TITAN F

ANGLE BRACKET FOR SHEAR LOADS

DESIGN REGISTERED

ETA-11/0496

LOW HOLES
Ideal for TIMBER FRAME, designed for fastening on platform beams or on the studs of the frame structures. It also has certified values for use with partial nailing.

TIMBER FRAME
Thanks to the lowered position of the holes on the vertical flange, it offers excellent shear strength values even on low height platform beams (38 mm | 2''). $R_{2,k}$ up to 51.8 kN on concrete and 55.1 kN on timber.

HOLES FOR CONCRETE
The TITAN angle bracket are designed to offer two fastening possibilities, in order to avoid interference with the rods in the concrete support.

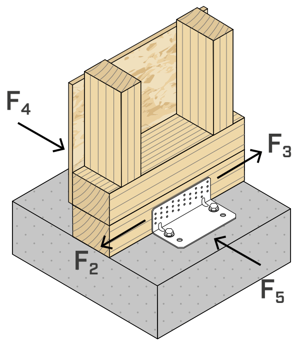
USA, Canada and more design values available online.

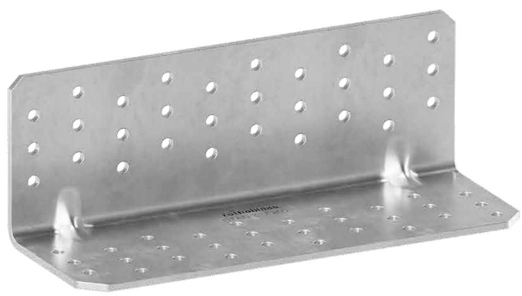
SERVICE CLASS SC1 SC2

MATERIAL

DX51D Z275 — **TITAN F**: DX51D + Z275 carbon steel.

EXTERNAL LOADS





FIELDS OF USE

Shear joints for timber walls.
Optimised for fastening frame walls.
Timber-to-timber, timber-to-concrete and timber-to-steel configurations.

Can be applied to:
- solid timber and glulam
- timber frame
- CLT and LVL panels

TIMBER-TO-TIMBER

Ideal for shear joints between floor and wall and between wall and wall. The high shear strength allows to optimize the number of fastenings.

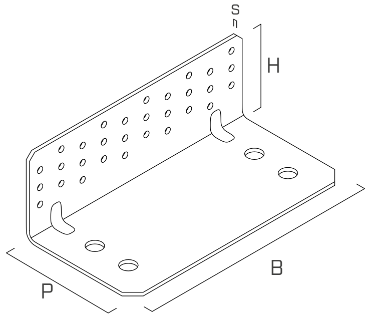
PARTIAL NAILING

Partial nailing allows installation even with the presence of bedding grout. It can also be used on thin frame walls (38 mm | 2'').

CODES AND DIMENSIONS

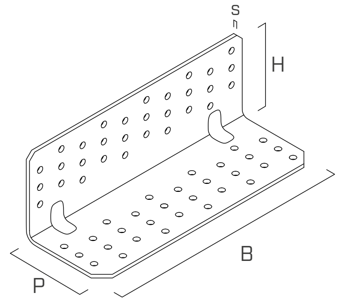
TITAN F - TCF | CONCRETE-TO-TIMBER JOINTS

CODE	B [mm] *[in]*	P [mm] *[in]*	H [mm] *[in]*	holes [mm] *[in]*	n_V Ø5 *n_V Ø0.20* [pcs]	s [mm] *[in]*		pcs
TCF200	200 *8*	103 *4 1/16*	71 *2 13/16*	Ø13 *Ø0.52*	30	3 *0.12*	●	10



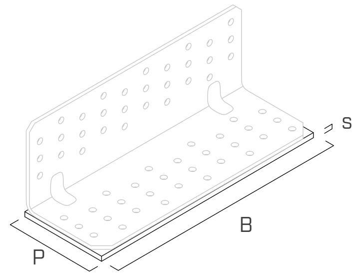
TITAN F - TTF | TIMBER-TO-TIMBER JOINTS

CODE	B [mm] *[in]*	P [mm] *[in]*	H [mm] *[in]*	n_H Ø5 *n_H Ø0.20* [pcs]	n_V Ø5 *n_V Ø0.20* [pcs]	s [mm] *[in]*		pcs
TTF200	200 *8*	71 *2 13/16*	71 *2 13/16*	30	30	3 *0.12*	●	10



ACOUSTIC PROFILE | TIMBER-TO-TIMBER JOINTS

CODE	type	B [mm] *[in]*	P [mm] *[in]*	s [mm] *[in]*		pcs
XYL3570200	XYLOFON PLATE	200 *8*	70 *2 3/4*	6 *0.24*	●	10

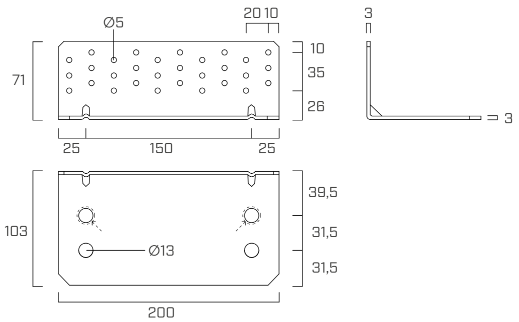


FASTENERS

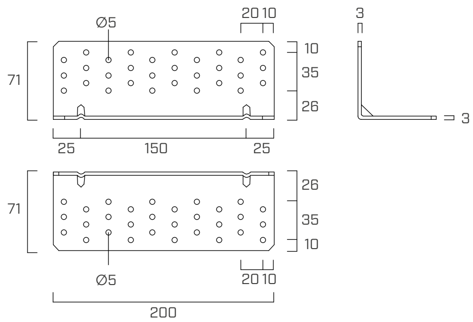
type	description		d [mm]	support	page
LBA	high bond nail		4		570
LBS	round head screw		5		571
LBS EVO	C4 EVO round head screw		5		571
AB1	CE1 expansion anchor		12		536
SKR	screw-in anchor		12		528
VIN-FIX	vinyl ester chemical anchor		M12		545
HYB-FIX	hybrid chemical anchor		M12		552
EPO-FIX	epoxy chemical anchor		M12		557

GEOMETRY

TCF200



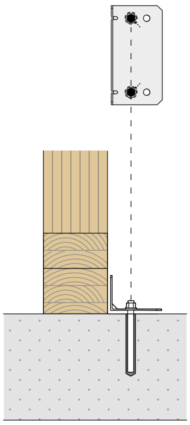
TTF200



INSTALLATION ON CONCRETE

To fix the **TITAN TCF200** angle bracket to the concrete, **2 anchors** must be used, according to one of the following installation modes:

ideal installation



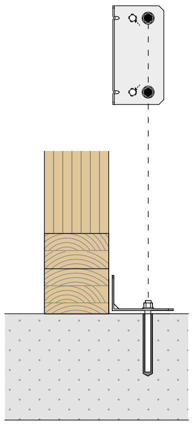
2 anchors positioned in the INTERNAL HOLES (**IN**)
(identified by a mark on the product)

$e=e_{y,IN}$

reduced stress on the anchor
(minimum e_y and k_t eccentricity)

optimized connection strength

alternative installation



2 anchors placed in the EXTERNAL HOLES (**OUT**)
(e.g. in case of clash between the anchor and the concrete support reinforcement)

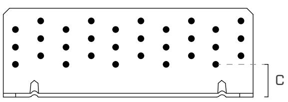
$e=e_{y,OUT}$

maximum stress on the anchor
(maximum e_y and k_t eccentricity)

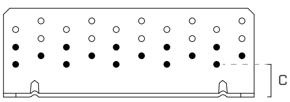
reduced connection strength

FASTENING PATTERNS

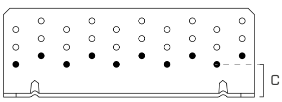
In the presence of design requirements such as $F_{2/3}$ stresses of different value or presence of sill or platform beam, it is possible to use partial fastening patterns:



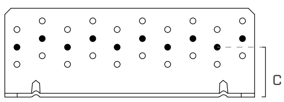
full pattern



pattern 3



pattern 2



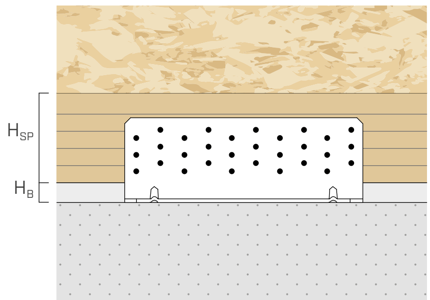
pattern 1

configuration	fastening holes Ø5			support	
	n_V [pcs]	n_H [pcs]	c [mm]		
full pattern	30	30	26	●	●
pattern 3	15	15	26	●	●
pattern 2	10	10	26	●	●
pattern 1	10	10	40	-	●

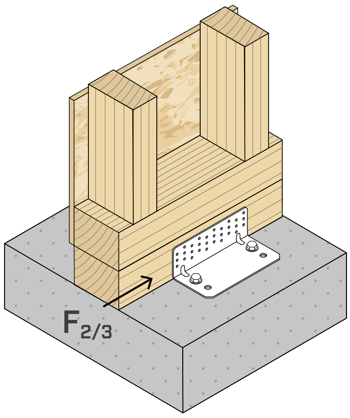
INSTALLATION

MAXIMUM HEIGHT OF THE INTERMEDIATE H_B LAYER

configuration	fastening holes Ø5		$H_{B\,max}$	$H_{SP\,min}$
	n_V	n_H	LBA Ø4 - LBS Ø5	
	[pcs]	[pcs]	[mm]	[mm]
full pattern	30	30	14	80
pattern 3	15	15	14	60
pattern 2	10	10	14	45
pattern 1	10	10	28	60



STRUCTURAL VALUES | **TCF200** | TIMBER-TO-CONCRETE | $F_{2/3}$



TIMBER STRENGTH

configuration on timber	fastening holes Ø5			$R_{2/3,k\ timber}$	$K_{2/3,ser}$
	type	Ø x L	n_V		
		[mm]	[pcs]	[kN]	[N/mm]
full pattern	LBA	Ø4 x 60	30	**48,9**	**9000**
	LBS	Ø5 x 70		**51,8**	
pattern 3	LBA	Ø4 x 60	15	**28,7**	**-**
	LBS	Ø5 x 70		**27,7**	
pattern 2	LBA	Ø4 x 60	10	**20,8**	**4000**
	LBS	Ø5 x 70		**33,4**	
pattern 1	LBA	Ø4 x 60	10	**17,2**	**3000**
	LBS	Ø5 x 70		**27,5**	

CONCRETE STRENGTH

Strength values of some of the possible fastening solutions for anchors installed in the internal (IN) or external (OUT) holes.

configuration on concrete	fastening holes Ø13			$R_{2/3,d\ concrete}$			
	type	Ø x L	n_H	IN(1)	OUT(2)	$e_{y,IN}$	$e_{y,OUT}$
		[mm]	[pcs]	[kN]	[kN]	[mm]	[mm]
uncracked	VIN-FIX 5.8	M12 x 140	2	**35,5**	**29,1**	**38,5**	**70**
	VIN-FIX 8.8	M12 x 140		**48,1**	**39,1**		
	SKR	12 x 90		**34,5**	**28,5**		
	AB1	M12 x 100		**35,4**	**28,9**		
cracked	VIN-FIX 5.8	M12 x 140		**35,5**	**29,1**		
	VIN-FIX 8.8	M12 x 140		**39,8**	**32,6**		
	SKR	12 x 90		**24,3**	**20,0**		
	AB1	M12 x 100		**35,4**	**28,9**		
seismic	HYB-FIX 8.8	M12 x 195		**29,0**	**23,8**		
	SKR	12 x 90		**9,0**	**7,3**		
	AB1	M12 x 100		**10,6**	**8,7**		

installation	anchor type		t_{fix}	h_{ef}	h_{nom}	h_1	d_0	h_{min}
	type	Ø x L [mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
TCF200	VIN-FIX 5.8/8.8 HYB-FIX 8.8	M12 x 140	3	121	121	130	14	200
	HYB-FIX 8.8	M12 x 195	3	176	176	185	14	210
	SKR	12 x 90	3	64	87	110	10	200
	AB1	M12 x 100	3	70	80	85	12	200

Precut INA threaded rod, with nut and washer: see page 562.
MGS threaded rod class 8.8 to be cut to size: see page 174.

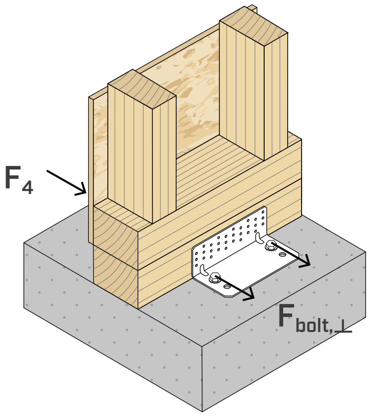
t_{fix} fastened plate thickness
h_{nom} nominal anchoring depth
h_{ef} effective anchoring depth
h_1 minimum hole depth
d_0 hole diameter in the concrete support
h_{min} concrete minimum thickness

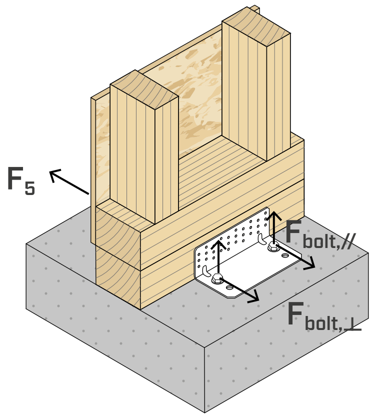
NOTES

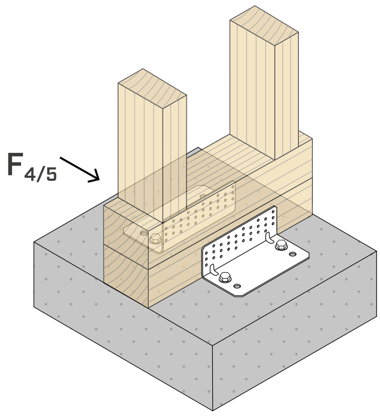
(1) Installation of the anchors in the two internal holes (IN).
(2) Installation of the anchors in external holes (OUT).

For the GENERAL PRINCIPLES of calculation, see page 249.
For the anchors verification refer to page 248.

STRUCTURAL VALUES | **TCF200** | TIMBER-TO-CONCRETE | F_4 | F_5 | $F_{4/5}$







	TIMBER				CONCRETE			
F_4	fastening holes Ø5			$R_{4,k\ timber}$	fastening holes		IN(1)	
	type	Ø x L	n_V		Ø	n_H	$k_{t\perp}$	$k_{t//}$
		[mm]	[pcs]	[kN]	[mm]	[pcs]		
full pattern	LBA	Ø4 x 60	30	**18,6**	M12	2	0,5	-
	LBS	Ø5 x 70						

The group of 2 anchors must be verified for: $V_{Sd,y} = 2 \times k_{t\perp} \times F_{4,d}$

	TIMBER				STEEL		CONCRETE			
F_5	fastening holes Ø5			$R_{5,k\ timber}$	$R_{5,k\ steel}$		fastening holes		IN(1)	
	type	Ø x L	n_V				Ø	n_H	$k_{t\perp}$	$k_{t//}$
		[mm]	[pcs]	[kN]	[kN]	γ_{steel}	[mm]	[pcs]		
full pattern	LBA	Ø4 x 60	30	**6,4**	**9,5**	γ_{M0}	M12	2	0,5	0.27
	LBS	Ø5 x 70		**19,3**						

The group of 2 anchors must be verified for: $V_{Sd,y} = 2 \times k_{t\perp} \times F_{5,d}$ $N_{Sd,z} = 2 \times k_{t//} \times F_{5,d}$

	TIMBER				CONCRETE			
$F_{4/5}$ TWO ANGLE BRACKETS	fastening holes Ø5			$R_{4/5,k\ timber}$	fastening holes		IN(1)	
	type	Ø x L	n_V		Ø	n_H	$k_{t\perp}$	$k_{t//}$
		[mm]	[pcs]	[kN]	[mm]	[pcs]		
full pattern	LBA	Ø4 x 60	30 + 30	**25,0**	M12	2 + 2	0,31	0,10
	LBS	Ø5 x 70		**28,1**				

The group of 2 anchors must be verified for: $V_{Sd,y} = 2 \times k_t \times \perp F_{5,d}$ $N_{Sd,z} = 2 \times k_{t//} \times F_{4/5,d}$

NOTES

- The F_4, F_5, $F_{4/5}$ values in the table are valid for the calculation eccentricity e=0 (timber elements prevented from rotating).

(1) Installation of the anchors in the two internal holes (IN).

For the GENERAL PRINCIPLES of calculation, see page 249.

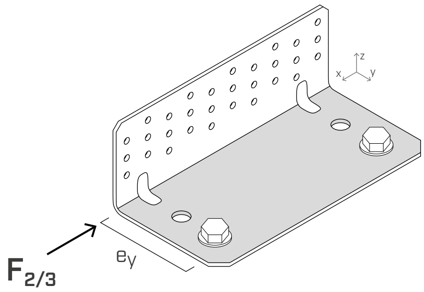
TCF200 | ANCHORS VERIFICATION FOR STRESS LOADING $F_{2/3}$

Fastening elements to the concrete through anchors shall be verified according to the load acting on the anchor, which can be evaluated through the tabulated geometric parameters (e).

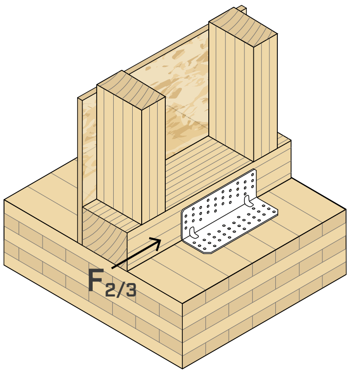
ey calculation eccentricities vary depending on the type of installation selected: 2 internal anchors (IN) or 2 external anchors (OUT).

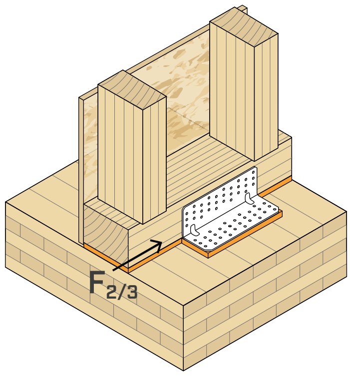
The anchor group must be verified for:

$V_{Sd,x} = F_{2/3,d}$
$M_{Sd,z} = F_{2/3,d} \cdot e_{y,IN/OUT}$



STRUCTURAL VALUES | TTF200 | TIMBER-TO-TIMBER | $F_{2/3}$





TIMBER STRENGTH

configuration on timber	fastening holes Ø5				$R_{2/3,k\ timber}$	$K_{2/3,ser}$
	type	Ø x L	n_V	n_H		
		[mm]	[pcs]	[pcs]	[kN]	[N/mm]
full pattern	LBA	Ø4 x 60	30	30	**48,9**	**10000**
	LBS	Ø5 x 70			**55,1**	
pattern 3	LBA	Ø4 x 60	15	15	**28,8**	**7000**
	LBS	Ø5 x 70			**36,3**	
pattern 2	LBA	Ø4 x 60	10	10	**20,8**	-
	LBS	Ø5 x 70			**20,0**	

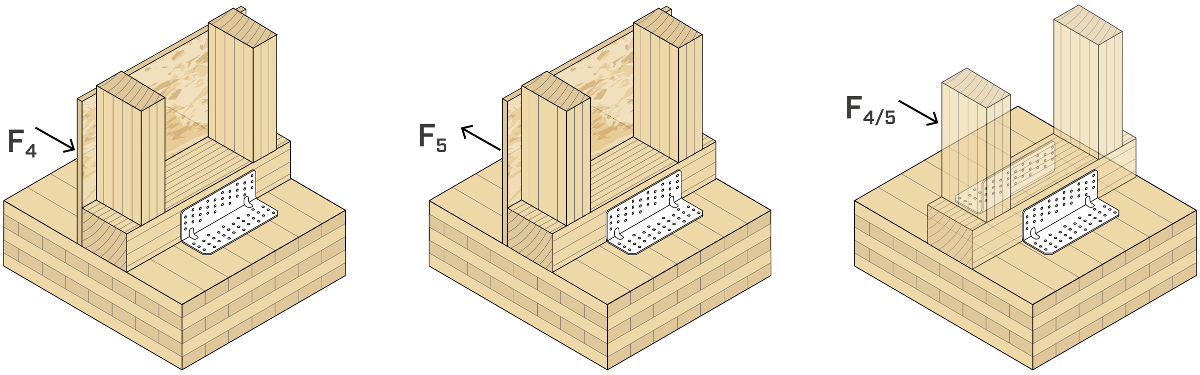
TIMBER-SIDE STRENGTH WITH ACOUSTIC PROFILE

configuration on timber	fastening holes Ø5				$R_{2/3,k\ timber}$	$K_{2/3,ser}$
	type	Ø x L	n_V	n_H		
		[mm]	[pcs]	[pcs]	[kN]	[N/mm]
full pattern + XYLOFON	LBA	Ø4 x 60	30	30	**40,8**	**7000**
	LBS	Ø5 x 70			**45,1**	
pattern 3 + XYLOFON	LBA	Ø4 x 60	15	15	**24,1**	-
	LBS	Ø5 x 70			**28,3**	

NOTES

- The F_4, F_5, $F_{4/5}$ values in the table are valid for the calculation eccentricity e=0 (timber elements prevented from rotating).

For the GENERAL PRINCIPLES of calculation, see page 249.



F_4	TIMBER			
	fastening holes Ø5			$R_{4,k\ timber}$
	type	Ø x L	n	
		[mm]	[pcs]	[kN]
full pattern	LBA	Ø4 x 60	30+30	**29,7**
	LBS	Ø5 x 70		

F_5	TIMBER				STEEL	
	fastening holes Ø5			$R_{5,k\ timber}$	$R_{5,k\ steel}$	
	type	Ø x L	n			
		[mm]	[pcs]	[kN]	[kN]	γ_{steel}
full pattern	LBA	Ø4 x 60	30+30	**6,4**	**9,5**	γ_{M0}
	LBS	Ø5 x 70		**19,3**		

$F_{4/5}$ TWO ANGLE BRACKETS	TIMBER			
	fastening holes Ø5			$R_{4/5,k\ timber}$
	type	Ø x L	n	
		[mm]	[pcs]	[kN]
full pattern	LBA	Ø4 x 60	60+60	**36,2**
	LBS	Ø5 x 70		**39,2**

GENERAL PRINCIPLES

- Characteristic values comply with the EN 1995:2014 standard in accordance with ETA-11/0496.
- Design values can be obtained from characteristic values as follows:

$$R_d = \min \begin{cases} \dfrac{R_{k,\ timber} \cdot k_{mod}}{\gamma_M} \\ R_{d,\ concrete} \end{cases}$$

  The coefficients k_{mod} and γ_M should be taken according to the current regulations used for the calculation.
- Dimensioning and verification of timber and concrete elements must be carried out separately. Verify that there are no brittle failures before reaching the connection strength.
- Structural elements in timber, to which the connection devices are fastened, must be prevented from rotating.
- A timber density of ρ_k = 350 kg/m^3 was considered for the calculation process. For higher ρ_k values, the strength on timber side can be converted by the k_{dens} value:

$$k_{dens} = \left(\frac{\rho_k}{350}\right)^{0,5} \quad \text{for } 350\ kg/m^3 \le \rho_k \le 420\ kg/m^3$$

$$k_{dens} = \left(\frac{\rho_k}{350}\right)^{0,5} \quad \text{for LVL with } \rho_k \le 500\ kg/m^3$$

- In the calculation phase, a strength class of C25/30 concrete with thin reinforcement was considered, in the absence of spacing and distances from the edge and minimum thickness indicated in the tables listing the installation parameters of the anchors used. The strength values are valid for the calculation hypothesis defined in the table; for boundary conditions different from the ones in the table (e.g. minimum distances from the edge or different concrete thickness), the concrete-side anchors can be verified using MyProject calculation software according to the design requirements.
- Seismic design in performance category C2, without ductility requirements on anchors (option a2) and elastic design according to EN 1992:2018. For chemical anchors subjected to shear stress it is assumed that the annular space between the anchor and the plate hole is filled (α_{gap}=1).
- The product ETAs for the anchors used in the concrete-side strength calculation are indicated below:
  - VIN-FIX chemical anchor according to ETA-20/0363;
  - HYB-FIX chemical anchor according to ETA-20/1285;
  - SKR screw-in anchor according to ETA-24/0024;
  - AB1 mechanical anchor according to ETA-17/0481 (M12).

INTELLECTUAL PROPERTY

- TITAN F angle brackets are protected by the following Registered Community Designs:
  - RCD 002383265-0002;
  - RCD 002383265-0004.

UK CONSTRUCTION PRODUCT EVALUATION

- UKTA-0836-22/6373.