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Institute for Building Materials, Concrete Construction and Fire Protection | Braunschweig Civil Engineering Materials Testing Institute

Materialprüfanstalt (MPA) für das Bauwesen · Beethovenstr. 52 · D-38106 Braunschweig

B+Btec BV
Munterij 8
4762 AH Zevenbergen
Niederlande

Letter **8724/2013**

Our Ref.:	(3475/602/13)-NB
Customer-No.:	14305
Official in Charge:	Frau Bollmohr
Dept.:	BS
Contact:	0531-391-5461
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Your Ref.:	
Your message of:	
Date:	31.05.2013

Extension of the validity of Test Report No. (3349/800/10)-NB of 25/06/2010, "B+Btec Injection system BIS-V for concrete" bonded anchor

Dear Sir or Madam,

In reply to your enquiry we wish to inform you that the statements made in the above Test Report No. (3349/800/10)-NB of 25/06/2010 regarding the reaction to fire of centrically tensioned

"B+Btec Injection system BIS-V for concrete"

bonded anchors, with M8 to M30 anchor rods made from electrogalvanised steel (strength class ≥ 5.8) or

with M8 to M30 anchor rods made from A4 stainless steel or HCR steel (strength class ≥ A70),

which are set in uncracked reinforced concrete (strength class between ≥ C20/25 and ≤ C50/60) and exposed on one side to a fire in accordance with the DIN EN 1363-1 : 1999-10 standard temperature-time curve (ETK), continue to apply until 6 March 2018.

This letter consists of 4 pages and contains an abstract of the above Test Report.

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Notified body (0761-CPD)
MPA Braunschweig has been approved and notified as a civil engineering testing, inspection and certifying body. MPA Braunschweig has been accredited as a testing and calibration laboratory in compliance with ISO/IEC 17025, and as an inspection body in compliance with ISO/IEC 17020.

1 General

In view of the results that were achieved in the fire test, the fire resistance times that are listed in the tables in section 2 below can be assigned to the "B+Btec Injection system BIS-V for concrete" bonded anchors as a function of the maximum tensile loads, due consideration being to the notes in section 3 below. The edge and centre distances have to be selected so that the steel failure / the mortar failure (failure as a result of ETK temperature exposure) becomes decisive.

If the edge distance c is so large that steel failure becomes the failure mode, the load values in tables 1 to 2 can also be transferred to anchors that are subjected to lateral loads.

2 Evaluation of test results

Table 1: Fire resistance times of the "B+Btec Injection system BIS-V for concrete" bonded anchor in conjunction with M8 to M30 anchor rods made from electrogalvanised steel strength class ≥ 5.8) as a function of the maximum tensile load

Designation	**Fire resistance time in minutes**			
"B+Btec Injection system BIS-V for concrete" bonded anchor[1)]	**30 max. N [kN]**	**60 max. N [kN]**	**90 max. N [kN]**	**120 max. N [kN]**
M8	≤ 1.64	≤ 1.12	≤ 0.59	≤ 0.33
M10	≤ 2.60	≤ 1.77	≤ 0.94	≤ 0.52
M12	≤ 3.35	≤ 2.59	≤ 1.82	≤ 1.44
M16	≤ 6.25	≤ 4.82	≤ 3.40	≤ 2.69
M20	≤ 9.75	≤ 7.52	≤ 5.30	≤ 4.19
M24	≤ 14.04	≤ 10.84	≤ 7.64	≤ 6.04
M30	≤ 18.26	≤ 14.10	≤ 9.94	≤ 7.86

1) When rating fasteners it has to be checked whether the permissible loads of the general type approvals (e.g. ETA-10/0128) are decisive.

Table 2: Fire resistance times of the "B+Btec Injection system BIS-V for concrete" bonded anchor in conjunction with M8 to M30 anchor rods made from A4 stainless steel or HCR steel as a function of the maximum tensile load

Designation	Fire resistance time in minutes			
"B+Btec Injection system BIS-V for concrete" bonded anchor[1)]	30 max. N [kN]	60 max. N [kN]	90 max. N [kN]	120 max. N [kN]
M8	≤ 1.64	≤ 1.12	≤ 0.59	≤ 0.33
M10	≤ 2.60	≤ 1.77	≤ 0.94	≤ 0.52
M12	≤ 3.35	≤ 2.59	≤ 1.82	≤ 1.44
M16	≤ 6.25	≤ 4.82	≤ 3.40	≤ 2.69
M20	≤ 9.75	≤ 7.52	≤ 5.30	≤ 4.19
M24	≤ 14.04	≤ 10.84	≤ 7.64	≤ 6.04
M30	≤ 18.26	≤ 14.10	≤ 9.94	≤ 7.86

1) When rating fasteners it has to be checked whether the permissible loads of the general type approvals (e.g. ETA-10/0128) are decisive.

3 Special notes

The above-mentioned Test Report, together with this extension, does not replace an approval (Building Code Test Certificate - abP, National Technical Approval - abZ, European Technical Approval - ETA) that is required under the German building code procedure. It should, in addition, be noted that load values under fire exposure conditions may in the future be regulated by European Technical Approvals.

The above assessment only applies to the tested "B+Btec Injection system BIS-V for concrete" bonded anchors on the basis of the conditions that are set out in the Technical Data Sheets of B+Btech BV. The anchors must be installed in accordance with the specification provided by B+Btech BV and in accordance with valid type approval (ETA, abZ).

The assessment for the above "B+Btec Injection system BIS-V for concrete" bonded anchors only applies in connection with substrates made from reinforced concrete (strength class ≥ C20/25 and ≤ C50/60) that can at least be classified under a fire resistance class that corresponds to the fire resistance class of the anchors.

The validity of Test Report No. (3349/800/10)-NB of 25/06/2010 will in connection with this letter expire on 06/03/2018.

Yours sincerely

i. A.
ORR Dr.-Ing. Rohling
Head of Testing Laboratory

i. A.
Dipl.-Ing. Bollmohr
Engineer in Charge

iBMB MPA TU BRAUNSCHWEIG

Institut für Baustoffe, Massivbau und Brandschutz | Materialprüfanstalt für das Bauwesen

Test Report

Document No.:	(3349/800/10) – NB dated 25.06.2010
Client:	B+BTec BV Munterij 8 4762 AH Zevenbergen Niederlande
Order date:	09.02.2010
Order Ref.:	Herr Jeroen Nijland
Order received:	21.05.2010
Subject:	"B+Btec Injection System BIS-V for concrete", bonded anchors placed in the non-cracked tension zone of RC floor sections, strength class ≥C20/25, and subjected to centric tension loads, to be tested and evaluated in connection with anchor rods (dimensions M8 to M30) for their reaction to fire to determine their fire resistance time
Test basis:	DIN EN 1363-1 : 1999-10
Test material received:	Week 46/2006
Sampling:	The Testing House does not have any information indicating official sampling.
Test material marking:	None
Test date:	21/11/2006, 28/11/2006, 06/12/2006, 24/01/2007 and 20/02/2007
Valid until:	06/03/2013

This Test Report consists of 8 pages, incl. cover and 11 annexes.

The Test Report No.: (3349/800/10) – NB dated 25.06.2010 does not replace a General Building Code Test Certificate (abP; abZ, ETA) according to the German Laender Building Regulations.

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Steuer-Nr.: 14/201/22859
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Notified body (0761-CPD)
Die MPA Braunschweig ist für Prüfung, Überwachung, Inspektion und Zertifizierung bauaufsichtlich anerkannt und notifiziert. Die MPA Braunschweig ist als Prüf- und Kalibrierlaboratorium nach ISO/IEC 17025 und als Inspektionsstelle nach ISO/IEC 17020 akkreditiert.

Contents

1 Background and general statement

Under the order placed with the Testing House, a Test Report was to be drawn up on the reaction to fire of "B+Btec Injection System BIS-V for concrete" bonded anchors, which are subjected to centric tension and tested for steel failure in compliance with section 2.3 of TR 020 : 2004-05, when exposed to a fire in compliance with DIN EN 1363-1 : 1999-10 to determine their fire resistance time.

Related documents:

(1) DIN EN 1363-1 : 1999-10, Fire resistance tests - Part 1: General requirements,

(2) EOTA Technical Report TR 020 : 2004-05 - Evaluation of anchorages in concrete concerning resistance to fire,

(3) "B+Btec Injection System BIS-V for concrete", European Technical Approval ETA-10/0128 of 10-05-2010, issued by DIBt, Berlin,

(4) is a transfer of Test Report No. (3290/0966)-NB dated 06-03-2008. The injection adhesive anchors evaluated in the present Test Report are per statement of the client identical with the anchors evaluated in the Test Report No. (3290/0966)-NB. This document is the translated version of Test Report No. (3290/0966)-NB dated 06-03-2008. The german version is the only legally binding text.

Using the results achieved in the fire test, the "B+Btec Injection System BIS-V for concrete" were to be examined and evaluated respecting requirements (steel failure, pullout) specified in EOTA Technical Report TR 020 : 2004-05.

2 Description of system tested

The "B+Btec Injection System BIS-V for concrete" bonded anchor is an injection system that uses the bonding effect between anchor rod, bonding mortar and concrete to become anchored in the substrate. According to the type approval for cold design of anchoring means primarily subjected to static loads, the "B+Btec Injection System BIS-V for concrete" bonded anchor may be used in reinforced and non-reinforced normal-weight concrete (strength class C20/25 as a minimum and C50/60 as a maximum) in the non-cracked concrete.

Main elements of the tested "B+Btec Injection System BIS-V for concrete" bonded anchor are a two-component mortar cartridge (injection mortar: styrene-free vinylester resin system with cement, water and sand) and cold-formed anchor rods (dimensions M8 to M30), together with a hexagon nut and a washer. The anchor rods and the nuts and washers are made from electro-galvanized steel (strength class ≥5.8) and from stainless steel (material No. 1.4401 (A4) and 1.4571 (A5), 1.4529 (HCR), strength class 70). Forces are transmitted by the bond stress between the anchor rod and the anchoring substrate. For the service conditions, the "B+Btec Injection System BIS-V for concrete" bonded anchor is regulated by the above-named approval.

As specified in the above type approval, the "B+Btec Injection System BIS-V for concrete" bonded anchors were installed with the installation tools (hammer drill and drill, cleaning device and injection device) defined in these documents.

Further structural details and details of the as-installed condition of the bonded anchors are shown annexes 1.1 to 1.4 of this Test Report.

3 Test set-up and testing

The "B+Btec Injection System BIS-V for concrete" bonded anchors were fire tested in a small-sized furnace with the inside dimensions 1,000 mm x 1,500 mm x 1,500 mm (W x D x H). RC slabs (strength class C20/25) formed the horizontal barrier, into the tension zones of which the "B+Btec Injection System BIS-V for concrete" bonded anchors were placed.

In compliance with TR 020 : 2004-05, section 2.3.1, external loading systems and protected steel elements (dead loads) of the required weight, which were suspended for an unsupported and

unprotected length of l ≤500 mm with tension rods and an additional steel adapter, were used for introducing the centric loads into the "B+Btec Injection System BIS-V for concrete" bonded anchors.

The furnace was exposed to a fire in compliance with the standard temperature-time curve (ETK) as specified in DIN EN 1363-1 : 1999-10, section 5.1.1. The temperatures in the furnace were measured with 2 plate thermometers with measuring heads made from Ni-Cr/Ni-Al wire (type K) dia. 1.0 mm in compliance with DIN EN 1363-1 : 1999-10, section 4.5.1.1.

The temperatures measured in the furnace during the fire tests are illustrated by the graphs in annexes 2.1, 3.1, 4.1, 5.1 and 6.1.

4 Test results, evaluation and conclusions

4.1 Evaluation of test results respecting centric tension loading

On 21/11/2006, 28/11/2006, 06/12/2006, 24/01/2007 and 20/02/2007, a total of 23 "B+Btec Injection System BIS-V for concrete" bonded anchors were placed in the non-cracked tension zone of RC floor sections (strength class C20/25) and tested for their reaction to fire when subjected to centric tension loads in compliance with DIN EN 1363-1 : 1999-10 to determine their fire resistance time.

Tables 4-1 to 4-5 in Test Report No. (3290/0966)-NB dated 06-03-2008 list the test results for the 23 "B+Btec Injection System BIS-V for concrete" bonded anchors in connection with anchor rods made from electro-galvanized steel and stainless steel and make reference to the cause of failures.

4.2 Evaluation of test results respecting steel failure

4.2.1 General

The basis used for evaluation was section 2.3.1 of EOTA Technical Report TR 020 : 2004-05:

$\sigma_{s1} = c_1 + c_2 / t_u$ equation: regression curve

$\sigma_{s2} = c_3 (c_1 + c_2 / t_u)$ equation: design curve

Equations for determination of the characteristic steel stress for fire resistance times of 60 min., 90 min. and 120 min.:

$\sigma_{Rk,s,fi(60)} = c_3 (c_1 + c_2 / 60\ min)$

$\sigma_{Rk,s,fi(90)} = c_3 (c_1 + c_2 / 90\ min)$

$\sigma_{Rk,s,fi(120)} = c_3 (c_1 + c_2 / 120\ min)$

Equation for determination of the characteristic steel stress for fire resistance times of 30 min., using the equation of the straight line through points t_u = 60 min/ $\sigma_{Rk,s,fi(60)}$ and t_u = 90 min/ $\sigma_{Rk,s,fi(90)}$:

$\sigma_{Rk,s,fi(30)} = c_4 - c_5 \times 30\ min$

To calculate the tensile stress, the stress cross section A_s of the corresponding diameter of the "B+Btec Injection System BIS-V for concrete" bonded anchors was entered in the computation.

4.2.2 Presentation of test results and evaluation

The graphs in annex 7.1 show the test results as a function of the stress sigma s of the "B+Btec Injection System BIS-V for concrete" bonded anchors made from electro-galvanized steel and stainless steel A4 (diameter M8 to M16) when subjected to centric tensile loads.

The "B+Btec Injection System BIS-V for concrete" bonded anchors with the dimensions M24 to M30 are evaluated on the basis of the steel stress utilization level in relation to the stress cross section.

4.2.3 Proposed rating for the "B+Btec Injection System BIS-V for concrete" bonded anchors (dimensions M8 to M30) in connection with anchor rods made from electro-galvanized steel (strength class ≥ 5.8)

Using the results achieved in the tests as a basis, fire resistance periods are proposed for the "B+Btec Injection System BIS-V for concrete" bonded anchors (dimensions M8 to M30) made from electro-galvanized steel as shown in table 4-1 below as a function of the maximum centric tensile load.

Based on the results achieved in the tests, and departing from the evaluation specifications in TR 020 : 2004-05, the ratings for "B+Btec Injection System BIS-V for concrete" bonded anchors made from electro-galvanized steel have been increased with regard to the 30-minute fire resistance time.

Table 4-1: Proposed rating for "B+Btec Injection System BIS-V for concrete" bonded anchors (dimensions M8 – M30) made from electro-galvanized steel and stainless steel, regarding their fire resistance times as a function of stress σ_s when exposed to centric tensile loads

Designation	**"B+Btec Injection System BIS-V for concrete" bonded anchor**						
Fire resistance time t_u [min]	**Maximum tensile load[1)] F [kN]**						
	M8	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Minimum set depth [mm]	80	90	110	125	175	210	280
30	1.64	2.60	3.35	6.25	9.75	14.04	18.26
60	1.12	1.77	2.59	4.82	7.52	10.84	14.10
90	0.59	0.94	1.82	3.40	5.30	7.64	9.94
120	0.33	0.52	1.44	2.69	4.19	6.04	7.86

[1)] Loads resulting from European Technical Approval ETA-10/0128 of 10-05-2010 may be decisive for the service condition.

4.2.4 Proposed rating for the "B+Btec Injection System BIS-V for concrete" bonded anchors (dimensions M8 – M30) in connection with anchor rods made from stainless steel

Starting from the results achieved in the tests, the same characteristic tensile stresses (cf. table 4-1) are recommended for the "B+Btec Injection System BIS-V for concrete" bonded anchors, when adequate anchor rods made from stainless steel (material No. 1.4401 (A4) or 1.4571 (A5), 1.4529 (HCR), strength class 70) and nuts made from stainless steel (A4, strength class A-70) are used.

5 Annotations

5.1 This Test Report does not replace the attestation (General Building Code Test Certificate - abP; National Technical Approval - abZ, ETA) required under the German building code procedure. It should, in particular, be noted that the fire load density values of "B+Btec Injection System BIS-V for concrete" bonded anchors can in the future be regulated by European Technical Approvals.

5.2 The above evaluation shall only apply to the tested "B+Btec Injection System BIS-V for concrete", bonded anchors due consideration being given to the boundary conditions shown in the technical annexes attached to this Test Report and/or the technical data sheets of B+BTec BV.

5.3 The "B+Btec Injection System BIS-V for concrete" bonded anchors may be used for anchoring applications in non-cracked reinforced concrete (strength class C20/25 as a minimum and C50/60 as a maximum) when primarily subjected to static loads.

5.4 The evaluation shall only apply in connection with members made from reinforced concrete, which can as a minimum be classified under the same fire resistance class as that of the anchors.

5.5 The validity of the Test Report will expire on 06/03/2013.

This document is the translated version of Test Report No. (3290/0966)-NB dated 06-03-2008. The legally binding text is the aforementioned German Test Report.

ORR Dr.-Ing. Rohling
Head of Testing Laboratory

Materialprüfanstalt f. d. Bauwesen MPA BS 3.1 Braunschweig

by order
Dipl.-Ing. Bollmohr
Engineer in charge

Braunschweig, dated 25.06.2010

List of annexes

Annex 1.1: Structural design of the test installation

Annex 1.2: "B+Btec Injection System BIS-V for concrete" bonded anchors after installation

Annex 1.3: Technical details of "B+Btec Injection System BIS-V for concrete"

Annex 1.4: Technical details of "B+Btec Injection System BIS-V for concrete"

Annex 1.5: Technical details of "B+Btec Injection System BIS-V for concrete"

Annex 2.1: Furnace temperatures – test 1

Annex 3.1: Furnace temperatures – test 2

Annex 4.1: Furnace temperatures – test 3

Annex 5.1: Furnace temperatures – test 4

Annex 6.1: Furnace temperatures – test 5

Annex 7.1: Evaluation of test results - "B+Btec Injection System BIS-V for concrete"