



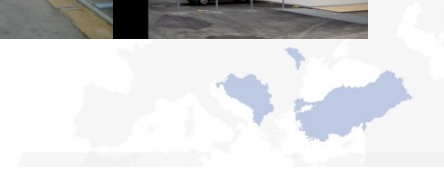
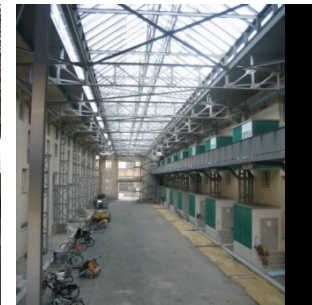
Assessment and retrofitting of existing structures

Highlights from the second generation of Eurocodes

**Paul Luechinger – Convenor of
CEN/TC250/WG2**

Content

- 1. Policy Framework*
- 2. Assessment and retrofitting of existing structures*
- 3. CEN/TC250 Initiative / Mandate 515*
- 4. Approach to execution of the Mandate*
- 5. JRC Science and Policy Report*
- 6. Prospect of CEN Guidance*





Policy Framework

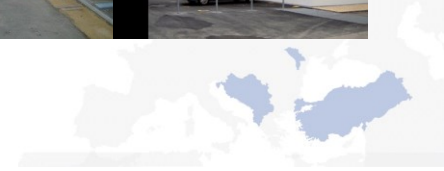
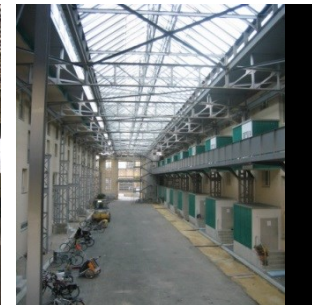
Strategic importance of construction sector

Largest single economic activity

Sector employs directly almost 20 million people

Representing more than 10% of EU GDP

More than 50% of fixed capital formation





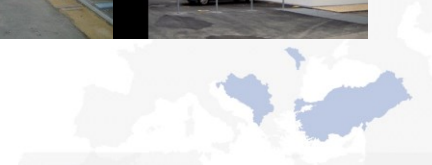
Policy Framework

Environmental impact of construct

Total energy consumption: 40%

Consume of raw materials: 50%

Waste streams: 40 - 50%



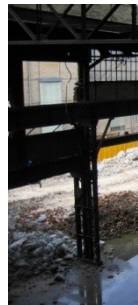
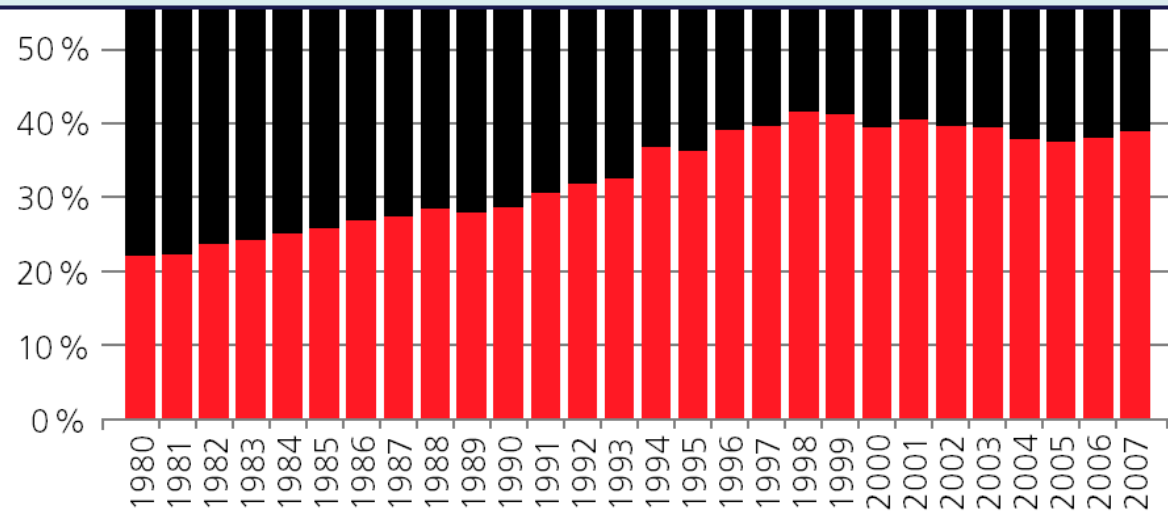


Policy Framework

Trends in the construction sector



Increasing rate of rehabilitation of existing structures compared with construction of new structures





Policy Framework

CPR: Basic requirements for construction works

1. Mechanical resistance and stability

2. Safety in case of fire

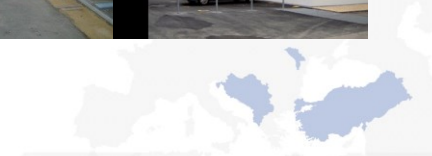
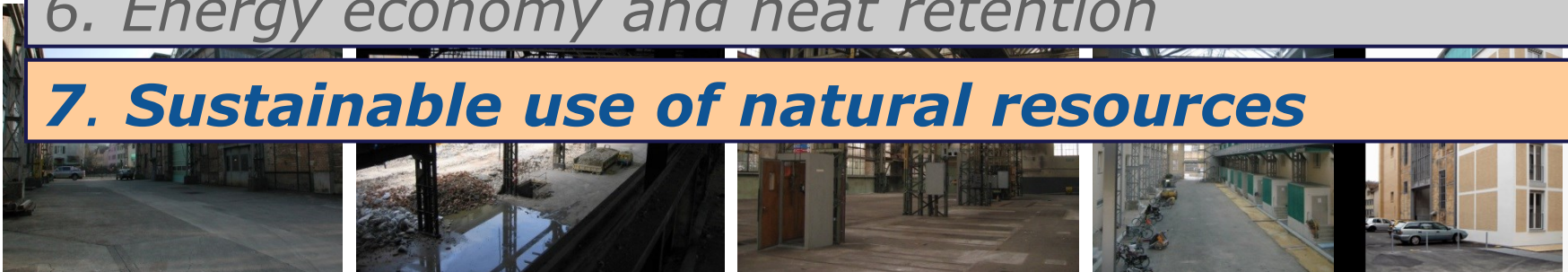
3. Hygiene, health and environment

4. Safety and accessibility in use

5. Protection against noise

6. Energy economy and heat retention

7. Sustainable use of natural resources

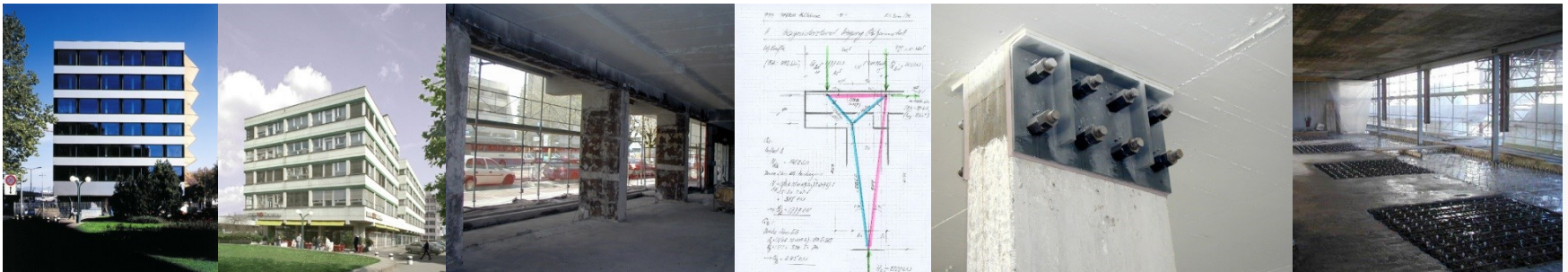




Assessment of existing structures

Existing structures and sustainability

- *A sustainable development for construction will not simply respond to new needs by adding new buildings to the existing building stock or demolish old buildings and simply substitute them by new ones.*
- *It will analyse existing structures to identify their possibilities for meeting sustainability goals.*

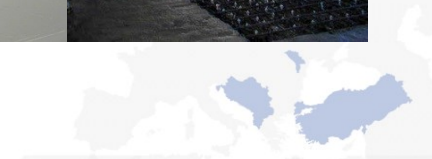
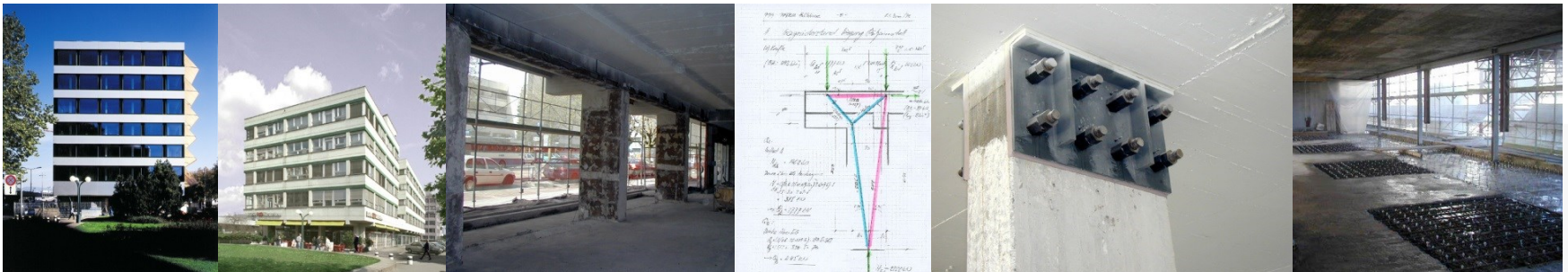




Assessment of existing structures

Needs for assessment of existing structures (1)

- *check whether the existing structure can resist loads due to change in use, operational changes or extension of design working life*
- *repair of an existing structure, deteriorated due to environmental effects or suffered damage from accidental actions.*

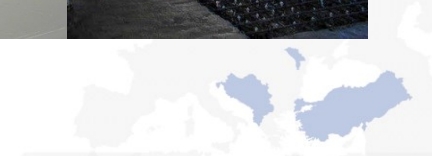
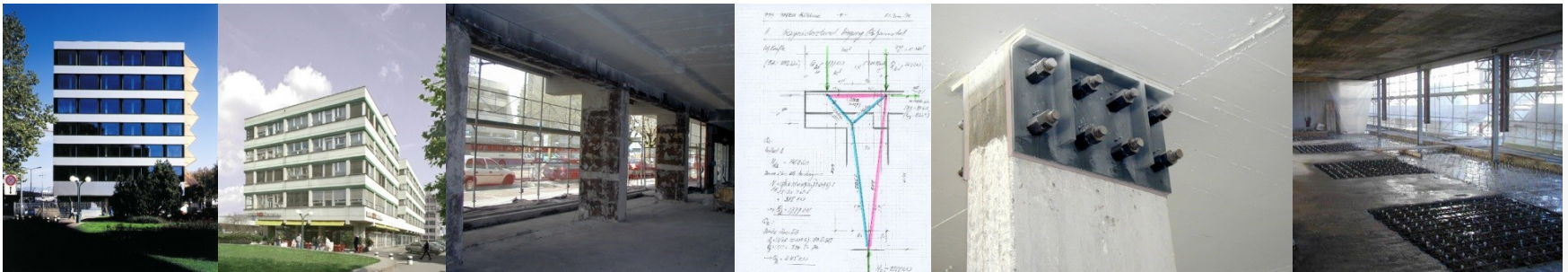




Assessment of existing structures

Needs for assessment of existing structures (2)

- *doubts concerning the actual reliability of the structure*
- *rehabilitation in connection with retrofitting the building technical systems*
- *requirements from authorities, insurance companies or owners or from a maintenance plan.*





Assessment of existing structures

Additional aspects for the assessment of existing bridges

- *consider and reduce the environmental impact by means of a life cycle analysis*
- *estimate and optimise the overall cost by means of life cycle cost calculation*
- *take into account maintenance and management concepts.*





Assessment of existing structures

Potential for future development

- *General principles of sustainable development lead to the need for extension of the life of the structure, in most cases in conjunction with severe economic constraints.*
- *The approach for the assessment of existing structures is in many aspects different from that for designing new structures. The application of design-orientated methods to the assessment of existing structures leads to a high degree of conservatism.*





CEN/TC250 Initiative /Mandate 515

CEN/TC250 Business plan – EC 2nd generation

The development of Eurocodes 2nd generation aims to cover:

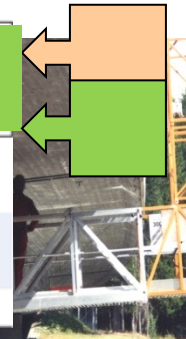
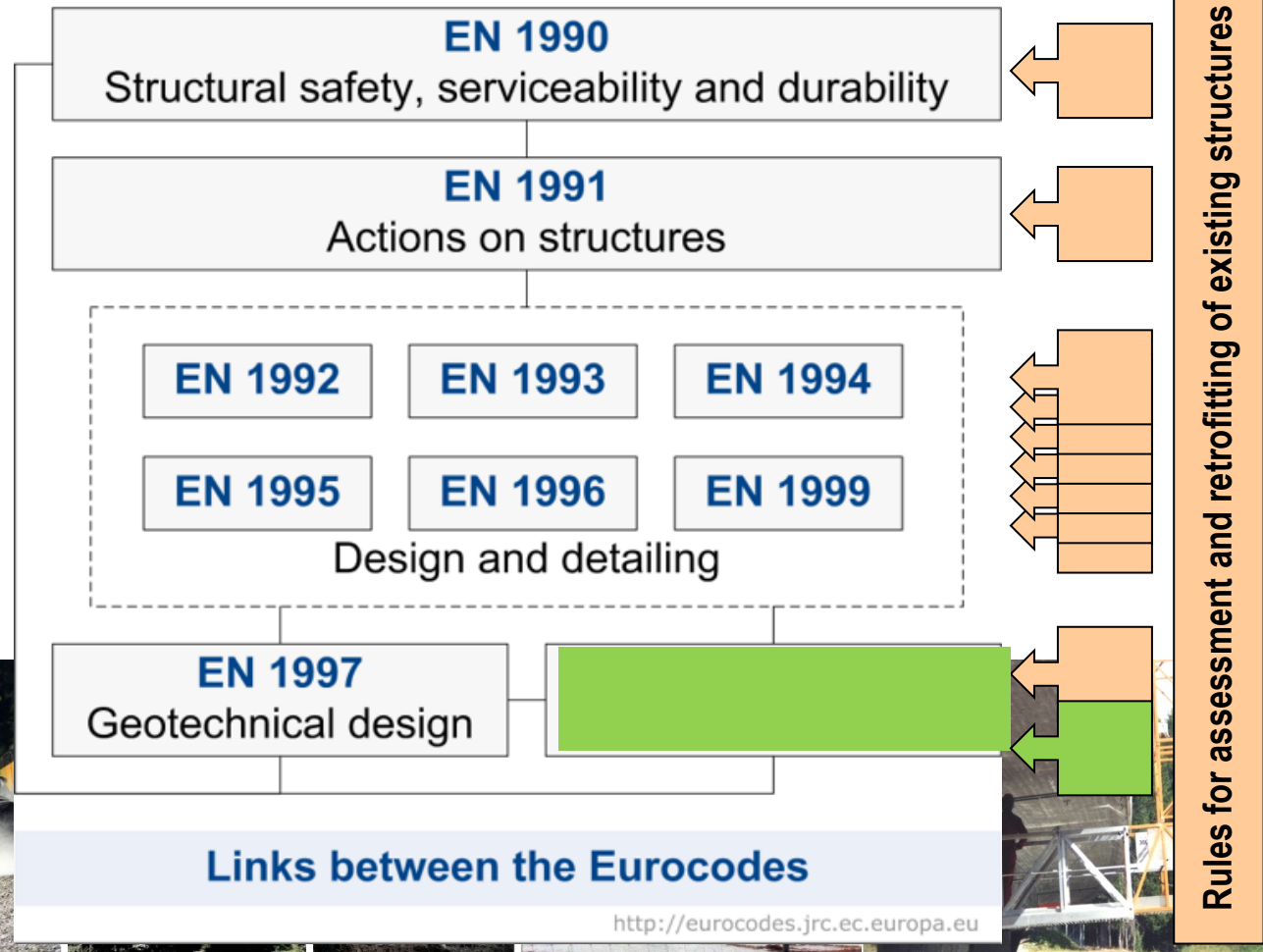
- *improving the **ease of use** of the Eurocodes, particularly for day-to-day calculations*
- ***increased harmonisation** through a reduction in National Determined Parameters*
- ***aspects of the assessment, re-use and retrofitting of existing structures***
- *strengthening of the **requirements for robustness, ...etc.***





CEN/TC250 Initiative / Mandate 515

Structure of the Eurocodes 2nd generation

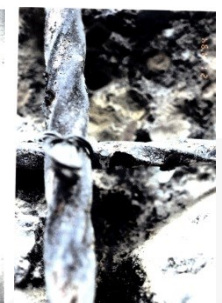
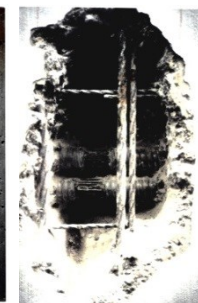




Approach to execution of the Mandate

Work packages

- *Main purpose Mandate M/515 was to initiate the process of **further development of the Eurocode system***
- *Mandate M/515 identifies **two work packages***
- *Package I is concerned with standards of general relevance: **including general rules for the assessment and retrofitting of existing structures***
- *Package II is concerned with material specific standards.*





Approach to execution of the Mandate

Stepwise procedure

1

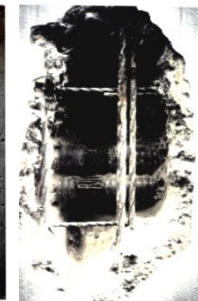
Preparation and publication of a pre-normative "Scientific and Policy Report", subject to agreement of CEN/TC250.

2

After agreement of CEN/TC250, preparation and publication of CEN Technical Specifications (previously known as ENV).

3

After a period for trial use and commenting, CEN/TC250 will decide whether the CEN Technical Specifications should be converted into Eurocode Parts or Annexes.

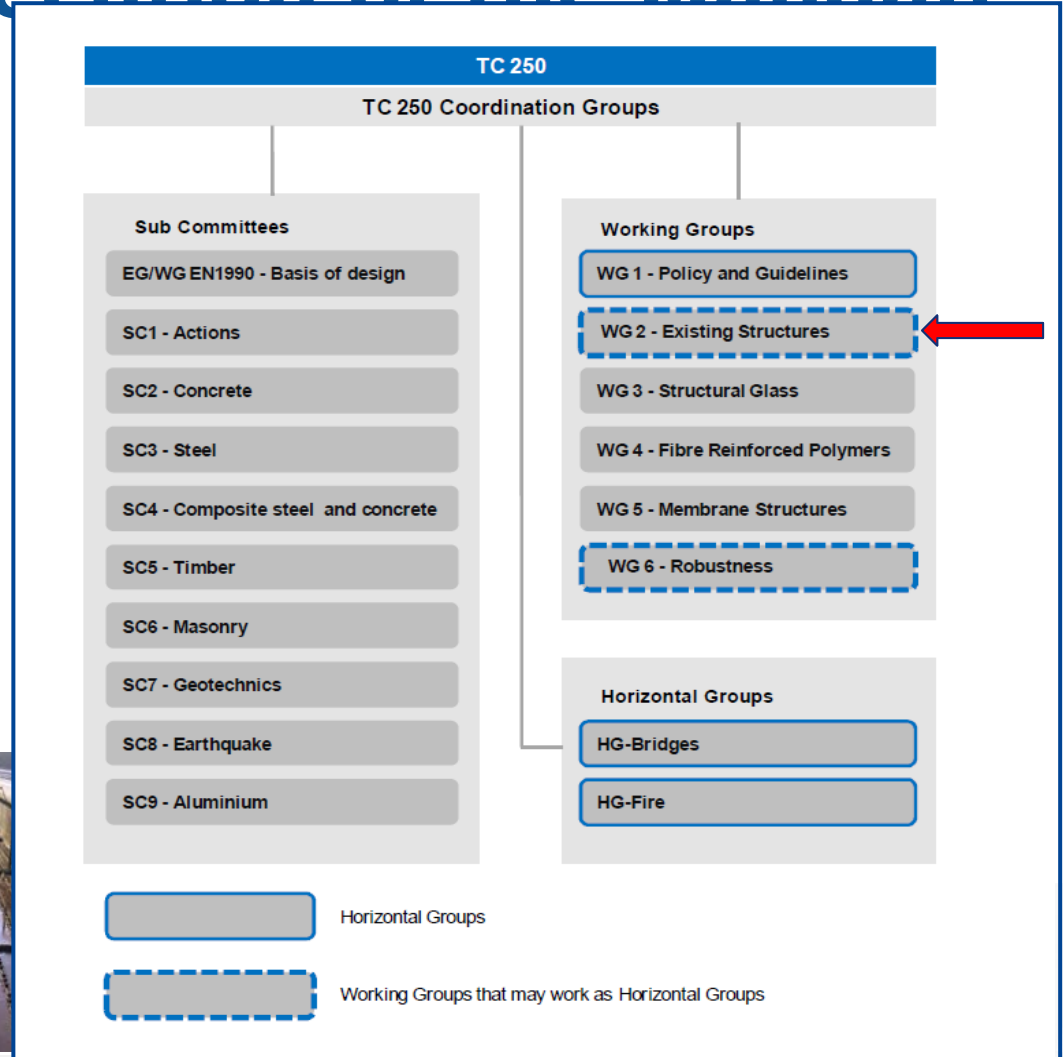




Approach to execution of the Mandate

Organisation of work

- **WG2** is integrated in CEN/TC250 structure
- **WG2** acts as working group for general rules
- **WG2** will function as horizontal group for material oriented rules

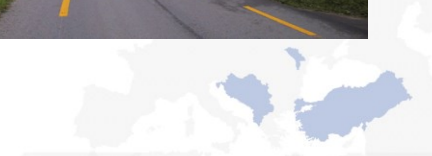




JRC SCIENCE AND POLICY REPORT

Status of the document

1. *The production of the Science and Policy Reports is declared as **pre-normative work***
2. *The report was **developed within WG2***
3. *The Science and Policy Report is subdivided in:*
 - Part I:** *Policy Framework*
 - Part II:** *Existing Regulations and Standards*
 - Part III:** *Prospect for CEN Guidance.*

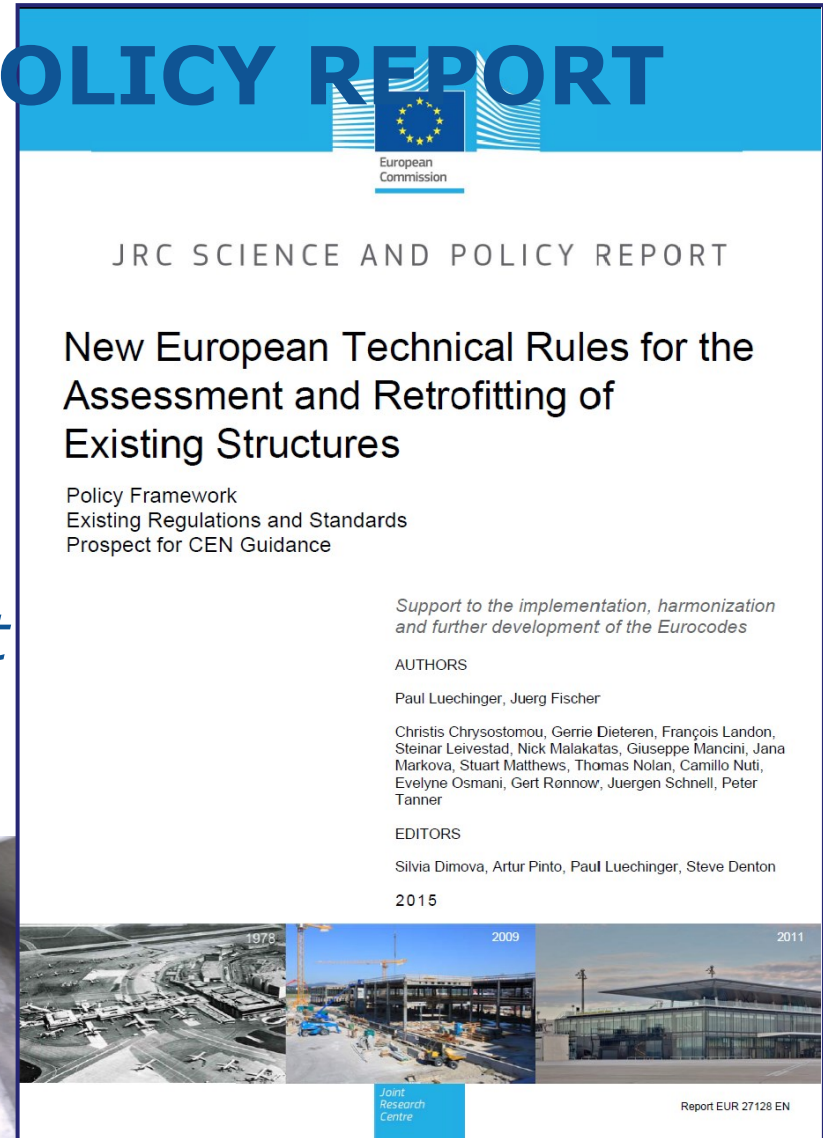




JRC SCIENCE AND POLICY REPORT

Procedure of agreement

1. Publication 15-03-09 as agreed by CEN/TC250
2. Comments of NSBs via CIB platform <15-09-09
3. Comments on its content and suitability to be developed as CEN TS



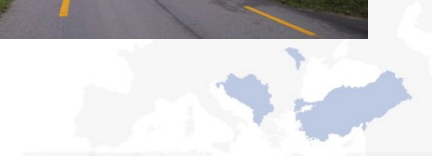


JRC SCIENCE AND POLICY REPORT

Objective of Part III

*Part III presents scientific and technical proposals intended to serve as a starting point for further work to achieve a harmonized European view on the assessment and retrofitting existing structures. **Its fundamental purpose is to stimulate debate.***

*To enable this objective to be fulfilled, it contains **preliminary proposals for technical provisions and identifies key issues requiring resolution.** It is emphasised, however, that it is **not intended for use in practice at this stage.***

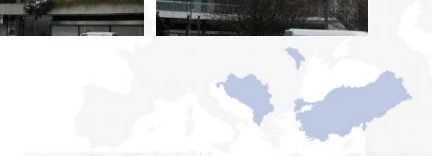




Prospect of CEN Guidance

Scope (1)

- 1. The new rules for the assessment and retrofitting of existing structures apply for **all type of construction works and construction materials.***
- 2. The **new rules are** based on the principles of structural reliability and consequences of failure in agreement with the principles of **EN 1990.***

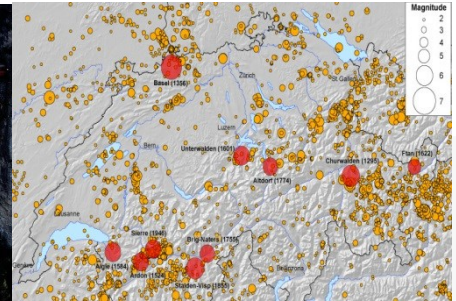




Prospect of CEN Guidance

Scope (2)

- 3. The new rules are also applicable for **heritage structures** provided that **additional considerations** are taken into account*
- 4. However the assesement and retrofitting of existing structures under **seismic actions** are to be performed according to the rules of **Eurocode EN1998-3**.*

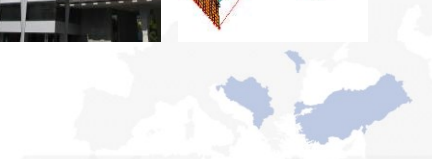
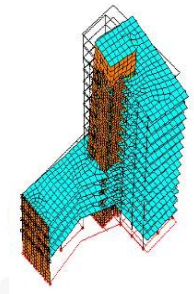




Prospect of CEN Guidance

Key issues (1)

- Will it be appropriate to have different target reliability levels for the assessment of existing structures compared to the design of new structures? If so, should the remaining working life, human safety, the consequences of failure and the proportionality of the costs of any required interventions be taken into account?*

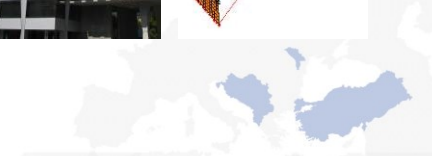
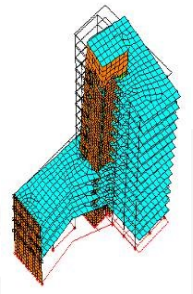




Prospect of CEN Guidance

Key issues (2)

- *Is it possible to update partial-safety factors, based on knowledge of the structure and its condition, recognising the uncertainties associated with the updating process?*
- *Should the remaining working life be taken into account when determining live loads, variable actions etc.?*

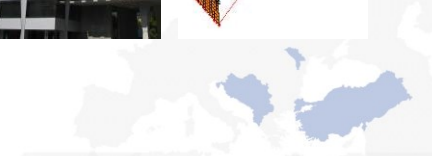
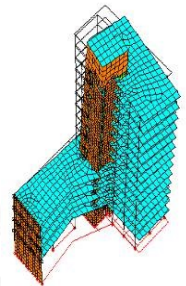




Prospect of CEN Guidance

Key issues (3)

- *Under what circumstances would it be appropriate for a structural assessment to be based solely upon satisfactory past performance of an existing structure?*
- *Should the approach of structural assessment based on knowledge levels, as defined in seismic design, also be applied to persistent design situations?*



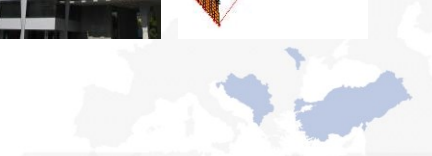
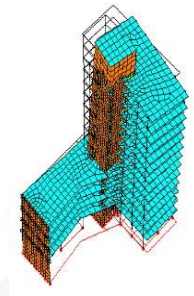


Prospect of CEN Guidance

Key issues (4)

Conclusions:

- The key issues will be discussed and resolved in step 2 in consideration of the CIB responses through NSBs.*
- Some of the key issues include aspects which are to be determined on national level.*





Prospect of CEN Guidance

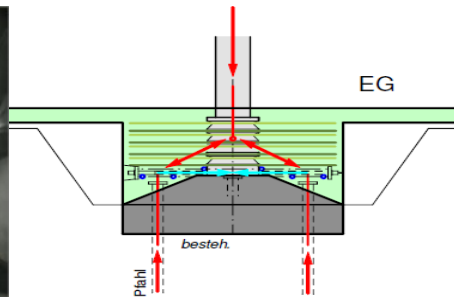
Chapters for general rules

1. *Assumptions, terms and definitions*

2. *Basic requirements*

3. *Framework assessment, structure management*

- *Generic procedure*
- *Preliminary assessment*
- *Detailed assessment*





Prospect of CEN Guidance

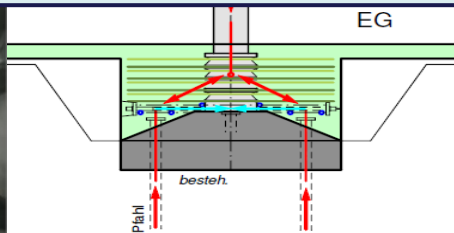
Specific chapters for assessment

4. Investigation and updating information

- *Actions*
- *Material properties*
- *Structural models*
- *Resistance and deformations*

5. Structural analysis and verifications

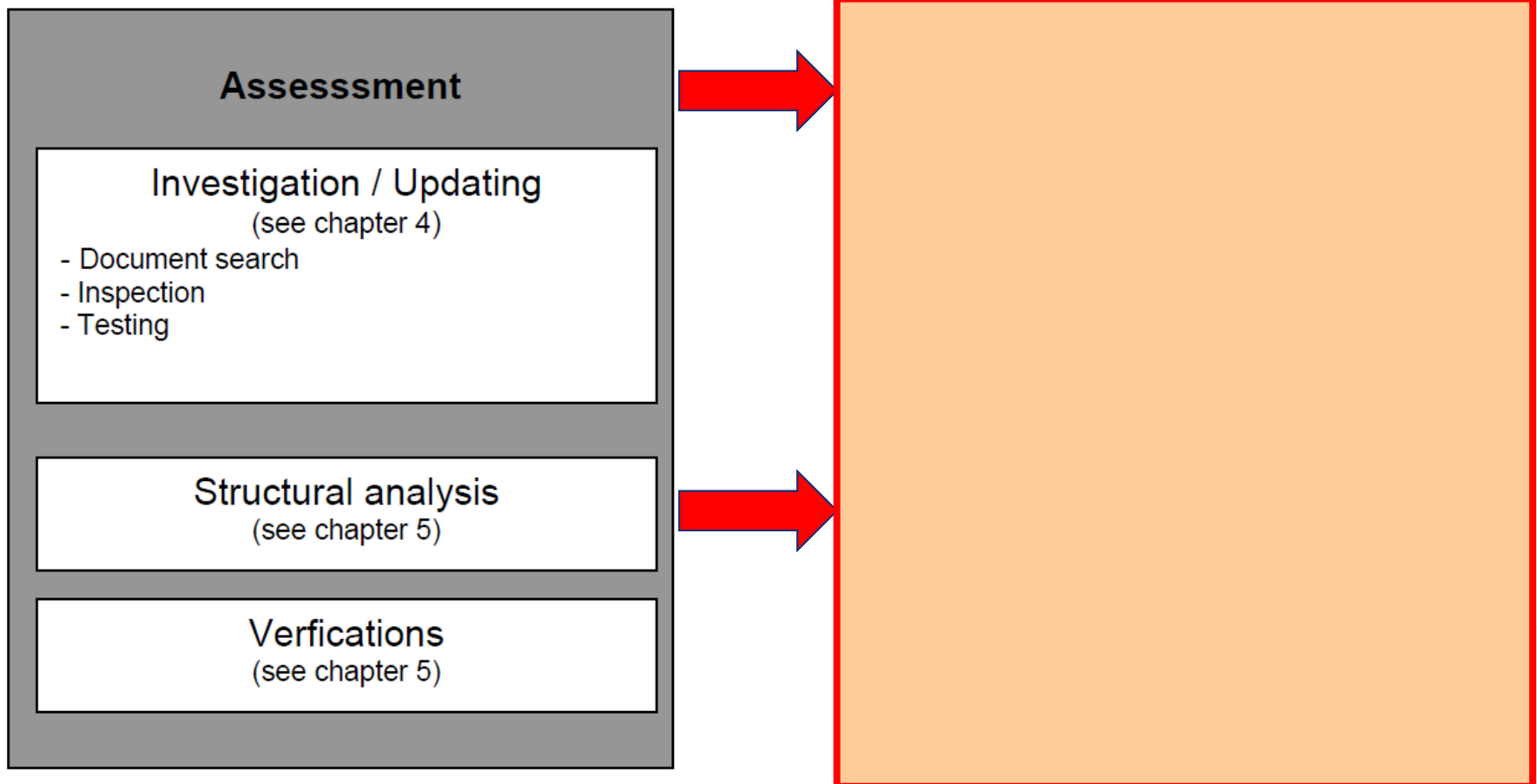
- *Verifications based on partial factors*
- *Verifications based on probabilistic format*





Prospect of CEN Guidance

Specific chapter for retrofitting

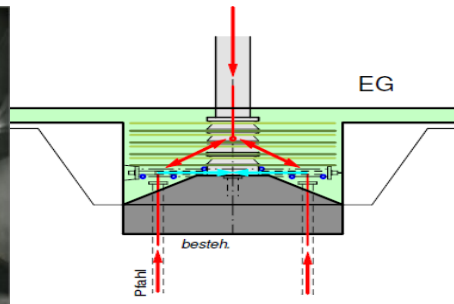




Prospect of CEN Guidance

Work programme for development of CEN TS

15-09-28	Meeting WG2	Preliminary valuation of comments
15-11-19	Meeting CEN/TC250	Decision upon starting step 2
15-11-26	WG2.T1 Project Team	Kick off meeting
16-04-30	WG2.T1 Project Team	Valuation of comments / First draft to NEN
17-04-30	WG2.T1 Project Team	Second draft to NEN
18-04-30	WG2.T1 Project Team	Final document to NEN





Conclusions

1. The 2nd generation of Eurocodes will highlight advanced concepts for the *design of new structures* as well as for *the assessment of existing structures*

2. The assessment of existing structures will analyse existing structures to identify *their potential for meeting sustainable goals*

3. Owners and operators will profit from a *higher value* and from *extending working life of existing structures*





Thank you for your attention

