06-00- Earthworks

06-01 Testing of the Formation

a. The developer shall arrange for the formation, as defined at Clause 6-04 and 7-02, to be tested every 20 m by means of a CBR test in accordance with Clause 06-05 a. The CBR testing shall be at the Developer's expense. Copies of the CBR Testing Certificates shall be provided to the Engineer.

06-02 General Excavation

a. Where sub soil has to be removed to reach the approved levels it shall be excavated in a manner that minimises the disturbance to the formation. The formation for the roadworks shall be prepared for the widths shown below:

Residential Roads	full width of the carriageway PLUS 1.0m each side
Industrial Roads	full width of the carriageway PLUS 2.5 m each side

Wherever possible the sub-grade shall be compacted at its natural moisture content by four passes of a smooth-wheeled roller, the roller having a mass per metre width of roll of 4.4 tonnes or greater.

b. Separation membranes shall be provided when required by the Engineer, before filling on sub-grades that are wet or of low bearing strength. The membrane / geotextile will be positioned as directed by the Engineer and shall be below the level of all services ducts etc. to avoid subsequent damage. Any damage to the membrane shall be repaired to the approval of the Engineer.

c. The Developer shall ensure all excavations are kept free from water during the progress of the works and provide permanent land drainage if required to do so by the Engineer.

06-03 General Fill Material

a. All fill materials shall be tested and certified as fit for purpose and approved in writing by the Engineer. This includes clay that is being recycled on the site or imported. It shall be free from contaminants and/or oversized material for example, soft brick, dust, ashes, wood, metal, plaster or other extraneous matter, and organic or inorganic impurities (e.g. sulphur or lime)

b. The use of properly certified recycled 6F5, as defined in SHW Table 6/1 is permitted for use as fill. Any 6F5 found on site to be of poor quality shall be re-tested at the Developer's expense. In these circumstances, subsequent deliveries to site shall be re-tested, at the developer's expense, when requested by the Engineer.

c. On brown field sites, the Developer may be permitted to re-use materials crushed on site subject to the materials being processed in accordance with SHW Clause 10 and complying with the requirements of the relevant fill. It shall not be used without the written approval of the Engineer. Any such material shall be fully tested to ensure it is free of contaminants and complies with the relevant specification clauses for its intended used prior to any material

being included in the works. Re-testing will be required every 200m^3 when requested by the Engineer to ensure continued compliance. Additional testing may be required as a result of adverse good or bad weather conditions. Further information is provided in NYC Specification 07 and MCHW Specification for Highway Works Clause 710.

d. The rising of levels with clay or clay strengthened using lime or cement or both may be permitted subject to the written approval of the Engineer before any such work commences on site. To secure the Engineer's approval details of the testing regime and proposed laboratory, methods of construction and provisions for the supervision of works on site by the developer and the Council will be required. All material and its placement shall comply with the relevant clauses in Series 600 Earthworks of SHW. The material shall be tested at agreed regular intervals at an independent NAMAS or UKAS approved laboratory. Additional on-site CBR testing shall be undertaken in accordance with a schedule agreed in writing by the Engineer. The CBR tests shall be at a maximum spacing of 10 metres. Any lime or cement added shall be undertaken by an approved mechanical method. Manual or excavator type mixing will not be permitted. No clay shall be used or imported to site until all necessary test certificates to prove compliance as a suitable fill material free of contamination have been submitted to the Engineer and approved in writing. Additional testing may be required because of adverse good or bad weather conditions. Any clay excavated from its natural strata and placed elsewhere on site shall be classed as fill.

06-04 Use of Geotextile Membrane as Part of the Construction

a. The membrane/geotextile shall be capable of sustaining a tensile force equal to 2kN/m at 5% axial strain.

b. Where the material is required to be overlapped, the overlap shall be a minimum of 300 mm.

c. The surface of the material on which geotextile is to be placed shall not have protrusions or sharp projection that are likely to damage the geotextile during installation.

d. The method of installation shall ensure that the geotextile is in continuous contact with the surface on which it is to be placed. The geotextile shall not be stretched or bridged over hollows or humps.

e. Operation of construction plant directly on the installed geotextile will not be permitted, and its covering with fill material shall take place immediately after its laying.

06-05 California Bearing Ratio (CBR)

a. Testing the formation layer to determine the CBR shall be done in-situ at formation level. The formation level may be on virgin ground or engineered fill built up to the required level. Testing shall be done by an independent NAMAS or UKAS accredited testing service. Unless otherwise agreed with the Engineer testing shall be undertaken using a 600mm diameter steel plate.

b. Engineered fill shall be tested in layers as the ground is made up. The frequency of testing shall be agreed in writing with the Engineer prior to works commencing. The minimum acceptable CBR value for made ground shall not be less than 5%.

c. The minimum acceptable CBR value on natural ground is 2% where a suitable ground investigation report has demonstrated no problematic ground conditions such as peat and / or clays with shrink swell properties etc.

d. Where CBR results fall below the values indicated in (b.) and (c.) above, additional testing, as directed by the Engineer, shall be undertaken to identify the extent of the poor ground.

e. Where in the opinion of the Engineer CBR testing identifies isolated pockets of poor quality sub-grade the removal of poor quality material may be accepted by the Engineer, this shall be replaced as directed by the Engineer with capping material or clean stone. The additional fill shall be brought up to level in layers no thicker than 225 mm and compacted in accordance with Table 07-07 for the compaction requirements for granular materials.

f. In circumstances where the CBR testing identifies large areas of poor subgrade, specialist interventions will be required. These will need to be supported by relevant design calculations that shall be submitted to and approved in writing by the Engineer prior to works commence. The calculations shall be undertaken by a suitably experienced professional Engineer. Specialist checking by the Engineer shall be charged to the developer. Once the remediation is complete further CBR testing, to the satisfaction of the Engineer, shall be undertaken by an independent NAMAS or UKAS accredited testing service to prove the required strengths have been achieved.

g. It is unlikely that CBRs of less than 0.5% will be acceptable to NYC without specialist interventions. These will need to be supported by relevant design documents that shall be submitted to and approved in writing by the Engineer prior to works commencing. The calculations shall be undertaken by a suitably experience professional Engineer

h. In some circumstances, the Engineer may agree to remediation being undertaken in accordance with Table 06-01 below.

Table 06-01

CBR%	Capping mm depth	75mm clean stone mm depth	Geo-textile
2%>	200	N/A	N/A
1.75%>	300	N/A	N/A
1.5%>	400	N/A	YES
1.25%>	500	N/A	YES
1%>	200	200	YES
0.75%>	200	300	YES
0.5%>	Determined by detailed design	Determined by detailed design	YES in accordance with detailed design