

Modelling of structural behaviour and design

- Chair: Foster (Univ. of New South Wales, Australia)
Deputy-Chair: Vecchio (Univ. of Toronto, Canada)
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Members: Balázs (Budapest Univ. of Technology and Economics, Hungary), Braestrup (Rambøll, Denmark), Curbach (Technische Univ. Dresden, Germany), Darwin (Univ. of Kansas, USA), Filippou (Univ. of California, USA), Hallgren (Rambøll Sverige AB, Sweden), Høj (HOJ Consulting GmbH, Switzerland), Kollegger (Technische Univ. Wien, Austria), Maekawa (Univ. of Tokyo, Japan), Mancini (Politecnico Torino, Italy), Marti (ETH Zurich, Switzerland), Monti (Sapienza Univ. di Roma, Italy), Rogowsky (Univ. of Alberta, Canada), Sigrist (TU Hamburg-Harburg, Germany), Walraven (Delft Univ. of Technology, The Netherlands)
- Recent Meetings: Athens (May 03), Avignon (Apr. 04), Budapest (May 05), Naples (June 06), Cavtat (May 07), Amsterdam (May 08)
- Recent Bulletins: *fib* Bulletin 38: **Fire design of concrete structures - materials, structures and modelling** (State-of-art report prepared by former WP 4.3.1 of TG 4.3, published 2007)
fib Bulletin 45: **Practioners' Guide to finite element modeling of reinforced concrete structures** (State-of-art report prepared by TG 4.4, published 2008)
fib Bulletin 46: **Fire design of concrete structures - structural behaviour and assessment** (State-of-art report prepared by former WP 4.3.2 of TG 4.3, published 2008)

Terms of reference

Scope

The scope of the Commission is to develop models for the behaviour of structures and structural members under short term and long term static loading, fatigue and impact loading. Both serviceability limit states and ultimate limit states and their interaction will be considered, and design recommendations shall be derived.

Areas of interest:

- serviceability limit state models;
- ultimate limit state models;
- fire design of concrete structures;
- computer-based modelling and design.

Working programme

The following Task Groups have been established according to the topics mentioned above (for details see below). They will screen and evaluate the available information by drafting state-of-the-art reports that will provide a basis for the derivation of design recommendations. The material produced should be a reference for regional and national codes and standards.

Task Group

TG 4.1 Serviceability models

- Convener: Balázs (Budapest Univ. of Technology and Economics, Hungary)
Members: Borosnyói (Budapest Univ. of Technology and Economics, Hungary), Burdet (EPF Lausanne, Switzerland), Burns (ETH Zürich, Switzerland), Ceroni (Univ. del Sannio, Italy), Debernardi (Politecnico di Torino, Italy), Eckfeldt (Technische Univ. Dresden, Germany), El-Badry (Univ. of Calgary, Canada), Fehling (IBB Fehling + Jungmann GmbH, Germany), Kaklauskas (Vilnius Gediminas Technical Univ., Lithuania),

Kohoutkova (Czech Technical Univ., Czech Republic), Lark (Cardiff Univ., United Kingdom), Lenkei (Pécs Polytechnic 'M. Pollack', Hungary), Lorrain (INSA de Toulouse, France), Mari Bernat (Univ. Politècnica de Catalunya, Spain), Pecce (Univ. del Sannino, Italy), Perez Caldentey (FHECOR, Spain), Taliano (Politecnico di Torino, Italy), Tkalcic (Civil Engineering Institute of Croatia), Vítek (Metrostav a.s., Czech Republic), Windisch (Germany)

Corr. Members: Beeby (United Kingdom), Cervenka (Cervenka Consulting, Czech Republic), Ghali (University of Calgary, Canada), Ozbolt (Universität Stuttgart, Germany), Toutlemonde (LNPC Paris, France), Ueda (Hokkaido University, Japan)

Recent Meetings: Pécs (Apr 03), Anglet (Oct. 03), Avignon (April 04), Madrid (Jan. 05), Budapest (May 05), Vilinius (Sept. 06), Budapest (Dec. 06), Prague (Dec. 07), Budapest (Apr. 08), Dresden (July 08), **Innsbruck (Jan. 09)**

Terms of reference

The Task Group is active in the areas of cracking and deformation of concrete structures under service conditions emphasizing conceptual design. In particular, it shall:

- define appropriate requirements for various types of structures (buildings, bridges, tunnels, containment structures, etc.);
- develop, verify and implement general models for linear and two-dimensional members subjected to combined actions;
- analyse results of service monitoring of existing structures;
- derive suitable design models and code requirements.

Task Group

TG 4.2 Ultimate limit state models

Convener: Sigrist (TU Hamburg-Harburg, Germany)

Members: Bentz (Univ. of Toronto, Canada), Denton (Parsons Brinckerhoff Ltd, United Kingdom), Fernández Ruiz (EPF Lausanne, Switzerland), Foster (Univ. of New South Wales, Australia), Görtz (CBP Consulting Engineers, Germany), Hegger (RWTH Aachen, Germany), Kuchma (Univ. of Illinois at Urbana-Champaign, USA), Minelli (Univ. of Brescia, Italy), Muttoni (EPF Lausanne, Switzerland)

Corr. Members: Gauvreau (Univ. of Toronto, Canada), Marti (ETH Zürich, Switzerland), Sherif (ECOGIM, Egypt), Walraven (Delft Univ. of Technology, The Netherlands)

Recent Meetings: Dubrovnik (May 07), Amsterdam (May 08)

Terms of reference

Task group 4.2 is established to evaluate and develop models for ultimate limit states of concrete structures as well as on conceptual design aspects. Topics within the scope of the work may include any models that deal with the ultimate limit state and with robustness and ductility as to their effect on peak and post peak behaviours. Research and development in this field is monitored with the aim to synthesize available results from research, testing and design experience.

Working Party 4.2.1 - Shear in slabs and beams

Convener: Sigrist (Hamburg Univ. of Technology, Germany)

Members: Bentz (Univ. of Toronto, Canada), Denton (Parsons Brinckerhoff Ltd, United Kingdom), Fernández Ruiz (EPF Lausanne, Switzerland), Foster (Univ. of New South Wales, Australia), Görtz (CBP Consulting Engineers, Germany), Hegger (RWTH Aachen, Germany), Kuchma (Univ. of Illinois at Urbana-Champaign, USA), Minelli (Univ. of Brescia, Italy), Muttoni (EPF Lausanne, Switzerland)

Terms of reference and working programme

WP 4.2.1 is established to undertake a study on shear and punching in slabs and beams so as to define the state-of-the-art. Further, the WP is tasked to seek a synthesis to design approaches for shear between Europe, the Americas and Asia. In the first instance, the commissioned report shall include current code provisions, comparisons with experimental data, design examples and an evaluation of various design approaches. The aim of the WP is to establish proposals for modelling of, and design for, shear for a future code of practice.

Task Group

TG 4.3 Fire design of concrete structures

- Convener: Høj (HOJ Consulting GmbH, Switzerland)
- Members: Bamonte (Politecnico di Milano, Italy), Boström (SP, Sweden), Breunese (TNO, The Netherlands), Denoël (Febelcem, Belgium), Dotreppe (Univ. de Liège, Belgium), Franssen (Univ. de Liège, Belgium), Gambarova (Politecnico di Milano, Italy), Jansson (SP, Sweden), Khoury (Imperial College of Science, Technology and Medicine, United Kingdom), Klingsch (ETH, Switzerland), Lennon (FRS, United Kingdom), Lottman (TU Delft, the Netherlands), Lublóy (Budapest Univ. of Technology, Hungary), Matthews (BRE, United Kingdom), Meda (Univ. of Bergamo, Italy), Msaad (CERIB, France), Ozbolt (Univ. Stuttgart, Germany), Riva (Univ. di Brescia, Italy), Rodrigues (Univ. of Coimbra, Portugal), Robert (CERIB, France), Taerwe (Ghent Univ., Belgium)
- Corr. Members: Anderberg (FSD, Sweden), Balázs (Budapest Univ. of Technology, Hungary), Behloul (Lafarge, France), Biondini (Politecnico di Milano, Italy), Branco (Univ. of Coimbra, Portugal), Dehn (Univ. Leipzig), Diederichs (Univ. Rostock, Germany), Felicetti (Politecnico di Milano, Italy), Huisman (BAM, Germany), Jelcic (Univ. of Zagreb, Croatia), Jumppanen (VTT, Finland), Kodur (Michigan State Univ., USA), Li (Hong Kong Univ. of Science and Technology, China), Korzen (BAM, Germany), Majorana (Univ. of Padua, Italy), Ota (Ota Engineering, Japan), Phan (NIST, USA), Rohena (FHWA, USA), Walraven (Delft Univ. of Technology, the Netherlands), Wetzig (Hagerbach, Switzerland),
- Recent Meetings: Athens (May 03), Avignon (Apr. 04), Milano (Dec. 04), Budapest (May 05), Naples (June 06), Cavtat (May 07), Coimbra (Nov. 07), Amsterdam (May 08)
- Recent Bulletins and publications: Proceedings of Workshop "Fire Design of Concrete Structures: What now? What next?" Milan University of Technology, 2-3 Dec 2004
fib Bulletin 38: *Fire design of concrete structures - materials, structures and modeling* (State-of-art report prepared by former WP 4.3.1 of TG 4.3, published 2007)
Thematic issue of *Structural Concrete* (Volume 9, No. 1, March 2008)
fib Bulletin 46: *Fire design of concrete structures - structural behaviour and assessment* (State-of-art report prepared by former WP 4.3.2 of TG 4.3, published 2008)

Terms of reference

The Task Group concentrates on conceptual design considerations for fire, bridging material science and structural application. Research and development in this field is monitored with the aim to synthesize available results from research, testing and design experience. The composition of the Task Group includes a balanced representation from researchers, test institutes, consultants, contractors and end-users.

The Task Group takes advantage of the results of research programmes in this field and keeps close contacts with ongoing activities elsewhere avoiding any duplication of work but concentrating on the elaboration of guidelines for the practical design of concrete structures. The group organised a workshop in Malta in March 2001, a second one in Milan in December 2004 and a third one in Coimbra in November 2007.

Task Group

TG 4.4 Computer-based modeling and design

- Conveners: Monti (Sapienza Univ. di Roma, Italy), Vecchio (Univ. of Toronto, Canada)
- Members: Bayrak (Univ. of Texas at Austin, USA), Bentz (University of Toronto, Canada), Blaauwendraad (Delft Univ. of Technology, The Netherlands), Cervenka (Cervenka Consulting, Prague, Czech Republic), Curbach (Technische Univ. Dresden, Germany), Foster (Univ. of New South Wales, Australia), Ishida (Univ. of Tokyo, Japan), Jirasek (Czech Tech. Univ. in Prague, Czech Republic), Kaufmann (Dobler, Schällibaum + Partner AG, Switzerland), Kollegger (Technische Univ. Wien, Austria), Kuchma (Univ. of Illinois, USA), Lowes (Univ. of Washington, USA), Marti (ETH Zurich, Switzerland), Mazars (INP Grenoble, France), Ozbolt (Univ. Stuttgart, Germany), Pantazopoulou (Demokritus Univ. of Thrace, Greece), Polak (Univ. of Waterloo, Canada), Preisinger (Technische Univ. Wien, Austria), Spacone (Univ. Chieti-Pescara, Italy)
- Recent Meetings: Osaka (Oct 02), Zurich (Sept. 03), Avignon (April 04), Naples (June 06)
- Recent Bulletins: *fib* Bulletin 45: *Practioners' Guide to finite element modeling of reinforced concrete structures* (State-of-art report prepared by TG4.4, published 2008)

Terms of reference

In order to bridge the gap between complex and advanced analyses and practical design applications the task group shall, with the highest priority:

- provide guidance on the application of linear and non-linear computer-based methods to the analysis and design of concrete structures;
- discuss the application of computer-based procedures to the solution of practical design questions such as minimum reinforcement, ductility, crack widths, etc.;
- provide guidance on the application of finite element procedures to post-construction assessments, forensic engineering, and rehabilitation work relating to concrete structures.

With a second degree priority, the Task Group will:

- propose criteria and/or databases for calibrating or validating computer-based procedures;
- review and/or propose appropriate constitutive models and analysis methodologies;

With a third degree priority, the Task Group will:

- work towards an integration of continuum mechanics and fracture mechanics based approaches;
- discuss the extension of computer-based procedures to fibre-reinforced concrete and composite structures.

Reports will be written primarily for the benefit of the practising engineer, rather than as a state-of-art for researchers. They are intended to provide a diverse and balanced portrayal of the technical knowledge while avoiding biased or skewed representation of the work of committee members.

Working Party

WP 4.4.5 Modelling of fibre reinforced concrete

Convener: Vecchio (Univ. of Toronto, Canada)

Members: To be advised

Working Party

WP 4.4.6 Modelling of repaired and strengthened concrete structures

Convener: Foster (Univ. of New South Wales, Australia)

Members: To be advised

Working Party

WP 4.4.7 Nonlinear dynamic analysis for design and assessment of RC structures

Convener: Monti (Univ. di Roma La Sapienza, Italy)

Members: Barbato (Louisiana State Univ., USA), Cervenka J. (Cervenka Consulting, Czech Republic), Foster (Univ. of New South Wales, Australia), Kunnath (Univ. of California at Davis, USA), Lucchini (Sapienza Univ. of Rome, Italy), Saatci (Izmir Institute of Technology, Turkey), Scott (Oregon State Univ., USA), Spacone (Univ. G. D'Annunzio, Italy), Vecchio (Univ. of Toronto, Canada)

Task Group

TG 4.5 Bond models

Convener: Cairns (Heriot-Watt University, Edinburgh, United Kingdom)

Members: Aiello (Univ. of Lecce, Italy), Alander (Celsa Steel Service Oy, Finland), Balázs (Budapest Univ. of Technology and Economics, Hungary), De Lorenzis (Univ. of Lecce, Italy), Eligehausen (Univ. Stuttgart, Germany), Metelli (Univ. di Brescia, Italy), Pantazopoulou (Demokritus Univ. of Thrace, Greece), Plizzari (Univ. di Bergamo, Italy), Wildermuth (Univ. Stuttgart, Germany), Williamson (Univ. Birmingham, United Kingdom)

Corr. Members: Engström (Chalmers Univ. of Technology, Sweden), Gambarova (Politecnico di Milano, Italy), Genesio (Univ. Stuttgart, Germany), Jirsa (Univ. Texas, USA), Lundgren (Chalmers Univ. of Technology, Sweden), Tepfers (Ralejs Tepfers Consulting, Sweden), Ueda (Hokkaido Univ., Japan)

Recent Meetings: Athens (May 03), Edinburgh (Oct. 04), Bergamo (Apr. 05), Stuttgart (Nov. 05), Budapest (Mar. 06), Stuttgart (Nov. 06), Brescia (Nov. 07)

Terms of reference

The principal goal is to eliminate inconsistencies in the present Model Code 90 rules and to formulate consistent behavioural models for bond in view of the preparation of a future Model Code. Explicit links for bond related sections have to be developed, for example the bond-slip model has to be linked

- to crack widths and rotation capacity formulations,
- to the limit state model for splitting failure of laps and anchorages.

Moreover, the existing Model Code rules have to be extended to cover new products and materials, including headed or epoxy-coated bars, fibre-composite reinforcement, High Strength Concrete, the effects of deterioration due to corrosion and to fire, etc.

Liaison to other *fib* Task Groups with activities related to bond phenomena will be established and communication with young researchers in this field of activity will be sought.