GENERAL SPECIFICATION
FOR
CIVIL ENGINEERING WORKS

SECTION 1
GENERAL
SECTION 1

GENERAL

INTERPRETATION OF DOCUMENTS

Application of the General Specification for Civil Engineering Works

1.01 (1) The provisions contained in the Particular Specification and the Drawings shall prevail over the provisions contained in this General Specification for Civil Engineering Works (GS).

(2) The provisions contained in this General Specification for Civil Engineering Works shall prevail over the provisions contained in British Standards, British Standard Codes of Practice and similar standard documents stated in the Contract.

Abbreviations

1.02 (1) The following list shows the meaning of the abbreviations for the common terms used in this GS but is not intended to be exhaustive:

AASHTO American Association of State Highway and Transportation Officials
APHA American Public Health Association
AWWA American Water Works Association
ANSl American National Standards Institute
AS/NZS Australian/New Zealand Standards
ASTM American Society for Testing and Materials
BQ Bills of Quantities
BS British Standards
BS EN European Standard adopted as British Standards
BS EN ISO European Standards (EN) & International Organization for Standardization for (ISO)’s Standards adopted as British Standards
CBR California Bearing Ratio
CCTV Closed circuit television
CD Chart Datum
C & D Construction and demolition
CI Cast iron
CIPP Lining with cured-in-place pipes
CS Construction Standards of Hong Kong
CP British Standard Code of Practice
CSSM Construction Site Safety Manual
DI Ductile iron
DDF Disposal Delivery Form
DFT Dry film thickness
DN Nominal size
dn Nominal size of tees and tapers
DRS Daily Record Summary
EM&A Environmental Monitoring and Audit
EPD Environmental Protection Department
ET Environmental Team
FGL Finished ground level, or finished level of the permanent works
GCC General Conditions of Contract
GEO Geotechnical Engineering Office, Civil Engineering and Development Department
GI Galvanized iron

1.3
(2) The following list shows the meaning of the abbreviations for the units used in this GS but is not intended to be exhaustive:

- °C: degrees Celsius
- dB: decibels
- g: gram
- g/mL: gram(s) per millilitre
- g/m²: gram(s) per square metre
- ha: hectare
- hr: hour
- Hz: hertz
- J: joule
- kg: kilogram
- kHz: kilohertz
- kJ: kilojoule
- km: kilometre
- km/hr: kilometre(s) per hour
- kN: kiloNewton
- kPa: kiloPascal
- kV: kiloVolt
- kW: kiloWatt
- L: litre
- L/min: litre(s) per minute
- L/s: litre(s) per second
- m: metre
Glossary of terms 1.03

(1) Words and expressions to which meanings are assigned in any section of the GS shall have the same meanings in other sections of the GS except when the context otherwise requires.

(2) Utilities are the installations (including cables, ducts and pipes) used to supply or provide electricity, lighting, traffic control, telecommunications, cable television, gas, water, drainage, sewerage and tramway, including all associated protection, supports, ancillary structures, fittings and equipment.

Trials and approval 1.04

(1) Reference in this GS to the approval of the Engineer shall mean approval given by the Engineer in writing. Materials, methods of construction and any other matters, which have been approved by the Engineer, shall not be changed without the approval of the Engineer to the proposed changes.

(2) Trials shall be carried out as stated in the Contract to demonstrate that proposed materials and methods of construction will produce work which complies with the specified requirements.

(3) Trials shall be carried out before the relevant permanent work starts so as to allow the Engineer a sufficient period to determine if the trial complies with the specified requirements. The Contractor shall inform the Engineer 24 hours, or such shorter period agreed by the Engineer, before the trial starts.

(4) Trials shall be carried out using materials and methods of construction of the types submitted to the Engineer, and at locations agreed by the Engineer.

(5) If in the opinion of the Engineer, the work that complies with the specified requirements has not been produced in the trial, particulars of proposed changes to the materials or methods of construction shall be submitted to the Engineer. Further trials shall be carried out until the work
that complies with the specified requirements has been produced in the trial unless otherwise agreed by the Engineer. Works for which trials are required shall not commence, until in the opinion of the Engineer, the work that complies with the specified requirements has been produced in the trial.

(6) Unless permitted by the Engineer, the materials and methods of construction used to produce the work that complies with the specified requirements in a trial, shall not be changed unless further trials have been carried out to demonstrate that the proposed changes are satisfactory.

**British Standards, Codes of Practice and other standards**

1.05 (1) Unless otherwise stated in the Contract, reference in this GS to British Standards, British Standard Codes of Practice and similar standards shall be to that edition of the document stated in Appendix 1.1 of this Section.

(2) Later editions of British Standards, British Standard Codes of Practice and other similar standards, or standards which are considered to be equivalent, shall not apply unless approved by the Engineer. The Engineer shall not be bound to give or withhold his approval until the Contractor has provided him with a legal copy of the relevant standard for information. If approval is obtained, the Contractor shall provide two legal copies of the document for use by the Engineer.

**Specifications in metric and imperial units**

1.06 (1) Specifications in imperial units shall not be substituted for specifications in metric units stated in the Contract unless approved by the Engineer.

(2) Conversion of metric units to imperial units and of imperial units to metric units shall be in accordance with the Hong Kong Government Metric Reference Guidebook.

**Dimensions from Drawings**

1.07 Dimensions shall not be obtained by scaling from the Drawings. Dimensions that are not shown on the Drawings or calculable from dimensions shown on the Drawings shall be obtained from the Engineer.

**PROGRAMME**

1.08 (1) In addition to the programme to be submitted to the Engineer in accordance with Clause 16 of GCC for Civil Engineering Works, the Contractor shall submit within a further 14 days a programme showing a detailed breakdown of the work to be carried out in the first 3 months, and an outline for the remainder of the work. A programme showing the work completed to date, a detailed breakdown of the work to be carried out in the next 3 months and an updated outline for the remainder of the work shall be submitted to the Engineer not later than 4 weeks before the commencement of each subsequent 3-monthly period.

(2) Programmes submitted in accordance with Clause 1.08 (1) shall be in the form of a bar chart showing the earliest and latest start and finish dates for each activity, and the critical path.

(3) The breakdown of the work to be shown for each Section of the Works on the programme submitted in accordance with Clause 1.08 (1) shall be comprehensive. It shall include the key activities, key dates and milestones from the programme submitted under Clause 16 of GCC for Civil Engineering Works, the information required under Clause 16 of GCC for
Civil Engineering Works and the effects of the matters listed in Clause 63 of GCC for Civil Engineering Works, together with the following:

(a) Work to be carried out, including testing and commissioning,

(b) Fabrication, delivery and installation of materials to be fabricated off the Site,

(c) Delivery of critical materials originating from outside the HKSARG,

(d) Activities for which the Employer or Engineer is responsible, including the issue of critical drawings and other information, provision of materials by the Employer, nomination and approval of Nominated Sub-contractors and consideration and approval of drawings and proposals, and

(e) Work to be carried out by Government departments, utility undertakings and other contractors.

(4) The Contractor shall be responsible for arranging, co-ordinating and agreeing with the utility undertakings a programme for their works. The Contractor shall make full allowance for time and provision of facilities for the utility undertakings in the preparation of his programmes.

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CONTRACTOR'S SUPERINTENDENCE

**Surveyor**

1.09 (1) The Contractor shall employ on the Site a Surveyor for setting out the Works and for conducting slope and retaining wall record survey.

(2) The Surveyor shall possess a Diploma/Higher Certificate in Land Surveying from a Hong Kong technical institute/polytechnic or university, or equivalent qualification appropriate to the nature of the survey work required for the Contract, plus a minimum of 2 years of relevant experience in engineering surveying.

**Foreman for concrete works**

1.10 If structural concrete works are included in the Contract, the Contractor shall employ on the Site a Foreman who is suitably experienced in concrete works. The Foreman shall be on the Site at all times when concreting is in progress.

**Supervision of piling works**

1.11 (1) If piling works are included in the Contract, the Contractor shall employ on the Site a Construction Engineer who is required to visit the site at such time and frequency as necessary and shall be present to supervise inter alia, but not limited to, the following items:

(a) 100% check on the depth of excavation and the quality of retrieved material at the founding stratum, and

(b) 100% verification on the depth of the constructed piles by proof drilling (for large-diameter bored piles) including the retrieval of concrete and rock core samples for inspection and testing.

(2) The Contractor shall also employ on the Site a Construction Supervisor who shall be full time on site to supervise the piling works.
(3) The Construction Engineer shall be a holder of a recognized degree in civil/structural/geotechnical engineering with 5 years of relevant experience. The Construction Supervisor shall either be a holder of a Higher Diploma/Higher Certificate in civil/structural/geotechnical engineering with 3 years of relevant experience, or a holder of a Diploma/Certificate in the same subjects with 5 years of relevant experience.

(4) The following particulars of the proposed Construction Engineer and Construction Supervisor for piling works shall be submitted to the Engineer for approval:

(a) Name;

(b) Copy of Hong Kong Identity Card;

(c) Details of qualifications, including copies of certificates;

(d) Details of previous experience.

1.12 Particulars of Agent and employees

(1) The proposed Agent as an employee of the Contactor shall hold a university degree acceptable to the Engineer and the HKIE academic requirements for Corporate Membership, or an equivalent qualification, in civil engineering or in a branch of civil engineering appropriate to the nature of the work included in the Contract, and shall have at least two years of relevant working experience. He must be bestowed with adequate authority to receive and carry out the directions and instructions from the Engineer and the Engineer’s Representative.

(2) The following particulars of the proposed Agent, Surveyor, Construction Engineer and Construction Supervisor for piling works and foreman for concrete 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.

(3) The particulars of the proposed Agent, Surveyor, Construction Engineer and Construction Supervisor for piling works shall be submitted to the Engineer for approval and the particulars of the proposed foreman for concrete works shall be submitted to the Engineer for information.

(4) The particulars of the proposed Agent, Surveyor, Construction Engineer and Construction Supervisor for piling works shall be submitted within 7 days of commencement of the Works. The particulars of the proposed Foreman for concrete works shall be submitted within 7 days of his appointment.
SAFETY

1.13 (1) The Contractor shall keep on the Site a set of the current Construction Site Safety Manual (CSSM) issued by the Environment, Transport and Works Bureau (ETWB) of the Government of the Hong Kong Special Administrative Region (HKSAR). Attention of the Contractor is drawn to Appendix III of Chapter 3 of the CSSM about the need to keep one set of the legislation, regulations and/or codes of practice on the Site.

(2) Safety precautions for working in sewers, drains and other confined spaces shall comply with the Factories and Industrial Undertakings (Confined Spaces) Regulations. The major provisions of these Regulations are contained in the current edition of the document “A Brief Guide to the Factories and Industrial Undertakings (Confined Spaces) Regulation” issued by the Labour Department of the Government of the HKSAR.

(3) Divers shall undergo regular medical checks and obtain certificates of fitness. Safety precautions for diving shall be in accordance with the current edition of the “Code of Practice: Safety and Health at Work for Industrial Diving” issued by the Labour Department of the Government of the HKSAR.

(4) Adequate safety equipment including, as appropriate, safety helmets, goggles, ear protectors, safety belts, safety equipment for working in sewers, drains and confined spaces, equipment for rescue from drowning, fire extinguishers, first aid equipment and other necessary safety equipment shall be available on the Site at all times.

(5) Safety equipment, scaffolds, working platforms, ladders and other means of access, and lighting, signing and guarding equipment shall be inspected and maintained regularly. Lights and signs shall be kept clean and easy to read. Equipment that are damaged, dirty, incorrectly positioned or not in working order shall be repaired or replaced immediately.

(6) Posters in both English and Chinese to draw attention to safety shall be obtained from the Labour Department and displayed at prominent locations around the Site including site offices, workshops and canteens.

WORK ON ROADS

1.14 (1) In addition to any other requirements stated in the Contract, temporary traffic arrangements shall be in accordance with conditions and restrictions imposed by the Commissioner for Transport and the Commissioner of Police. Temporary lighting, signage, guarding and traffic control arrangements shall be in accordance with conditions and restrictions imposed by the Director of Highways. Traffic signs that are not prescribed by the Road Traffic Ordinance or its subsidiary legislation shall be in accordance with conditions and restrictions imposed by the Commissioner for Transport.

(2) The Contractor shall make all arrangements with and obtain the necessary approvals from the Commissioner for Transport, the Commissioner of Police, the Director of Highways and any other relevant authority for temporary traffic arrangements and control.
## Temporary traffic arrangements and control

1.15 (1) Temporary traffic diversions and pedestrian routes shall be provided where work in roads or footways obstructs existing vehicular or pedestrian access. The relevant work shall not commence until the approved temporary traffic arrangements and control have been implemented.

(2) Temporary traffic arrangements and control for work in roads and footways shall comply with the requirements contained in the current edition of the document 'Code of Practice for Lighting, Signing and Guarding of Road Works' issued by the Government of the HKSAR. A copy of the document shall be kept on the Site.

(3) Temporary traffic light signals shall be of a type approved by the Commissioner for Transport and shall comply with the requirements contained in the current editions of the documents 'Type Approval Procedure for Portable Traffic Light Signals' and 'Specification for Vehicle Actuated/Fixed Time Portable Traffic Signal Equipment' issued by the Government of the HKSAR.

(4) Temporary traffic signs, including posts, backing plates and faces, shall comply with the requirements for traffic signs contained in Section 12 except as stated in Clauses 1.15(5) and (6).

(5) The thickness of backing plates for temporary traffic signs that will be erected for less than 6 months may be reduced to 1.5 mm. The posts for signs may be constructed of timber or other material provided that in the opinion of the Engineer the traffic signs will be stable and safe.

(6) The Contractor shall design the arrangement of information on sign the faces for temporary traffic directional signs. The details of the background, borders and legends, including letters, numerals, characters and symbols, shall comply with the requirements of the Commissioner for Transport.

(7) The Contractor shall inspect and regularly maintain the temporary traffic arrangements and control, both day and night. He shall keep the traffic lights, lights and signs clean and easy to read, and shall immediately repair or replace the equipment that is damaged, dirty, incorrectly positioned or not in working order.

## Particulars of temporary traffic arrangements and control

1.16 The following particulars of proposed temporary traffic arrangements and control shall be submitted to the Engineer for approval at least 7 days before the traffic arrangements and control are implemented:

(a) Details of traffic diversions and pedestrian routes,

(b) Details of lighting, signage, guarding and traffic control arrangements and equipment, and

(c) Any conditions or restrictions imposed by the Commissioner for Transport, the Commissioner of Police, the Director of Highways or any other relevant authority, including copies of applications, correspondence and approvals.
Use of roads and footways

1.17 (1) Roads, footways and cycle-tracks on the Site shall be maintained in a clean and passable condition and shall not be used to store materials or park construction plant or other vehicles, other than those required for immediate use on the Works. The construction plant, materials and temporary works shall be placed with minimum interference with or disturbance to the use of any right of way by the public.

(2) Measures shall be taken to prevent excavated material, silt or debris from entering drainage systems in roads, footways and cycle-tracks. Entry of water to gullies shall not be obstructed.

(3) Surfaced roads on the Site and leading to the Site shall not be used by tracked vehicles unless protection against damage is provided.

(4) Construction plant and other vehicles leaving the Site shall be properly cleaned, loaded and covered in such a manner that excavated material, mud or debris is not deposited on roads. Measures to be adopted shall include but not be limited to those specified under Clauses 25.15 and 25.26.

Work on roads and footways

1.18 (1) Work on roads on the Site shall be carried out in sections such that the length of road occupied at any time does not exceed that stated in the Contract and the width of road occupied at any time does not exceed the width of one traffic lane unless permitted by the Engineer. Work on each section shall be completed and the road shall be reinstated and opened to traffic before work commences on the next section. Work on any section, including loading and unloading, shall be carried out in such a manner that traffic and utilities on the adjacent road and pedestrian access in the adjacent footway are adequately maintained.

(2) Before excavations are carried out on roads or footways, except in areas covered with paving blocks or tiles, the limits of the area to be reinstated shall be bounded by a continuous saw-cut groove. The groove shall be at least 6 mm wide and at least 50 mm deep. Cutting the groove and breaking out the road or footway shall be carried out in such a manner that the adjacent road or footway, including edges, is not damaged.

(3) Excavated material shall not be stored adjacent to excavations in roads or footways unless permitted by the Engineer.

(4) Vehicular access across excavations in roads shall be provided with steel covers. The covers shall be designed to BS 449: Part 2 and shall be capable of withstanding the full load of traffic permitted to use the road. The covers shall be secured in position and shall have anti-skid coating so that the skid resistance values of the covers measured in accordance with BS 3262 shall be not less than 45. Sufficient steel covers shall be kept on the Site adjacent to excavations in roads to permit vehicular access across the excavations in case of emergency. When installed, the steel covers shall be set to be flush with the road surface and shall not result in any noise nuisance by rocking under the action of traffic.

(5) Work on roads, footways and cycle-tracks shall be carefully planned to minimize the period of temporary excavation. If the Contractor is unable to proceed with the works after any excavation is carried out, he shall immediately backfill or temporarily reinstate the excavation.
(6) In respect of works covered by the excavation permits issued by Highways Department and/or Lands Department as appropriate pursuant to the Land (Miscellaneous Provisions) Ordinance Cap 28 where the Contractor is the Nominated Permittee and the Employer is the Permittee, the Contractor shall comply with all conditions stated in the excavation permits.

**Reinstatement of roads and footways**

Temporary diversions, pedestrian access and lighting, signage, guarding and traffic control equipment shall be removed immediately they are no longer required. Roads, footways and other items affected by temporary traffic arrangements and control shall be reinstated to the condition existing before the work started or to such other condition as may be agreed or instructed by the Engineer.

### CARE OF THE WORKS

**Protection from water**

1.20 (1) Unless otherwise permitted by the Engineer, all work shall be carried out, as near as may be practicable in the circumstances, in dry conditions, except where the work is required to be carried out in or with water or other fluids.

(2) Where necessary and as far as practicable, the Works including materials for use in the Works shall be kept free of water and protected from damage due to water. Temporary drainage, pumping systems or other effective measures approved by the Engineer shall be used. Silt and debris shall be intercepted with traps before water is discharged from the Site.

(3) The discharge points of the temporary drainage and pumping systems shall be approved by the Engineer. The Contractor shall make all arrangements with and obtain the necessary approvals and inspections from the relevant authorities for discharging water to drains, watercourses or the sea. The relevant work shall not start until the approved arrangements for disposal of the water have been implemented.

(4) Measures shall be taken to prevent flotation of new and existing structures.

**Protection from weather**

1.21 (1) Works shall not be carried out in weather conditions that may adversely affect the works unless protection by methods agreed by the Engineer is provided.

(2) Permanent works, including materials for permanent works, shall be protected by methods agreed by the Engineer from exposure to weather conditions that may adversely affect the work or materials.

**Protection of works**

1.22 Finished works shall be protected with methods agreed by the Engineer from damage that could arise from the execution of adjacent works. Works shall be carried out in such a manner that works carried out by others, including Government departments, utility undertakings and other contractors, is not damaged.
**DAMAGE AND INTERFERENCE**

**1.23 Damage and interference**

1. Works shall be carried out in such a manner that, as far as is reasonable and practicable, there is no damage to or interference with the following, other than such damage as is required to enable the execution of the Works:

   (a) Watercourses;
   
   (b) Utilities;
   
   (c) Structures, roads including street furniture, or other property;
   
   (d) Public or private vehicular or pedestrian accesses; and
   
   (e) Trees, graves or burial urns.

2. The Contractor shall inform the Engineer as soon as practicable of any item, utility or thing which is not stated in the Contract as requiring diversion, removal or relocation but which the Contractor considers as requiring diversion, removal or relocation to enable the Works to be executed. The Contractor shall not divert, remove or relocate any such item, utility or thing without the prior approval of the Engineer.

3. Items which are damaged or interfered with as a result of the works being carried out and items which are diverted, removed or relocated to enable the works to be carried out, shall be reinstated to the same condition as was existing before the works started or to such other condition as may be agreed or instructed by the Engineer.

**1.24 Watercourses and drainage systems**

1. The Contractor shall be responsible for maintaining all river and stream courses, drains and culverts within the Site until handover of the Site to the Employer. Rivers and stream courses shall be maintained in accordance the requirements of Clause 25.09. Maintenance of drains and culverts shall include, but not be confined to, the periodic clearance of debris, weed growth and other obstructions from the drains, culverts, manholes and flap valve chambers to the satisfaction of the Engineer. The Contractor shall ensure throughout the contract period that the flow capacity is not reduced and the quality of water is not worsened by execution of the Works.

2. The Contractor shall be responsible for any temporary training or diversion of natural streams/rivers, drainage systems, nullahs and watercourses during execution of the Works and subsequent reinstatement. The Contractor shall submit to the Engineer particulars of the diversion and reinstatement proposals at least 21 days before the diversions are implemented. The Contractor shall programme construction of the Works to take account of all the necessary temporary diversions of the existing natural streams/ rivers, nullahs, watercourses and drains. The Contractor shall illustrate in his overall programme how the Works can be phased smoothly with the various necessary diversions.

3. All diversions shall be of adequate capacity so as not to increase the risk of flooding to any area within, upstream or downstream of the Site either from heavy rainfall or high tides. The Contractor shall ensure that adequate provision is made for dealing with flood flows. Where the design of diversion
proposals relies on contingency measures to quickly remove the installed temporary works from the drainage systems in order to provide sufficient flow capacity during adverse weather conditions, any such contingency measures and associated procedures shall be demonstrated to be ‘fail-safe’. The diversion shall be carefully planned to minimize disturbance caused to the natural beds of river/streams and riparian vegetation. The diversion shall be properly reinstated, including removal of any obstructions to flow, as soon as practicable after the works are completed, to the satisfaction of the Engineer.

(4) The natural bottom and existing flow in the river shall be preserved as much as possible to avoid disturbance to the river habitats. If temporary access track on riverbed is unavoidable, this shall be kept to the minimum width and length. Temporary river crossings shall be supported on stilts above the riverbed. Stockpiling of construction material, if necessary, shall be properly covered and located away from any natural stream/river. Measures shall be taken to prevent excavated material, silt or debris from being deposited or washed into existing streams and rivers, drainage systems, nullahs, watercourses, diversion channels or the sea. The measures to be adopted shall include but not be limited to those specified under Clauses 25.07, 25.08 and 25.09.

(5) Any sediment or debris that accumulates in any catchpit, manhole, sump, trap, drain, drainage channel or watercourse, whether temporary, existing or newly constructed, within the Site, shall be removed on a frequent basis, or as directed by the Engineer.

(6) Removal of existing vegetation alongside the riverbanks shall be avoided or minimized. When disturbance to vegetation is unavoidable, all disturbed areas shall be hydroseeded or planted with suitable vegetation to blend in with the natural environment upon completion of works.

Utilities

1.25

(1) The details of existing utilities are given for information only and the accuracy of the details is not guaranteed. The Contractor shall make his own enquiries and shall carefully excavate inspection pits to locate accurately the utilities indicated to him by the utility undertakings.

(2) Temporary supports and protection to utilities shall be provided by methods agreed by the Engineer. Permanent supports and protection shall be provided if instructed by the Engineer.

(3) The Contractor shall inform the Engineer and the utility undertakings without delay of the following:

(a) Damage to utilities,

(b) Leakage of utilities,

(c) Discovery of utilities not shown on the Drawings, and

(d) Diversion, removal, repositioning or re-erection of utilities, which is required to enable the execution of the Works.

(4) The Contractor shall take all steps necessary to enable the utility undertakings to proceed in accordance with the programme agreed between the Contractor and the utility undertakings under Clause 1.08(4). The Contractor shall maintain close liaison with the utility undertakings and shall inform the Engineer of any delays in works by the utility undertakings.
(5) Records of existing utilities encountered shall be kept by the Contractor on the Site with a copy provided for the Engineer. The records shall be agreed by the Engineer and shall contain the following details:

   (a) Location of utility,

   (b) Date on which utility was encountered,

   (c) Nature and size of utility,

   (d) Condition of utility, and

   (e) Temporary or permanent supports provided.

(6) Further to Clause 1.25(1), the Contractor shall submit for the Engineer's agreement, at least 14 days before any excavation by mechanical plant, a proposal for investigations to ascertain the nature, location and size of existing utilities by hand-dug inspection pits. Such investigations by inspection pits shall not relieve the Contractor of any of the duties, responsibilities, obligations or liabilities imposed upon him by any of the provisions of the Contract.

(7) Unless otherwise agreed by the Engineer in writing, the Contractor shall carry out investigations to locate utilities in accordance with the proposal referred to in Clause 1.25(6). The Contractor shall make his own enquiries with the utility undertakings as and when required and should any utility installations including cover tiles be exposed, the respective utility undertakings shall be contacted to determine if all their utilities have been located. Utility installations including cover tiles shall only be removed by the utility undertakings concerned.

(8) No excavation with mechanical plant shall commence until the nature, location and size of utilities that may be affected by the excavation have been ascertained and the setting-out details have been checked by the Engineer. The nature includes the type of utilities, protective uPVC/GI ducts or conduits, concrete surround, haunching and the like. The location includes the top/bottom levels, the coordinates of the center-lines of the utilities and the like.

(9) The Contractor shall provide adequate and experienced site personnel to control the operation of heavy mechanical plant in the proximity of utilities.

(10) The Contractor shall make arrangements to avoid any heavy mechanical plant or vehicles standing or passing over buried pipe-work in particular those at shallow depths with less than 1 metre overburden cover, especially when the road surface is removed. Unless agreed by the Engineer, the Contractor shall not stockpile any material immediately over or in the vicinity of any pipe-work.

(11) Pursuant to Clause 1.25(1), the Contractor shall carry out the Works in such a manner to avoid any damage or interference with any concrete blocks or structures attached to the utilities. The Contractor shall ensure that all cable draw-pits, valve-pits and the like are not covered up or removed as a result of his works and are accessible by utility undertakings at any time during the course of the Works for emergency repair.
(12) Further to Clause 1.25(2), where utility installations are exposed, the Contractor shall liaise with the utility undertakers about the necessary protection for the exposed utilities and provide temporary protective measures and warning signs to prevent damaging the utility installations.

**Structures, roads and other property**

1.26 The Contractor shall immediately inform the Engineer of any damage to structures, roads or other property not required for the execution of the Works.

**Access**

1.27 Alternative access shall be provided if interference with existing public or private vehicular or pedestrian access is necessary to enable the execution of the Works. The arrangements for the alternative access shall be as agreed by the Engineer. The permanent access shall be reinstated as soon as practicable after the works are complete and the alternative access shall be removed as soon as practicable after it is no longer required.

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**RECORDS**

**Records of wage rates**

1.28 The average, high and low wage rates for workers of each trade employed on the Site shall be entered on monthly wage return forms provided by the Engineer, and the completed forms returned to the Engineer within 4 days of the start of the succeeding month. For the purpose of completing the returns, actual trades shall be entered as the equivalent trades stated in Table 1.1.

**Records of correspondence**

1.29 Copies of correspondence relevant to execution of the Works (and not of a confidential nature) received from or despatched to Government departments, utility undertakings and other contractors employed by the Employer shall be submitted to the Engineer for information as soon as possible, but in any case not later than 7 days after receipt or despatch.

**Records and reports**

1.30 Reports and records, which are to be submitted to the Engineer, shall be in a format agreed by the Engineer. Reports and records shall be signed by the Contractor's agent or by another representative authorised by the Contractor.
Table 1.1: Equivalent trades

<table>
<thead>
<tr>
<th>Actual trade</th>
<th>Equivalent trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office attendant</td>
<td>Labourer (unskilled)</td>
</tr>
<tr>
<td>Watchman</td>
<td>Labourer (unskilled)</td>
</tr>
<tr>
<td>Working ganger</td>
<td>Ordinary worker in the trade in which he is employed or, if the trade is not listed, lorry driver</td>
</tr>
<tr>
<td>Survey labourer</td>
<td>Concretor's labourer</td>
</tr>
<tr>
<td>Turf-layer</td>
<td>Concretor's labourer</td>
</tr>
<tr>
<td>Bituminous material layer</td>
<td>Concretor's labourer</td>
</tr>
<tr>
<td>Shot-firer</td>
<td>Plasterer</td>
</tr>
<tr>
<td>Lorry checker</td>
<td>Labourer (unskilled)</td>
</tr>
<tr>
<td>Motor driver (car/van)</td>
<td>Truck driver</td>
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<td>Survey leveller</td>
<td>Plumber</td>
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<td>Welder</td>
<td>Painter</td>
</tr>
<tr>
<td>Coxswain, barge Engineer</td>
<td>Truck driver</td>
</tr>
<tr>
<td>Dredger crew, barge crew</td>
<td>Diver's linesman</td>
</tr>
</tbody>
</table>

LIAISON WITH OTHERS

Liaison with others 1.31

(1) The Contractor shall make all necessary arrangements with and obtain the necessary approvals from Government departments, utility undertakings and other duly constituted authorities for carrying out the Works.

(2) The Contractor shall maintain close liaison with other contractors employed by the Employer, and utility undertakings or other authorities who are carrying out works on or adjacent to the Site. The Contractor shall ensure as far as possible that the progress of the Works is not adversely affected by the activities of such other contractors.

SITE CLEANLINESS

Site cleanliness 1.32

(1) The Site shall be maintained in a clean and tidy condition. Materials, including materials required for Temporary Works, shall be stored in an orderly manner. The measures to be taken shall include but not limited to the following:
(a) Promptly remove all debris and litter on the site including those dumped into the site from outside by the public.

(b) Promptly remove debris and litter not within the site if the debris and litter are in connection with the Works or disposal of by the persons working on the site.

(c) Keep traffic cones, temporary traffic lights and signs clean, secure and in an orderly manner and refurbish, repaint and/or repair hoardings and/or steel barriers half yearly.

(d) Keep passageways clear and free of greasy dirt, waste and timber.

(2) The Contractor shall assign a designated person, with adequate knowledge, experience and authority, for the overall co-ordination, monitoring and overseeing of the performance of the site on cleanliness and control of mosquito breeding. Thereafter, the Contractor shall notify the Engineer of the name and contact telephone number of the assigned person and any subsequent change.

Prevention of mosquito breeding

1.33

(1) Measures shall be taken to prevent mosquito breeding on the Site. The measures to be taken shall include the following:

(a) Empty cans, oil drums, packings and other receptacles that may retain water shall be deposited at a central collection point and those not required for future use shall be removed from the Site regularly.

(b) Standing water shall be treated at least once every week with an oil which will prevent mosquito breeding.

(c) Construction plant and other items on the Site which may retain water shall be stored, covered or treated in such a manner that water will not be retained.

(d) Properly cover all water storage tanks, remove unnecessary stagnant water and disused containers, or use non-hazardous larvicide to prevent mosquito breeding as the last resort. The Contractor shall submit the characteristics, mixing formulation and method of application of the proposed larvicide to the Engineer for approval before its use; and

(e) Cut bamboo poles for scaffolding as near to the nodes of the poles as possible.

(2) Posters in both English and Chinese drawing attention to the dangers of permitting mosquito breeding shall be obtained from the Government of the HKSAR and displayed prominently on the Site.

Prevention of dust

1.34

Works shall be carried out in such a manner that avoidable dust is not generated. Measures to be adopted shall include but not be limited to those specified under Clause 25.15.
MATERIALS AND EQUIPMENT

Materials and equipment provided by the Employer

1.35 (1) Materials and equipment which are to be provided by the Employer will be as stated in the Contract.

(2) Materials and equipment provided by the Employer shall be collected by the Contractor from the locations stated in the Contract and delivered by the Contractor to the Site. The Contractor shall inspect the materials and equipment before taking receipt and shall immediately inform the Engineer of any shortage or damage.

(3) Materials or equipment provided by the Employer which are damaged after collection shall be repaired by the Contractor and submitted to the Engineer for approval. Materials or equipment, which are lost or which in the opinion of the Engineer are not capable of being or have not been repaired satisfactorily, shall be replaced by the Contractor.

(4) Crates and containers for materials or equipment provided by the Employer shall be disposed of by the Contractor.

(5) Equipment and materials provided by the Employer which are surplus to the requirements of the Works shall be returned to the locations stated in the Contract.

(6) The Contractor shall protect and maintain equipment provided by the Employer while it is on the Site and shall provide operatives, fuel and other consumables required to operate the equipment.

Materials

1.36 (1) Materials for inclusion in the permanent works shall be new or other material as stated in the Contract or approved by the Engineer.

(2) Certificates of tests by manufacturers that are submitted to the Engineer shall relate to the material delivered to the Site. Certified true copies of certificates may be submitted if the original certificates cannot be obtained from the manufacturer. A letter from the supplier stating that the certificates relate to the material delivered to the Site shall be submitted with the certificates.

(3) Samples of materials submitted to the Engineer for information or approval shall be kept on the Site and shall not be returned to the Contractor or used in the permanent works unless permitted by the Engineer.

TESTING

Quality assurance schemes

1.37 Tests stated in the Contract may be omitted or reduced in number as agreed by the Engineer if materials or articles delivered to the Site:

(a) Bear the stamp of the registered certification trade mark of the BS Institution, known as the BS Kitemark, or

(b) Are covered by a manufacturer's quality assurance scheme stated in the Contract or approved by the Engineer.
1.20 Batches, samples and specimens

1.38 (1) A batch of material is a specified quantity of the material, which satisfies specified conditions such that it may be assumed that all of the material in the batch is of consistent type and quality. If one of the specified conditions is that the material is delivered to the Site at the same time, material delivered to the Site over a period not exceeding 7 days may be considered as part of the same batch if in the opinion of the Engineer there is sufficient evidence that the other specified conditions applying to the batch apply to all of the material delivered over the period.

(2) A sample is a specified amount, or a specified number of pieces or units, taken from a batch for testing, such that the result of tests on the sample can be taken as representing the quality of the batch as a whole.

(3) A specimen is a portion of a sample that is to be tested.

1.39 (1) For the purpose of this Clause and Clauses 1.40, 1.42 and 1.49, “the Employer’s laboratories” shall mean:

(a) The laboratories of the Employer such as Public Works Laboratories (PWL), and

(b) The laboratories currently appointed by the Employer.

(2) Samples for laboratory tests or test locations for insitu tests shall be randomly selected by the Engineer. In addition, the Engineer shall be free to select samples he suspects to be defective. The test locations for insitu tests so selected and, if applicable, the area/extent of Works covered by the tests, shall be traceable by means of either a referenced co-ordinates system or a location plan with defined test positions and levels.

(3) Samples shall be representative and of sufficient size to enable all specified tests to be performed.

(4) Samples shall be taken on Site under close supervision of the Engineer or by the Employer’s laboratories having no direct commercial relationship with the Contractor or material supplier, and shall be clearly, indelibly and individually marked for identification.

(5) Once selected and taken, samples stored on Site before delivery to the place of testing shall remain in the charge of the Engineer or the Employer’s laboratories, who/which shall be given adequate facilities (including sample store room) to keep samples securely under lock and key inaccessible to unauthorised persons at all times.

(a) Samples shall be protected, handled and stored in such a manner that they are not damaged nor contaminated such that the properties of the sample do not change. The method of storage shall comply with the requirements of the relevant test methods.

(b) Where insitu concreting works are to be carried out, the Contractor shall, at the discretion of the Engineer, provide sufficient number of steel container rooms (or the like) and curing tanks for storage and curing test cubes to the satisfaction of the Engineer in accordance with Clause 1.49(4).
(6) Samples shall be collected and delivered by the Contractor under close supervision of the Engineer or by the Employer’s laboratories to the specified place of testing. During transportation from Site to the specified place of testing, all samples shall be securely locked in containers or suitably modified vehicle compartments unless otherwise approved by the Engineer, with keys kept by the Engineer or the Employer’s laboratories.

(7) The transfer of samples from one place/person to another shall be clearly documented and checked. The person receiving the samples shall acknowledge the receipt and confirm the identification of the samples. A record showing:

(a) When, where and by whom the samples are taken, and

(b) Persons who have handled the samples before and during delivery to the place of testing,

shall be prepared and maintained by the Engineer (with assistance of the Employer’s laboratories when necessary) so that the samples delivered from Site to the specified place of testing are traceable.

(8) For those tests where supervisory attendance is essential for providing guidance on Site or for obtaining test data, details of such supervisory site staff present shall be recorded in relevant data sheets and/or sample submission forms to enhance data integrity.

(9) For the purpose of stock control to preclude the swapping of materials under test and where applicable the unauthorised use of materials before receipt of test results, the Contractor shall:

(a) Clearly identify all batches of materials arriving on the Site (the identification marks so designed shall contain information which can reveal the identity of the batch for each type of material such as the Contract number, type of material, batch number and other information as required by the Engineer);

(b) Keep stockpiles and stock items from which samples have been taken pending test results separated from other materials by means of labels denoting “Stock under Test” or similar agreed by the Engineer;

(c) Establish and maintain a record system showing identification marks, testing status of all materials (under test or approved for use or rejected or re-test or omitted for testing, etc.), key dates (e.g. date of testing) and locations of storage; and

(d) In connection with the above, submit a proposal for a stock management system on Site peculiar to the Contract to prevent unauthorised or uncontrolled use of materials for approval by the Engineer at the commencement of the Contract and subsequent supervision by the Engineer.

(10) Samples on which non-destructive tests have been carried out shall be collected from the place of testing after testing and delivered to the Site or other location instructed by the Engineer.
(11) Samples which have been tested may be incorporated in the permanent works provided that:

(a) The sample complies with the specified requirements,

(b) The sample is not damaged, and

(c) Such use as permitted under Clause 1.36(3).

(12) Additional samples shall be provided for testing if in the opinion of the Engineer:

(a) Material previously tested no longer complies with the specified requirements, or

(b) Material has been handled or stored in such a manner that it is no longer represented by previously tested samples.

Testing 1.40

(1) Unless otherwise stated in the Contract, insitu tests and laboratory tests shall be carried out by the Employer’s laboratories if the aforesaid tests can be undertaken by the Employer’s laboratories. Testing shall not be carried out in other laboratories unless permitted by the Engineer. If testing is permitted to be carried out by the Contractor:

(a) Independent laboratories with no affiliation as a legal entity to the Contractor or its sub-contractors shall be used,

(b) Laboratories accredited by HOKLAS for the relevant tests shall be used, if available, in which case results shall be issued on HOKLAS endorsed test reports,

(c) Particulars of the laboratory proposed by the Contractor shall be submitted to the Engineer for approval, and

(d) Tests shall be adequately supervised by the Engineer.

(2) The Contractor shall be entitled to attend testing associated with the Works that is carried out in the Employer's laboratories, and to inspect relevant records.

(3) Unless otherwise stated in the Contract, equipment, apparatus and materials for insitu tests and laboratory tests carried out by the Contractor shall be provided by the Contractor. The equipment and apparatus shall be maintained by the Contractor and shall be calibrated before testing starts and at regular intervals agreed by the Engineer. Calibration requirements and source of calibration applicable to all laboratory equipment shall follow those recommended in the HOKLAS Supplementary Criteria No. 2 “All Test Categories - Equipment Calibration”. The equipment, apparatus and materials for insitu tests shall be removed by the Contractor as soon as practicable after testing is complete.

(4) Workability tests of fresh concrete shall be carried out by skilled personnel of the Contractor.

Compliance of a batch 1.41

(1) Unless otherwise stated in the Contract, the results of tests on samples or specimens shall be considered as representing the whole of the batch from which the sample was taken.
(2) A batch shall be considered as complying with the specified requirements for the material if the results of specified tests for specified properties comply with the specified requirements for the properties.

(3) If additional tests are permitted and separate compliance criteria for the additional tests are not stated in the Contract, the Engineer shall determine if the batch complies with the specified requirements for the material on the basis of the results of all tests, including the additional tests, for every property.

Raw records of tests and test reports

1.42

(1) Raw records of insitu tests and laboratory compliance tests carried out by the Contractor (excluding the laboratories engaged by the Contractor) shall be submitted to the Engineer immediately after the tests, or at such other time stated in the Contract, with a copy of the whole set of records kept by the Contractor on the Site.

(2) For all insitu tests and laboratory compliance tests, a test report shall be submitted to the Engineer in sealed envelope within 7 days, or such other time stated in the Contract, after completion of each test. The report shall contain the following details:

(a) Material or part of the work tested,
(b) Location and area/extent of the batch from which the samples were taken or location and area/extent of the part of the work,
(c) Place of testing,
(d) Date and time of each test,
(e) Weather conditions in the case of insitu tests,
(f) Technical personnel supervising or carrying out the tests,
(g) Size and description of samples and specimens,
(h) Method of sampling,
(i) Properties tested,
(j) Method of testing,
(k) Readings and measurements taken during the tests,
(l) Test results, including any calculations and graphs, and
(m) Other details stated in the Contract.

(3) All test reports compiled by the laboratories (which refer to the Employer’s laboratories and those engaged by the Contractor) shall be delivered directly to the Engineer in a sealed envelope without routing through the Contractor.

(4) Copies of test records carried out through the Employer’s laboratories will be given to the Contractor on request.
WORKMANSHIP AND TOLERANCES

**Workmanship** 1.43 Workmanship shall comply with best trade practice and with relevant British Standard.

**Tolerances** 1.44

(1) Tolerances stated in the Contract shall be measured perpendicular to the specified lines unless otherwise stated in the Contract.

(2) If adjacent parts of the Works are subject to different dimensional tolerances then the most critical tolerance shall apply to all such works that relate to each other in respect of dimension, line and level.

SITE ESTABLISHMENT

**Use of the Site** 1.45

(1) The Site shall not be used by the Contractor for any purpose other than for executing the Works or carrying out other works associated with the Works and approved by the Engineer.

(2) Concrete batching and mixing plant erected on the Site shall not be used to provide concrete for work outside the Site.

(3) Bituminous materials batching and mixing plant erected on the Site shall not be used to provide bituminous materials for works outside the Site.

(4) Rock crushing plant shall not be erected on the Site unless stated in the Contract.

(5) The location and size of stockpiles of materials, including excavated material, within the Site shall be as agreed by the Engineer. Stockpiles shall be maintained in a stable condition.

(6) Entry to and exit from the Site shall be only gained at the locations stated in the Contract or agreed by the Engineer.

**Submission of particulars** 1.46

(1) The following particulars shall be submitted to the Engineer for approval not more than 14 days of the commencement of the Works:

   (a) Drawings showing the layout within the Site of the Engineer's and Contractor's accommodation, project signboards, access roads and major facilities required early in the Contract,

   (b) Drawings showing the layout and the construction details of the Engineer's accommodation, and

   (c) Drawings showing the details to be included on project signboards.

(2) Drawings showing the location of stores, storage areas, concrete and bituminous materials batching and mixing plants, rock crushing plants and other major facilities not required early in the Contract shall be submitted to the Engineer for approval as early as possible, but in any case not later than 28 days before such facilities are constructed on the Site.
Survey of the Site 1.47 A survey of the Site to establish the precise boundaries of the Site and the levels within the Site will be carried out by the Engineer after site clearance, and before other works start in each area to be surveyed. The Contractor shall carry out the survey jointly with the Engineer and agree the result as soon as practicable after completion of site clearance, before commencing other works in the area surveyed.

Fences and signs on the Site 1.48 (1) Hoardings, fences, gates and signs on the Site shall be maintained in a clean, presentable, stable and secure condition. Logos, pictures and text shall be legible and not visually obstructed at all times.

(2) Project signboards stated in the Contract shall be erected not more than 4 weeks, or such other period agreed by the Engineer, after the date for commencement of the Works. Other advertising signs shall not be erected on the Site unless permitted by the Engineer.

(3) The Engineer’s permission shall be obtained before hoardings, fences, gates or signs are removed. Hoardings, fences, gates and signs that are to be left in position after completion of the Works shall be repaired and repainted as instructed by the Engineer.

(4) All components of site hoardings and signboards shall be metallic and not be made of timber. Bolts and nuts shall be used to join the panels of hoardings and signboards unless otherwise approved by the Engineer.

The Engineer's Site accommodation 1.49 (1) For new accommodation to be erected, preference shall be given to the used prefabricated units that are in good working and serviceable conditions. The accommodation to be provided on the Site for the Engineer shall be ready for occupation, including connection of all utilities, not more than 8 weeks after the date of approval by the Engineer of the proposed location, layout, construction details and measures against all foreseeable hazards such as flooding, landslides, lightning, etc.

(2) The accommodation shall be maintained in a clean, stable and secure condition and shall be cleaned at least daily. The services of a full-time attendant shall be provided for the Engineer.

(3) Equipment provided for the use of the Engineer or persons authorised by the Engineer shall be maintained in a clean and serviceable condition and all consumables shall be replenished when required. Equipment shall, wherever practicable, have Grade 1 Energy Efficiency Labels, or Energy Labels for equipment operated only under the “Recognition Type” labelling system, under the Hong Kong Energy Efficiency Labelling Scheme. They shall include features to facilitate the minimization of waste and consumables. Office equipment must be able to handle use of paper on both sides. Consumables shall be made from recycled material and shall be recyclable wherever practicable. Measuring and testing equipment shall be calibrated before it is used and at regular intervals agreed by the Engineer. Calibration requirements as well as source of calibration applicable to all laboratory equipment shall follow those recommended in the HOKLAS Supplementary Criteria No. 2 “All Test Categories - Equipment Calibration”. Survey equipment shall be maintained by the service agent and shall be calibrated by an approved laboratory at regular intervals agreed by the Engineer. Equivalent replacements shall be provided for equipment that is out of service.
(4) Where insitu concreting works are to be carried out, steel container rooms and curing tanks shall be provided on the Site, at the discretion of the Engineer, according to the requirements stated in Appendix 1.2 and Appendix 1.3 respectively. In this connection, concreting works shall not commence until curing tanks and container rooms (or the like) are completed and accepted by the Engineer or unless otherwise approved by the Engineer. Where directed by the Engineer, Employer’s laboratories shall be given sole access and use of the steel container rooms and curing tanks together with all the equipment provided under the Contract.

(5) The Engineer’s permission shall be obtained before accommodation or equipment is removed. Portable accommodation shall be moved at the times instructed by the Engineer. Accommodation or equipment which is to be left in position or become the property of the Employer after completion of the Works shall be repaired, repainted and serviced as instructed by the Engineer.

### Table: The Contractor's Site accommodation

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
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<tbody>
<tr>
<td>1.50</td>
<td>The Contractor's offices, sheds, stores, mess rooms, latrines and other accommodation on the Site shall be maintained in a clean, stable and secure condition. Living accommodation shall not be provided on the Site unless stated in the Contract or approved by the Engineer.</td>
</tr>
</tbody>
</table>

### Table: Site utilities and access

<table>
<thead>
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<th>Item</th>
<th>Details</th>
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</table>
| 1.51 | **(1)** Temporary water, electricity, telephone, sewerage and drainage facilities shall be provided for the Engineer's accommodation and for the Contractor's use in carrying out the Works. The Contractor shall make all arrangements with and obtain the necessary approvals from the relevant authorities for the facilities.  

**(2)** Access roads and parking areas shall be provided within the Site as required and shall be maintained in a clean, passable and stable condition with regular suppression of dust as required in Section 25. |

### Table: Transport for the Engineer

<table>
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<th>Item</th>
<th>Details</th>
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| 1.52 | **(1)** A new motor vehicle as transport for the Engineer will not always be required. However, where a used motor vehicle will suffice, it shall not be more than 2 years old when first brought to Site. Transport for the Engineer shall be provided from the date of commencement of the Works unless otherwise permitted or instructed by the Engineer.  

**(2)** The transport shall be for the exclusive use of the Engineer in connection with supervision of Works and persons authorised by the Engineer and shall be available at all times during normal working hours and at other times when the Contractor is working or when instructed by the Engineer. The transport shall not be used by the Contractor or other persons who are not authorised by the Engineer.  

**(3)** The transport shall be maintained in a clean and serviceable condition and shall be serviced regularly. Fuel, oil and other consumables, taxes, licenses, insurances, toll charges and parking and mooring fees shall be provided by the Contractor. The engines of land transport shall be propelled by petrol, liquefied petroleum gas (LPG), electricity, hybrid of petrol-electricity, or any other non-fossil fuels as approved by the Engineer. Land transport shall be covered by fully comprehensive insurance, which includes passenger liability and which allows the vehicle to be driven by any driver.  

**(4)** A competent English-speaking driver shall be appointed and shall be available to drive transport when required by the Engineer.
(5) Marine transport shall be equipped and manned in accordance with the statutory requirements of the Marine Department and licensed under the Merchant Shipping (Launches and Ferry Vessels) Regulations Chapter 281. A qualified English-speaking coxswain shall be appointed and shall be available when the marine transport is required by the Engineer.

(6) Records of journeys shall be kept in logbooks provided by the Engineer. Records shall include details of the times and purpose of journeys with appropriate odometer readings and distances travelled. The person using the transport or authorising the journey shall sign against the logbook entries. Logbooks shall be presented for inspection when required by the Engineer and all completed logbooks shall be handed over to the Engineer.

(7) Equivalent transport shall be provided when transport is unavailable for any reason.

(8) The transport shall be provided until the end of the Maintenance Period or such earlier date instructed by the Engineer.

**Clearance of the Site**

1.53 Temporary Works that are not to remain on the Site after completion of the Works shall be removed on completion of the Works or at other times instructed by the Engineer. The Site shall be cleared and reinstated to the lines and levels and to the condition existing before the Works started except as otherwise stated in the Contract.

**MEETINGS**

1.54 The Contractor's agent shall attend, and shall arrange for the representatives of Sub-contractors, Government departments, transport companies, utility undertakings and other Contractors to attend, meetings when required by the Engineer. The Contractor shall inform the Engineer in 48 hours (or such a shorter period as agreed by the Engineer) before conducting meetings with Government departments, transport companies, utility undertakings and/or other Contractors and shall give the Engineer an opportunity to attend such meetings.

**PHOTOGRAPHS**

1.55 Colour photographs, including underwater photographs, showing the progress of the Works and the quality of the materials and workmanship shall be taken at the times and at locations instructed by the Engineer. Photographs shall be captioned with the time, date and location. Selected prints shall be authenticated by the Contractor and the Engineer by signing the back of the prints and the following shall be provided for the Engineer:

(a) A negative of each photograph,

(b) One 3R print of each photograph,

(c) Albums to store the photographs, and

(d) Framed 8R prints of photographs selected by the Engineer.
APPENDIX 1.1

STANDARDS

1.1.1 BRITISH STANDARDS

1. BS4
   BS 4: Part 1: 1980
   Structural steel sections
   Specification for hot-rolled sections

2. BS 21: 1985
   Specification for pipe threads for tubes and fittings
   where pressure - tight joints are made on the threads
   (metric dimensions)

   Specification for carbon steel forgings above 150 mm
   ruling section

   Specification for vitrified clay pipes, fittings, also
   flexible mechanical joints for use solely with surface
   water pipes and fittings

5. BS 144: 1990
   Wood preservation using coal tar creosotes

6. BS 373: 1957(1986)
   Methods of testing small clear specimens of timber

7. BS 381C: 1996
   Specification for colours for identification, coding and
   special purposes

8. BS 410: 1986
   Specification for test sieves

9. BS 416: 1990
   Discharge and ventilating pipes and fittings, sand-cast or
   spun in cast iron

    Specification for galvanized low carbon steel cisterns,
    cistern lids, tanks and cylinders - metric units

11. BS 427: 1990
    Method for Vickers hardness test and for verification of
    Vickers hardness testing machines

12. BS 434: 1984
    Bitumen road emulsions (anionic and cationic)
    BS 434: Part 1: 1984
    Specification for bitumen road emulsions
    BS 434: Part 2: 1984
    Code of practice for use of bitumen road emulsions

    Specification for the use of structural steel in building -
    metric units

14. BS 534: 1990
    Specification for steel pipes, joints and specials for
    water and sewage

15. BS 544: 1969
    Specification for linseed oil putty for use in wooden
    frames

17. BS 743: 1970 Specification for materials for damp-proof courses


19. BS 812 Testing aggregates
   BS 812: Part 1: 1975 Methods for determination of particle size and shape
   BS 812: Part 2: 1975 Methods for determination of physical properties
   BS 812: Part 4: 1976 Chemical properties
   BS 812: Part 101: 1984 Guide to sampling and testing aggregates
   BS 812: Part 102: 1989 Methods for sampling
   BS 812: Part 103 Methods for determination of particle size distribution
   BS 812: Section 103.1: 1985 Sieve tests
   BS 812: Section 103.2: 1989 Sedimentation test
   BS 812: Part 105 Methods for determination of particle shape
   BS 812: Section 105.1: 1989 Flakiness index
   BS 812: Section 105.2: 1990 Elongation index of coarse aggregate
   BS 812: Part 110: 1990 Methods for determination of aggregate crushing value (ACV)
   BS 812: Part 112: 1990 Method for determination of aggregate impact value (AIV)
   BS 812: Part 113: 1990 Method for determination of aggregate abrasion value (AAV)
   BS 812: Part 118: 1988 Method for determination of sulphate content
   BS 812: Part 121: 1989 Method for determination of soundness


21. BS 873 Road traffic signs and internally illuminated bollards
    BS 873: Part 1: 1983 Road traffic signs and internally illuminated bollards. Methods of test

22. BS 882: 1992 Specification for aggregates from natural sources for concrete

23. BS 890:1995 Specification for building limes
24. BS 903
   Physical testing of rubber
   BS 903: Part A2: 1989 Determination of tensile stress-strain properties
   BS 903: Part A3: 1982 Determination of tear strength (trouser, angle and crescent test pieces)
   BS 903: Part A4: 1990 Determination of compression stress-strain properties
   BS 903: Part A5: 1974 Determination of tension set
   BS 903: Part A6: 1969 Determination of compression set after constant strain
   BS 903: Part A9: 1988 Determination of abrasion resistance
   BS 903: Part A16: 1987 Determination of the effect of liquids
   BS 903: Part A19: 1986 Heat resistance and accelerated ageing tests
   BS 903: Part A26: 1969 Determination of hardness
   BS 903: Part A43: 1990 Method for determination of resistance to ozone cracking (static strain test)
   BS 903: Part C2: 1982 Determination of volume resistivity
25. BS 952
   Glass for glazing
   BS 952: Part 1: 1978 Classification
   BS 952: Part 2: 1980 Terminology for work on glass
26. BS 970: Part 1: 1996 General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels
27. BS 1004: 1972(1985) Specification for zinc alloys for die casting and zinc alloy die casting
28. BS 1006: 1990 Methods of test for colour fastness of textiles and leather
29. BS 1010: Part 2: 1973 Draw-off taps and above-ground stopvalves
33. BS 1155: 1986
   Specification for natural rubber compounds for extrusion

34. BS 1161: 1977(1984)
   Specification for aluminium alloy sections for structural purposes

35. BS 1181: 1989
   Specification for clay flue linings and flue terminals

36. BS 1191
   Specification for gypsum building plasters
   Excluding premixed lightweight plasters
   Premixed lightweight plasters

37. BS 1199 and 1200: 1976
   Specification for building sands from natural sources

38. BS 1203: 1979
   Specification for synthetic resin adhesives (phenolic and aminoplast) for plywood

39. BS 1204
   Synthetic resin adhesives (phenolic and aminoplast) for wood
   Specification for gap-filling adhesives

40. BS 1212
   Float operated valves
   BS 1212: Part 1: 1990
   Specification for piston type float operated valves (copper alloy body) (excluding floats)
   BS 1212: Part 2: 1990
   Specification for diaphragm type float operated valves (copper alloy body) (excluding floats)
   BS 1212: Part 3: 1990
   Specification for diaphragm type float operated valves (plastic bodied) for cold water services only (excluding floats)

41. BS 1247: 1990
   Manhole steps

42. BS 1336: 1971(1988)
   Specification for knotting

43. BS 1369
   Steel lathing for internal plastering and external rendering
   BS 1369: Part 1: 1987
   Specification for expanded metal and ribbed lathing

44. BS 1377: 1990 (as modified in accordance with Geospec 3, entitled “Model Specification for Soil Testing”, except for Clause 7.39(1) where the year of edition remains to be 1975)
   Methods of test for soils for civil engineering purposes

45. BS 1387: 1985(1990)
   Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads
<table>
<thead>
<tr>
<th>No.</th>
<th>BS</th>
<th>Description</th>
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<tbody>
<tr>
<td>46.</td>
<td>BS 1400: 1985</td>
<td>Specification for copper alloy ingots and copper alloy and high conductivity copper castings</td>
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<tr>
<td>48.</td>
<td>BS 1452: 1990</td>
<td>Specification for flake graphite cast iron</td>
</tr>
<tr>
<td>49.</td>
<td>BS 1473: 1972</td>
<td>Specification for wrought aluminium and aluminium alloys for general engineering purposes - rivet, bolt and screw stock</td>
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<tr>
<td>50.</td>
<td>BS 1494: Part 2: 1967</td>
<td>Sundry fixings</td>
</tr>
<tr>
<td>51.</td>
<td>BS 1610</td>
<td>Materials testing machines and force verification equipment</td>
</tr>
<tr>
<td></td>
<td>BS 1610: Part 1: 1992</td>
<td>Specification for the grading of the forces applied by materials testing machines when used in the compression mode</td>
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<td>52.</td>
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108. BS 4211: 1987
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110. BS 4232: 1967
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130. BS 4568 Specification for steel conduit and fittings with metric threads of ISO form electrical installations

BS 4568: Part 1: 1970 Steel conduit, bends and couplers


131. BS 4570: 1985 Specification for fusion welding of steel castings


133. BS 4604 Specification for the use of high strength friction grip bolts in structural steelwork.


137. BS 4652: 1971(1979) Specification for metallic zinc-rich priming paint (organic media)

138. BS 4660: 2000 Specification for thermoplastics ancillary fittings of nominal sizes 110 and 160 for below ground gravity drainage and sewerage


140. BS 4677: 1984 Specification for arc welding of austenitic stainless steel pipework for carrying fluids

141. BS 4682: Part 1: 1971 Determination of extension under mechanical action


144. BS 4772: 1988 Ductile piping and fittings

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165. BS 5268: Part 2: 1988  
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166. BS 5284: 1976  
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168. BS 5325: 2001  
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169. BS 5385-1:1995  
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170. BS 5385: Part 2: 1991  
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172. BS 5400  
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174. BS 5492:1990  
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175. BS 5493: 1977  
Code of practice for protective coating of iron and steel structures against corrosion

176. BS 5572: 1994  
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177. BS 5573: 1978  
Code of practice for safety precautions in the construction of large diameter boreholes for piling and other purposes

178. BS 5589: 1989  
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179. BS 5756: 1980(1985)  
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197. BS 6362: 1990 Specification for stainless steel tubes suitable for screwing in accordance with BS 21 ‘Pipe threads for tubes and fittings where pressure-tight joints are made on the threads’

198. BS 6405: 1984 Specification for non-calibrated short link steel chain (Grade 30) for general engineering purposes: class 1 and 2

199. BS 6431 Ceramic floor and wall tiles

BS 6431: Part 1: 1983 Specification for classification and marking, including definitions and characteristics

BS 6431: Part 2: 1984 Specification for extruded ceramic tiles with a low water absorption (E ≤ 3%). Group A1

BS 6431: Part 3 Extruded ceramic tiles with a water absorption of 3% < E ≤ 6%. Group A11a

BS 6431: Part 3: Section 3.1: 1986 Specification for general products

BS 6431: Part 3: Section 3.2: 1986 Specification for products (terre cuite, cotto, baldosin catalan)

BS 6431: Part 4 Extruded ceramic tiles with a water absorption of 6% < E ≤ 10%. Group A11b

BS 6431: Part 4: Section 4.1: 1986 Specification for general products

BS 6431: Part 4: Section 4.2: 1986 Specification for specific products (terre cuite, cotto, baldosin catalan)


200. BS 6443: 1984 Method for penetrant flaw detection

201. BS 6463 Quicklime, hydrated lime and natural calcium carbonate

   BS 6463: Part 1: 1984 Methods of sampling
   BS 6463: Part 2: 1984 Methods of chemical analysis
   BS 6463: Part 4: 1987 Methods of test for physical properties of hydrated lime and lime putty

202. BS 6510: 1984 Specification for steel windows, sills, window boards and doors

203. BS 6558: 1985 Optical fibres and cables

204. BS 6566 Plywood

205. BS 6577: 1985 Specification for mastic asphalt for building (natural rock asphalt aggregate)

206. BS 6657: 1986 Guide for prevention of inadvertent initiation of electro-explosive devices by radio-frequency radiation

207. BS 6681: 1986 Specification for malleable cast iron

208. BS 6717: 2001 Precast, unreinforced concrete paving blocks. Requirements and test methods

209. BS 6700: 1987 Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their cartilages

210. BS 6744: 2001 Stainless steel bars for the reinforcement of and use in concrete. Requirements and test methods


212. BS 6920 Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water

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BS 6920: Section 2.3: 1990 Appearance of water
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BS 6920: Section 2.5: 1990 The extraction of substances that may be of concern to public health
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BS 6920: Part 3: 1990 High temperature tests

213. BS 6925: 1988 Specification for mastic asphalt for building and civil engineering (limestone aggregate)
214. BS 6949: 1988 Specification for bitumen-based coatings for cold application, excluding use in contact with potable water
215. BS 7263: 1990 Precast concrete flags, kerbs, channels, edgings and quadrants
    BS 7263: Part 1:1990 Specification
216. BS 8000:1989 Workmanship on Building Sites
217. BS 8004: 1986 Code of practice for foundations
219. CP 144 Roof coverings
220. CP 144: Part 4: 1970 Mastic asphalt. Metric units
### 1.1.2 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS

1. ASTM C 117-95  
   Test method for materials finer than 75-µm sieve in mineral aggregates by washing

2. ASTM C 127-88  
   Test method for specific gravity and absorption of coarse aggregate

3. ASTM C 128-88  
   Test method for specific gravity and absorption of fine aggregate

   Test method for resistance to degradation of small-size coarse aggregate by abrasion and impact in the Los Angeles Machine

5. ASTM C 136-96a  
   Method for sieve analysis of fine and coarse aggregates

6. ASTM C 188-84  
   Test method for density of hydraulic cement

7. ASTM C 939-87  
   Test method of flow of grout for preplaced-aggregate concrete

8. ASTM C940-98a  
   Standard test method for expansion and bleeding of freshly mixed grouts for preplaced-aggregate concrete in the laboratory

9. ASTM C 1028-89  
   Standard test method for determining the static coefficient of friction of ceramic tile and other like surfaces by the horizontal dynamometer pull-meter method

10. ASTM D 5-86  
    Test method for penetration of bituminous materials

11. ASTM D 113-86  
    Test method for ductility of bituminous materials

12. ASTM D 140-88  
    Method for sampling bituminous materials

13. ASTM D 242-85  
    Specification for mineral filler for bituminous paving mixtures

14. ASTM D 546-88  
    Method for sieve analysis of mineral filler for road and paving materials

15. ASTM D790-2000  
    Measurement/Properties of internal lining for repair of pipelines and culverts: Flexural properties

16. ASTM D 854-83  
    Test method for specific gravity of soils

17. ASTM D 946-82  
    Specification for penetration-graded asphalt cement for use in pavement construction

18. ASTM D 979-87  
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<td>ASTM D 1754-87</td>
<td>Test method for effect of heat and air on asphaltic materials (thin-film over test)</td>
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<tr>
<td>22.</td>
<td>ASTM D 2000-86</td>
<td>Classification system for rubber products in automobile applications</td>
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<td>24.</td>
<td>ASTM D 2041-95</td>
<td>Test method for theoretical maximum specific gravity of bituminous paving mixtures</td>
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<td>26.</td>
<td>ASTM D 2171-88</td>
<td>Test method for viscosity of asphalts by vacuum capillary</td>
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<td>27.</td>
<td>ASTM D 2172-95</td>
<td>Test method for quantitative extraction of bitumen from bituminous paving mixtures</td>
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<td>28.</td>
<td>ASTM D 2240</td>
<td>Standard test method for rubber property - durometer hardness</td>
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<td>29.</td>
<td>ASTM D 2486-96</td>
<td>Standard test method for scrub resistance of wall paints</td>
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<td>30.</td>
<td>ASTM D 2726-96a</td>
<td>Test method for bulk specific gravity of compacted bituminous mixtures using saturated surface-dry specimens</td>
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<td>31.</td>
<td>ASTM D 3203-94</td>
<td>Test method for percent air voids in compacted dense and open bituminous paving mixtures</td>
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<td>32.</td>
<td>ASTM D 3289-85</td>
<td>Test method for specific gravity or density of semi-solid and solid bituminous materials by nickel crucible</td>
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<td>33.</td>
<td>ASTM D 3359</td>
<td>Standard test methods for measuring adhesion by tape test</td>
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<td>34.</td>
<td>ASTM D 4329</td>
<td>Standard practice for fluorescent UV exposure of plastics</td>
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<td>35.</td>
<td>ASTM D 6307-98</td>
<td>Standard test method for asphalt content of hot-mix asphalt by ignition method</td>
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<td>36.</td>
<td>ASTM G 53-88</td>
<td>Practice for operating light and water-exposure apparatus (fluorescent UV-condensation type) for exposure of non-metallic materials</td>
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<td>37.</td>
<td>ASTM D4956-05</td>
<td>Standard Specification for Retroreflective Sheeting for Traffic Control</td>
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</table>
1.1.3  **AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) STANDARD**

AASHTO Designation M252-81  Standard specification for corrugated polyethylene drainage tubing

1.1.4  **AMERICAN WATER WORKS ASSOCIATION (AWWA) STANDARDS/AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)**

1.  AWWA C 203-86  Coal tar enamel protective coatings for steel water pipes
2.  ANSI/AWWA C210-97  Liquid-Epoxy Coating Systems for the Interior and Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
3.  ANSI/AWWA C213-01  Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
4.  ANSI A118.6: 1992  Ceramic tile grouts

1.1.5  **CONSTRUCTION STANDARDS OF THE GOVERNMENT OF THE HKSAR**

CS1: 1990 (Current version)  Testing Concrete
CS2: 1995 (Current version)  Carbon Steel Bars for the Reinforcement of Concrete

1.1.6  **SWEDISH STANDARDS**

SIS 05 59 00  Surface preparation standard for painting steel surfaces

1.1.7  **AMERICAN PUBLIC HEALTH ASSOCIATION (APHA) STANDARDS**

1.1.8 EUROPEAN STANDARDS ADOPTED AS BRITISH STANDARDS (BS EN)

1. BS EN: 196-1: 1995
   Method of testing of Cement – Part 1: Determination of strength

2. BS EN: 196-2: 1995
   Method of testing of Cement – Part 2: Chemical analysis of cement

   BS EN: 196-3: 1995
   Method of testing of Cement – Part 3: Determination of setting time and soundness

   BS EN: 196-6: 1992
   Method of testing of Cement – Part 6: Determination of fineness

   BS EN: 196-7: 1992
   Method of testing of Cement – Part 7: Methods of taking and preparing samples of cement

   BS EN: 196-21: 1992
   Method of testing of Cement – Part 21: Determination of the chloride, carbon dioxide and alkali content of cement

3. BS EN 197-1: 2000
   Cement – Part 1: Composition, specifications and conformity criteria for common cements

4. BS EN 287: Part 1: 1992
   Approval testing of welders for fusion welding Steels

   Building lime: definitions, specification and conformity criteria

   Aluminium and aluminium alloys. Sheet, strip and plate. Technical conditions for inspection and delivery

   BS EN 485: Part 2: 2004
   Aluminium and aluminium alloys. Sheet, strip and plate. Mechanical properties

   BS EN 485: Part 3: 2003
   Aluminium and aluminium alloys. Sheet, strip and plate. Tolerances on dimensions and form for hot-rolled products

   BS EN 485: Part 4: 1994
   Aluminium and aluminium alloys. Sheet, strip and plate. Tolerances on shape and dimensions for cold-rolled products

7. BS EN 545: 2002
   Ductile iron pipes, fittings, accessories and their joints for water pipelines

   Non-destructive testing. Penetrant testing. General principles

9. BS EN 598: 1995
   Ductile iron pipes, fittings, accessories and their joints for sewerage applications

    Aluminium and aluminium alloys. Cold drawn rod/bar and tube. Technical conditions for inspection and delivery
<table>
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<th>Standard Code</th>
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<tr>
<td>BS EN 754: Part 4:1996</td>
<td>Aluminium and aluminium alloys. Cold drawn rod/bar and tube. Square bars, tolerances on dimensions and form</td>
</tr>
<tr>
<td>BS EN 755: Part 5: 1996</td>
<td>Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Rectangular bars, tolerances on dimensions and form</td>
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14. BS EN 1008:2002  Mixing water for concrete. Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete


16. BS EN 1097-2: 1998  Test for mechanical and physical properties of aggregates – Part 2 : Methods for the determination of resistance to fragmentation

17. BS EN 1342: 2001  Sets of natural stone for external paving. Requirements and test methods

18. BS EN 1344:2002  Clay pavers. Requirements and test methods

19. BS EN 1346:1999  Adhesives for tiles. Determination of open time

20. BS EN 1348:1999  Adhesives for tiles. Determination of tensile adhesion strength for cementitious adhesives

21. BS EN 1423:1998  Road marking materials. Drop on materials. Glass beads, antiskid aggregates and mixtures of the two

22. BS EN 1436:1998  Road marking materials. Road marking performance for road users

23. BS EN 1714: 1998  Non-destructive examination of welded joints. Ultrasonic examination of welded joints

24. BS EN 1871:2000  Road marking materials. Physical properties


26. BS EN 10025: 1993: 2004  Hot rolled products of non alloy structural steels


28. BS EN 10088-1:2005  Stainless steels. List of stainless steels

29. BS EN 10137: 1996  Plates and wide flats made of high yield strength structural steels in the quenched and tempered or precipitation hardened conditions
<table>
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<th>No.</th>
<th>Standard Code/Year</th>
<th>Description</th>
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<tr>
<td>30</td>
<td>BS EN 10223: 1998</td>
<td>Steel wire and wire products for fences</td>
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<td>31</td>
<td>BS EN 10244-2: 2001</td>
<td>Steel wire and wire products. Non-ferrous metallic coatings on steel wire. Zinc or zinc alloy coatings</td>
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<td>32</td>
<td>BS EN 10298:2005</td>
<td>Steel tubes and fittings for onshore and offshore pipelines. Internal lining with cement mortar</td>
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<td>33</td>
<td>BS EN 12004:2001</td>
<td>Adhesives for tiles. Definitions and specifications</td>
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<td>36</td>
<td>BS EN 22063: 1994</td>
<td>Metallic and Other Inorganic Coating-Thermal Spraying-Zinc, Aluminium and Their Alloys (F)</td>
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</table>

### 1.1.9 EUROPEAN STANDARDS (EN) and/or INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO) STANDARDS ADOPTED AS BRITISH STANDARDS (BS EN ISO)

1. BS EN ISO 178: 2003 | Measurement/Properties of internal lining for repair of pipelines and culverts: Flexural properties
2. BS EN ISO 1461: 1999 (Replaces former BS 729) | Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods
5. BS EN ISO 8492: 2004 | Metallic materials tube flattening test


13. BS ISO 14654: 1999 Epoxy-coated steel for the reinforcement of concrete
14. BS ISO 14656:1999
Epoxy powder and sealing material for the coating of steel for the reinforcement of concrete

1.1.10 JAPANESE INDUSTRIAL STANDARDS (JIS)

JIS Z 1902: 2000
Petrolatum tapes for corrosion protection

JIS A 6910 – 1988
Quality tests for multi-layer acrylic paint

1.1.11 INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO) STANDARDS

1. ISO 1183: 1999
Plastics - Methods for determining the density of non-cellular plastics

2. ISO 178: 2001
Plastics - Determination of flexural properties

3. ISO 4591:1992
Plastics - Film and sheeting - Determination of average thickness of a sample, and average thickness and yield of a roll, by gravimetric techniques (gravimetric thickness)

4. ISO 4593:1993
Plastics - Film and sheeting - Determination of thickness by mechanical scanning

5. ISO 9001:2000
Quality management systems - Requirements

1.1.12 WATER INDUSTRY SPECIFICATION, WATER RESEARCH CENTRE

WIS 4-34-04:1995 issue 2
Specification for renovation of gravity sewers by lining with crude-in-place pipes

WIS 4-52-01: 1992
Polymeric anti-corrosion (barrier) coatings

1.1.13 National Water Council, UK

Manual of Sewer Condition Classification, 4th Ed, 2003
Coding system for recording of results
<table>
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<tr>
<th>1.1.14 AUSTRALIAN/NEW ZEALAND STANDARDS (AS/NZS)</th>
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<td>AS/NZS 4456.2:1997</td>
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**APPENDIX 1.2**

**REQUIREMENTS FOR STEEL CONTAINER ROOM**

**General**

1.2.1 As a reference, a standard steel container room of nominal size 6000 mm x 2500 mm x 2350 mm may accommodate up to a maximum of five standard curing tanks (see Appendix 1.3 – Clause 1.3.1(2)).

**Equipment**

1.2.2 Each steel container room shall be equipped with the following:

- (a) A security door-lock.
- (b) Windows with security metal grilles.
- (c) Fluorescent lighting.
- (d) Air-conditioner with heating and cooling facilities that is capable of keeping the room temperature at 25°C ± 5°C.
- (e) Adequate number of power sockets for operating the curing tanks.
- (f) Water supply.
- (g) Drainage outlets for connecting to the drainage valves and overflow system of the curing tanks.
APPENDIX 1.3

REQUIREMENTS FOR CURING TANK

General 1.3.1 (1) The requirements for a curing tank shall be as stated in Appendix A of CS1.

(2) As a reference, a standard curing tank of nominal size 1650 mm x 860 mm x 510 mm has a capacity to accommodate about sixty-four number of 150 mm concrete cubes.

(3) For curing tanks of different non-standard sizes, the number of curing tanks required may be estimated on the basis of the capacity for a standard curing tank of equivalent volume at the discretion of the Engineer, who may require appropriate adjustments in the pump and heater capacities.

(4) Each curing tank shall be accessible for operation and maintenance.

(5) At least one stand-by curing tank shall be provided at all times.

Equipment 1.3.2 Each curing tank shall be constructed of corrosion-resistant material of adequate strength such as galvanized sheet steel to BS EN ISO 1461:1999 for hot-dip galvanized coating or BS 2569 for flame sprayed metal coating, fully welded on all seams and equipped with the following accessories:

(a) A lockable insulated lid (or cover) properly numbered.

(b) A recirculating water pump and a stand-by pump, both of a waterproof type and with capacity not less than 1000 litres per hour, earthed and fitted internally at one end of the tank drawing water through a pipe from the bottom to the diagonally opposite top of the tank at least 25 mm above the water level to stimulate efficient mixing of the water by free falling.

(c) A thermostatically controlled electric immersion heater and a stand-by heater, both with power of not less than 3 kW and connected through a temperature sensor for continual control of the water temperature at 27°C ± 3°C.

(d) A set of three removable lower racks.

(e) A drainage valve and an overflow system.

(f) A steel stand supporting the water tank.

(g) Minimum/maximum thermometers for measuring water temperature.

(h) A switch panel.

Maintenance 1.3.3 Each curing tank shall be cleaned at regular intervals and the water in each tank be changed at least once a month in accordance with CS1 or as directed by the Engineer. In order to ensure adequate circulation of water and to facilitate the removal of test cubes from the curing tank, a gap of at least 15 mm shall be provided between the test cubes and the sides of the tank.