

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

### Convener:

<b>Eligehausen</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
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### Members:

Akiyama	Tokyo Soil Research CO., LTD	Japan
<b>Asmus</b>	IEA GmbH & Co. KG	Germany
<b>Bergmeister</b>	Universität für Bodenkultur, Wien	Austria
Block	fobatec GmbH	Germany
Bokor	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Bucher</b>	fischerwerke GmbH & Co. KG	Germany
<b>Cook</b>	University of Florida	USA
<b>Elfgren</b>	Luleå University of Technology	Sweden
<b>Grosser</b>	Hilti AG	Liechtenstein
<b>Guillet</b>	Centre Scientifique et Technique du Bâtiment	France
<b>Hofmann</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
Hsieh	National Pingtung University of Science and Technology, Taiwan	Taiwan
Ilki	Istanbul Technical University	Turkey
<b>Li</b>	Dr. Li, Anchor Profi GmbH	Germany
Lotze	Universität Stuttgart, Materialprüfungsanstalt Otto-Graf-Institut	Germany
Mallee	Consultant	Germany
Matsuzaki	Science University of Tokyo	Japan
<b>Mattis</b>	CEL Consulting	USA
<b>Muciaccia</b>	Politecnico di Milano	Italy
Nakano	University of Tokyo	Japan
<b>Schätzle</b>	fischerwerke GmbH & Co. KG	Germany
<b>Sharma</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Silva</b>	Hilti Inc.	USA
Silverman	ICC-Evaluation Service	USA
<b>Sippel</b>	European Engineered Construction Systems Association	Germany
<b>Stork</b>	Adolf Würth GmbH & Co KG	Germany
Vintzileou	National Technical University Athens	Greece
<b>Wall</b>	Hilti AG	Liechtenstein
<b>Wendner</b>	Universität für Bodenkultur, Wien	Austria

### Corresponding Members:

Abate	ITW CP Italy	Italy
Adediran	SRS, Bechtel	USA
Ayoubi	Jordahl GmbH	Germany
Ando	Sumitomo Osaka Cement	Japan
Beer	Halfen GmbH	Germany
Bergkivist	Vattenfall	Sweden
<b>Buhler</b>	Adolf Würth GmbH & Co KG	Germany
Cebulla	S&P Leipzig	Germany

Chui	ICC-Evaluation Service	USA
Davis	Milwaukee School of Engineering	USA
Dorst	CEL Consulting	USA
Fletcher	Lite Steel Technologies	Australia
Fuchs	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
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
Hoermann-Gast	Private	USA
<b>Hordijk</b>	Adviesbureau Hageman	Netherlands
Hosokawa	University of Tokyo	Japan
Julier	Jordahl GmbH	Germany
<b>Kinnunen</b>	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
Nilforoush	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
<b>Randl</b>	Carinthia University of Applied Sciences	Austria
Rostaind	Spit	France
<b>Rutz</b>	MKT Metall-Kunststoff-Technik GmbH	Germany
Schillinger	fischerwerke GmbH & Co. KG	Germany
Spieth	Private	Germany
Stochlia	KSPE (Kurt Stochlia Professional Engineer)	USA
<b>Strater</b>	Chemofast Anchoring	Germany
Takahashi	Hilti Japan	Japan
Toth	IEA GmbH & Co. KG	Germany
Thiele	Technische Universität Kaiserslautern	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
<b>Zhao</b>	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.

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### 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.

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

### Convener:

<b>Hofmann</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
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### Members:

<b>Asmus</b>	IEA GmbH & Co. KG	Germany
<b>Elfgren</b>	Luleå University of Technology	Sweden

<b>Eligehausen</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Sharma</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Silva</b>	Hilti Inc.	USA
<b>Sippel</b>	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:

<b>Stork</b>	Adolf Würth GmbH & Co KG	Germany
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### Members:

Bokor	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Bucher</b>	fischerwerke GmbH & Co. KG	Germany
<b>Buhler</b>	Adolf Würth GmbH & Co. KG	Germany
<b>Li</b>	Dr. Li Anchor Profi GmbH	Germany
Mallee	Consultant	Germany
Pregartner	Stanley Black & Decker Deutschland GmbH	Germany
<b>Sharma</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
Toth	IEA GmbH & Co. KG	Germany
<b>Wall</b>	Hilti AG	Liechtenstein
Wendt	Simpson Strong Tie Company, Inc.	Germany

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

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:

<b>Sippel</b>	European Engineered Construction Systems Association	Germany
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### Members:

Beer	Halfen GmbH	Germany
<b>Eligehausen</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Grosser</b>	Hilti AG	Liechtenstein
Häusler	Halfen GmbH	Germany
Julier	Jordahl GmbH	Germany
<b>Li</b>	Dr. Li, Anchor Profi GmbH	Germany
Lotze	Universität Stuttgart, Materialprüfungsanstalt Otto-Graf-Institut	Germany
Mahrenholtz, C.	Jordahl GmbH	Germany

<b>Sharma</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
Silverman	ICC-Evaluation Service	USA
<b>Stork</b>	Adolf Würth GmbH & Co KG	Germany
Zhu	fischerwerke GmbH & Co. KG	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:**

<b>Cook</b>	University of Florida	USA
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**Members:**

<b>Elgehausen</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
Michler	Technische Universität Dresden	Germany
<b>Silva</b>	Hilti Inc.	USA
<b>Stork</b>	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:**

<b>Block</b>	Fobatec GmbH	Germany
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**Members:**

<b>Bucher</b>	fischerwerke GmbH & Co. KG	Germany
<b>Hofmann</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Li</b>	Dr. Li Anchor Profi GmbH	Germany
Lotze	Universität Stuttgart, Materialprüfungsanstalt Otto-Graf-Institut	Germany
<b>Sippel</b>	European Engineered Construction Systems Association	Germany
Toth	IEA GmbH & Co. KG	Germany
<b>Wall</b>	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

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## Working Party 2.9.5: Bonded anchors under sustained load

### Convener:

<b>Hofmann</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Cook</b>	University of Florida	USA

### Members:

<b>Eligehausen</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Guillet</b>	Centre Scientifique et Technique du Bâtiment	France
<b>Schätzle</b>	fischerwerke GmbH & Co. KG	Germany
<b>Wall</b>	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.

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

### Convener:

<b>Silva</b>	Hilti Inc.	USA
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### Members:

<b>Eligehausen</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
Mahrenholtz	Jordahl GmbH	Germany
<b>Sharma</b>	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.

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## Working Party 2.9.7: Splitting of bonded anchors

### Convener:

<b>Asmus</b>	IEA GmbH & Co. KG	Germany
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### Members:

<b>Bucher</b>	fischerwerke GmbH & Co. KG	Germany
<b>Cook</b>	University of Florida	USA
<b>Guillet</b>	Centre Scientifique et Technique du Bâtiment	France
Kummerow	Deutsche Institut für Bautechnik	Germany

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

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.

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## Working Party 2.9.8: Required stiffness of baseplates

### Convener:

<b>Li</b>	Dr. Li Anchor Profi GmbH	Germany
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### Members:

<b>Bokor</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Cook</b>	University of Florida	USA
<b>Eligehausen</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Kummerow</b>	Deutsche Institut für Bautechnik	Germany
<b>Mallee</b>	Consultant	Germany
<b>Sharma</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Stork</b>	Adolf Würth GmbH & Co KG	Germany
<b>Thiele</b>	Technische Universität Kaiserslautern	Germany
<b>Wall</b>	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.

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

### Convener:

<b>Guillet</b>	Centre Scientifique et Technique du Bâtiment	France
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### Members:

<b>Eligehausen</b>	Universität Stuttgart, Institute für Werkstoffe im Bauwesen	Germany
<b>Hofmann</b>	Universität Stuttgart, Institute für Werkstoffe im Bauwesen	Germany
<b>Lange</b>	Deutsches Institut für Bautechnik	Germany
<b>Pimienta</b>	Centre Scientifique et Technique du Bâtiment	France
<b>Pinoteau</b>	Centre Scientifique et Technique du Bâtiment	France
<b>Sharma</b>	Universität Stuttgart, Institut für Werkstoffe im Bauwesen	Germany
<b>Silva</b>	Hilti Inc.	USA
<b>Stochlia</b>	KSPE (Kurt Stochlia Professional Engineer)	USA
<b>Takahashi</b>	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:

<b>Elfgren</b>	Luleå University of Technology	Sweden
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### Members:

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

<b>Cook</b>	University of Florida	USA
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### Members:

<b>Eligehausen</b>	Universität Stuttgart, Institute für Werkstoffe im Bauwesen	Germany
<b>Hofmann</b>	Universität Stuttgart, Institute für Werkstoffe im Bauwesen	Germany
<b>Muciaccia</b>	Politecnico di Milano	Italy
<b>Silva</b>	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.

