European Commission

# Recent progress on climatic actions and seismic map developments in Turkey

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# Outline

- *Management on technical regulations*
- *Current status of Eurocodes*
- *Current practice on climatic actions*
- *Seismic code and hazard map*

# Management on technical regulations

*As the main authority, The Ministry of Environment and Urbanism (MoEU) is responsible in publishing and implementing the regulations on Construction Products (CPD-CPR 305/2011) ; drafting of legislation in the construction area, and also manages the national policy for introduction of design and construction codes, specifications etc. - drafting of construction policy,*

*Turkish Standardization Institute (TSE) adopts European Standards under the CPD/CPR - Structural Eurocodes, Harmonized ENs and Supporting ENs, including determination of the Nationally Determined Parameters in respect to specific geographic, climatic and seismic conditions.*

# Current status of Eurocodes in Turkey

| | | The EN part was translated in National language? | NDP | The EN part was pubslihed as National standard? | Turkish structural codes cite |
|---|---|---|---|---|---|
| **EN 1990: Basis of structural design** | | | | | |
| EN 1990 | BASE + buildings | Yes | No | Yes | NA |
| EN 1990 / A1 | | Yes | No | Yes | NA |
| **EN 1991: ACTION TO STRUCTURES** | | | | | |
| EN 1991-1-1 | ACTIONS loads | Yes | No | Yes | NA |
| EN 1991-1-2 | fire | Yes | No | Yes | NA |
| EN 1991-1-3 | snow | Yes | No | Yes | Yes |
| EN 1991-1-4 | wind | Yes | No | Yes | Yes |
| EN 1991-1-5 | temp | No | No | Yes | No |
| EN 1991-1-6 | exec | No | No | Yes | No |
| EN 1991-1-7 | accid | No | No | Yes | No |
| EN 1991-2 | traffic | No | No | Yes | No |
| EN 1991-3 | crane | No | No | Yes | No |
| EN 1991-4 | silo | No | No | Yes | No |
| **EN 1992: DESIGN OF CONCRETE STRUCTURES** | | | | | |
| EN 1992-1-1 | CONCRETE gen. | Yes | No | Yes | Partial |
| EN 1992-1-2 | fire | Yes | No | Yes | No |
| EN 1992-2 | bridge | No | No | Yes | No |
| EN 1992-3 | tanks | No | No | Yes | No |

# Current status of Eurocodes in Turkey

| | | The EN part was translated in National language? | NDP | The EN part was pubslihed as National standard? | Turkish structural codes cite |
|---|---|---|---|---|---|
| **EN 1993: DESIGN OF STEEL STRUCTURES** | | | | | |
| EN 1993-1-1 | STEEL general | Yes | No | Yes | Partial |
| EN 1993-1-2 | fire | Yes | No | Yes | No |
| EN 1993-1-3 | gauge | No | No | Yes | No |
| EN 1993-1-4 | stainless | No | No | Yes | No |
| EN 1993-1-5 | plane | No | No | Yes | No |
| EN 1993-1-6 | shell | No | No | Yes | No |
| EN 1993-1-7 | plates | No | No | Yes | No |
| EN 1993-1-8 | joints | No | No | Yes | Partial |
| EN 1993-1-9 | fatigue | No | No | Yes | No |
| EN 1993-1-10 | quality | No | No | Yes | No |
| EN 1993-1-11 | cable | No | No | Yes | No |
| EN 1993-1-12 | HS | No | No | Yes | No |
| EN 1993-2 | bridge | No | No | Yes | No |
| EN 1993-3-1 | tower | No | No | Yes | No |
| EN 1993-3-2 | chimney | No | No | Yes | No |
| EN 1993-4-1 | silo | No | No | Yes | No |
| EN 1993-4-2 | tanks | No | No | Yes | No |
| EN 1993-4-3 | pipes | No | No | Yes | No |
| EN 1993-5 | piling | No | No | Yes | No |
| EN 1993-6 | crane | No | No | Yes | No |

# Current status of Eurocodes in Turkey

| | | The EN part was translated in National language? | NDP | The EN part was pubslihed as National standard? | Turkish structural codes cite |
|---|---|---|---|---|---|
| **EN 1994: DESIGN OF COMPOSITE STEEL AND CONCRETE STRUCTURES** | | | | | |
| EN 1994-1-1 | COMPOSITE gen. | Yes | No | Yes | No |
| EN 1994-1-2 | fire | No | No | Yes | No |
| EN 1994-2 | bridge | No | No | Yes | No |
| **EN 1995: DESIGN OF TIMBER STRUCTURES** | | | | | |
| EN 1995-1-1 | TIMBER gen. | No | No | Yes | Yes |
| EN 1995-1-2 | fire | No | No | Yes | No |
| EN 1995-2 | bridge | No | No | Yes | No |
| **EN 1996: DESIGN OF MASONRY STRUCTURES** | | | | | |
| EN 1996-1-1 | MASONRY gen. | No | No | Yes | Yes |
| EN 1996-1-2 | fire | No | No | Yes | No |
| EN 1996-2 | material | No | No | Yes | Yes |
| EN 1996-3 | simple | No | No | Yes | No |
| **EN 1997: GEOTECHNICAL DESIGN** | | | | | |
| EN 1997-1 | GEOTECHNICS | No | No | Yes | Partial |
| EN 1997-2 | tests | No | No | Yes | Partial |
| **EN 1998: EARTHQUAKE RESISTANT DESIGN OF STRUCTURES** | | | | | |
| EN 1998-1 | EARTHQUAKE | Yes | No | Yes | Partial |
| EN 1998-2 | bridge | No | No | Yes | No |
| EN 1998-3 | repair | Yes | No | Yes | No |
| EN 1998-4 | silo etc | No | No | Yes | No |
| EN 1998-5 | foundations | Yes | No | Yes | No |
| EN 1998-6 | tower etc | No | No | Yes | No |
| **EN 1999: DESIGN OF ALUMINIUM STRUCTURES** | | | | | |
| EN 1999-1-1 | ALUMINIUM gen. | No | No | Yes | NA |
| EN 1999-1-2 | fire | No | No | Yes | NA |
| EN 1999-1-3 | fatigue | No | No | Yes | NA |
| EN 1999-1-4 | trapeze | No | No | Yes | NA |
| EN 1999-1-5 | shell | No | No | Yes | NA |

# Current status (actions) reported by Turkish Standards Insitute (TSE)

| QUESTIONNAIRE TO ASSESS CURRENT STATUS OF | | | |
|---|---|---|---|
| ELABORATION OF MAPS FOR CLIMATIC AND SEISMIC ACTIONS FOR STRUCTURAL DESIGN IN THE BALKAN REGION | | | |
| *Affiliation:* | Turkish Standards Institute | | |
| **Section & Clauses/Description** | **NATIONAL DETERMINED PARAMETERS** | | |
| | **Accepted** | **Modified** | |
| | | Value | Reason for modification |
| **EN 1991-1: ACTIONS ON STRUCTURES; Part 1-3: General Actions - Snow loads** | | | |
| 1.1 (2) Advice for the treatment of snow loads for altitudes above 1500 m | No NDP prepared/No decision taken yet | | |
| 1.1 (3) Identification of different locations. | No NDP prepared/No decision taken yet | | |
| …… | | | |
| **EN 1991-1: ACTIONS ON STRUCTURES; Part 1-5: General Actions - Thermal actions** | | | |
| 5.3 (2 Table 5.1) Values for $T_1$ and $T_2$ | No NDP prepared/No decision taken yet | | |
| 5.3 (2 Table 5.2) Values of the maximum shade air temperature $T_{max}$, minimum shade air shade temperature $T_{min}$, and solar radiation effects $T_3$, $T_4$, and $T_5$, | No NDP prepared/No decision taken yet | | |
| …… | | | |
| **EN 1998: Design of structures for earthquake resistance, Part 1: General rules, seismic actions and rules for buildings:** | | | |
| **Chapters 2 & 3: Ground conditions and seismic action** | | | |
| 2.1 (1 NOTE 1) Reference return period $T_{NCR}$ of seismic action for no-collapse requirement (or, equivalently, reference probability of exceedance in 50 years, $P_{NCR}$) | No NDP prepared/No decision taken yet | | |
| 2.1 (1 NOTE 3) Reference return period $T_{DLR}$ of seismic action for the damage limitation requirement. (or, equivalently, reference probability of exceedance in 10 years, $P_{DLR}$) | No NDP prepared/No decision taken yet | | |
| …… | | | |
| **EN 1998: Design of structures for earthquake resistance, Part 3: Assessment and retroffiting of buildings** | | | |
| 2.1 (3) Return period of seismic actions under which the Limit States should not be exceeded | | | |
| | **Total NDPs (relevant to seismic actions): 0** | | |
| | **Accepted NDPs (relevant to the seismic actions): 0** | | |
| | **Accepted NDPs [%] (relevant to the seismic actions): 0** | | |

# Current Codes-General view

***Building Structures***

*Structural Concrete Design: TS 500/2000 (ACI 318, CEB-fib)*

*Earthquake code /TDY2007 (IBC/ASCE, Eurocode)*

*Structural Steel Design (needs to be updated): TS 648/1980 (DIN 1030)*

*Masonary (needs to be updated): TS 2510/1977*

*Loads (needs to be updated): TS 498/1987 (DIN 1055)*

*Not available: Aluminium, Timber, Geotechnics*

***Bridges***

*Technical Specification for Highway Bridges, General Directorate of Highways (AASHTO)*

# Current Status in Turkey

- *Revisions of existing codes*
- *Development of new codes*
- *Ongoing work and future plans*

# Current work in progress

- *TSE*
  - **Translation of EN's to Turkish by TSE**
- *Ministry of environment and Urbanization*
  - **Specifications for determination of high risk buildings under Urban renewal**
- *AFAD*
  - **Revision of parts of TEC 2007-AFAD**
  - **New parts for seismic code-AFAD**
- *KGM*
  - **Revision of Bridge Specification**

# Revisions/Additions in progress

*Revision and extension of TEC 2007*

- **Revision of existing code**
  - General Rules
  - Seismic actions
  - Reinforced concrete buildings
  - Masonry buildings
  - Geotechnical aspects
  - Assessment and Rehabilitation
- **Addition of new parts**
  - Prefabricated buildings
  - Steel and Composite buildings
  - Wood buildings
  - Seismic isolation and damper
  - Tall buildings
  - Approximate procedures for simple buildings

# Design Loads for Buildings - TS 498-1997

- TS 498 is the main code for loads which is actually based on BSI Code of Basic Data for the Design of Building, DIN 1055 and DIN 18196
- *The scope of EN1991-1-4 is much wider than TS498, it includes wind actions on other structures, which in Turkey are taken from a number of other international codes and design guides. In most cases, there is no equivalent Turkish standard.*

| Comparison between EN1991-1-4 and current Turkish practice | |
|---|---|
| EN1991-1-4 | TR Practice |
| Buildings (static) | TS 498 |
| Buildings (dynamic) | No equivalent (ASCE 7-10) |
| Bridges | Design manuals for roads and bridges |
| Chimneys | No equivalent |
| Scaffolding | TS EN 12811 |
| Spheres, domes, barrel vaults | No direct equivalent (reference books, papers) |

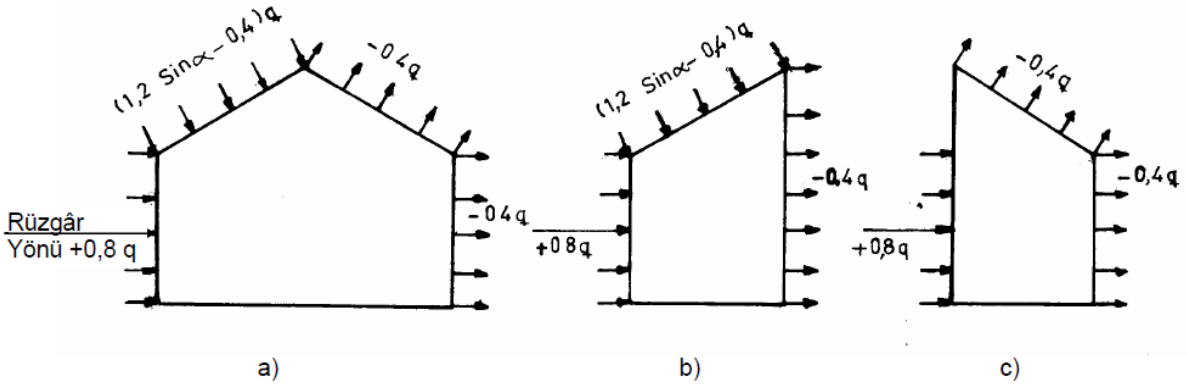
- *Because map of fundamental basic wind velocity is not developed yet, for determination of the wind velocity, an amprical approach is being followed. But for special projects (eg. tall buildings) analysis of the meteorological wind speed data is required.*

# Wind Load

- *Computed based on elevation and geometry*

TS498 Table 5: Wind speed at different elevations

| Zeminden Yükseklik m | Rüzgar Hızı v m/s | Emme q ($kN/m^2$) |
|---|---|---|
| 0 - 8 | 28 | 0,5 |
| 9 - 20 | 36 | 0,8 |
| 21 - 100 | 42 | 1,1 |
| > 100 | 46 | 1,3 |



# Snow loads

- *Computed based on a regional snow map*
  - Elevation
  - Region

TS498 Table 4: Snow Loads (Pko) kN/m$^2$

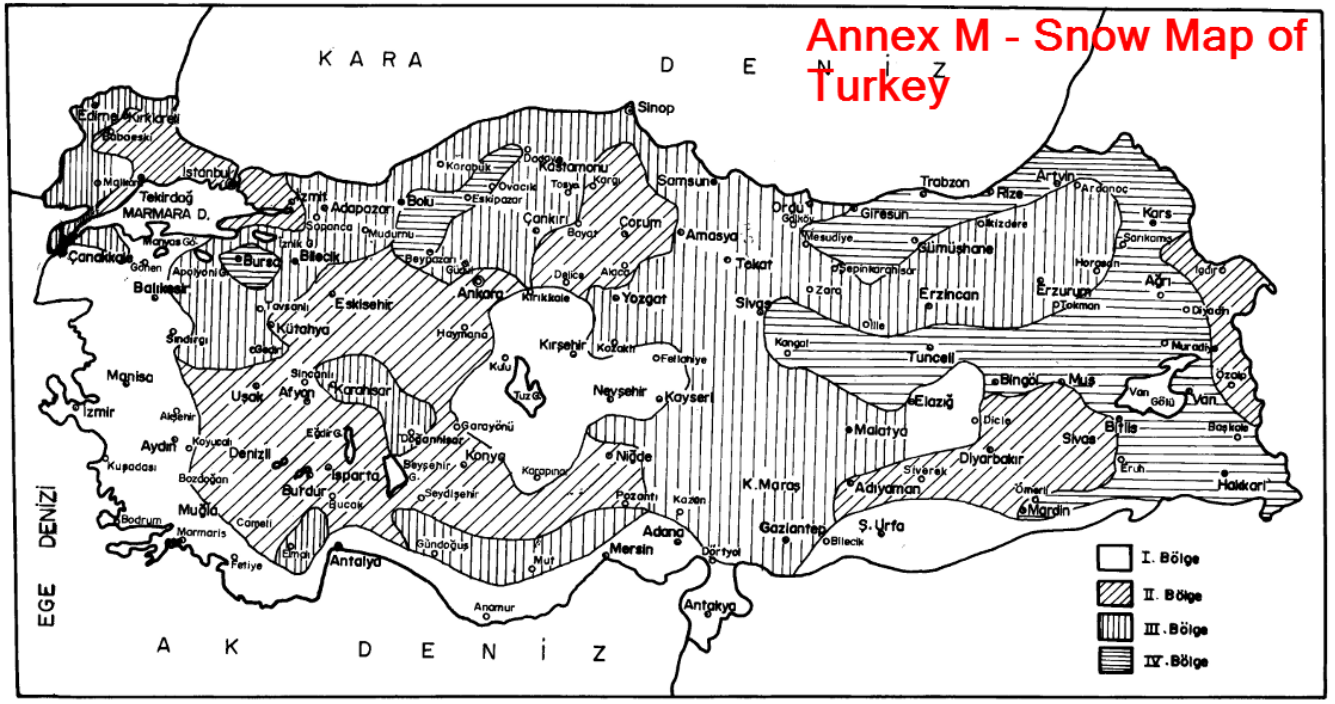
| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | Elevation from sea | REGION | | | |
| | m | I | II | III | IV |
| | ≤ 200 | 0,75 | 0,75 | 0,75 | 0,75 |
| 2 | 300 | 0,75 | 0,75 | 0,75 | 0,80 |
| | 400 | 0,75 | 0,75 | 0,75 | 0,80 |
| | 500 | 0,75 | 0,75 | 0,75 | 0,85 |
| 3 | 600 | 0,75 | 0,75 | 0,80 | 0,90 |
| | 700 | 0,75 | 0,75 | 0,85 | 0,95 |
| | 800 | 0,80 | 0,85 | 1,25 | 1,40 |
| 4 | 900 | 0,80 | 0,95 | 1,30 | 1,50 |
| | 1000 | 0,80 | 1,05 | 1,35 | 1,60 |
| 5 | > 1000 | 1000 m'ye tekabül eden değerler, 1500 m'ye kadar %10, 1500 m'den yukarı yüksekliklerde %15 artırılır. | | | |

# TS EN 1991-1-3 can be used in TR with the accompanying National Annex. The National Annex (NA) contains only country specific climatic data

ICS 91.010.30 | TÜRK STANDARDI | TS EN 1991-1-3/Nisan 2007

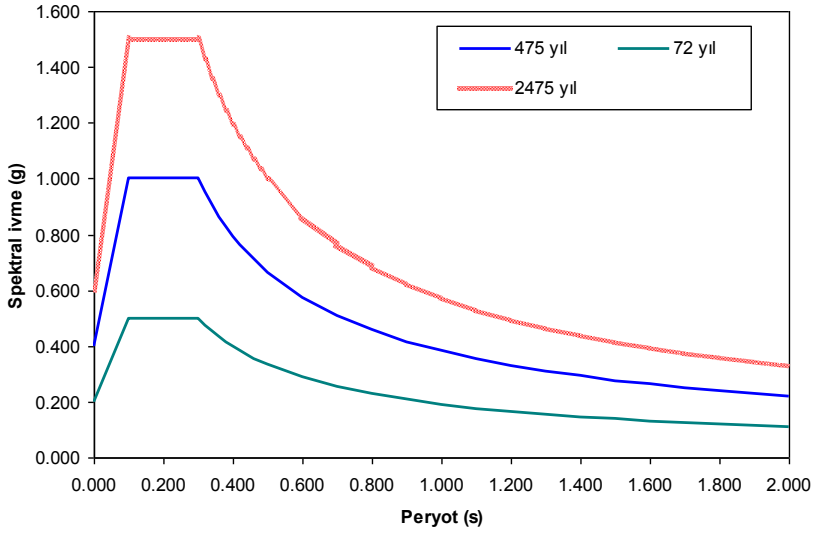
**Ek MA**

Türkiye'de kullanılacak kar haritası, bölgelere ve yüksekliğe bağlı olarak alınması gereken kar yükleri ve il ve ilçelere göre kar yükü bölgeleri.

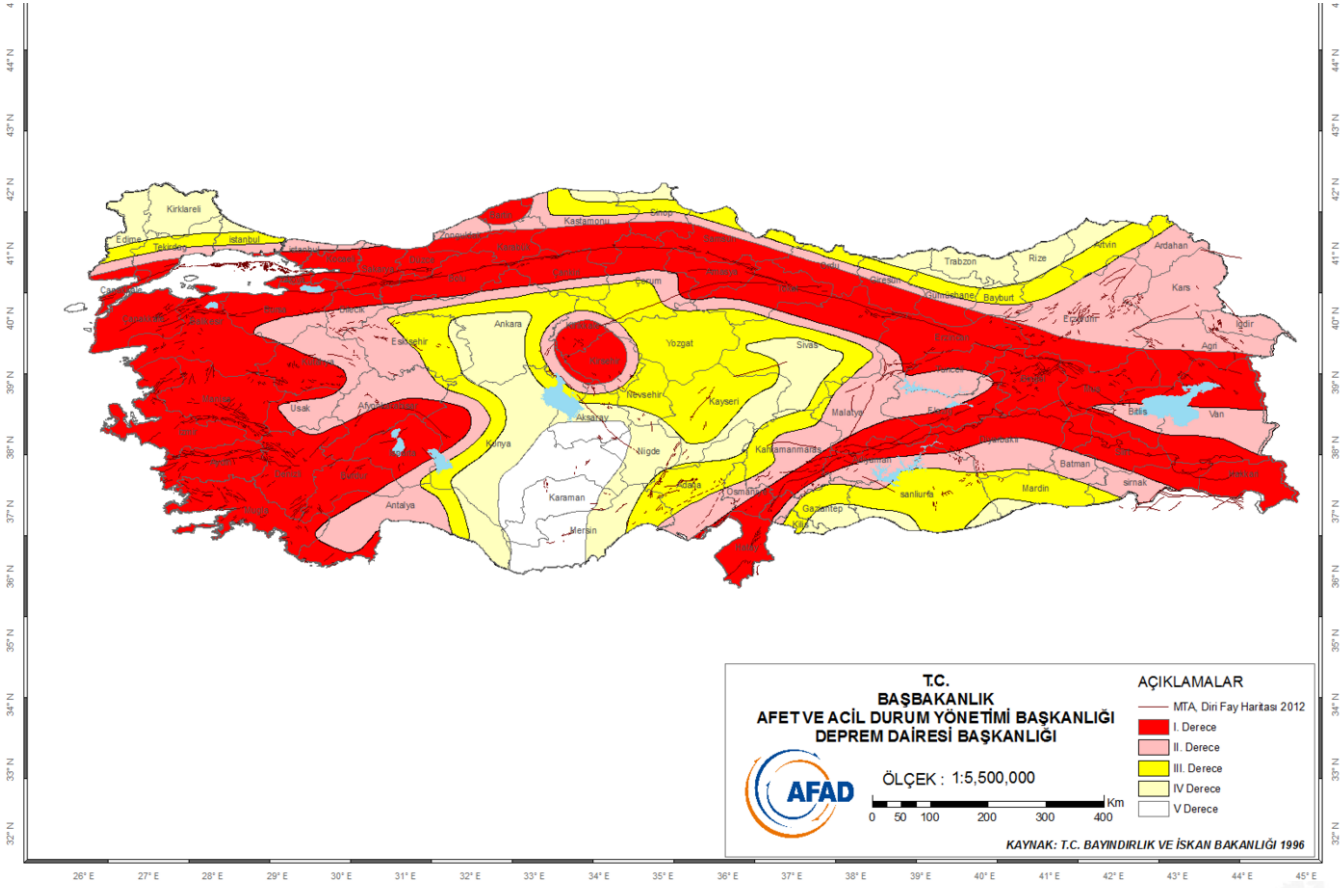


# Seismic code

- *The current seismic code: DBYBHY 2007, revised in 2007*
- *Four earthquake zones*
- *Based on a design spectrum*
  - **Soil type**
  - **Earthquake zone**



# Seismic hazard map: Earthquake zones



# New seismic code and hazard map

- *Under  revision*
- *New approach for hazard map*
  - Maps for different return periods
  - For PGA, Spectral accelerated at two periods

# Thank you

- *Questions.....*