Eurocódigos 2G:

Technical Reports (TR) y *Technical Specifications* (TS)

José M.ª Goicolea

Presidente CTN-UNE 140/SC10

Escuela de Ingenieros de Caminos, UPM

4 de diciembre de 2025

Contenido

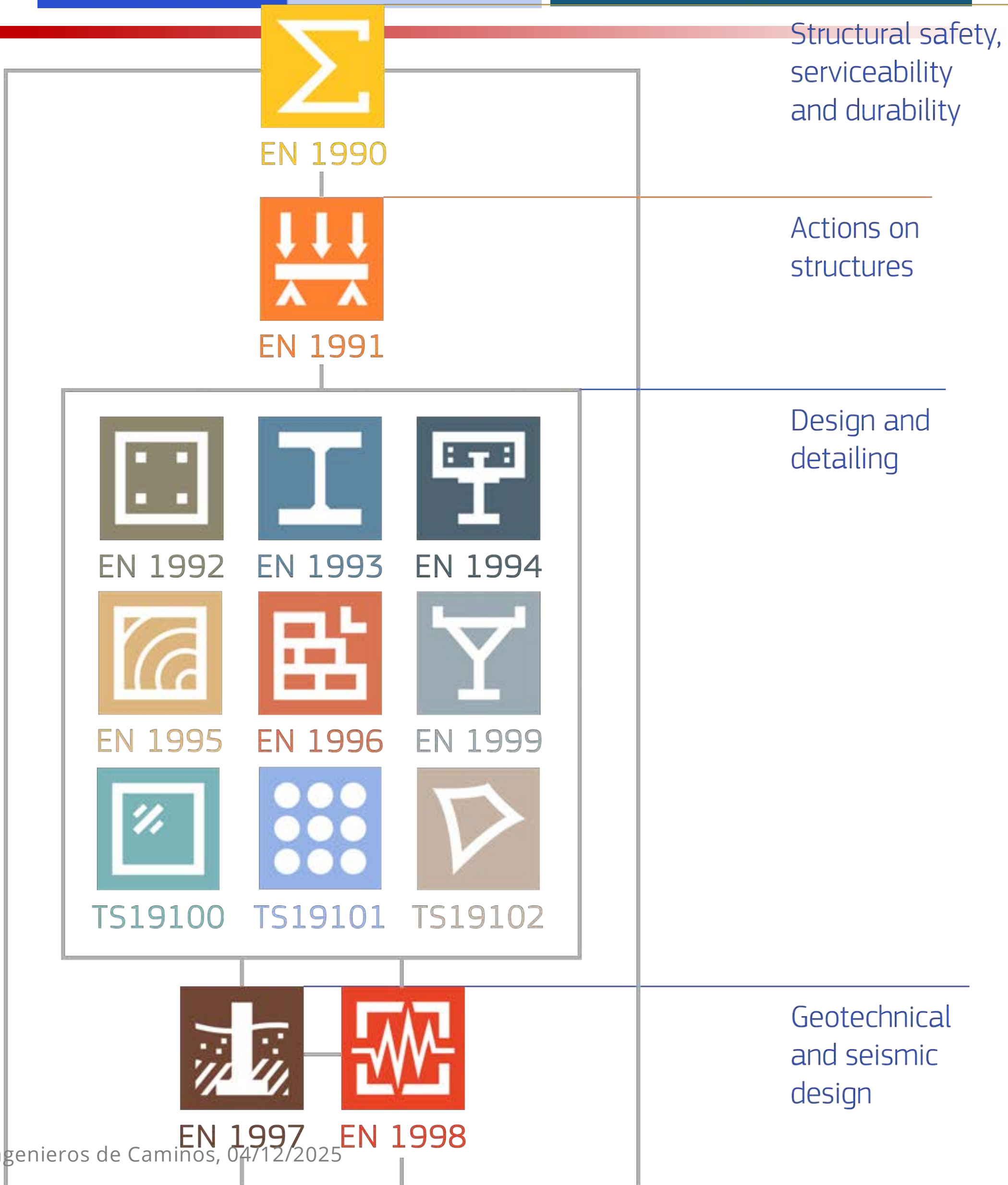
1. Eurocódigos 2G
2. TS - *Technical Specifications* prenormativas y complementarias
3. Recursos y *Technical Reports* JRC
4. TR - *Technical Reports* CEN
5. Conclusiones

Contenido

1. Eurocódigos 2G
2. TS - *Technical Specifications* prenormativas y complementarias
3. Recursos y *Technical Reports* JRC
4. TR - *Technical Reports* CEN
5. Conclusiones

Eurocódigos – EN 199X-Y

- EC 0 – EN 1990: Criterios proyecto estructural y geotécnico
- EC 1 – EN 1991: Acciones
- EC 2 – EN 1992: Hormigón
- EC 3 – EN 1993: Acero
- EC 4 – EN 1994: Mixtas
- EC 5 – EN 1995: Madera
- EC 6 – EN 1996: Fábrica
- EC 9 – EN 1999: Aluminio
- EC 7 – EN 1997: Geotecnia
- EC 8 – EN 1998: Sismo



Organización de CEN/TC 250

Management Group
Chair: S Denton

Chairman's Advisory Panel(s)

CEN/TC 250 Structural Eurocodes
Chair: S Denton
Vice Chair: G Breitschaft
Secretary: T Wilkins [BSI]
CEN PM: P Karagianni

CEN/TC 250 Coordination Group
Chairman: S Denton
Secretary: T Wilkins [BSI]

Horizontal Group Bridges
Convenor: P Croce

Horizontal Group Fire
Convenor: B Zhao

Horizontal Group Assessment and Retrofitting
Convenor: T Lang [SIA]

WG 1 Policy and guidelines
Convenor: A Bond [BSI]

Other Tier 1 WG's

WG 4 Fibre reinforced polymer
Convenor: L Ascione [UNI]

WG 5 Membrane Structures
Convenor: M Mollaert [AFNOR]

WG 6 Robustness
Convenor: J Bregulla [NEN]

CEN/TC 250 Subcommittees

SC 10 - EN 1990
Chairman: P Formichi
Secretary: V Meløysund [SN]

SC 1 - EN 1991 M Stacey 01/26
Chairman: N Malakatas
Secretary: D Reinhard [DIN]

SC 2 - EN 1992
Chairman: A Pérez Caldentey
Secretary: D Zorcec [DIN]

SC 3 - EN 1993
Chairman: M Knobloch
Secretary: S Kempa [DIN]

SC 4 - EN 1994
Chairman: S Hicks
Secretary: C Starr [BSI]

SC 5 - EN 1995
Chairman: S Winter
Secretary: A Vaghei [SN]

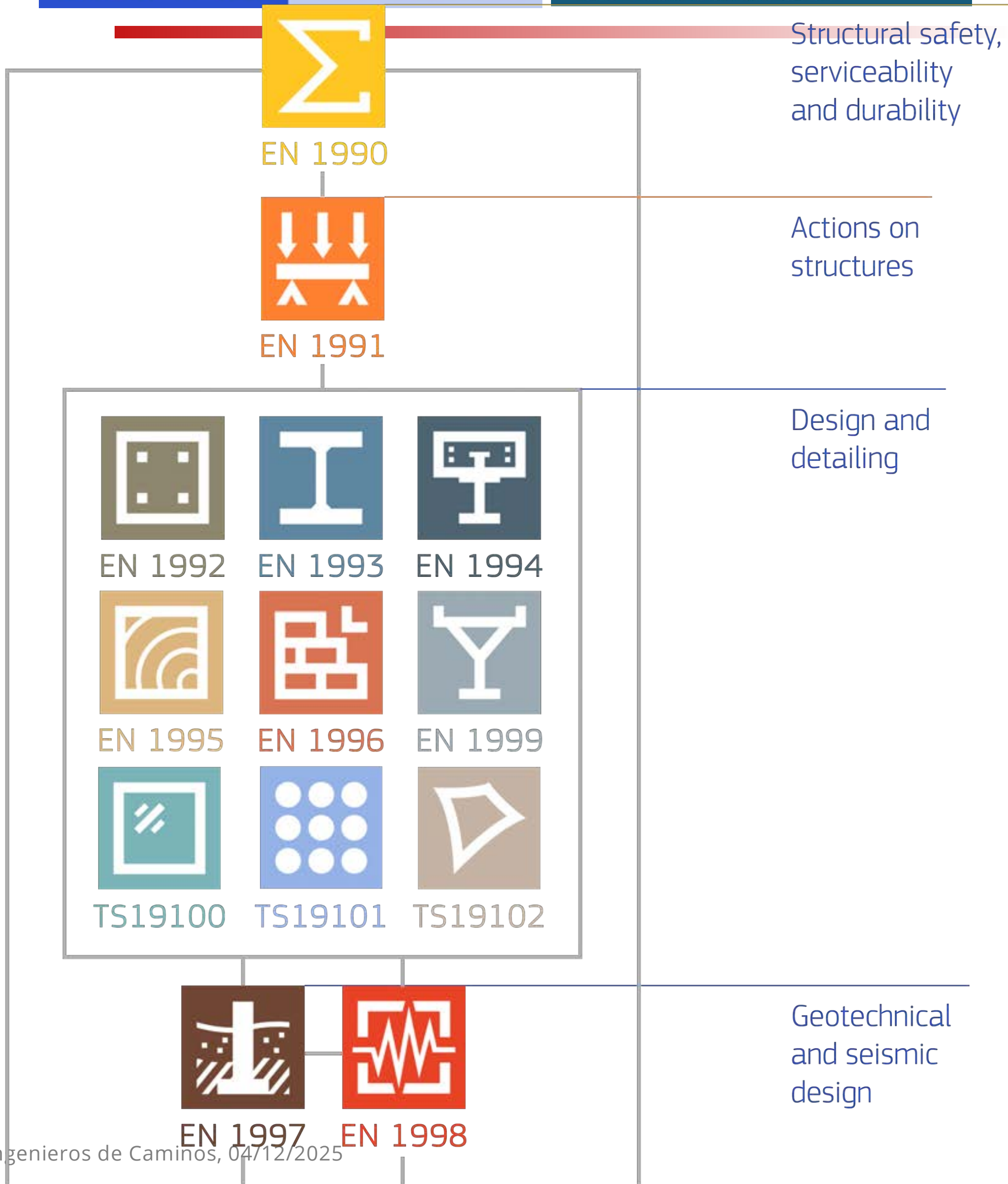
SC 6 - EN 1996
Chairman: R Van der Pluijm
Secretary: N Hu [DIN]

SC 7 - EN 1997
Chairman: A Van Seters
Secretary: G Kraijema [NEN]

SC 8 - EN 1998
Chairman: P Bisch
Secretary: A Correia [IPQ]

SC 9 - EN 1999
Chairman: A Mandara
Secretary: A Malvåg [SN]

SC 11 - EN 'Structural Glass'
Chairman: M Feldmann
Secretary: L Hoffmann [DIN]



Organización de UNE-CTN 140

UNE-CTN 140
Presidente: **Miguel Ortega**

(15+16)

Subcomités (SCs)

- SC10 – EN 1990 & SC1 – EN 1991 (Bases de Cálculo y Acciones) *Coordinadores*: **JM Goicolea, JM Simón-Talero** *(18)*
- SC2 – EN 1992 (Hormigón) *Coordinador:* **Jesús Rodríguez Santiago** *(45)*
- SC3 – EN 1993 (Acero) *Coordinador:* **Enrique Mirambell** *(32)*
- SC4 – EN 1994 (Mixtas) *Coordinador:* **Miguel Ortega** *(32)*
- SC5 – EN 1995 (Madera) *Coordinador:* **Francisco Arriaga** *(16)*
- SC6 – EN 1996 (Fábrica) *Coordinador:* **Luis Carrillo** *(9)*
- SC7 – EN 1997 (Geotecnia) *Coordinador:* **José Estaire** *(24)*
- SC8 – EN 1998 (Sismo) *Coordinador:* **Amadeo Benavent** *(5)*
- SC9-EN1999 (Aluminio) *Coordinador :* ***(pendiente)*** *(-)*

Grupos Horizontales y de Trabajo (GTs)

- GT2 – Estructuras Existentes *Coordinador:* **Eduardo Díaz Pavón**
- GT4 – Polímeros con Fibras *Coordinador:* **Stefano Primi**
- GT5 – Estructuras membrana *Coordinador:* **José Llorens**
- GT6 - Robustez *Coordinador:* **Enrique Calderón**
- GT7 Adaptación a cambio climático *Coordinador:* **Ismael Carpintero**
- GHP Grupo Horizontal Puentes *Coordinador:* **Álvaro Serrano**

Gestión y soporte UNE

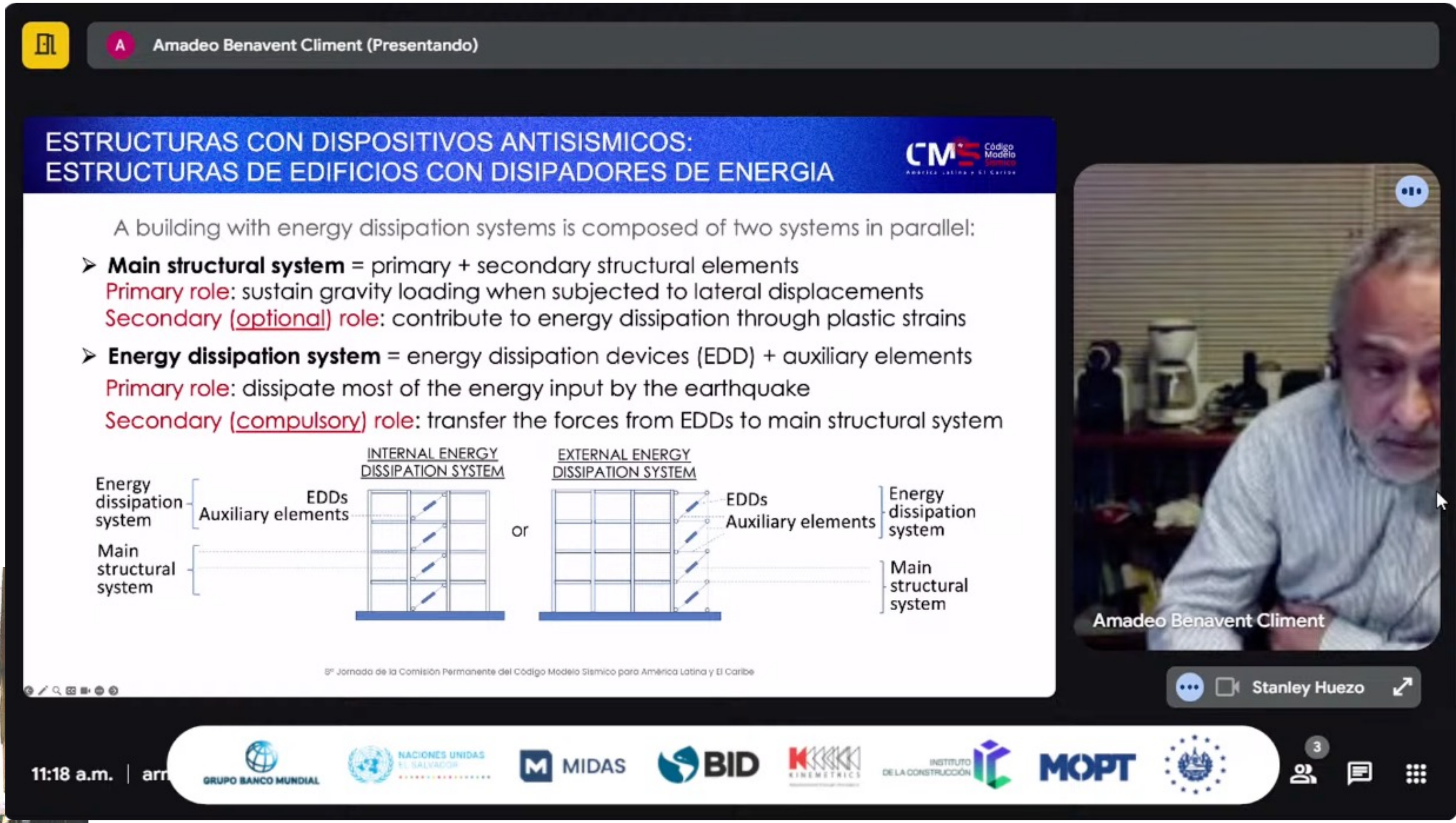
Responsable: **Raquel Martínez**

Principios

- Estructuración coherente, principios y métodos comunes: EC0-EC1 + EC's materiales + EC's específicos
- Niveles ejemplares de consenso internacional
- Alta calidad de redacción
- Consideración, respuesta e incorporación de comentarios (técnicos, editoriales…)
- Incorporación de investigaciones contrastadas
- Implementación en cada país: Anejos Nacionales, permiten elegir nivel de seguridad

Repercusión internacional - ALC

Amadeo Benavent – UNE-CTN140 SC8



Managua
1972

Europa es una potencia mundial en normativa
(¡y España debe aprovecharlo!)

Bases

- La **base** de los Eurocódigos la forman:
  - ✓ EN 1990 establece los formatos de seguridad (ELS, ELU), define las expresiones y los coeficientes de combinación (ψ), valores de cálculo de acciones (γ), establece criterios y requisitos de aceptación,…
  - ✓ EN 1991 define las acciones (valores característicos y grupos de acciones)
- En cada país **Anejos Nacionales**: Parámetros NDP's, decisión sobre partes informativas, documentos complementarios.
- EC1, EC3-EC5 y EC8 tienen partes "-2" para **puentes**

Historia y Evolución

- **1990 – 1992** Elaboración "Normas Experimentales" (**ENV 199*n*-*x***)
- **2002-2006** Elaboración y publicación como Normas Europeas (**EN 199*n*-*x***)
- **junio 2007** Disponibilidad de los 10 Eurocódigos (58 partes) por los **NSB**
- **2015** Inicio trabajos del mandato **M/515** de la CE a CEN: redacción / evolución Eurocódigos 2.ª Generación

Evolución actual 2G

- **jul 2018 – ene 2026** "Textos finales" de los Eurocódigos 2.ª generación
- **sep 2022 – jun 2025** Inicio de elaboración de los nuevos **Anejos Nacionales**
- **jun 2025 – ene 2027** Eurocódigos (traducidos) con sus Anejos Nacionales

junio 2007 – abril 2025 = 18 años de estabilidad normativa

Eurocódigo EN 1990 - Criterios

- Contiene criterios y requisitos, comunes a todos los ECs
- Partes 1 y 2, ambas con igual estructura:
  - **EN 1990-1**: Proyecto de estructuras nuevas
  - **EN 1990-2**: Evaluación de estructuras existentes

(28/11/2025: ¡ambas partes revisadas y aprobadas!)

- Texto del EC0 (casi sin NDP's) y 9 anejos A-H (2 normativos, 7 informativos)
- Conceptos principales que incluye:
  - Verificación para ELU, ELS
  - Requisitos o límites (en anejos)

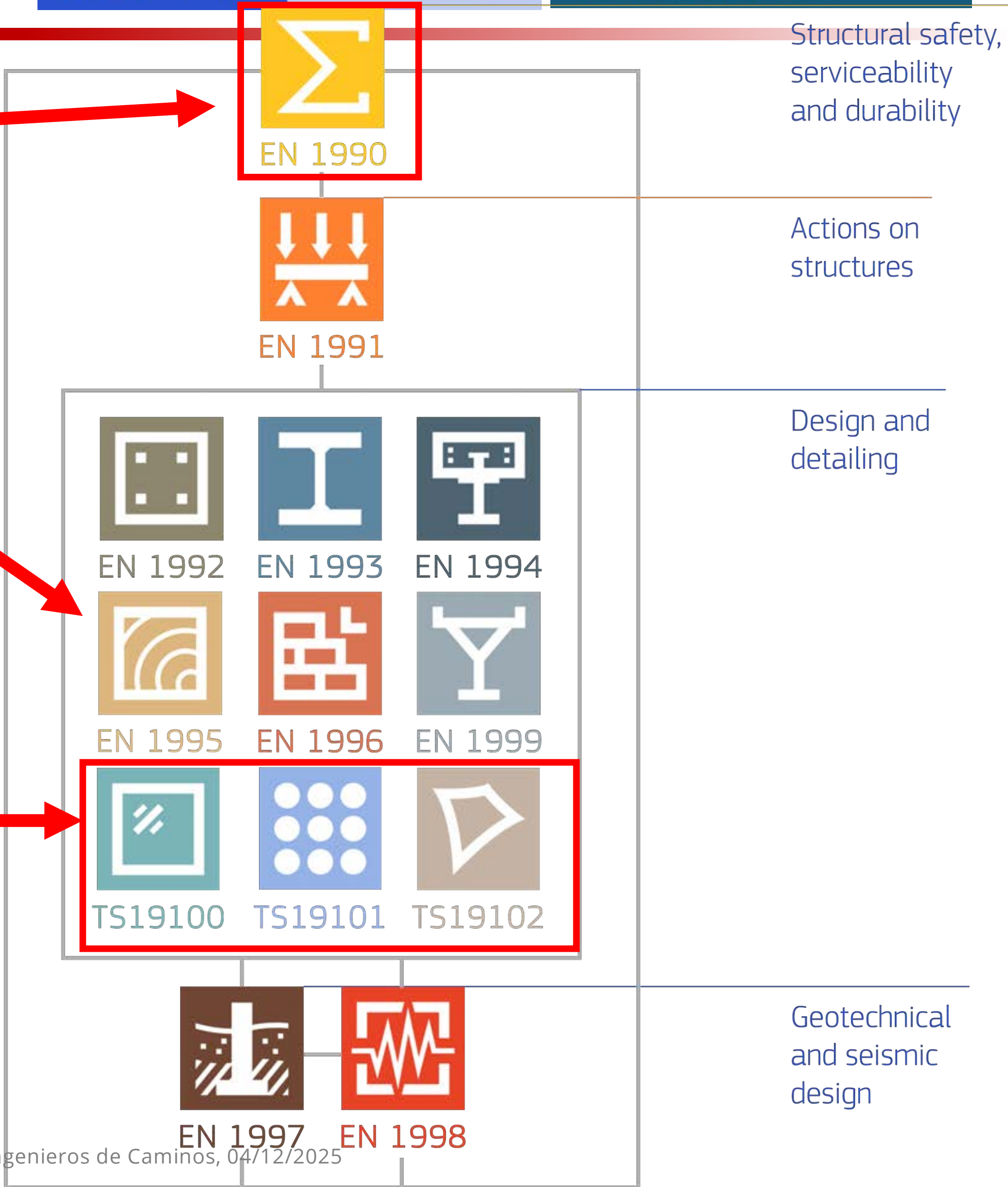
Contenido

1. Eurocódigos 2G
2. TS - *Technical Specifications* prenormativas y complementarias
3. Recursos y *Technical Reports* JRC
4. *TR - Technical Reports* CEN
5. Conclusiones

TS – Prenormativas

- TS 17440: **estructuras existentes**
  -> EN 1990-2 (02/2026)
- TS 19103: **madera-hormigón**
- -> EN 1995-1-3 (N/A)

- TS 19100 : **Vidrio estructural**
  -> EN 19100 (09/2026)
- TS 19101: materiales **compuestos con fibras**
  -> EN 19101 (n/a)
- TS 19102: **estructuras de membrana** en tracción
  -> EN 19102 (n/a)



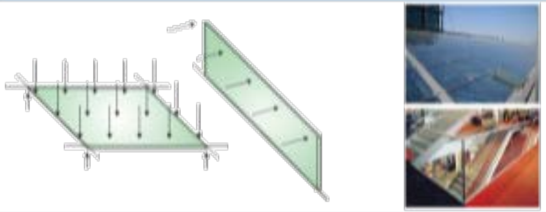
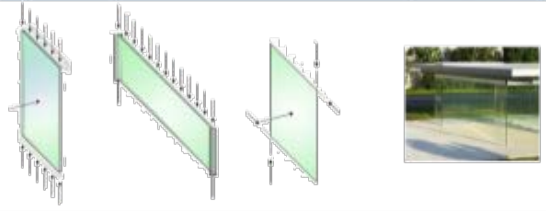
TS 19100 – Vidrio estructural

General overview of the Evolution of prCEN/TS 19100: Design of glass structures

2020-09-02

Issue 1
Date: 02/09/2020

Scope and content, key items

part 1 Principles and Materials	• "Design philosophy" • Glass types, strengths and characteristics • Interlayers and its features	
part 2 Design of out-of-plane loaded glass components	• Elements that do not transfer loads from superordinated structure • Out-of-plane loading (only)	
part 3 Design of in-plane-loaded glass components and their mechanical joints	• Elements that also transfer loads from superordinated structure • Out-of-plane loading • In-plane loading	

Issue 1
Date: 02/09/2020

5

2020-09-02

TS 19101 – Compuestos con fibras

CEN/TC 250

Date: 2021 -10

CEN/TS 19101: 2021

Secretariat:

Design of fibre-polymer composite structures

COMMENTARY TO

FprCEN/TS 19101: 2021

"Design of fibre-polymer composite structures"

BACKGROUND DOCUMENTS IN SUPPORT TO THE IMPLEMENTATION, HARMONIZATION AND FURTHER DEVELOPMENT OF THE EUROCODES

J. R. Correia | T. Keller | J. Knippers | J. T. Mottram | C. Paulotto | J. Sena-Cruz | L. Ascione

31 MARCH 2022

TS 19102 – Membranas a tracción

Background Document SaP report

CEN/TC 250

Date: 2002-09-08

FprCEN/TS 19102

Secretariat: BSI

Design of tensioned membrane structures

1 Introduction and general

1.1 Placement of a Eurocode on membrane structures

Membrane structures made from technical textiles or foils are increasingly present in the urban environment. They are all summarized in the term 'Textile Architecture'. Whereas membrane structures were, decades ago, mainly built as – highly curved – roofs because they are able to economically and attractively span large distances (such as sports facilities), an evolution towards a much wider scope of applications is noticeable today. Textile architecture in the built environment can nowadays be found in a variety of structural skins, ranging from private housing to public buildings and spaces. This may be in the form of small scale canopies (to provide solar shading or protection against rain), in performance enhancing façades (such as dynamic solar shading, foils replacing glass elements and acting as substrates for solar energy harvesting systems), roof constructions (to protect archaeological sites, market places, bus stations…) and formwork for light shell structures, see exemplary Figure 1-1.

Trichterschirm Montabaur, Germany, source and ©: formTL ingenieure für tragwerk und leichtbau GmbH

Swimming Center, Peking, China, source: Vector Foiltec GmbH, © Werner Huthmacher

Media TIC, Barcelona, Spain, source and ©: Vector Foiltec GmbH

Campus Luigi Einaudi Turin, Italy, source: formTL ingenieure für tragwerk und leichtbau GmbH, © Michele D'Ottavio

Zénith de Strasbourg, France, source and ©: formTL ingenieure für tragwerk und leichtbau GmbH

Gare de Bellegarde, Bellegarde, France, source: Vector Foiltec GmbH, © Andreas Braun

Figure 1-1 Modern membrane structures

Tensioned membrane constructions have unique properties that other, more conventional building elements often do not possess simultaneously, such as low self-weight, high flexibility, deformability, translucency and the capability of forming architecturally expressive shapes that enhance the urban environment. In addition, membrane structures are known to be 'optimal' since they are only loaded in tension and adapt their shape to the flow of forces. Hence, they use a minimal amount of material to cover a space. Typical shapes are synclastic and anticlastic forms, in some cases also flat structures are built like façades, which are presented in Figure 1-2. Generally, synclastic structures are pneumatically and flat and anticlastic structures are mechanically prestressed.

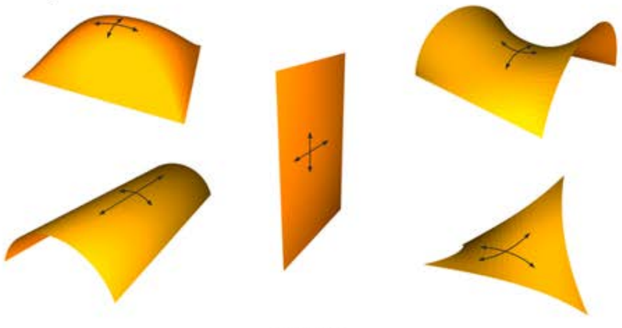


Figure 1-2 Typical shapes of membrane structures [US13a]

In most cases membrane structures consist of a primary and secondary structure. The primary structure is the supporting structure which is in most cases a steel structure but can also be made of aluminium, timber or concrete. The secondary structure is the textile membrane or foil structure possibly reinforced by cables or belts. Only for air supporting halls or when inflatable beams are used, the primary and secondary structures may be both made of textile fabrics or foils. In cases of different materials for the primary and secondary structures the design of these structures has to be performed using design rules which are matched for different materials, e.g. steel-membrane or timber-membrane, to achieve the same safety level and reliability. This is one of the main reasons for which a harmonized European standard for the design of membrane structures is required which would rely on the principles of existing Eurocodes.

However, at present only few national design codes for specific types of membrane structures, such as air halls, are available in some European countries, despite of a considerable amount of scientific knowledge of the structural behaviour. For this reason, the industry desired a comprehensive European design code in order to

- provide verification techniques representing the latest state of the art and recognized research,
- provide a common pool of design approaches and
- achieve a harmonized safety level.

TS 17440 – Estructuras existentes -> EN 1990-2

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

FINAL DRAFT
FprCEN/TS 17440

January 2020

ICS 91.010.30

English Version

Assessment and retrofitting of existing structures

CEN/TC 250

Date: 2023-07

…rEN 1990-2:2023

Secretariat: BSI

Eurocode — Basis of structural and geotechnical design — Part 2: Assessment of existing structures

Date: 28 November 2025

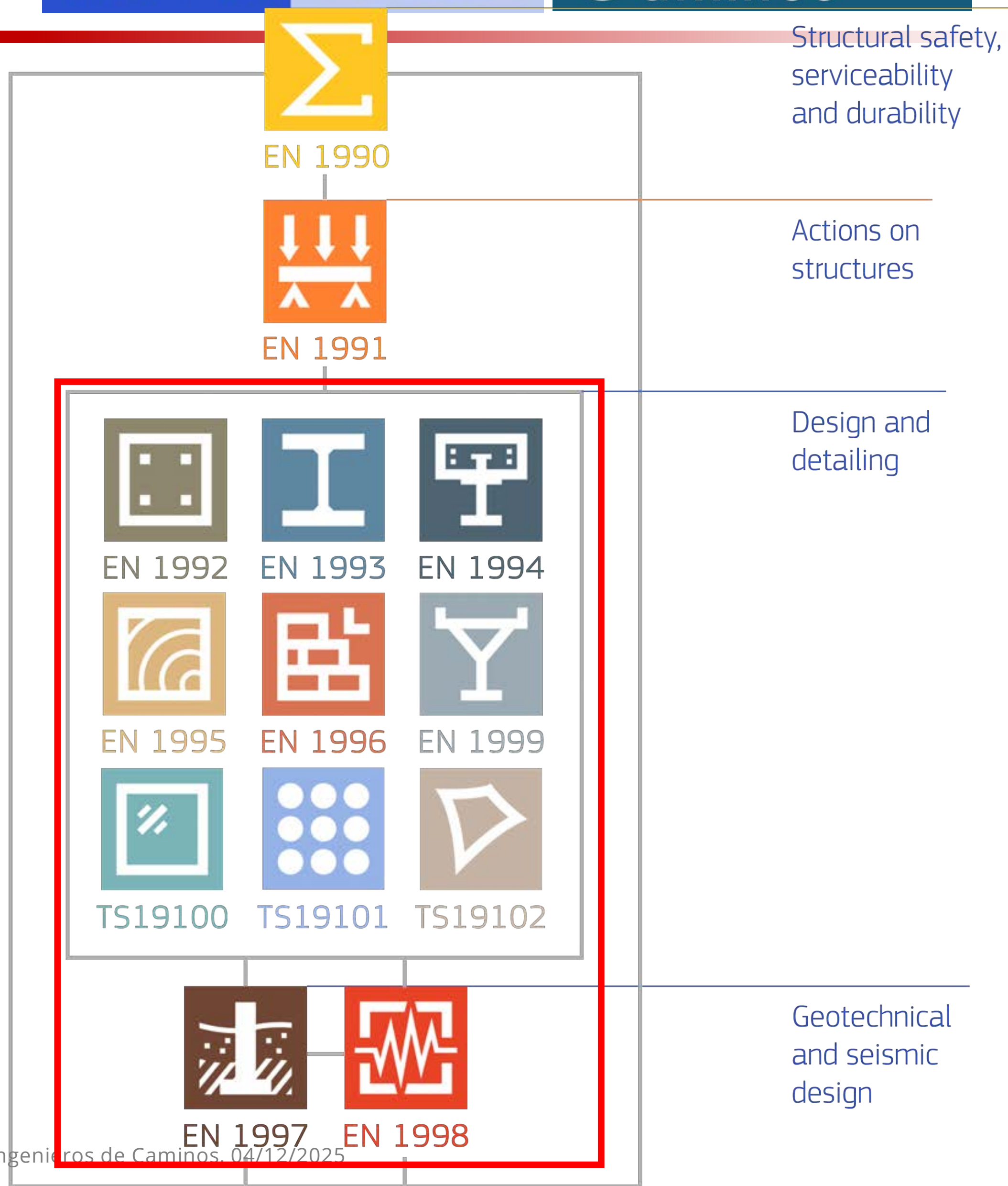
To the Members of CEN/TC 250 Structural Eurocodes

Secretariat of CEN/TC 250
Email: tracey.wilkins@bsigroup.com

Subject: Ballot result - Formal Vote FprEN 1990-2 Eurocode — Basis of structural and geotechnical design — Part 2: Assessment of existing structures - **APPROVED**

TS – Complementarias a EC's

- TS 1993-1-101: método alternativo de interacción para flexión y compresión
- TS 1994-1-101: estructuras compuestas con piel doble o única
- TS 1994-1-102: dovelas compuestas
- TS 1995-1-101: proyecto asistido por métodos numéricos
- TS 1998-1-101: caracterización por ensayos cíclicos



Contenido

1. Eurocódigos 2G
2. TS - *Technical Specifications* prenormativas y complementarias
3. **Recursos y *Technical Reports* JRC**
4. TR - *Technical Reports* CEN
5. Conclusiones

Difusión y Comunicación - JRC

- Plan de comunicación de Eurocódigos conjunto con JRC:
  - Guías e Informes técnicos, con bases, explicaciones, ejemplos…
  - Videos cortos de información
  - Podcasts y diapositivas resumiendo principales cambios
  - Webcast de explicación de los EC's 2G

Communications plan

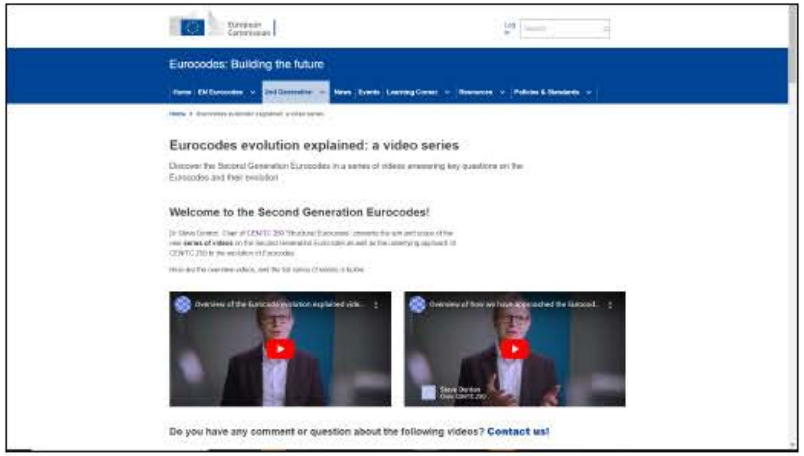
- Strong collaboration with JRC on communications
- Three series of material anticipated

1. General information on Eurocode evolution programme, objectives and approach - Video ← Launched via JRC website 'Eurocode evolution explained'

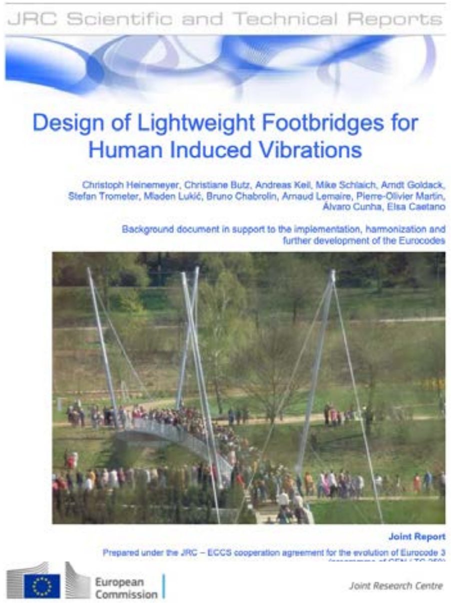
2. General overview of key technical changes to each Eurocode – Podcast plus slide decks ← Slide decks already available

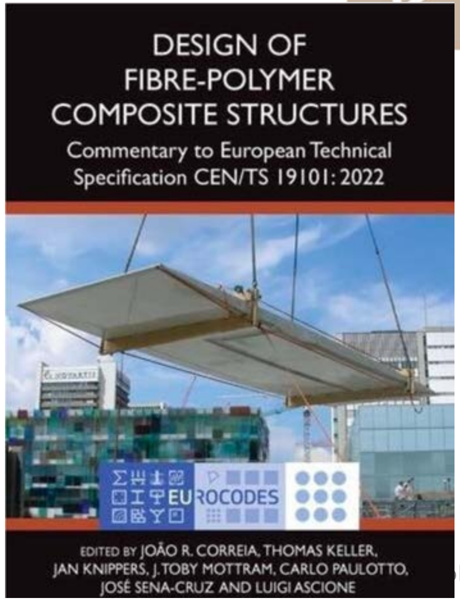
3. Detailed technical (training) webcasts on 2nd Generation Eurocodes - Webcast

https://eurocodes.jrc.ec.europa.eu/2nd-generation/eurocodes-evolution-explained-video-series

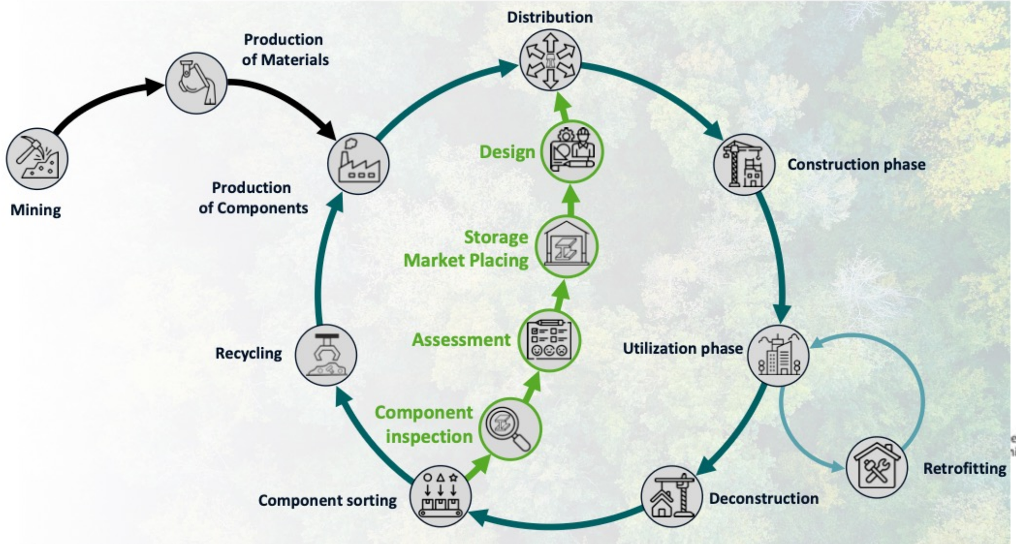


Difusión y Comunicación – JRC
Guías e Informes técnicos

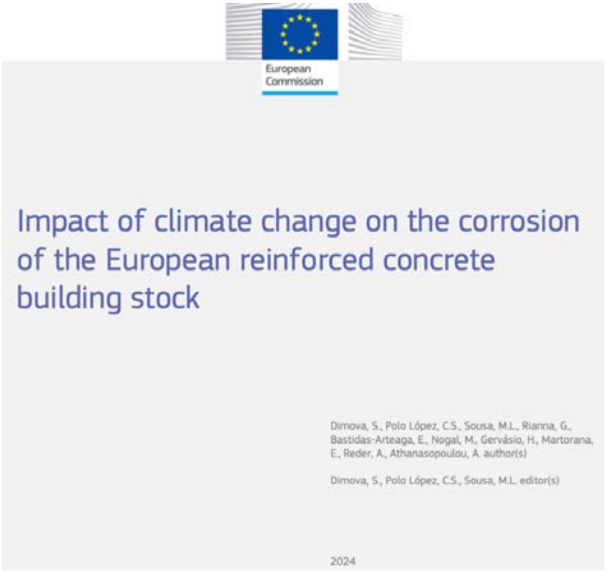




Reuse (20 Nov 2025)



Difusión y Comunicación – JRC
Guías e Informes técnicos


European Commission

Impact of climate change on the corrosion of the European reinforced concrete building stock

Dimova, S., Polo López, C.S., Sousa, M.L., Rianna, G., Bastidas-Arteaga, E., Nogal, M., Gervásio, H., Martorana, E., Reder, A., Athanasopoulou, A. author(s)

Dimova, S., Polo López, C.S., Sousa, M.L. editor(s)

2024


European Commission

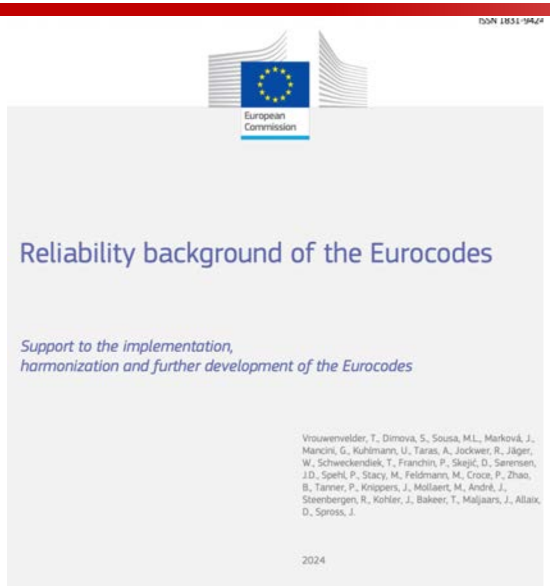
Guidance on the design for structural robustness

Support to the implementation, harmonization and further development of the Eurocodes

Andre, J., Anghileri, M., Belletti, B., Biondini, F., Caspeele, R., Demonceau, J., Izzuddin, B., Martinelli, P., Molkens, T., O'Connor, A., Parisi, F., Sio, J., Sousa, M.L., Thienpont, T.

Edited by: Caspeele, R., Thienpont, T., Sousa, M.L.

2024


ISSN 1831-9424

European Commission

Reliability background of the Eurocodes

Support to the implementation, harmonization and further development of the Eurocodes

Vrouwenvelder, T., Dimova, S., Sousa, M.L., Marková, J., Mancini, G., Kuhlmann, U., Taras, A., Jockwer, R., Jäger, W., Schweckendiek, T., Franchin, P., Skejić, D., Sørensen, J.D., Spehl, P., Stacy, M., Feldmann, M., Croce, P., Zhao, B., Tanner, P., Knippers, J., Mollaert, M., André, J., Steenbergen, R., Kohler, J., Bakeer, T., Maljaars, J., Allaix, D., Spross, J.

2024


ISSN 1831-9424

European Commission

Reliability-based verification of limit states for geotechnical structures

Guidelines for the application of the 2nd generation of Eurocode 7: Geotechnical design

van Den Eijnden, B., Knuuti, M., Lesny, K., Löfman, M., Mavritsakis, A., Roubos, A., Schweckendiek, T., Sciarretta, F., Ebener, A., Escher, K., Spross, J., Commend, S., Hehenkamp, M., Arnold, P., Wilhelm, S., Ene, A., Rimoldi, P., Pereira, R.

Edited by Schweckendiek, T.

2024


European Commission

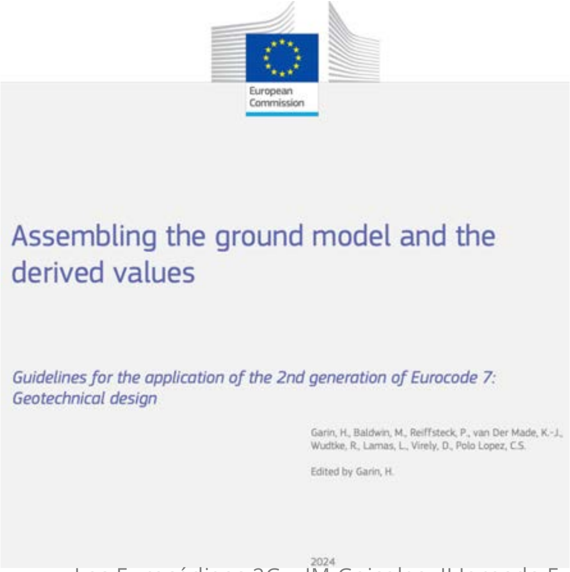
Implementation of Design during Execution & Service Life

Guidelines for the application of the 2nd generation of Eurocode 7: Geotechnical design

Bogusz, W., Caplane, C., Hard, D., Idda, K., Ingram, P., Kanty, P., Kushwaha, A., Nayrand, N., Sand, O., Sciarretta, F., Tsitsas, G., Vogt, H.

Edited by Hard, D.

2024


European Commission

Assembling the ground model and the derived values

Guidelines for the application of the 2nd generation of Eurocode 7: Geotechnical design

Garin, H., Baldwin, M., Reiffsteck, P., van Der Made, K.-J., Wudtke, R., Lamas, L., Virely, D., Polo Lopez, C.S.

Edited by Garin, H.

2024


European Commission

Determination of representative values from derived values for verification with limit states with EN 1997

Guidelines for the application of the 2nd generation of Eurocode 7: Geotechnical design

Orr, T., Sorgatz, J., Estaire, J., Prästings, A., D'Ignazio, M., Andries, J., Ene, A., Polo Lopez, C.S.

Edited by Estaire, J.

2025

Contenido

1. Eurocódigos 2G
2. TS - *Technical Specifications* prenormativas y complementarias
3. Recursos y *Technical Reports* JRC
4. **TR - *Technical Reports* CEN**
5. Conclusiones

TR 16949 – Parapetos peatonales

TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CEN/TR 16949

June 2016

ICS 13.200; 93.080.30

Supersedes CEN/TR 1317-6:2012

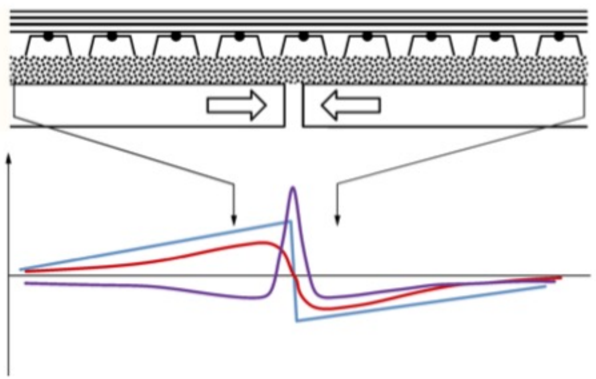
English Version

Road restraint system - Pedestrian restraint system - Pedestrian parapets

TR 17231 – Interacción puente-vía

Norma Española
UNE-CEN/TR 17231:2018
Idioma: Inglés

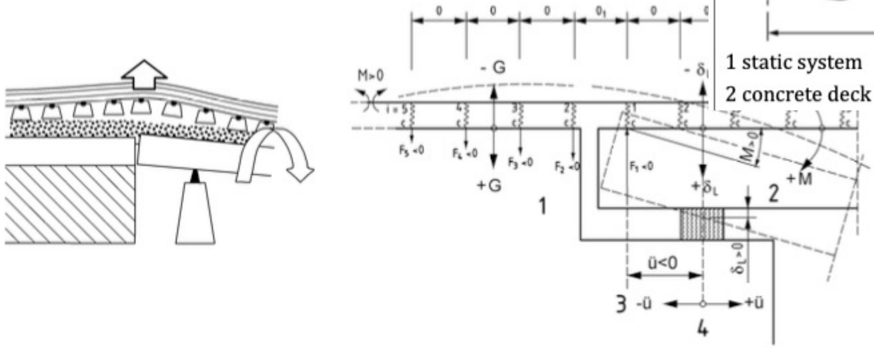
Eurocódigo 1: Acciones en estructuras. Cargas de tráfico en puentes. Interacción vía-puente (Ratificada por la Asociación Española de Normalización en abril de 2019.)



Key

1 displacement / stress
rail displacement
deck displacement
rail stress

Figure 4 — Effect of longitudinal joint movement on rail stress

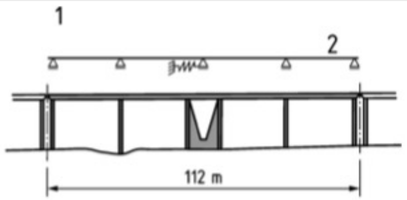
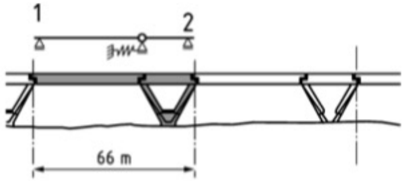


Key

1 abutment
2 bridge deck
3 last rail fastening position on deck
4 axis of bridge bearing

$\delta = \delta_L + \varphi \cdot \ddot{u}$

Figure 6 — Effect of bridge deck end rotation

Example 1: Gänsebachtalbrücke HSL Erfurt-Leipzig/Halle (Germany)	**Example 2:** Viaduc de la savoureuse HSL Rhin-Rhône (France)
 Photograph © MarxKrontal	 Photograph © SNCF
 1 static system 2 concrete deck	 1 static system 2 steel deck

TR DIBRST – Dinámica puente-tren

CEN/TC 250

Date: 2025-11

prCEN/TR 00250291:2025

Secretariat: XXX

Dynamic interface between Railway Bridges and Rolling Stock — State of the art report

TR DIBRST – Dinámica puente-tren

a) span 8 m

b) span 10 m

Figure 12 — portal frame structures under HS line Madrid-Valladolid

6.2.4.2 Features influencing dynamic behaviour

Portal frame bridges as a general rule do not experience excessive dynamic effects from traffic actions and no cases of excessive dynamic system responses due to traffic loads in construction practice were reported. In general vibrations and dynamic effects in portal frames are lower than in alternative simple decks. Accelerations generally do not exceed limit values defined in EN 1990:2023, Annex A. However excessive vibrations may occur in particular cases and should not be excluded.

Below are listed some of the main specific features affecting the dynamic behaviour of portal frames, among others:

— Models representing reasonably correct dynamic behaviour may be complex: 3D finite elements with non-reflecting boundary elements (Figure 13). Such models are not common in standard engineering design calculations or may exceed the budget. Simplified approaches attempt to represent the boundary through dynamic bedding moduli.

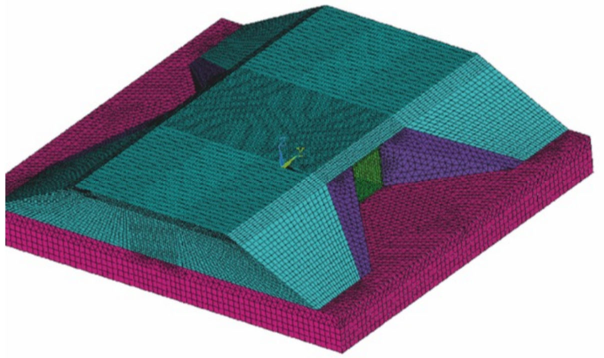


Figure 13 — 3D Finite Element model with non-reflecting boundaries and different materials

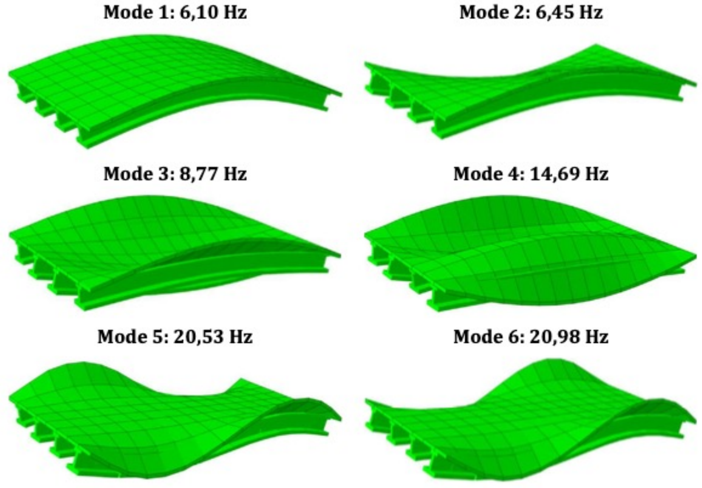


Figure 24 — First 6 modes of vibration $\phi_n(x)$ and frequencies, for a 3D model of a railway bridge deck (span L=20 m, width b=10,70 m).

Modes of vibration may also be evaluated through experimental methods, such as Operational Modal Analysis (OMA). These allow to calibrate certain parameters of the structure which may be not well known, and updating the Finite Element numerical models. In Figure 25 results are shown for a real case of a representative high speed railway bridge.

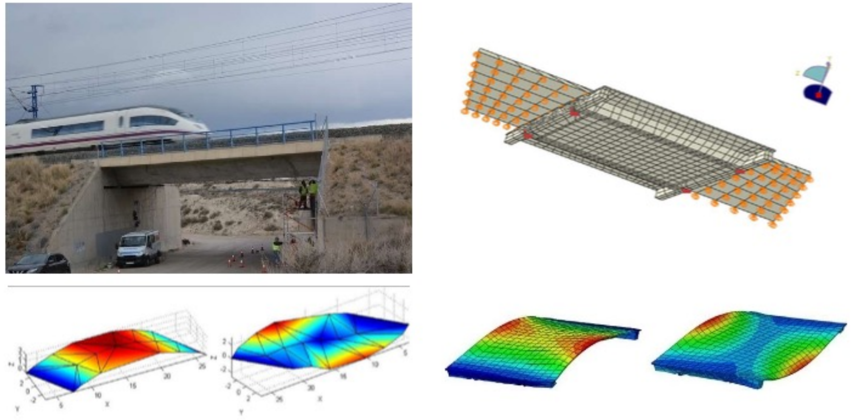


Figure 25 —First modes of vibration of railway bridge evaluated by experimental methods (Operational Modal Analysis, OMA) and Finite Element model.

TR DIBRST – Dinámica puente-tren

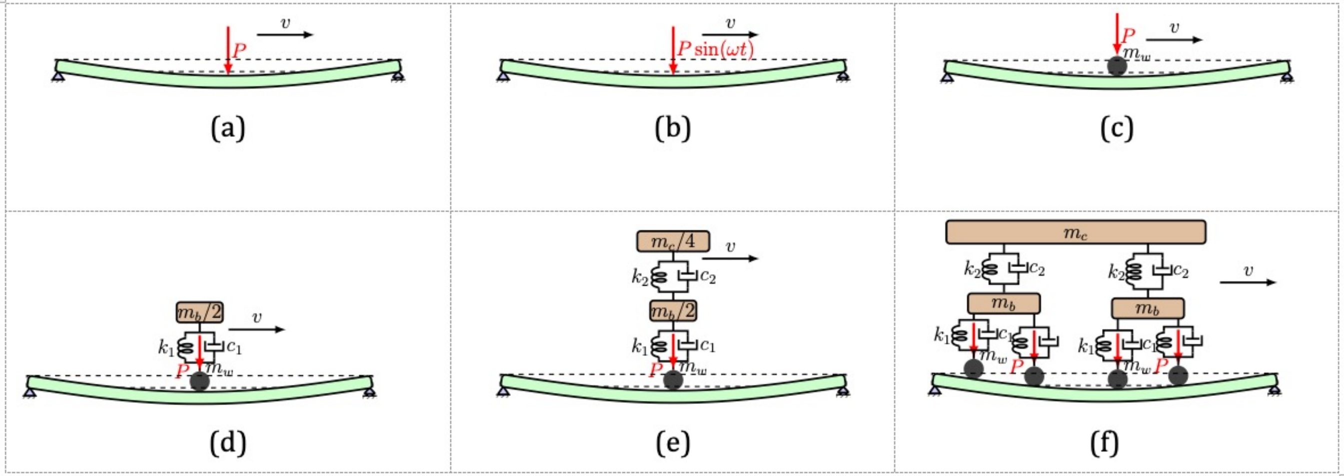


Figure 66 — Vehicle-Bridge Interaction models (VBI) for vertical dynamics: (a) moving loads, (b) moving harmonic loads, (c) unsprung moving mass (wheel axles), (d) simplified model of primary suspension (half bogie), (e) simplified model of primary and secondary suspension (quarter vehicle), (f) full vehicle model.

Contenido

1. Eurocódigos 2G
2. TS - *Technical Specifications* prenormativas y complementarias
3. Recursos y *Technical Reports* JRC
4. TR - *Technical Reports* CEN
5. **Conclusiones**

Conclusiones

- Conjunto **completo y coherente** de normativa, para todos los materiales y estructuras, con **métodos comunes a toda Europa** y con aceptación y prestigio internacional
- Importante **participación española**, pero...
- debe **aumentar el compromiso de las empresas e instituciones**
- Permiten **unificar y dar coherencia en España** al proyecto y evaluación de estructuras con todo tipo de materiales y geotecnia
- **Nuevos desarrollos** (**TS**: vidrio, membranas, compuestos, estructuras existentes...) y guías consensuadas extensas (**TR**)
- **Oportunidades** nacionales/internacionales para empresas constructoras, ingenierías etc.

Conclusiones

¡Gracias por la atención!

¿Preguntas?