BRITISH STANDARD

BS EN 14490:2010

Execution of special geotechnical works — Soil nailing

ICS 93.020

National foreword

This British Standard is the UK implementation of EN 14490:2010. It partially supersedes BS 8006:1995 which is currently being revised in order to remove conflicting material and to include technical updates. In the meantime, where conflict exists between the two standards, the provisions of BS EN 14490 take precedence.

The UK participation in its preparation was entrusted to Technical Committee B/526/4, Strengthened/reinforced soils and other fills.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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Execution of special geotechnical works - Soil nailing

Exécution des travaux géotechniques spéciaux - Clouage

Ausführung von Arbeiten im Spezialtiefbau - Bodenvernagelung

This European Standard was approved by CEN on 25 April 2010.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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Foreword

This document (EN 14490:2010) has been prepared by Technical Committee CEN/TC 288 “Execution of special geotechnical works”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2010, and conflicting national standards shall be withdrawn at the latest by December 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

The remit of CEN/TC 288 is the standardisation of the execution procedures for geotechnical works (including testing and control methods) and of the required material properties. CEN/TC 288/WG 13 has been charged with the preparation of EN 14490 in the subject area of soil nailing.

The document has been prepared to stand alongside EN 1997-1, *Eurocode 7: Geotechnical design.* "Design considerations" of this European Standard deals only with those matters which should be taken into account during the execution stage of soil nailing so that the design of the soil nailing system may be fulfilled. This European Standard, however, provides full coverage of the construction and supervision requirements.

This European Standard has been drafted by a working group comprising delegates from ten countries and the comments of these countries have been taken into account.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

1.1 This European Standard establishes general principles for the execution, testing, supervision and monitoring of soil nailing.

1.2 Soil nailing is a construction technique, used to enhance/maintain the stability of a soil mass by installation of reinforcing elements (soil nails). Typical examples of soil nailing are given in Annex A.

1.3 The scope of soil nailing applications considered in this European Standard includes the installation and testing of soil nails and associated operations, required when stabilising existing and newly cut slopes and faces in soil, existing earth retaining structures, embankments, existing tunnels and the excavated facing of new tunnels in soil.

1.4 Soil nailing may be used to form part of a hybrid construction. This European Standard is relevant only to the soil nailing aspect of such constructions.

1.5 Techniques, such as reinforcement of ground by vertical inclusions (sheet piles, bored or driven piles, or other elements) and stabilisation with rock bolts, prestressed ground anchors or tensions piles are not covered by this European Standard.

1.6 Guidance on practical aspects of soil nailing and aspects on design, durability and testing is given in informative Annexes A, B and C, respectively.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 196-1, *Methods of testing cement — Part 1: determination of strength*

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 206-1, *Concrete — Part 1: Specification performance, production and conformity*

EN 1537, *Execution of special geotechnical work — Ground anchors*

EN 1992-1-1, *Eurocode 2: Design of concrete structures — Part 1-1: General rules and rules for buildings*

EN 1997-1:2004, *Eurocode 7: Geotechnical design — Part 1: General rules*

EN 1997-2:2007, *Eurocode 7 — Geotechnical design — Part 2: Ground investigation and testing*

EN 10025-2, *Hot rolled products of structural steels — Part 2: Technical delivery conditions for non-alloy structural steels*

EN 10079, *Definition of steel products*

EN 10080, *Steel for the reinforcement of concrete — Weldable reinforcing steel — General*

EN 10138 (all parts), *Prestressing steels*

EN 10210 (all parts), *Hot finished structural hollow sections of non-alloy and fine grain steels*

EN 10219 (all parts), *Cold formed welded structural hollow sections of non-alloy and fine grain steels*

EN 10244 (all parts), *Steel wire and wire products — Non-ferrous metallic coatings on steel wire*

EN 10245 (all parts), *Steel wire and wire products — Organic coatings on steel wire*

EN 13251:2000, *Geotextiles and geotextile-related products — Characteristics required for use in earthworks, foundations and retaining structures*

EN 13670, *Execution of concrete structures*

EN 14487-1, *Sprayed concrete — Part 1: Definitions, specifications and conformity*

EN 14488 (all parts), *Testing sprayed concrete*

EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods (ISO 1461:2009)*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
bearing plate
fr: plaque d'appui
de: Kopfplatte
plate connected to the head of the soil nail to transfer a component of load from the facing or directly from the ground surface to the soil nail

3.1.2
design life
fr: durée de service
de: Entwurfslebensdauer
service life in years required by the design

3.1.3
drainage system
fr: système de drainage
de: Dränagesystem
series of drains, drainage layers or other means to control surface and ground water

3.1.4
facing
fr: parement
de: Frontausbildung
covering to the exposed face of the reinforced ground that may provide a stabilising function to retain the ground between soil nails, provide erosion protection and have an aesthetic function

3.1.5
facing drainage
fr: drainage de parement
de: Dränage der Frontausbildung
system of drains used to control water behind the facing

3.1.6
facing system
fr: système de parement
de: Frontausbildungssystem
assemblage of facing units used to produce a finished facing of reinforced ground

3.1.7
facing unit
fr: élément de parement
de: Frontausbildungselement
discrete element used to construct the facing

3.1.8
flexible facing
fr: parement flexible
de: bedingt nachgiebige Frontausbildung
flexible covering which assists in containing soil between the nails

3.1.9
ground
fr: terrain
de: Baugrund
soil, rock and fill existing in place prior to the execution of the construction works

3.1.10
hard facing
fr: parement rigide
de: starre Frontausbildung
stiff covering, for example sprayed concrete, precast concrete section or cast *in-situ* concrete

3.1.11
production nail
fr: clou de l'ouvrage
de: Bauwerksnagel
soil nail which forms part of the completed soil nail structure

3.1.12
reinforcing element
fr: élément de renforcement
de: Bewehrungselement
generic term for reinforcing inclusions inserted into ground

3.1.13
reinforced ground
fr: massif renforcé, sol cloué
de: bewehrter Boden
ground that is reinforced by the insertion of reinforcing elements

3.1.14
sacrificial nail
fr: clou sacrificiel
de: Sondernagel
soil nail installed in the same way as the production nails, solely to establish the pullout capacity but not forming part of the soil nail structure