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TECHNICAL REPORT

Design of post-installed rebar connections, bonded fasteners, and mechanical fasteners for use in concrete for a service life up to 120 years

TR 086

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EOTA WG “33 - Fixings” convened by TAB CSTB

The table of contents should only show 3 - 4 levels (essential characteristics/specific intended use(s) should be seen) and should preferably not be longer than 2 pages.

Contents

1 SCOPE OF THE TECHNICAL REPORT

1.1 Description

This Technical Report (TR) covers the requirements for the design of post-installed rebars, and post-installed fastenings intended for a working life of 50, 100 and 120 years.

The design method included in this TR covers static and quasi-static, seismic, and fire loading conditions. Fatigue loading conditions are not covered by this TR.

This TR is only applicable to post-installed rebar connections with mortar that hold European Technical Assessments (ETAs) based on EAD330087 [1], and to post-installed fastening systems that hold European Technical Assessments (ETAs) based on EAD330499 [2] or EAD330232 [3].

1.2 Relevance

This Technical Report (TR) does not cover the design of reinforced or unreinforced concrete members that are part of the connection. The design of these members shall be carried out in compliance with the requirements of appropriate and applicable Standards.

This TR does not purport to address all the safety concerns, if any, associated with its use. It is the responsibility of the user of this technical report to establish appropriate safety practices and determine the applicability of regulatory limitations prior to use.

2 DESIGN

2.1 Design of post-installed rebar connections with mortar

2.1.1 Static and quasi static loading

The provisions given in EN 1992-1-1 [4] for cast-in rebars for designs intended for a working life of up to 50 years shall be applicable to post-installed rebars system qualified in accordance with EAD330087 [1] and an intended working life of up to 50 years.

The provisions given in EN 1992-1-1 [4] for cast-in rebars for designs intended for a working life of up to 100 years shall be applicable to post-installed rebars system qualified in accordance with EAD330087 [1] and an intended working life of up to 100 years.

The design of post-installed rebar systems qualified in accordance with EAD330087 [1] and an intended working life of up to 120 years shall be in accordance with the principles of EN 1992-1-1 [4] for cast-in rebars.

In all cases, the anchorage length shall be determined in accordance with EN 1992-1-1 [4] using the bond strength $f_{bd,PIR}$, $f_{bd,PIR,100y}$, or $f_{bd,PIR,120y}$ relevant to the intended working life.

2.1.2 Seismic loading

The provisions given in EN 1992-1-1 [4] and EN1998-1 [5] for cast-in rebars for designs intended for a working life of up to 50 years shall be applicable to post-installed rebars system qualified in accordance with EAD330087 [1] and an intended working life of up to 50 years.

The provisions given in EN 1992-1-1 [4] and EN1998-1 [5] for cast-in rebars for designs intended for a working life of up to 100 years shall be applicable to post-installed rebars system qualified in accordance with EAD330087 [1] and an intended working life of up to 100 years.

The design of post-installed rebar systems qualified in accordance with EAD330087 [1] and an intended working life of up to 120 years shall be in accordance with the principles of EN 1992-1-1 [4] and EN1998-1 [5] for cast-in rebars.

In all cases, the anchorage length shall be determined in accordance with EN 1992-1-1 [4] using the bond strength $f_{bd,PIR,seis}$, $f_{bd,PIR,seis,100y}$, or $f_{bd,PIR,seis,120y}$ relevant to the intended working life.

2.1.3 Fire loading

The provisions given in EN 1992-1-1 [4] and EN1992-1-2 [6] for cast-in rebars for designs intended for a working life of up to 50 years shall be applicable to post-installed rebars system qualified in accordance with EAD330087 [1] and an intended working life of up to 50 years.

The provisions given in EN 1992-1-1 [4] and EN1992-1-2 [6] for cast-in rebars for designs intended for a working life of up to 100 years shall be applicable to post-installed rebars system qualified in accordance with EAD330087 [1] and an intended working life of up to 100 years.

The design of post-installed rebar systems qualified in accordance with EAD330087 [1] and an intended working life of up to 120 years shall be in accordance with the principles of EN 1992-1-1 [4] and EN1992-1-2 [6] for cast-in rebars.

In all cases, the anchorage length shall be determined in accordance with EN 1992-1-1 [4] using the bond strength $f_{bd,fi}$, $f_{bd,fi,100y}$, or $f_{bd,fi,120y}$ relevant to the intended working life.

2.2 Design of post-installed fasteners

2.2.1 Static and quasi static loading

The provisions given in EN 1992-4 [5] for the design of fastenings for use in concrete intended for a working life of up to 50 years shall be applicable to fasteners qualified in accordance with EAD330499 [2] or EAD330232 [3] and an intended working life of up to 50 years.

The design of post-installed fastening systems qualified in accordance with EAD330499 [2] or EAD330232 [3] and an intended working life of up to 100 or 120 years shall be in accordance with the principles of EN 1992-4 [5] for design of fastenings for use in concrete.

In all cases, the anchorage design shall be determined in accordance with EN1992-4 [7] using the performance (e.g., $\tau_{Rk,100,cr}$ for bonded fasteners, $N_{Rk,p,100,cr}$ for mechanical fasteners) relevant to the intended working life in cracked or uncracked concrete.

2.2.2 Seismic loading

The provisions given in EN 1992-4 [7] for the design of fastenings for use in concrete intended for a working life of up to 50 years shall be applicable to fasteners qualified in accordance with EAD330499 [2] or EAD330232 [3] and an intended working life of up to 50 years.

The design of post-installed fastening systems qualified in accordance with EAD330499 [2] or EAD330232 [3] and an intended working life of up to 100 or 120 years shall be in accordance with the principles of EN 1992-4 [7] for design of fastenings for use in concrete.

In all cases, the anchorage design shall be determined in accordance with EN1992-4 [7] using the performance (e.g., $\tau_{Rk,100,C2}$ for bonded fasteners, $N_{Rk,p,100,C2}$ for mechanical fasteners) relevant to the intended working life.

2.2.3 Fire loading

The provisions given in EN 1992-4 [7] and EOTA TR082 [8] for the design of fastenings for use in concrete intended for a working life of up to 50 years shall be applicable to fasteners qualified in accordance with EAD330499 [2] or EAD330232 [3] and an intended working life of up to 50 years.

The design of post-installed fastening systems qualified in accordance with EAD330499 [2] or EAD330232 [3] and an intended working life of up to 100 or 120 years shall be in accordance with the principles of EN 1992-4 [7] and EOTA TR082 [8] for design of fastenings for use in concrete.

In all cases, the anchorage design shall be determined in accordance with EN1992-4 [7] and EOTA TR082 [8] using the performance relevant to the intended working life as basis for the determination of the anchor resistances under fire conditions (e.g., $\tau_{Rk,fi,p,100y}(\theta) = k_{fi,p}(\theta) \cdot \tau_{Rk,100,cr}$ for bonded fasteners).

Note: For bonded fasteners the reduction factor for bond resistance under fire exposure, $k_{fi,p}(\theta)$, is independent of the intended working life.

3 REFERENCE DOCUMENTS

As far as no edition date is given in the list of thereafter, the publication in its current version is of relevance.

1	EAD 330087	Systems for post-installed rebar connections with mortar
2	EAD 330499	Bonded fasteners and bonded expansion fasteners for use in concrete
3	EAD 330232	Mechanical fasteners for use in concrete
4	EN 1992-1-1:2004/AC:2010/A1:2014	Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings
5	EN 1998-1:2004/AC:2009/A1:2013	Eurocode 8: Design of structures for earthquake resistance – Part 1: General rules, seismic actions and rules for buildings
6	EN 1992-1-2:2004/AC:2008/A1:2019	Eurocode 2: Design of concrete structures - Part 1-2: General rules - Structural fire design
7	EN 1992-4:2018	Eurocode 2 – Design of concrete structures – Part 4: Design of fastenings for use in concrete
8	EOTA TR082	Design of bonded fasteners in concrete under fire conditions, April 2024