## Task Group 2.9: Fastenings to structural concrete and masonry

### Convener:

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<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Country</th>
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<tbody>
<tr>
<td>Eligeghausen</td>
<td>Universität Stuttgart, Institut für Werkstoffe im Bauwesen</td>
<td>Germany</td>
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### Members:

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<tr>
<th>Name</th>
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<tr>
<td>Akiyama</td>
<td>Tokyo Soil Research CO., LTD</td>
<td>Japan</td>
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<td>Asmus</td>
<td>IEA GmbH &amp; Co. KG</td>
<td>Germany</td>
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<td>Bergmeister</td>
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<td>Hsieh</td>
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<td>Ilki</td>
<td>Instanbul Technical University</td>
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<td>Dr. Li, Anchor Profi GmbH</td>
<td>Germany</td>
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<td>Wendner</td>
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### Corresponding Members:

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<td>Adediran</td>
<td>SRS, Bechtel</td>
<td>USA</td>
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<td>Ayoubi</td>
<td>Jordahl GmbH</td>
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<td>Vattenfall</td>
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<td>Cebulla</td>
<td>S&amp;P Leipzig</td>
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Chui ICC-Evaluation Service USA
Davis Milwaukee School of Engineering USA
Dorst CEL Consulting USA
Fletcher Lite Steel Technologies Australia
Fuchs Universität Stuttgart, Germany
Institut für Werkstoffe im Bauwesen
Gad Swinburne University of Technology Australia
Genesio Hilti AG Germany
Gerber IAPMO USA
Häusler Halfen GmbH Germany
Hoehler National Institute of Standards and Technology USA
Hordijk Adviesbureau Hageman Netherlands
Hosokawa University of Tokyo Japan
Julier Jordahl GmbH Germany
Kinnunen Peikko Group Finland
Kolden Element Materials Technology USA
Kolczak ITW North America USA
Kuhn Adolf Würth GmbH & Co KG Germany
Kummerow Deutsches Institut für Bautechnik Germany
Lange Deutsches Institut für Bautechnik Germany
Mahrenholtz, C. Jordahl GmbH Germany
Mahrenholtz, P. Stanley Black & Decker Deutschland GmbH Germany
Marasco ITW-Spit France
Michler Technische Universität Dresden Germany
Niforoush Lulea University of Technology Sweden
Olsen Powers Fasteners Inc. USA
Pimienta Centre Scientifique et Technique du Bâtiment France
Pinoteau Centre Scientifique et Technique du Bâtiment France
Randl Carinthia University of Applied Sciences Austria
Rostaind Spit France
Rutz MKT Metall-Kunststoff-Technik GmbH Germany
Schilling fischerwerke GmbH & Co. KG Germany
Spieth Private Germany
Stochlia KSPE (Kurt Stochlia Professional Engineer) USA
Strater Chemofast Anchoring Germany
Takahashi Hilti Japan
Toth IEA GmbH & Co. KG Germany
Thiele Technische Universität Kaiserlautern Germany
Turley Simpson Strong Tie Company, Inc. USA
Wendt Simpson Strong Tie Company, Inc. Germany
Wiewel Consultant USA
Xiong Hilti China
Yamamoto GAL Building Consultant Office Japan
Zeman IKI-Vienna Austria
Zhao University of Wisconsin-Milwaukee USA
Zhu fischerwerke GmbH & Co. KG Germany
Ziegler Powers Fasteners Inc. USA

(fib members are listed in bold)

Recent meetings
Milan (May 2016); Philadelphia (October 2016); Vienna (May 2017), Stuttgart (May 2018); Taipei (November 2018)
Terms of reference

Motivation/background (in brief)
Modern fastening technique is employed extensively for the transfer of concentrated loads into concrete and masonry structures. Cast-in-place anchors, placed in the formwork before casting of the concrete, as well as post-installed anchors and reinforcing bars, which are installed in hardened structural concrete or masonry, are equally common. Loads are transferred into the concrete or masonry by mechanical interlock, friction, bond or a combination of these mechanisms. However, independently of the load-transfer mechanism, all anchorages rely on the tensile strength of the concrete or masonry, a fact which must be taken into account in both assessment and design. Despite the widespread use of cast-in-place as well as post-installed anchors and reinforcing bars in construction, the overall level of understanding in the engineering community regarding their behaviour remains quite limited.

Scope and objective of technical work
In order to improve the general state of knowledge in this field, Task Group 2.9 Fastenings to Structural Concrete and Masonry (former Special Activity Group 4) was formed.

The aim of TG2.9 is to collect and discuss the latest research results in the field of fastening technology, to identify new areas of research and to synthesise the research results in harmonised provisions for the design of fastenings.

Description of workflow and timeline
TG2.9 meets one to two times per year to discuss the latest research results as well as to present the activities of the working parties. The working parties usually have additional meetings once or twice a year. TG2.9 aims to issue a new general design guide in 2020.

Collaboration with other groups
fib Task Group 2.5 Bond and material models
ACI Commissions 318, 349 and 355
CEN, TC250/SC2/WG 2 "Design of fastenings in concrete"
EOTA, Working Group "Anchors"

Target audience
Researchers, consultants, approval bodies, manufacturers, designers

Expected outcome and delivery dates
Continuous revision of the fib Bulletin 58 "Design of anchorages in concrete" with regular output every four to five years based on the work of the working parties. Single topics will be treated in specific fib documents. A new general "Design Guide" will be issued in approximately 2020.

Working Party 2.9.1: Review of current fib model with a view to Model Code 2010 and model for anchor reinforcement

Convener:
Hofmann
Universität Stuttgart,
Institut für Werkstoffe im Bauwesen
Germany

Members:
Asmus
IEA GmbH & Co. KG
Germany
Elfgren
Luleå University of Technology
Sweden
Eligehausen
Universität Stuttgart,
Institut für Werkstoffe im Bauwesen
Germany

Sharma
Universität Stuttgart,
Institut für Werkstoffe im Bauwesen
Germany

Silva
Hilti Inc.
USA

Sippel
European Engineered Construction Systems Association
Germany

(fib members are listed in bold)

Revision of the design model for supplementary reinforcement for fastenings based on recent research results.

Working Party 2.9.2: Open topics in the current design guide

Convener:
Stork
Adolf Würth GmbH & Co KG
Germany

Members:
Bokor
Universität Stuttgart,
Institut für Werkstoffe im Bauwesen
Germany

Bucher
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Germany

Buhler
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Germany

Li
Dr. Li Anchor Profi GmbH
Germany

Mallee
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Pregartner
Stanley Black & Decker Deutschland GmbH
Germany

Sharma
Universität Stuttgart,
Institut für Werkstoffe im Bauwesen
Germany

Toth
IEA GmbH & Co. KG
Germany

Wall
Hilti AG
Liechtenstein

Wendt
Simpson Strong Tie Company, Inc.
Germany

Review of the design provisions for anchorages with cast-in headed and post-installed fasteners in respect to inconsistencies and new research results and development of improved design provisions.

Working Party 2.9.2-1: Anchor Channels

Convener:
Sippel
European Engineered Construction Systems Association
Germany

Members:
Beer
Halfen GmbH
Germany

Eligehausen
Universität Stuttgart,
Institut für Werkstoffe im Bauwesen
Germany

Grosser
Hilti AG
Liechtenstein

Häusler
Halfen GmbH
Germany

Julier
Jordahl GmbH
Germany

Li
Dr. Li, Anchor Profi GmbH
Germany

Lotze
Universität Stuttgart,
Materialprüfungsanstalt Otto-Graf-Institut
Germany

Mahrenholtz, C.
Jordahl GmbH
Germany
Review of the design provisions for anchorages with cast-in anchor channels in respect to new research results and development of improved design provisions. In particular, design provisions for anchor channels loaded by a shear load in the direction of the longitudinal channel axis will be incorporated.

Working Party 2.9.3: Shear lugs
Convener:
   Cook University of Florida USA
Members:
   Eligehausen Universität Stuttgart, Institut für Werkstoffe im Bauwesen Germany
   Michler Technische Universität Dresden Germany
   Silva Hilti Inc. USA
   Stork Adolf Würth GmbH & Co KG Germany
(fib members are listed in bold)
Development of provisions for the design of shear lugs. A proposal for designing fastenings with shear lugs has been accepted by TG2.9 and will be incorporated in the new edition of the fib design guide.

Working Party 2.9.4: Fatigue loading
Convener:
   Block Fobatec GmbH Germany
Members:
   Bucher fischerwerke GmbH & Co. KG Germany
   Hofmann Universität Stuttgart, Institut für Werkstoffe im Bauwesen Germany
   Li Dr. Li Anchor Profi GmbH Germany
   Lotze Universität Stuttgart, Materialprüfungsanstalt Otto-Graf-Institut Germany
   Sippel European Engineered Construction Systems Association Germany
   Toth IEA GmbH & Co. KG Germany
   Wall Hilti AG Liechtenstein
(fib) members are listed in bold
Review of the existing simplified design provisions for anchorages under fatigue loading and development of less conservative design provisions.
Working Party 2.9.5: Bonded anchors under sustained load

Convener:
- **Hofmann**
  - Universität Stuttgart, Institut für Werkstoffe im Bauwesen
  - Germany
- **Cook**
  - University of Florida
  - USA

Members:
- **Eligehausen**
  - Universität Stuttgart, Institut für Werkstoffe im Bauwesen
  - Germany
- **Guillet**
  - Centre Scientifique et Technique du Bâtiment
  - France
- **Schätzle**
  - fischerwerke GmbH & Co. KG
  - Germany
- **Wall**
  - Hilti AG
  - Liechtenstein

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

Review of research results on bonded anchors under sustained load and development of provisions for the design of anchorages with bonded anchors and connections with post-installed reinforcement to take into account the negative influence of sustained load. A proposal for design provisions has been accepted by TG2.9 and will be incorporated in the fib design guide.

Working Party 2.9.6: Post-installed reinforcement – Harmonisation of rules for reinforced concrete and anchorages with bonded anchors and post-installed reinforcement

Convener:
- **Silva**
  - Hilti Inc.
  - USA

Members:
- **Eligehausen**
  - Universität Stuttgart, Institut für Werkstoffe im Bauwesen
  - Germany
- **Mahrenholtz**
  - Jordahl GmbH
  - Germany
- **Sharma**
  - Universität Stuttgart, Institut für Werkstoffe im Bauwesen
  - Germany

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

Development of a harmonised design concept for connections with bonded anchors and post-installed reinforcement under static and seismic loading.

Working Party 2.9.7: Splitting of bonded anchors

Convener:
- **Asmus**
  - IEA GmbH & Co. KG
  - Germany

Members:
- **Bucher**
  - fischerwerke GmbH & Co. KG
  - Germany
- **Cook**
  - University of Florida
  - USA
- **Guillet**
  - Centre Scientifique et Technique du Bâtiment
  - France
- **Kummerow**
  - Deutsche Institut für Bautechnik
  - Germany

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

COM2 Terms of Reference
Development of design provision for bonded anchors to prevent splitting of the concrete member during pretensioning and loading which shall replace the currently required approval tests. A proposal has been presented and is under discussion in TG2.9.

**Working Party 2.9.8: Required stiffness of baseplates**

**Convener:**

Li

Dr. Li Anchor Profi GmbH

Germany

**Members:**

Bokor

Universität Stuttgart,

Institut für Werkstoffe im Bauwesen

Germany

**Cook**

University of Florida

USA

**Eligehausen**

Universität Stuttgart,

Institut für Werkstoffe im Bauwesen

Germany

Kummerow

Deutsche Institut für Bautechnik

Germany

Mallee

Consultant

Germany

**Sharma**

Universität Stuttgart,

Institut für Werkstoffe im Bauwesen

Germany

**Stork**

Adolf Würth GmbH & Co KG

Germany

Thiele

Technische Universität Kaiserslautern

Germany

**Wall**

Hilti AG

Liechtenstein

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

In general anchorages are designed under the assumption that the baseplate is stiff. However, no criteria are given in the fib Design Guide to assure a stiff baseplate. These provisions are under development. Furthermore, design rules for fastenings with flexible base plates are being discussed.

**Working Party 2.9.9: Fire Resistance of anchors and post-installed reinforcement**

**Convener:**

Guillet

Centre Scientifique et Technique du Bâtiment

France

**Members:**

**Eligehausen**

Universität Stuttgart,

Institut für Werkstoffe im Bauwesen

Germany

**Hofmann**

Universität Stuttgart,

Institute für Werkstoffe im Bauwesen

Germany

**Lange**

Deutsches Institut für Bautechnik

Germany

**Pimienta**

Centre Scientifique et Technique du Bâtiment

France

**Pinoteau**

Centre Scientifique et Technique du Bâtiment

France

**Sharma**

Universität Stuttgart,

Institut für Werkstoffe im Bauwesen

Germany

**Silva**

Hilti Inc.

USA

**Stochlia**

KSPE (Kurt Stochlia Professional Engineer)

USA

**Takahashi**

Hilti Japan

Japan

(fib members are listed in **bold**)
Development of more refined provisions for the design of anchorages with all types of anchors and of connections with post-installed reinforcement under fire exposure. A proposal for the design of fastenings with post-installed reinforcement under fire exposure has been accepted by TG2.9. These will be incorporated in the fib design guide.

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**Working Party 2.9.10: Evaluation and assessment of existing anchorages**

**Convener:**
- **Elfgren**
  - Luleå University of Technology
  - Sweden

**Members:**
- **Asmus**
  - IEA GmbH & Co. KG
  - Germany
- **Eligehausen**
  - Universität Stuttgart,
  - Institute für Werkstoffe im Bauwesen
  - Germany
- **Guillet**
  - Centre Scientifique et Technique du Bâtiment
  - France
- **Li**
  - Dr. Li Anchor Profi GmbH
  - Germany
- **Mattis**
  - CEL Consulting
  - USA
- **Matsuzaki**
  - Science University of Tokyo
  - Japan
- **Muciaccia**
  - Politecnico di Milano
  - Italy
- **Nilforoush**
  - Lulea University of Technology
  - Sweden
- **Sharma**
  - Universität Stuttgart,
  - Institute für Werkstoffe im Bauwesen
  - Germany
- **Silva**
  - Hilti Inc.
  - USA

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

Development of provisions for evaluation and assessment of existing anchorages which are currently not available but urgently needed.

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**Working Party 2.9.11: Steel shear strength of anchorages with stand-off base plate connection**

**Convener:**
- **Cook**
  - University of Florida
  - USA

**Members:**
- **Eligehausen**
  - Universität Stuttgart,
  - Institute für Werkstoffe im Bauwesen
  - Germany
- **Hofmann**
  - Universität Stuttgart,
  - Institute für Werkstoffe im Bauwesen
  - Germany
- **Muciaccia**
  - Politecnico di Milano
  - Italy
- **Silva**
  - Hilti Inc.
  - USA

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

Development of provisions to calculate the design steel shear strength of anchorages with stand-off base plate connections. Design provisions proposed by WP have been accepted by TG2.9 and will be incorporated in fib design guide.
Working Party 2.9.12: Seismic Design

Convener:

Muciaccia
Politecnico di Milano
Italy

Members:

Sharma
Universität Stuttgart,
Institut für Werkstoffe im Bauwesen
Germany

Sippel
European Engineered Construction Systems Association
Germany

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

Development of provisions for seismic design of anchorages.