MINUTES

of the 1st meeting at the CTU in Prague, Klokner Institute, 26-27/10/2011

Participants:

Representatives of the partner organizations:
P1 (contractor) – CTU KI: M. Holický, Jana Marková, Jana Pallierová
P2 - SPSS: Roman Gottfried, Vladka Návarová
P3 – HR: Dimitris Diamantidis
P4 – IETcc: Angel Arteaga
P5 – UOP: Pietro Croce
P6 – TNO: Ton Vrouwenvelder
P7- PAU: Selcuk Toprak, Mehmet Inel, Sevket Senel

PPT presentation, used during the meeting to enable effective discussion of all the points of the agenda, supplements these minutes.

Thursday 26/10/2011, 10 a.m.

Milan Holický (P1) welcomed the project participants and opened the meeting. All partners of the project consortium were present. Agenda proposed for the 1st meeting was adopted, with a slight change in the order of topics to be discussed.
The basic information on the project and its work plan were outlined, pointing out the technical aspects and key referenced materials. Then partners started to discuss in detail the supposed contents and layout of the following products:

**Handbook 1 – Innovative methods for the assessment of existing structures** (the title may be changed)  
*(Slides 14-21 of the PPT presentation)*

Partners agreed on P3 – Dimitris Diamantidis to be the responsible person for the Handbook 1 completion.

Then partners revised the draft of the contents. P4 – Angel Arteaga, who was not originally supposed to participate in the work on the Handbook 1, was added to the list of authors. Partners agreed on implementation of relevant parts of the RILEM book “Probabilistic Assessment of Existing Structures”.

By 30/11/2011, P3 - Dimitris Diamantidis and P6 - Ton Vrouwenvelder are to revise and send to all other partners a final version of contents of Handbook 1 enriched by the above mentioned parts of the RILEM book, and address all other partners to write down their contributions according to the schedule.

By 15/02/2012, the partners involved in making Handbook 1 will send their contributions to P3 – Dimitris Diamantidis.

By 28/02/2012, P3 – Dimitris Diamantidis will distribute the final draft of Handbook 1 to other partners.

**Handbook 2 – Operational techniques for the assessment of existing structures** (the title may be changed)  
*(Slides 22-23 of the PPT presentation)*

Partners agreed on P5 – Pietro Croce to be the responsible person for the Handbook 2 completion.

By 31/01/2012, Pietro Croce will send all partners a list of contents with indication of partners´ responsibilities.

By 28/02/2012, partners should return Pietro the list of contents with their comments.

By the term of extra meeting in Pisa, 08–09/03/2012, Pietro will distribute to all partners the final version of the list of contents of Handbook 2.

**Handbook 3 – Basis for assessment of existing structures** (the title may be changed)  
*(Slides 24-25 of the PPT presentation)*

Partners agreed on P2 – Roman Gottfried and P1 – Milan Holický to be the responsible persons for the Handbook 3 completion.

Partners agreed that the Handbook 3 should be a simplified version of the Handbooks 1 and 2, adapted for the needs of technical students, scholars and practising engineers. It should provide straightforward guidance for the assessment of existing structures.

**Software tools**  
*(Slides 26-27 of the PPT presentation)*

Partners agreed that P7 – Selcuk Toprak is responsible for development and collection of at least 15 tools from all other partners (deadline – 31/05/2013 on the project website).

**Website**  
*(Slide 28 of the PPT presentation)*

Partners agreed on P1 – Milan Holický to be responsible for the website development.

It should include:

- Handbook 1-3 translations to Czech - P1, P2 (deadline 07/13)
- E-learning (ENG,CZ) – P1, P2, P3, P4, P5, P7 contributions (deadline 05/13)
- Software tools – P7 and all
- FAQ – (exists in CZ, ENG) - P2, P3, P5 contributions (deadline 06/13)
Background materials
(Slide 29 of the PPT presentation)
Partners agreed on P5 – Pietro Croce to be responsible for the development of the background materials
- CEN TC 250/WG2 development of a new document on existing structures (deadline 06/13)
- ISO TC 98/SC2/WG 11 – ISO 13822, background materials for a foreseen revision (deadline 06/13)

Upcoming meetings of consortium
(Slide 30 of the PPT presentation)
- Extra meeting of several partners in Pisa, 08-09/03/2012

Regarding the long time interval between the kick-off meeting and the 2nd planned consortium meeting in June 2012, partners agreed on an additional work meeting at the University of Pisa, Department of civil engineering, to be held on 08–09/03/2012.
Topics to be discussed: Handbook 1 – final version, Handbook 2 – list of contents, Programme of the seminar in Madrid.
Preliminary meeting schedule: 08/03/2012 (evening session 7 – 9 p.m.), 09/03/2012 (9 a.m. – afternoon)
P1, P3, P4, P5, P6 will be present, P7 will still confirm his possible attendance to the meeting.

- Plenary meeting 28/05/2012 and seminar 29/05/2012 in Barcelona,

The venue was changed from originally planned Madrid to Barcelona regarding the information that there are far less civil engineering events organized in Barcelona than in Madrid, and therefore we can expect larger turnout on the seminar organized there. P1 – Jana Pallierová will inform the National Agency of the LdV Programme about the change of venue.

- Plenary meeting in Regensburg, 18-19/10/2012
- Plenary meeting in Pisa, 04/2013
- Plenary meeting in Denizli, 06/2013
- Final plenary meeting in Prague, 09/2013

The session was closed at about 5 p.m.

Friday 27/10/2011, 10 a.m.

Partners except the representatives of P2 and P6 were present.
The contents of Handbook 1 were discussed in detail and key words of individual chapters were identified.
Power point presentation accompanying this minutes indicate the results of the discussion in detail (slides 16 to 21).

The session was closed at about 1 p.m.

Prague, 27/10/2012 Minutes prepared by J. Pallierová
Welcome to the first meeting in Prague on 26. and 27.10.2011

Vocational Training in Assessment of Existing Structures

Agreement number: CZ/11/LLP-LdV/TOI/134005

Draft agenda
1. Opening (on Wednesday, October 26 at 10:00 am).
2. Roll call of delegates.
3. Adoption of the agenda.
5. Administrative and financial rules.
6. Discussion of work plan (included in the Proposal).
7. Distribution of tasks and target dates.
9. Closure of the meeting (on Thursday, October 27 at 4:00 pm).

Partners – roll call of delegates

P1: KI, Applicant co-ordinator, Milan Holicky
P2: SPSS, Associated p., Roman Gottfried
P3: HR, Core partner, Dimitris Diamantidis
P4: IET, Core partner, Angel Arteaga
P5: UOP, Core partner, Pietro Groce
P6: TNO, Associated p., Ton Vrouwenkyelder
P7: PAU, Core partner, Selcuk Toprak
Adoption of agenda

Draft agenda

1. Opening (on Wednesday, October 26 at 10:00 am).
2. Roll call of delegates.
3. Adoption of the agenda – Any other business. Referenced materials …
4. Contracts and subcontracts – pink folder, shifted to Thursday.
5. Administrative and financial rules. – pink folder, shifted to Thursday.
6. Discussion of work plan (included in the Proposal).
7. Distribution of tasks and target dates.
9. Closure of the meeting (on Thursday, October 27 at 4:00 pm).

Contracts and subcontracts

- Duration: from 1.10.2011 to 30.9.2013
- Total approved 305909,50 EUR, National agency support of 74,81%, i.e. 228850,90 EUR
Administrative and financial rules

• Project duration 24 months
  from 1.10.2011 to 30.9.2013
• Interim report (1.10.2011 to 30.9.2012)
• Final report (1.10.2011 to 30.9.2013)
• All rules are given in Lifelong Learning Programme
  Guide for 2011 – sent you by e-mail with minutes
• Guide available on
  http://ec.europa.eu/education/llp/doc848_en.htm
• In an uttermost case, contact please
  Jana.Pallierova@klok.cvut.cz

Technical aspects: key referenced materials

• EN 1990, Basis of structural design, 2002
• ISO 2394, General principles …,1998
• ISO 13822, Assessment of existing …, 2010
• ISO 3898, Names and Symbols, 2010
• ISO 8930, List of terms, 2010
• ICC: International Existing Building Code, 2009
• RILEM, Probabilistic Assessment …, 2000
• JCSS PMC, present version 2001
  http://www.jcss.ethz.ch/
• JRC-ECCS-Joint report, 2008
• Fib Bulletins, new expected in 2012
• CEN TC250/WG2 Existing Structures, since July 2011
Project set-up

- Work packages: WP1 to WP 10
- Main results: 10 items
  - Handbooks 1 to 3, HR, UOP, KI and SPSS
  - Software tools, PAU and all
  - E learning, KI
  - Background materials, UOP
  - Web sites, KI
  - Seminars, all
  - Courses, all
  - Papers, all

Main results

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Partners involvement

Main outcomes

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- ◆ convenor
- × partner

Handbook 1: Innovative methods

P3 and all – 30.9.2012

- General framework of the assessment (terminology and basic requirements for safety, serviceability and durability, basic variables, assessment of heritage structures)
- Reliability differentiation (risk acceptability criteria, differentiation of reliability levels, probabilistic optimisation of the life-cycle costs)
- Advanced methods of assessment, model uncertainties
- Statistical evaluation of data for the assessment (materials, geometry, actions, degradation, evaluation of results of inspections, proof loading and testing)
- Probabilistic reliability assessment (time-variant analysis, updating, satisfactory past performance)
- Worked examples (integrated).
Handbook 1: Preliminary contents


• Basic concepts, terminology – P1, P4
• Current Standards for existing structures – P3
• Requirements on performance (safety and serviceability, …) – P1, P3
• Reassessment Process/Decision criteria P3
• Information processing/basic variables of existing structures – P3
• Structural Assessment (Limit state analysis, global behaviour-robustness-system analysis- non-linear behaviour) P5
• Probabilistic assessment – P1
• Reliability differentiation – P3
• Probabilistic optimization, life cycle consideration – P1
• Verification methods (Design value method/Partial Safety Factor) – P3
• Evaluation of experiments/ proof loading – P7
• Bayesian updating (Annex 1) – P1
• Software tools (Annex 2) – All
• Examples (Integrated in text) – P1, P3, P5, P7

? Damaged structures, deterioration, fatigue, residual life, heritage structures, earthquake check list, scoring system, ?

Basic concepts

• Reasons for assessment
• Difference between design of new and assessment of existing structures
• Performance concepts (safety, serviceability, durability, robustness)
• Actual structural conditions, diagnosis
• Original documentation
• History of loading and interventions, structural evolution
• Deterministic and probabilistic approach
• Heritage structures
Hierarchie of fundamental terms

- **Reliability**
  - Safety, serviceability, durability, …

  - **Safety**
    - Related to Ultimate Limit States

  - **Serviceability**
    - Related to Serviceability Limit States

- In ISO 8930 „the structural safety is related to the ultimate limit states“ (see ISO clauses 2.3.1, 2.3.6, 2.13.11 and others). The same concept is accepted in existing ISO 2394 and Eurocode EN 1990.
- When used in the sense of „safety of people“ then it should be distinguished, or different terms like “protection” or “security” could be used.

Standards

- Provide information about national and international documents
- ISO 13822, including annex I
- ISO 8930, 3898
- ISO 2394
- ISO 13823 and 13824
- EN 1990 and 1998
- Swiss, US, SAMCO, BRE, Italy
Requirements on performance

- Safety, serviceability,
- Durability, robustness,
- Utility, risk
- Reliability level

Reassessment Process/Decision criteria

- Preliminary examination
- Detail investigation
- Expert investigation
Information processing/basic variables of existing structures

- Representative data
- Reference information
- Experimental data
- Expert judgments

Handbook 2: Operational methods

P5 – 31.5.2013

- Operational methodology of collecting and evaluating data for the assessment (materials, geometry, actions, degradation, evaluation of results of inspections, proof loading and testing)
- Overview of material properties of existing structures
- Justifiable simplifications in structural analysis
- Reliability assessment based on partial factor method, updating
- Worked examples:
  - -- evaluation of data (material tests, permanent actions, updating of traffic load models based on measurements, degradation processes)
  - -- proof loading
  - -- Worked examples - assessment of
Handbook 2: Preliminary contents

P5 - 31.5.2013

- Review of operational methods (structural, probabilistic) P5, P2
- Verification procedure (specification of partial factors, other) P3
- Updated Actions and action effects P4
- Updated Material properties P4
- Updated Geometric data P4
- Evaluation of measurements/tests/inspection planning P1, P2
- Case studies
  - bridge P5
  - concrete building P4
  - pipeline P7
  - heritage structure P5, P7

Handbook 3: Basis of Assessment

P2 and P1 – 31.5.2013

- General framework of the assessment (terminology and basic requirements for safety, serviceability and durability)
- Methods of assessment
- Statistical evaluation of data for the assessment (materials, geometry, actions, degradation, evaluation of results of inspections, proof loading and testing)
- Verification of buildings (partial factor method)
- Worked examples.
Handbook 3: Main topics

P2, P1 – 31.5.2013

• General philosophy (conclusions from HB 1 and 2)
• General framework of the assessment P2
• Standards/Common procedures P3
• Existing codes for existing structures (HB 1, HB 2)
• Flow chart
• (Previous) design codes (permissible stresses, global factors)
• Updating of information P1, P3 (with examples)
• Methods of reliability verification P1 (with examples)
• Assessment of buildings P4 Case studies
• Assessment of bridges P5 Case studies
• Assessment of pipelines P7 Case studies

Software tools

P7 and all partners

EXCEL spread sheets
Mathcad sheets
Matlab sheets
Mathematica sheets
Computer aided training programs
An example of Mathcad sheet

**Characteristic, design and $\gamma M$ values determined using test data**

MATHCAD sheet for determination of the characteristic, design and partial factor $\gamma M$ values using test data in accordance to EN 1990, Annex D.

**Approximating curves for coefficients of fractile estimation given in EN 1990, Annex D**

5% fractile V unknown

$$ks_{fit}(n) := 11.7 \cdot n^{-1.75} + 1.65$$

$$ks_{fit}(10) = 1.858$$

5% fractile V known

$$k\sigma_{fit}(n) := 0.66 \cdot n^{-0.87} + 1.65$$

$$k\sigma_{fit}(10) = 1.739$$

0.1 % fractile V unknown

$$d_{sf_{it}}(n) := 255 \cdot n^{-2.465} + 3.09$$

$$d_{sf_{it}(10) = 3.964}$$

0.1 % fractile V known

$$d\sigma_{fit}(n) := 1.27 \cdot n^{-0.902} + 3.09$$

$$d\sigma_{fit}(10) = 3.249$$

**Characteristic and design values (relative values related to the mean)**

**Single variable, V unknown:**

$$x_k := \xi_{ks} \cdot \mu x$$

$$xd := \xi_{ds} \cdot \mu x$$

**Single variable, V known:**

$$x_k := \xi_{k\sigma} \cdot \mu x$$

$$xd := \xi_{d\sigma} \cdot \mu x$$

Web sites

P1 and all partners

- HB translations, CZ - P1 (deadline 07/13)
- E-learning (ENG,CZ) – P1, P2,P3,P4,P5, P7 contributions (deadline 05/13)
- Software tools – P7 and all
- FAQ – (exists in CZ, ENG) - P2,P3,P5 contributions (deadline 06/13)
Background materials

P5

- CEN TC 250/WG2 Development of a new document on Existing structures (deadline 06/13)
- ISO TC 98/SC2/WG 11 – ISO 13822, background materials for a foreseen revision (deadline 06/13)

Meetings

- kick-off meeting, Prague, 26., 27.10/2011
- plenary meeting in Barcelona, 28., 29. 05/2012
- plenary meeting in Regensburg, 18., 19.10/2012
- plenary meeting in Pisa, 04/2013
- plenary meeting in Denizli, 06/2013
- final plenary meeting in Prague, 09/2013

Additional meetings between P1 and relevant partners will be planned depending on work progress. A first meeting is scheduled:
- Pisa, ~ 8. and 9.03/2012 discussion handbook 1, preparation seminar Madrid and Regensburg. Bilateral meetings (for example between P1 and P2) or other upon need
Any other business

- CEN TC250/WG2 Existing Structures, First meeting 13.7.2011
- Fifth International Conference on Forensic Engineering, ICE, London, April 2013
- International IABSE Spring Conference: May 6-8, 2013: Assessment, Upgrading and Refurbishment of Infrastructures
- International conference: Sustainable City 2012

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Supported by the International Journal of Sustainable Development and Planning

SAMCO
SAMCO Final Report 2006
F08a Guideline for the Assessment of Existing Structures

F08a
Guideline for the Assessment of Existing Structures

Dir. u. Prof. Dr. W. Rücker, Dipl.-Ing. F. Hille, Dipl.-Ing. R. Rohrmann

Federal Institute of Materials Research and Testing (BAM),
Division VII.2 Buildings and Structures
Unter den Eichen 87, 12205 Berlin, Germany
Warning: this is an example of misleading terminology
Recommendation: follow the Eurocode and ISO terminology

Thanks for attending the first meeting
Hope to see you all in Pisa

Heritage structures are difficult to assess
Existing Buildings

By Ronald L. Geren, AIA, CSI, CCS, CCCA, SCIP

If you thought designing a new building to comply with the building code was a difficult task, try applying the building code to an existing building. In many cases, it is impossible, either financially or physically, to bring an existing building into full compliance with the current, adopted building code.

In the past, building codes have included provisions to address the unique situations presented by altering, repairing, or adding to existing structures. However, the content of these provisions was very minimal. For example, the 1997 Uniform Building Code had only 2 pages devoted to existing structures. When the International Building Code was published for the first time in 2000, the chapter on existing structures expanded significantly to 14 pages.

By the time the International Code Council was ready to publish their second edition (2003) of the International Codes, the family of codes grew by one to include the International Existing Building Code, or IEBC. This new member of the International Codes took a dramatic leap by adding 67 pages of provisions, with an additional 214 pages of appendices and resource materials—a one-stop-shop for existing building code compliance. The IBC still has a chapter on existing structures (Chapter 34), but all of its content is based on selected provisions in the IEBC.


PREFACE

Introduction

Internationally, code officials recognize the need for a modern, up-to-date code addressing repair, alteration, addition or change of occupancy in existing buildings. The International Existing Building Code®, in this 2009 edition, is designed to meet this need through model code regulations that safeguard the public health and safety in all communities, large and small.


The International Existing Building Code provisions provide many benefits, including the model code development process, which offers an international forum for building professionals to discuss performance and prescriptive code requirements. This forum provides an excellent arena to debate proposed revisions. This model code also encourages international consistency in the application of provisions.
Safety acceptance criteria for existing structures

Dimitris Diamantidis
University of Applied Sciences, Regensburg, Germany

Paolo Bazzurro
AIR Worldwide, San Francisco, California, U.S.A

Abstract

Due to the social and economic need of utilizing existing structures, their safety evaluation is of major concern. In principle, criteria for safety acceptance of existing structures should be based on present guidelines, standards and methodologies. The mere fact that the structure fulfills the code of its time of construction cannot be decisive. Codes have changed over time due, for example, to technology development and experience gained with the performance of structures when struck by past events. This does not mean, however, that if a new code with more severe requirements than old ones comes into practice, old buildings should necessarily be deemed unsafe. A “discount” in the safety requirements for existing structures is simply unavoidable due to economical and legal constraints. The present contribution discusses current risk acceptability criteria for existing structures based on:

- experience gained from European practice
- review of current criteria for existing structures in seismic regions of US
- industrial experience gained from various projects
- recommendations given by the Joint Committee on Structural Safety (JCSS)
- cost benefit approach including implied costs to avert casualties

Suggestions for future recommendations for risk acceptance criteria of existing structures are also provided.

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Assessment of Existing Steel Structures: Recommendations for Estimation of Remaining Fatigue Life


Background documents in support to the implementation, harmonization and further development of the Eurocodes

Joint Report

Prepared under the JRC – ECCS cooperation agreement for the evolution of Eurocode 3 (programme of CEN / TC 250)

Editors: G. Sedlacek, F. Bijlaard, M. Géradin, A. Pinto and S. Dimova

EUR 23252 EN - 2008

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**Fig. 2-9:** Reliability re-evaluation [Lit. 57]
PERFORMANCE-BASED ASSESSMENT OF EXISTING STRUCTURES ACCOUNTING FOR RESIDUAL DISPLACEMENTS

by

Jorge Ruiz-Garcia
and
E. Miranda
2005