Chapter 1
General principles

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Article 1 Objective

This Structural Code is the regulatory framework setting out the requirements that concrete structures, steel structures and composite steel and concrete structures must meet in order to satisfy the further requirements on structural and fire safety, environmental protection and efficient use of natural resources, and providing procedures to demonstrate compliance with adequate technical guarantees.

The requirements must be met in both the design and the construction of the structures, as well as in their maintenance. In addition, the bill also sets out criteria for managing existing structures over their useful life.

This Code assumes that the design, construction, control and maintenance of structures falling under its scope shall be performed by technicians and operators with the required knowledge and adequate experience. Moreover, these structures are expected to be used for the purpose for which they were designed and to be adequately maintained by the owner throughout their useful life.

Article 2 Scope

This Structural Code shall apply to all structures and structural elements made from concrete, steel of concrete/steel composites, with the exceptions indicated for specific cases in Articles 26, 79 and 109.

If specific regulations on actions exist, this Code shall apply in full to the former.

In general, it shall apply to all new construction works. If in view of the characteristics of the work, defined by the owner, the structure may be regarded as a special or unique work, this Code shall apply with the amendments and additions set out by the project designer to meet the requirements detailed there, with the same level of guarantee.

In addition, it shall be used for any work on or deconstruction of existing structures, in accordance with the criteria defined and the limits set out in the articles.

Article 3 General considerations

All parties involved in the design, construction, control and maintenance of the structures falling under this Code shall be familiar with and shall apply this Code.

To ensure that a structure meets the requirements set out in Article 5 of this Code, the parties involved shall verify compliance with the requirements set out there for the design, execution, control and maintenance of the structure.

To demonstrate compliance of the structure with the requirements set out in this Code, with the conformity of property, the project designer and project management shall:

a) adopt technical solutions according to the procedures as per this Code, whose application is adequate to demonstrate compliance with the requirements set out in this Code; or

b) for dimensioning and verification of the structure in the design, adopt the procedures set out in the Eurocodes indicated below, along with the corresponding National Annexes published on the website of the Ministry of Public Works, whose application may be regarded as a means of demonstrating compliance with the requirements set out in this Code, and in any case within its scope and according to the other specific standards that apply:

    a. UNE-EN 1990:2003 and UNE-EN 1990:2003/A1:2010 - Eurocodes: Basis of structural design;
    b. UNE-EN 1992-1-1:2013 and UNE-EN 1992-1-1:2013/A1:2015 - Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings;
    c. UNE-EN 1992-1-2:2011 - Eurocode 2: Design of concrete structures - Part 1-2: General rules - Structural fire design;
    d. UNE-EN 1992-2:2013 - Eurocode 2: Design of concrete structures - Part 2: Concrete bridges - Design and detailing rules;
    e. UNE-EN 1993-1-1:2013 and UNE-EN 1993-1-1:2013/A1:2014 - Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings;
    f. UNE-EN 1993-1-2:2016 - Eurocode 3: Design of steel structures - Part 1-2: General rules - Structural fire design;
    g. UNE-EN 1993-1-4:2012 - Eurocode 3: Design of steel structures - Part 1-4: General rules - Supplementary rules for stainless steels;
    h. UNE-EN 1993-1-5:2013 UNE-EN 1993-1-5:2013/A1:2019 y UNE-EN 1993-1-5:2013/A2:2020 - Eurocode 3: Design of steel structures - Part 1-5: Plated structural elements;
    i. UNE-EN 1993-1-8:2013 - Eurocode 3: Design of steel structures - Part 1-8: Design of joints;
    j. UNE-EN 1993-1-9:2013 - Eurocode 3: Design of steel structures - Part 1-9: Fatigue;
    k. UNE-EN 1993-1-10:2013 - Eurocode 3: Design of steel structures - Part 1-10: Material toughness and through-thickness properties;
    l. UNE-EN 1993-2:2013 - Eurocode 3: Design of steel structures - Part 2: Bridges;
    m. UNE-EN 1994-1-1:2013 - Eurocode 4: Design of composite steel and concrete structures - Part 1-1: General rules and rules for buildings;
    n. UNE-EN 1994-1-2:2016 - Eurocode 4: Design of composite steel and concrete structures - Part 1-2: General rules - Structural fire design;
    o. UNE-EN 1994-2:2013 - Eurocode 4: Design of composite steel and concrete structures - Part 2: General rules and rules for bridges.

, or

c) adopt alternative solutions that deviate, in whole or part, from the procedures as per this Code; for this, the project designer and project management may adopt alternative solutions (using different systems of design and detailing rules, control procedures, etc.) within their powers, under their personal responsibility and with the approval of the owner, provided that documentary evidence shows that the

structure meets the requirements of this Code because its performance levels are at least equivalent to those that would be attained by applying the procedures of this Code.

Article 4 General conditions

4.1 Administrative conditions

Goods legally marketed in another Member State of the European Union, in Turkey, or originating in a State of the European Free Trade Association signatory to the Agreement on the European Economic Area and legally marketed in it, are considered to comply with this Code, even when they do not meet the technical conditions established therein, provided that, as indicated in section 3.c of the same, they ensure a level equivalent to that required by this Code, in terms of safety and the use for which they are intended. The application of this measure is subject to Regulation (EU) No. 2019/515 of the European Parliament and of the Council, of March 19, 2019, regarding the mutual recognition of goods legally marketed in another Member State and which repeals the Regulation (CE) nº764/2008).

For the purpose of this Code, the UNE, UNE-EN or UNE-EN ISO standards referred to in the articles always refer to the versions listed in Annex 1, except where UNE-EN standards transpose EN standards whose reference has been published in the Official Journal of the European Union, in application of Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products, in which case the indication shall refer to the latest European Commission Communication including said reference. In cases of standards on test methods referenced in the harmonised standards, the version included in the harmonised UNE-EN standards listed above shall apply.

The standards specified in this Code may be replaced by others used by any other EU Member State or party to the Agreement on the European Economic Area or any country party to a customs Association Agreement with the European Union, provided that it is shown that they have equivalent technical specifications.

Voluntary quality marks that facilitate compliance with the requirements of this Code may be recognised by the relevant competent Public Authorities in any State in the European Economic Area and may refer to products, construction processes or sustainability criteria.

Marks officially recognized in another Member State of the European Union, in Turkey, or originating in a State of the European Free Trade Association signatory to the Agreement on the European Economic Area, which may refer to the products, to the processes for their construction or to the consideration of sustainability criteria, are considered to comply with this Code, even when they do not meet the technical conditions established therein, provided that they ensure a level equivalent to that required by this Code, in terms of safety and the use to which they are intended. The application of this measure is subject to Regulation (EU) No. 2019/515 of the European Parliament and of the Council, of March 19, 2019, regarding the mutual recognition of goods legally marketed in another Member State and by which repeals the Regulation (CE) nº764/2008.

In accordance with article 8.3 of Regulation (EU) No. 305/2011, of March 9, 2011, for construction products covered by a harmonized standard or by a european technical evaluation, officially recognized marks (both quality and sustainability) do not may certify compliance with the declared benefits with regard to the essential characteristics, nor with the benefits related to any essential characteristic related to the basic requirements included in Annex I of Regulation (EU) 305/2011, of March 9 from 2011.

4.2 Technical conditions for conformity with this Code

4.2.1 Technical conditions for products, equipment and systems

The materials and construction products permanently integrated into structures (concrete, structural steel, cement, aggregates, corrugated steel, fabricated reinforcements, prestressing systems, prefabricated elements, etc.) shall have adequate characteristics so the structure meets the requirements of this Code, which in turn requires verification of their conformity as per the general criteria set out in Chapter 5, as well as the criteria specific to each structure type as per Chapters 12, 13, 14, 22, 23, 24, 32, 33 and 34.

The characteristics of any materials used to manufacture the products referred to in the preceding paragraph shall enable the finished products to meet the requirements of this Code, which in turn requires them to meet the specifications set out for the materials in question.

4.2.2 Technical design conditions

The design shall describe the structure, justify the selected solution and detail the technical requirements for the execution works in adequate detail for their assessment and unambiguous interpretation during execution.

In particular, the design shall specify the planned works in adequate detail for explicit verification that the selected solutions meet the requirements of this Code and any other applicable technical regulations. This specification shall include at least the following information:

- the technical characteristics of each work unit, indicating its execution conditions and the checks and inspections to be conducted to verify its conformity with the design specifications;
- the minimum technical characteristics for the products, equipment and systems permanently integrated into the planned structure, as well as their supply conditions, quality guarantees and acceptance checks to be conducted;
- in view of the possible further technical and traceability guarantees that quality marks may offer, the project designer shall assess inclusion of a requirement to use materials, products and processes that bear an officially recognised quality mark in the special technical specifications;
- any required load checks and tests on the completed structure;
- instructions for use and maintenance of the structure; and

- any criteria for demolition, recycling, etc., after the end of the useful life of the structure.

4.2.3 Technical execution conditions

The execution works for the structure shall be performed in accordance with the design and the amendments approved by project management, under its responsibility and within its powers, and if applicable with the approval of the owner. In addition, they shall meet the instructions of project management, the applicable regulations and the standards of good building practice.

The construction stage shall include the checks required to verify the conformity of execution processes, the materials and products received on-site and those prepared on-site for permanent integration into the structure. This shall also include verification of the ancillary means used to execute the structures, such as falsework and shoring.

In view of the guarantee criteria set out in the subparagraph above, project management shall evaluate the appropriateness of requiring products and processes bearing an officially recognised quality mark.

During execution of the works, the contractor shall prepare the documents required by law, including at least a report indicating the main execution incidents, a set of drawings showing the final condition of the works as built and the documentation from the quality control conducted during the works, all in accordance with the design specifications and the provisions of this Code. This documentation shall be submitted to project management which, after approval, shall forward it to the owner as part of the final works documentation.

Article 5 Requirements on structures

5.1 Requirements

In accordance with the applicable regulations, and to guarantee the safety of persons, animals and property, social welfare and environmental protection, structures falling under this Code, in their entirely or in their separate parts, shall be suitable for use throughout the entire useful life for which they were designed. For this, without prejudice to the provisions of Section 2 of Annex 18, the following requirements shall be met:

- structural safety and functionality, consisting in reduction – to an acceptable level – of the risk of inadequate mechanical behaviour of the structure under the foreseeable actions and forces to which it may be subject during its construction and planned use, for its entire useful life;
- fire safety, consisting in reduction – to an acceptable level – of the risk of injuries to users of the structure due to an accidental fire;
- hygiene, health and environmental protection according to the specific relevant regulations;
- in particular, use of natural resources by acquisition of secondary and recycled materials in construction works is recommended, as is reuse and recyclability of the works, their materials and components after demolition.

Satisfaction of the above requirements requires compliance with the provisions set out in this article. For verification, in some cases it shall suffice to apply the procedures indicated in this Code, while other cases shall also require compliance with other more detailed regulations applicable according to the use of the structure.

The owner may also impose other additional requirements, such as on appearance, in which case the provisions associated with satisfaction of aforementioned additional requirements, as well as their verification criteria, shall be identified before project implementation.

The above requirements shall be met by way of a design that includes a suitable selection for the structural solution and building materials, careful execution in accordance with the design, adequate verification of the design and execution, as well as proper operation, use and maintenance.

In cases of works on an existing structure, the requirements shall be set by the owner, which may choose between various alternatives:

a) relax the requirements that applied to the structure at the time of the original design because the requirements on the structure have become less stringent over time (such as for insurance, a bridge for road or rail traffic that becomes a footbridge, a structure that changes to a use with a lower maximum permissible load, etc.);

b) apply the requirement set at the time of the original design of the structure, so it continues to meet the permissible criteria until the end of the planned useful life of the structure;

c) have the structure meet the requirements that would apply to a newly built structure, for a useful life that could be the initially planned useful life, or even a longer one based on the works; or

d) any situations intermediate between the above.

5.1.1 Useful life

In any case, before the start of the project, the owner shall specify the nominal useful life of the structure, which must meet the provisions of any relevant special regulations or, barring this, those of Annex 18.

The ‘nominal useful life’ (or simply ‘useful life’) of a structure shall mean the period of time, starting from its execution end date, over which it must continue to meet the requirements. During this time period, it shall require normal conservation that does not entail extraordinary works not indicated in the maintenance plan.

A shorter useful life may be applied for the structural elements making up the structure, according to the element type, replaceability and execution conditions.

The nominal useful life, t_L, defined in this manner is a design value for keeping compliance above certain thresholds.

The ‘actual useful life’ shall be the period of time actually lapsed from the completion date of the structure to the time when any of the acceptability thresholds are reached for the requirements.

In cases of existing structures whose actual useful life is less than the nominal useful life, the ‘useful life deficit’ shall be the difference between the two values. In the latter

case, the owner shall assess which works are required on the existing structure to allow it to reach its initially planned nominal useful life.

The ‘remaining useful life’ of a structure is the period of time, starting from the assessment date, over which it must maintain its performance level above the permissible thresholds.

5.2 Requirements

The requirements on any structure falling under this Code in order to meet the further requirements indicated in paragraph 5.1 are those set out below.

5.2.1 Requirements for structural safety and functionality

To meet the corresponding further requirement, the structures shall be designed, built, controlled and maintained so they meet certain minimum reliability levels for each of the requirements set out in the paragraphs below, in accordance with the safety system covered in Annexes 18 to 32.

Compliance with this Code, along with the applicable special regulations, shall suffice to ensure compliance with this further structural security requirement.

5.2.1.1 Strength and stability requirement

The strength and stability of the structure shall be adequate to avoid unacceptable risks due to foreseeable actions and forces, both during the execution stage and during use, and to maintain it throughout its planned useful life.

The general minimum reliability for structures falling under this Code shall be defined by reliability class RC2 under those specified in Section B.3.2 of Annex 18. Therefore, the reliability index for the reference period of 50 years shall be no less than 3.8. In cases of unique or minor structures, the Owner may apply different indexes consistent with the possible types of consequences and in accordance with the provisions in the aforementioned section of Annex 18.

The procedures included in this Code by verification of the Ultimate Limit States, along with the other criteria for execution and control, enable compliance with this requirement.

5.2.1.2 Serviceability requirement

Serviceability shall be in accordance with the intended use of the structure to prevent unacceptable deformations, keep any risk of dynamic behaviour impermissible for user comfort to an acceptable level, and prevent unacceptable degradation and cracking.

The structure shall be deemed to have acceptable deformations if it meets the deflection limits set out in the applicable special regulations.

The structural element shall be deemed to have acceptable vibrations if it meets the limits set out in the applicable special regulations.

The procedures included in this Code by verification of the Service Limit States, along with the other criteria for execution and control, enable compliance with this requirement.

The minimum reliability for structure serviceability shall be defined by reliability class RC2 for those specified in Section B.3.2 of Annex 18.

Therefore, the reliability index for a reference period of 50 years shall be no less than 1.5.

5.2.1.3 Robustness and redundancy requirement

The structures included in this Code shall be designed so extraordinary events do not have consequences that are disproportionate to the root cause.

If the owner specifies such, the design shall include selection of a structural scheme and conceptual design to ensure that accidental loss of an element or limited part of the structure shall result in proportionate and limited damage, so the rest of the structure that is not affected can ensure minimum stability.

The procedures included in this Code are not adequate to meet this requirement.

5.2.1.4 Durability requirements

The design shall include a durability strategy to reach the nominal useful life determined for the structure. This strategy shall be reviewed during execution and shall set out conditions on maintenance during the service phase.

5.2.2 Requirements for fire safety

For fire safety, where applicable, the works shall be designed, built, controlled and maintained so they meet a series of requirements, including fire resistance of the structure.

Thus, compliance with this Code is not adequate to meet this further requirement, as the provisions of the other applicable regulations must also be met.

5.2.2.1 Requirement for fire resistance of the structure

The structure shall maintain its fire resistance for the time period set out in the applicable special regulations, to limit fire spread and facilitate occupant evacuation and firefighting and emergency response operations.

In cases of building structures, the provisions of Basic Document DB-SI of the Technical Building Code gives the fire resistance requirements for each structural element.

Compliance with this Code shall be adequate to meet this requirement, without prejudice to the other applicable special regulations.

5.2.3 Requirements for hygiene, health and the environment

The structures shall be designed, built, controlled and maintained to meet the requirement for environmental quality in execution.

5.2.3.1 Requirement for environmental quality in execution

Construction of the structure shall be planned and executed to minimise any resulting environmental impacts and waste.

In addition, work tasks on the existing structures, including those falling under maintenance, shall be specified, scheduled and performed according to the same criteria set out in the paragraph above.

5.2.3.2 Requirement for reuse and recyclability

If the owner deems such fitting, the design, construction and maintenance of the structure shall be geared towards its total or partial reuse and recycling after the end of its useful life. A special strategy shall be drawn up for this, according to the criteria set out in this Code.