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## **Quality Supervision of Soil Nailing Works**

### **Introduction**

The use of soil nails for upgrading existing slopes and in forming new slopes is becoming very common in Hong Kong. Close supervision and timely design review during construction are essential to ensure the quality of the soil nailing works.

2. A soil nail, when constructed, is buried in the ground, and its built quality is not readily visible. There is a need to put in place reliable procedures for the supervision, testing and certification for acceptance of the soil nailing works during construction to ensure the quality of the works. This practice note promulgates the supervision, testing and certification requirements at various stages of soil nailing works and specifies the criteria for acceptance of the works.

3. Reference may be made to the Particular Specifications and standard drawings for soil nailing works as well as guidance notes and checklists for their supervision that are used by the Civil Engineering and Development Department (CEDD) of the HKSAR Government under the LPM Programme which can be found on the CEDD website <<http://www.cedd.gov.hk/eng/publications/>>. GEO (2003)<sup>#</sup>, which can also be downloaded from the CEDD website, gives guidance on non-destructive testing of soil nail length. These documents may be used as a guide for private development projects.

### **Buildability of Soil Nails**

4. In designing soil nails, the designer should give due consideration to the buildability of the soil nails to ensure that the designs are practical and could be built. For long nails, say with length exceeding 20m, there is a higher chance of encountering loose or permeable ground, or buried stream course, leading to difficulties in construction. Examples include collapses of soil or rock along the drillhole (which may obstruct the insertion of the nail reinforcement assembly), and high grout loss. Grout quality may also be difficult to ensure as the length of nail increases. For cases where long nails are proposed or where the ground or groundwater conditions are likely to be adverse to soil nail construction, the Registered Geotechnical Engineer (RGE) may be required to undertake an assessment of buildability and the effects of soil nail installation on the existing ground and groundwater conditions, based on a site trial, prior to carrying out the soil nailing works. The site trial may be incorporated in and should include the pull-out tests of soil nails where possible. Soil nails for site trials and pull-out tests should be installed and tested prior to the installation of working soil nails.

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<sup>#</sup>GEO (2003). *Non-destructive Tests for Determining the Lengths of Installed Steel Soil Nails*. GEO Report No. 133, Geotechnical Engineering Office, Civil Engineering and Development Department, the Government of the HKSAR, 54p. (This can be downloaded from the CEDD website <[http://www.cedd.gov.hk/eng/publications/geo\\_reports/geo\\_rpt133.htm](http://www.cedd.gov.hk/eng/publications/geo_reports/geo_rpt133.htm)>.)

5. Examples of ground conditions that may present difficulties for soil nail construction include loose fill or colluvium, rockfill, presence of soil pipes, buried stream courses, rock mass with open discontinuities and fractures, alternating zones of soil and rock. The installation of soil nails in areas with groundwater flow will pose particular difficulties. The hole drilled may be more susceptible to collapse than dry ground and the quality of the grout may also be in doubt. Suitable measures, e.g. groundwater drainage, may have to be incorporated to facilitate installation of soil nails.

### **Particular Requirements for Approval of Plans**

6. The RGE is required to include the following particulars in the site formation submission for approval by the Building Authority:

- (i) Details of the site trial, if required, to confirm the buildability of the soil nails, including its locations.
- (ii) Procedure adopted for the pull-out tests.
- (iii) Methodology and details of the proposed non-destructive test (NDT) for verifying the length of installed soil nails, with suitable provisions incorporated to allow the test to be carried out.

### **Quality Supervision Requirements for Soil Nailing Works**

7. The details of the quality supervision requirements for soil nailing works, the minimum qualification and experience required for site supervisors for soil nailing works and the details of non-destructive testing of installed soil nails are provided in the Technical Memorandum for Supervision Plans and the Code of Practice for Site Supervision.

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(Paragraphs 4 & 6 amended to include 'RGE', paragraph 6(iii) revised, original paragraphs 7 to 18 and App A & B deleted, new paragraph 7 added.)

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