

# *Geregistreeerde Belgische norm*

**NBN EN 1991-1-1**

1e uitg., juli 2002

**Normklasse: B 03**

## **Eurocode 1 - Belastingen op constructies - Deel 1-1 : Algemene belastingen - Volumieke gewichten, eigen gewicht en opgelegde belastingen voor gebouwen (+ AC:2009)**

Eurocode 1 - Actions sur les structures - Partie 1-1 : Actions générales - Poids volumiques, poids propres, charges d'exploitation bâtiments (+ AC:2009)

Eurocode 1 - Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings (+ AC:2009)

### **Toelating tot publicatie: 28 juni 2002**

Vervangt NBN ENV 1991-2-1 (2002), NBN B 03-102 (1976), NBN B 03-103 (1976),

Deze Europese norm EN 1991-1-1 : 2002 heeft de status van een Belgische norm.

Deze Europese norm bestaat in drie officiële versies (Duits, Engels, Frans).

Er is bij het NBN ook een Nederlandstalige versie beschikbaar, die dezelfde status heeft als de officiële versies.

Deze norm mag in België slechts samen met zijn nationale bijlage (ANB) worden toegepast. Deze laatste legt hoofdzakelijk de waarden van de parameters vast die op nationaal vlak worden bepaald.

***norme belge  
enregistrée***

**NBN EN 1991-1-1**

1e éd., juillet 2002

**Indice de classement: B 03**

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**Eurocode 1 - Actions sur les structures - Partie 1-1 : Actions générales - Poids volumiques, poids propres, charges d'exploitation bâtiments (+ AC:2009)**

Eurocode 1 - Belastingen op constructies - Deel 1-1 : Algemene belastingen - Volumieke gewichten, eigen gewicht en opgelegde belastingen voor gebouwen (+ AC:2009)

Eurocode 1 - Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings (+ AC:2009)

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**Autorisation de publication: 28 juin 2002**

Remplace NBN ENV 1991-2-1 (2002), NBN B 03-102 (1976), NBN B 03-103 (1976),

La présente norme européenne EN 1991-1-1 : 2002 a le statut d'une norme belge.

La présente norme européenne existe en trois versions officielles (allemand, anglais, français).

Une version en néerlandais, ayant le même statut que les versions officielles, est également disponible au NBN.

Cette norme ne peut être utilisée en Belgique qu'en combinaison avec son annexe nationale (ANB) qui fixe principalement la valeur des paramètres à déterminer au niveau national.

# NATIONAAL VOORWOORD van de NBN EN 1991-1-1:2002

1. De norm NBN EN 1991-1-1:2002 «Eurocode 1 - Belastingen op constructies - Deel 1-1: Algemene belastingen - Volumieke gewichten, eigen gewicht en opgelegde belastingen voor gebouwen» omvat de Nationale Bijlage NBN EN 1991-1-1 ANB:2007 met normatief karakter in België.

Hij vervangt alleszins vanaf 1/8/2008 de volgende normen:

NBN B 03-102:1976 “Werkingen op constructies - Rechtstreekse werkingen - Blijvende belastingen te wijten aan het eigengewicht” (bekrachtigd BS 26/11/1976);

NBN B03-103:1976 “Werkingen op constructies - Rechtstreekse werkingen - Gebruikbelastingen van gebouwen” (bekrachtigd BS 16/12/1977),  
alsook het ontwerp van Addendum prNBN B 03-103/A1:1993;

NBN ENV 1991-2-1:2002 “Eurocode 1 - Grondslag voor ontwerp en belasting op draagsystemen - Deel 2-1 : Belasting op draagsystemen - Dichtheden, eigengewicht en opgelegde belastingen”, samen met de Belgische toepassingsrichtlijn (bekrachtigd BS 27/8/2004 + NTD).

2. De Nederlandstalige versie van EN 1991-1-1 werd opgesteld in samenwerking tussen NBN en NEN. Daarbij werd voor elk begrip een unieke woordkeuze gemaakt. Dit heeft voor gevolg dat in de norm uitdrukkingen voorkomen die in één van de twee landen minder gebruikelijk zijn. Hierna volgt een lijst met gelijkwaardige termen :

Oorspronkelijke term (Engels)	Verplichte term (Nederlands)	Synoniem (B); (N)
accidental design situation	buitengewone ontwerpsituatie	bijzondere toestand
civil engineering work	civieltechnisch werk	werk van burgerlijke bouwkunde (B)
concentrated load	geconcentreerde belasting	puntlast (B)
construction work	bouwwerk	werk (B)
effects of actions	belastingeffecten	belastingsuitwerkingen (N)
the individual project	een (elk) project in het bijzonder	het afzonderlijke project
kerb	opstaande rand	schamkant (N)
pavement	wegdek	bekleding (B)
permanent action	blijvende belasting	permanente belasting (N)
relevant	van toepassing	voorkomend (B)

resistance	weerstand	capaciteit, sterkte (N)
serviceability limit state	bruikbaarheidsgrenstoestand	gebruiksgrenstoestand (B)
slab (bij bruggen)	dek	rijvloer
spacing	hart-op-hartafstand	steekmaat, tussenafstand
technical specifications	technische voorschriften	technische specificaties
verification	toetsing	verificatie, controle (N)

**2bis** De Europese normen (EN) waarnaar de tekst van deze norm met hun Engelse titel verwijst, dragen in België de volgende Nederlandstalige titels:

<b>Vermelde norm met Engelse titel</b>	<b>Nederlandstalige titel (NBN)</b>
EN 1990:2002 Eurocode – Basis of structural design	NBN EN 1990 Eurocode - Grondslagen van het constructief ontwerp
EN 1991-1-3:2003 Eurocode 1 - Actions on structures - Part 1-3: General actions - Snow loads	NBN EN 1991-1-3:2003 Eurocode 1: Belastingen op constructies - Deel 1-3: Algemene belastingen - Sneeuwbelasting
EN 1991-1-4:2005 Eurocode 1: Actions on structures - Part 1-4: General actions - Wind actions	NBN EN 1991-1-4:2005 Eurocode 1: Belastingen op constructies - Deel 1-4: Algemene belastingen - Windbelasting
EN 1991-1-6:2005 Eurocode 1 - Actions on structures Part 1-6: General actions - Actions during execution	NBN EN 1991-1-6:2005 Eurocode 1: Belastingen op constructies - Deel 1-6: Algemene belastingen - Belastingen tijdens uitvoering
EN 1991-1-7:2006 Eurocode 1 - Actions on structures - Part 1-7: General actions - Accidental actions	NBN EN 1991-1-7:2006 Eurocode 1: Belastingen op constructies - Deel 1-7: Algemene belastingen - Buitengewone belastingen: stootbelastingen en ontploffingen
EN 1991-2:2004 Eurocode 1: Actions on structures – Part 2: Traffic loads on bridges	NBN EN 1991-2:2004 Eurocode 1: Belastingen op constructies - Deel 2: Verkeersbelasting op bruggen

EN 1991-3:2006 Eurocode 1 - Actions on structures - Part 3: Actions induced by cranes and machinery

NBN EN 1991-3:2006 Eurocode 1: Belastingen op constructies - Deel 3: Belastingen veroorzaakt door kranen en machines

EN 1991-4:2006 Eurocode 1 - Actions on structures - Part 4: Silos and tanks

NBN EN 1991-4:2006 Eurocode 1: Belastingen op constructies - Deel 4: Silo's en opslag tanks

3. Aanvullende opmerkingen van het NBN : de volgende redactionele verbeteringen behoren te worden aangebracht, of werden reeds aangebracht, in de Nederlandstalige versie van de NBN EN 1991-1-1:2002. Te noteren is dat het Corrigendum N444G van SC1 nog niet goedgekeurd was op het ogenblik van deze publicatie.

Oorsprong	Paragraaf	Te vervangen tekst	Nieuwe tekst
CEN SC1 N444G	Lijst v/d NDP		Bij te voegen : 6.3.2.2 (3)
Commissie NBN E25001 SC1 N444G	3.3.2(1)	De regel “ <i>Bij daken behoren opgelegde belastingen en sneeuw- of windbelastingen niet samen gelijktijdig te zijn opgelegd</i> » is in tegenstrijd met het principe 3.3.1(1)P « <i>Voor ruimten die zijn bedoeld om te worden blootgesteld aan verschillende soorten belastingen, moet het ontwerp en de berekening het meest kritische belastingsgeval beschouwen</i> »	<u>Er is op Belgisch vlak een normatieve oplossing aangebracht in de ANB :</u> de regel is enkel van toepassing in de bruikbaarheidsgrenstoestand voor daken van categorie H
NBN E25001	6.3.1.2 (10)	In overeenstemming met 6.2.1 (4) mag een reductiefactor ... uit de tabellen 6.2 en 6.10 voor vloeren,...	In overeenstemming met 6.2.1 (4) mag een reductiefactor ... uit de tabellen 6.2 en 6.4... <u>reeds in de Nederlandstalige versie verbeterd</u>
SC1 N444G	6.3.1.2 (10)	“De aanbevolen waarde voor de reductiefactor $\alpha_A$ voor de klassen A t.m. E wordt als volgt bepaald”	“De aanbevolen waarde voor de reductiefactor $\alpha_A$ voor de klassen <u>A t.m. D</u> wordt als volgt bepaald”
NBN E25001 SC1 N444G	6.3.4.1 Tabel 6.9	De definitie van de klasse I “ <i>Daken toegankelijk voor gebruik volgens klasse A tot en met D</i> ” is niet conform de regel 6.3.4.1(2)	De definitie van de klasse I dient gelezen te worden als “ <i>Daken toegankelijk voor gebruik volgens klasse <u>A</u> tot en met <u>G</u></i> ”

SC1 N444G	6.4(1)	(geen OPMERKING)	Bij te voegen : OPMERKING De waarden van $q_k$ in tabel 6.12 mogen in de nationale bijlage gekozen worden. De aanbevolen waarden zijn onderlijnd
	Table A2 en A7	References to prEN 771-1, prEN 771-2, prEN 771-3, prEN 771-4, prEN 771-5, prEN 771-6, prEN 1051, prEN 206	References to EN 771-1, EN 771-2, EN 771-3, EN 771-4, EN 771-5, EN 771-6, EN 1051, EN 206
	Table A9	In de Franse en Engelse versies is het volumiek gewicht 1 lijn te hoog geschreven (van “appels” tot “tomaten”)	<u>reeds in de Nederlandstalige versie verbeterd</u>

# AVANT-PROPOS NATIONAL à la NBN EN 1991-1-1:2002

1. La norme NBN EN 1991-1-1:2002 «Eurocode 1 - Actions sur les structures - Partie 1-1 : Actions générales - Poids volumiques, poids propres, charges d'exploitation bâtiments» comprend l'annexe nationale NBN EN 1991-1-1-ANB:2007 qui a un caractère normatif en Belgique. Elle remplace à partir du 1/8/2008 les normes suivantes :

NBN B 03-102:1976 “Actions sur les constructions - Actions directes - Charges permanentes dues au poids propre” (homologuée MB 26/11/1976);

NBN B03-103:1976 “Actions sur les constructions - Actions directes - Charges d'exploitation des bâtiments” (homologuée MB 16/12/1977)

ainsi que le projet d'addendum prNBN B 03-103/A1:1993

NBN ENV 1991-2-1:2002 “Eurocode 1 - Bases du calcul et actions sur les structures - Partie 1 : Bases du calcul y compris le document d'application belge (version homologuée + DAN) (homologuée MB 27/8/2004 avec DAN).

2. La version de langue française de l'EN 1991-1-1 a été rédigée en France par l'AFNOR. En conséquence, on y rencontre certaines expressions d'usage moins courant en Belgique.

Une liste de termes équivalents est donnée ci-après :

Terme de l'EN 1991-1-1	Terme équivalent en Belgique
poteau	colonne
analyse	calcul
client	le maître de l'ouvrage assisté de ses bureaux d'architectes, d'ingénierie et de consultance

3. Note complémentaire du NBN : les corrections éditoriales suivantes sont à apporter à la version française de la NBN EN 1991-1-1:2002. Il est à noter que le Corrigendum N444G de la commission TC250 SC1 n'avait pas encore été approuvé au moment de cette publication.

Origine	Paragraphe	Texte à corriger	Nouveau texte
Commission NBN E25001 SC1 N444G	3.3.2(1)	La règle “ <i>Sur les toitures, il convient de ne pas appliquer simultanément les surcharges d'exploitation et les charges dues à la neige ou au vent.</i> » est en contradiction avec le principe 3.3.1(1)P « <i>Pour les surfaces devant supporter différentes catégories de charges, le dimensionnement doit considérer le cas de charge le plus critique.</i> »	Une solution normative a été apportée dans l'ANB : la règle est d'application uniquement aux états-limites de service des toitures de la catégorie H.

NBN E25001	5.1(3)	Traduction du mot anglais «roofing» par «toiture» dans la liste des éléments non structuraux	Le terme anglais “roofing” doit être traduit par “couverture de toiture”
NBN E25001	tableaux 6.2, 6.8 et 6.12	Les valeurs recommandées n’ont pas été soulignées.	Les valeurs à utiliser sont fixées par l’ANB
NBN E25001	6.3.1.2 (10)	Conformément à 6.2.1(4), un coefficient de réduction ... des Tableaux 6.2 et 6.10...	Conformément à 6.2.1(4), un coefficient de réduction ... des Tableaux 6.2 et 6.4... <u>(corrigé en version néerlandaise)</u>
SC1 N444G	6.3.1.2 (10)	“La valeur de $\alpha_A$ recommandée pour les catégories A à E est déterminée comme suit :”	“La valeur de $\alpha_A$ recommandée pour les catégories <u>A</u> à <u>D</u> est déterminée comme suit :”
NBN E25001	6.3.2.3		Ce numéro de paragraphe est erronément numéroté 1.5.1.1
NBN E25001 SC1 N444G	6.3.4.1 Tableau 6.9	La définition de la catégorie I “ <i>Toitures accessibles pour les usages des catégories A à D</i> ” n’est pas conforme à la règle 6.3.4.1(2)	La définition de la catégorie I doit être lue comme suit : “ <i>Toitures accessibles pour les usages des catégories <u>A</u> à <u>G</u></i> ”
SC1 N444G	6.4(1)	(pas de NOTE)	A ajouter : NOTE Les valeurs de $q_k$ du Tableau 6.12 peuvent être définies dans l’Annexe Nationale. Les valeurs recommandées sont soulignées.
	Table A2 et A7	Références à prEN 771-1, prEN 771-2, prEN 771-3, prEN 771-4, prEN 771-5, prEN 771-6, prEN 1051, prEN 206	Références à EN 771-1, EN 771-2, EN 771-3, EN 771-4, EN 771-5, EN 771-6, EN 1051, EN 206
	Table A9	(erreur éditoriale pour les fruits)	Pour les fruits, les poids volumiques et angles de talus naturel sont à lire en les remettant sur la ligne adéquate, depuis 8,3 kN/m <sup>3</sup> pour les pommes en vrac jusqu’à 6,8 kN/m <sup>3</sup> pour les tomates.



English version

## Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings

Eurocode 1: Actions sur les structures - Partie 1-1: Actions  
générales - Poids volumiques, poids propres, charges  
d'exploitation bâtiments

Eurocode 1: Einwirkungen auf Tragwerke - Teil 1-1:  
Wichten, Eigengewicht und Nutzlasten im Hochbau

This European Standard was approved by CEN on 30 November 2001.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## EN 1991-1-1:2002 (E)

### Foreword

This document (EN 1991-1-1:2002) has been prepared by Technical Committee CEN/TC 250 "Structural Eurocodes", the secretariat of which is held by BSI.

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 October 2002, and conflicting national standards shall be withdrawn at the latest by March 2010.

CEN/TC 250 is responsible for all Structural Eurocodes.

This document supersedes ENV 1991-2-1:1995.

The annexes A and B are informative.

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

### Background of the Eurocode programme

In 1975, the Commission of the European Community decided on an action programme in the field of construction, based on article 95 of the Treaty. The objective of the programme was the elimination of technical obstacles to trade and the harmonisation of technical specifications.

Within this action programme, the Commission took the initiative to establish a set of harmonised technical rules for the design of construction works which, in a first stage, would serve as an alternative to the national rules in force in the Member States and, ultimately, would replace them.

For fifteen years, the Commission, with the help of a Steering Committee with Representatives of Member States, conducted the development of the Eurocodes programme, which led to the first generation of European codes in the 1980s.

In 1989, the Commission and the Member States of the EU and EFTA decided, on the basis of an agreement<sup>1</sup> between the Commission and CEN, to transfer the preparation and the publication of the Eurocodes to CEN through a series of Mandates, in order to provide them with a future status of European Standard (EN). This links *de facto* the Eurocodes with the provisions of all the Council's Directives and/or Commission's Decisions dealing with European standards (e.g. the Council Directive 89/106/EEC on

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<sup>1</sup> Agreement between the Commission of the European Communities and the European Committee for Standardisation (CEN) concerning the work on EUROCODES for the design of building and civil engineering works (BC/CEN/03/89).

construction products - CPD - and Council Directives 93/37/EEC, 92/50/EEC and 89/440/EEC on public works and services and equivalent EFTA Directives initiated in pursuit of setting up the internal market).

The Structural Eurocode programme comprises the following standards generally consisting of a number of Parts:

EN 1990	Eurocode :	Basis of Structural Design
EN 1991	Eurocode 1:	Actions on structures
EN 1992	Eurocode 2:	Design of concrete structures
EN 1993	Eurocode 3:	Design of steel structures
EN 1994	Eurocode 4:	Design of composite steel and concrete structures
EN 1995	Eurocode 5:	Design of timber structures
EN 1996	Eurocode 6:	Design of masonry structures
EN 1997	Eurocode 7:	Geotechnical design
EN 1998	Eurocode 8:	Design of structures for earthquake resistance
EN 1999	Eurocode 9:	Design of aluminium structures

Eurocode standards recognise the responsibility of regulatory authorities in each Member State and have safeguarded their right to determine values related to regulatory safety matters at national level where these continue to vary from State to State.

### Status and field of application of Eurocodes

The Member States of the EU and EFTA recognise that Eurocodes serve as reference documents for the following purposes:

- as a means to prove compliance of building and civil engineering works with the essential requirements of Council Directive 89/106/EEC, particularly Essential Requirement N°1 – Mechanical resistance and stability – and Essential Requirement N°2 – Safety in case of fire ;
- as a basis for specifying contracts for construction works and related engineering services ;
- as a framework for drawing up harmonised technical specifications for construction products (ENs and ETAs)

The Eurocodes, as far as they concern the construction works themselves, have a direct relationship with the Interpretative Documents<sup>2</sup> referred to in Article 12 of the CPD, although they are of a different nature from harmonised product standards<sup>3</sup>. Therefore, technical aspects arising from the Eurocodes work need to be adequately considered by

<sup>2</sup> According to Art. 3.3 of the CPD, the essential requirements (ERs) shall be given concrete form in interpretative documents for the creation of the necessary links between the essential requirements and the mandates for harmonised ENs and ETAGs/ETAs.

<sup>3</sup> According to Art. 12 of the CPD the interpretative documents shall :

- a) give concrete form to the essential requirements by harmonising the terminology and the technical bases and indicating classes or levels for each requirement where necessary ;
- b) indicate methods of correlating these classes or levels of requirement with the technical specifications, e.g. methods of calculation and of proof, technical rules for project design, etc. ;
- c) serve as a reference for the establishment of harmonised standards and guidelines for European technical approvals.

The Eurocodes, *de facto*, play a similar role in the field of the ER 1 and a part of ER 2.

## **EN 1991-1-1:2002 (E)**

CEN Technical Committees and/or EOTA Working Groups working on product standards with a view to achieving full compatibility of these technical specifications with the Eurocodes.

The Eurocode standards provide common structural design rules for everyday use for the design of whole structures and component products of both a traditional and an innovative nature. Unusual forms of construction or design conditions are not specifically covered and additional expert consideration will be required by the designer in such cases.

### **National Standards implementing Eurocodes**

The National Standards implementing Eurocodes will comprise the full text of the Eurocode (including any annexes), as published by CEN, which may be preceded by a National title page and National foreword, and may be followed by a National annex.

The National annex may only contain information on those parameters which are left open in the Eurocode for national choice, known as Nationally Determined Parameters, to be used for the design of buildings and civil engineering works to be constructed in the country concerned, *i.e.* :

- values and/or classes where alternatives are given in the Eurocode,
- values to be used where a symbol only is given in the Eurocode,
- country specific data (geographical, climatic, etc.), e.g. snow map,
- the procedure to be used where alternative procedures are given in the Eurocode,–.

It may also contain

- decisions on the application of informative annexes,
- references to non-contradictory complementary information to assist the user to apply the Eurocode.

### **Links between Eurocodes and harmonised technical specifications (ENs and ETAs) for products**

There is a need for consistency between the harmonised technical specifications for construction products and the technical rules for works<sup>4</sup>. Furthermore, all the information accompanying the CE Marking of the construction products which refer to Eurocodes should clearly mention which Nationally Determined Parameters have been taken into account.

### **Additional information specific for EN 1991-1-1**

EN 1991-1-1 gives design guidance and actions for the structural design of buildings and civil engineering works, including the following aspects:

- densities of construction materials and stored materials ;
- self-weight of construction elements, and
- imposed loads for buildings.

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<sup>4</sup> see Art.3.3 and Art.12 of the CPD, as well as clauses 4.2, 4.3.1, 4.3.2 and 5.2 of ID 1.

EN 1991-1-1 is intended for clients, designers, contractors and public authorities.

EN 1991-1-1 is intended to be used with EN 1990, the other Parts of EN 1991 and EN 1992 to EN 1999 for the design of structures.

### **National annex for EN 1991-1-1**

This standard gives alternative procedures, values and recommendations for classes with notes indicating where National choices have to be made, therefore the National Standard implementing EN 1991-1-1 should have a National Annex containing all Nationally Determined Parameters to be used for the design of buildings and civil engineering works to be constructed in the relevant country.

National choice is allowed in EN 1991-1-1 through:

- 2.2(3),
- 5.2.3(1) to 5.2.3(5),
- 6.3.1.1 (Table 6.1),
- 6.3.1.2(1)P (Table 6.2),
- 6.3.1.2(10) & (11),
- 6.3.2.2 (1)P (Table 6.4),
- 6.3.2.2 (3),
- 6.3.3.2(1) (Table 6.8),
- 6.3.4.2 (Table 6.10) and
- 6.4 (1)(P) (Table 6.12)

## Section 1 General

### 1.1 Scope

(1) EN 1991-1-1 gives design guidance and actions for the structural design of buildings and civil engineering works including some geotechnical aspects for the following subjects:

- Densities of construction materials and stored materials;
- Self-weight of construction works;
- Imposed loads for buildings.

(2) Section 4 and Annex A give nominal values for densities of specific building materials, additional materials for bridges and stored materials. In addition for specific materials the angle of repose is provided.

(3) Section 5 provides methods for the assessment of the characteristic values of self-weight of construction works.

(4) Section 6 gives characteristic values of imposed loads for floors and roofs according to category of use in the following areas in buildings:

- residential, social, commercial and administration areas;
- garage and vehicle traffic areas;
- areas for storage and industrial activities;
- roofs;
- helicopter landing areas.

(5) The loads on traffic areas given in Section 6 refer to vehicles up to a gross vehicle weight of 160 kN. The design for traffic areas for heavy vehicles of more than 160 kN gross weight needs to be agreed with the relevant authority. Further information may be obtained from EN 1991-2.

(6) For barriers or walls having the function of barriers, horizontal forces are given in Section 6. Annex B gives additional guidance for vehicle barriers in car parks.

NOTE Forces due to vehicle impact are specified in EN 1991-1-7 and EN 1991-2.

(7) For the design situations and effects of actions in silos and tanks caused by water or other materials see EN 1991-3.