ENGINEERING

# Fastening Technology Manual



Version 2.0
July 2026

# Foreword

## Dear customer,

As it is our ambition to be the worldwide leader in fastening technology and related structural and non-structural connections, we are continuously striving to provide you with state-of-the-art technical information reflecting the latest development in codes, regulations, and approvals as well as technical information for our products.

The “Engineering Fastening Technology Manual” is the gateway to technical documents for post-installed and cast-in anchoring in concrete and masonry, strengthening solutions in concrete, timber and timber connections. It reflects our ongoing investment into long-term research and development of leading fastening products.

While the selection and detailed design of our solutions has largely moved to digital means, i.e. using our design software PROFIS Engineering or the Hilti webpages, the Engineering Fastening Technology Manual is a very valuable tool when solving fastening tasks and looking up technical details. It guides you through the complex world of Applications, Code Landscape, and wide variety of fastener products, provides you with profound technical know-how and helps you to be more productive in your daily work without any compromise regarding reliability and safety.

We are available at any time to answer additional questions that go beyond this content.

**Dr. Lars Taenzer**
Business Unit Anchors

# Important notices

1) The technical data presented in the Product Technical Data Sheets (PDS) linked to this Anchor Fastening Technology Manual is based on numerous tests and evaluation criteria according to the current state of the art and the relevant European regulations.

2) For all those anchors holding a European Technical Assessment (ETA), the technical data given in the PDS is based on and is in accordance with the information given in the respective ETA. The relevant ETA is listed in the certificates with a link to the document. Additional Hilti technical data may be available and will be noted on footnotes and/or tables.

3) For all those anchors not holding an ETA, the technical data given in the PDS is based on numerous tests and evaluation criteria according to the current state of the art and/or the relevant European applicable regulations for the assessment of fasteners, which are the basis for obtaining an ETA.

4) In addition to the tests for different loading conditions considered by the ETA, in some cases, tests have been performed following local guidelines, e.g., to assess the resistance to fatigue, fire and shock. In such cases national approvals, industrial certificates or expert reports are referenced in the applicable PDS.

5) The data and values are based on tests under laboratory or other controlled conditions, or on generally accepted methodology. It is the customer's responsibility to use the provided data taking into account the local conditions and to consider the intended use of the respective products. The customer must check that the listed prerequisites and criteria conform with the conditions existing on the jobsite. Whilst Hilti can give general guidance and advice, the nature of Hilti products means that the ultimate responsibility for selecting the right product for a particular application must lie with the customer.

6) Technical data presented herein was current as of the date of publication (see cover sheet of each linked PDS). Hilti's policy is one of continuous development. We therefore reserve the right to alter technical data and specifications, etc. without notice.

7) The given technical data in each PDS are valid for the service conditions indicated. Due to variations in local base materials, on-site testing may be required to determine or confirm the performance at any specific jobsite. If the base material is not found to be suitable for the scope of the published technical data of the selected product, contact the Engineering Competence Center of your local Hilti organization for further assistance.

8) Instructions for use published by Hilti. The actual documents can be found using the links provided in the installation instructions table of each PDS.

9) The Product Technical Data Sheet (PDS) selectors contain extensive information on fastening types, substrates, installation methods, and load types. Each PDS and its linked documents provide the necessary details on which combinations have been tested and approved.

10) All product deliveries and advisory services are subject to the terms and conditions of the relevant local Hilti organization.

11) While reasonable efforts have been made to ensure the accuracy and completeness of the information provided, no guarantee is given as to its freedom from errors. Hilti shall not, under any circumstances, be held liable for any direct, indirect, incidental, consequential, or other damage, losses, or expenses arising from or in connection with the use of, or inability to use, the products or information for any purpose. Any implied warranties of merchantability or fitness for a particular purpose are expressly disclaimed.

12) Handbooks, technical guides, and white papers presented in this Engineering Fastening Technology Manual are intended to provide engineering reference information and detailed technical data related to specific applications. Although Hilti takes extensive measures to help ensure the accuracy and reliability of the information provided, responsibility for the selection, verification, and application of this information ultimately rests with the user.

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FL-9494 Schaan
Principality of Liechtenstein

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# 1. Applications

## 1.1. Steel-to-concrete connections (post-installed anchors)

The connection between structural (beams, columns, plates, brackets etc.) and non-structural (railings, facades, mechanical supports, fencing etc.) steel sections to existing concrete members cast at a previous point in time is called steel-to-concrete (S2C) post-installed connections. These connections are typically used for structural modifications, retrofitting existing structures and light fixtures for architectural or secondary applications. S2C connections provide essential support in both new or retrofitting applications allowing flexibility, strength and durability.

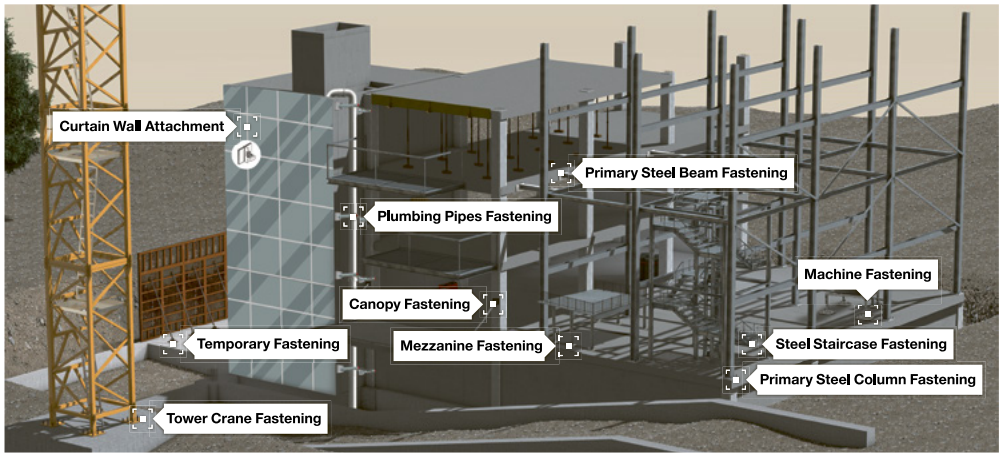



Illustration of typical applications in a building under construction

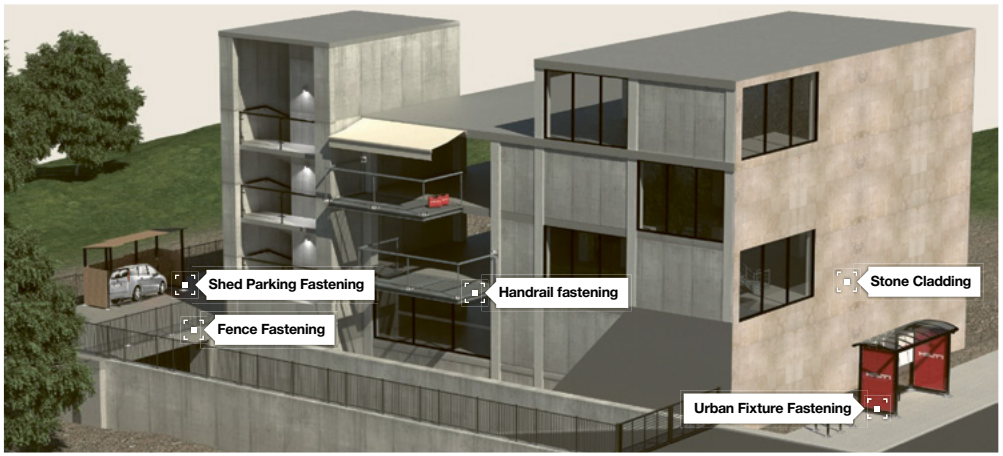
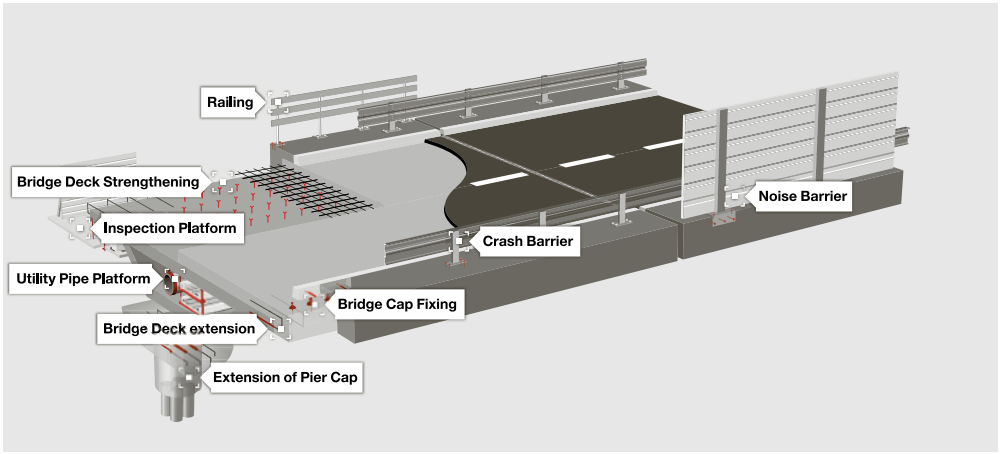



Illustration of typical applications for building finishings




Illustrations of typical applications for jobsite bridges

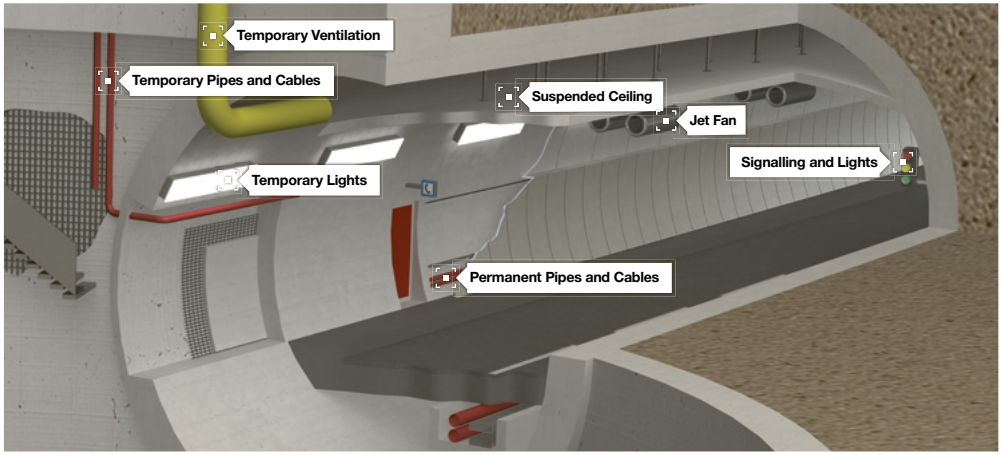


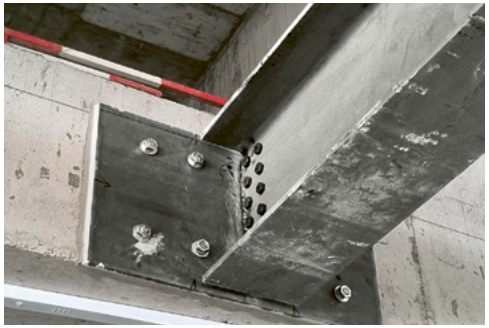

Illustration of typical applications for tunnel structures

## 1.1.1 Typical applications and jobsite references

**Steel-to-concrete connections (post-installed anchors)**



Primary steel column



Primary steel beam



Canopies



Steel staircase



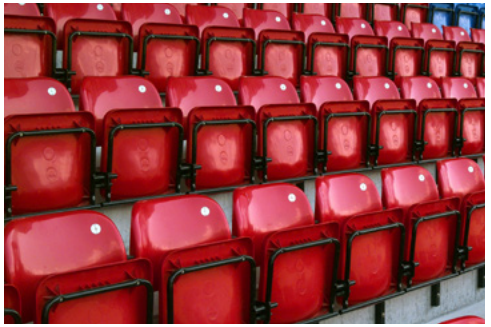
Temporary wall support



Tower crane support



Handrails



Seats in stadium

## Jobsite reference



At Hilti, we support some of the most inspiring construction projects around the world. By providing anchoring systems for steel-to-concrete connections, we help engineers and contractors solve real challenges on site.

View online

## 1.1.2 Handbooks, articles and design software

**Steel-to-concrete connections (post-installed anchors)**

## Main information




**Steel-to-concrete connections**
This technical handbook for post-installed anchors in steel-to-concrete applications provides an overview on working principle, qualifications and design details against static/seismic/fire/fatigue loads as per European guidelines. It also describes methods of proper installation, on-site testing and other jobsite services offered by Hilti as total solution provider.

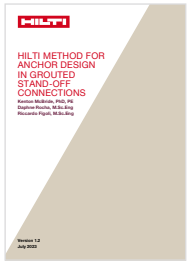
View online

## Supporting information




**Hilti Method for anchor design in ungrouted stand-off connections**
This document helps to understand the detail design criteria for Hilti Method for shear force application with ungrouted stand-off. It presents design examples along with the functionalities in PROFIS Engineering.

View online




**Hilti Method for anchor design in grouted stand-off connections**
This document helps to understand the detail design criteria for Hilti Method for shear force application with grouted stand-off. It presents design examples along with the functionalities in PROFIS Engineering.

View online




**Beyond the edge with the Hilti method for fastening design**
This document presents the Hilti Method, which introduces an updated approach for distributing shear to a greater number of anchors beyond edge conditions. It includes design details and calculation examples based on EN 1992-4 and fib guidelines, along with features available in the PROFIS software for anchor design.

View online

## Supporting information




**Post-installed bonded screw anchor, an innovative technology**
This document showcases the advantages of using post-installed bonded screw anchor HUS4-MAX over mechanical and chemical anchors. It describes updated design method with examples, qualification criteria as per European framework.

View online




**Hilti method supplementary reinforcement**
This document explains the design of post-installed anchor connections with supplementary reinforcement in reinforced concrete according to Hilti method based on EN 1992-4 and state-of-the-art research (fib). The description of load-transfer mechanisms, resistance calculations for tension and shear loads and interaction, highlighting improved resistance are explained with worked examples.

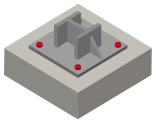
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## Design software

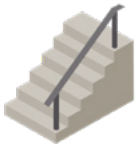
**PROFIS Engineering**

PROFIS Engineering for design of post installed anchor to concrete connections is an integrated software for design of anchors and steel baseplate.

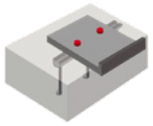
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**Anchoring to concrete**



**Handrail**



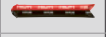
**Façade**

## 1.1.3 Product technical data sheet selector

**Steel-to-concrete connections (post-installed anchors)**

View detailed PDS selector

## Chemical anchors

| | | | Fastener type | | | | Base material | | Setting | | Design app |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Link to product technical data sheet (PDS) | Product picture | Threaded rod HAS (U) | Internal threaded sleeve HIS-N HIT-IC | Expansion threaded rod HIT-Z HAS-D HAS-TZ HIT-CS-F | Rebar | Cracked concrete | Uncracked concrete | Fast cure @ 20 °C | Slow cure @ 20 °C | PROFIS Engineering |
| Injection system | HIT-HY 200-R V3 |  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| | HIT-HY 200-A V3 |  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| | HIT-RE 500 V4 |  | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ |
| | HIT-RE 500 V3 |  | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ |
| | HIT-RE 100 |  | ✓ | | | ✓ | ✓ | ✓ | | ✓ | ✓ |
| | HIT-HY 170 |  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| | HIT-CT 100 |  | ✓ | | | | ✓ | ✓ | ✓ | | ✓ |
| | HIT-RE 100-HC |  | ✓ | | | ✓ | ✓ | ✓ | | ✓ | |
| | HIT-MM Plus |  | ✓ | ✓ | | ✓ | | ✓ | ✓ | | |
| | HIT-RE 10 |  | ✓ | | | ✓ | | ✓ | | ✓ | |
| | HIT-ICE |  | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| | HIT-1 |  | ✓ | | | | | ✓ | ✓ | | |
| Capsule system | HVU2 |  | ✓ | ✓ | | | ✓ | ✓ | ✓ | | ✓ |
| | HVU-TZ |  | | | ✓ | | ✓ | ✓ | ✓ | | ✓ |

View detailed PDS selector

# Mechanical anchors

| | | | Fastener type | | | | | | Base material | | Design app |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Link to product technical data sheet (PDS) | Product picture | Externally threaded | Internally threaded | Hex head | Countersunk | Flat head | Close / open eye bolt | Cracked concrete | Uncracked concrete | PROFIS Engineering |
| Metal expansion anchor | HSL4 |  | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| | HSL-3-R |  | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| | HST4 |  | ✓ | | | | | | ✓ | ✓ | ✓ |
| | HST2 V3 |  | ✓ | | | | | | ✓ | ✓ | ✓ |
| | HST2 |  | ✓ | | | | | | ✓ | ✓ | ✓ |
| | HSA |  | ✓ | | | | | | | ✓ | ✓ |
| | HSV |  | ✓ | | | | | | | ✓ | |
| | HSV G02 |  | ✓ | | | | | | | ✓ | |
| | HSB |  | ✓ | | | | | | | ✓ | |
| Undercut anchor | HDA |  | ✓ | | | | | | ✓ | ✓ | ✓ |
| | HMU-PF |  | ✓ | | | | | | ✓ | ✓ | ✓ |
| | HSC |  | ✓ | ✓ | | | | | ✓ | ✓ | ✓ |
| Flush anchor | HKD |  | | ✓ | | | | | | ✓ | ✓ |
| | HKD redundant |  | | ✓ | | | | | ✓ | ✓ | |
| | HKV |  | | ✓ | | | | | | ✓ | |
| Screw anchor | HUS4 |  | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| | HUS4-R |  | | | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| | HUS3 |  | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| | HUS(-S) 6 |  | | | | | ✓ | | ✓ | ✓ | |
| | HUS redundant |  | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| Bonded screw anchor | HUS4-MAX |  | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ |

| | | | Fastener Type | | | | | | Base Material | | Design App |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Link to product technical data sheet (PDS) | Product picture | Externally threaded | Internally threaded | Hex head | Countersunk | Flat head | Close / open eye bolt | Cracked concrete | Uncracked concrete | PROFIS Engineering |
| Plastic anchor | HRD |  | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| | HRD red. |  | | | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| | HPS-1 |  | | | | | ✓ | | | ✓ | |
| | HUD-1 |  | | ✓ | | | | | | ✓ | |
| | HUD-2 |  | | ✓ | | | | | | ✓ | |
| | HUD-L |  | | ✓ | | | | | | ✓ | |
| | GD14 |  | | ✓ | | | | ✓ | | ✓ | |
| | HRV |  | | ✓ | ✓ | | | | | ✓ | |
| Light duty anchor | HLV |  | ✓ | | ✓ | | | | | ✓ | |
| | HK |  | ✓ | ✓ | | | | | ✓ | ✓ | |
| | HFB |  | ✓ | | | | ✓ | | ✓ | ✓ | |
| | DBZ |  | | | | | ✓ | | ✓ | ✓ | |
| | HCA |  | | | ✓ | | | | ✓ | ✓ | |
| | HA8 NG |  | | | | | | ✓ | | ✓ | |
| | HLC |  | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| | HAM |  | | ✓ | ✓ | | | | | ✓ | |
| | HT |  | | | | ✓ | | | | ✓ | |
| Insulation fastener | HTH |  | | | | | ✓ | | | ✓ | |
| | HTR-P/M |  | | | | | ✓ | | | ✓ | |
| | IDP |  | | | | | ✓ | | | ✓ | |
| | IZ 8 |  | | | | | ✓ | | | ✓ | |
| Others | HAP 2.5 |  | Hoist Anchor Plate | | | | | | ✓ | ✓ | ✓ |
| | HAP 1.15 |  | Hoist Anchor Plate | | | | | | ✓ | ✓ | ✓ |

# 1.2 Steel-to-concrete connections (cast-in systems)

Anchor channel and single point cast-in systems are a cost-effective cast-in anchoring to concrete technology. These technologies provide solutions for job site tolerances and on-site adjustability when connecting structural and non-structural elements. Anchor channel systems consist of a group of anchors connected to a channel profile (anchor channel) and a proprietary matching head channel bolt (T-bolt). The anchor channel is installed prior to casting of the concrete.

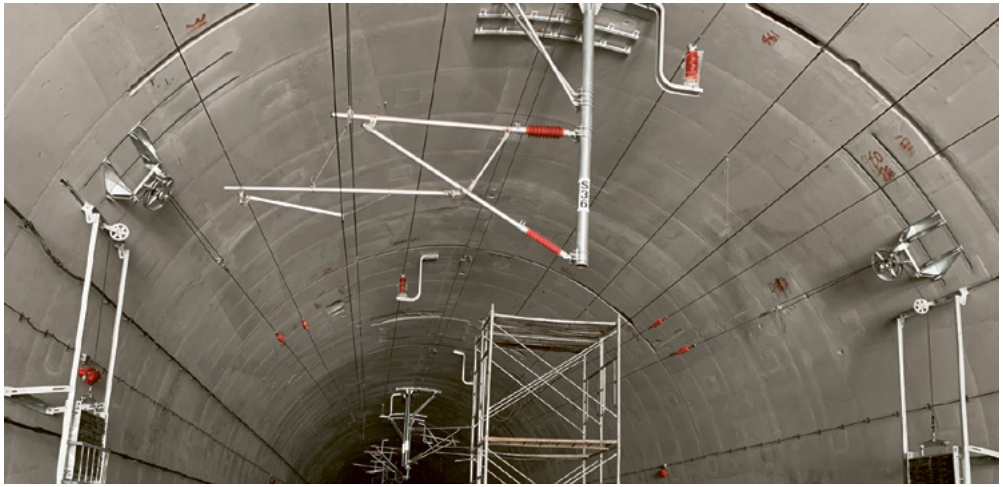
Single point fastenings consist of a steel element installed in the desired position of a concrete member before casting the concrete. While they require a high level or pre-planning to ensure the right positioning, they ensure reliable load transfer with minor sensitivity to onsite installation conditions.

## 1.2.1 Typical applications

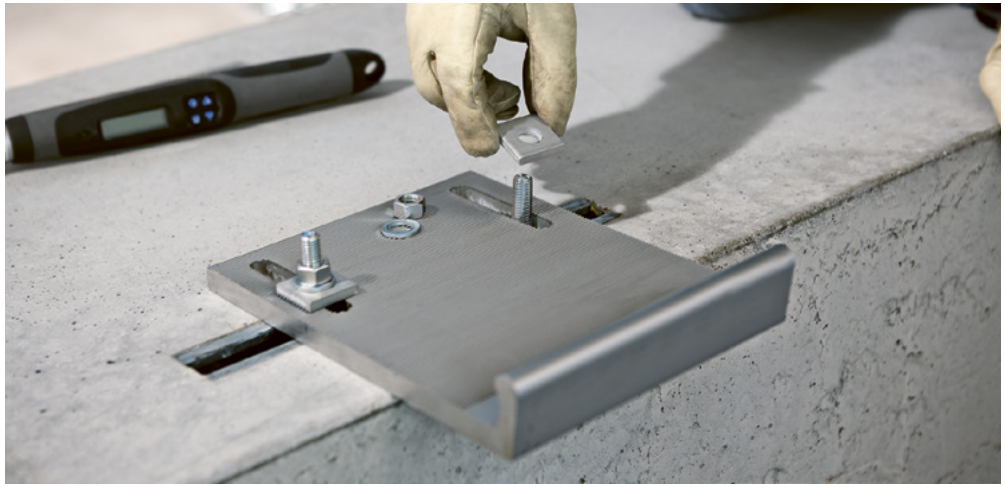
**Steel-to-concrete connections (cast-in-systems)**



Elevator



Tunnel



Façade

## 1.2.2 Handbooks, articles and design software

**Steel-to-concrete connections (cast-in-systems)**

## Main information




**Anchor channel fastening**
This document explains the design of anchor channel fastening systems for static, fatigue, and fire loads in accordance with European guidelines. It also presents design examples using Hilti's core products.

View online

## Supporting information



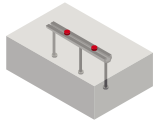

**Field fixes**
This document provides technical guidance on field fixes for installation errors involving HAC, HAC-T, and HAC-C(-P) cast-in anchor channels used with HBC channel bolts. It illustrates the correct installation procedures and offers recommendations and corrective measures to be applied on-site in cases of improper installation.

View online

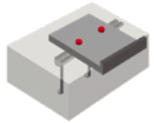
## Design software

**PROFIS Engineering**
The design software solution for cast-in anchor channel connections enables structural calculations and supports efficient detailing for various concrete applications. A specific module for fixing of façade elements to concrete is also available.

View online



**Anchor channel**

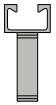
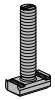
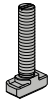
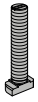


**Façade**

# 1.2.3 Product technical data sheet selector

View detailed PDS selector

**Steel-to-concrete connections (cast-in-systems)**

| | | | Channel type | | | | | | | Fastener type | | | | | Base material | | | Design app |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | Link to product technical data sheet (PDS) | Product picture | Round anchor | I-anchor | Smooth channel lip | Serrated channel lip | Cold formed | Hot rolled | TCRS | Serrated bolt | Notched bolt | Smooth bolt | Internal thread | | Cracked concrete | Uncracked concrete | Steel | PROFIS Engineering |
| Anchor channels | HAC-C-T serrated |  | ✓ | | | ✓ | | ✓ | | ✓ | | | | | ✓ | ✓ | | ✓ |
| | HAC-C cold formed |  | ✓ | | ✓ | | ✓ | | | | | ✓ | | | ✓ | ✓ | | ✓ |
| | HAC-C hot rolled |  | ✓ | ✓ | ✓ | | | ✓ | | | ✓ | ✓ | | | ✓ | ✓ | | ✓ |
| | HAC-C-P hot rolled |  | ✓ | ✓ | ✓ | | | ✓ | | | ✓ | ✓ | | | ✓ | ✓ | | ✓ |
| | HAC-V |  | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | | ✓ |
| | HAC-V with MQM Wing nut |  | ✓ | | | ✓ | | | | | | | ✓ | | ✓ | ✓ | | ✓ |
| Weldable channels | HMC |  | | | ✓ | ✓ | | ✓ | | ✓ | | ✓ | | | | | ✓ | |
| Special elements | HCX(-R) |  | ✓ | | | | | | | | | | ✓ | | ✓ | ✓ | | |
| | HLB |  | ✓ | | | | | | | | | | | ✓ | ✓ | ✓ | | |

# 1.3. Steel-to-masonry connections (post installed anchors)

The connection between non-structural (railings, facades, mechanical supports, fencing etc.) steel sections to existing masonry units built at a previous point in time is called steel-to-masonry (S2M) post-installed connections. These connections are typically used for retrofitting existing structures and light fixtures for architectural or secondary applications. S2M connections provide essential support in both new or retrofitting applications allowing flexibility, strength and durability.

## 1.3.1 Typical applications

**Steel-to-masonry connections (post-installed anchors)**



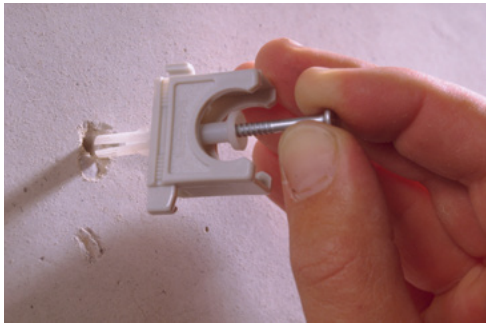
Window grilles



Handrail



Console



Electric

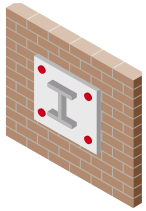
## 1.3.2 Design software

**Steel-to-masonry connections (post-installed anchors)**

### Design software

**PROFIS Engineering**
The design software solution for post-installed anchor-to-masonry connections enables structural calculations and supports efficient detailing for various masonry base materials.

View online



**Anchoring to masonry**

# 1.3.3 Product technical data sheet selector

**Steel-to-masonry connections (post-installed anchors)**

View detailed PDS selector

| | | | Fastener Type | | | Base Material | | Setting | | Design App |
|---|---|---|---|---|---|---|---|---|---|---|
| | Link to product technical data sheet (PDS) | Product picture | Threaded rod HAS (U) | Internal threaded sleeve HIS-N HIT-IC | Rebar | Solid brick masonry | Hollow brick masonry | Fast cure @ 20 °C | Slow cure @ 20 °C | PROFIS Engineering |
| Injection system | HIT-HY 270 | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| | HIT-HY 170 | | ✓ | ✓ | | ✓ | ✓ | ✓ | | |
| | HIT-MM Plus | | ✓ | ✓ | | ✓ | ✓ | ✓ | | |

| | | | Fastener Type | | | | | | Base Material | | | Design App |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Link to product technical data sheet (PDS) | Product picture | Externally threaded | Internally threaded | Hex head | Countersunk | Flat head | Close / open eye bolt | Solid brick masonry | Hollow brick masonry | Drywall | PROFIS Engineering |
| Screw anchor | HUS4 | | ✓ | | ✓ | ✓ | | | ✓ | | | ✓ |
| | HUS4-R | | | | ✓ | ✓ | | | ✓ | | | ✓ |
| | HUS3 | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | | ✓ |
| | HUS(-S) 6 | | | | | | ✓ | | ✓ | | | |
| Plastic anchor | HRD red | | | | ✓ | ✓ | ✓ | | ✓ | ✓ | | |
| | HPS-1 | | | | | | ✓ | | ✓ | ✓ | | |
| | HUD-1 | | | | | | | | ✓ | ✓ | ✓ | |
| | HUD-2 | | | ✓ | | | | | ✓ | ✓ | ✓ | |
| | HUD-L | | | ✓ | | | | | ✓ | ✓ | ✓ | |
| | HLD | | | ✓ | | | | | | | ✓ | |
| | HAM | | | ✓ | ✓ | | | | ✓ | | | |
| | HT | | | | | ✓ | | | ✓ | ✓ | | |
| | HHD-S | | | ✓ | | | | | | | ✓ | |
| | HSP, HFP | | | ✓ | | | | | | | ✓ | |
| | HTB 3 | | | ✓ | | | | | | | ✓ | |
| Insulation fastener | HTH | | | | | | ✓ | | ✓ | ✓ | | |
| | HTR-P/M | | | | | | ✓ | | ✓ | ✓ | | |
| | IDP | | | | | | ✓ | | ✓ | ✓ | | |
| | IZ 8 | | | | | | ✓ | | ✓ | ✓ | | |
| Others | Heli-Brick | | Masonry connector / strengthening | | | | | | ✓ | | | |

# 1.4 Concrete-to-concrete connections and strengthening (post-installed anchors)

The need to connect concrete members cast at different times – or to strengthen existing structural members – is becoming increasingly important and relevant. This growing demand arises from factors such as aging buildings, hazard-related risks, updated codes, sustainability goals, functional repurposing, and construction efficiency. Post-installed rebars (PIR) and shear connectors installed into hardened concrete are well-established solutions that enable faster, safer, more economical, and more reliable connections between existing and new concrete elements (C2C connections). C2C connections can be used for member extensions, end anchorages, and shear strengthening using concrete overlays.

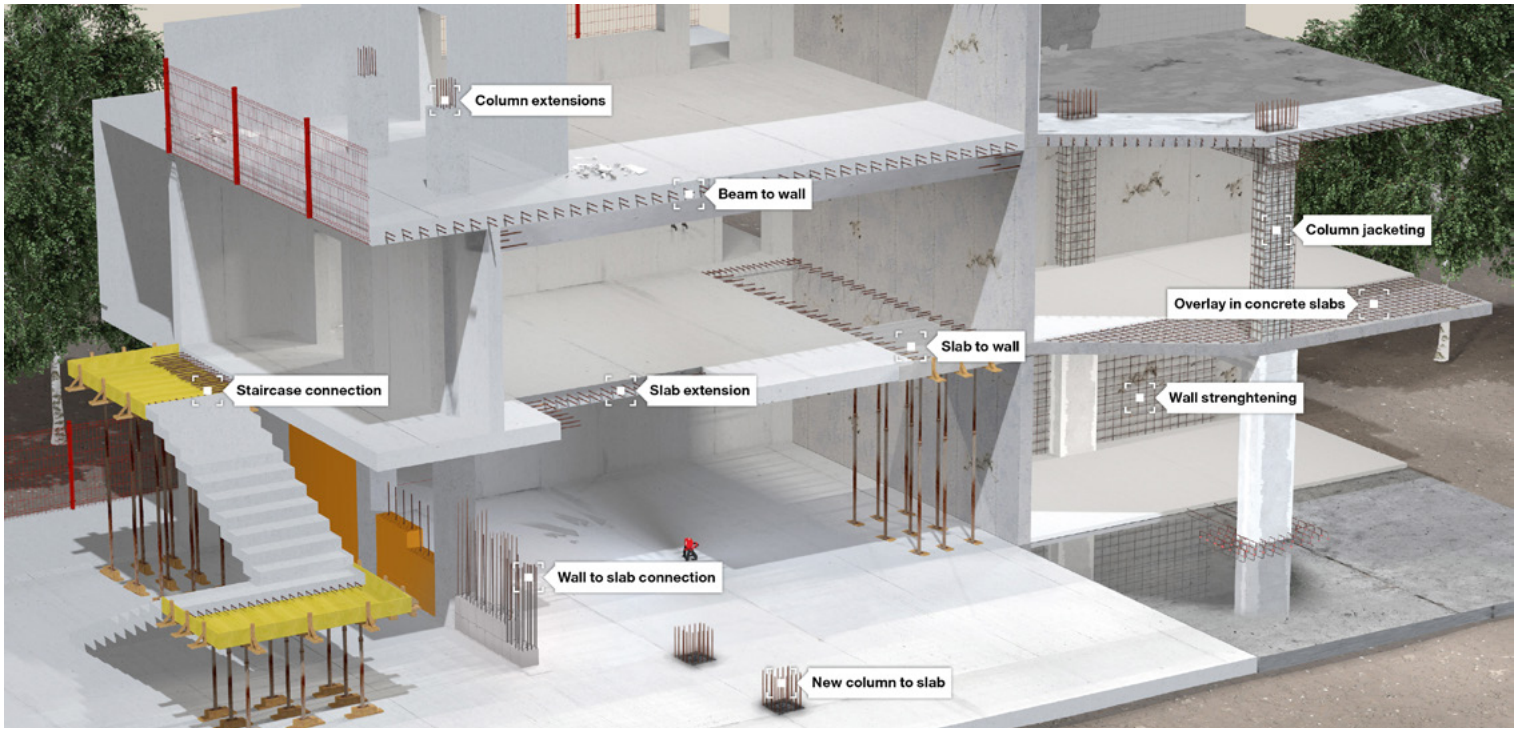



Illustration of typical applications in a building under construction

## 1.4.1 Typical applications and jobsite references

**Concrete-to-concrete connections and strengthening (post-installed anchors)**



Stair-to-wall connection



Slab-to-wall connection



Column-to-slab connection



Beam-to-column connection



Increasing RC beam depth



Strengthening of industrial floor



Increasing bridge girder thickness



Increasing bridge deck slab thickness

## Jobsite reference



At Hilti, we support some of the most inspiring construction projects around the world. By providing post-installed rebar connection solutions, we help engineers and contractors overcome real challenges on site.

View online

## 1.4.2 Handbooks, articles and design software

**Concrete-to-concrete connections and strengthening (post-installed anchors)**

## Main information




**Concrete-to-concrete connections**
The handbook is a one-stop reference guide for post-installed rebar applications, including shear-connectors. It explains the state-of-the-art design methods & qualifications based on the European framework for static, seismic, fire, and fatigue loads. It also includes several design calculation examples.

View online




**Strengthening concrete members for punching shear**
This document introduces techniques to strengthen reinforced concrete members deficient in punching shear resistance, featuring Hilti's new post-installed HIT-Punching Shear Strengthening solution. It presents the qualification criteria and introduces the design method and reinforcement detailing of the new Hilti solution to EN 1992-1-1:2004 and the German National Annex with a worked design example for slabs and foundations.

View online




**Strengthening concrete members in shear**
This document introduces techniques to strengthen reinforced concrete members deficient in shear resistance, featuring Hilti's new post-installed HIT-Shear Strengthening solution. It presents the qualification criteria and introduces the design method and reinforcement detailing of the new Hilti solution to EN 1992-1-1:2004 and the German National Annex with a worked design example for a beam.

View online

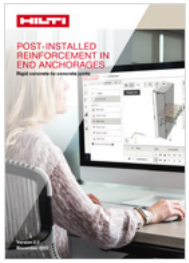
## Supporting information




**Shear friction applications and concrete overlays**
This document details advanced design and construction practices for post-installed concrete overlays. Utilizing the EOTA TR 066 design framework, it enables optimized thin overlay configurations. The Hilti method can be applied where bent-end rebars embedded in the cast-in substrate function as shear connectors.

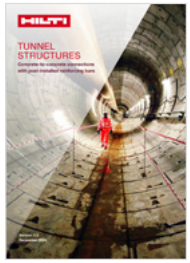
View online

## Supporting information




**Post-installed reinforcement in end anchorages**
EOTA TR 069 provides a design method based on improved bond-splitting behavior for end anchorages in structural members experiencing moment actions, using post-installed rebars without the need for establishing lap splices with existing reinforcement.

View online




**Tunnel structures**
This document explores how post-installed rebars can be designed to form monolithic connections between new concrete elements and existing tunnel linings across a wide range of applications. It also addresses key considerations such as fatigue, fire resistance, seismic loading, corrosion, and service life.

View online



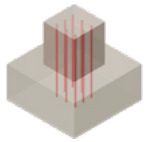

**Fire design in post-installed rebar applications**
Fire design in post-installed rebar applications is important since the behaviour of injection mortars is different from steel cast-in concrete at elevated temperatures.
This whitepaper covers state-of-the-art fire design methods for both lap splices and end anchorages.

View online

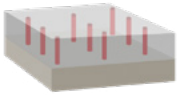
# Design software

**PROFIS Engineering**
The design software solution for post-installed rebar connections, shear friction applications and concrete overlays enables precise, code-compliant structural calculations and supports efficient detailing for complex reinforcement scenarios. Additional modules addressing strengthening solutions for shear and punching-shear are available.

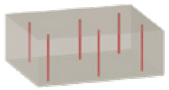
View online



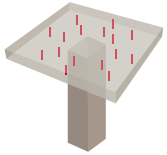
**Post-installed rebar**



**Concrete overlay**



**Shear strengthening**

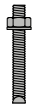
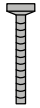


**Punching shear strengthening**

# 1.4.3 Product technical data sheet selector

View detailed PDS selector

## Concrete-to-concrete connections and strengthening (post-installed anchors)

| | | | Fastener type | | | Base material | | Setting | | Design app |
|---|---|---|---|---|---|---|---|---|---|---|
| | | |  |  |  |  |  |  |  |  |
| | Link to product technical data sheet (PDS) | Product picture | Threaded rod HAS (U) | Rebar | Concrete connector HCC-K HCC-B HCC-U | Cracked concrete | Uncracked concrete | Fast cure @ 20 °C | Slow cure @ 20 °C | PROFIS Engineering |
| Injection system | HIT-HY 200-R V3 |  | | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| | HIT-HY 200-A V3 |  | | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| | HIT-RE 500 V4 |  | | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| | HIT-RE 500 V3 |  | | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| | HIT-FP 700 R |  | | ✓ | | ✓ | ✓ | | ✓ | ✓ |
| | HIT-CT 100 |  | | ✓ | | ✓ | ✓ | ✓ | | ✓ |
| | HIT-HY 170 |  | | ✓ | | ✓ | ✓ | ✓ | | |
| | HIT-RE 100-HC |  | | ✓ | | ✓ | ✓ | | ✓ | |
| | HIT-RE 100 |  | | ✓ | | ✓ | ✓ | | ✓ | |
| | HIT-RE 10 |  | | ✓ | | ✓ | ✓ | | ✓ | |
| Shear connector | HCC-K |  | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | HCC-U |  | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | HCC-B |  | | | ✓ | ✓ | ✓ | | ✓ | ✓ |
| | HUS4 connector |  | | | ✓ | ✓ | ✓ | | | ✓ |
| Strengthening | Shear strengthening |  | ✓ | | | ✓ | | | ✓ | ✓ |
| | Punching shear strengthening |  | ✓ | | | ✓ | | | ✓ | ✓ |

# 1.5 Timber connections and reinforcement

Timber is increasingly adopted in modern construction due to its renewability, material efficiency and favorable structural performance. Engineered timber products such as glued laminated timber (GLT), cross-laminated timber (CLT), and laminated veneer lumber (LVL) enable the development of high-performance building system in both residential and commercial applications.

Depending on the structural system, various types of connections can be implemented, including timber-to-timber, timber-to-steel and timber-to-concrete connections. Additionally, reinforcement of timber elements can be carried out in existing buildings to enhance structural capacity and extend service life.

## 1.5.1 Typical applications

**Timber connections and reinforcement**



Industrial Timber Frames



Cross Laminated Timber Panels



Timber Portal Frames

## 1.5.2 Handbooks, articles and design software

**Timber connections**

## Supporting information




**Timber-to-concrete handbook**
The objective of this handbook is to provide guidance for selecting and designing post-installed anchors for timber-to-concrete fastening with steel elements applications complete with design examples and detailed calculations.

View online




**Hilti Coupler Wood (HCW)**
This whitepaper focuses on the connection between timber elements and the concrete member, explains challenges in design and provides guidance on how to design the connection detail. A new design approach was developed and verified by testing which is described in the whitepaper.

View online




**HTC-P2P: Hilti CLT panel-to-panel connector**
This technical guide shares the features of the product, installation parameters with the intended use of the application. You will find detailed explanations of the design method for static, seismic and fire-loading conditions with a design example under these three loading conditions.

View online



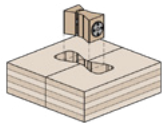

**Hilti Glued-in Rod (GiR)**
This technical guide presents Hilti glued-in rod solution and explains the applications in connection and reinforcement systems. The guide also highlights the advanced GiR software module, relevant design methods and verification approaches with different worked-out design examples.

View online

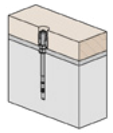
# Design software

**PROFIS Engineering**
The design software solution for timber connections and reinforcement enables structural calculations and support efficient detailing for various timber applications, a specific module for timber applications is available.

View online

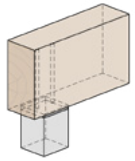


**CLT-panels with HTC-P2P**

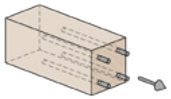


**HCW**

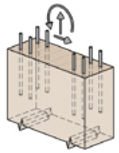
## With Hilti GiR and Hilti HIT-RE 500



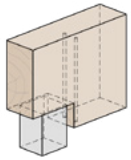
**Transverse compression reinforcement**



**Tension connection**



**Moment loaded connection**



**Notched beam reinforcement**

# 1.5.3 Product technical data sheet selector

View detailed PDS selector

## Timber connections

| | Link to PDS (product technical data sheet) | Product picture | Dimensions | Product usage | Base material: CLT (Cross Laminated Timber) | Base material: GLT (Glued Laminated Timber) | Base material: LVL (Laminated Veneer Lumber) | Base material: Concrete | Base material: Steel | Design app: PROFIS Engineering | Approval: European Technical Assessment (ETA) | Load type: Static / quasi-static | Load type: Seismic | Load type: Fire Resistance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLT panel with HTC-P2P | HTC-P2P |  | HTC-P2P 60<br>HTC-P2P 90 | **Connect**<br>Panel elements<br>Wall elements | ✓ | | | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Hilti HCW | HCW |  | HCW | **Connect**<br>Timber wall to podium<br>Timber wall to timber floor<br>Timber floor to timber wall<br>Timber roof to timber wall | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | |
| | |  | HCW-S | | | | | | | | | | | |
| | |  | HCW-UP | | | | | | | | | | | |
| | |  | HCW-L | | | | | | | | | | | |
| | |  | HST4 M12 | | | | | | | | | | | |
| | |  | HST2 V3 M12 | | | | | | | | | | | |
| | |  | HAS M12 | | | | | | | | | | | |
| | |  | HSW M12 | | | | | | | | | | | |
| Hilti GiR (Glued in Rod) with HIT-RE 500 | GiR |  | Hilti HIT-RE 500 V4 | **Connections for**<br>Tension loads<br>Bending moments<br><br>**Reinforcement for**<br>Lateral compression<br>Notched beam | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| | |  | HAS-U/HIT-V/AM | | | | | | | | | | | |
| | |  | HIT-DS | | | | | | | | | | | |
| | |  | HIT-CR-M | | | | | | | | | | | |

# 2. Engineering support for fastening

## 2.1 Design software tools

**PROFIS Engineering Suite** is a one-stop tool for designing structural connections to leverage efficiency and productivity. It consists of several module, e.g., concrete-to-concrete, steel-to-concrete, steel-to-masonry. It uses state-of-the-art and code compliant design methods in an illustrated 3D and 2D user interface environment.

View online

## 2.2 Anchors @ Hilti Online




**The Engineering Center** is Hilti's global digital hub for engineers, combining trusted technical guidance, design tools and practical resources to support informed design and specification decisions.
Engineers can explore application-based content across structural connections, fire protection, and support systems. The platform provides access to technical articles, design data, CAD/BIM details, and product documentation, along with on-demand learning such as webinars, how-to guides, and e-learning modules. The Engineering Center also offers direct access to engineering expertise, enabling engineers to ask questions and receive reliable, experience-based guidance when needed.
Available 24/7, the Engineering Center is designed to help engineers design with confidence, make informed decisions, and move efficiently from concept to specification.

View online

## 2.3 BIM / CAD library

**The BIM / CAD Library** is Hilti's digital content platform providing BIM and CAD objects for Hilti products to support efficient planning and detailing workflows. It offers high quality, parameterized objects for direct insertion into common design tools such as AutoCAD, Revit, or MicroStation, and allows downloads in multiple file formats, including .stp, .dwg, and .ifc. The library provides standardized, up to date objects with accurate technical data and geometry to enable consistent and compliant digital planning.

View online

# 2.4 E-learnings for engineers on Hilti Academy



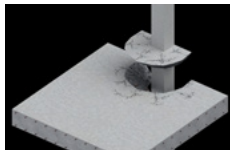
**Steel-to-concrete connection**
Dive into the fundamentals of engineering with our focused e-learnings on steel-to-concrete connections. Learn the essential techniques, from anchor design to load transfer principles, ensuring durable and safe structures. Whether you're a beginner or looking to refine your expertise, the course modules on Hilti Academy equip you with the right knowledge. Ready to build stronger connections?

View online



**Concrete-to-concrete connection**
Discover the essentials of concrete-to-concrete connections, from joint design to load transfer techniques. The specific  e-learning modules equip you with the tools to create seamless, durable structures with confidence.

View online



**Post-installed punching shear reinforcement**
Dicover the essentials of strengthening concrete members deficient in punching shear. This e-learning module equips you with the tools to understand the Hilti HIT-Punching Shear strengthening system and apply it using Profis Engineering's Punching Shear Strengthening module to strengthen concrete members in punching shear.

View online



**Strengthening concrete members in shear**
Discover the essentials of strengthening concrete members deficient in shear. This e-learning module equips you with the tools to understand the Hilti HIT-Shear strengthening system and apply it using Profis Engineering's Shear Strengthening module to strengthen concrete members in shear.

View online

# 2.5 Handbooks and articles

## Main information




**Corrosion handbook**
This handbook helps in raising your general awareness of everything about corrosion. It provides you with essential information on causes and types of corrosion, its behavior and assessment procedures as well as the materials used to protect metallic products.

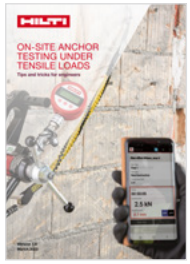
View online

## Supporting information




**Possibilities and limitations of on-site anchor testing**
This expert article for engineers discusses and explains why and under which conditions on-site testing of anchors can be useful, and the advantages of using Hilti's on-site testing service with some jobsite case studies.

View online




**On-site anchor testing under tensile loads**
This article for engineers and project managers list tips and tricks to support execution and assessment of on-site anchor testing.

View online

# 3. Code landscape

## 3.1. Qualification and design

### European framework

**European standards and regulatory frameworks guide testing, assessment, and design of post-installed systems. The Construction Products Regulation (CPR) lays down harmonized rules for the marketing of construction products (taken from the EU webpage) in Europe. Below are definitions to clarify terminology that may be used throughout this document:**

**European Committee for Standardization (CEN)**
CEN, recognized by the European Union as a European Standardization Organization, brings together knowledge and expertise from its members, business and industry, and from other stakeholders, to develop European Standards. CEN provides a platform for the development of European Standards and other technical documents in relation to various kinds of products, materials, services and processes. These standards help to protect the environment, as well as the health and safety of consumers and workers.

**Eurocodes**
Eurocodes (EC or EN) are harmonized technical rules specifying how structural design should be conducted within the European Union. These codes are developed by the European Committee for Standardization upon the request of the European Commission.

**European Organization for Technical Assessment (EOTA)**
EOTA was established by Regulation (EU) No 305/2011 and comprises all Technical Assessment Bodies (TABs) designated by member states of the European Union and the European Economic Area. EOTA coordinates the application of the procedures set for requests for European Technical Assessment (ETA) and for the procedures for adopting a European Assessment Document (EAD). EOTA also informs the European Commission and the Standing Committee on Construction of any issues related to the preparation of EADs and suggests improvements to the European Commission based on its experience.

**European Assessment Document (EAD)**
A European Assessment Document (EAD) is a harmonized technical specification developed by EOTA as the basis for European Technical Assessments (ETAs). The development of new, or the amendment of existing, EADs is usually triggered by an ETA request from a manufacturer.

**European Technical Assessment (ETA)**
The European Technical Assessment (ETA), also referred to as an “Approval” provides an independent Europe-wide procedure for assessing the essential performance characteristics of a construction product. It provides the documented assessment of the performance of a construction product, in relation to its essential characteristic, in accordance with the respective EAD.

**CE-marking**
The manufacturer is required to affix CE marking to construction products covered by an ETA as a recognizable indication of compliance with a Europe-wide technical specification (which, in the case of product qualification via an ETA, is the underlying EAD). CE stands for “Conformité Européenne.” The complete CE mark includes not only the letters “CE” in a predefined format but also references to relevant supporting content.

**Certificate of Constancy of Performance (CoCP)**
For construction products covered by a European Technical Assessment (ETA), it is required to continuously assess and verify the constancy of performance (AVCP) as defined in the ETA. To ensure this, the manufacturer must implement and maintain a quality assurance program at the manufacturing plant, known as Factory Production Control (FPC).

Due to its critical safety relevance—particularly for anchor products—it is required to appoint a surveillance agency, independent of the supplier, to verify the proper execution of the FPC through audits at the manufacturing facility. This surveillance agency is referred to as the Notified Body (NB), whose competence for the relevant European Assessment Document (EAD) must be confirmed in advance by notification through the appropriate building authority.

The Notified Body issues the Certificate of Constancy of Performance, referencing the ETA, as independent confirmation that constancy of performance is ensured through the successful implementation and maintenance of the FPC.

**Declaration of Performance (DoP)**
This document is prepared by the manufacturer for a construction product being placed on the market, which is either subject to a European Technical Assessment (ETA) or covered by a harmonized standard. It contains a statement about the product's performance in relation to its essential characteristics, in accordance with the relevant EAD or harmonized technical specification.

Each DoP has a unique identification code, which is referenced in the CE marking affixed to the product. The DoP serves as the manufacturer's binding confirmation that the delivered product complies with the performance as assessed in the corresponding ETA according to the relevant EAD.

**Technical Reports (TR)**
EOTA Technical Reports are developed as supporting documents to EADs. They contain detailed aspects relevant to construction products—such as design, execution, and evaluation of tests—and reflect the shared understanding of existing knowledge and experience among the Technical Assessment Bodies in EOTA at a given point in time.

**National Approvals**
Most technical data for the products and solutions listed in this document have been assessed by TABs according to EOTAs EADs. However, in some case national approvals are also referenced, as they address state-of-the-art assessment of product characteristics, which are not covered by EADs. Such approvals find a wide acceptance at international level. Examples are fatigue assessment of post-installed rebar system (DIBt) and shock approvals for post-installed anchors (Swiss Federal Civil Protection BZS).

Refer to each Product Technical Data Sheet (PDS) for more details.

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