CBM load capacity, guidelines for installation of mechanical joints

List of performance properties of Marbet CBM beams and complementary elements according to ITB-KOT-2018/0410 1st edition

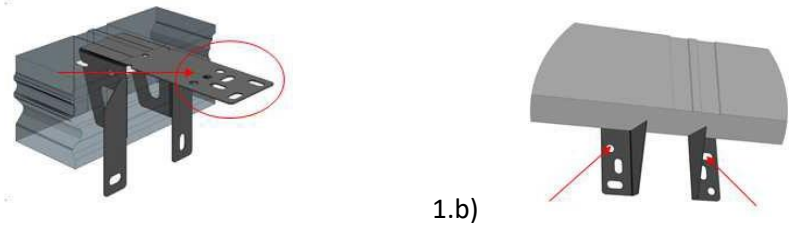
(generated based on ITB-KOT-2018/0199 1st edition from 12.03.2018 and ITB-KOT-2018/0418/0410 1st edition from 26.03.2018)

1. The type, quantity, and unit placement of CB beams is dependent on the size and type of fenestration joinery.
2. Before beginning works, it is essential to plan the number and placement of mechanical fasteners of the fenestration joinery (according to manufacturer's guidelines).
3. The places suggested by the manufacturers for the placement of anchoring screws (distance from corners, posts and mullions) apply to the elements of the brackets in the CBM system and indicate the placement of mechanical mounting elements of the CBM beam to the wall.
4. The safety and stability of the installed fenestration joinery are ensured by: the load capacity of all mechanical fasteners in all CBM beams and their attachment with adhesives to the wall.
5. Steel elements of the brackets are made of sheet metal galvanised on both sides with a thickness of 1.5 mm with the symbol DX51D Z275. The brackets are encased at the manufacturing stage in hard EPS styrofoam with a minimum density of 40kg/m^3.
6. **The calculated load capacity N_{Rd} or V_{Rd} of the fastenings of steel brackets in CBM beam mounted in the jamb is given in Table 1.**
   Static diagrams for control of the selection of mechanical fasteners to the substrate are given in Figures 2 and 3.
7. **Characteristic load capacity N_{Rk} or V_{Rk} of WHO or WHOW fasteners to pull out and shear forces in steel brackets of CBM beams is given in Table 2.** To calculate the load capacity of fasteners, the load capacities given in Table 2 should be divided by a partial safety coefficient in which γ_m = 1.33. Testing of characteristic load capacity was conducted according to the scheme presented in Figure 4.
8. During mounting and weighting of under-sill beams, a deformity of up to several millimetres in the whole system may appear. The value of this potential deformation of between 1 and 3 mm can be predicted based on the report "CBM-Consoles – detailed load capacity testing …" (10.6) and this lowering can be accounted for by raising the assumed level of the installation. The degree of deformation is a factor of the type of bracket (internal or external), the extent of protrusion of the window (60 – 160 mm), and the resulting load value which applies to the weighted steel bracket.
9. In complex and heavy assemblies, the selection of appropriate CBM beams should be entrusted to specialists.

Table 1

Item	Type of CBM element	Calculated load capacity for fastening with at least two mechanical fasteners in the lower element of the frame, VRd, NRd, kN	Calculated load capacity for fastening with at least one mechanical fastener in the upper and side element of the frame, VRd, NRd, kN
1	CBM.10.25.W[1)]	1.5	0.8
2	CBM.10.70.W[1)]	1.5	0.8
3	CBM.20.25.W[1)]	1.5	0.6
4	CBM.20.70.W[1)]	1.5	0.6
5	CBM.10.25.Z	1.5[2)]	0.8
6	CBM.10.70.Z	1.5[2)]	0.8
7	CBM.20.25.Z	1.0[3)]	0.6
8	CBM.20.70.Z	1.0[3)]	0.6

1) in CBM.10.25.W, CBM.10.70.W, CBM.20.25.W and CBM.20.70.W elements, one of the fasteners must ensure the stability of the fastening in the plane of the jamb (according to Fig.1a)
2) one mechanical fastener situated in the upper part of the steel bracket (according to Fig. 1b)
3) two mechanical fasteners situated in the upper part of the steel bracket (according to Fig. 1b)



1.a) 1.b)

Fig. 1. Diagram of placement of fasteners dependent on load capacities in Table 1

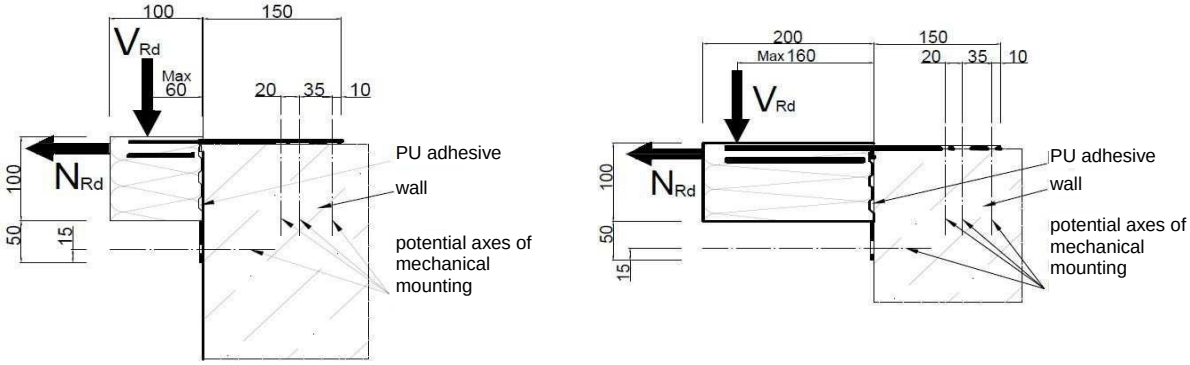


Fig.2. Diagrams of CBM static elements mounted in the jamb (symbols CBM.10.W….. or CBM.20 W….)

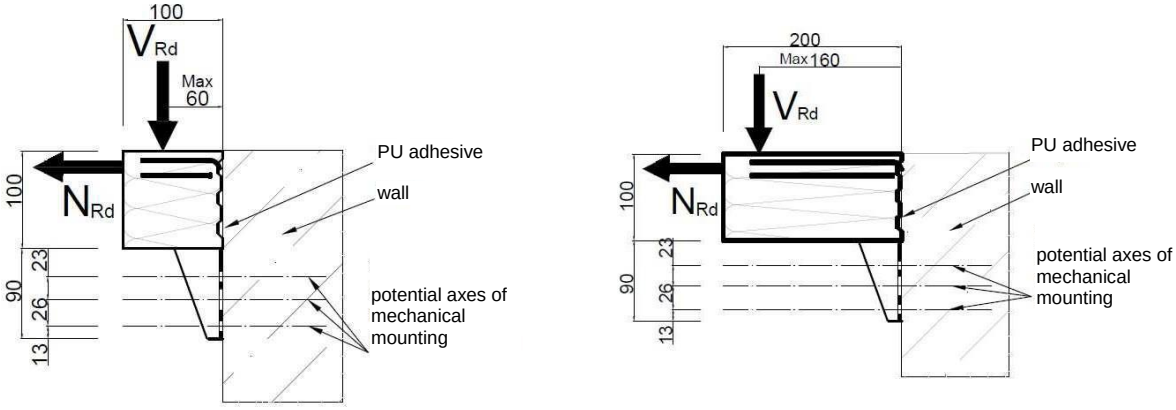


Fig. 3. Diagrams of CBM static elements mounted in the wall face (symbols CBM.10.Z….. or CBM.20. Z….)

Table 2

Item	Type of CBM element	Characteristic load capacity of WHO and WHOW fasteners for pull out from the steel bracket, N_{Rk}, kN	Characteristic load capacity of WHO and WHOW fasteners for shear force, V_{Rk}, kN
1	CBM.10.25.W CBM.10.25.Z CBM.10.70.W CBM.10.70.Z	1.83	0.63[1)] / 2.01[2)]
2	CBM.20.25.W CBM.20.25.Z CBM.20.70.W CBM.20.70.Z	1.51	0.63[1)] / 2.01[2)]

(1) for Warm Mounting Beam (CBM) with Under-sill beam (BP)

(2) for Warm Mounting Beam (CBM) without Under-sill beam (BP)

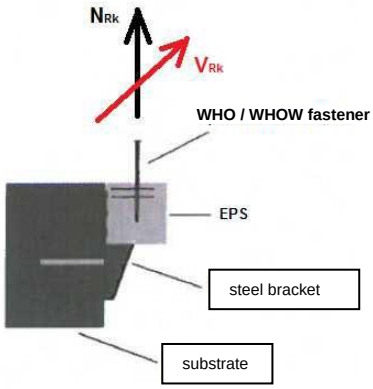


Fig. 4. Characteristic load capacities N_{Rk} and V_{Rk} for WHO or WHOW fasteners fixed in the steel bracket element of the CBM beam

10. Declared performance properties for Styrofoam goods:

Table 3.

Basic characteristics of construction material for its intended application or uses	Performance properties	Notes
Density of styrofoam (EPS), [kg/m^3]: - Under-sill beam BP.HARD - other elements	 ≥ 60 ≥ 40	
Compressive stress at 10% relative deformation, [kPa]: - Under-sill beam BP.HARD - other elements	 ≥ 600 (CS(10)600) ≥ 300 (CS(10)300)	
Declared value of thermal conductivity coefficient λ_D, at a temperature of 10°C, [W/m·K]: - Under-sill beam BP.HARD - other elements	 0.034 0.032	
Classification of reaction to fire of styrofoam elements (EPS)	E	
Durability – thickness of anti-corrosion coating of steel brackets, [µm]	≥ 20	
Calculated load capacity for pull and shear forces, N_{Rd} and V_{Rd} , of steel bracket frame plugs , [kN] [1)]	as in Table 2	
[1)] tests conducted with mechanical fasteners KPR-FAST compliant with European Technical Assessment ETA-12/0272		

11. List of reports, test reports, assessments and classifications and list of testing and certification units

List of reports, classifications, and assessments

10.1 CBM-thermal insulation, BP.HARD elements– report from test no. LZF00-02089/17/Z00NZF from 27.10.2017 , [1]
10.2 CBM- thermal insulation, CBM basic elements– report from test no. LFS00-20693/15/Z00OSK from 31.12.2015 , [3]
10.3 CBM-compressive strength testing, BP.HARD elements – report from test no. LZM00-02125/17/Z00NZF from 17.11.2017 , [4]
10.4 CBM- compressive strength testing, CBM basic elements – report from test no. LZF00-2125/17/Z00NZF from 20.11.2017 , [4]
10.5 CBM-Consoles – console type determination – testing certificate no. 01-01204/16/Z00NZE from 26.09.2016 , [1]
10.6 CBM-Consoles – detailed load capacity testing – report from test no. LZE01-01204/16/Z00NZE from 26.09.2016 , [1]
10.7 CBM-Consoles –WHO frame plug load capacity testing – report from test no. LZK00-01863/16/R32NZK from 22.08.2016 , [5]
10.8 CBM-Consoles – collective report for CBM console load capacity – report no. LZK00-2252/16/Z00NZK from 02.09.2016 , [6]
10.9 CBM-Fire – Determination of E class for EPS elements – classification no. 02427.1/16/Z00NZP from 18.12.2017 , [7]
10.10 CBM-Fire – EPS elements – report from test no. LZP01-02427/16/Z00NZP from 30.09.2016 , [7]

List of testing and certification units

[1] – Building Elements Laboratory, ITB Building Research Institute, Warsaw ul. Ksawerów 21
[3] – Thermal Physics, Acoustics, and Environment Laboratory, ITB Building Research Institute, Warsaw ul. Ksawerów 21
[4] – Building Elements Laboratory, ITB Building Research Institute, Warsaw ul. Ksawerów 21
[5] – Building Structures and Geotechnics Laboratory, ITB Building Research Institute, Katowice ul. Korfantego 191
[6] – Building Structures and Geotechnics Laboratory, ITB Building Research Institute, Warsaw ul. Filtrowa 1
[7] – Notified body no. 1488, Accredited Laboratory Group, ITB Building Research Institute, Warsaw ul. Filtrowa 1