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June 2006

Results of the 2006 *fib* Awards for Outstanding Concrete Structures competition

Winners of the 2006 *fib* Awards for Outstanding Structures competition (clockwise from top left): HSB Turning Torso, Malmö, Sweden; Shawnessy LRT Station, Calgary, Canada; Floating Breakwater, Monaco; Seiun Bridge, Japan; Rion-Antirion Bridge, Greece.

The Jury's selections for the 2006 edition of the *fib* Awards for Outstanding Structures will be presented to the public on Monday 5 June at the *fib* Congress in Naples, Italy.

These awards are attributed every four years, with the goal of enhancing the international recognition of concrete structures that demonstrate the versatility of concrete as a structural medium. They consist of a bronze plaque to be displayed on the structure, and certificates given to the main parties responsible for the work.

The entries are judged in two categories, Buildings and Civil Engineering Structures, and in addition to the Award Winners, other projects can be singled out for Special Mention. Furthermore, for the current edition of the Awards, the Jury decided to attribute two Exceptional Recognition citations, in addition to the Winners and Special Mentions.

As follows tradition, the 2006 Jury was made up of the *fib* Presidium and a number of invited Honorary Presidents. The Members of the Jury were as follows:

- Jim Forbes, Chairman of the Jury and Honorary President
- Michael Virlogeux, Honorary President
- Jan Moksnes, Honorary President
- Giuseppe Mancini, President
- Hans-Rudolf Ganz, Deputy President
- György L. Balazs, Presidium member
- Michael Fardis, Presidium member
- Jean-Phillippe Fuzier, Presidium member
- Shoji Ikeda, Presidium member
- Ulrich Litzner, Presidium member
- Tippur Subba Rao, Presidium member
- Rüdiger Tewes, Secretary General

The Jury met in Berlin in November 2005 to select the winners and special mentions in all categories. The Jury examined each entry in detail and following discussion selected the nominees to be voted upon

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Special Mentions, Buildings Category: Forsterstrasse Apartment House, Zürich, Switzerland; Tomorrow Square, Shanghai, China

and subsequently published in the Awards Brochure (see next page). A series of secret ballots were cast to select the winners, Special Mentions as well as those singled out for Exceptional Recognition.

The jury took into account criteria such as:

- design aspects including aesthetics and design detailing,
- construction practice and quality of work,
- environmental aspects of the design and its construction,
- durability and weathering potential,
- contribution made by the entry to the development and improvement of concrete construction.

Overall, the Jury were impressed with the large number of high quality entries, which were received from a wide cross section of *fib* National Member Groups covering a variety of construction types.

The fact that a considerable number of entries were received from North America and Asia, as well as the more traditional entries from Europe indicated to the Jury that the Awards are truly international.

The entries in the Buildings category admirably demonstrated the use of concrete in a wide variety of structural forms. The Jury was particularly impressed by the use of concrete to provide light and airy forms that contrasted with the stereotypical view of concrete as being only associated with heavy, bulky and brutal elements.

Furthermore the Jury noted that the emphasis on concrete as a primarily load-bearing and durable element was not hidden or compromised by the architectural expression of the buildings; indeed it complemented the form and function of the building.

Entries in the Civil Engineering Category showed a strong emphasis on innovative construction methodology to achieve outstanding and very practical results.

Many projects made use of traditional structural forms that emphasise the simple structural actions of tension and compression to achieve their aims.

The elegance shown in this simplicity of form was achieved by the marriage of concrete and its complementary material in a manner that demonstrates the strength of each element.

Many of the Civil Engineering Structures are located in areas of outstanding natural beauty and the Jury were impressed at the way the structures enhanced rather than detracted from the natural setting.

The results of the 2006 fib Awards for Outstanding Structures competition are as follows.

Special Mentions, Civil Engineering Category: Flaz River Bridge, Switzerland; New Svinesund Bridge, Norway/Sweden; Infante Dom Henrique Bridge, Portugal

Structures that received "Exceptional Recognition" citations from the Jury: Millau Viaduct, France; Döllnitz Creek Bridge, Oschatz, Germany

Winning structures

Category B, Buildlings

- HSB Turning Torso, Malmö, Sweden
- Shawnessy Light Rail Transit Station, Calgary, Canada

Category C, Civil Engineering Structures

- Rion-Antirion Bridge, Greece
- Floating Breakwater, Monaco
- Seiun Bridge, Tokusima, Japan

Special Mentions

Category B, Buildlings

- Forsterstrasse Apartment House, Zürich, Switzerland
- Tomorrow Square, Shanghai, China

Category C, Civil Engineering Structures

- Flaz River Bridges, Samedan, Switzerland
- Infante Dom Henrique Bridge, Porto, Portugal
- New Svinesund Bridge, Norway/ Sweden

Exceptional Recognition

- Millau Viaduct, France
- Döllnitz Creek Bridge, Oschatz, Germany

Nominees

Category B, Buildlings

- Braga Stadium, Portugal
- FIU School of Architecture, Florida, USA
- Aurora Municipal Center, Colorado, USA
- Fujian Industrial Bank, Shenzhen, China
- Borgata Hotel, Casino & Spa, New Jersey, USA

Category C, Civil Engineering Structures

- Delhi Metro Rail Line 36, New Delhi, India
- River Deba Bridge, San Sebastian, Spain
- Nozomi Bridge, Gifu Prefecture, Japan
- Vienne River Bridge, Limoges, France
- Modena Viaducts, Italy
- Himi Bridge, Nagasaki, Japan
- Shin-Meisei Bridge, Nagoya, Japan
- Akihabara Public Deck, Tokyo, Japan
- Krka Bridge, Sibenik, Czech Republic
- Yahagigawa Bridge, Toyota City, Japan
- LBJ Expressway Interchange, Texas, USA

The decisions of the Jury are definitive and cannot be challenged.

fib has published a full-colour commemorative brochure presenting the structures selected as Award Winners, Special Mentions, Exceptional Recognition, and Nominees. The brochure is Bulletin 36 in *fib*'s series of technical bulletins, and can be ordered from the secretariat using the order form given at www.fib-international.org/publications/order

- *fib* Bulletin 36, 40 pages, format approx. DIN A4 (210 x 297 mm), ISBN 2-88394-076-2
- Non-member price 50 CHF, surface mail included; for airmail add 20% extra charge

fib Bulletin 34, "Model Code for Service Life Design": a basis for international standardisation

During the 1990s international experts realized that there was a need to upgrade the traditional concept for service life design of concrete structures.

Accepting the statistical spread for all influencing factors for deterioration, this community of enthusiasts wished to introduce a probability-based approach both for the performance criteria and the design itself. The goal was to establish an analytical and transparent methodology as close as possible to that used in traditional structural design.

At an international workshop in Tromsø, Norway in 2001, experts from Europe together with colleagues from overseas settled on a strategy for implementing such technology in operative standards. The group concluded that fib would be the appropriate body for developing a model for such standardization. This strategy was endorsed by ISO and CEN.

In April of this year fib published the result of this work, its bulletin number 34 "Model Code for Service Life Design" (see page 88).

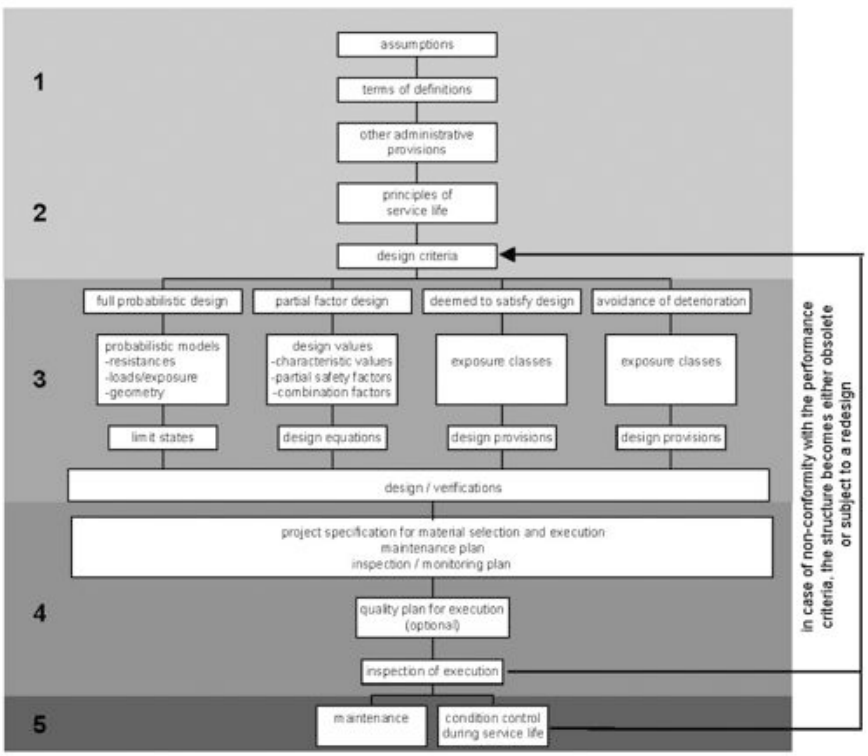


Figure 1 Flow chart for service life design

The initiative

In 2002 fib Task Group 5.6 was established and began its work to develop a model code for service life design of concrete structures (MC SLD). TG 5.6 was headed by Peter Schiessl; Christopher Gehlen acted as technical secretary. The TG had members from Japan, USA, Brazil, Switzerland, UK, Germany, Norway, Denmark and Sweden. The resulting document, *fib* Bulletin 34, was published in April 2006.

ISO and CEN recognize *fib*'s role as the optimal body for prestandardization in our field. The initiative was therefore endorsed by both organizations, which suspended their own work on the subject while awaiting the fib document.

The mandate from *fib*, ISO and CEN was to develope a document based on probabilistic and reliability-based principles in parallel with those traditionally applied for structural design. The document should cover a "total package" from basis of design down through design, execution, test methods, maintenance and repair.

The document is based on ISO 2394:1998 "General principles for the reliability for structures". This ISO document had earlier served as a mother document for the Eurocode EN 1990 "Basis of Design".

A performance-, reliability- and probabilistic based approach

The document's backbone, which enables the designer to perform calculations, is the three performance criteria defining the service life design of a structure:

- A definition of the relevant limit state
- A number of years
- A level of reliability for not passing the limit state during this period

These performance criteria have to be agreed with the owner of the structure, keeping in mind possible minimum levels given in national legislation and standards.

The designer is given four options to verify that his design fulfils the performance criteria:

1. Full probabilistic design
2. Partial factor design
3. Deemed-to-satisfy design
4. Avoidance of reaction design

The same four options will be given for the verification of traditional structural design in the future fib general Model Code.

Option 1 will, as for structural design, seldom be possible for new structures, due to lack of statistical data. For assessment of existing structures, relevant data might be derived from the structure. Option 1 is therefore well suited in these cases.

Option 2 will have to be calibrated against either the full probabilistic method, or on the basis of long-term field experience of building tradition. The MC SLD gives the principles for such calibration.

Option 3, the deemed-to-satisfy method, is a set of rules for dimensioning, material and product selection, as well as execution procedures that ensures the fulfillment of the performance criteria. This is the traditional method in today's operative standards. It typically comprise a set of water-cement ratios, cover to the reinforcement, limitations of crack width, etc.

The calibration of the deemed-to-satisfy method has to be done by the standardization body in the same way as for the partial factor method. Such a calibration, mainly based on in-field experience of 10 – 15 year old existing structures, has been performed by the Norwegian Standardization body for marine structures and carbonation-exposed structures. The calibrations are available from the author of this article (steinar.helland@skanska.no).

Option 4 gives the most robust design. It implies that the design excludes the detrimental reaction. Examples are avoidance of excessive moisture for frost-exposed structures, use of stainless steel, non-reactive aggregate etc.

For a number of deterioration mechanisms, the international research community has not settled on one single model. The MC SLD therefore gives informative examples of models for chloride ingress, carbonation and freeze-thaw, regarded as sufficiently mature and representing international efforts.

The MC SLD assumes that the anticipated inspection and planned maintenance during the service life of the structure is an integrated part of the design. No systematic activities in these two fields should result in the need for a more robust solution, and vice-versa.

If inspections during the use of the structure reveal non-conformance with the inspection criteria, a partial or full redesign based on the new data has to be performed according to the same principles as given for new structures. The outcome of the redesign might be a need for repair.

The flow of actions described in the MC SLD is give in figure 1 and corresponds to that expected for traditional structural design.

The future

ISO TC 71 formed a working party last winter with experts from USA, Japan, China, UK and Norway to come up with recommendations to the TC on how to implement the MC SLD in future ISO standards. The group is headed by Steinar Helland.

CEN TC-104 and TC-250 have also worked with the MC SLD this winter. However, as none of the major European concrete related standards for the moment are under revision, its implementation in CEN will have to come later.

The elements of the MC SLD will be integrated in the new *fib* Model Code, which is currently being developed by *fib*

The DuraNet international workshop in Tromsø, Norway, in June 2001, that decided on the strategy for implementation of modern service life design of concrete structures

Special Activity Group 5.

In addition to serving as a model for standard writers, the MC SLD is very well suited for assessment of remaining service life of existing structures.

Its definitions and methodology may also assist national standardization bodies to calibrate their present "deemed-to-satisfy" requirements on durability.

It is thought-provoking to notice that a survey of national standards from North America, the Pacific Rim and Europe revealed that, for instance, the water-cement ratio required for a submerged concrete structure in seawater (a very defined exposure regime) ranged from 0.55 down to 0.40 (with similar cover to the reinforcement).

The differences cannot reflect differences in technical insight, but must be on the account of the absence of a commonly accepted and consistent methodology and definitions.

The *fib* MC SLD is meant to form the needed basis to resolve this unacceptable situation.

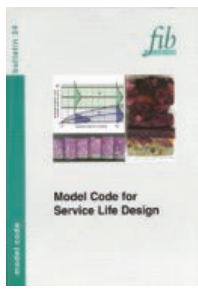
Steinar Helland
fib Task Group 5.6

In addition to his work in TG 5.6 and ISO TC 71, the author is an active member of several fib commissions, including C 8 "Concrete", C 10 "Construction", and SAG 5 "New Model Code". He is also an elected member of the Steering Committee and a national delegate for the Norwegian fib group.

New bulletins

The series of *fib* Bulletins for the subscription year 2006 began with number 34, *Model Code for Service Life Design*, and number 35, *Retrofitting of Concrete Structures through Externally Bonded FRP, with emphasis on Seismic Applications*, mailed to members in April and May. Brief descriptions are given below. Non-members may order this or any other publication by simply following the instructions given at www.fib-international.org/publications/.

Model Code for Service Life Design (*fib* Model Code)



- *fib* Bulletin 34, 116 pages, format approx. DIN A4 (210 x 297 mm), ISBN 2-88394-074-6
- Non-member price 110 CHF, surface mail included; for airmail add 20% extra charge

This bulletin addresses Service Life Design (SLD) for plain concrete, reinforced concrete and pre-stressed concrete structures, with a special focus on design provisions for managing the adverse effects of degradation. Its objective is to identify agreed durability related models and to prepare the framework for standardization of performance based design approaches.

Four different options for SLD are given:
– a full probabilistic approach,
– a semi probabilistic approach (partial factor design),
– deemed-to-satisfy rules,
– avoidance of deterioration.

The service life design approaches described in this document may be applied for the design of new structures, for updating the service life design if the structure exists and real material properties and/or the interaction of environment and structure can be measured (real concrete covers, carbonation depths), and for calculating residual service life.

The bulletin is divided into five chapters:

1. General
2. Basis of design
3. Verification of Service Life Design
4. Execution and its quality management
5. Maintenance and condition control

It also includes four informative annexes, which give background information and examples of procedures and deterioration models for the application in SLD.

The format of Bulletin 34 follows the CEB-FIP tradition for Model Codes: the main provisions are given on the right-hand side of the page, and on the left-hand side, the comments.

This document will be submitted to the *fib* General Assembly in June 2006 for approval as a Model Code.

Retrofitting of concrete structures by externally bonded FRPs, with emphasis on seismic applications (*fib* Technical Report)

- *fib* Bulletin 35, 224 pages, format approx. DIN A4 (210 x 297 mm), ISBN 2-88394-075-4
- Non-member price 120 CHF, surface mail included; for airmail add 20% extra charge

fib Bulletin 35 is the first bulletin to publish documentation from an *fib* short course. These courses are held worldwide and cover advanced knowledge of structural concrete in general, or specific topics. They are organized by *fib* and given by internationally recognized experts in fib, often supplemented with local experts active in *fib*. They are based on the knowledge and expertise from *fib*'s ten Commissions and nearly fifty Task Groups.

fib Bulletin 35 presents the course materials developed for the short course "Retrofitting of Concrete Structures through Externally Bonded FRP, with emphasis on Seismic Applications", given in Ankara and Istanbul in June 2005. The course drew on expertise both from outside Turkey and from the large pool of local experts on this subject.

This bulletin was recently used as the basic course material for another *fib* short course on retrofitting using externally bonded FRPs, held in Mexico City on 12-13 May 2006.

In most countries of the world, the building stock is ageing and needs continuous maintenance or repair. Moreover, the majority of existing constructions are deficient in the light of current knowledge and design codes. The problem of structural deficiency of existing constructions is especially acute in seismic regions, as, even there, seismic design of structures is relatively recent. The direct and indirect costs of demolition and reconstruction of structurally deficient constructions are often prohibitive; furthermore they entail a substantial waste of natural resources and energy. Therefore, structural retrofitting is becoming increasingly widespread throughout the world.

Externally bonded Fibre Reinforced Polymers (FRPs) are rapidly becoming the technique of choice for structural retrofitting. They are cleaner and easier to apply than conventional retrofitting techniques, reduce disruption to the occupancy and operation of the facility, do not generate debris or waste, and reduce health and accident hazards at the construction site as well as noise and air pollution in the surroundings.

fib Bulletin 35 gives state-of-the-art coverage of retrofitting through FRPs and presents relevant provisions from three recent standardisation milestones: EN 1998-3:2005 "Eurocode 8: Design of structures for earthquake resistance – Part 3: Assessment and retrofitting of buildings", the 2005 Draft of the Turkish seismic design code, and the Italian regulatory document CNR-DT 200/04, "Instructions for Design, Execution and Control of Strengthening Interventions by Means of Fibre-Reinforced Composites" (2004).

List of contents and authors

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Design rules for seismic retrofitting with FRPs according to Eurocode 8 and their background.
M.N. Fardis, University of Patras, Greece

Congresses and symposia

The calendar lists *fib* congresses and symposia, co-sponsored events and, if space permits, events supported by *fib* or organised by one of its National Groups. It reflects the state of information available to the Secretariat at the time of printing; the information given may be subject to change.

Date and location	Event	Main organiser	Contact
23-26 August 2006 Zürich, Switzerland	6th *fib* International Ph.D. Symposium in Civil Engineering	ETH-Zürich	Institute of Structural Engineering ETH Hoenggerberg phdce6@ibk.baug.ethz.ch www.phdce6.ethz.ch
20-23 May 2007 **Dubrovnik, Croatia**	***fib* Symposium:** **Concrete Structures: Stimulators of Development**	***fib* group Croatia**	**Symposium secretariat** **Tel.: +385 1 4639 329** **fib-dubrovnik-2007@igh.hr** **www.igh.hr/fib-dubrovnik-2007**
16-18 July 2007 Patras, Greece	8th International Symposium on Fiber Reinforced Polymer Reinforcement for Concrete Structures	University of Patras	Symposium secretariat Prof. Thanasis Triantafillou Dept. of Civil Engineering University of Patras frprcs8@upatras.gr www.frprcs8.upatras.gr
4-7 September 2007 Stuttgart, Germany	Second Symposium on Connections between Steel and Concrete	University of Stuttgart	Symposium secretariat c/o IWB University of Stuttgart symposium@iwb.uni-stuttgart.de
29 May - 3 June 2010 **Washington D.C.**	***fib* Congress**	**U.S. *fib* group** **PCI**	**Symposium secretariat** **Precast/Prestressed Concrete Institute (PCI)** **info@pci.org** **www.pci.org**