Commission 1 – Concrete structures

Chair:

Moussard	ARCADIS	France

Co-Chair:

van der Horst	Delft University of Technology	Netherlands

Members:

Almeida	DECivil, Instituto Superior Técnico	Portugal
Clark	Ramboll UK	United Kingdom
Curbach	TU Dresden	Germany
Forbes	Hyder Consulting	Australia
Kasuga	Sumitomo Mitsui Construction Co. Ltd.	Japan
Klein	T ingénierie SA	Switzerland
Meda	University of Rome “Tor Vergata”	Italy
Olsen	Dr. techn. Olav Olsen AS	Norway
Strásky	Department of Concrete and Masonry	Czech Republic
Truby	Truby Stevenson Ltd.	United Kingdom
Virlogeux	Consultant	France

Corresponding members:

Ikeda	Hybrid Research Inst. Inc.	Japan

(*fib* members are listed in **bold**)

Recent meetings:

Copenhagen (May 2015); Paris (March 2016)

Terms of reference

Motivation/background (in brief)

Commission 1 (COM1) seeks to encourage and develop good practices in the design of concrete structures, with a special emphasis on innovation and imagination. Its work should complement national, regional (e.g. Eurocodes), or international codes (e.g. the *fib* Model Code for Concrete Structures 2010) which in principle give only design specifications.

COM1 examines all aspects of specific types of structures, from their structural and architectural design up to construction and service life.

Scope and objective of technical work

COM1 aims to provide state-of-the-art documentation and recommendations for all types of structures where structural concrete plays a significant role. This will apply in priority to fields of development where data and guidelines are not yet available, either new types of structures or implementation of new developments of materials, or a combination of both.

COM1 endeavours to promote practices leading to sound, economical, durable and aesthetic design, with special attention to sustainable development principles.

Description of workflow and timeline

Because of its broad scope, COM1 is comprised of a number of task groups (TGs) that operate somewhat as sub-commissions, and are comprised themselves of working parties (WPs).

The workflow and timeline are set and checked at each commission meeting with the TG conveners, annually or bi-annually. These meetings devote significant time to the review and identification of new fields of activity.

Collaboration with other groups

COM1 collaborates with other *fib* commissions and task groups at all levels. COM1 Task Group 1.4 *Tunnels* is currently working with Commission 4, and COM1 is also working with Commission 5 on the creation of Working Party 5.2.1, *Guidelines for detailing*.

Collaboration with the International Tunneling Association was recently initiated for TG1.4 *Tunnels*.

Target Audience

Consulting engineers, architects, contractors, owners, governmental agencies, and other organizations

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Task Group 1.1: Bridges

Convener:

Klein	T ingénierie SA	Switzerland

Members:

Curran	Ramboll	United Kingdom
Imberty	Razel SA	France
Kasuga	Sumitomo Mitsui Construction Co. Ltd.	Japan
Marx	Leibniz Universität Hannover	Germany
Morgenthal	Bauhaus University	Germany
Schlaich	TU Berlin, Inst für Bauingenieurwesen	Germany
Sobrino	Pedelta, S. L. Ingenieria de Estruct.	Spain

Corresponding Members:

Astiz Suarez	Carlos Fernandez Casado S. L.	Spain

(*fib* members are listed in **bold**)

Terms of reference

Motivation/background (in brief)

Task Group 1.1 (T1.1) is dedicated to bridge engineering. All types of bridges are concerned with a predominance of concrete bridges. Theoretical and practical aspects are treated, as well as construction techniques. Innovations and recent developments but also established good practices are highlighted. Emphasis is placed on bridge architecture and design.

Scope and objective of technical work

The general objective of the task group is to provide design guides, recommendations, practical design rules and technical advice on bridge design and related construction techniques. Rules of good practice and recommendations for the correct use of materials and techniques are formulated.

Description of workflow and timeline

T1.1 has been in place since the beginning of *fib* commission work and will be a continuous task group. Working parties are organized on specific subjects and are disbanded when the relevant work is finished. Proposals for numerous new subjects are continuously being formulated. A selection of the most interesting and current subjects is made to drive the work of the working parties throughout the years.

Collaboration with other groups

fib Commission 6 *Prefabrication*

fib Commission 5 *Reinforcements*

Target Audience

Bridge designers, contractors, owners, authorities, universities, and students

Expected outcome and delivery dates

State-of–the-art report on "Corrugated steel web bridges", published in March 2016

Working Party 1.1.1: Bridges for high-speed trains

Convener:

Marx	Leibniz Universität Hannover	Germany

Members:

Astiz Suarez	Carlos Fernandez Casado S. L.	Spain
Fackler	Schlaich Bergermann und Partner GmbH	Germany
Matsumoto	Railway Technical Research Institute	Japan
Schmitt	SNCF – Direction de l'Ingénierie	France
Seidl	SSF Ingenieure AG	Germany
Sobrino	Pedelta, S. L.	Spain
Sun	Sun Engineering Consultants International	China

(*fib* members are listed in **bold**)

WP1.1.1 aims to provide guidance for designers of bridges for high speed trains covering issues such as loads, dynamics, rail deck interaction, wind, slipstream forces, accidental situations, maintenance and inspection, etc. The document will be based on existing guidance edited by the German railway administration. International expertise will broaden the recommendations and bring them to an international level.

Working Party 1.1.3: Integral bridges

Convener:

Dreier	structurame	Switzerland

Members:

Almeida	Instituto Superior Técnico Lisboa	Portugal
Alvarez	Swiss Federal Roads Office	Switzerland
Breña	University of Massachusetts Amherst	USA
de Beulaker	BAM	France
Dicleli	Ankara Middle East Technical University	Turkey
Havy	ARCADIS	France
Inoue	Osaka Institute of Technology	Japan
Jandin	CEREMA	France
Klein	T ingénierie	Switzerland
Laaksonen	Tampere University of Technology	Finland
Marx	Leibniz Universität Hannover	Germany
Palermo	The University of Canterbury	New Zealand
Perez-Caldentey	Polytechnic University of Madrid	Spain

Sanchez	ARUP	Ireland
Wenger	Schlaich Bergmann and Partners	Germany
Wenner	Marx Krontal GmbH	Germany

Corr. Members:

Champenoy	CEREMA	
Collin	Luleå University of Technology	Sweden
Kaufmann	ETH Zürich	Switzerland
Kurita	Osaka Institute of Technology	Japan
Moussard	ARCADIS	France
Muttoni	EPF Lausanne	Switzerland

(*fib* members are listed in **bold**)

The scope of Working Party 1.1.3 is to prepare a practical guideline on semi-integral and integral bridges. The objective of this guideline is to define the current best practical response to specific problems associated with semi-integral and integral bridges from an international perspective. It will be based on existing guidelines, results from scientific research and feedback from practical experience.

The specific topics related to semi-integral and integral bridges to be studied include the following, non-exhaustive list:

- Terminology
- Specific issues (practical and feedback from experience)
- Loads
- Soil-structure interaction
- Design
- Construction details

The guideline is expected to be a source of inspiration for writers who implement standards for semi-integral and integral bridges.

Working Party 1.1.4: Light railway bridges

Convener:

Pochat	Systra	France

Motivation/background (in brief)

While road and railway bridges benefit from standards and extensive documentation often published by state agencies, it is not the case for lightweight railway bridges. This can be explained by the variety of systems ranging from LRT (Light Rail Transit) to MRT (Mass Rapid Transit) and the fact that these systems are mainly operating at a city or regional level.

However, from a bridge engineering perspective, common features, particular requirements and good practices for design and construction can be identified that specifically apply to these transportation modes.

Scope and objective of technical work

The general objective of this working party is to provide a state-of-the-art report for the design of LRT and MRT bridges. This report will:

- Define the limits of its study by pointing out the most widespread aspects of these structures: environment, length, gauges and loads, etc.,
- Provide some historical background,
- Present specific constraints and driving parameters (how to deal with stations, operation and maintenance aspects, evacuation, equipment, …

- Propose guidelines for design and execution with regards to loads, service limit states, track-structure interaction, vibrations, …
- Focus on detailing aspects such as structural joints, earthing, bonding and stray current collection, track typologies, rail systems integration, …

Description of workflow and timeline

The task group members will be identified in 2016 on basis of recommendations provided by experts in the field, and invitations sent by the convener. The group plans to start work in Fall 2016 and conclude in 2018.

Collaboration with other groups

WP 1.1.3 Integral Bridges TG 6.5 Precast Bridges

Target Audience

Designers, consulting engineers, contractors, architects, owners, authorities, academia.

Working Party 1.1.5: Management of prestressed concrete bridges

Convener:

Collins	Ramboll	United Kingdom

Motivation/background (in brief)

Over recent years some significant work has gone into inspection and investigations of post-tensioned bidges around the world. This has led to an increase in understanding the methods of inspection to determine the condition of the prestressing tendons and the whole process to assess structural safety. Repairs to such bridges have been undertaken and some have been replaced. Long term management of such bridges is becoming important to bridge owners around the world and guidance is scarce.

Scope and objective of technical work

The fib can collect the current state-of-the-art of such processes from its member countries and prepare a state-of-the-art report with guidance to assist those countries which are still to embark on inspecting their stock of such bridges.

Description of workflow and timeline

An initial study has been carried out by Ramboll in conjunction with the Nippon Expressway Company Research Institute of Japan (NEXCO-RI) which can serve as the starting point for the working party to extend the data gathering to more countries to establish their current practices. The basis for this has already been prepared so work can start almost immediately.

Collaboration with other groups

Collaboration with T1.1 Bridges, COM5 Reinforcements and T8.5 revising Bulletin 33

Target Audience

Bridge owners, consultants and maintenance authorities

Expected outcome and delivery dates

State-of-the-art report with guidance, with publication in 2019. The topic could also be considered for an international workshop.

Task Group 1.2: Concrete structures in marine environments

Convener:

Olsen	Dr. techn. Olav Olsen a.s.	Norway

Members:

Haugerud	Dr. techn. Olav Olsen a.s.	Norway
Rogne	Dr. techn. Olav Olsen a.s.	Norway

(*fib* members are listed in **bold**)

New members have been invited and will be appointed.

Terms of reference

Motivation/background (in brief)

Well-designed, well-built concrete structures are particularly suited for the marine environment. Task Group 1.2 has so far focused on structures for oil and gas fields in hostile marine environments (*fib* Bulletin 50); now the focus will be on concrete structures in marine environments in general.

Significant experience has been gained from the design and construction of the 50 major offshore concrete structures of the world. The most recent ones are: Sakhalin I installed in the summer of 2012, Hebron, which is currently under construction in New Foundland, Canada, and yet another platform expected to be built in Canada.

There are additional markets as well, even in urban areas, where societal activities could be effectively located on or in marine concrete structures. For example, artificial islands could be constructed for dwellings, offices, parking lots or other similar needs. Airports have also been considered. Urban infrastructure also has other potential applications, such as submerged floating tunnels, floating bridges and immersed tunnels.

In coastal areas, docks, fish farming, renewable energy and storage may be suitable applications. Ships and barges should also be considered.

Some of these applications may not be in easily accessible locations, such as offshore platforms, leading to structures that are not fully utilized from a structural point of view. In turn, this may lead to the structures being too costly and inefficient, which is a challenge to be addressed.

Thus, it is believed that the future will see an increased demand for applications which support societal activities in the marine environment. Examples may be related to:

- Food (farming and cultivation)
- Infrastructure
- Energy
- Environment
- Dwellings and urban development
- Nearshore industrial development
- Offshore industrial development
- Storage
- Vessels
- Recreation
- Natural disasters
- Military installations
- Other

Concrete structures in marine environments may very well be a useful tool for these activities.

Description of workflow and timeline

To be determined; delivery of the next bulletin is targeted for 2017

Working Party 1.2.1: Floating concrete structures

Convener:

Olsen	Dr. techn. Olav Olsen a.s.	Norway

Members:

Almeida	Instituto Superior Técnico Lisboa	Portugal
Corres Peiretti	FHECOR Ingenieros Consultores	Spain
Godejord	Arup	USA
Gudmestad	University of Stavanger	Norway
Hamon	DORIS Engineering	France
Haugerud	Dr. techn. Olav Olsen a.s.	Norway
Haynes	VSL	Hong Kong
Helland	Skanska Norge AS	Norway
Hjorteset	BergerABAM	USA
Jackson	Arup	United Kingdom
Jenssen		Norway
Kalny	Pontex	Czech Republic
Klein	T Ingénierie SA	Switzerland
Muttoni	EPFL	Switzerland
Østlund	Kværner	Norway
Paschalis	BESIX	Belgium
Rettedal	Statoil	Norway
Rogne	Dr. techn. Olav Olsen a.s.	Norway
Rozier	Bouygues Travaux Publics	France
Stucchi	EGT Engenharia	Brazil
Thorsen	Snøhetta	Norway
Vache	Private, prev. DORIS Engineering	France
Wike	ØKAW	Norway
Zich	Strasky, Husty and Partners	Czech Republic

(*fib* members are listed in **bold**)

Motivation/background (in brief)

In many cases, floating structures have some clear advantages compared to fixed structures. The motivation of the work in this WP is to demonstrate these advantages, and attempt to draw conclusions as to what applications are particularly promising.

Scope and objective of technical work

The objective of WP1.2.1 is to demonstrate the usefulness of concrete in a modern society where floating structures may be needed. It will identify and consider potential applications of marine floating concrete structures, and then make selections and go into more detail on how the selected applications can be made competitive.

The work will be related to a book released in September 2014 "*Large floating structures: Technological advances*", edited by C.M.Wang and B.T.Wang, Springer.

Description of workflow and timeline

Delivery of the next bulletin is targeted for end of 2017.

Collaboration with other *fib* commissions, task groups, and other organizations

WP1.2.2 Submerged floating tunnels, otherwise to be decided

Target audience

The general construction industry (academia, consultants, authorities/governmental, institutions, manufacturers, contractors

Expected outcome and delivery dates

Report, 2015.

Working Party 1.2.2: Submerged floating tunnels (SFT)

Convener:

Olsen	Dr. techn. Olav Olsen a.s.	Norway

Members:

To be decided

(*fib* members are listed in **bold**)

Motivation/background (in brief)

Sometimes our infrastructure needs to cross water. Immersed tunnels, which sit on the seabed, are widely used; more than 100 have been built.

Submerged floating tunnels have never been built, at least not for traffic. Similar to bridges, submerged floating tunnels span the water. Submerged floating tunnels may be supported between landfalls, either by tension legs or pontoons.

Scope and objective of technical work

The main scope of this working party is to concisely describe the most important merits of these sea tunnels, give relevant references to important literature, describe important design premises, and provide guidance on potential improvements.

Description of workflow and timeline

The group plans to start work in Fall 2014 and conclude in 2016.

Collaboration with other *fib* commissions, task groups, and other organizations

WP1.2.2 will collaborate with WP1.2.1 *Floating Concrete Structures*. WP1.2.2 will liaise with the International Tunneling Association (ITA) and affiliated national associations. Others to be decided.

Target audience

The general construction industry (academia, consultants, authorities/governmental, institutions, manufacturers, contractors), in particular rail and road departments, and developers

Expected outcome and delivery dates

Report, end of 2018

Task Group 1.3: Buildings

Convener:

Truby	Truby Stevenson Ltd	United Kingdom

Members:

Burridge	The Concrete Centre	United Kingdom
Cammelli	BMT Fluid Mechanics Ltd.	United Kingdom
Dahl	Rambøll Denmark A/S	Denmark
Fraser	Ramboll UK	United Kingdom
Gent	Explore Manufacturing	United Kingdom
Jaeger	Setec tpi	France
Keliris	Buro Happold Ltd.	United Kingdom
Mansell	Ramboll UK	United Kingdom
Marsh	Skidmore Owings & Merrill LLP	United Kingdom
McKechnie	Arup	United Kingdom
Palmisano	PPV Consulting	Italy
Pitt	Explore Manufacturing	United Kingdom
Stehle	Laing O'Rourke	United Kingdom
Surendran	PRAETER Engineering Ltd	United Kingdom
Vickers	Explore Manufacturing	United Kingdom
Wells	WSP Group	United Kingdom

Corres. Members

Cairns	Heriot-Watt University	United Kingdom
Chiorino	Politecnico di Torino	Italy
Ha	Daewoo Engineering & Construction	South Korea

Recent meetings:

London (March 2016)

Terms of reference

Motivation/background (in brief)

The use of concrete in building structures is widespread throughout the world and is frequently well documented in the various national codes and standards. There are however a number of areas where guidance to designers is unclear or where significant interpretation is required. The aim of Task Group 1.3 (T1.3) is to review the current design and construction approaches used and to identify where additional guidance is required. Where it is deemed necessary T1.3, will undertake the appropriate literature searches, review the available current guidance and produce new design advice and recommendations in the form of *fib* bulletins.

Scope and objective of technical work

The main goals of T1.3 are:

- to identify how recent improvements in concrete knowledge and technology are, or could be, applied to building structures; and
- to prepare state-of-the-art reports, guidelines, and recommendations on the use of concrete in the design and construction of concrete buildings.

Description of workflow and timeline

The task group members will be identified in early 2015, and the areas for work will be determined shortly thereafter. However, the following preliminary topics have been established:

- Ground / structure interaction
- Optimized design for buildability

- The design of SRC (steel reinforced concrete) columns
- Slab edge deflections - interactions with facade systems
- Early thermal movement and its effects on concrete pour size
- The effects of restraint in post-tensioned buildings
- Design considerations for transfer structures
- Design considerations for offset and sloping concrete columns
- Considerations for demolition of concrete building structures
- Considerations for alterations to concrete building structures
- Guidance on deflections for concrete buildings

Under the direction of this task group, *fib* Bulletin 73 – Tall Buildings in Concrete, was published in October 2014.

Task Group 1.4: Tunnels

Convener:

Meda	University of Rome "Tor Vergata"	Italy

Members:

Dehn	MFPA Leipzig GmbH	Germany
Dobashi	Shutoko Engineering Company Ltd.	Japan
Edvardsen	COWI A/S	Denmark
Larive	Tunnels Study Centre	France
Lensen		Netherlands
Moussard	ARCADIS	France

Corr. Members:

Bergmeister	Universität für Bodenkultur	Austria
Tiberti	University of Brescia	Italy

(*fib* members are listed in **bold**)

Terms of Reference

Motivation/background (in brief)

Transportation, mining, water management, energy network development, combined with environmental concerns, have lead to a significant increase in the construction of tunnels around the world. Along with other materials, structural concrete plays a primary role in the realization of these structures, and accordingly, many issues related to the use of concrete in tunnels ought to be addressed in order to promote the best use of structural concrete in this field of civil engineering

Scope and objective of technical work

The main goals of T1.4 main goals are to:

- identify how recent improvements in concrete knowledge and technology are, or could be, applied to tunnels, and how new developments in tunnel construction can rely upon concrete technologies;
- prepare state-of-the-art reports, guidelines, recommendations on the use of concrete in tunnel design and construction.

Description of workflow and timeline

T1.4 started its activities in 2013. Three main issues have been highlighted: fibre-reinforced concrete tunnels, immersed or floating tunnels, and materials for tunnels. The TG's activities will focus on these issues over the next three years.

Collaboration with other groups

T1.4 will liaise with other commissions and task groups on specific issues such as: behaviour of concrete in a fire (*fib* COM2 and COM4), cracking evaluation and control, concrete properties (*fib* COM4 and COM8), fibre-reinforced concrete (*fib* COM4).

T1.4 has liaised with the International Tunneling Association (ITA) and its affiliated national associations.

Target Audience

Academia, consultants, authorities/governmental, institutions, producers, contractors

Expected outcome and delivery dates

The preparation of bulletins on the aforementioned topics is planned over the next three years.

Working Party 1.4.1: Tunnels in fibre-reinforced concrete

Convener:

Meda	University of Rome “Tor Vergata”	Italy

Members:

Dehn	MFPA Leipzig GmbH	Germany
Blasini	Eiffage	
de La Fuente	Universidad Polytecnica de Catalunya	Spain
Dobashi	Shutoko Engineering Company Ltd.	Japan
Edvardsen	Cowi AS	Denmark
Fantilli	Politecnico di Torino	Italy
Giuliani-Leonardi	Vinci	Italy
Guedon	ARCADIS	France
Kodra	Eiffage	
Larive	Tunnels Study Center	France
Plizzari	University of Brescia	Italy
Tiberti	University of Brescia	Italy

Corresponding Members:

Lensen	ARCADIS	Netherlands
Moussard	ARCADIS	France

(*fib* members are listed in **bold**)

Terms of reference

Motivation/background (in brief)

The *fib* Model Code for Concrete Structures 2010 (*fib* MC2010) introduced indications for fibre-reinforced concrete, which has lead to increased use of fibre-reinforced concrete, particularly in the construction of tunnels. The use of fibre-reinforced in tunnels is one of the main applications of this material both in natural excavated tunnels (mainly in sprayed concrete) and in mechanical excavated tunnels (precast elements)

The main scope of this working party is to support the designer in the use of the *fib* MC2010 for tunnel design. Indications on how to deal with aspects not explicitly covered by the *fib* MC2010 will be given.

Description of workflow and timeline

Initially, the focus will be on precast tunnel segments in fibre-reinforced concrete only (without steel cage). Subsequently, the WP plans to prepare a "guide to good practice" bulletin to support designers of fibre-reinforced concrete segmental lining tunnels.

Collaboration with other groups

WP1.4.1 will collaborate with T2.2 (Ultimate limit state models), T2.9 (Fastenings to structural concrete and masonry) and T4.1 (Fibre-reinforced concrete).

Target Audience

Academia, consultants, authorities/governmental institutions, producers, contractors

Expected outcome and delivery dates

The preparation of a bulletin (guide to good practice) on the aforementioned topics is planned for 2017.

Working Party 1.4.2: Design and construction of openings in precast lining

Convener:

Pompeu Santos	SPS Consulting	Portugal

Members:

TBD

Terms of reference

Motivation/background (in brief)

The realization of openings in precast lining of tunnels, for example, to enlarge the space (creating recesses, etc.) or to build connections with other underground spaces or tunnels requires local disassembly of precast lining segments and cast concrete walls in situ. These areas of the tunnels are subject to specific load conditions, so that the structural requirements should be carefully considered in the design.

The construction of the openings also requires special attention, particularly when there is water pressure around the tunnel, in order to prevent water entrance and allow work to be carried out safely. The realization of the new walls and connections with existing lining segments also need specific procedures, according to the technology used.

Description of workflow and timeline

The start will be the identification of the commonly used solutions and the difficulties and challenges they face. The second phase will be to identify areas for future research on the subject. Subsequently, the WP envisages to prepare a "Guide to Good Practice" to help designers and contractors.

Collaboration with other groups

WP 1.4.2 plans collaboration with T1.2 (Concrete Structures in Marine Environments), T1.7 (Construction of Concrete Structures), T2.2 (Ultimate limit state models) and T2.9 (Fastenings to structural concrete)

Target audience

Academia, consultants, authorities/governmental institutions, producers, contractors

Expected outcome and delivery dates

It is expected that a bulletin (Guide to Good Practice) on the subject will be prepared in the next three years.

Task Group 1.5: Structural Sustainability

Convener:

Kasuga	Sumitomo Mitsui Construction	Japan

Members:

Almeida	DeCivil, Instituto Superior Técnico	Portugal
Cimellaro	Politecnico di Torino	Italy
Clark	Ramboll	UK
Corres Peiretti	FHECHOR Ingenieros Consultores	Spain
Hajek	CVUT – Czech Technical Univ., in Prague	Czech Republic
Kalny	PONTEX	Czech Republic
Klein	T ingenierie SA	Switzerland
Kata	Sumitomo Mitsui Construction	Japan
Montens	SYSTRA	France
Moussard	ARCADIS	France
Sakai	Japan Sustainability Institute	Japan
Vion	SYSTRA	France

(*fib* members are listed in **bold**)

Recent meetings:

Madrid (June 2016)

Terms of reference

Motivation/background (in brief)

Recently, sustainability has been discussed with regard to materials, recycling and so on, relating to the reduction of CO_2 emissions. However, sustainability has another aspect, for example, the structure, design and construction, which can lead to reducing energy consumption and non-renewable resources over the course of the full life-time of a structure. Minimizing energy consumption and non-renewable resources, will be discussed in the context of environmental, social and economic aspects in order to provide sustainable solutions for our society. These discussions will be key for developing sustainable structures. This philosophy is defined as “Structural Sustainability”.

Scope and objective of technical work

The aim of this task group is to focus on minimizing energy consumption and non-renewable resources during the life-time of structures from the structural point of view. Basically, the structures built using current specifications are durable. Therefore, structural sustainability should be defined as the difference from existing technologies to new ones in order to make structural sustainability clear. Examples of structural type, detailing, design, special construction techniques and so on for structural sustainability will be collected to publish a state-of-the-art report.

Structural sustainability includes the following subjects:

Existing Technologies

- Member replaceability (ex. external tendon)
- Adaptability in the future (ex. FRP sheet, external tendon)
- Local materials (ex. timber bridge)
- Minimum maintenance (ex. composite bridge)
- Earthquake resistance (ex. light weight structure, rigid frame)
- Fire resistance (ex. concrete structure)
- Integrated structure (ex. high-rise building, shell structure)
- Ductile structure (ex. rigid frame)
- Retrofitting with service = serviceability (ex. composite bridge)
- Detailing (ex. water tightness)

New Technologies

- High durability (ex. UFRC, butterfly web, FRP bridge)
- Inspection accessibility (ex. butterfly web bridge)
- Environmentally-friendly construction method (ex. Seiun Bridge, Linn Cove Viaduct)
- Minimizing construction errors (ex. vacuum pump grouting)
- Optimized design (ex. stay cable force optimization)
- Sound engineering through conceptual design by *fib* Model Code 2010

Description of workflow and timeline

By the end of 2015: First draft prepared

By the end of 2016: Publishing the report

Collaboration with other groups

Collaboration with COM7 - Sustainability

Target Audience

Academia, architects, consultants, authorities/governmental, institutions, producers, contractors

Expected outcome and delivery dates

State-of-the-art report published by the end of 2017

Task Group 1.6: History of concrete structures

Convener:

Curbach	Technische Universität Dresden	Germany

Co-Convener:

Moussard	ARCADIS	France

Members:

Aprea	EPFL	Switzerland
Cussigh	Vinci	France
Fernández Ordóñez	Universidad Politecnica de Madrid	Spain
Jahren		Norway
León	Universidad Politecnica de Madrid	Spain
Taerwe	Ghent University	Belgium
van Stipriaan	Technische Universität Dresden	Germany

Corresponding Members:

Acker	Consultant	France
Torrenti	IFSTTAR	France

(*fib* members are listed in **bold**)

Terms of reference

Motivation/background (in brief)

During the long history of CEB, FIP and now *fib*, the main objectives of their commissions, task-groups and special activity groups were and are actual topics of research, application and dissemination.

Construction history is a rapidly growing research field in the community of architects and civil engineers. The last conference on construction history took place in Paris in July 2012 and consisted of 66 sessions. Only two of them focused on concrete and concrete construction. Furthermore, none of the key lectures was related to concrete.

Therefore, the suggestion is made to form a group within *fib* with the main objective to work on the topic of the history of concrete and concrete construction.

Background and scope

The older the application of concrete and concrete structures become the more important it is to remember the experiences, the knowledge, even the development of knowledge, and also the errors of the past. Or as George Santayana has written: “Those who cannot remember the past are condemned to repeat it.”

The commission intends to set up a process which shall result in the publication of a series of bulletins covering the global history of structural concrete, from its first developments to the present situation.

At the beginning, it is very important to organize the extremely broad field of historic research. It is suggested to start with a more narrow approach, mainly with the collection of historic material and the development of the relationship between the collected material. A broader approach implies the integration of concrete history within the time, including political, social, climatic, economic and ecological circumstances. This does not only need more time, but also the addition of historically educated experts.

Several approaches are possible and also necessary. The collection of material may be organized by

- time and their constraints
- persons and their motivations
- countries/continents
- building types such as bridges/industrial buildings/shells etc.
- scientific results
- companies (coming – growing – merging – going/ turn-around, strategy)
- universities (first lectures in concrete construction , research)
- books, rules, codes

A lot of connections are self-evident, as e.g. the development of special structures through specific persons, or the growth of a company due to the work of one or more persons or due to special knowledge for specific buildings, or the connection between scientists and their research.

Description of workflow and timeline

The first task that has to be done is the formulation of a systematic approach, in which the ongoing work – the collection and the formulation of connections – will be integrated.

The groundwork could be made by members of the group with a short description of how concrete came into their country (through buying patents, etc, from whom and to which company or person) to cover the early period from 1850 to 1910.

Collaboration with other groups

Close cooperation with comparable task groups in the course of formation within the International Association for Bridge and Structural Engineering IABSE, which will focus on construction history in general. The task group will also be in contact with Eberhard Pelke of Germany.

Target Audience

Academia (teachers as well as students and Ph.D. students), Consultants, Authorities/Governmental Institutions, Producers (Concrete, Admixtures, Concrete Additions/Extenders, Cement, Aggregates, Steel Reinforcement, Prestressed Steel), Contractors with interest in history in their field.

Expected outcome and delivery dates

One or more bulletins about the history of concrete design. Presumably a more general written history at the beginning with the option of more detailed written history in the above mentioned fields.

Other activities (e.g., workshops, courses):

Workshops on special topics within the history of concrete and concrete construction history, later on a conference on Concrete Design History.

Task Group 1.7: Construction of concrete structures

Convener:

van der Horst	Delft University of Technology	Netherlands

Co-Convener:

Schmitt	SNCF – Direction de L'Ingénierie	France

Members:

Burtet	VSL (Suisse) SA	Switzerland
Cayron	Bouygues Travaux Publics	France
Contreras	ARUP	Spain
Fischer	TU München	Germany
Heggade	Gammon India Ltd	India
Herrero Beneitez	Ferrovial – Agromán S.A.	Spain
Imberty	Razel SA	France
Klein	T-ingénierie SA	Switzerland
Portenseigne	Bouygues Travaux Publics	France
Primault	Vinci Construction	France
Rombach	Techn. Univ. of Hamburg-Harburg	Germany
Sanchez	Roughan & O'Donovan	Ireland
Srinivasan	Arup	United Kingdom
Turmo Coderque	Universitat Politecnica de Catalunya	Spain

Corresponding Members:

Buron Meastro	IECA	Spain
Mancini	Politecnico di Torino	Italy
Tassin	International Bridge Technologies, Inc.	USA

(*fib* members are listed in **bold**)

Terms of reference

Background and scope

The areas of interest have been developed from the viewpoint that the construction process has two main components: perception related aspects and process aspects. The perception related aspects comprise materials, workmanship, formwork and scaffolding, curing of concrete, concrete surface, testing and monitoring, high performance concrete, special technologies, specifications and training/education. The process related aspects comprise the construction process of concrete structures, quality management and life cycle management.

Each of the areas has been detailed further and can be summarized as follows:

1. The construction process of concrete structures: basic principles and drivers to success

- Management of a process
- Multiple discipline interaction
- Interface management
- Information generation versus tasks
- Specifics of design/construct
- Optimisation of cost: exchange of labour, material and time
- Environmental care, safety and health
- Trace ability of product and activities
- The impact of adequate preparation and workmanship
- The construction phase and its impact on durability
- Strategic choice of materials: robust concrete mixes versus hi-tech, narrow window applicable mixes, reliability/uniformity of concrete properties, properties demand: cover zone versus global section

2. Quality Management:

- Principles and criteria
- Guidelines for implementation
- ISO 9000-2000 principles
- Global versus detailed process/indicators
- Improvement through learning
- The decisive impact of attitude
- Project Quality Plan
- Qualified site supervision and/versus ISO 9000-2000 self-control

3. Materials: packaging, transportation, storage and handling

Cement, additives, sand and gravel, reinforcing steel and prestressing steel, carbon reinforcement

4. Workmanship:

- Mixing, casting and post casting treatment of concrete
- Detailing and installation of reinforcement, both steel and carbon
- Detailing and installation of prestressing, both steel and carbon

5. Formwork and scaffolding:

Principles, systems and details, design, erection and striking

6. Curing of concrete

- Moisture curing of concrete and early age crack control
- Cooling and heating of concrete
- Protection of the concrete surface after casting

7. Concrete surface: quality and texture

8. Testing, monitoring and control during construction

- Destructive/non destructive testing: aspects, criteria and procedures
- In- situ monitoring: aspects and procedures
- Crack width control

9. Life cycle management (construction phase aspects only)

- Basic principles:

Integral approach versus individual phases, overall cost optimisation, maintenance, repair and replacement strategies, reliability of LCM: robustness versus high-tech, choice of materials, durability strategy based on both concrete and reinforcement,

- Birth certificate
- Data management: gathering, analysis and measures, record keeping and storage
- Monitoring and control: aspects, readings, analysis, measures, record keeping and storage
- Demolition plan

10. Special materials: high performance concrete: both strength and workability

11. Special technologies

- Equipment and robots
- ICT in construction: 4D CAD, CAM, data communication and project management

12. Specifications for materials and workmanship: typical examples only

13. Training and education

The task group addresses state-of-the-art basic principles of the construction process of concrete structures at site. Furthermore, the task group reflects on anticipated developments, which could have a significant influence on construction. The objective is to develop awareness regarding aspects which have an impact on safety, serviceability, durability and environmental issues of concrete structures to be build at site, and to provide information as how to handle the basic principles. The output will be presented as internationally harmonized reports.

Description of workflow and timeline

The draft version of a Guide to Good practice for Precast Segmental Bridges is in preparation and will be submitted for formal review by the Technical Council in 2015.

Terms of reference for the Precast segmental bridge report

The Commission members are preparing state-of-the-art information and design specifications on precast segmental construction of bridges.

The main aspects under consideration are related to the construction, assembly and design of both segments and bridges, with internal and external or mixed prestressing. The following main aspect are being considered in detail:

- concreting and curing of precast elements: One sequence concreting, partial concreting, concreting position, delay or conditions for the first move of the element, curing of element, surface preparation or treatment before coupling or glueing of the joint
- transportation and storage of different segments
- assembling by means of: launching girder, four wheel winches acting on the top of the deck, crane trucks acting from the bottom, tower cranes mounted on rails or a combination of previous systems; if necessary with use of temporary stays
- temporary prestressing during the assembling and epoxy resin (or other material) used during the coupling of joints, ducts coupling, thightness in the joints
- shear keys design and their distribution along the perimeter
- positioning of anchorages of construction and continuity tendons
- deviators for external prestressing
- camber in construction and geometry corrections for the cantilever (construction on a jack system and final adjustment before the connection of bearings)
- conceptual design in the choice of span sequences, geometrical profile (constant of variable depth)
- use of extremity counterweight for orografic reasons
- prestressing layout for internal, external and mixed prestressing
- particular design models for the ULS, to be adopted in presence of joint opening and different type of prestressing
- durability aspects related to the use of tendon anchorages within the joints, to the ducts to be used for internal tendons, in particular crossing the joints and to the type of duct grouting

The resulting document will summarize the experience cumulated in construction of precast segmental bridges all around the world and will give designers a guide to conceive economical and performance based bridges assembled by precast segments.

Target Audience

Structural engineers, site engineers, construction management

Expected outcome and delivery dates

Publication in 2015

Task Group 1.8: Concrete Industrial Floors

Convener:

Plizzari	University of Brescia	Italy

Members:

TBD

Motivation/background (in brief)

Concrete is often used for industrial floors that are designed to withstand static and dynamic loads as well as the degradation caused by operations and the environment. Shrinkage phenomena play a major role since they provoke early age cracks that can be controlled by contraction joints that are likely to damage due to wheel crossing.

Scope and objective of technical work

The main scope of the task group is to describe in short terms the most important issues in concrete technology for industrial floors, give relevant references to important literature, describe important design premises and give guidance on potential improvements and maintenance.

Timeline

The group will start activities in the fall or winter of 2016 and will conclude in 2019.

Collaboration with other groups and organizations

T1.8 will liaise with the main international associations and affiliated national groups

Target Audience

Academia, consultants, authorities/governmental agencies, institutions, producers, contractors

Expected outcome and delivery dates

The preparation of an *fib* bulletin is forecast in the next three years.