BRIDGE RENOVATION APPLICATIONS

Hilti Northern Europe

Part 1:
Concrete strengthening

HILTI OFFERS END-TO-END APPLICATION SOLUTIONS INCLUDING HARDWARE, SOFTWARE & SERVICES

Engineering

Hardware

Measuring | **Drilling & Demolition** | **Cutting & Grinding** | **Fastening & Installation** | **Firestop, Foams**

Services

BIM Solutions

Technical support

Detection

Leveling & alignment

Hammer drills & breakers

Diamond drilling & sawing

Saws & grinders

Blades & discs

Direct & Screw Fastening

Anchor & Façade systems

Foams & sealants

Firestop solutions

On-site testing

Tool Services

Software

Software

AGENDA

1. Introduction – why talk about renovation?
2. Bridge concrete strengthening methods and design logic
3. How we can help creating better specifications
4. How we can help creating safer installations

WHY TALK ABOUT RENOVATION, RESTORATION AND REFURBISHMENT WITH CIVIL PROJECTS – E.G. BRIDGES?

"Bridges, culverts, and tunnels are the glue that holds the surface transportation network together."

Increasing rates of functional & moral obsolesce

Share of substandard road bridges:
USA – 7.5%
GB – 4.4%

Extended design life, design redundancy and repair strategies

Environmental and social responsibility:
40% of the GB's CO2 emissions – from new build projects
60% of the GB's waste – from demolition works

RIBA – THE 8 SUSTAINABLE OUTCOMES - 2030

Whole Life Net Carbon:

- "Prioritise Retrofit / Refurbishment of existing structures"
- "Prioritise fabric first principles for form and envelope"

Net Zero Embodied Carbon:

- Prioritise building re-use
- Carry out a Whole Life Carbon Analysis (LCA) of building elements
- Prioritise Low Embodied Carbon materials
- Target Zero-construction waste diverted to Landfill
- Consider Modular off site construction systems and Circularity

DO HILTI SOLUTIONS ADDRESS TODAY'S NEEDS WITH THE BRIDGE RENOVATION PROJECTS?

Efficient design	PROFIS Engineering Software (Concrete to concrete modules) – easy & reliable calculation interface, design optimization functionality
Prioritise fabric first principles for form and envelope	Strengthening existing concrete elements with overlay and post-installed rebar technologies
Optimal and ethical material sourcing. Zero waste target	Design methods and installations technologies allowing optimizations of material and labor
Extended design life	Products built to last – 50 / 100 / 120 years design life approvals for all our chemical mortars for post installed rebar applications
Carry out a Whole Life Carbon Analysis (LCA) of building elements	Material transparency through product documentation We aim to add LCA (life cycle assessment) and EPD (environmental product declaration) data and integrate sustainable calculation in PROFIS Engineering

AGENDA

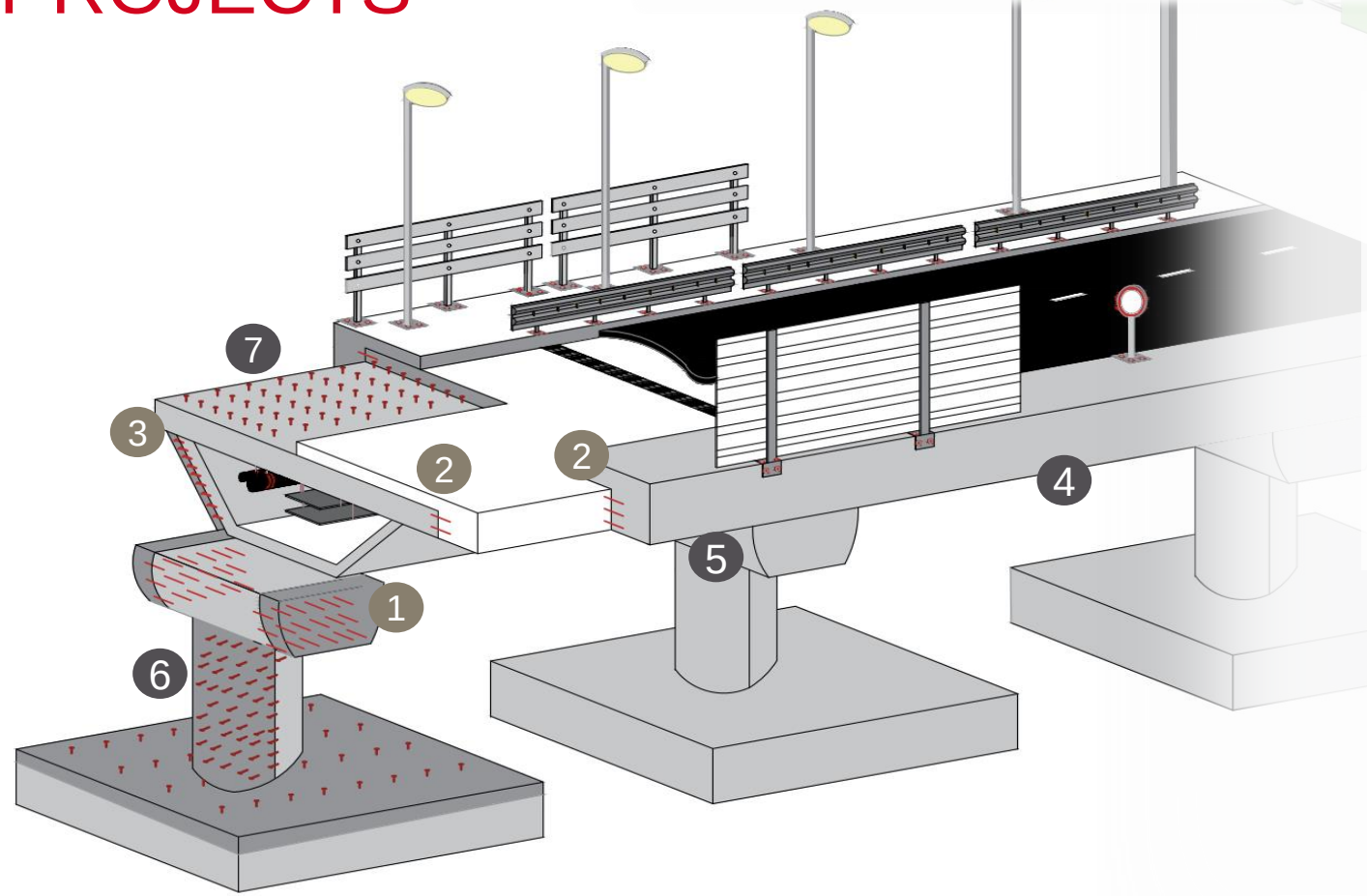
1. Introduction – why talk about renovation?
2. Bridge concrete strengthening methods and design logic
3. How we can help creating better specifications
4. How we can help creating safer installations

CONCRETE STRENGTHENING DESIGN CASES IN BRIDGE RENOVATION PROJECTS

1 Pier Extension

2 Deck extension PIR

3 Wall Extension



4 Shear strengthening

5 Punching Shear

6 Pier Strength.Overlay

7 Deck Strength.Overlay

Concrete Member Connection/Extension

Concrete Thickness and Reinforcement

CONCRETE STRENGTHENING DESIGN CASES IN BRIDGE RENOVATION PROJECTS: COMMON TRAITS

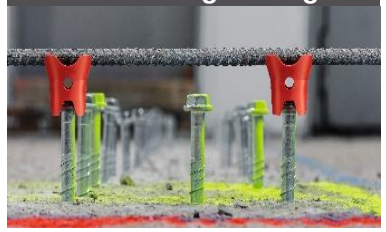
Deck extension

Deck Strengthening

Column connection

Shear Strengthening

Pier Strengthening



Punching Shear Strengthening

- Drill deep
- Drill straight
- Variety of loading cases
- Multiple drilling points
- Efficient installation required
- Avoid hitting rebar (scanning)
- Fire resistant solution

Hilti Portfolio

Hardware

Chemical

RE500 V4 / HY200 A V3

FP700 R / CT100

Mechanical

HCC-B / HUS4-H (+) HCC

Software

V.Calculat | **Detection**

PROFIS

Services

OST | **Design**

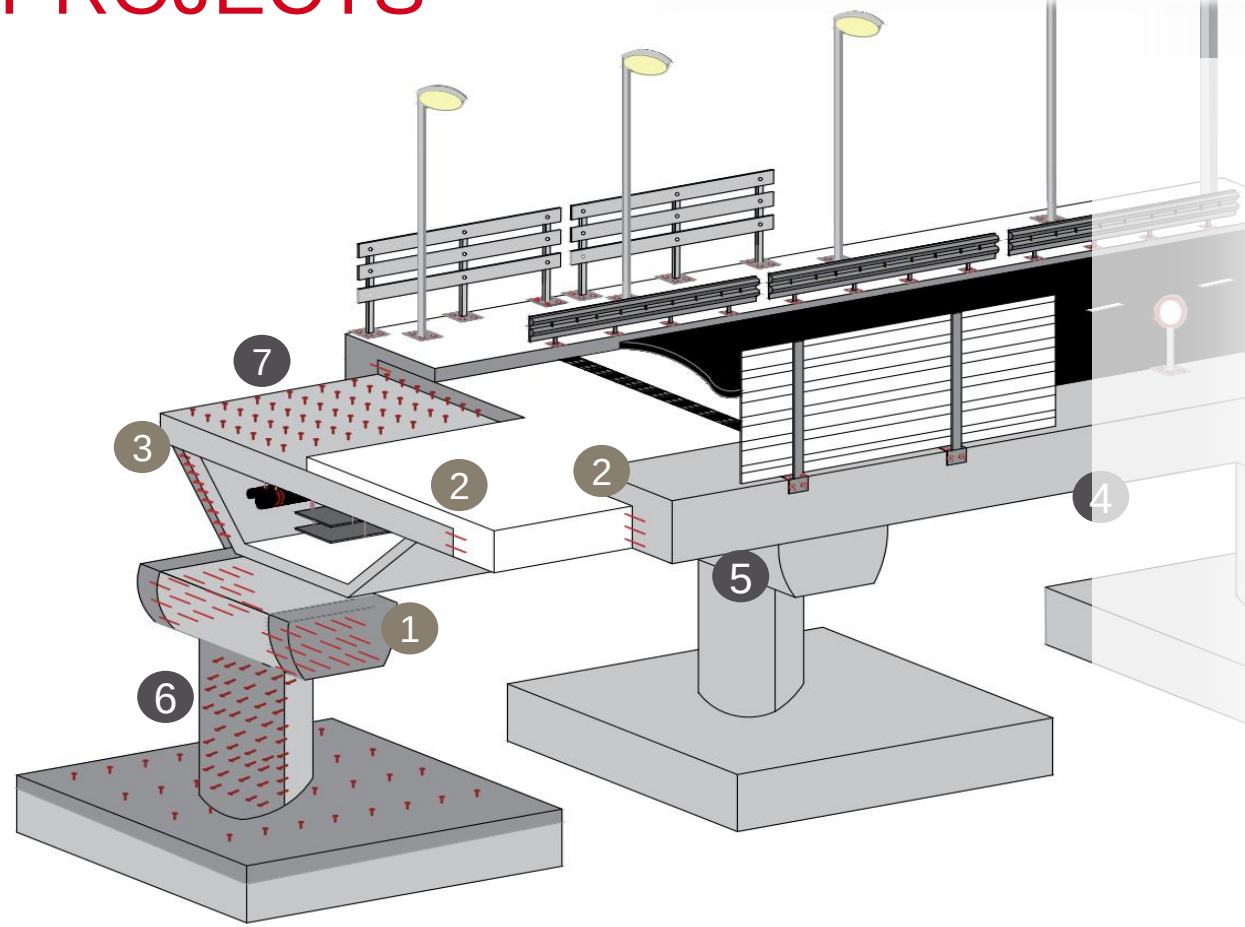
OS Training

CONCRETE STRENGTHENING DESIGN CASES IN BRIDGE RENOVATION PROJECTS

1 Pier Extension

2 Deck extension PIR

3 Wall Extension

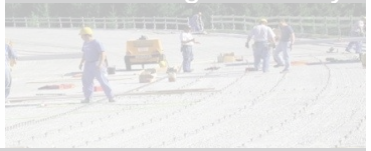


4 Shear strengthening

5 Punching Shear

6 Pier Strength.Overlay

7 Deck Strength.Overlay



Concrete Member Connection/Extension

Concrete Thickness and Reinforcement

CONCRETE MEMBER CONNECTION/EXTENSION: POST-INSTALLED REBAR

What are we referring to when talking about post installed rebar applications:

- Reinforcing bars are often installed in various applications in bridge structures.
- These include anchoring edge caps, widening the roadway, strengthening bridge piers, and increasing the cross-section.
- The connections for subsequent reinforcement can be made either as a **lap joint** or as **end anchoring**.

Pier Extension

Deck extension PIR

Design requirements:

- Static bending & shear under normal conditions and fire under emergency conditions. Requires flexibility in embedment depth for connection in pre-cast concrete tunnel lining or directly in natural stone.
- Design for **wet and water-filled boreholes** due to rough jobsite conditions. **100 - or 120-year service life**, seismic, and fire resistance must be considered.
- Rebar diameters can be any size between 8m-32mm as per mortar approval (please check ETA for more specific details)

Installation requirements:

- Robust solutions for different jobsite conditions. (wet, water-filled, diamond cored…)
- **TCO:** Elimination of the borehole cleaning process provides significant time savings. Precise dosing is needed to reach specified performance and reduce material waste. A “fail-safe system” to reduce errors and increase health and safety. Large volume, repetitive post-installed rebar application that needs a fast installation system.

Tools for installation:

Cordless tools and consumables

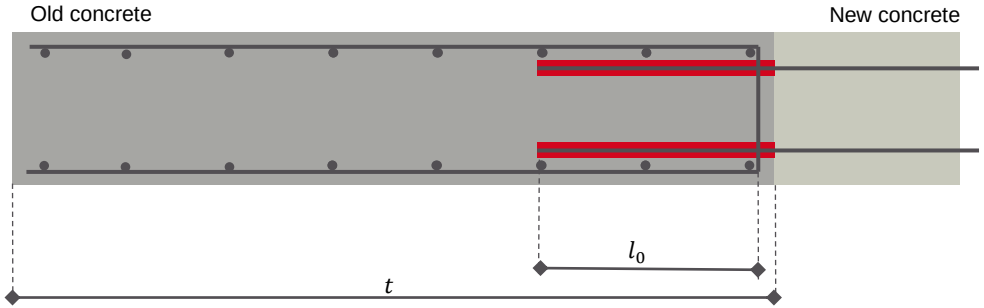
‘Auto-cleaning’ systems

Electric dispenser

EXTENDING EXISTING ELEMENTS WITH LAP SPLICES

Lap splices to existing rebars: this is the ideal solution to transfer tensile loads between reinforced concrete elements cast at different times.

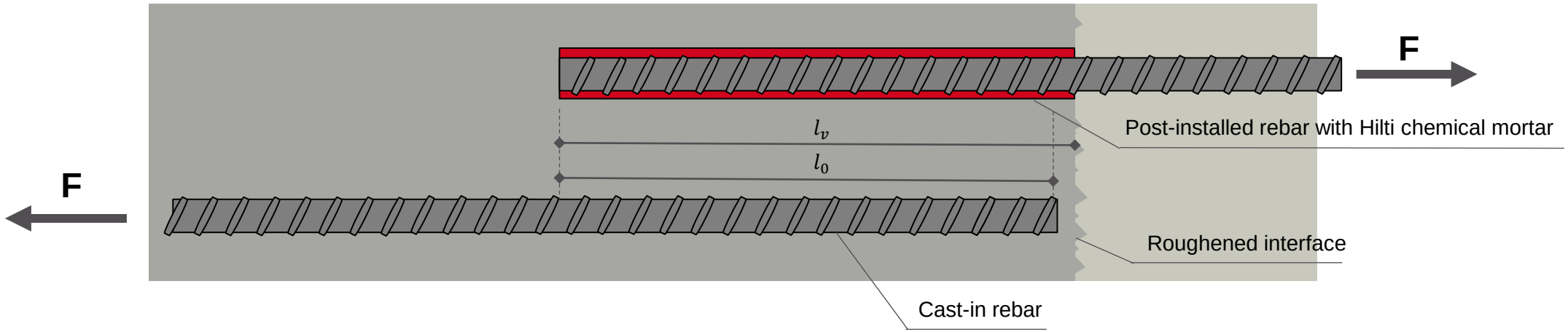
In PROFIS Engineering, **lap splices** are starting point solution for **extensions** of columns, beams, walls & slabs.



1. Cast in rebars in the direction where the lap splice are required.
2. Drilling must be executed in a straight way
3. The required lap length (l_0) must fit inside the existing concrete thickness (t).

When possible, this is the best solution to transfer tensile load to concrete!

EC2-1-1 LAP SPLICE LENGTH CALCULATIONS IN PROFIS ENGINEERING



Drill length (l_v) calculation:

$$l_v = \max(l_{0,CI}, l_{0,PI}) + c$$

Where,

$l_{0,CI}$ lap splice of cast-in bar

$l_{0,PI}$ lap splice of post-installed bar ➡ ?

c concrete cover

General lap splice equation (EN1992-1-1, 8.7.3)

$$l_0 = \alpha_1 \alpha_2\ \alpha_3\ \alpha_5\ \alpha_6\ l_{bd,req} \geq l_{0,min}$$

$$l_{bd,req} = \frac{\emptyset}{4} \frac{\sigma_{sd}}{f_{bd}}$$

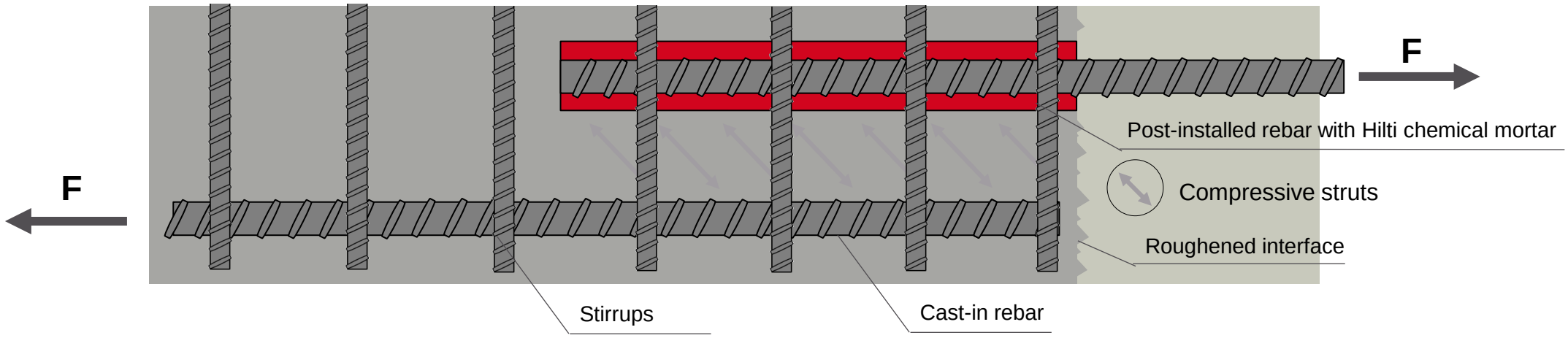
For post-installed rebar, add k_b & α_{lb} :

$$f_{bd,PIR} = k_b f_{bd}$$

$$l_{0,min,PIR} = \alpha_{lb} l_{0,min}$$

(check product ETA)

EC2-1-1 LAP SPLICE LENGTH CALCULATIONS IN PROFIS ENGINEERING



2 Keep in mind, you need sufficient transverse reinforcement to transfer the loads

Important!

In case the rebars are spaced further away than $4 \cdot \emptyset$ or 50mm, the lap length is being increased by a length equal to the clear spacing where it exceeds than $4 \cdot \emptyset$ or 50mm [EN1992-1-1, 8.7.2 (3)].

Important!

There should be an area of transverse reinforcement in the existing concrete which is sufficient to ensure the load transfer per EN1992-1-1, 8.7.4. This is not checked by PROFIS Engineering.

HOW TO DESIGN A LAP SPLICES CONNECTION IN PROFIS

Hilti software design

Design tools:

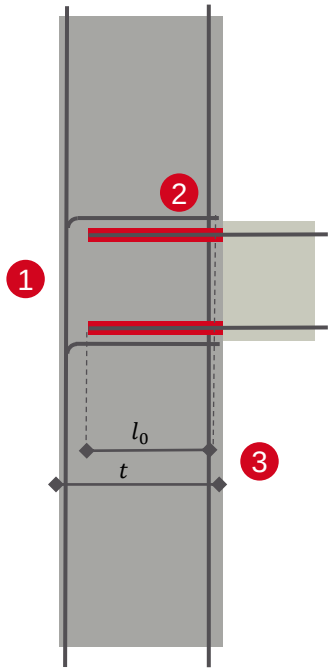
PE
Software

What benefits do you get from using PROFIS Engineering Suite

- Several different applications available
- Code compliant designs
- Wide product portfolio range
- Easy to optimize solution
- Report print option to incorporate to your project deck
- Installation instructions page

SOLUTIONS FOR LAP SPLICES ARE OFTEN NOT POSSIBLE

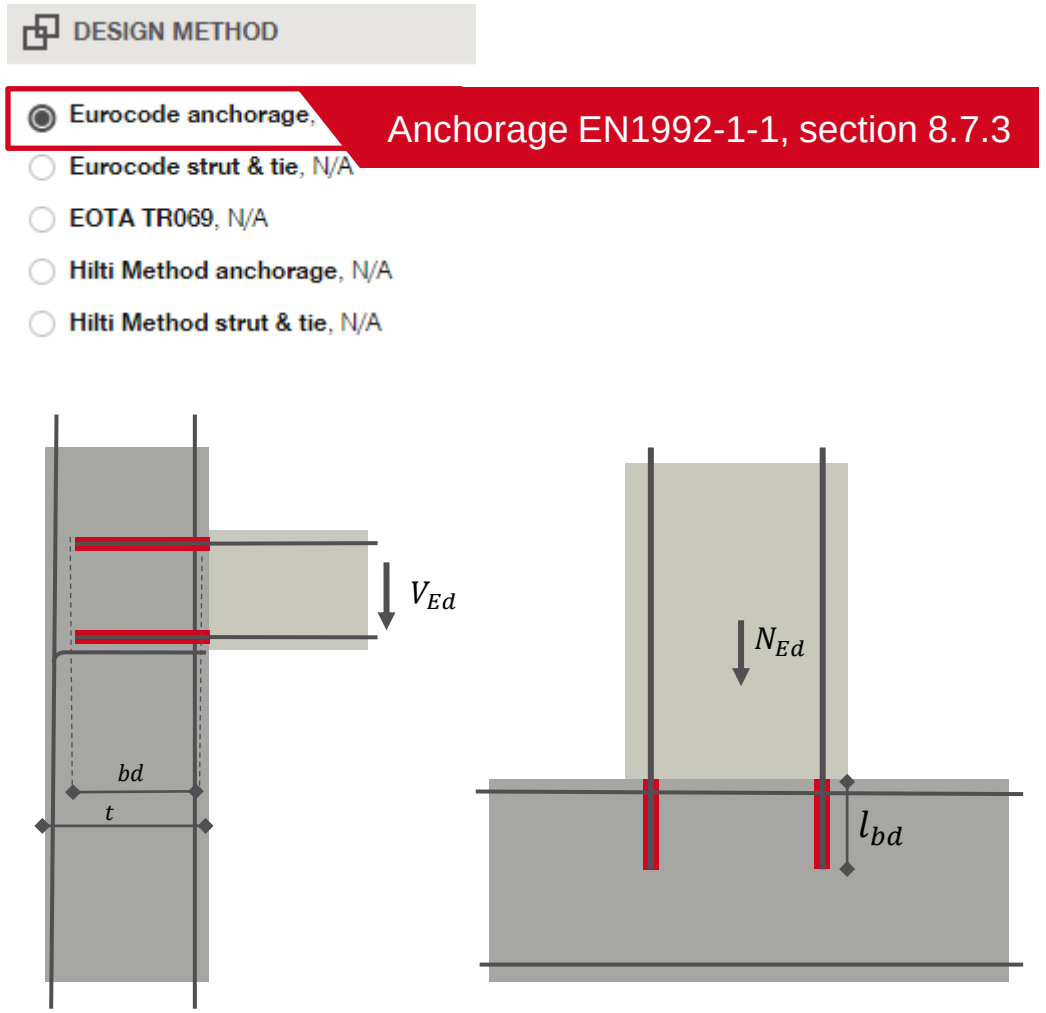
There are cases where it's **not possible** to execute joints with post-installed lap splices, particularly in T-joints.
The main three reasons for this are listed below:



1. Cast in rebars in the direction of the lap splice are required. These rebars often don't exist in the jobsite.
2. Drilling must be executed in a straight way – bent lap splices are not possible for PI
3. Straight lap splices require ~30% higher lap length (l_0), making it difficult to fit inside the existing concrete thickness (t).

PROFIS Engineering provides **multiple practical solutions** to solve these cases: **EOTA TR069** & **EC2 Strut and Tie and Hilti Methods**

SIMPLE SUPPORTS CAN BE SOLVED WITH EC2 ANCHORAGE



Drill length (l_v) calculation: $l_v = l_{bd}$

Where,

l_{bd} anchorage length of post-installed rebar

General anchorage length equation (EN1992-1-1, 8.4.5)

$$l_{bd} = \alpha_1 \alpha_2\ \alpha_3\ \alpha_4\ \alpha_5\ l_{bd,req} \geq l_{0,min}$$

$$l_{bd,req} = \frac{\emptyset}{4} \frac{\sigma_{sd}}{f_{bd}}$$

For post-installed rebar, check product ETA for k_b & α_{lb} :

$$f_{bd,PIR} = k_b f_{bd}$$

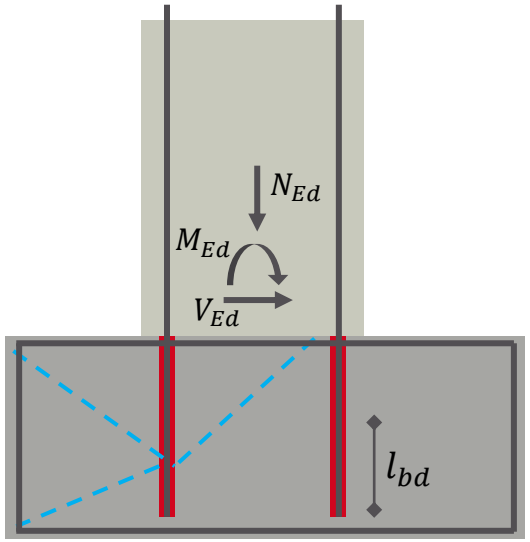
$$l_{0,min,PIR} = \alpha_{lb} l_{0,min}$$

STRUT AND TIES DELIVERS EUROCODE SOLUTIONS FOR SOME CASES OF UNIAXIAL BENDING

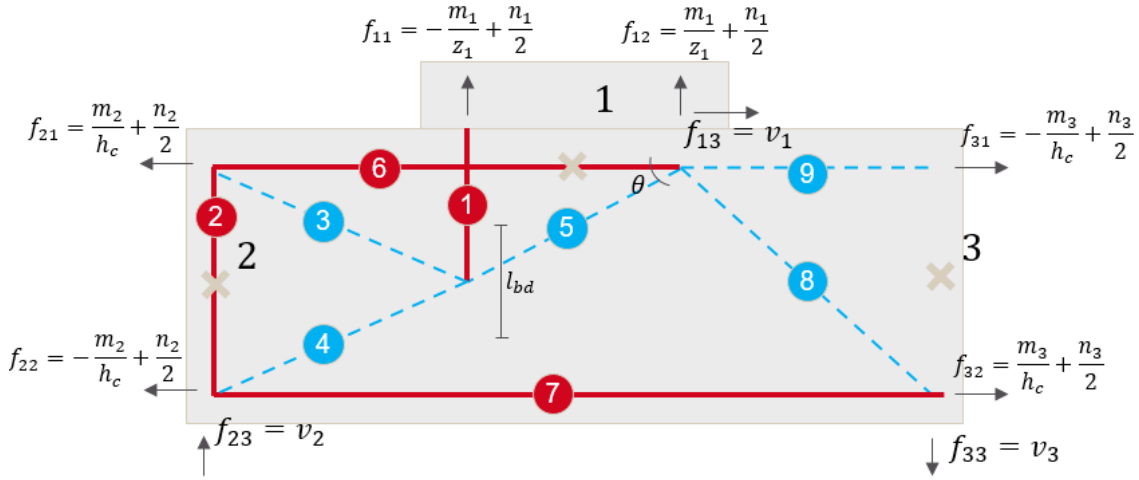
DESIGN METHOD

- (●) Eurocode anchorage, N/A
- ( ) Eurocode strut & tie, N/A — Anchorage EN1992-1-1, section 8.7.3
- ( ) EOTA TR069, N/A
- ( ) Hilti Method anchorage, N/A
- ( ) Hilti Method strut & tie, N/A

✓ **Uniaxial bending and shear**

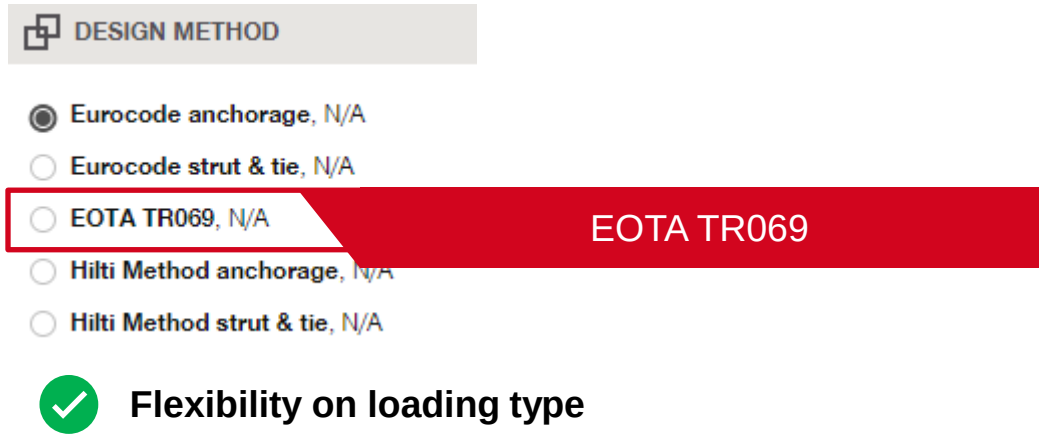


The bending moment is equilibrated by a system of struts and ties in the base material.

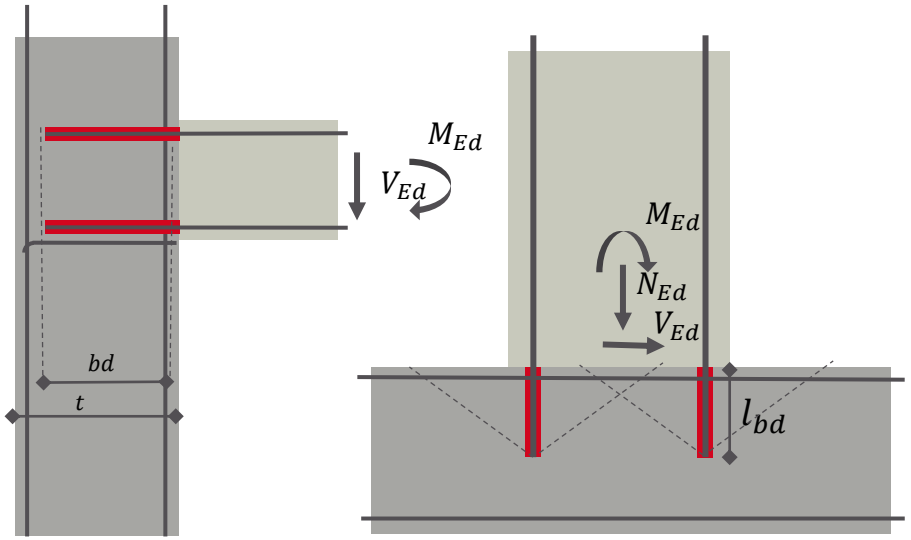


- The force in every strut and tie is calculated.
- Anchorage length for the post-installed rebar is calculated per EC2 and product ETA [slides above], but it must start at the CCT-node
- Strut 5 is checked as this can be decisive as well as the shear in the existing element
- The user is responsible to check that there's sufficient reinforcement in the base material, so that the strut and ties is possible.

EOTA TR069 ALWAYS PROVIDES SOLUTIONS FOR JOINTS UNDER UNI OR BI-AXIAL BENDING



Flexibility on loading type



The anchorage length l_{bd} calculated per EOTA TR069 takes into account the tensile strength and failure modes in concrete.

$$R_d = \min(N_{Rd,y}, N_{Rd,c}, N_{Rd,sp})$$ EOTA TR069 [Eq. 4.1]

Steel resistance

Concrete breakout resistance

Concrete splitting resistance

Examples of concrete breakout failure mode:

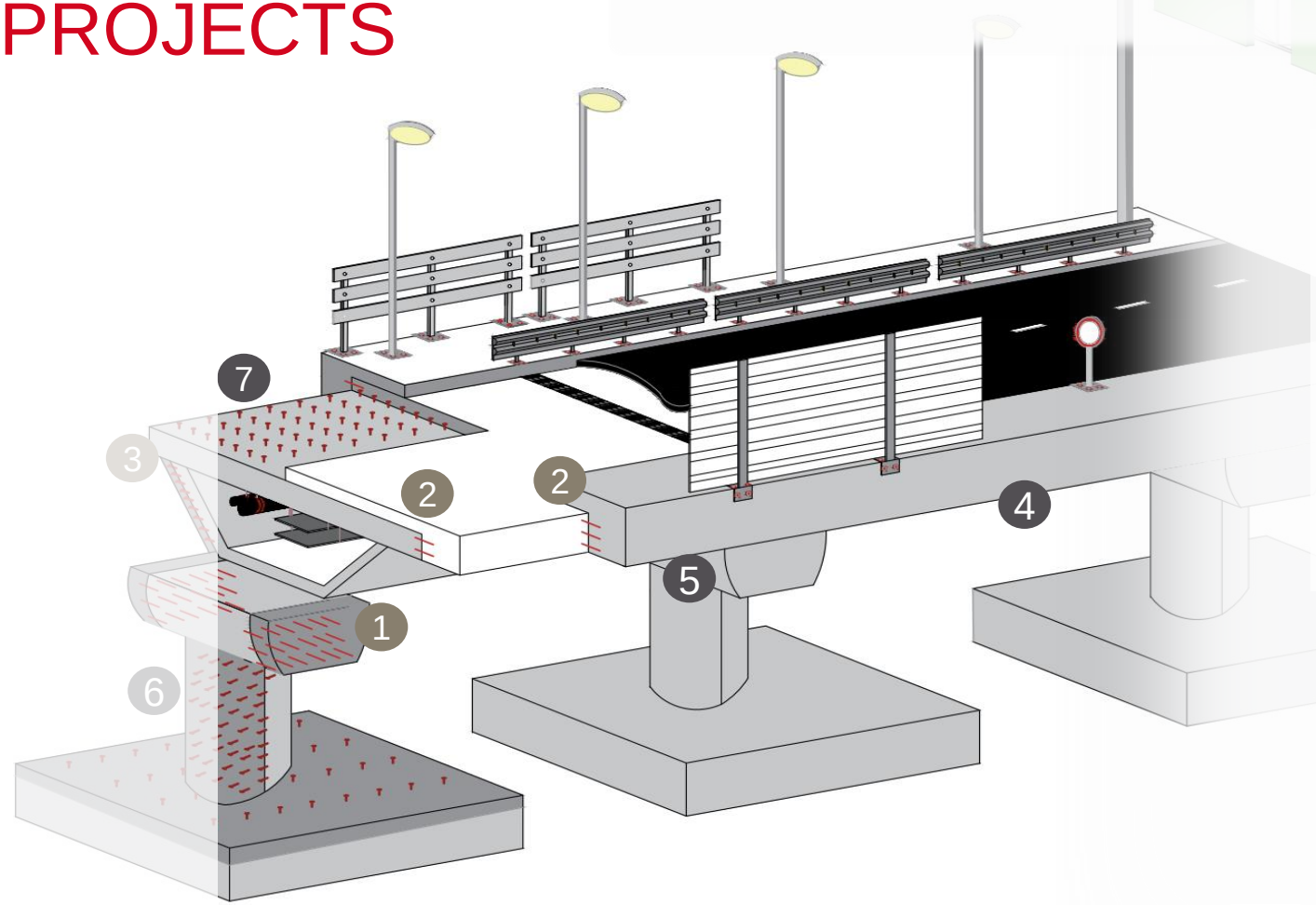
Often (e.g. 2D bending) TR069 is the only solution for T-joints.

CONCRETE STRENGTHENING DESIGN CASES IN BRIDGE RENOVATION PROJECTS

1 Pier Extension

2 Deck extension PIR

3 Wall Extension



4 Shear strengthening

5 Punching Shear

6 Pier Strength.Overlay

7 Deck Strength.Overlay

Concrete Member Connection/Extension

Concrete Thickness and Reinforcement

CONCRETE STRENGTHENING WITH INCREASING THICKNESS: CONCRETE OVERLAY

- Reinforcement measures are necessary to increase the load-bearing resistance of bridge structures.
- One effective solution for strengthening or repairing to expand capacity is to enlarge the cross-section using concrete.
- To ensure monolithic load-bearing behavior, special shear connectors are used.
- These connectors are used for shear-resistant load transfer between the road slab and the concrete layer.

Design requirements:

- High-performing solution with high shear loads in tough concrete connections.
- Application in seismic (local requirement), corrosion (project-specific A4 or HCR)
- **Pier & columns:** from 8mm-16mm anchor with flexible height adjustment is needed.
- **Deck:** typically, a 14mm anchor with flexible height adjustment is needed.

Tools for installation:

Cordless tools and consumables

'Auto-cleaning' systems

Impact Wrench

Installation requirements:

- Multiple fastening point installations in tough concrete, with possible wet, water-filled boreholes. Height adjustment is needed for rebar mesh connection.
- **TCO:** Large quantity of anchoring points require fast and easy anchoring preparation and setting process. Speed and quality of installation are key!

REGULATIONS AND DESIGN METHODS EVOLUTION

New construction

Renovation

EN 1992-1
EN 1992-2

Section 6.2.5 Shear force transmission in joints (shear friction theory)

- ! Applies to semi-precast elements with in-situ reinforcement and to concreting sections produced at different times (sufficient anchoring of reinforcement).
- ! Post-installed reinforcement: anchorage length according to EC2 not feasible
- ! No explicit consideration of post-installed shear connectors
- ! Steel load-bearing capacity of shear connectors is assumed to yield

Jan 2011

Fib Model Code 2010

Oct 2013

EOTA TR 066

Apr 2019 (static and fatigue)

EOTA TR 066

Amended Nov 2020 (+ seismic)

EOTA TR 066 REGULATES THE DESIGN OF OVERLAY IN EXISTING STRUCTURES

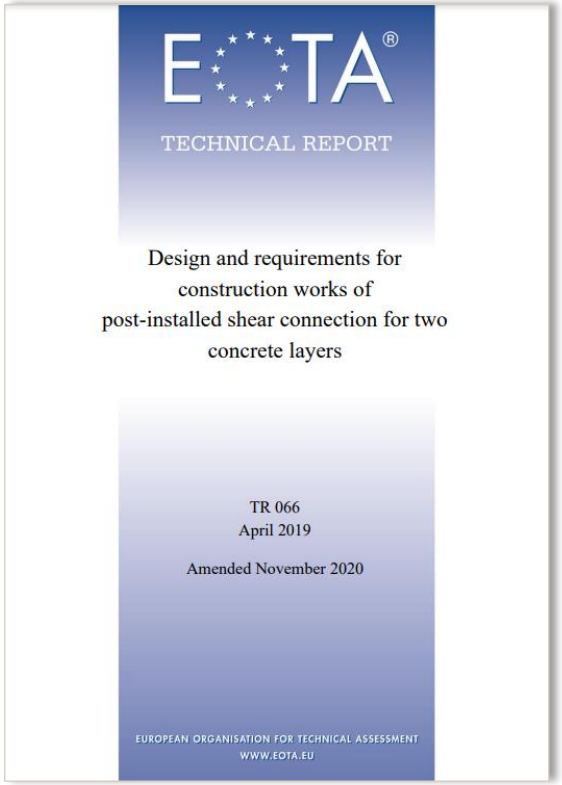
European Design Method in addition to EC2: safest, officially recognized and most economical solution

Clear procedure for **static**, quasi-static, **seismic** and **fatigue**

Considers interlock, friction and dowel action and the **real stress σ_s acting** in the post-installed connector

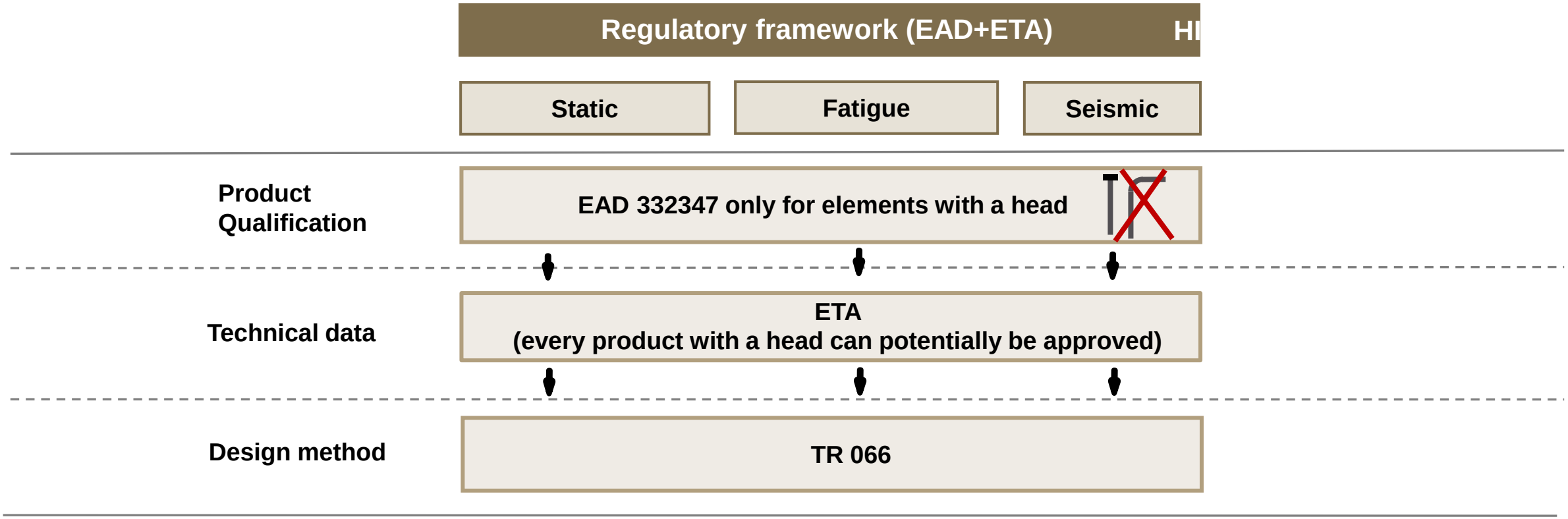
Differentiated consideration of **roughness for the interface**

Qualification of shear connectors according to EAD 332347-00-0601

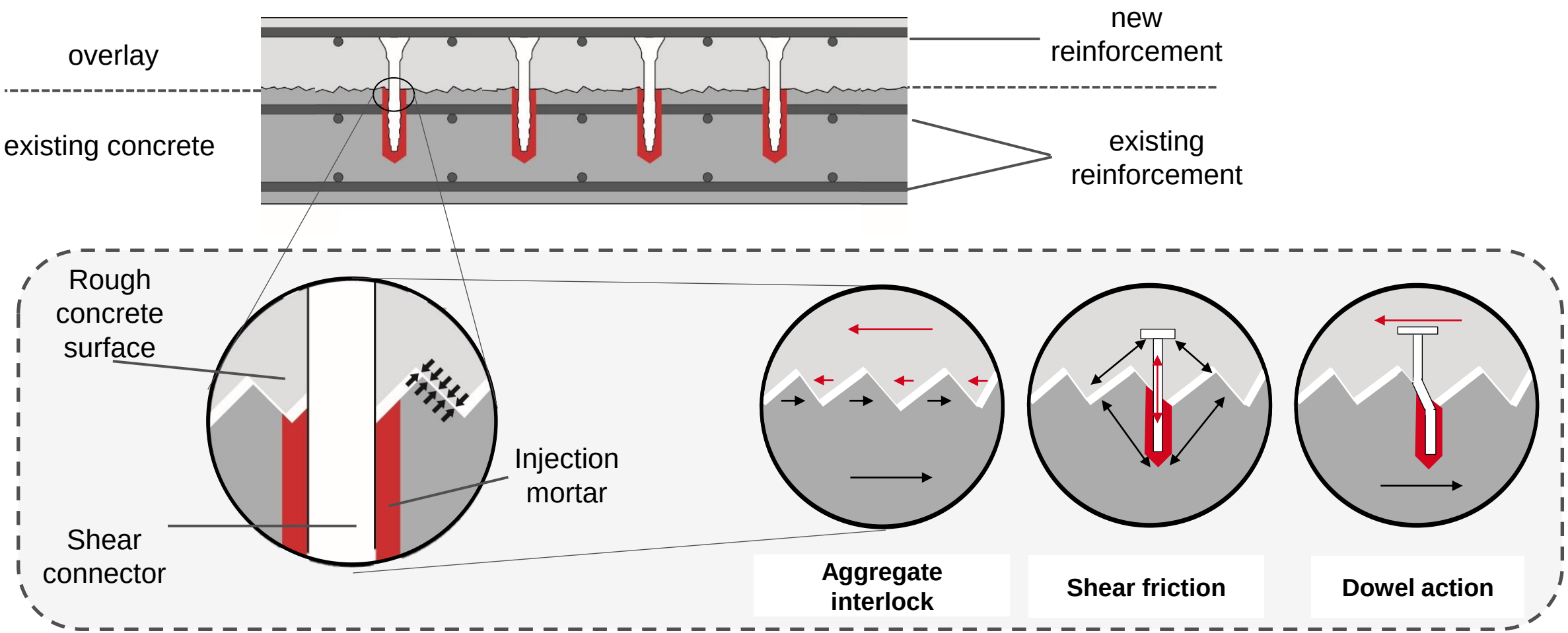


"classical" anchor ETA is not sufficient, since it does not provide characteristics (e.g. ductility & geometry of the shear connector, etc.) in order to realistically consider the load-bearing behavior in the design.

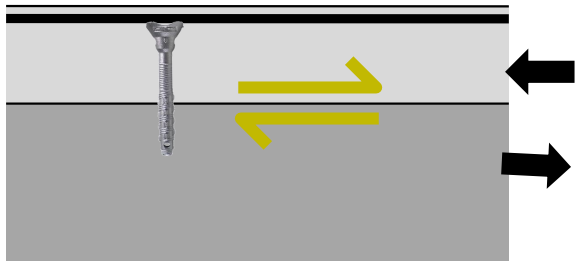
REGULATORY FRAMEWORK:
TR066 FOR FASTENERS WITH A SYMMETRICAL HEAD

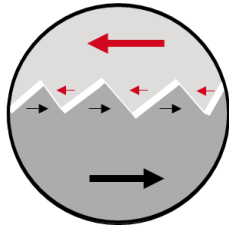


VERIFICATION MODEL IN ACCORDANCE WITH EOTA TR 066 FOR STRENGTHENING SHEAR INTERFACE

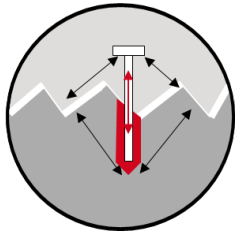


VERIFICATION MODEL IN ACCORDANCE WITH EOTA TR 066 FOR STRENGTHENING SHEAR INTERFACE



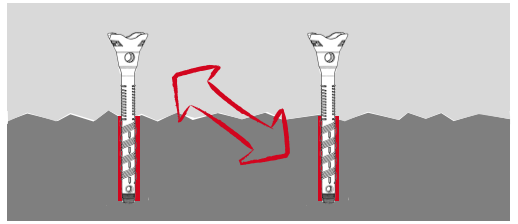


Aggregate Interlock



Shear Friction

Dowel action



Concrete strut resistance

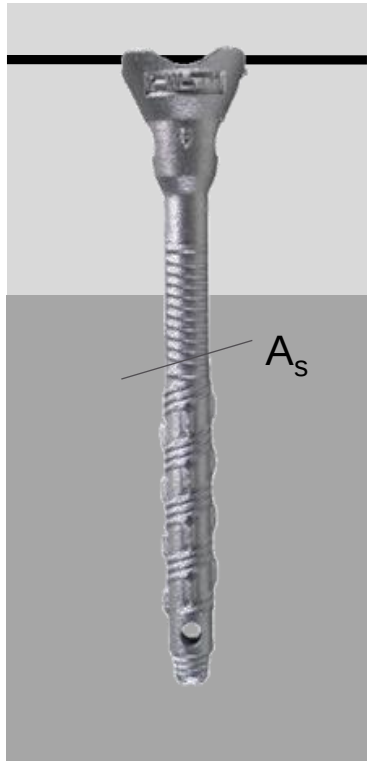
Design by EN 1992-1-1:

$$v_{Rdi} = cf_{ctd} + \mu\sigma_n + \rho f_{yd}(\mu sin\alpha + cos\alpha) \leq 0.5 v f_{cd}$$

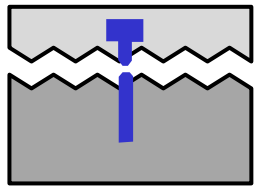
Design by EOTA TR 066 for post-installed connector:

$$\tau_{Rd} = c_r \cdot f_{ck}^{\frac{1}{3}} + \mu \cdot \sigma_n + \kappa_1 \cdot \alpha_{\kappa 1} \cdot \rho \cdot \sigma_s \cdot \mu + \kappa_2 \cdot \alpha_{\kappa 2} \cdot \rho \cdot \sqrt{\frac{f_{yk}}{\gamma_s} \cdot \frac{0.85 f_{ck}}{\gamma_c}} \leq \beta_c \cdot v \cdot \frac{0.85 f_{ck}}{\gamma_c}$$

BASED ON TR 066, ALL THE POSSIBLE FAILURE MODES MUST BE CHECKED WHEN THE CONNECTOR IS DESIGNED

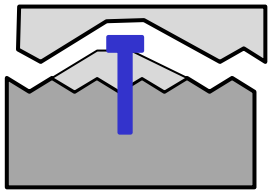


Steel failure



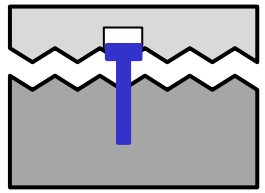
$N_{Rd,s}$

Concrete cone in new concrete



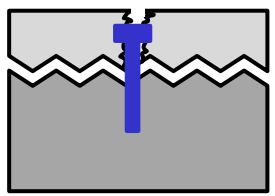
$N_{Rd,c,n}$

Pull out in new concrete



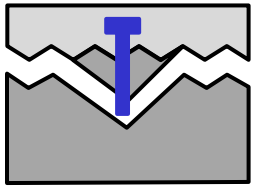
$N_{Rd,p,n}$

Splitting in new concrete



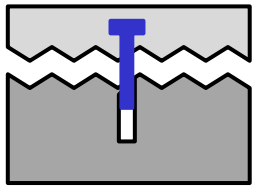
$N_{Rd,sp,n}$

Concrete cone existing concrete



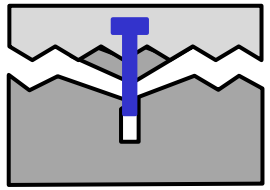
$N_{Rd,c,e}$

Pull out in existing concrete



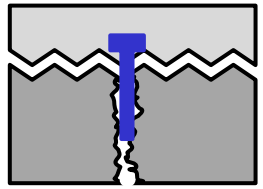
$N_{Rd,p,e}$

Pull out + concrete cone in existing concrete



$N_{Rd,p,e}$

Splitting in existing concrete



$N_{Rd,sp,e}$

$$N_{Rd} = \min\{N_{Rd,c,n};\ N_{Rd,p,n};\ N_{Rd,sp,n};\ N_{Rd,s};\ N_{Rd,c,e};\ N_{Rd,p,e};\ N_{Rd,sp,e}\}$$

$$\sigma_s = N_{Rd} / A_s$$

OTHER CALCULATION METHODS

Simple calculation on total area of steel connectors:

$$A_{s,rqd} \cong \frac{V_{Ed}}{0.5 f_{yd}}$$

where V_{Ed} is the interface shear force,
k is usually taken as 0.5 or 0.6 and
f_{yd} is the steel yield strength

Caution with “rule of thumb” connector design!

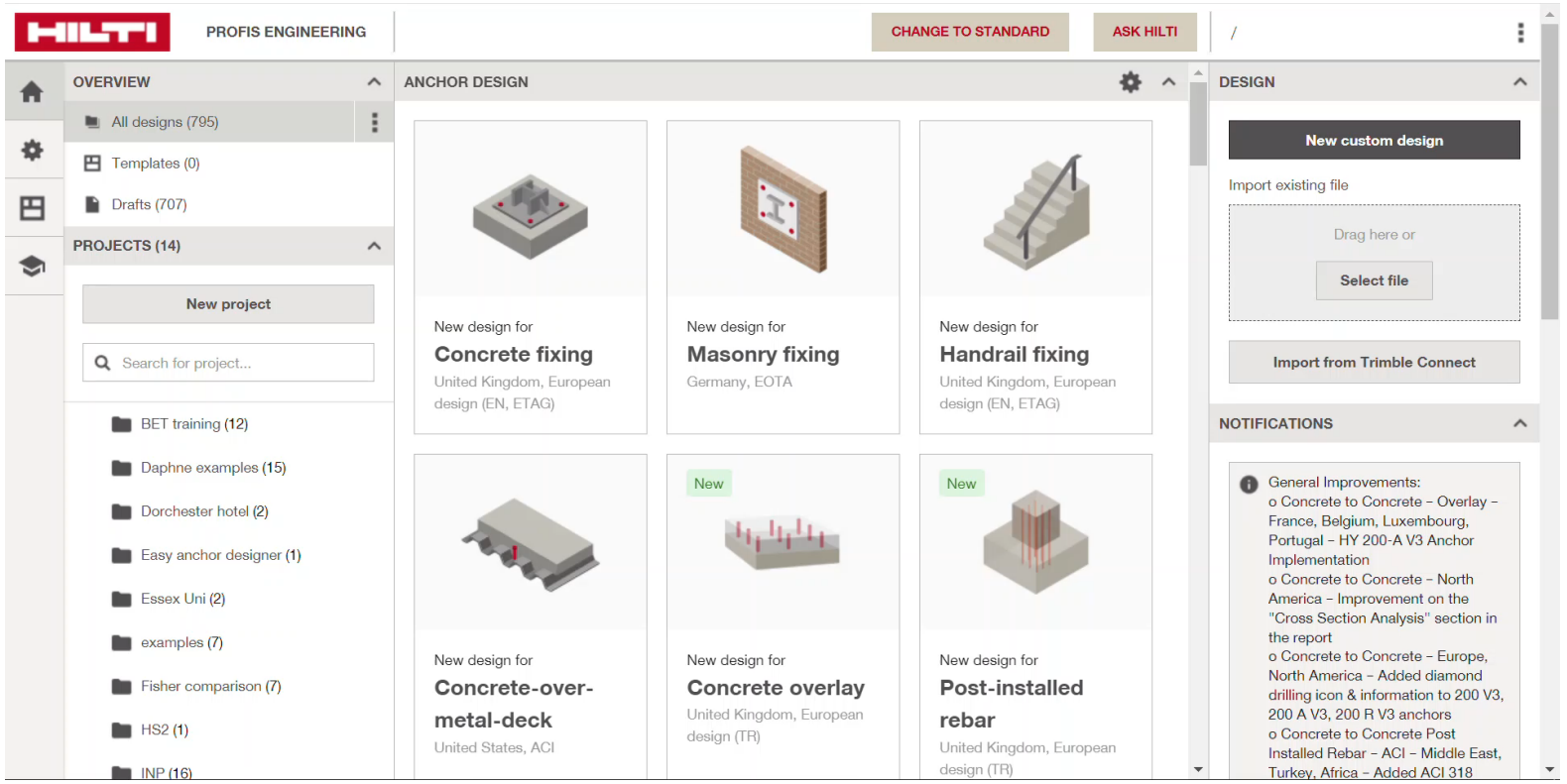
Unnecessarily high number of connectors

ROAD BRIDGE APPLICATION:
CONCRETE OVERLAY IN BRIDGE SLAB APPLICATION

Hilti software design

Design tools:

PE Software



AGENDA

1. Introduction – why talk about renovation?
2. Bridge concrete strengthening methods and design logic
3. How we can help creating better specifications
4. How we can help creating safer installations

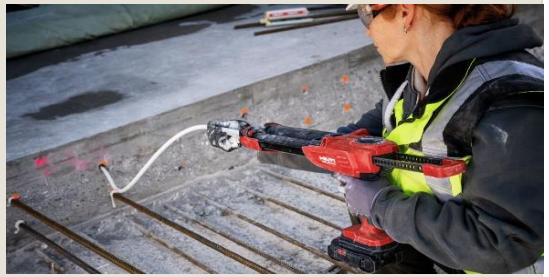
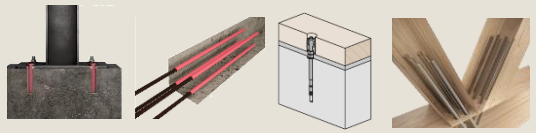
WE CAN HELP YOU VALUE ENGINEER HIGHER PERFORMING SPECIFICATIONS GIVING MORE PEACE OF MIND

HIGHER PERFORMING:
High performing anchoring solutions, for a wide variety of technical challenges

VALUE ENGINEERED:
Optimized and model code compliant designs, swiftly created with software that integrates with structural suites

MORE PEACE OF MIND:
Innovative Hilti systems, knowledge sharing, and jobsite presence help ensure that you get what you spec

Improving every key element in structural connection design to be the '**best partner for productivity, safety and sustainability**'

Hardware Solutions	**Design Methods & Software**	**You get what you Spec**
		
		
Innovative and differentiated hardware solutions	Steel to concrete, concrete to concrete, timber to timber/concrete/steel, special applications	'Auto' or no cleaning systems, Accurate dosing, Anchor setting tools, Adaptive Torque System

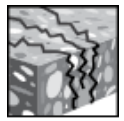
WE OFFER A VAST ANCHORING PORTFOLIO THAT COVERS YOUR DESIGN AND APPLICATION NEEDS

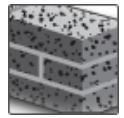
Chemical Anchors

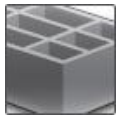
Application conditions

Base Materials


Uncracked Concrete


Cracked Concrete


Solid Masonry

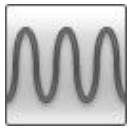

Hollow Masonry


Wet Concrete

Loading Conditions


Static

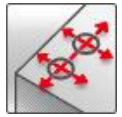

Seismic

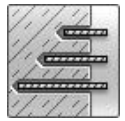

Fatigue


Shock


Fire

Additional Parameters


Edge and Spacing


Variable Embedment


Nuclear

A4 316
Corrosion

ICC ES IAPMO
Approvals

AT HILTI, WE KNOW THAT VALUE ENGINEERING IS IMPORTANT FOR DESIGNERS, CONTRACTORS & OWNERS

Lower material cost + **Lower workflow cost** = **Value for Money**

Shorter anchors, smaller diameter anchors, smaller baseplates

Fewer steps (no cleaning), quicker installation (setting tools, AT torquing)

Improved cost to performance ratio, Lower Total Cost of Ownership

If Engineers solve this equation with Hilti,
their design can be optimized and **Value Engineered**

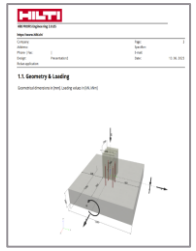
Value Engineering your structural connections with Hilti enables you to **translate lower material and workflow costs into tangible savings on the jobsite, in the design office, and over the lifetime of the structure.**

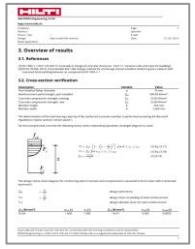
HOW DOES HILTI HELP TRANSLATE A SPEC FROM PROFIS ENGINEERING TO THE JOBSITE?

Design | **Build**

PROFIS Engineering provides the following

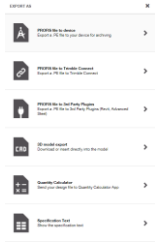
- Optimize your design in a few clicks
- Report provides a clear representation of the application
- Full Transparency on Design Method

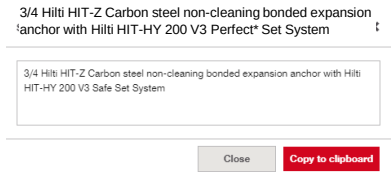




Designs easily transferred to specs and drawings

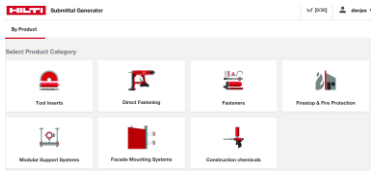
- Recommended and customizable specification text
- Detail export in BIM/CAD
- Quantity Calculator to create Bill of Materials (BOM)





Product submittals, simplified installation, and onsite support

- Submittal Generator to provide proper documentation
- Installation systems that are faster, simpler, and safer
- Field team members provide onsite training and support



AGENDA

1. Introduction – why talk about renovation?
2. Bridge concrete strengthening methods and design logic
3. How we can help creating better specifications
4. How we can help creating safer installations

“SMALL DETAILS” CAN HEAVILY INFLUENCE THE FINAL INSTALLATION QUALITY ON THE JOBSITE

Example of factors influencing execution quality and common triggers to structural failure

- Lack of skilled employees
- ‘Optimization’ of material costs
- Non-compliance to installation steps

- Improper borehole cleaning
- Bond failure by insufficient adhesive in borehole
- Over-torquing of anchor
- Under-torquing of anchor
- Improper setting of anchor

Examples of structural collapse

Academy building failure caused by excessive corrosion of the steel structure

Roof section collapse due to numerous construction flaws

WE CAN HELP YOU MAKE STRUCTURAL CONNECTIONS **FASTER**, **SIMPLER** & **SAFER**

Chemical Solutions

FASTER

Our systems allow fewer and faster installation steps, delivering the lower total cost of ownership

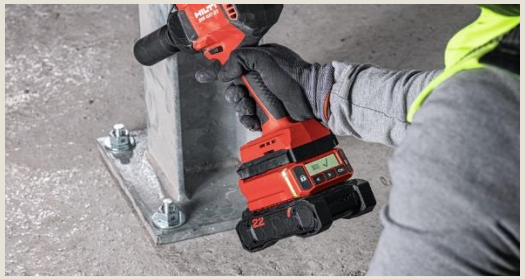
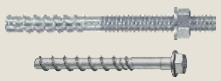
SIMPLER

Our systems allow an intuitive and straight forward installation process, anyone can do it

SAFER

Our systems, knowledge sharing, and jobsite presence help ensure that you comply with the specification

Improving every on-site workflow step that matters to be the '**best partner for productivity, safety and sustainability**'

Borehole Cleaning	Accurate Dosing	Adaptive Torquing
		
 'No' cleaning anchors	 'Auto-cleaning' systems	 Volume calculator App & HDE accurate dosing	 HUS4 MAX & HVU2	 SIW + AT Module system

WHY ADOPT ‘BETTER SITE PRACTICES’ SOLUTIONS?

All-weather	Dust-removal systems designed to **work in damp concrete without load reduction** to bond capacity
Improved performance	**Up to 70% of performance is lost** when holes are not properly cleaned. Our offering include systems that clean as you drill ensuring proper performance.
Save time	Our systems can **reduce overall installation time by up to 60%**
Save money	**HDE 500 dosers** give you full transparency and result in **up to 30% less mortar** consumption
Save worries	**HILTI Adaptative Torque (AT)** technology sets the right torque for you and speeds up this step by **up to 80%**
Be up to date	Benefit from HILTI **customized trainings** on the jobsite and enable anyone to properly install anchors, **turning specs into reality**

Improving every on-site workflow step that matters to be the ‘best partner for productivity, safety and sustainability’

LET US SUM UP

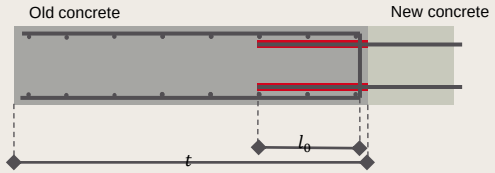
DECK EXTENSIONS WITH POST-INSTALLED REBAR

Design method

Eurocode 1992-1-1, Lap splices

Requisites:

- Cast in rebars in the direction where the lap splice are required
- Drilling must be executed straight
- Length must fit in the existing concrete thickness



Specification creation

HIGHER PERFORMING:

- Robust post-installed mortar for rebar connections to allow fast egress under emergency scenarios such as fire.

VALUE ENGINEERED: An easy-to-use post-installed rebar module in PROFIS Engineering combined with high/performing hardware allows for value engineering (e.g., smaller diameter, less embedment depth, etc.). Savings of up to 30% in material cost and installation time.

MORE PEACE OF MIND:

- Designed to meet specific performance criteria: 100- or 120 years service life and fire
- A dedicated installation system is used to meet the performance parameters during the installation phase.

Hardware solutions

Leading solution

Hilti HIT-RE 500 V4, the solution finder: Slow cure for standard application range and applications where **very large rebar diameter and deep boreholes** or many boreholes are needed (pneumatic dispenser). EC2 design & TR 069

Other solution for fire requirements

Hilti HIT-FP 700-R: Developed for temperature critical applications as **fire**, very long curing time compared to resin-based systems, EC2 design only

Hilti HIT-CT 100
environmentally friendly

Hilti HIT-HY 200-A V3
Fast cure solution

Software

PROFIS Engineering

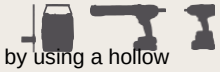
Post installed rebar

Services

Technical support and trainings
Get support with your designs, get your people trained in the office and on site

On site testing
Up to 180kN test performed by our experts
CFA certified

Site installation



FASTER

- Elimination of borehole cleaning preparation step by using a hollow drill bit
- Faster dispensing against competitors' electrical dispensing solutions
- Both features are reducing overall installation time and cost

SIMPLER

- Easy to use, automated dispensing for accurate material usage, significantly reducing material waste
- Repeat function for continuous, consistent dispensing makes the installation process easy and fast for the user

SAFER

- Specified performance is achieved by eliminating user mistakes
- Elimination of Silica dust with dedicated systems during the drilling process.
- Reduction of user fatigue with an automated electrical dispenser. (vs manual)

Other support

Ferro scanners
Avoid hitting the existing rebar when drilling by scanning your concrete first

24/7 Training
Ask Hilti Access to our trainings and articles
E-learning platform about rebar applications and fire design

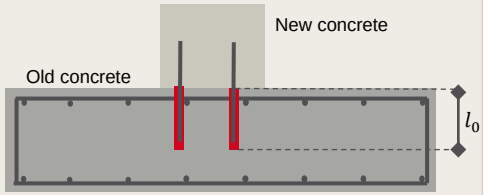
COLUMN CONNECTIONS / EXTENSIONS WITH POST-INSTALLED REBAR

Design method

Eurocode 1992-1-1, end anchorage
TR069/Strut and tie model
Hilti method

Requisites:

- Type of load to identify the right design method



Specification creation

HIGHER PERFORMING:

- Robust post-installed mortar for rebar connections to allow fast egress under emergency scenarios such as fire.

VALUE ENGINEERED: An easy-to-use post-installed rebar module in PROFIS Engineering combined with high/performing hardware allows for value engineering (e.g., smaller diameter, less embedment depth, etc.). Savings of up to 30% in material cost and installation time.

MORE PEACE OF MIND:

- Designed to meet specific performance criteria: 100- or 120 years service life and fire
- A dedicated installation system is used to meet the performance parameters during the installation phase.

Hardware solutions

Leading solution

•**Hilti HIT-HY 200-A V3**: Fast cure for standard application range, EC2 design & EOTA TR 069

Other solution for environmental friendly solutions

HIT-CT 100: Fast cure for standard application range or application where particularly **environmentally friendly** connection should be executed, EC2 design only

Hilti HIT-FP 700-R with better fire performance

Hilti HIT-RE 500 V4, the solution finder: very large rebar diameter and deep boreholes

Software

PROFIS Engineering

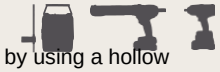
Post installed rebar

Services

Technical support and trainings
Get support with your designs, get your people trained in the office and on site

On site testing
Up to 180kN test performed by our experts CFA certified

Site installation



FASTER

- Elimination of borehole cleaning preparation step by using a hollow drill bit
- Faster dispensing against competitors' electrical dispensing solutions
- Both features are reducing overall installation time and cost

SIMPLER

- Easy to use, automated dispensing for accurate material usage, significantly reducing material waste
- Repeat function for continuous, consistent dispensing makes the installation process easy and fast for the user

SAFER

- Specified performance is achieved by eliminating user mistakes
- Elimination of Silica dust with dedicated systems during the drilling process.
- Reduction of user fatigue with an automated electrical dispenser. (vs manual)

Other support

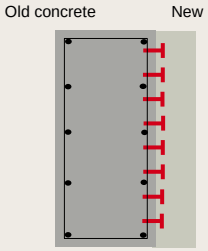
Ferro scanners
Avoid hitting the existing rebar when drilling by scanning your concrete first

24/7 Training
Ask Hilti Access to our trainings and articles
E-learning platform about rebar applications and fire design

PIER / COLUMN / WALL STRENGTHENING WITH CONCRETE OVERLAY

Design method

Eurocode 1992-1 + TR066, Overlay



Requisites:

- Roughening the existing concrete
- Defining the shear load to be carried by the connectors
- Defining other requirements like fatigue load needs

Specification creation

HIGHER PERFORMING:

- High-performing solution with high shear loads in tough concrete connections.

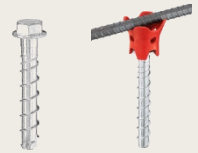
VALUE ENGINEERED:

- Approved system (ETA) according to EAD 3302347-00-0601 for a design according to EOTA TR 066.
- Dedicated design software, to support precise design process

MORE PEACE OF MIND:

- Approved system – No cleaning eliminates a working step of the application; the precise dosing process assists with reaching specified loads and makes the installation “fail safe” for consistent installation quality, especially in large volume applications. Design for a service life up to 100 yrs.

Hardware solutions



Hilti HUS-H 4: screw anchor

Leading solution

Hilti HIT-RE 500 V4 + HCC-B connector

Site installation

FASTER

- Fast work progress: setting and height leveling are done in one step
- Immediate loading is possible thanks to the mechanical properties of the connector

SIMPLER

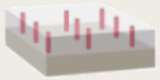
- Multiple drilling methods (hammer drilling, diamond drilling with roughening tool, and hollow drilling).
- No additional hole cleaning is required

SAFER

- No dust with the help of dedicated solutions – (removal of silica dust)
- User fatigue prevention for drilling and setting, with a dedicated fast and easy-to-use tool portfolio
- User health & safety with lightweight cordless tools

Software

PROFIS Engineering



Overlay

Services

Technical support and trainings
Get support with your designs, get your people trained in the office and on site

On site testing
Up to 180kN test performed by our experts CFA certified

Other support

Ferro scanners
Avoid hitting the existing rebar when drilling by scanning your concrete first

24/7 Training
Ask Hilti Access to our trainings and articles
E-learning platform about rebar applications and fire design

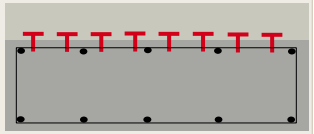
DECK STRENGTHENING WITH CONCRETE OVERLAY

Design method

Eurocode 1992-1 + TR066, Overlay

Requisites:

- Roughening the existing concrete
- Defining the shear load to be carried by the connectors
- Defining other requirements like fatigue load needs



Specification creation

HIGHER PERFORMING:

- High load performance for challenging jobsite conditions, tough concrete, wet/ water filled, boreholes, corrosion, seismic, and fatigue.

VALUE ENGINEERED:

- Approved system (ETA) according to EAD 3302347-00-0601 for a design according to EOTA TR 066, including for fatigue stress
- Dedicated design software, to support precise design process

MORE PEACE OF MIND:

- Approved system – No cleaning eliminates a working step of the application; the precise dosing process assists with reaching specified loads and makes the installation “fail safe” for consistent installation quality, especially in large volume applications. Design for a service life up to 120 yrs.

Hardware solutions

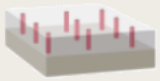
Hilti HIT-RE 500 V4 + HCC-B connector

Leading solution

Hilti HUS-H 4: screw anchor

Software

PROFIS Engineering



Overlay

Services

Technical support and trainings
Get support with your designs, get your people trained in the office and on site

On site testing
Up to 180kN test performed by our experts CFA certified

Site installation

FASTER

- Fast work progress: setting and height leveling are done in one step
- Immediate loading of 1kn is possible while mortar reaches fully curing
- Shear connector can be loaded immediately

SIMPLER

- Multiple drilling methods (hammer drilling, diamond drilling with roughening tool, and hollow drilling).
- Part of the Hilti Perfect Set system - no additional hole cleaning is required when using TE-CD or TE-YD hollow drills and HDE dispensers for accurate and easy anchor setting.

SAFER

- No dust with the help of dedicated solutions – (removal of silica dust)
- User fatigue prevention for drilling, dispensing, and setting, with a dedicated fast and easy-to-use tool portfolio
- User health & safety with lightweight cordless tools

Other support

Ferro scanners
Avoid hitting the existing rebar when drilling by scanning your concrete first

24/7 Training
Ask Hilti Access to our trainings and articles
E-learning platform about rebar applications and fire design

AS WELL AS TRAINING AND ENGINEERING SERVICES TO SUPPORT YOU THROUGH YOUR PROJECT LIFECYCLE

ANCHOR TRAINING FOR INSTALLERS

REBAR TRAINING FOR INSTALLERS

ONSITE TESTING FOR ANCHORS

HEALTH & SAFETY TRAINING

ANCHOR AND REBAR DESIGN SERVICES

CAD DRWAING AND BIM SERVICES

HILTI Services

- ✓ Professional services to drive productivity, quality and reliability: Fleet, ON!Track equipment management, tool repair, engineering consultancy, training, testing and logistics
- ✓ Our experienced certified HILTI engineers and technical specialists can help throughout your project lifecycle – from design to installation to building management
- ✓ We can give advice on the jobsite, or help with training, onsite testing and with back up advice on the phone or online

THANK YOU!

Contact us:

- GB
Tel: 0800 886 100
Email: gbtas@hilti.com
Web: www.hilti.co.uk/engineering

- IE
Tel: 1850 287 387
Email: ieteamtechnicalsupport@hilti.com
Web: www.hilti.ie/engineering

- Finland
Tel: 0207 999 350
Email: tekninenosasto@hilti.com
Web: www.hilti.fi/engineering

- Sweden
Tel: 020 555 999
E-post: tc@hilti.com
Web: www.hilti.se

- Denmark
Tel: 44 88 80 80
Email: tekniskafdeling@hilti.com
Web: www.hilti.dk

ASK.HILTI.CO.UK