

**General Specification for Civil Engineering Works****2020 Edition****AMENDMENT NO. 1/2024****VOLUME 1****SECTION 6 EARTHWORKS****APPENDIX 6.3****DETERMINATION OF THE MAXIMUM CONVERTED BULK DENSITY BY THE HILF METHOD**

- (a) Appendix 6.3.2 **Replace “Method 10.1 or 10.2” with “Methods 10.1, 10.2, 10.5 or 10.6” after “Test” in item (a).**
- (b) Appendix 6.3.3 **Replace “10” with “13” after “The size of the sample shall be sufficient to yield a minimum of” in the first paragraph of item (a).**

**Add the following at the end of item (a):**

For material which is susceptible to crushing, following minimum mass of material shall be collected:

- i. Minimum 15 kg for material with percentage by mass of the sample retained on 20mm BS test sieve less than 5%;
- ii. Minimum 20 kg for material with percentage by mass of the sample retained on 20mm BS test sieve between 5% and 20%;
- iii. Minimum 40 kg for material with percentage by mass of the sample retained on 20mm BS test sieve exceeding 20%.

**Replace “four” with “five” after “by using a riffle box to obtain a minimum of” in item (e).**

**Replace “as shown in Civil Engineering and Development Department Standard Drawing No. C2006” with “where the ordinate shows the converted bulk density and the abscissa shows the amount of water added/ removed as a percentage of the mass of the specimen (see Civil Engineering and Development Department Standard Drawing No. C2006/1)” after “at the in-situ moisture content (z) on a graph” in item (h).**

**Replace** “Clause 10.1.5 or Test Method 10.2, Clause 10.2.5” **with** “Clause 10.1.5, Test Method 10.2, Clause 10.2.5, Test Method 10.5, Clause 10.5.5 or Test method 10.6 Clause 10.6.5” **after** “in accordance with Geospec 3,” **and** “(w<sub>i</sub>)” **with** “(w)” **after** “The in-situ moisture content of the slice” **in the second bullet point of item (i).**

**Add** “approximately” **after** “adding an amount of water equal to” **in the second bullet point of item (j).**

**Add** “approximately” **before** “4% of the mass of the specimen” **and** “2% of the mass of the specimen” **in item (l).**

**Add** “, as the maximum converted bulk density (MCBD),” **after** “The peak value of the curve” **in item (o).**

**Replace** “The” **with** “Calculate the” **in item (p).**

**Replace in item (q) with the following:**

(q) The moisture content adjustment value ( $z_c$ ) shall be determined according to Civil Engineering and Development Department Standard Drawing No. C2006/2.

(c) Appendix 6.3.4 **Replace** “value of the moisture correction curve passing through the peak value of the plotted parabolic curve” **with** “moisture content adjustment value” **in the second bullet point of item (3).**

**Delete item (4).**

**Add** “-  $w_i$  is the in-situ moisture content of the material (%)” **after** “where:” **in item (5).**

(d) Appendix 6.3.5 **Add the following item after item (f):**

(g) The difference between optimum moisture content and the in-situ moisture content to the nearest 0.1%, if determined.

**APPENDIX 6.4****ADJUSTMENT OF THE MAXIMUM CONVERTED BULK DENSITY FOR THE DETERMINATION OF THE RELATIVE COMPACTION**

- (e) Appendix 6.4.3 **Add the following at the end of item (e):**

The material to be tested shall be thoroughly mixed and divided by quartering or by using a riffle box to obtain a minimum of five specimens of at least 6,000g each, ensuring that moisture loss is kept to minimum. Alternatively, if it has previously been ascertained that the material is not susceptible to crushing, a single specimen of at least 6,000g may be used for repeat testing.

- (f) Appendix 6.4.4 **Add the following bullet points at the end:**

- m is the weight of particles retained on the 20mm BS test sieve expressed as a fraction of the fill wet weight
- G<sub>s</sub> is the specific gravity of the particles retained on the 20mm BS test sieve

**APPENDIX 6.5****DETERMINATION OF THE MOISTURE CONTENT OF SOIL BY THE INFRARED OVEN DRYING METHOD AT 105 ± 5 °C**

- (g) Appendix 6.5.1 **Delete “soil with particle size distribution within the range stated in Table 6.5.1 as a percentage of the mass of the dry soil” after “the moisture content of” in the first paragraph.**

**Add “with convection heating” after “by infrared oven drying” in the first paragraph.**

**Delete Table 6.5.1.**

- (h) Appendix 6.5.2 **Replace item (a) with the following:**

(a) An infrared oven with convection heating and with a suitable power control device and ventilation, capable of maintaining oven temperature at 105 ± 5 °C and meeting the following performance requirements: -

- (i) the difference of mass of the test specimens<sup>(1)</sup> taken in 3 hours and 3½ hours after drying in the infrared oven shall be less than 0.1% of the original wet mass of the test specimens;
- (ii) the temperature of test specimens not exceeding 110°C; and
- (iii) the difference between the moisture content values of the test

specimens by infrared oven drying and further convection oven drying at  $105 \pm 5$  °C for 24 hours shall be less than 0.4%.

Note: (1) Test specimens used for verifying the performance of the infrared oven should have a minimum moisture content of optimum moisture content plus 3%.

**Replace “glass” with “corrosion-resistant” in item (b).**

**Add “for fine-grained soils” after “accurate to 0.05g” in item (c).**

**Add the following items after item (c):**

(d) A balance, readable to 0.1g and accurate to 0.3g for medium-grained soils.

(e) A balance, readable to 1g and accurate to 3g for coarse-grained soils.

- (i) Appendix 6.5.3 **Add “, 0.1g or 1g for fine-grained, medium-grained or coarse-grained soils respectively” after “nearest 0.01g” in item (a), (c), (e), (g) and (h)(i).**

**Replace “be at least 300g and in no case be greater than 350g.” with “follow Clause 5.1.4 of Test Method 5.1 of Geospec 3.” after “a test specimen shall” in item (b).**

**Delete “transferred to convection oven to continue drying in accordance with Test Method 5.2 of Geospec 3. Alternatively, the test specimen may be” after “the test specimen shall be”, “drying” after “to the infrared” and “or for one or more cycles of drying before transferring to the convection oven as specified, if no abnormality is identified” after “criterion is satisfied” in item (g)**

- (j) Appendix 6.5.4 **Replace the following**

$m_1$  is the mass of container and its lid (g);

$m_2$  is the mass of container, its lid and contents before drying (g); and

$m_3$  is the mass of container, its lid and contents after drying (g).

**with**

- $m_1$  is the mass of container (in g);
- $m_2$  is the mass of container and wet soil (in g); and
- $m_3$  is the mass of container and dry soil (in g).

- (k) Appendix 6.5.5 **Replace “the nearest 0.1%.” with “two significant figures for values up to 10% or to the nearest whole number for values above 10%.” in item (b).**

**Delete item (e).**

**SECTION 7 GEOTECHNICAL WORKS**

**PART 3: SLOPE TREATMENT WORKS**

**MATERIALS**

- (1) Clause 7.140 **Replace the heading with “*Repairs to galvanized coating*”.**

## **VOLUME 2**

### **SECTION 17 PRESTRESSING**

#### **MATERIALS**

- (m) Clause 17.07 **Add the following item after item (2):**

(3) Anchorages shall be fabricated with inspection holes allowing a probe or inspection by borescope of the upper part of the duct behind the anchor heads. The holes shall also facilitate the post-grouting inspection. Alternatively, the anchorages shall be equipped with a device which permits the inspection personnel to monitor and verify the complete filling of grout in the anchorage.

#### **INSTALLATION OF PRESTRESSING SYSTEMS**

- (n) Clause 17.37 **Replace “, and” with “and couplers for joints in prestressing tendons,” in item (c).**

#### **Add the following items after item (e):**

- (f) Deviators for external prestressing tendons.
- (g) For external tendons, in case the vents cannot be placed because of encroachment upon the diaphragm/deviator block, vents should be installed on both sides of the diaphragm/deviator block. For anchorage locations, vents should be provided at the other side of the diaphragm.

#### **GROUTING OF PRESTRESSING SYSTEMS**

- (o) Clause 17.45 **Replace the paragraph with the following paragraphs:**

(1) Grouting of prestressing tendons shall be effective such that the duct and anchorage are completely filled, and the prestressing tendon is completely surrounded, with grout. Vacuum-assisted grouting shall be adopted. For vacuum-assisted grouting, a negative pressure of no less than 0.75 bar shall be maintained within the tendon duct for at least one minute before the injection of grout and throughout the whole grouting operation.

(2) For external prestressing tendons, to inspect the quality of grout at ducts, hammer sounding or other equivalent inspection methods shall be conducted at all grouted tendons. The Contractor shall submit for approval by the Engineer a detailed method statement for hammer sounding (or other equivalent inspection methods), outlining the operation and type of apparatus to be used. In the case of suspected void within the grouted

ducts, drilling of holes on sheathing and remedial measures shall be conducted. The Contractor shall submit for approval by the Engineer a detailed method statement for the drilling and remedial works.

(3) The quality of grouting at anchorages and deviators shall also be inspected. Such inspection can be conducted in form of visual inspections of the grouting condition at grout vents and inspection holes. If suspected abnormalities are found, further verification by drilling through the grout vents or pre-installed inspection holes and borescope inspections shall be carried out. The Contractor shall submit for approval by the Engineer a detailed method statement for the drilling and remedial works.

(4) The inspection of the quality of grout detailed in sub-clauses (2) and (3) shall be conducted by an experienced person from an organization independent of the main contractor and prestressing works contractor, and shall possess at least three years of experience in the inspection of grouting quality at ducts.

(5) Records on the inspection on quality of grouting, inspection of grouting condition at ducts, anchorages and deviators, and the subsequent remedial and reinstatement works, shall be submitted to the Engineer.

- (p) Clause 17.46 **Add** “In case grouting cannot be carried out within 5 days after tensioning of the prestressing tendons, temporary corrosion protection measures should be implemented. The Contractor shall submit proposal of corrosion protection measures to the Engineer for approval before commencement of tendon prestressing works.” **at the end of item (2).**

**Add the following items after item (10):**

(11) In addition to the grouting trials stated in Clause 17.19(1), the Contractor shall select and propose for the Engineer’s approval an external prestressing tendon to be completed first, and demonstrate to the Engineer that the workmanship and quality of the grouting works for the tendon is satisfactory. Hammer sounding or other equivalent inspection methods shall be conducted in accordance with Clause 17.45 to inspect the quality of grouting. The Contractor shall not commence the grouting works for the remaining external tendons without the prior agreement of the Engineer.

(12) If the Contractor fails to demonstrate that the workmanship and quality of the grouting works for the tendon is satisfactory, or if in the opinion of the Engineer any aspect of the grouting procedure as demonstrated by the Contractor is unsatisfactory, remedial measures and/or particulars of proposed changes to the method of grouting shall be submitted by the Contractor to the Engineer. Further grouting of external tendons shall not be carried out until in the opinion of the Engineer the remedial measures and/or every aspect of the grouting procedure is satisfactory.

(13) The Contractor shall employ on the Site in connection with execution of grouting works for prestressing systems an experienced site personnel

who is required to supervise, witness and take record of the whole grouting process of each tendon. The site personnel shall record the sequence of work and check against the prescribed method statement. Any anomaly shall be recorded and investigated. The record shall be countersigned by a supervising engineer and submitted to the Engineer within 3 days of each grouting operation.

(14) The supervising engineer shall be a holder of a recognized degree in civil/structural engineering with 5 years of relevant experience in tendon prestressing works.

(15) The following particulars of the proposed supervising engineer for grouting works shall be submitted to the Engineer:

- (a) Name,
- (b) Copy of Hong Kong Identity Card,
- (c) Details of qualifications, including copies of certificates, and
- (d) Details of previous experience.

(16) The particulars shall be submitted to the Engineer for approval at least 8 weeks before the approval is required.

**Technical Secretariat Unit**  
**Civil Engineering and Development Department**  
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