
Izvedba posebnih geotehničnih del - Diafragme

Execution of special geotechnical work - Diaphragm walls

Ausführung von Arbeiten im Spezialtiefbau - Schlitzwände

Exécution des travaux géotechniques spéciaux - Parois moulées

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EUROPEAN STANDARD
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Execution of special geotechnical work - Diaphragm walls

Exécution des travaux géotechniques spéciaux - Parois
moulées

Ausführung von Arbeiten im Spezialtiefbau -
Schlitzwände

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European foreword

This document (prEN 1538:2026) has been prepared by Technical Committee CEN/TC 288 “Execution of special geotechnical works”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1538:2010 + A1:2015.

This document includes the following significant technical changes with respect to EN 1538:2010 + A1:2015:

- revised substantially in its structure and content;
- harmonized in particular to align with prEN 1536:2026.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

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Introduction

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

The general scope of TC 288 is the standardisation of the execution procedures for geotechnical works, including considerations to design, provisions on materials, supervision, testing and monitoring, records of the works executed, and on special requirements including sustainability.

WG25 has been charged to revise EN 1538:2015, with the subject area of diaphragm walls, functioning as retaining walls, cut-off walls, or as foundation elements (barrettes). Barrettes were dealt with previously in prEN 1536:2026.

The design, planning and execution of diaphragm walls call for experience and knowledge in this specialised field. The execution phase requires skilled and qualified personnel, and the present document cannot replace the expertise of specialist contractors.

The document has been prepared to complement EN 1997, *Eurocode 7: Geotechnical design*. Clause 7 “Considerations related to design” of this document expands on design only where necessary (e.g. the detailing of reinforcement) but shall provide full coverage of the execution and supervision requirements.

With regards to EN 13670, Execution of concrete structures, EN 1538 contains specific requirements for diaphragm walls as a concrete structure, such as the detailing of the reinforcement, the concrete placement and the supervision of concreting process which are complementing the provisions of EN 13670.

Guidelines providing supplementary information, published by the European Federation of Foundation Contractors and the Deep Foundation Institute, can be found in the bibliography. These are considered to reflect state-of-the-art experience and contribute to a more elaborate understanding of the subject matter.

1 Scope

1.1 This document establishes general principles for the execution of diaphragm walls and barrettes as per the execution specifications.

NOTE 1 It is expected that the execution specifications define the execution standard to be applied based on EN 1997 where relevant.

NOTE 2 Walls which deviate from the following clauses in this section can be considered as diaphragm walls provided the execution principles correspond to this document (see Clause 8).

NOTE 3 The term diaphragm wall is used throughout this document and, where applicable, includes barrettes.

1.2 This document applies to diaphragm walls which may have various cross-sectional shapes, uniform over depth (straight shaft), see Figure 1 and Figure 2.

1.3 This document applies to diaphragm walls with

- a wall thickness $B \geq 0,4$ m,
- a depth to width ratio $D/B \geq 5$, with $D \geq 5$ m.

1.4 This document applies to permanent or temporary works for:

- retaining walls
- cut-off walls
- foundations (barrettes), usually formed by single panels or a combination of panels.

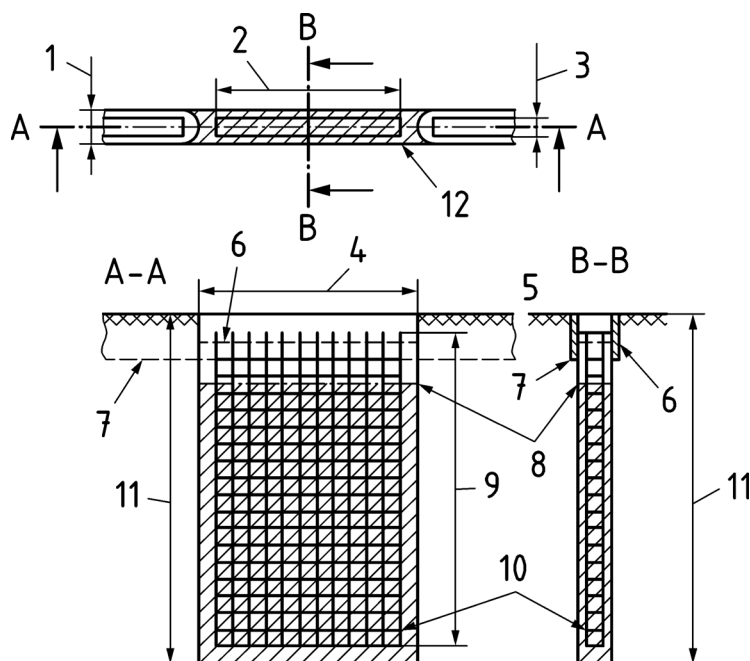
1.5 This document applies to diaphragm walls where excavation methods are either continuous or discontinuous using support fluids for stabilizing the excavation walls where required.

1.6 This document applies only to execution methods that allow the designed cross-sections to be produced.

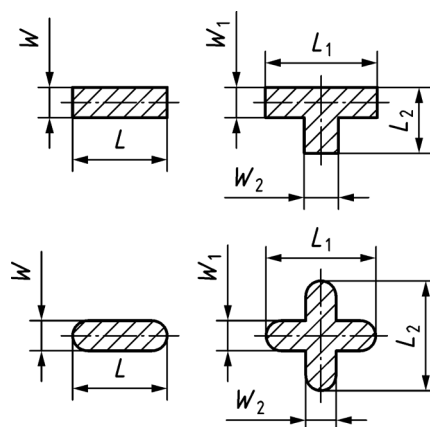
1.7 This document applies to diaphragm walls constructed of:

- self-hardening slurries;
- unreinforced (plain) concrete incl. plastic concrete;
- reinforced concrete;
- concrete reinforced by structural elements (reinforcing elements);
- precast concrete (including prestressed concrete) elements or steel tubes where the gap between the element or tube and the ground is filled by concrete or self-hardening slurry.

NOTE Concrete can be substituted by grout, where applicable.

**Key**

- | | | | |
|---|---|----|---------------------------------------|
| 1 | Wall thickness (B) | 7 | Guide-wall |
| 2 | Horizontal length of reinforcement cage | 8 | Cut off level |
| 3 | Cage width | 9 | Vertical length of reinforcement cage |
| 4 | Length of panel | 10 | Reinforcement cage |
| 5 | Working platform level | 11 | Depth of excavation (D) |
| 6 | concreting level | 12 | Concave portion of curved joints |

Figure 1 — Typical geometry of a panel**Key**

- | | |
|---|-----------------------------------|
| L | Barrette length |
| B | Barrette thickness |
| A | Cross-sectional area of the shaft |

Figure 2 — Barrette

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 206-1, *Concrete - Specification, performance, production and conformity - Part 1: Performance, requirements, factory production control and assessment criteria for individual values*

EN 206-3, *Concrete - Specification, performance, production and conformity - Part 3: Additional requirements for specification and conformity of concrete for special geotechnical works*

EN 1992 (all parts), *Eurocode 2: Design of concrete structures*

EN 1993 (all parts), *Eurocode 3: Design of steel structures*

EN 1994 (all parts), *Eurocode 4: Design of composite steel and concrete structures*

EN 1997 (all parts), *Eurocode 7: Geotechnical design*

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

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

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 10248 (all parts), *Hot rolled sheet piling of non alloy steels*

EN 10249 (all parts), *Cold formed sheet piling of non alloy steels*

EN 12715, *Execution of special geotechnical work - Grouting*

EN 13670, *Execution of concrete structures*

EN 16228 (all parts), *Drilling and foundation equipment – Safety*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

execution specifications

set of documents covering all relevant requirements, technical specifications and construction drawings necessary for the execution of the works

3.2

diaphragm wall

wall constructed in a trench excavated in the ground

3.3

panel

discrete length of diaphragm wall or a number of interconnecting lengths, formed by continuous or discontinuous excavation methods and (simultaneously) filled with a self-hardening material (e.g. I-, L-, T- or X-shape)

3.4

retaining wall

wall that provides lateral and/or vertical support to the ground or additional loads, usually to support the sides of an excavation in the ground

3.5

cut-off wall

relatively thin barrier element used to prevent migration of groundwater or for confinement purposes

3.6

barrette

a single panel for the transfer of forces

3.7

base grouting

pressure injection of grout below the base of an installed barrette in order to enhance performance under load

3.8

shaft grouting

injection of grout carried out after concrete of the barrette has set for the enhancement of skin friction accomplished by the use of grouting pipes which are installed down the shaft, normally placed with the barrette reinforcement

3.9

concreting level

upper level to which concrete is cast in a trench

3.10**cut-off level**

designed level of the panel head

3.11**empty trench**

length of excavation from the working platform level to the cut-off level

3.12**guide wall**

a pair of shallow-depth, parallel temporary walls which used as a guide for the excavating tool, and to secure the sides of the trench beneath the working platform level

3.13**support fluid**

fluid consisting of bentonite or polymer or a combination of both used to support the sides of the excavation

Note 1 to entry: A support fluid can also convey cuttings, e.g. in direct and reverse circulation operations.

3.14**self-hardening slurry**

suspension consisting of binders with or without additions and admixtures which acts as a support fluid during excavation and hardens with time

3.15**grout**

pumpable material (suspension, solution or resins, emulsion or mortar respectively “sanded grout”) which hardens with time

Note 1 to entry: Grout is typically used for injection but can also be a substitute for concrete.

3.16**plastic concrete**

low-strength, low-stiffness and low-permeability concrete with high deformation capacity

3.17**concreting pipe**

A section or sections of pipe generally made of steel, surmounted by a hopper or chute for concreting under dry conditions

3.18**tremie pipe**

concreting pipe, with watertight joints for submerged concrete placement

3.19**integrity test**

test carried out on an installed panel to verify the soundness of materials and, depending on the method used, the panel geometry

3.20**obstruction**

a natural or artificial local anomaly generally requiring special tools or methods for its removal and or penetration

prEN 1538:2026 (E)**3.21****spacer****spacer pad**

component of plastic or steel material or concrete (pad) fixed to the reinforcement cage to maintain the predetermined gap width, usually the concrete cover

3.22**stop-end**

special formwork element to shape the vertical end of a panel and create a definite joint for the adjacent panel

3.23**waterstop**

special flexible element attached longitudinally to a stop-end in such a way that part of the waterstop is embedded in concrete in a panel after the concreting and stop-end extracting operations

3.24**filter cake**

formation of retained material such as bentonite and excavated soil from a suspension built up on the face of a permeable medium by water drainage due to a pressure differential

3.25**trimming**

removal of excess concrete above the designed cut-off level

3.26**excavation curve**

diagram representing the excavation depth versus time

3.27**concreting curve**

diagram representing the volume of poured concrete versus depth

4 Information needed for the execution of the work**4.1 General**

4.1.1 Prior to the execution of the work, all necessary information shall be provided in the execution specifications.

NOTE It is expected that the information includes technical requirements resulting from the function of the diaphragm wall.

4.1.2 This information should include:

- any legal or statutory restrictions;
- the location of main grid lines for setting out;
- the conditions of structures, roads, services, etc. adjacent to the work, including any necessary surveys;
- a suitable quality management system, including supervision, inspection, testing and monitoring and maintenance in accordance with EN 1997-1:2024, Clause 10 and Clause 11.

NOTE Clause 9 of this document refers to supervision, inspection, testing, monitoring during execution.

4.1.3 The information regarding the site conditions shall cover, where relevant:

- the geometry of the site (boundary conditions, topography, access, slopes, headroom restrictions, etc.);
- the existing underground structures, services, known contaminations, and archeological constraints;
- the environmental restrictions, including noise, vibration, pollution;
- the future or ongoing activities such as dewatering, tunnelling, deep excavations.

4.2 Specific information

4.2.1 The execution specifications shall include specific information.

4.2.2 The specific information shall include geotechnical information and data as specified in Clause 5.

NOTE Different from the reason for design of geotechnical structures, for execution the average ground properties and their distribution are relevant to choose suitable work methods.

4.2.3 The specific information shall cover, where relevant:

- execution specifications;
- previous use of the site;
- adjacent foundations (types, loads and geometry);
- presence of obstructions in the ground (old masonry, anchors, etc.);
- presence of headroom restrictions;
- presence of archeological remains;
- presence of natural and/or man made cavities (mines, etc.);
- presence of contaminated ground, and type, extent and degree of contamination;
- any specific requirements for the diaphragm wall, in particular those pertaining to tolerances, quality of materials, class of watertightness;
- where available, previous experience with diaphragm walls or underground works on or adjacent to the site;
- for cut-off walls, permeability, strength and deformation properties of the wall material;
- proposed adjacent enabling or advance works such as underpinning, pre-treatment of soil, dewatering that may affect the execution of a diaphragm wall ;
- functional requirements for instrumentation and monitoring of potentially affected structures;

4.2.4 Necessity, extent, procedure and content for any survey of the conditions of structures, roads, utilities, etc. adjacent to the works area, during execution, shall be specified.