



# OPTIMIZING QUALITY WITH POST-INSTALLED REBAR

From Design to Installation



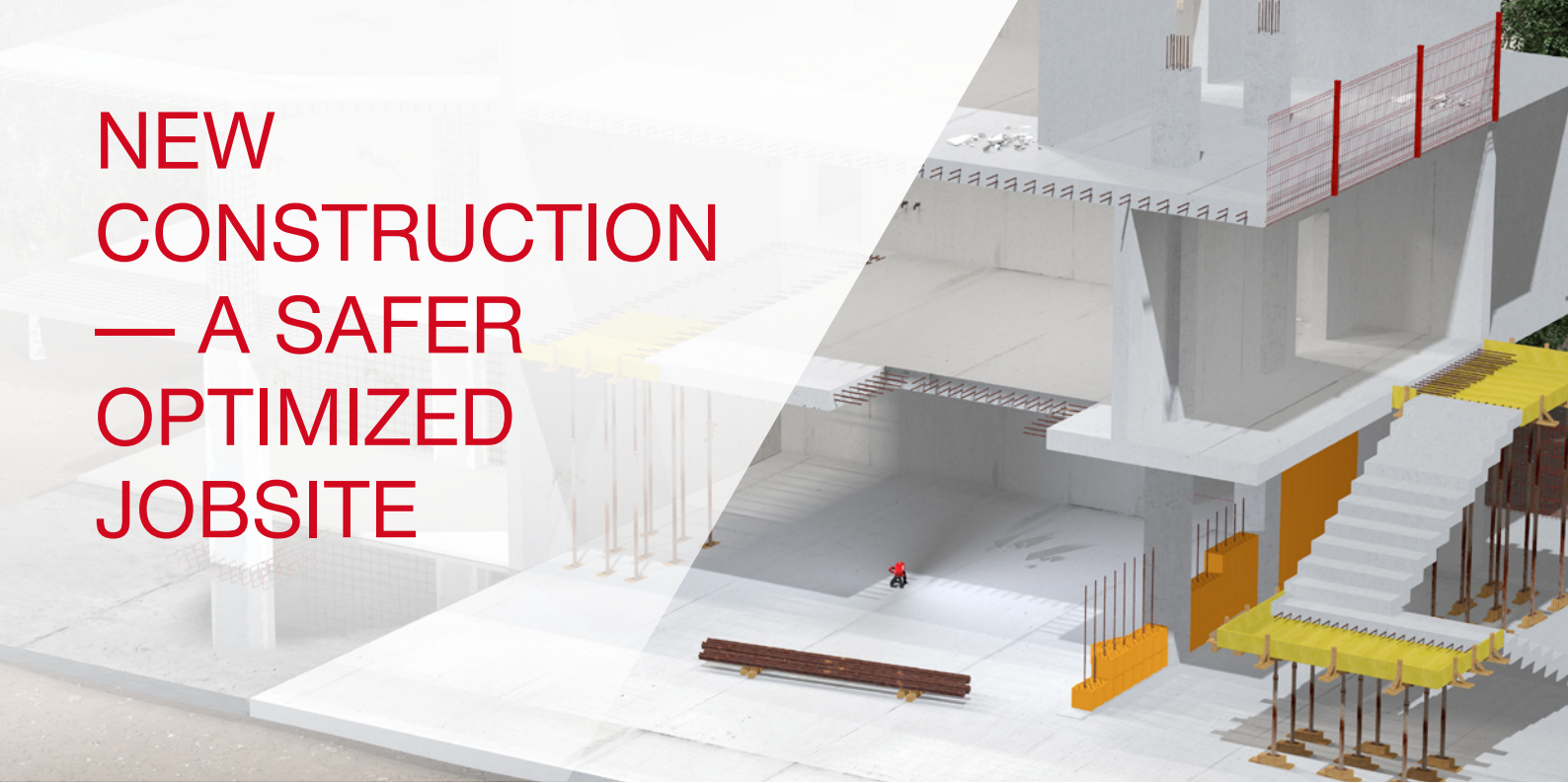
# HOW IMPORTANT IS IT TO GET POST-INSTALLED REBAR RIGHT THE FIRST TIME?



While cast-in rebar offers builders an economical and dependable option for many structures, post-installed rebar has its own advantages. It can be used to retrofit existing structures, to enhance their load-carrying capacity or to repair damage. Not only it can reduce construction time and eliminate the need for costly demolition and reconstruction, it can also reduce the risk of concrete cracking..

Post-installed rebar is not without challenge. Errors during installation such as improper hole preparation, insufficient cleaning of the hole, or improper placement of the rebar can be dangerous, and can cost you time and money for rework.

# NEW CONSTRUCTION — A SAFER OPTIMIZED JOBSITE



Countless starter rebars jutting out from concrete represent a real risk for workers and restrict site access.

While some alternative solutions are more expensive than cast-in rebar, they make sense in many applications.

For example, cast-in box and cast-in couplers are valuable engineered solutions designed to overcome these pain points. But again, mistakes do happen, and what was described above for cast-in rebar applies to other cast-in solutions as well. Moreover, the biggest advantage of adhesive injection mortars compared with the above cast-in systems comes from their high level of flexibility in terms of sizes and layout covered.



# EXISTING STRUCTURES — A PLAN FOR THE UNPLANNED



As urban areas grow and increase in density and society relies evermore on dependable infrastructure, existing structures may require modification or **improvement** to comply with new regulations, such as for

- **seismic** qualification or
- repairing damage from a natural **disaster**.

Unplanned situation on the jobsite are always a risk. Examples include

- Improperly positioned rebars
- Missing rebars
- Design changes

All these day-to-day cases require a rework, and injection mortars can indeed cover most of the needs better than any other post-installed solutions.



# CHALLENGES



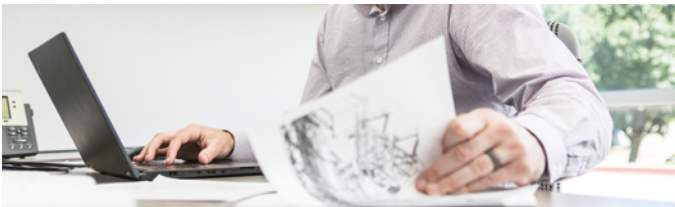
## Code compliance

Capability of various post installed adhesives varies, so they should be compared with a standard measurement. A rigorously tested and approved mortar ensures your post-installed rebar design will perform as well as cast-in rebar under all possible conditions. International product approvals like ICC-ESR and ETA provide a reliable indication of compliance.



## Lack of standardized design tools

In the past, engineers used individual design spreadsheets and lacked standardized tools or methods that could minimise [UK spelling] errors. Often they faced compatibility issues between these sheets and other software suites that introduced inefficiencies and risked code noncompliance.



## Installation

**21%**, an alarming number of engineers and contractors lack confidence that post installed adhesives are being properly installed on construction projects, according to New Civil Engineer survey in the UK. Drilling rebar bore holes creates dust. If dust remains in the holes drilled, this creates a barrier between the mortar and the concrete, thereby preventing proper adhesion. Experience has proven that this procedure is too often neglected by the installer or, at best, is a job half done.



## Site requirements

Site conditions should be considered for a safe and qualified design including site temperature, loading conditions (seismic, sustained loading at high temp.), how corrosive the environment is, humidity (including wet, dry and submerged), fire resistance and lifecycle requirements.





# CRITICAL FACTORS ENSURING HIGH STANDARDS OF REBAR CONNECTIONS FROM DESIGN TO INSTALLATION



**Select**  
the right  
mortar

**Design**  
with  
standardized  
and compliant  
methods

**Install**  
properly as  
designed





Select  
the right mortar

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Install  
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# SELECT THE RIGHT MORTAR

International codes established the criteria to qualify injection mortar for post-installed rebar in the construction industry, more than for other alternative connection solutions. Injection mortar should be qualified to perform in all possible conditions (examples below), and the acceptance criteria are defined in international standards (i.e. AC308 and EAD 330087).

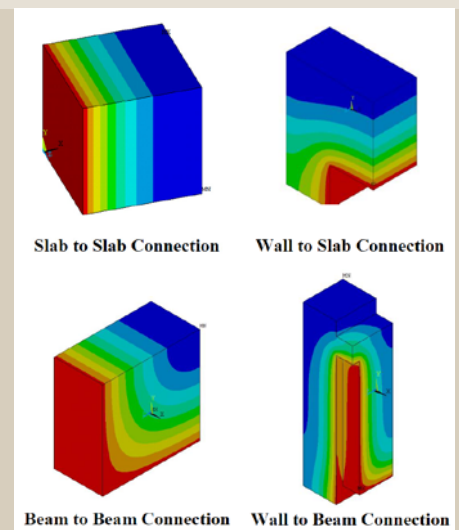
Mortar	Approval	Features
RE 500 V3 	ETA-16/0142 ICC ESR-3814	<ul style="list-style-type: none"> <li>Highest bond performance in special conditions i.e., wet conditions, deep injection, diamond-cored hole</li> <li>Injectable epoxy suitable for all-year use and longer working time</li> </ul>
HY 200 V3 	ETA-19/0600 ICC ESR-4878	<ul style="list-style-type: none"> <li>Fast curing</li> <li>Design loads are the same for dry and saturated concrete</li> </ul>



## Fire Limit State Design

Fire is certainly a clear danger to any construction and needs to be prevented as a fire may occur anywhere and at any phase over the lifetime of a building, whether during construction or during service. When post-installed reinforcing bar connections are part of a fire-rated assembly (floor, roof, etc.), it is important that the fire resistance of the connection is evaluated using test data for the time-dependent reduction in bond strength associated with typical geometries and time-temperature loading protocols.

The qualification of post-installed rebar connections in fire conditions is covered by the European Assessment Document EAD 330087-02, which is issued by EOTA and allows a design according to Eurocode 2. In Hong Kong, local fire assessment is needed for fire limit state design. The thermal contour based on the configuration and FRR of connection is combined with the fire performance of chemical adhesive at different temperature to give the resultant force of rebar under different scenarios using finite element simulation method. ULS & FLS should both be considered if there is fire concern in the application



Select  
the right mortar

Design  
with standardized  
and compliant methods

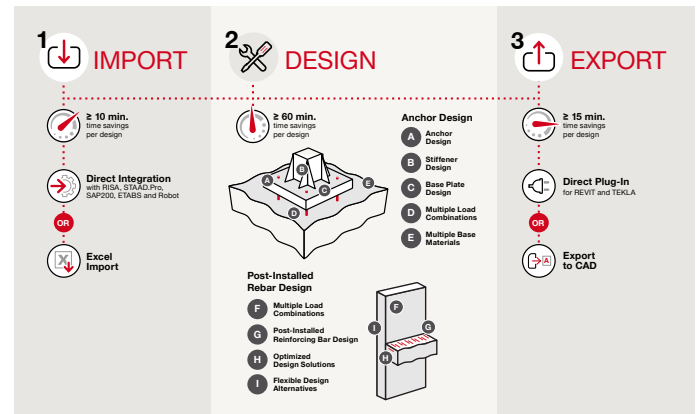
Install  
properly as designed

# DESIGN WITH STANDARDIZED AND COMPLIANT METHODS

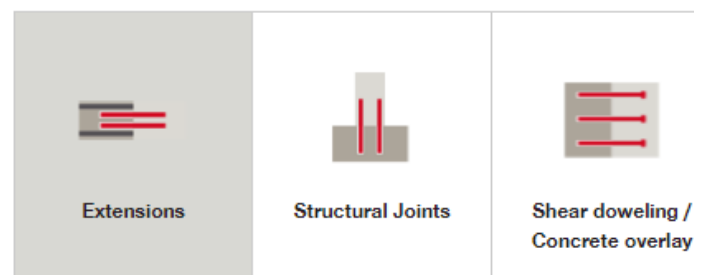
PROFIS Engineering Suite is user-friendly, cloud-based software that makes designing and analysing structural connections faster and easier than ever.

Not just for anchors, PROFIS designs, calculates and analyses multiple fixings, including steel to concrete, concrete to concrete and baseplate solutions that are more reliable, more cost-effective and code-compliant. It's based on the latest model building codes and regulations including Eurocode 2. The software also comes with application specific engineering trainings that enable you to unlock the full potential of PROFIS.

## GAME-CHANGING FEATURES



Concrete to concrete module in Profis Engineering includes extensive design options TO SOLVE EXTENSIONS, STRUCTURAL JOINTS & OVERLAY



- For different loads — static, seismic, fire resistance and fatigue resistance
- For different conditions — dry or wet concrete
- For different drilling methods — hammer drilling or diamond drilling with or without a roughening tool



Select  
the right mortar

Design  
with standardized and  
compliant methods

Install  
properly as designed

# INSTALL PROPERLY AS DESIGNED

Safer, Faster, Easier Way to  
Install Rebar



DRILLING & CLEANING

Virtually dust-free jobsite environment!

## MINIMIZE HEALTH & SAFETY RISK

Hilti Active Vibration Reduction (AVR) technology makes working with the power tools less tiring and increases productivity. A Dust Removal System (DRS) protects workers from dangerous silica dust.

## SAVE INSTALLATION TIME AND COMPLEXITY

Drilling and hole cleaning in one-step installation replaces the manual blow-brush-blow steps. This approved installation system with optimal hole cleaning helps anchors carry their load values safely and consistent anchor setting.



INJECTION

Correct Installation, every time!

## LESS MORTAR WASTAGE BUT MORE ACCURACY

Hilti Volume Calculator mobile app helps find out the ideal volume based on your specific mortar, anchor, embedment depth and drilling diameter. The cordless adhesive dispenser increases installation speed and accuracy.

## RELIABLE INSTALLATION BY QUALIFIED PERSONNEL AND INSPECTION

Qualify personnel with Hilti Rebar Installer Training (RIT) service, which helps ensure proper installation following the right procedure. Hilti on-site testing service help verify the adherence to the installation instruction and design specification.

# CONTACT US FOR REBAR SOLUTIONS

Hilti can help you eliminate your day-to-day post-installed rebar challenges by providing you with a safer, faster and easier way to design and install rebar. Request a live product demo, learn more about PROFIS design or ask about onsite support and training.


## More technical resources and services



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