ring and Table 1.  Section of tree ring, notes and scale are revised.
Appendix 3	Drawing No. C2202	Replace “Type 2 Hot Dip Galvanized High Yield Deformed Bar” with “Hot Dip Galvanized Grade 500B Ribbed Reinforcement”.  Scale is revised from “1:5” to “Diagrammatic”.
Appendix 4	Drawing No. C2106/1  Drawing Nos. C2106/2 & C2106/3	Replace “Hot Dip Galvanized Type 2 High Yield Deformed Bar” with “Hot Dip Galvanized Grade 500B Ribbed Reinforcement”.  In Dimension Table, replace “T16” with “B16”.  Add note no. 5.  Scale is revised from “As Shown” to “Diagrammatic”.
Appendix 9	Drawing No. C2101	Scale is revised from “1:20” to “Diagrammatic”.
	Drawing No. C2103	Notes and scale are revised.

<b>Clause No.</b>	<b>Sub-heading of Clause</b>	<b>Major Changes</b>
	<b>Drawing No. C2102/1</b>	Notes and scale are revised.
	<b>Drawing No. C2102/2</b>	Scale is revised from "As Shown" to "Diagrammatic".