

Global Partnerships: Focus on RILEM and fib

27th June 2024

14:00 – 15:00 (LONDON)



Our Membership

80%

GCCA members account for 80% of the global cement industry volume outside of China - and include several leading Chinese manufacturers.

Our Members

Asia Cement Corporation
Breedon Group
BUA Cement
Buzzi
Cementir Holding
Cementos Argos
Cementos Moctezuma
Cementos Pacasmayo
Cementos Progreso
CEMEX
Cimenterie Nationale
Çimsa Cement
CNBM
CRH
Dalmia Cement
Dangote
Emirates Steel Arkan
Fletcher Building
GCC
Heidelberg Materials
Holcim
Hima Cement
Huaxin Cement
JK Cement

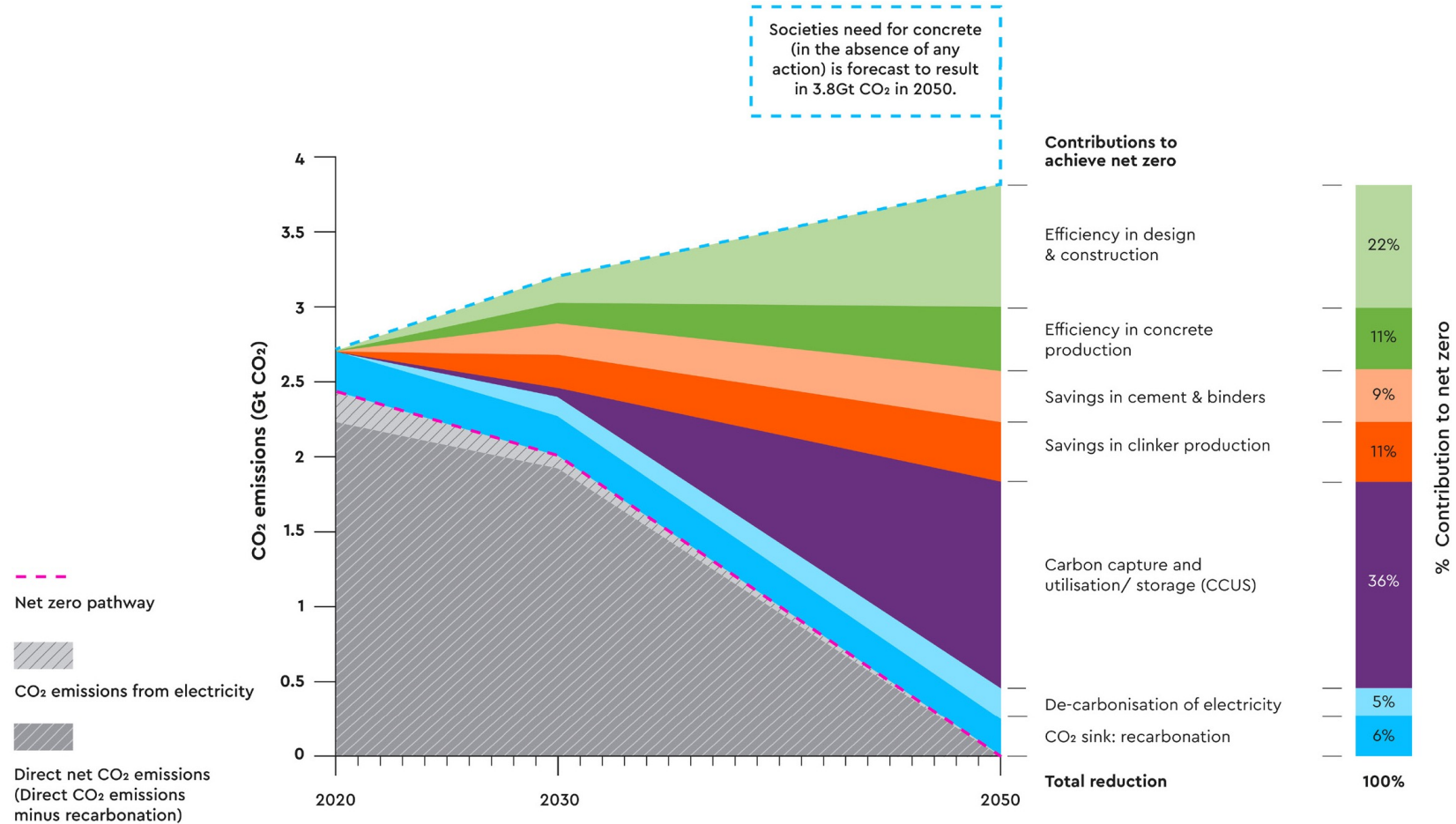
JSW Cement
Medcem
Misr Cement Group
Molins
Nesher Israel Cement Enterprises
Norm Cement
Northern Region Cement Company (Saudi Arabia)
Orient Cement
PT Solusi Bangun Indonesia
SCHWENK Zement
Secil
Siam Cement Group
Siam City Cement
Taiheiyo Cement
Taiwan Cement Corporation
TITAN Cement Group
TIPOLENE
UltraTech Cement
UNACEM
Vassiliko Cement
Votorantim Cimentos
YTL Cement
Yura Cement

National & Regional Association Partners

Asociación de Fabricantes de Cemento Portland – Argentina
Asociación de Productores de Cemento – Peru
Associação Brasileira de Cimento Portland – Brazil
Association of German Cement Manufacturers (VDZ) – Germany
Association Professionnelle des Cimentiers – Morocco
Betonhuis – Netherlands
BIBM – Europe
CANACEM – Mexico
Canadian Precast Prestressed Concrete Institute
Cement Association of Canada
Cement Concrete & Aggregates Australia
Cement Industry Federation – Australia
Cement Manufacturers Association – India
Cement Manufacturers Ireland

China Cement Association
Concrete NZ – New Zealand
European Cement Association (CEMBUREAU)
European Federation Concrete Admixtures
European Ready Mixed Concrete Organisation
Federación Iberoamericana del Hormigón Premezclado – LatAm
Federación Interamericana del Cemento (FICEM) – LatAm
Japan Cement Association
Korea Cement Association
Mineral Products Association – United Kingdom
National Ready Mixed Concrete Association – USA
Portland Cement Association – USA
South India Cement Manufacturers Association
Thai Cement Manufacturers Association
The Spanish Cement Association (Oficemen)
Turkish Cement Manufacturers Association (TürkÇimento)

GCCA Roadmap to Net Zero Concrete

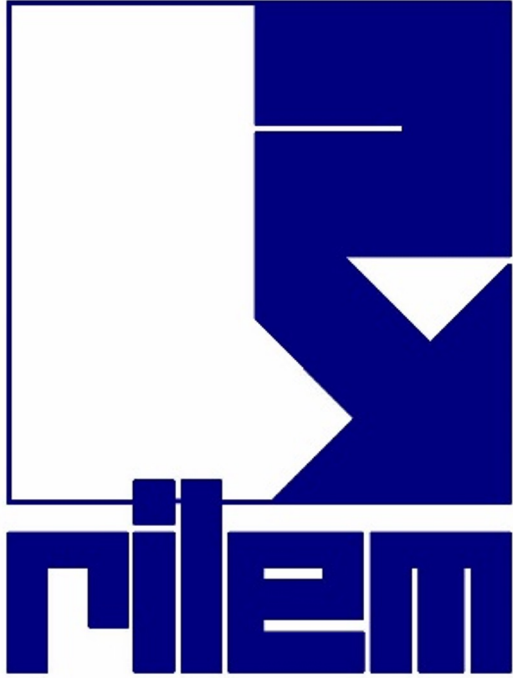




Dr Daniela Ciano

Implementation Manager

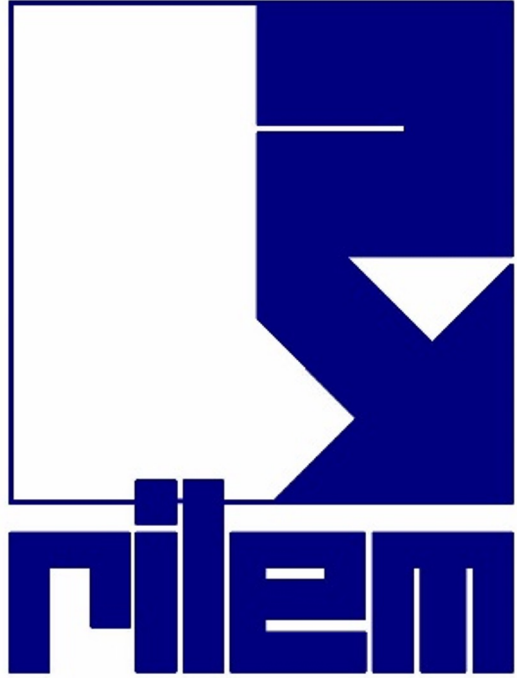
RILEM Association



All about RILEM: An international association for materials, building systems and structures

Presented by Daniela Ciancio, RILEM Implementation Manager

27 June 2024



The International
Union of
Laboratories
and Experts in
Construction
Materials,
Systems and
Structures



International Partners since March 2024

RILEM History & Goals

When did everything start?

1947 Paris



RILEM History & Goals

Who were the founders?



Robert L'Hermite (1910-1982)

RILEM Founding Members

S. BECHYNE, *Czechoslovakia*, **J.-L. BIENFAIT**, *The Netherlands*,
F. CAMPUS, *Belgium*, **G. COLONNETTI**, *Italy*,
E. L. Da FONSECA COSTA, *Brazil*, **S. A. DELPECH**, *Argentina*,
E. FORSLIND, *Sweden*, **W. GLANVILLE**, *United Kingdom*,
G. HANSEN, *Denmark*, **R. L'HERMITE**, *France*,
F. LEA, *United Kingdom*, **W. OLSZAK**, *Poland*,
M. ROCHA, *Portugal*, **E. TORROJA**, *Spain*,
M. ROS, *Switzerland*, **M. P. WHITE**, *United States*

**Renew international relations & cooperation
between institutions for testing and research
on materials and structures**

Paris, 17 - 20 June 1947

Laboratoires du Bâtiment et des Travaux Publics de Paris

RILEM History & Goals

RILEM goals

- favour and **promote cooperation at international scale** by general **access** to advanced knowledge,
- stimulate **new directions of research** and its applications, promoting excellence in construction,
- **promote sustainable and safe construction**, and improved performance and cost benefit for society.

RILEM organisation

RILEM presidents



President

Dr Nicolas Roussel
Université Gustave Eiffel
FRANCE



Vice-President

Dr Nele De Belie
Gent Univ.
BELGIUM



Past President

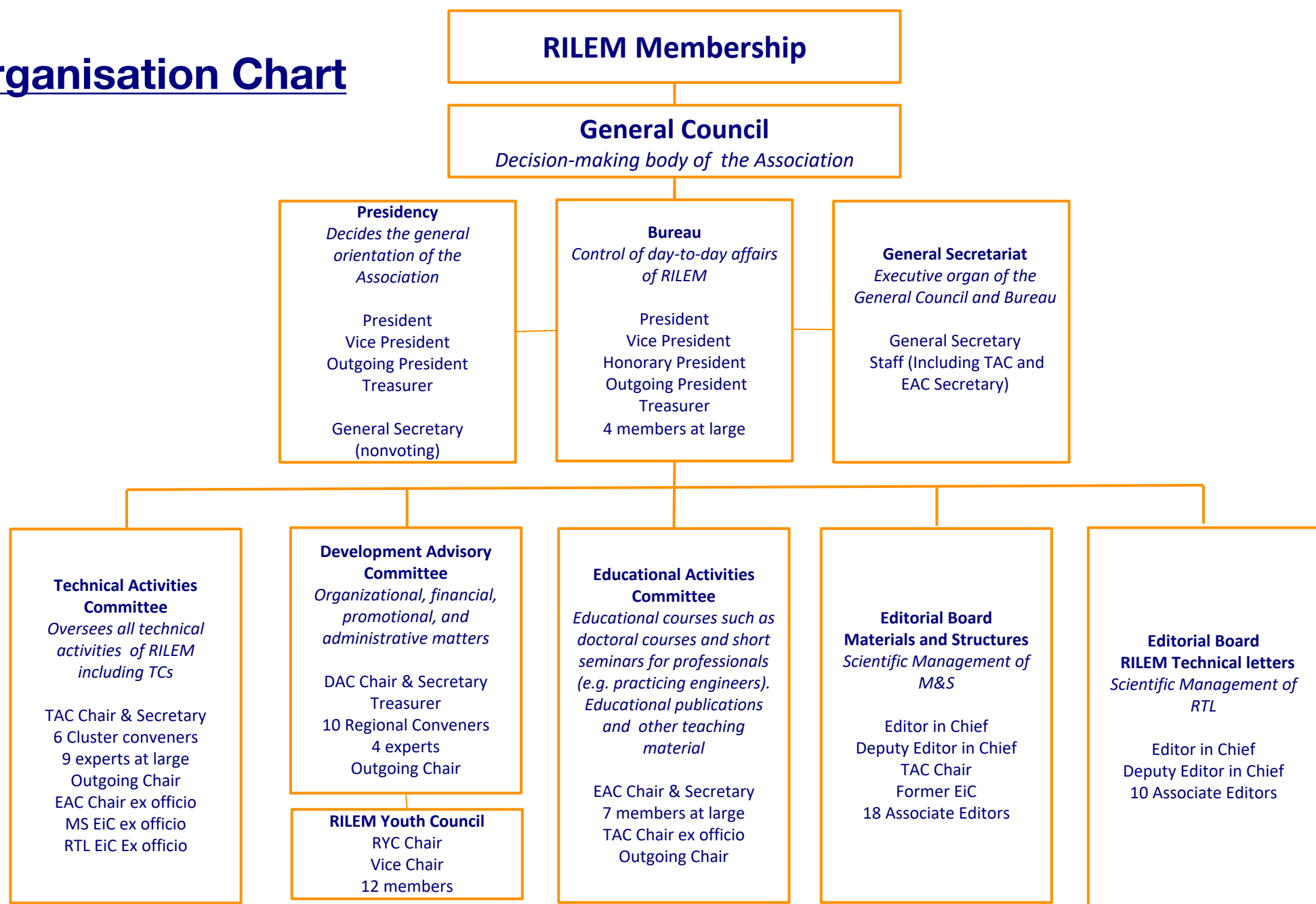
Dr Ravindra Gettu
IIT Madras
INDIA



Honorary President 2024

Prof. Alexandra Bertron
INSA Toulouse / LMDC
FRANCE

RILEM Organisation Chart



RILEM memberships

RILEM is composed of corporate members and individual members, including scientists and engineers, research and testing laboratories and companies.

Individual Members

- **A YOUNG MEMBER** (previously Student and Affiliate categories) is an under-graduated student (including PhD students) or a young research scientist or engineer who is at the early stage of his career **under the age of 35**. Each RILEM young member is linked to the International Network of RILEM, through his registration in the Directory of Members. A RILEM young member may register to contribute to the activity of a RILEM TC.
- **A SENIOR MEMBER** is an experienced scientist or engineer, having reached a position of responsibility and recognised expertise in a public or private organisation or company concerned with testing or research in the field of building materials and structures.
- **A RETIRED MEMBER** is a member who has retired.

Corporate Members

- **ASSOCIATE MEMBERS** are **smaller research, academic or building organisations** or companies.
- **INSTITUTIONAL MEMBERS** are **research and testing organisations** of national renown; universities, international or national standards organisations.
- **INDUSTRIAL MEMBERS** are **large firms or associations** in the materials or construction sectors.

RILEM Worldwide

3120 members
119 Corporates
110 countries



RILEM Technical Committees



Technical Committees (TCs)
are the **cornerstone** of RILEM

TC work typically results in:

- Technical Exchange
- State-of-the-art reports
- Recommendations on test methods

All TCs participants should register by filling the online “[Join a TC registration form](#)” on RILEM Website

The lifetime of a TC is between 5 and 7 years.



RILEM Technical Committees

47 TCs are active in 6 Clusters, 4 Clusters pertaining to cementitious materials



Material Processing and Characterization

Daman PANESAR, Canada



Transport and Deterioration Mechanisms

Josee DUCHESNE, Canada



Structural Performance and Design

Kei-ichi IMAMOTO, Japan



Service Life and Environmental Impact Assessment

Anya VOLLPRACHT, Germany



Masonry, Timber and Cultural Heritage

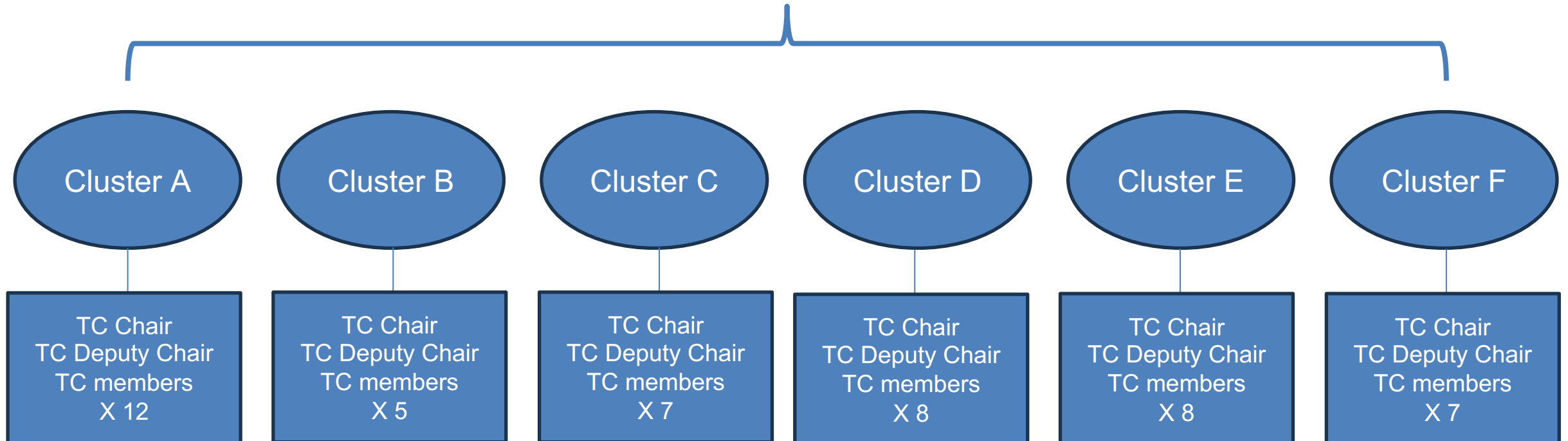
Arun MENON, India



Bituminous Materials and Polymers

Eshan DAVE, USA

Technical Activities Committee
TAC Chair: Enrico SASSONI



RILEM Technical Committees

Cluster A: Material Processing and Characterization

- 282-CCL : Calcined Clays as [Supplementary Cementitious Materials](#)
- 284-CEC : Controlled [expansion of concrete](#) by adding MgO-based expansive agents taking the combined
- 291-AMC : Use of Agro-Based Materials as [Cementitious Additions](#) in Concrete and Cement-Based Materials
- 296-ECS : Assessment of electrochemical methods to study [corrosion of steel in concrete](#)
- 302- CNC : Carbon-based [nanomaterials](#) for multifunctional cementitious matrices
- 303-PFC : Performance requirements and testing of fresh [printable cement-based materials](#)
- 304-ADC : Assessment of [Additively Manufactured Concrete](#) Materials and Structures
- 305-PCC : [Pumping of concrete](#)
- 309-MCP : Accelerated [Mineral Carbonation](#) for the production of construction materials
- 311-MBC : [Magnesia-based binders](#) in concrete
- 312-PHC : Performance testing of [hydraulic cements](#)
- ACP : Active Control of Properties of [Fresh and Hardening Cementitious Materials](#)

Cluster B: Transport and Deterioration Mechanisms

- 285-TMS: Test method for **concrete durability** under combined role of sulphate and chloride ions
- 286-GDP: Test Methods for **Gas Diffusion in Porous Media**
- 297-DOC : Degradation of organic coating materials and its relation to **concrete durability**
- 298-EBD : Test methods to evaluate **durability of blended cement pastes** against deleterious ions
- 313-MMS : Modelling and experimental validation of **moisture state in bulk cementitious materials**

Cluster C: Structural Performance and Design

- 287-CCS : Early age and **long-term crack width** analysis in RC Structures
- 288-IEC: **Impact and Explosion**
- 292-MCC : Mechanical Characterization and Structural design of **Textile Reinforced Concrete**
- 294-MPA : Mechanical properties of **alkali-activated concrete**
- 306-CFR : **Concrete during Fire** - Reassessment of the framework
- 314-OCM : On-site **Corrosion Condition** Assessment, Monitoring and Prediction
- RCC : **Rolled compacted concrete** for pavement applications

Cluster D: Service Life and Environmental Impact Assessment

- 289-DCM : Long-term durability of structural concretes in marine exposure conditions
- 299-TES : Thermal energy storage in cementitious composites
- 300-ARM : Alkali-aggregate reaction mitigation
- 301-ASR : Risk assessment of concrete mixture designs with alkali-silica reactive (ASR) aggregates
- CUC : Carbon dioxide uptake by concrete during and after service life
- DCS : Data-driven concrete science
- SDM : Scientific Metadata Management of Construction materials
- UMW : Upcycling Powder Mineral “Wastes” into Cement Matrices

Cluster E: Masonry, Timber and Cultural Heritage

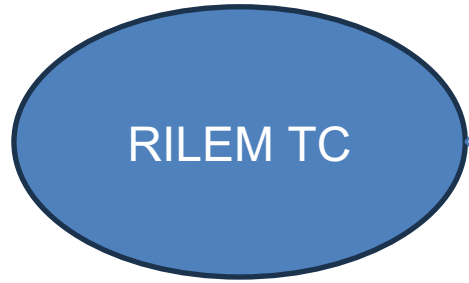
- 277-LHS : Specifications for testing and evaluation of lime-based repair materials for historic Structures
- 290-IMC : Durability of Inorganic Matrix Composites used for Strengthening of Masonry Constructions
- 310-TPT : Tests methods for a reliable characterization of resistance, stiffness and deformation properties of timber joints
- BEC : Bio-stabilised earth-based construction: performance-approach for better resilience
- CTM : Testing Methods For Masonry Cores
- MAE : Mechanical performance and durability assessment of earthen elements and structures
- MCB : Mechanical Characterisation of Bamboo
- PEM : Processing of earth-based materials

Cluster F: Bituminous Materials and Polymers

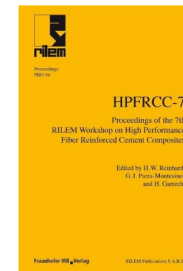
- 280-CBE : Multiphase characterisation of cold bitumen emulsion materials
- 295-FBB : Fingerprinting bituminous binders using physico-chemical analysis
- 307-PPB : Physicochemical Effects of Polymers in Bitumen
- 308-PAR : Performance-based Asphalt Recycling
- 316-FEE : Fume Emissions Evaluation for Asphalt Materials
- APD : Alternative Paving Materials - Design and Performance
- APS : Alternative Paving Materials - Sustainability

RILEM Publications

Dissemination of information worldwide



- Recommendation (Free Access paper in MAAS)
- Proceedings (Springer or RILEM Publications)
- TC report as Paper in Topical Collection of MAAS
- TC opening or finalising activities paper in RTL (Open Access)
- STAR state-of-the-art report, book published by Springer



RILEM Publications

Materials & Structures (M&S)

50th Anniversary Issue in Open Access

Materials and Structures, **the flagship publication** of the International Union of Laboratories and Experts in Construction Materials, Systems and Structures (RILEM), **provides a unique international and interdisciplinary forum for new research findings on the performance of construction materials.** A leader in cutting-edge research, the journal is dedicated to the publication of **high-quality papers examining the fundamental properties of building materials, their characterization and processing techniques, modelling, standardization of test methods, and the application of research results in building and civil engineering.** Materials and Structures also publishes comprehensive reports prepared by RILEM's technical committees.

RILEM Flagship, created in 1968



RILEM Publications

RILEM Technical Letters (RTL)

RILEM Technical Letters journal was launched in March 2016. With the new scientific peer review journal, RILEM Technical Letters, RILEM seeks to venture into the new era of open access publishing by disseminating contributions breaking new ground in the field of construction materials science.

Scope of the journal and profile of the publications

RILEM Technical Letters publishes reports of major innovative research or strategic research needs in the field of construction and building materials science in the form of short letters available online. The letters are submitted on invitation by the Editorial Board.

RILEM OPEN ACCESS JOURNAL

The logo for RILEM technical letters, featuring the word "RILEM" in a large, white, sans-serif font, with the words "technical letters" in a smaller, white, sans-serif font directly beneath it. The logo is set against a dark blue rectangular background.

The journal became indexed in the Directory of Open Access Journals (DOAJ) in September 2018.

In August 2020, RILEM Technical Letters was included in Scopus database.

RILEM Annual and Technical reports



RILEM Events

Future RILEM Annual Weeks and Spring Conventions



RILEM Annual Weeks

- 2024 - 78th Annual Week, Toulouse, France, Prof. Alexandra Bertron (25-30 August)
- 2025 - 79th Annual Week, Hanoi, Vietnam, Prof. Tuan Nguyen Vanand
- 2026 - 80th Annual Week, Nairobi, Kenya, Dr Wolfram Schmidt

RILEM Spring Conventions

- 2025 - Mendrisio, Switzerland, Dr Paglia Christian
- 2026 - Ghent, Belgium, Prof. Nele De Belie



RILEM Educational Activities

EAC

One of the main purposes of the Educational Activities Committee (EAC) of RILEM is to **broaden the education of both PhD students and the professional community through promotion of interesting and informative one-week PhD courses and seminars** on subjects of relevance to researchers working in specific areas. RILEM EAC is responsible for RILEM activities in the field of education. These include a number of different tasks, of which the basic and most important one is the courses to which we grant scientific sponsorship. Though RILEM EAC has only existed for a handful of years, our sponsored courses have been enjoyed by more than 2000 participants and about 200 teachers.



+140

Sponsored doctoral courses since 2010.



207

Participants of doctoral courses benefit from a 3-year free membership in 2022.



11

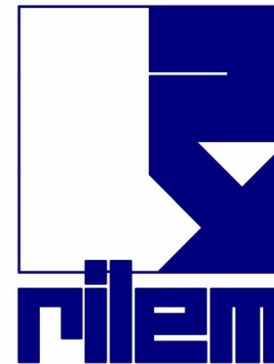
Recurring course series

RILEM EAC Webinars

NEW

- **Monthly free webinar series**, *RILEM Online Conferences & Transfer of Knowledge (ROC&TOK)*, designed to give information about how to communicate and teach subjects, related to the activities of RILEM and its technical committees.
- The webinars take place online on the first Thursday of each month, except for January and August, at 2 PM UTC.
- The webinars target professors and senior PhDs and are delivered by experts. However, they are open to all interested, including students and those working in industry.
- Each webinar is scheduled with a 30-min presentation followed by a 30-min Q&A session.
- The webinars are free, i.e. no registration fees are required.
- **Create your Membership or free Register user account and subscribe to our Newsletter to be kept posted !**

**CPD credits issued
by the Institute of
Concrete
Technology, UK**



ON ZOOM

On the first Thursday of each month, at 2pm UTC (GMT+0)



ROC&TOK Webinar series

How to communicate and teach subjects related to the activities of RILEM and its technical committees.

RILEM Awards for YOUNG members

RILEM awards the following recognised distinctions annually

Robert L'Hermite Medalist

In 1967 when RILEM celebrated its 20th anniversary, it was decided to create a RILEM Medal which would be granted each year to a research scientist. In 1981, the Medal was renamed the Robert L'Hermite Medal, in honour of the President-Founder of RILEM. Since then, each year, the Robert L'Hermite Medal is awarded to a **researcher of less than 40 years**, who has made an exceptional scientific contribution to the field of construction materials and structures.

Gustavo Colonnetti Medalist

Starting in 2016, each year, up to **two Gustavo Colonnetti Medals** are awarded to **researchers of less than 35 years**, who have made an outstanding scientific contribution to the field of construction materials and structures

RILEM Best Student Poster Award

Implemented in 2017, the RILEM Best Student Poster Award is to be given at every RILEM Annual Week conference. The award is given at the conference to a student who has a poster and is at the conference to present/explain the work. The selection is made by a jury chosen by the RILEM Honorary President. The awardee receives a diploma/certificate from the TAC Chair at the conference.

RILEM PhD Grant

Implemented in 2018 for the first time, this award is given every year at the RILEM Annual Week to PhD students under the age of 35 and residing in any of the countries where a special discount RILEM membership fee is applicable.

RILEM organisation

RILEM Youth Council RYC

- RILEM Tasked with attracting, involving and motivating young RILEM members
- Encourage participation in TAC and EAC activities
- Increasing awareness on RILEM events and courses
- Grooming young RILEM members for RILEM leadership positions
- Showcasing / celebrating the achievements of the RILEM Youth
- Creating networks between emerging researchers to increase visibility of / access to RILEM



RILEM industry endorsement



Dr. Fragkoulis Kanavaris, ARUP
London, UK

**Deputy Chair of RILEM TC 287-CCS:
Early age and long-term crack width
analysis in RC Structures**

“... industry companies and firms are very much project and income driven. RILEM is based on voluntary contributions from self-motivated members. This does not bring any profit to a firm but it does bring prestige, credibility and knowledge. Now... there are firms that appreciate that and there are firms that do not”

RILEM Partnerships



European Concrete Societies Network



RILEM Corporate Members



सी. एस. आई. आर. - केन्द्रीय भवन अनुसंधान संस्थान, रुड़की - भारत
CSIR - Central Building Research Institute, Roorkee - INDIA



A!

Aalto University



中交四航工程研究院有限公司
CCCC Fourth Harbor Engineering Institute Co., Ltd.



UNIVERSITÀ
CUSANO



CUGLA
Concrete Solutions



Cracow University
of Technology



ARUP



CHALMERS
UNIVERSITY OF TECHNOLOGY



BETOLAR



CIRCe

RILEM Corporate Members



ETH zürich



Imperial College
London



一般社団法人 建築研究振興協会
JAPAN ASSOCIATION FOR BUILDING RESEARCH PROMOTION



U.S. Department
of Transportation

Federal Highway
Administration



The Getty
Conservation Institute



LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG

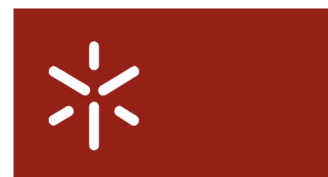


Produits et Services
pour construire dans le respect
de l'environnement
et du bien-être dans le logement

RILEM Corporate Members



RILEM Corporate Members



RILEM Supports Globe !

The objective of the Global Consensus on Sustainability in the Built Environment – GLOBE - is to direct the attention of the global community, politicians, industry leaders, and societal decision-makers to the critical importance of the built environment for sustainable development at global and local scales. To learn more about the consensus, please visit [Globe page](#) or the [Dec 2021 press release](#).



SUPPORT: <http://globe-consensus.com/>

RILEM organisation

Registered Users

Log in

Login or email





Password

☐ Stay connected

[Forgot your password?](#)

Log in

or

No account yet?

Registration

1 - RILEM membership

Becoming a RILEM member, allows you to access all online RILEM Publications with RILEM membership

BECOME A MEMBER

[Learn more about membership](#)

2 - Registered user (free account)

Creating your free account gives you access to all online RILEM Publications (non subscribing member) is welcome to be acknowledged as a contributor in a scientific paper or membership which will give them rights

CREATE YOUR FREE ACCOUNT

- It is free
- It gives access to the electronic version of the Proceedings published by RILEM Publications
- It gives access to the electronic version of the unedited versions of the RILEM STARs
- It gives access to other publications available on the website, i.e. reports, recommendations and compendiums
- It allows participation to TC meetings, but without the possibility to be listed as a TC member nor as an author on the TC outputs.

RILEM organisation

RILEM Subscribing Members

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Login or email





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CREATE YOUR FREE ACCOUNT

- Same benefits of registered users
- Membership in a RILEM Technical Committee. A RILEM member who actively contributes to the TC outputs (articles, STARS, etc.) will be listed as a TC member and author on the TC outputs
- Personal access to the documents produced by a RILEM Technical Committee of which you are member
- Access to electronic version of all RILEM Proceedings, published by RILEM Publications and Springer
- Free subscription to the online version of *Materials and Structures* journal (archives, current volumes)
- Reduced fees for RILEM events (in general 10%, subject to decision of local organisers)
- 20% discount on all SPRINGER e-books
- Much more...

RILEM organisation

Become a RILEM member!

❓ Individual fees in 2024

- Young Member: 27 euros
- Senior Member: 395 euros
- Retired Member: 80 euros

Young Member is an under-graduated student (including PhD students) or a young research scientist or engineer who is at the early stage of his career under the age of 35

❓ Corporate fees in 2024

- Associate Member: 1340 euros (3 staff members and one associate contact)
- Institutional Member: 2540 euros (15 staff members older than 35 + unlimited staff members under the age of 35)
- Institutional-Plus Member: 4660 euros (unlimited staff members)
- Industrial Member: 4660 euros (unlimited staff members)

A special discount (from 40% to 90%) is applicable for countries according to their GDP per capita. More information at <https://www.rilem.net/membership>

Contact us

Secretariat General

RILEM

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77447 Marne la Vallée Cedex 2 –
France

Telephone: + 33 1 60 05 14 04

Email: sg@rilem.org

Subscribe to RILEM's social media channels
on LinkedIn, Facebook, Twitter and YouTube
to stay abreast on what's happening at RILEM!



General Secretary

Mrs. Judith HARDY



Management Assistant

Ms. Aurelie MARTINGALE



Head of Publications and Communication

Ms. Anne GRIFFOIN



RILEM Implementation Manager (External consultant not at Secretariat General)

Dr. Daniela Ciano
rim@ext.rilem.org



Dr David Fernandez-Ordoñez

Secretary General

Fédération internationale du béton (fib)

International Federation for Structural Concrete
Fédération internationale du béton



fib Introduction and the Model Code for Concrete Structures.

Photo ©Loic Gardiol

David Fernández-Ordóñez
fib Secretary General
June 2024

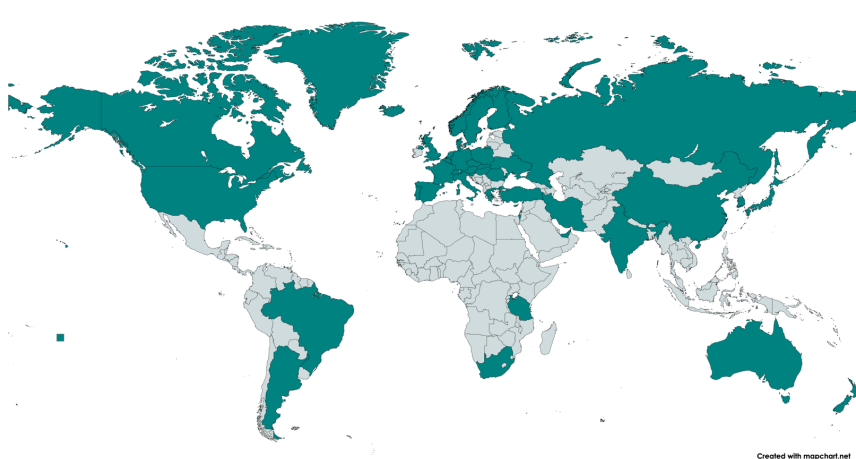
A Bridge between Research and Practice International Federation for Structural Concrete



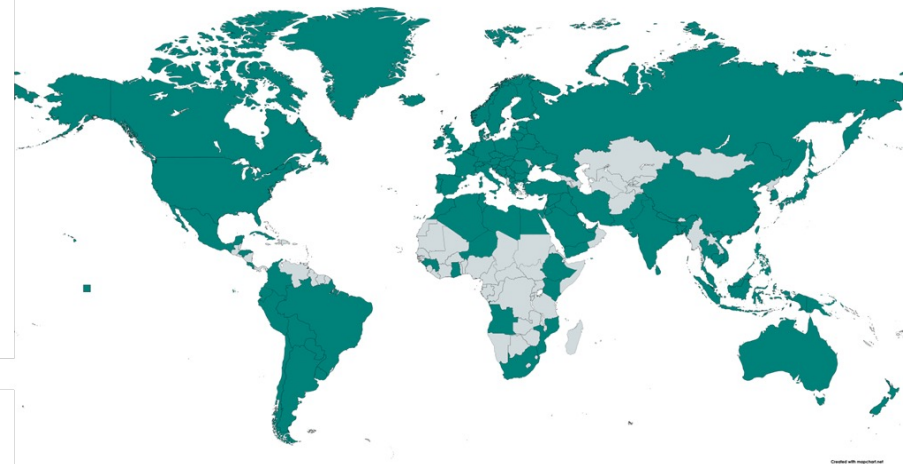
Creation of the *fib*



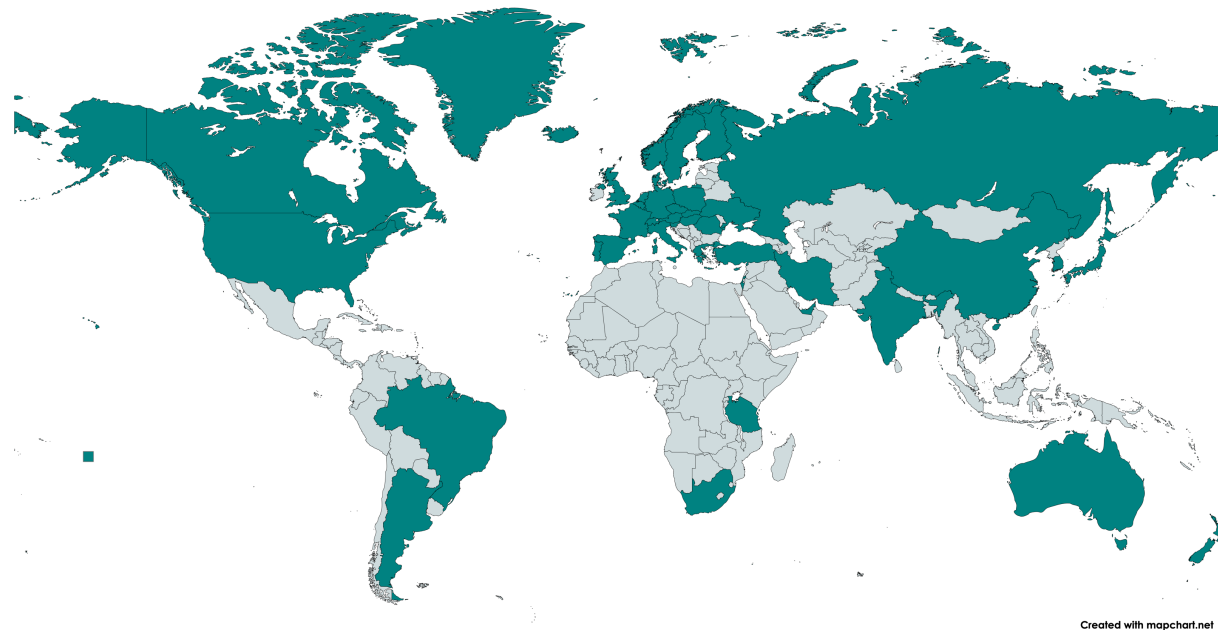
42 *fib* statutory members



fib members in 104 countries



2024 Statutory member countries



***fib* Statutory
Member Countries**


42 *fib* Statutory Member Countries

Argentina – Australia – Austria – Belgium – Brazil – Canada – China – Cyprus – Czech Republic – Denmark – Finland – France – Germany – Greece – Hungary – Iceland – India – Iran – Israel – Italy – Japan – Luxembourg – Netherlands – New Zealand – Norway – Poland – Portugal – Romania – Russia – Slovakia – Slovenia – South Africa – South Korea – Spain – Sweden – Switzerland – Tanzania – Turkey – UAE – Ukraine – United Kingdom – United States



Mission and Objectives of the *fib*

“To develop at an international level the study of scientific and practical matters capable of advancing the technical, economic, aesthetic and environmental performance of concrete construction.” *Statutes of the fib*



Stimulation of
research and
synthesis of
findings

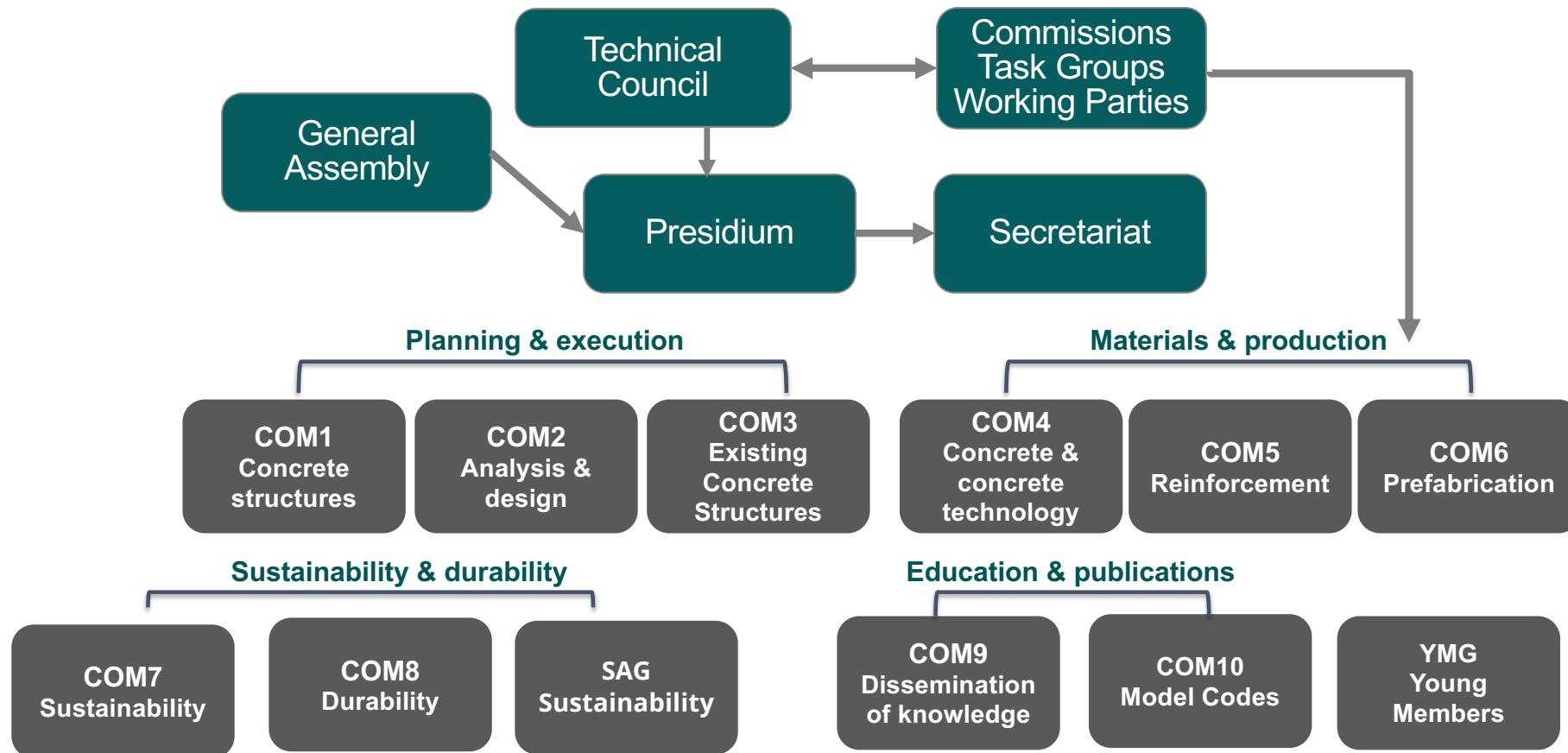
Transfer into
design and
construction
practice

Dissemination by
publications,
conferences, etc.

Production of
recommendations
and codes

Dissemination of
information to
members

The *fib*'s structure



A *Bridge* between *R*esearch and *P*ractice
International Federation for Structural Concrete



2023-24 *fib* Presidium members

Stephen Foster
Australia
President



Iria Doniak
Brazil
Deputy President



Akio Kasuga
Japan
Past President



Agnieszka Bigaj
Netherlands



Marco di Prisco
Italy



Larbi Sennour
USA



Jean Michel
Torrenti
France



Alberto Meda
Italy



Alfred Strauss
Austria



Sylvia Keßler
Germany



Steve Denton
UK



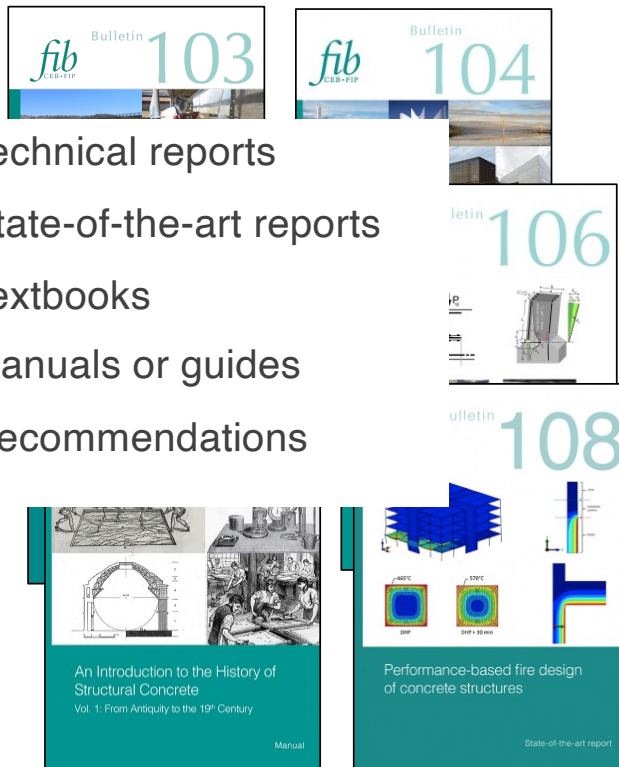
David Fernández-
Ordóñez
Secretary General



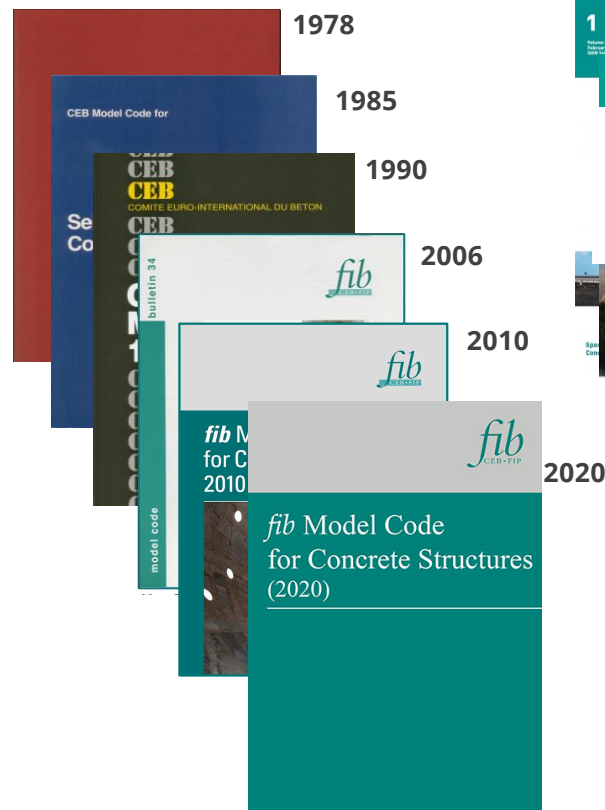
A Bridge between Research and Practice International Federation for Structural Concrete



fib Bulletins



Model Codes



The *fib*'s journal *Structural Concrete*



- Current impact factor: **3.2**
- 6 issues per year

The *fib*'s Structural Concrete journal



Impact factor 2022: **3.2**

6 issues starting from 2016

More than 3.800 pages and 300 papers in 2022

Ranked **28/63** in Construction & Building Technology and **50/136** in Civil Engineering

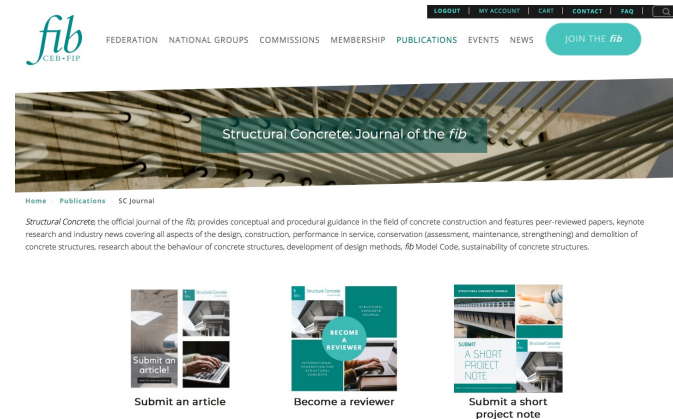


The *fib*'s Structural Concrete journal



Online Access

- Access to the SC Journal online after logging to the *fib* website !



Latest issues of the SC Journal

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ISSUE 1

DECEMBER 2019 VOL20
ISSUE 6

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ISSUE 5

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ISSUE 4

JUNE 2019 VOL20 ISSUE 3

APRIL 2019 VOL20 ISSUE 2



February 2020 Vol21 Issue 1

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Journal Article

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For *fib* members only: PDF files of articles published since 2011 are available from the Wiley Online Library.

The *fib*'s Structural Concrete journal

Short Project Notes



- Short Project Notes are intended to provide a description of a relevant project that has been built or is in the process of execution. The original or novel aspects in design or execution should be clearly indicated.
- Short Project Notes should be submitted online at: <https://mc.manuscriptcentral.com/suco>
- The guidelines for authors here: <https://onlinelibrary.wiley.com/page/journal/17517648/homepage/forauthors.html>



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Author Guidelines

Preparing a submission

Papers should be submitted online at <http://mc.manuscriptcentral.com/suco>. Manuscripts should be submitted with double line spacing and wide margins. The first page should include the full title of the paper and the full name(s) of the author(s), followed by their position held and the institution(s) where the work was done. The contact address, telephone number, and e-mail address of the lead author should also be supplied. Photographs of the author(s), clearly identified, should also be supplied.

Please try to use an official email address when registering to the submission system. Email providers such as Yahoo, Google or Microsoft sometimes block our emails.

Please also make sure to enter the full and correct contact details of you and your co-authors. These addresses will be used to send you the author copies when your paper has been accepted and published in the journal *Structural Concrete*.

The *fib*'s Structural Concrete journal

Short Project Notes



DOI: 10.1002/suco.20180001

SHORT PROJECT NOTE



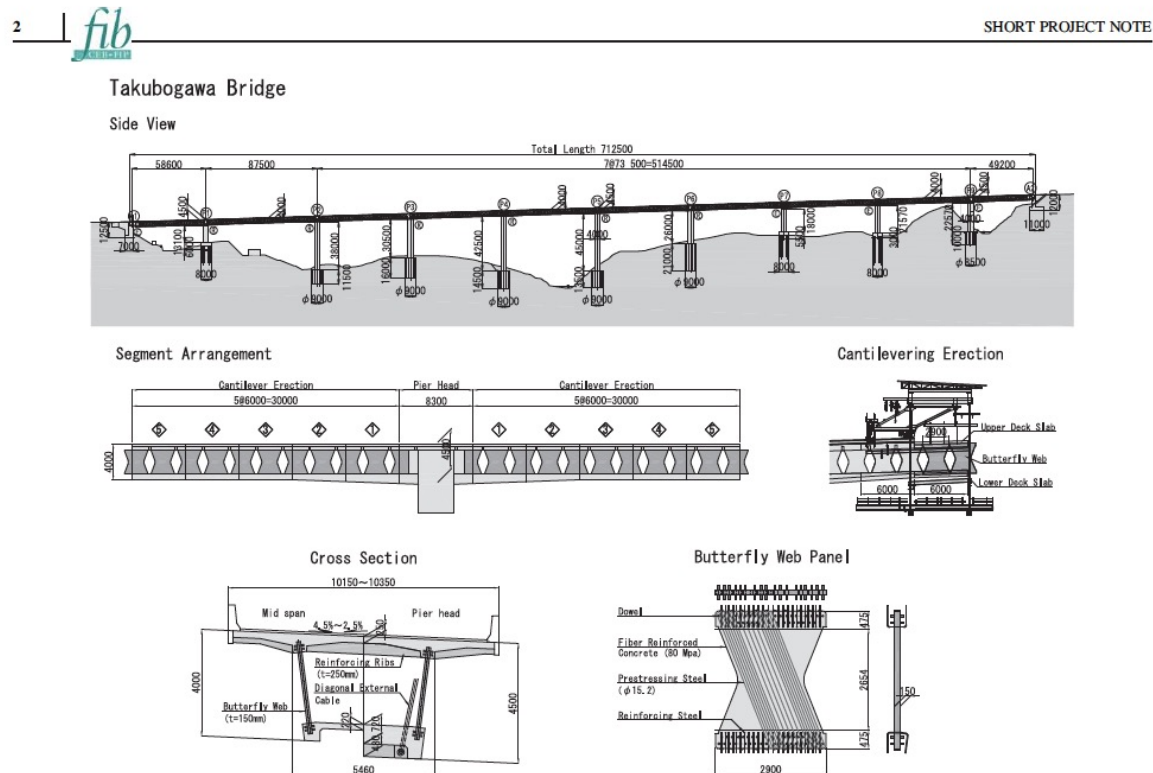
Takubogawa Bridge

The Tokugawa Bridge (Figure 1) is a 10-span continuous butterfly web box girder highway bridge, whose longest span is 87.5 m. “Butterfly Web Bridge” is a new type of bridge structure and this bridge is the world first application

bridge axis direction. Moreover, this is a simple structure in which the panels are connected to the upper and lower deck slabs linearly using dowels with no need to connect adjacent panels, thus facilitating a rapid construction.

The *fib*'s Structural Concrete journal

Short project notes:



Results of commissions and task groups are published as *fib* Bulletins



- All bulletins included in Google Books
- Possibility to buy hardcopy and pdf in the *fib* webstore
- DOI per bulletin and per chapter when there are main authors
- Indexing of Bulletins in Scopus data base

Authors by chapter

Chapters	Main Authors	DOI
1	Vítek	doi.org/10.35789/fib.BULL.0092.Ch01
2	Vítek	doi.org/10.35789/fib.BULL.0092.Ch02
3	Vítek	doi.org/10.35789/fib.BULL.0092.Ch03
4	Bisch, Caldentey, Duarte, Debernardi, Fehling, Guiglia, Mari Bernat, Taliano , Torres, Vítek and Vrablik	doi.org/10.35789/fib.BULL.0092.Ch04
5	Burns, Caldentey, Duarte, Fehling, Mari Bernat, Torres, Vítek and Vrablik	doi.org/10.35789/fib.BULL.0092.Ch05
6	Borosnyoi , Caldentey, Debernardi, Guiglia, Taliano, and Windisch	doi.org/10.35789/fib.BULL.0092.Ch06
7	Červenka	doi.org/10.35789/fib.BULL.0092.Ch07
8	Vítek	doi.org/10.35789/fib.BULL.0092.Ch08

Access to the Publications of the *fib*



PDF viewer

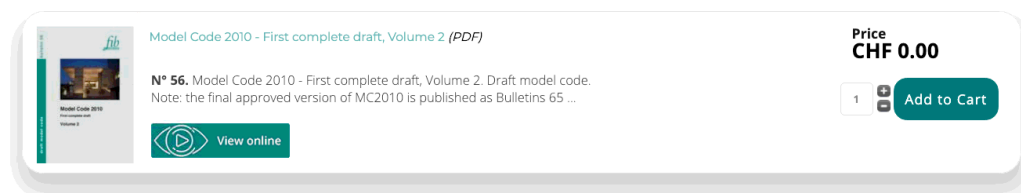
- View your *fib* Bulletin online and download it

✚ Prefabrication for affordable housing (PDF)

Model Code 2010 - First complete draft, Volume 2 (PDF)

N° 56. Model Code 2010 - First complete draft, Volume 2. Draft model code.

Note: the final approved version of MC2010 is published as Bulletins 65 and 66.



Access to the Publications of the *fib*


PDF viewer



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Rose Fitzgerald Kennedy Bridge

ROSE FITZGERALD KENNEDY BRIDGE
N25, NEW ROSS BYPASS, IRELAND



© Marcos Sánchez

The process of designing the Rose Fitzgerald Kennedy Bridge over the River Barrow spanned over 20 years from concept to completion.

The River Barrow Bridge provides the latest crossing point for the River Barrow which is at least 300 m wide at any point south of the town of New Ross. Located 30 km away from the sea, the bridge has been an engineering target for decades in Ireland. It provides a vital piece of infrastructure in the eastern corridor of the national roads network. Its completion removed a significant proportion of heavy traffic from the town of New Ross, enhancing the quality of life of the local communities while providing a much-needed reduction in long haul journey times in the south-east region.

The project was developed by Transport Infrastructure Ireland and their Technical Advisors Mott MacDonald Ireland in multiple stages. Between late 1998 and 2008, a concept design was developed during the planning and environmental studies stage and several alternatives were considered, from cable stayed to arches and balanced cantilevers, with a final preference for a three-tower extrados bridge which provided the right balance of slenderness and modest height towers. Tender for construction in a Public-Private Partnership (PPP) format took place in 2014, the contract was awarded in 2016 and the road was opened to traffic in January 2020.

The project, which includes a 12km long dual carriageway bypassing New Ross town, was tendered as a PPP Contract and awarded to BAM Iridium PPP Co with a team consisting of Dragados + BAM Ireland as contractors and Arup and Carlos Fernandez Casado S.L. as designers.

The design and value engineering of the structure was constrained by the requirements already established during planning as part of the Environmental Impact Statement and


covered in Construction Requirements (critical documents in the Irish planning and tendering process). The following constraints, amongst others, were established as fixed:

- The exact position of the three towers (thus fixing the main spans to 230m).
- The height of the pylons (causing the bridge to be an extrados structure and limiting the cable angle to less than 12 degrees).
- The clear envelope for the navigational river channel (117m wide and 36m high over Mean High-Water Spring).
- The requirement for a full concrete section for the deck and pylons (at least the outside surfaces) and the requirements of a "closed" section with inclined webs without props or ribs.
- The maximum deck depth at the central pylon of 8m and at midspan of 3.5m.
- The position of a central pylon and a central plane of cables in cross section.
- The maximum height of the abutments over ground level of 10m.

With all the above constraints, the number of variables to optimise the design was limited to the cable spacing, number and size, along with the cross-section configuration for the main spans. There was also room to tweak the road design, both in plan and elevation, on the approaches and the configuration of the side spans.

Working within the challenging constraints listed above, the detailed design phase aimed to optimise the preliminary design concept of the structure for structural efficiency and material savings. To achieve a world record span in concrete for an extrados structure with a significant slenderness, the following changes were made:

The cross section was modified from inclined outer webs to two vertical webs 8m apart, substituting the outer webs with precast panels to maintain the appearance of a closed section. The precast panels contribute to the transversal behaviour but there is a gap of 20mm between each panel longitudinally, so they do not contribute to the longitudinal direction.



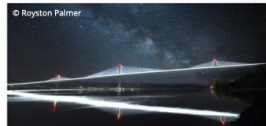
© Marc Cohite

The initial proposal of three parallel cables was substituted by a single cable, spaced 6.5m longitudinally and with a maximum size of 127 strands. Saddles were proposed for the cable detail passing on the pylons, allowing the pylon width to be reduced from 2.6m to 1.6m, to enable the minimum possible deck width.

To maintain a relatively light deck, the web and slab thickness were minimised using high strength concrete, where required. C80/95 concrete was used in the main spans and C60/75 in the side spans where the compression required this strength, while the approach spans were designed as C50/60.

Finally, minor adjustments to the side spans were implemented to optimise the longitudinal behaviour. The road alignment was also modified to reduce the bridge width on both ends to achieve a constant width cross section, where possible, and reducing the bridge length from 905m to 887m by changes in the vertical alignment.

The bridge's final configuration, after the minor span changes during tender, resulted in a total length of 887m, as already indicated, with an arrangement of $36 + 45 + 95 + 230 + 230 + 95 + 70 + 50 + 36$ m. In this way, the structure is characterised by 9 spans with 8 intermediate piers (P1 to P8) and the 2 abutments - A1 and A2. The plan alignment is straight along 440m located approximately in the central part of the bridge and then curved with a transition from a radius of 720m to the straight alignment at both ends. The height of the deck above the ground or over the river reaches 40m and the height of the towers above the deck is 27.0m for the central tower (P4) and 16.2m for the two lateral ones (P3 and P5). These values imply tower height to span ratios of 0.071 for the side towers and 0.1171 for the central tower (with L being the central span length). These are low values which lead to a classic extrados cable arrangement. In addition, the deck is only 3.5m deep at midspan (L/65), 8.5m at the central tower (L/27) and 6.5m at the side towers (L/35). These are quite slender parameters. It is also important to highlight the implication of the different heights of the towers. This leads to an asymmetric distribution of the cables along the main spans (8 from the side towers and 18 from the main tower). This asymmetry on the cable



© Royston Palmer

Support on the main spans leads to different cantilever lengths during construction: the 8 cables from the lateral towers support approximately 90m while the main tower supports the remaining 140m of each span, resulting in a cantilever length during construction of 140m which would have equated to a 280m equivalent main span.

This asymmetry and the presence of a central tower also affect the contribution of the cable system under traffic loads, as the central tower provides relatively low contribution when asymmetric spans are loaded.

The Rose Fitzgerald Kennedy Bridge over the River Barrow is a milestone in the design and construction of bridges of this typology. As a world record breaker span with a full concrete deck, its design and construction represented a significant challenge. This was not only due to its size, but also the slenderness achieved and the geometrical constraints derived from the Environmental Impact Statement. The fact that this structure presents a very slender deck affects the load distribution between this element and the cable system. This leads to a behaviour more closely related with cable stayed bridges in comparison with other extrados bridges. From an aesthetic point of view, this bridge is also unique due to the difference in height between the central tower and the side towers. This creates an asymmetry in the cable arrangement in relation to the central spans. Because of the slenderness of the deck, 3.5m deep at the tip with a maximum cantilever of 140m and extremely shallow cables angles (10 degrees with the deck), the geometric deflection control during construction was especially complicated, with the added difficulties of early age properties of the high strength concrete mix used in the project.

OWNER: Transport Infrastructure Ireland (TII)
AUTHORITIES TECHNICAL ADVISOR: Mott MacDonald
MAIN AUTHORS: Miguel Angel Azuá Suarez & Marcos Sánchez
OTHER PARTICIPANTS: Luca Bianco Martin, Guillermo Ayuso Calle, Borja Martín, Miguel Angel Gil, Paul González Aguilar, Cao Long, Claudia Semmen, Alonzo Ramirez Marchen, Mary Bowe, John Liff, Fergal Cahill, Pierre O'Loughlin, Joe Stokowski, John Murphy, Mike Wade & Ron Yee
CONTRACTORS: BAM Ireland & Dragados UK Ireland
SUBCONTRACTORS/SUPPLIERS: Tensa, Rubrica, Roadstone & Banagher
OPENED TO TRAFFIC: January 2020

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Civil Engineering Structures

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The Model Code (2020)

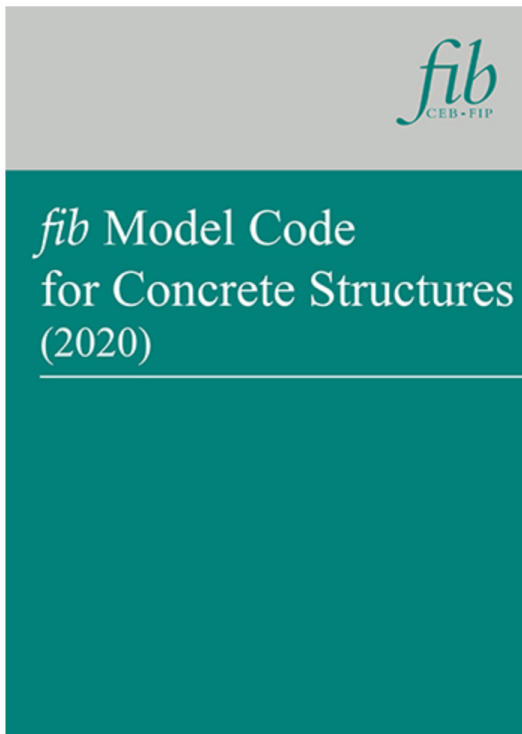


MC2020 FOR CONCRETE STRUCTURES

MC2020 PLAN

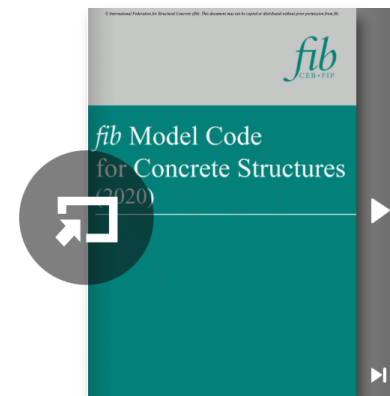
MC2020 VIDEOS

MC2020 EXPERT PAPERS



fib MC (2020) presents new consensus guidance on developments relating to concrete structures and structural materials, as well as providing a basis for future codes for concrete structure. It addresses significant advances made on a wide range of issues including those relating to structural design and analysis methods, seismic design and assessment procedures, durability, structural monitoring, service life design, structural assessment through-life and making interventions to adapt existing structures or enhance their performance to accommodate revised requirements or extend their useful life.

fib MC (2020), like previous editions of the *fib* Model Code, not only specifies requirements and recommended practices, but gives explanations in the adjoining informative column of the document.



Databases in *fib*



My working groups [All groups](#)

Name	Members	Discussions	Files
COM4: Concrete & concrete technology	20		19
Fiber DB	4		0
TG2.1 - Serviceability models	49		0

Front end DB in the *fib* Network

- Appears as a Working group
- Limited to a Read/export access to a DB user

Network [Dashboard](#) > [Groups](#) > [Fiber DB](#) > [Lists](#) > [Export](#)

Fibre export

1. Export output format

File format
Standard format

2. Select columns to export

Columns

- ☒ Name
- ☒ Material
- ☒ Anchorage type
- ☒ KSI
- ☒ K
- ☒ Diameter (mm)
- ☒ Length (mm)
- ☒ Fuf (MPa)
- ☒ Ef (GPa)

[Export records](#)

A *Bridge* between *R*esearch and *P*ractice International Federation for Structural Concrete



Let's keep in touch ...

- Social media
- *fib*-news
- e-newsletter



Join the *fib* Young Members Group!



Home - Commissions - YMG - Young Members Group

Motivation

The *fib* Presidium has approved the creation of an *fib* Young Members Group. All members of the Presidium have high expectations for the development of this group.

The *fib* thinks that it is crucial that young professionals are given the opportunity to fully participate in the activities of the organisation. They are welcome to participate in commissions and task groups and to become part of the decision bodies. However, young members do not normally participate in the development of documents and in the decisions of the *fib*.

The Young Members Group aims to build a framework that will allow young engineers to participate in the activities of the association and to bring their ideas to the working groups and the decision bodies.

Scope and objective

The main objectives of the *fib* Young Members Group include:

- Improving the profession's self-concept in the XXI century
- Encouraging mentoring within the *fib*
- Studying the work of other engineers to improve one's own work

YMG podcast series

- Concrete Sustainability Podcast-2
- Concrete Sustainability Podcast-3
- Rising Stars Podcast - 3



Commission Chair
Jemma Ehsman



Deputy Chair
Marcelo Melo

- Events
- Podcast series
- YMG competition
- ... and more!

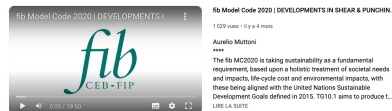


fib YouTube Channel



fib International Federation Structural Concrete
@fib-international 3,01 k abonnés 204 vidéos


ACCUEIL VIDEOS PLAYLISTS COMMUNAUTÉ CHAINES À PROPOS



Vidéos



Staying informed about the *fib*: Youtube



fib International Federation Structural Concrete
@fib-international · 3,34 K suscriptores · 230 videos
<https://www.fib-international.org/> >

Suscrito

Inicio Vídeos Shorts Pódcasts Listas Comunidad

fib Performance-Based Approach: Working on the Future-Oriented Standardization
MODEL CODE 2020 series
Agnieszka Bligaj Van Vliet
16:10

fib Model Code 2020 | PERFORMANCE-BASED APPROACH : WORKING ON THE FUTURE-ORIENTED STANDARDIZATION
fib International Federation Structural Concrete · 465 visualizaciones · hace 1 año
Agnieszka Bligaj Van Vliet **** The fib MC2020 is taking sustainability as a fundamental requirement, based upon a holistic treatment of societal needs and the environment.

Para ti

YMG podcast series: Conceptual Design of Structures with Jeannette Kuo
172 visualizaciones · hace 2 meses

YMG podcast series: Conceptual Design of Structures with Urs Meister
55 visualizaciones · hace 1 mes

fib Model Code 2020 | MODELLING CONCRETE PROPERTIES: NEW APPROACHES IN MC2020
516 visualizaciones · hace 1 año

Joint fib YMG Russia and Serbia Conference on Deflections of Reinforced Concrete
1,2 K visualizaciones · hace 3 años

A Bridge between Research and Practice

International Federation for Structural Concrete



fib Young Members Group!



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YMG podcast series

- **Concrete Sustainability Podcast- 2**
- **Concrete Sustainability Podcast- 3**
- **Rising Stars Podcast - 3**



Deputy Chair
Marcelo Melo



Next events

fib PhD Symposium 2024 in Budapest, Hungary

28-30 August 2024

fib ICCS24 Sustainability in Guimarães, Portugal

11-13 September 2024



fib Symposium 2024 in Christchurch, New Zealand

11-13 November 2024



fib International Symposium on Conceptual Design of Concrete Structures, 2025 Rio de Janeiro, Brazil

14-15 May 2025

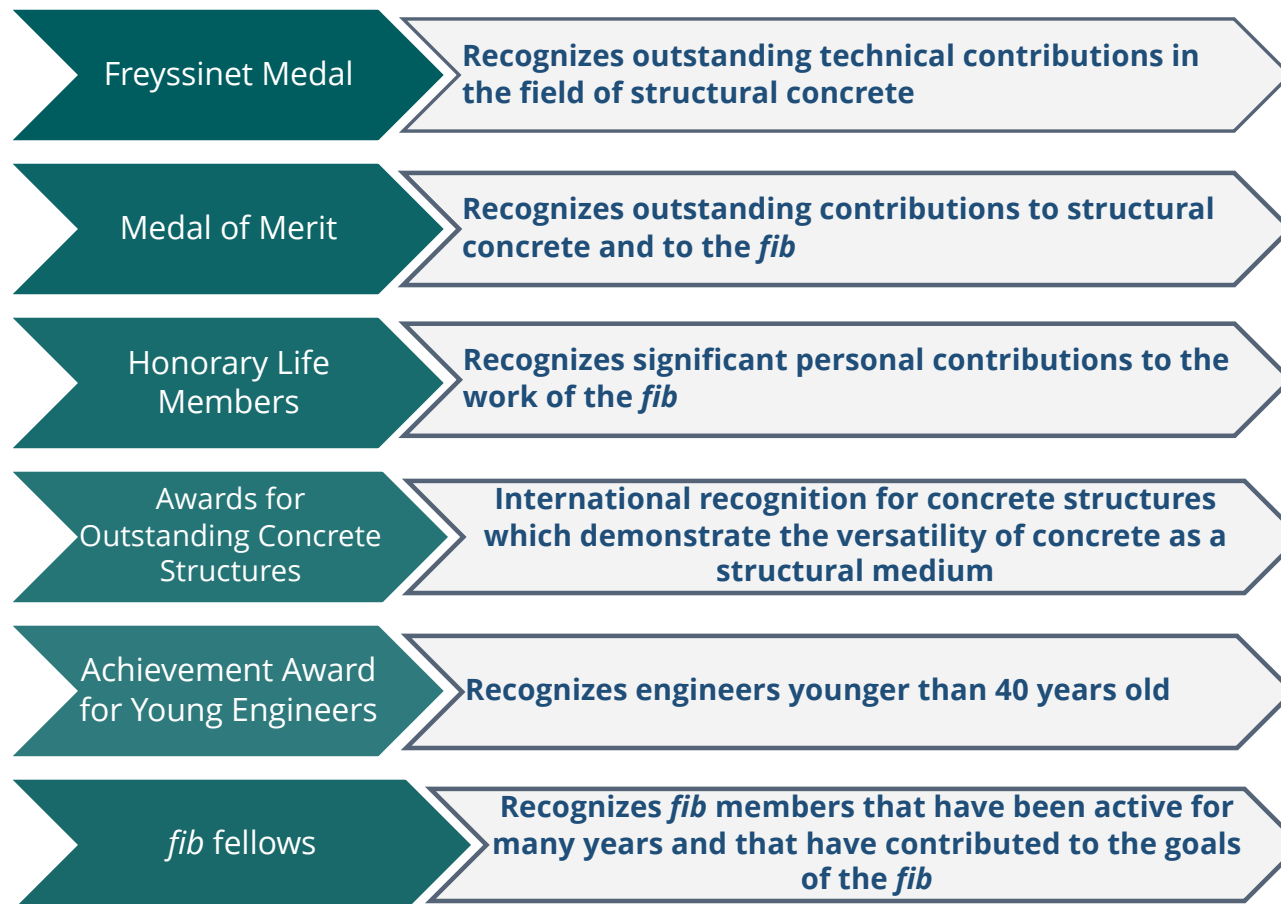


fib Symposium 2025 in Antibes, France

16-18 June 2025



fib Honours and Awards



2022 Award-winning concrete structures



The Helsinki Olympic
Stadium. Finland

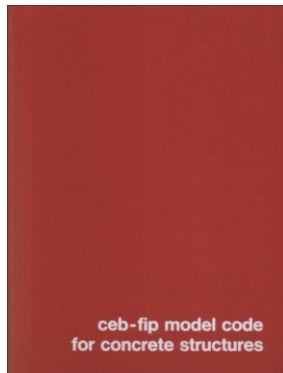


Rever Holdings Ryogoku
Japan

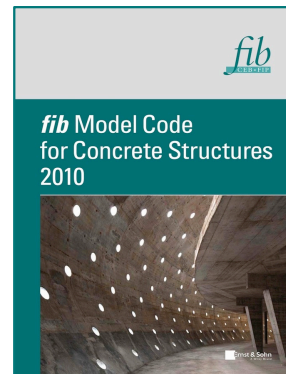


Rose Fitzgerald Kennedy Bridge. Ireland

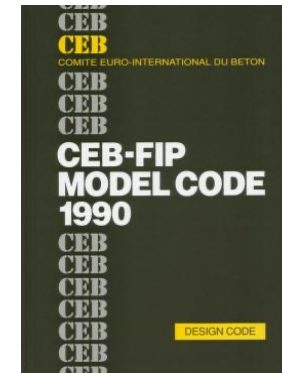
Evolution of Model Codes



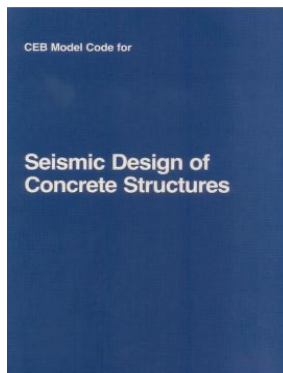
Model Code 1978



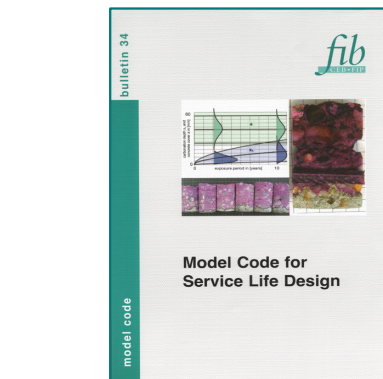
Model Code 2010



Model Code 1990

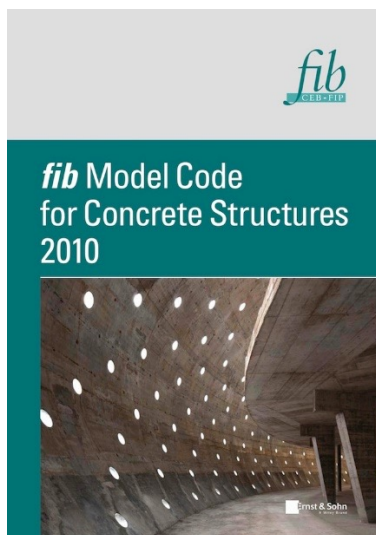


CEB Bull. 165 Seismic Design



fib Bull. 34 Service Life Design

fib Model Code 2010

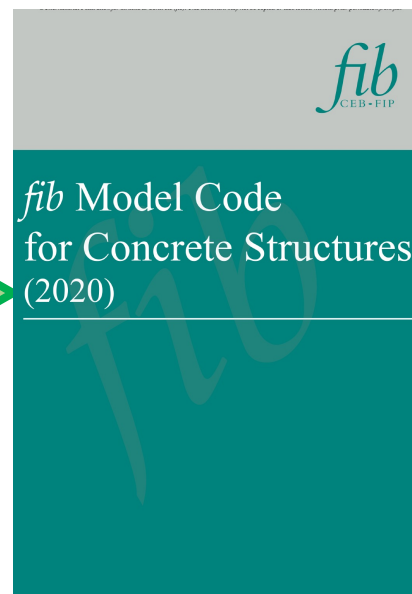


MC(2010)

5 Parts

10 Chapters

fib Model Code 2020



MC(2020)

10 Parts

39 Chapters

**Greatly
extended
technical
scope and
coverage**

MC2020

Identified overarching goals for the publication



- MC2020 is a single, merged structural code for new and existing structures
- Is an operational model code and oriented towards practical needs
- Includes worldwide knowledge with respect to materials and structural behaviour
- Recognizes the needs of engineering communities around the world

MC2020 Content



- Takes an integrated life cycle perspective
- Provides a holistic treatment of structural safety, serviceability, durability and sustainability
- Defines fundamental principles and a safety philosophy based on reliability concepts and sustainability
- Uses performance-based concept to remove specific constraints for novel types of concrete and reinforcing materials

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PART III	PRINCIPLES OF STRUCTURAL PERFORMANCE EVALUATION
PART IV	ACTIONS ON STRUCTURES
PART V	INPUT DATA FOR MATERIALS
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PART VII	DESIGN AND ASSESSMENT
PART VIII	EXECUTION
PART IX	CONSERVATION
PART X	CIRCULARITY AND DISMANTLEMENT

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the *fib* Statement on Sustainability (2021)



Received: 18 June 2021 | Accepted: 20 June 2021

DOI: 10.1002/suco.202100396

POSITION PAPER



The *fib* official statement on sustainability

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Email: akasuga@smcon.co.jp

Received: 18 June 2021 | Accepted: 20 June 2021
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Email: akasuga@smcon.co.jp

Sustainability is a key value for today's society and also for the *fib*. In this sense, the whole organization is focused to develop information, documents, and tools to be used by the construction community and the society in general to achieve sustainability goals.

The ambition of the *fib* is that the work developed by the organization creates relevant knowledge in the three pillars of sustainability for the society. The work in the *fib* on the three pillars of sustainability is linked to the United Nations 17 Sustainable Development Goals and the developments of other organizations.

The *fib* is a not-for-profit association formed by 41 national member groups and approximately 1,000 corporate and individual members. The *fib*'s mission is to develop at an international level the study of scientific and practical knowledge capable of advancing the technical, social, economic, and environmental performance of concrete structures.

The knowledge developed and shared by the *fib* (*fib* Model Codes, *fib* Bulletins, *fib* events, *fib* workshops, *fib* courses, etc.) is entirely the result of the volunteering work provided by the *fib* members.

The *fib* was created in 1998 by the merger of the Euro-International Committee for Concrete (the CEB) and the International Federation for Pre-stressing (the FIP). These predecessor organizations existed independently since 1953 and 1952, respectively.

The *fib* is an independent society of professionals working in the field of concrete that includes concrete

users, researchers, designers, and engineers from academia, design firms, constructors, and owners.

The *fib* has had a commission dedicated to environmental aspects of structural concrete from the start. Since then, the *fib* has created a Special Activity Group (SAGS) to deal with sustainability and environment in 2010 and created the Commission 7 "Sustainability" in 2015. In the *fib*, there are many Task Groups working on sustainability topics related to structural concepts, resilient structures, precasting, environmentally friendly concrete materials, recycling of materials and components, environmental product declarations, life cycle perspective analysis, etc. And *fib* will introduce some indicators to assess our commission activities in the field of sustainability. These indicators are used for the *fib* value assessment.

Sustainability concepts were already introduced in the Model Code 2010 and are a key part in the elaboration of the Model Code 2020 development. The *fib* Model Code is the only code which has sustainability philosophy as the main concept for the design, construction, and conservation of concrete structures built with concrete which started with MC2010.

Sustainability is a crucial concept for the design, construction, conservation and reuse of concrete structures. The *fib* has had a very intense activity on the environment and sustainability. As an example, we list the past bulletins developed in the *fib* about environmental aspects and sustainability:

- *fib* Bulletin 18. Recycling of offshore concrete structures. 2002.
- *fib* Bulletin 21. Environmental issues in prefabrication. 2003.
- *fib* Bulletin 23. Environmental effects of concrete. 2003.

Discussion on this paper must be submitted within two months of the print publication. The discussion will then be published in print, along with the authors' closure, if any, approximately nine months after the print publication.

Structural Concrete. 2021;22:1909–1910.

wileyonlinelibrary.com/journal/suco

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Sustainability in the Model Code

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ARTICLE



Sustainability perspective in *fib* MC2020: Contribution of concrete structures to sustainability

Petr Hajek

Open Access:

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DOI: 10.1002/suco.202300022



ARTICLE



Sustainability perspective in *fib* MC2020: Contribution of concrete structures to sustainability

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Abstract

Sustainability is a global goal of sustainable development aimed at ensuring a quality life on the Earth for the future generations. Buildings, infrastructure and the entire built environment should be better prepared for the new conditions—they should be sustainable, resilient and adaptable to new situations. This requires new technical solutions for the construction, reconstruction, and modernization of buildings and all other engineering structures. Concrete is gradually becoming a building material with great potential for realizing technical solutions that meet new requirements, leading to the necessary reduction of environmental impacts and consequent improvement of social and economic conditions. The paper presents implementation of sustainability principles in the new *fib* Model Code 2020 (MC2020). This represents a contribution of the International Federation for Structural Concrete (*fib*) to the achievements of the Sustainable Development Goals (SDGs), set by the United Nations in 2015 as an action plan for the period up to 2030.

KEYWORDS

concrete, LCA, sustainability

1 | INTRODUCTION

1.1 | Global situation

The world faces an increasing number of environmental damage and/or natural disasters, and constantly growing economic and social problems and challenges. The most critical causes of this situation are population growth and

global warming due to the rapidly increasing amount of greenhouse gasses in the atmosphere during last 2 hundred years.

In 2022, the world population has exceeded 8 billion. This represents 3.2× increase since 1950. During the same period, CO₂ emissions increased more than six times, world average temperature increased by 1°C and the number of recorded natural disasters increased 15 times.¹ Entire society, all nations, must take an action to slow down this process and adapt to the new natural and social conditions. To achieve these goals, it is crucial to implement sustainability and resilience as the most important objectives in all human activities and actions.

Discussion on this paper must be submitted within two months of the print publication. The discussion will then be published in print, along with the authors' closure, if any, approximately nine months after the print publication.

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1

Commissions and Task Groups

Special Activity Group. Sustainability



Chair: Domenico Asprone (Italy)






Scope:

The world will need the minimum CO₂ emissions concrete structures in the near future, not minimum cost as was required so far. Therefore, designers, constructors and owners might be asked to show the CO₂ emissions of the projects by clients and taxpayers. Under these situations, what kind of support can *fib* propose to members? The *fib* should prepare for these trends right now, and the *fib* can make members' benefits clearer. The *fib* has to take action in this direction as soon as possible. It is important that the *fib* can analyse and give information to the structural concrete community about the environmental impact of concrete structures.

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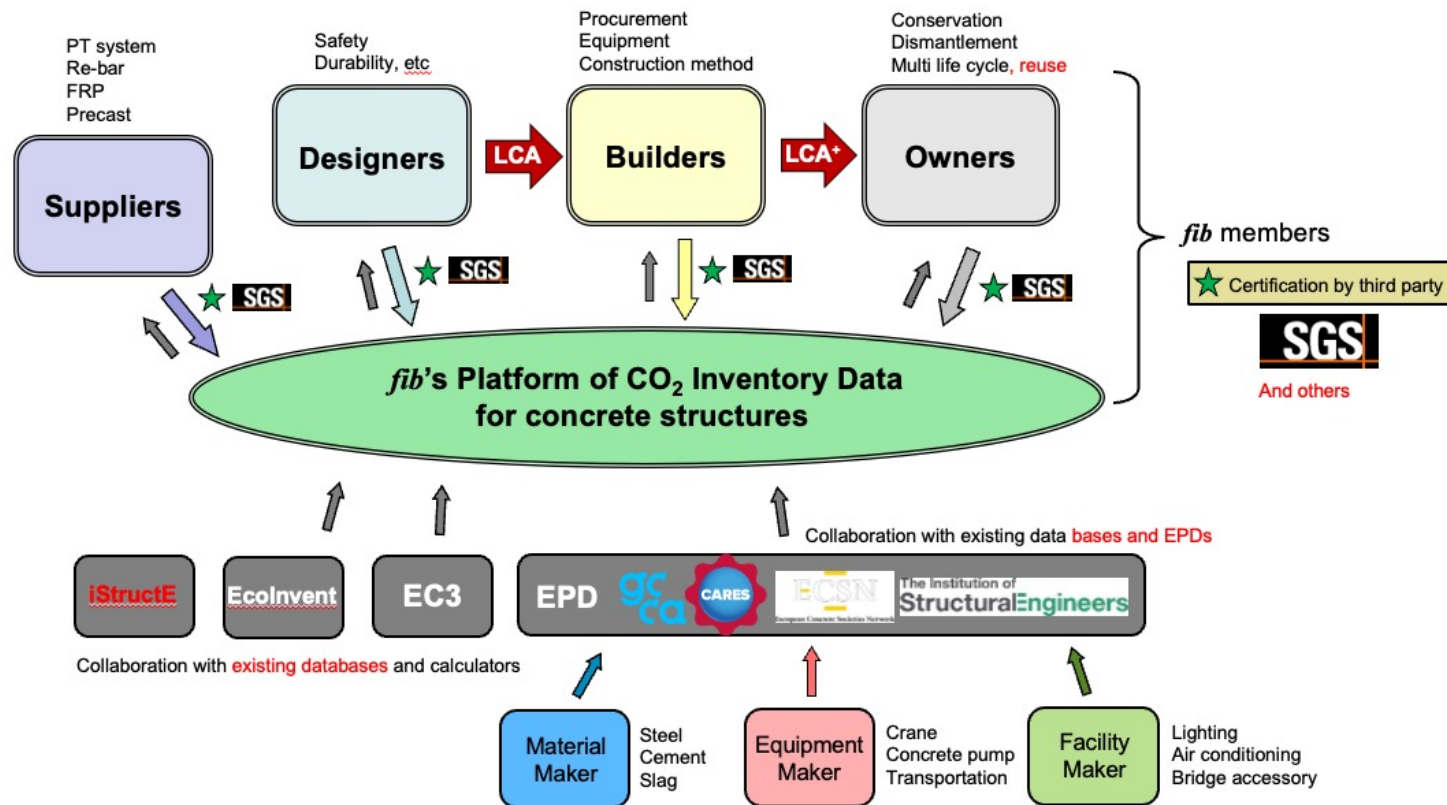


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BUILDING LIFE CYCLE INFORMATION														additional information outside the system boundary			
																	
A PRODUCT STAGE			A CONSTRUCTION STAGE		B USE STAGE							C END OF LIFE STAGE				D POTENTIAL BENEFITS AND LOADS	
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
Raw Material Supply	Transport	Manufacturing	Transport	Construction - Installation process	Use; installed products	Maintenance	Repair	Replacement	Refurbishment	Operational Energy use	Optional Water use	Deconstruction	Transport	Waste processing for reuse, recovery or/ and recycling	Disposal	Reuse - Recovery - Recycling - potential	

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Platform Structure



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Objective 1: *fib* Database (subgroup 1)

- Existing database at national or regional level: state-of-the-art and availability
- Main properties/needs of the *fib* Database (sql, no-sql, regional, LCA phases, time representativeness...)
- Source data (manufacturers, associations, literature, ...)
- Tools to use the database (online platform, report, specific Bill of Quantity software, BIM, ...)

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Objective 2: *fib* methodology (subgroup 1)

- Existing methodologies and standards: PCR, ISO, ...
- Main properties/needs of the *fib* methodology (regional, LCA phases, boundary system, inventory data, Impact categories...)
- Level of application (structural systems, structural typologies, technological boundaries)
- Tools to use the methodology (online platform, report, specific Bill of Quantity software, BIM, ...)
- Methodology certification/standardization (EPD, Model code...)
- Examples and case studies

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Objective 3.1: low carbon concrete structures and best practices (subgroup 2)

- Identifying range of **material, structural and technological innovation** to enhance sustainability of concrete structures
 - innovations at material level, structural design level, construction level, maintenance and interventions level, dismantlement and circular use:
 - ◆ addressed in ongoing fib activities
 - ◆ not yet addressed in ongoing fib activities
- Identifying **best practices for different innovative solutions**, for various structures, market conditions and geographical areas

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Objective 3.2: low carbon concrete structures and best practices (subgroup 2)

- Formulating consistent basis for performance-based design of sustainable structures in a life cycle perspective suitable for enhancing the sustainability of concrete structures
 - ❑ consistent safety philosophy for structural design innovative solutions (reliability requirements and uncertainties treatment in verification of structural performance)
 - ❑ principles of equivalent performance approach for structural design with innovative (material) solutions
 - ❑ framework for performance evaluation based on material and structural testing of innovative solutions

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Objective 3.3: low carbon concrete structures and best practices (subgroup 2)



- Identifying methodologies for **decision-making process towards sustainable structural solutions for design, execution and life cycle management including interventions**, optimized in terms of environmental impact, economic and social performance, and satisfying structural and functional performance requirements
 - optimization objectives
 - effective optimization strategies and procedures

International Federation for Structural Concrete
Fédération internationale du béton



Come, help us change the world ...



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Thank you!

David Fernández-Ordóñez
fib Secretary General