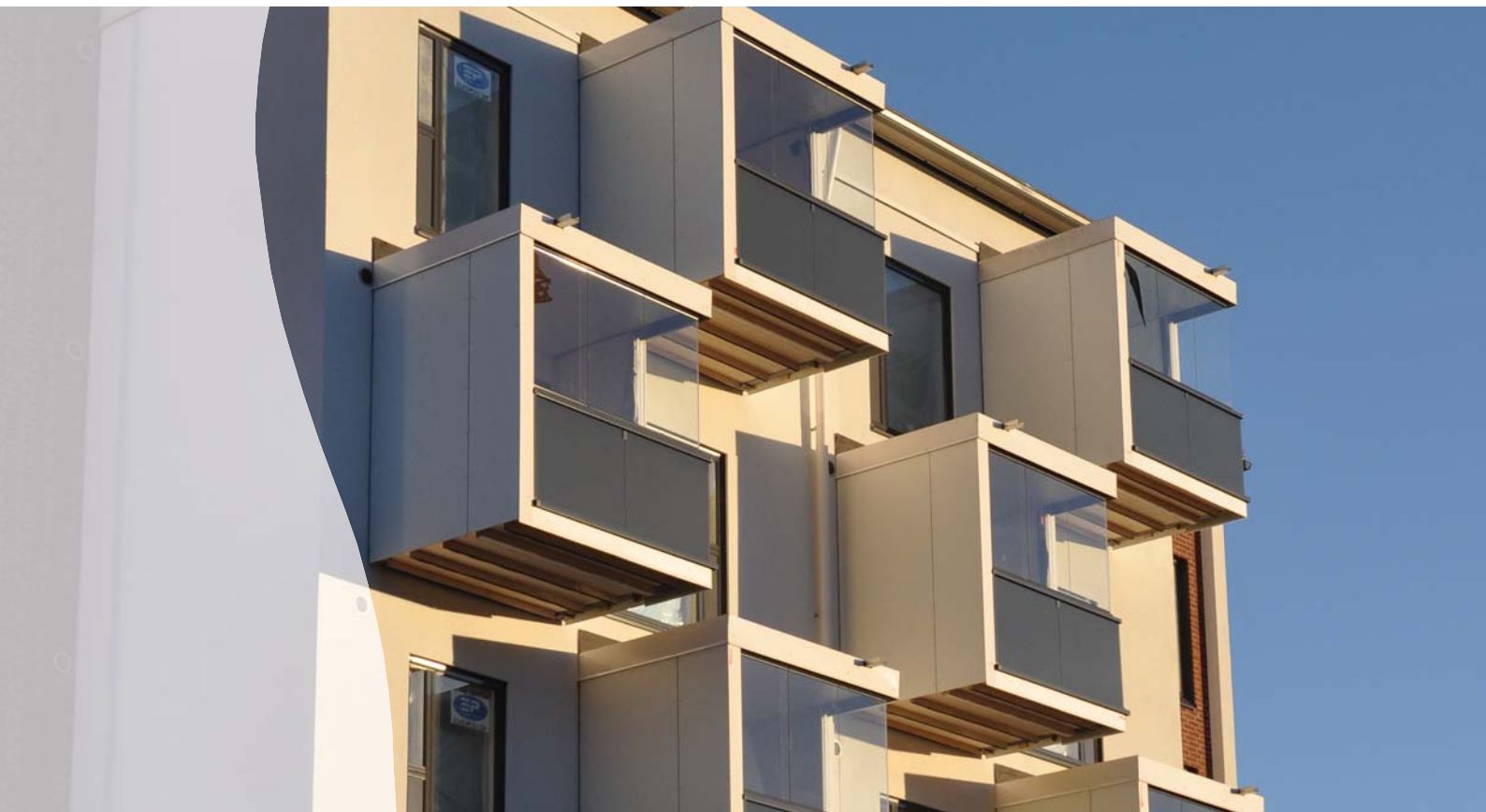


Lumon Balustrades
Technical file



This technical file is published in January 2016

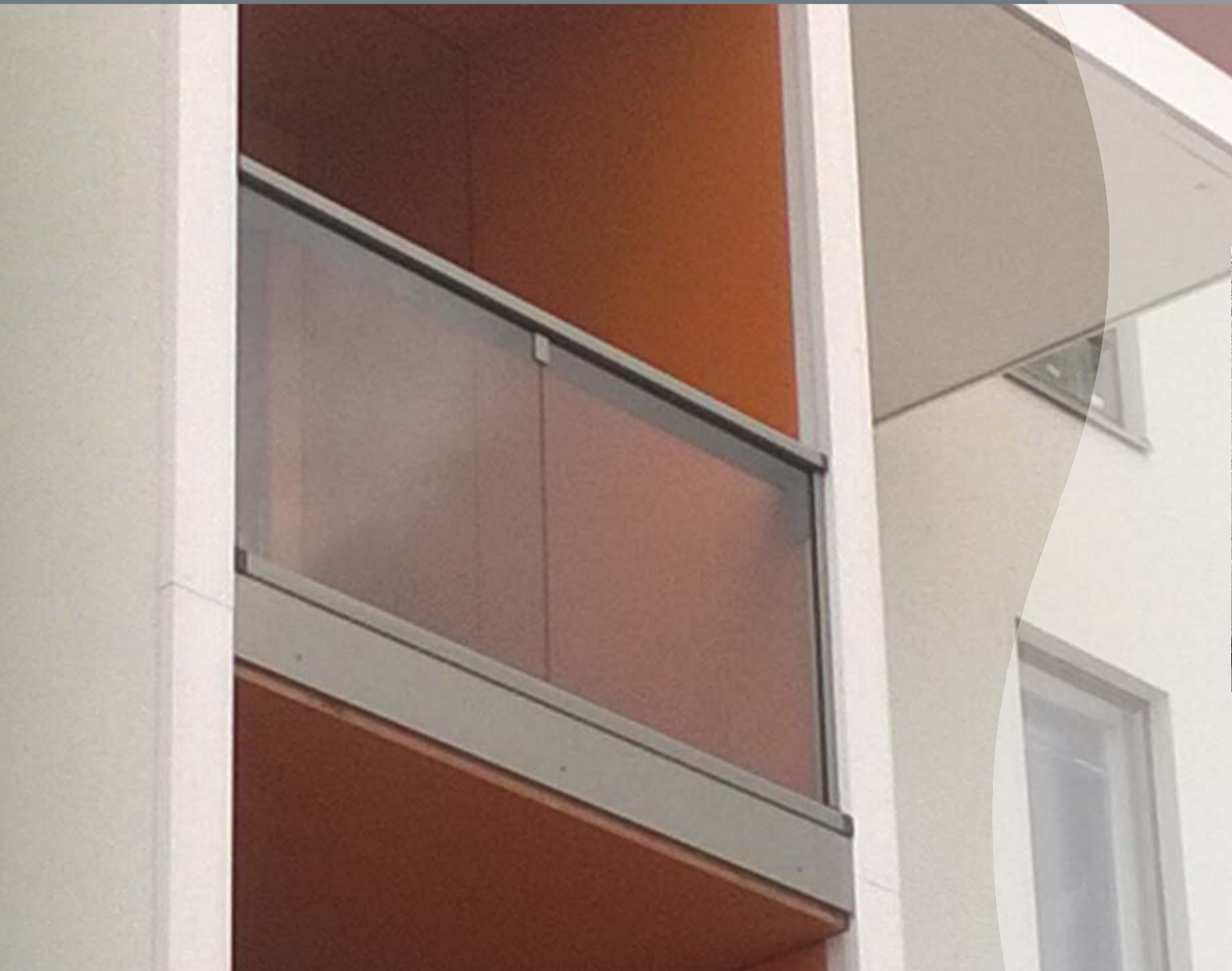
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Version	Date	Author	Approved	Modifications
1.0	2016	NHo		

Lumon Balustrade			
Author:	NHo	Version:	1.0
Verified:	JHo	Date:	2016
Approved:	TTo	Code:	02.03.01.01.EN

1	Introduction
2	Technical Description
3	Product Range
4	Sections
5	Measuring Instructions
6	Fixing Details
7	Installation Instructions
8	Names and numbers
9	Additional Products
10	Appendices - Dimensioning - RAL-price groups - Definition of quality - Warranty

The Lumon Balustrade System





The Lumon Balustrade System -Freedom of Design



The Lumon Balustrade system is flexible. Various fastening principles and profiles, colours and claddings are available in the Lumon Balustrade System. Lumon Balustrades are always individually designed, factory-made and delivered as ready to install elements.

General Information

The LUMON balcony balustrade system consists of matching aluminum profiles designed for use as balustrades. The slender balustrade structure includes handrails and glass frame profiles used for attaching the glass or other infill. The durability of the railing can be increased with balustrade support posts. The structural attachment has been given special attention.

The Lumon balustrade system has been designed to work perfectly with the Lumon balcony glazing system. Complementing structures like louvers and dividing partitions can be added to the balustrade system.

The Lumon balcony facade (balustrade + balcony glazing) gives added value and increased sustainability to the building.

Materials

The aluminum profiles are made of silicon and magnesium alloyed aluminum. These additives improve the strength properties of aluminum and the workability without degrading the surface quality. These alloys are readily anodized.

Matt polyester powder is used as a top coat. The profiles are powder coated according to the RAL color chart. All fasteners used in the system are made from non-corrosive materials.

Glass or suitable building board can be used as infill for the closed parts of the balustrade. The type of glass varies depending on local requirements.

The raw material for the plastic components is thermoplastic. Plastic components colour is dark grey RAL 7024.

The seals used in frame profiles are made of PVC or TPE. The seal colour is dark grey.

Screws and rivets which are used in aluminum profile joints are either aluminum or stainless steel. Balustrade brackets are also made of aluminum or stainless steel. The installation brackets are of cast aluminium, painted in the profile colour or in some other separately chosen RAL-colour.

Design and manufacturing of Lumon balustrade elements

Lumon's services always include the production and design of the aluminum balustrade elements. Each project is treated with equal importance, and project-specific special features, such as different fastening and drainage solutions, are provided.

Project-specific structural analyses are made according to official regulations. Extra wind load caused by (potential) balcony glazing is taken into consideration in the calculations.

The fastening method of the railing is based on horizontal stabilization. A horizontally stabilized balustrade is fastened from the ends of the handrail to the balcony walls. This structure is the load bearing one. The lower glass frame is attached with a lighter fastening since the load bearing capacity needed is minimal. The handrail can be strengthened with support posts. The amount of support posts needed depends on environmental conditions on site and local regulations. A 5m post free balustrade can be reached with the 225mm wide handrail and 3,6m with the narrower 160mm handrail (1KNm² load). The lower glassframe also works as a fastener, no additional brackets are needed. The cladding is always on the outside of the supporting posts.

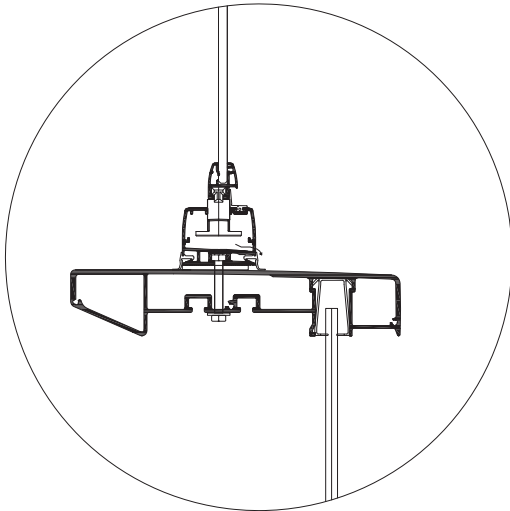
The cladding can not be divided horizontally with a double frame. Cladding variations must be made with vertical cladding sections only. Other types of cladding variations can be reached by patterning the glass panes or building boards (eg. screen printing, digital print or sandblasting). The lack of vertical post also excludes slab overhangs.

Installation and logistics

The balustrade elements are prepared at the modern Lumon production facilities in Kouvola. The balustrades are assembled from ready-made parts on site.

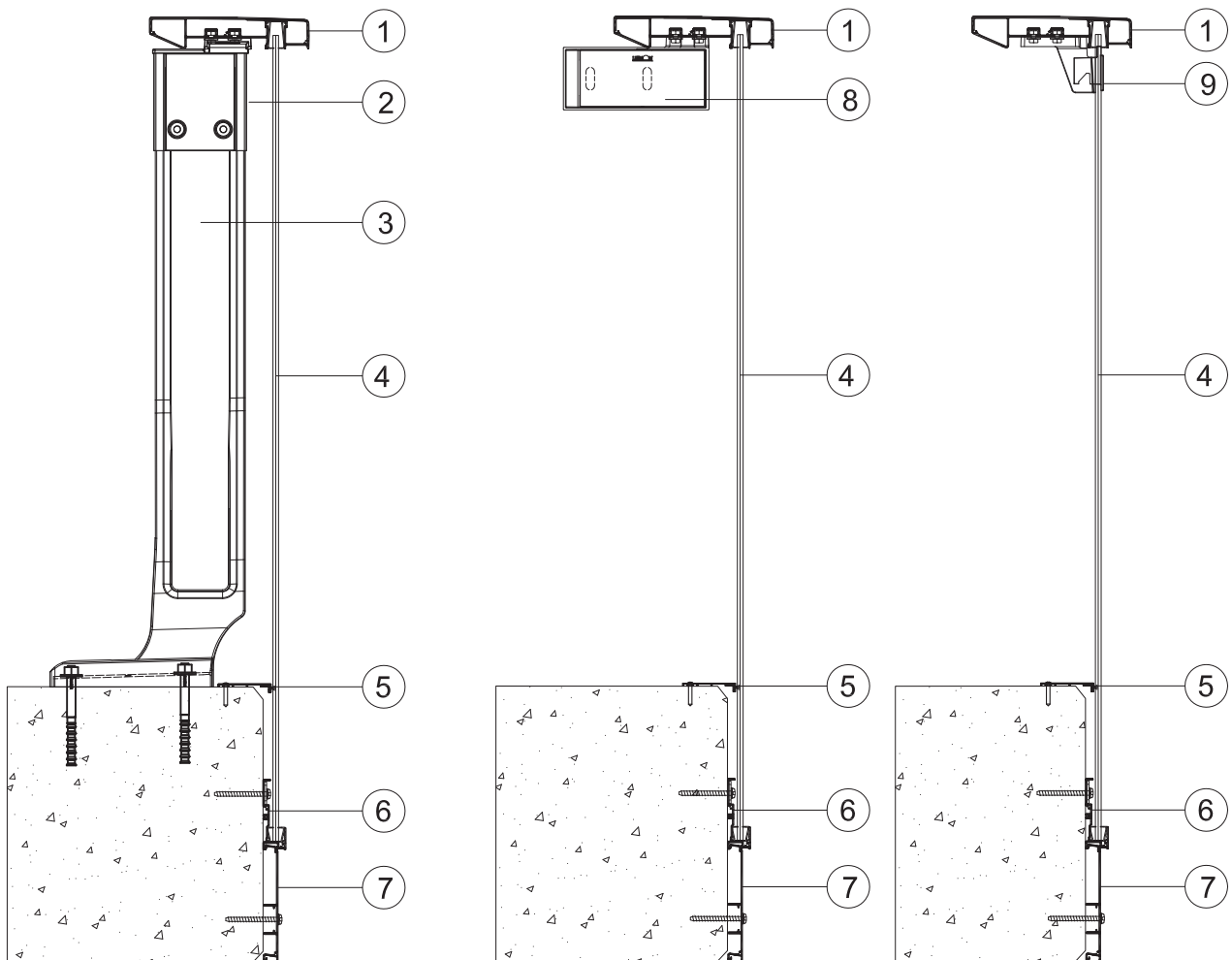
The prefabricated profiles are packed in balcony-specific packages and transported to the site. The Lumon balustrade system is a secure and safe, complete solution, which takes into account the local conditions and local building regulations.

Balustrade installed to the side of the slab

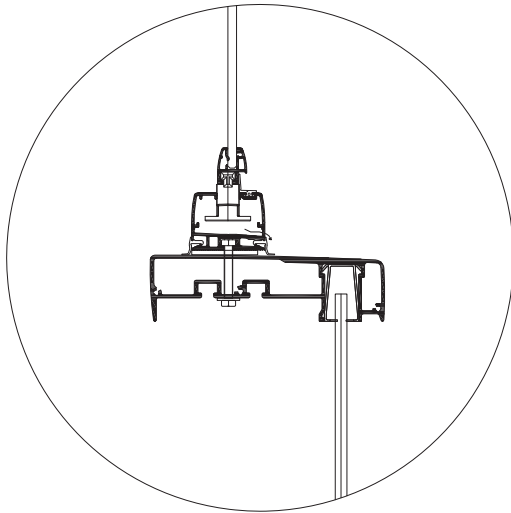


1. Handrail 225x45
2. Adjustment piece for balustrade support
3. Balustrade support
4. Cladding
5. Floor seal profile
6. Lower frame side installed
7. Facade cover profile
8. Handrail bracket Horizontal/ Vertical
9. Handrail support piece

The balcony glazing is fixed on top of the handrail

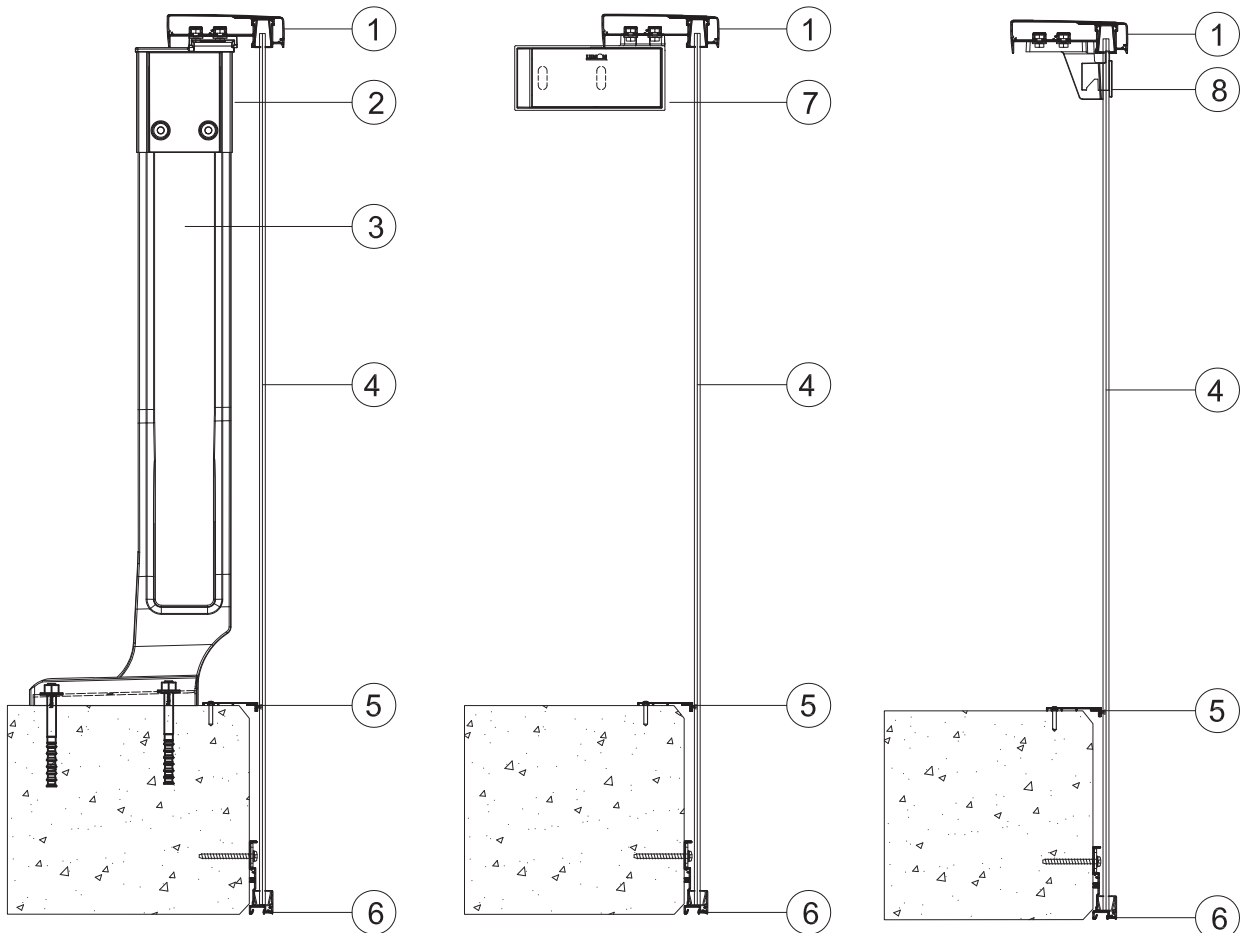


Balustrade installed to the side of the slab

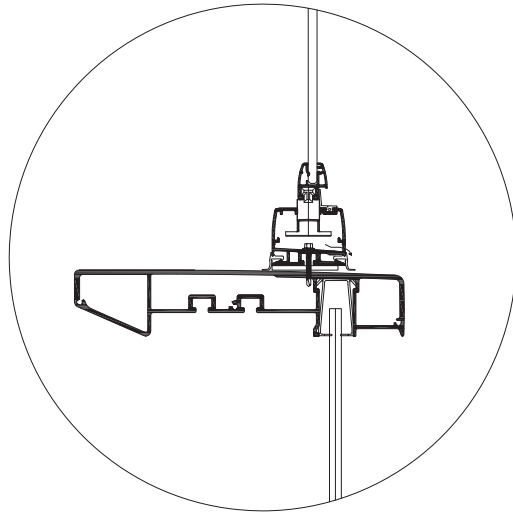


1. Handrail 160x45
2. Adjustment piece for balustrade support
3. Balustrade support
4. Cladding
5. Floor seal profile
6. Lower frame side installed
7. Handrail bracket Horizontal/ Vertical
8. Handrail support piece

The balcony glazing is fixed on top of the handrail

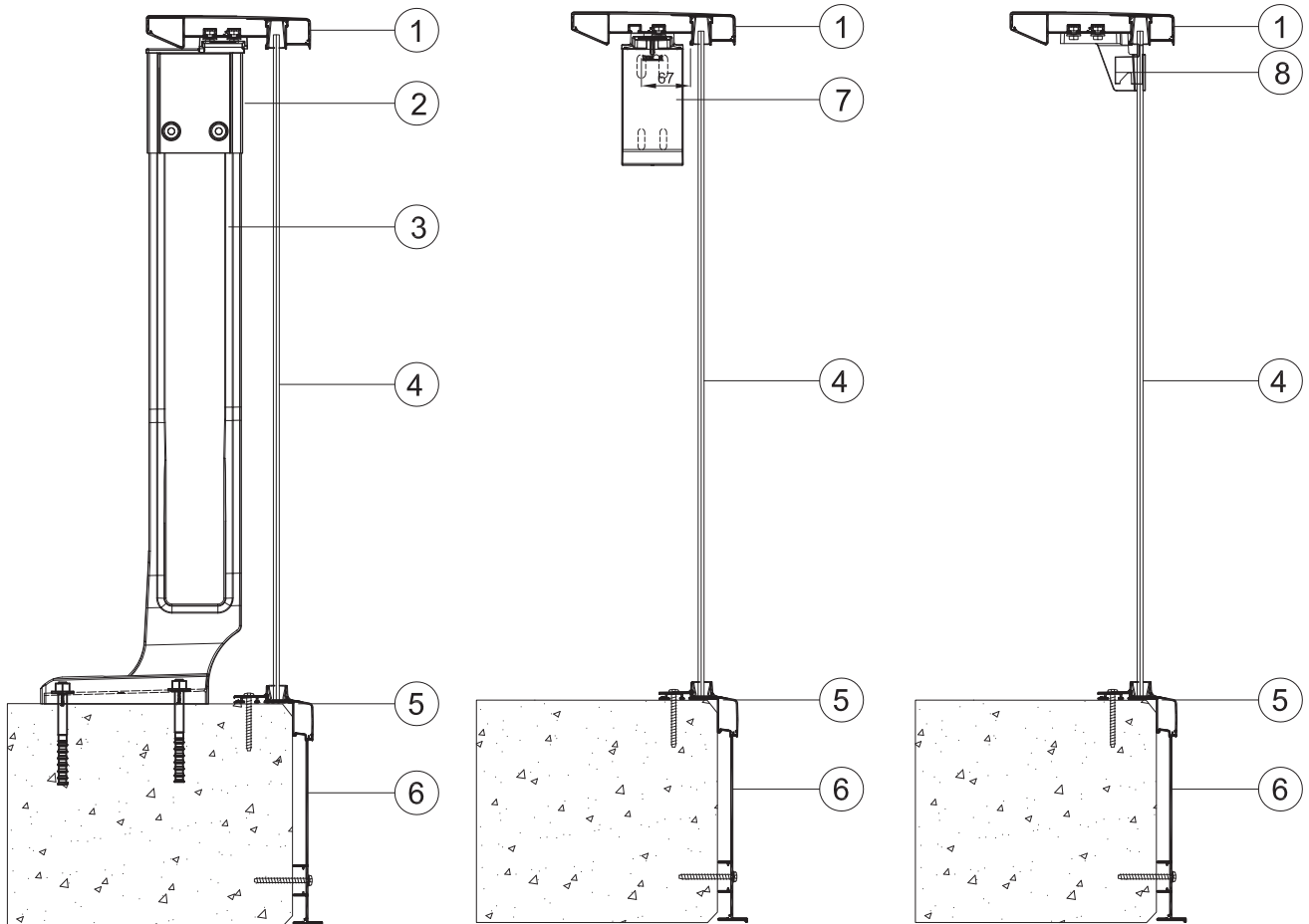


Balustrade installed on top of the slab

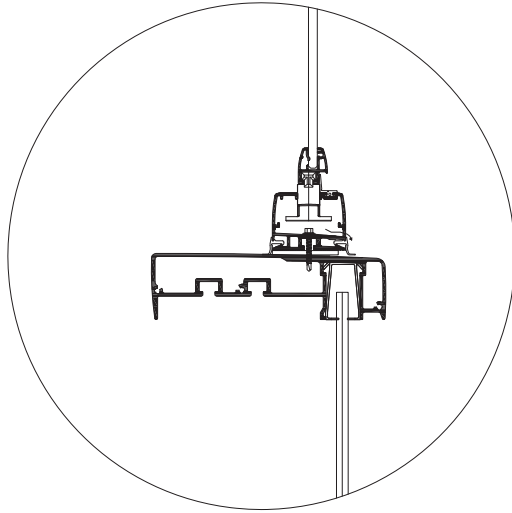


1. Handrail 225x45
2. Adjustment piece for balustrade support
3. Balustrade support
4. Cladding
5. Lower frame top installed
6. Facade cover profile L
7. Handrail bracket Horizontal/ Vertical
8. Handrail support piece

The balcony glazing is fixed on top of the handrail

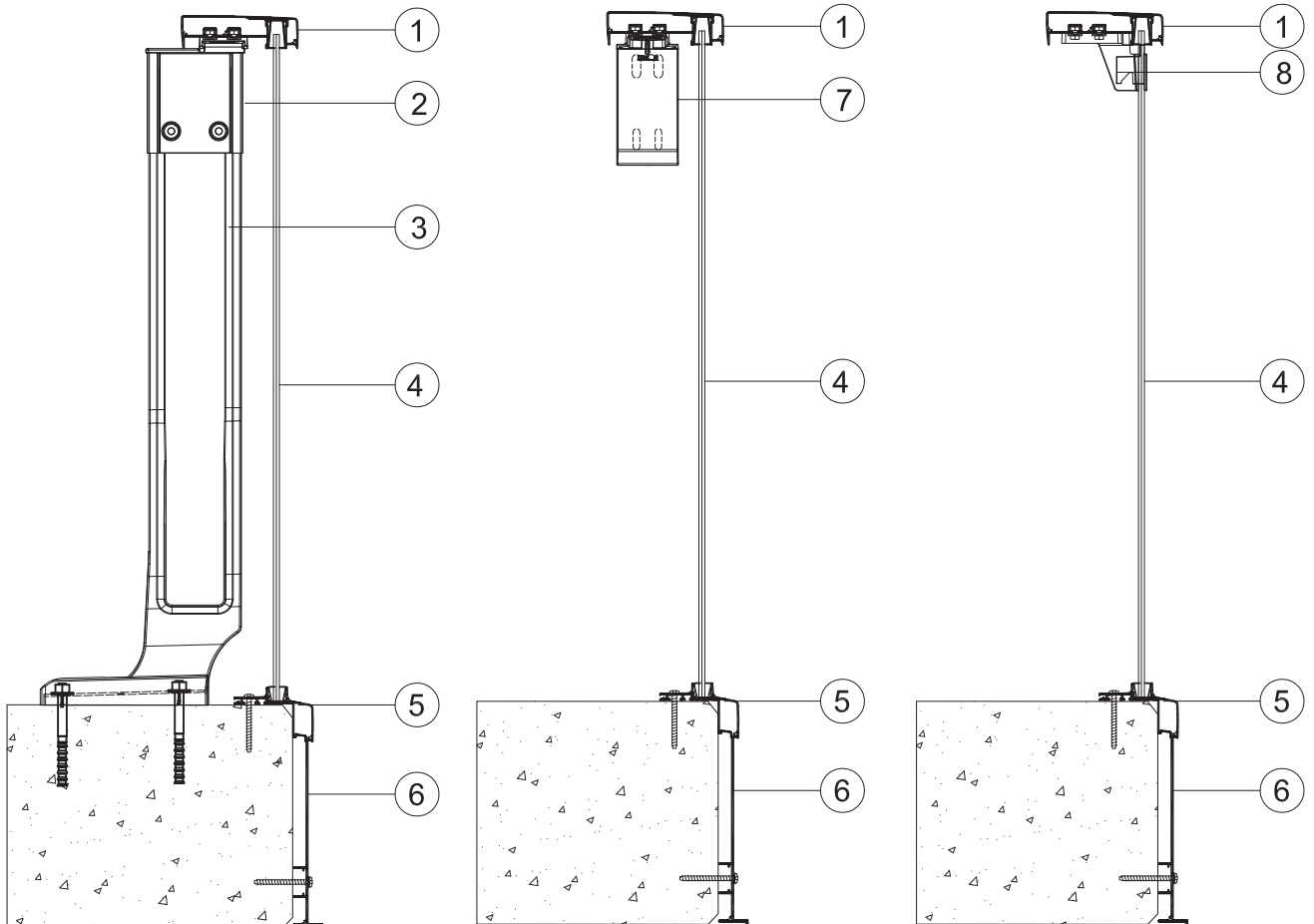


Balustrade installed on top of the slab



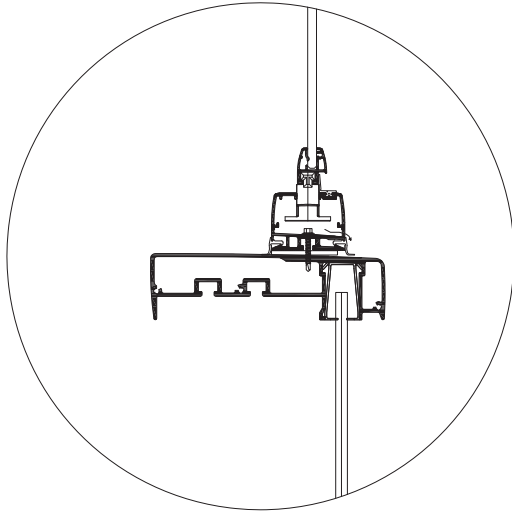
1. Handrail 160x45
2. Adjustment piece for balustrade support
3. Balustrade support
4. Cladding
5. Lower frame top installed
6. Facade cover profile L
7. Handrail bracket Horizontal/ Vertical
8. Handrail support piece

The balcony glazing is fixed on top of the handrail

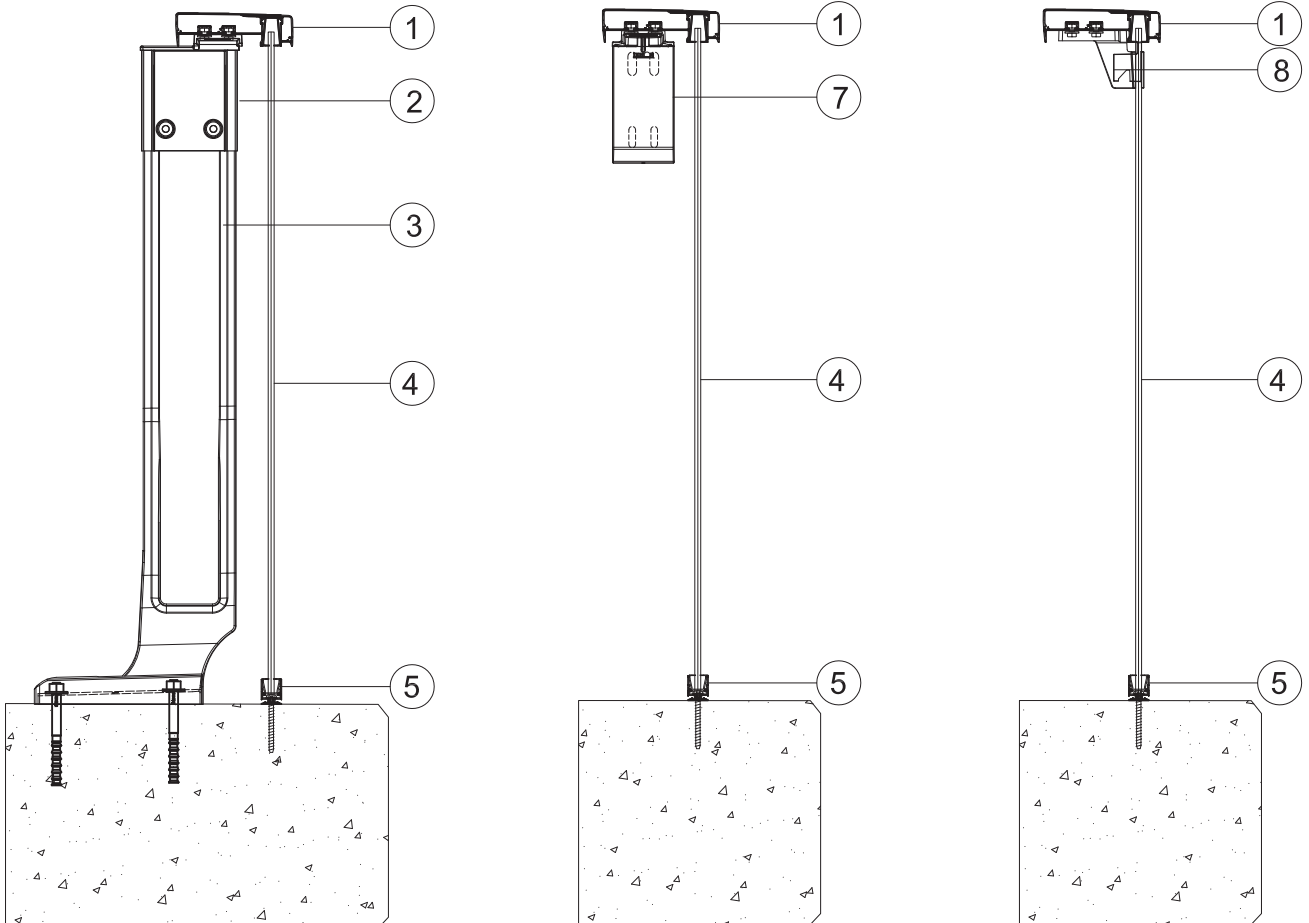


Balustrade installed on top of the slab

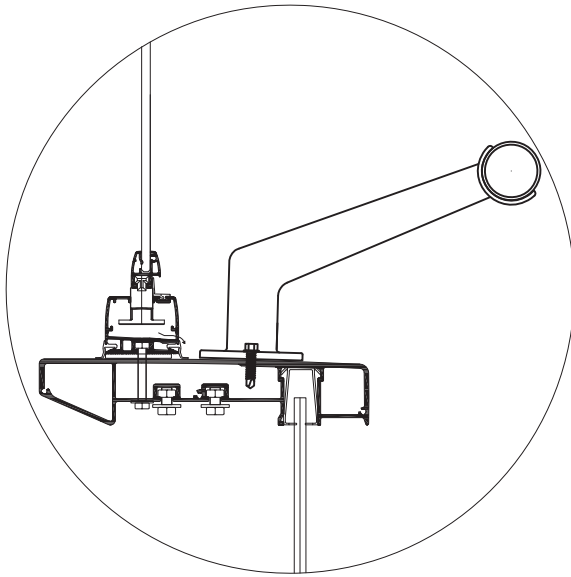
1. Handrail 160x45
2. Adjustment piece for balustrade support
3. Balustrade support
4. Cladding
5. Lower frame top installed
6. Facade cover profile L
7. HandrailbracketHorizontal/Vertical
8. Handrail support piece



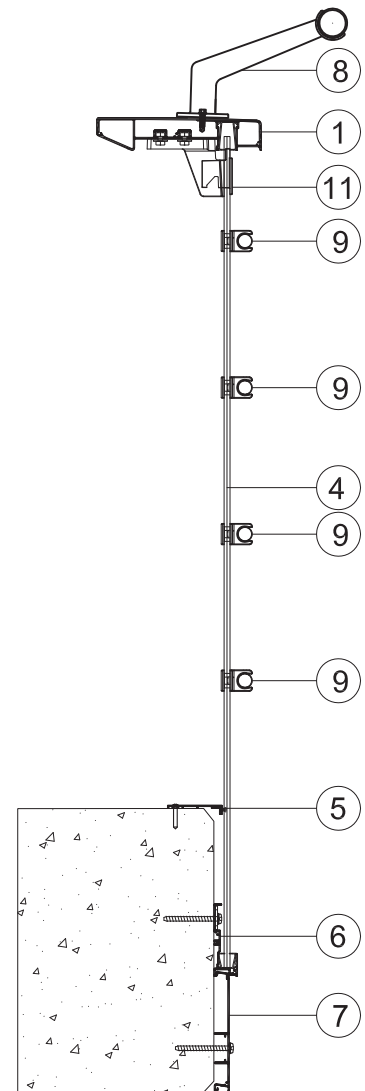
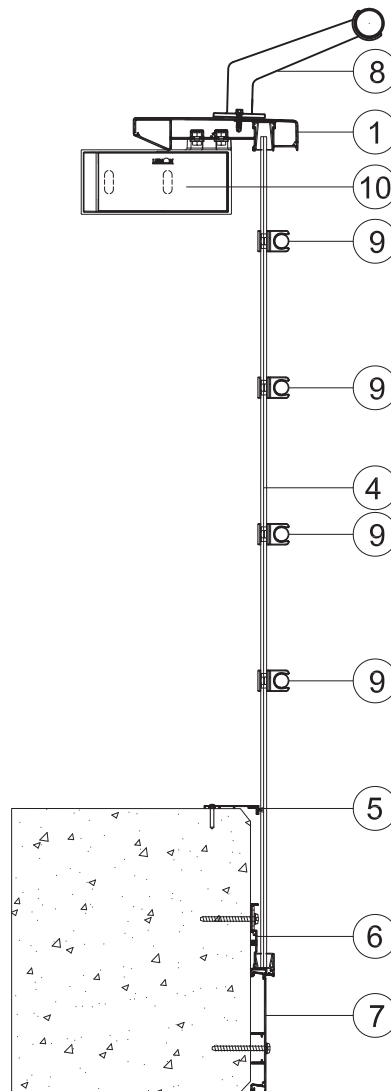
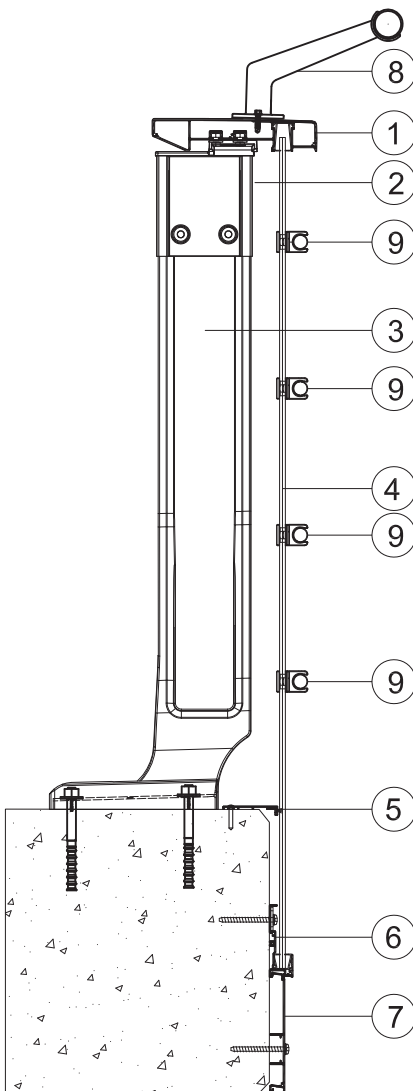
The balcony glazing is fixed on top of the handrail



The Decor profile brackets are installed on top of the handrail or between the cladding

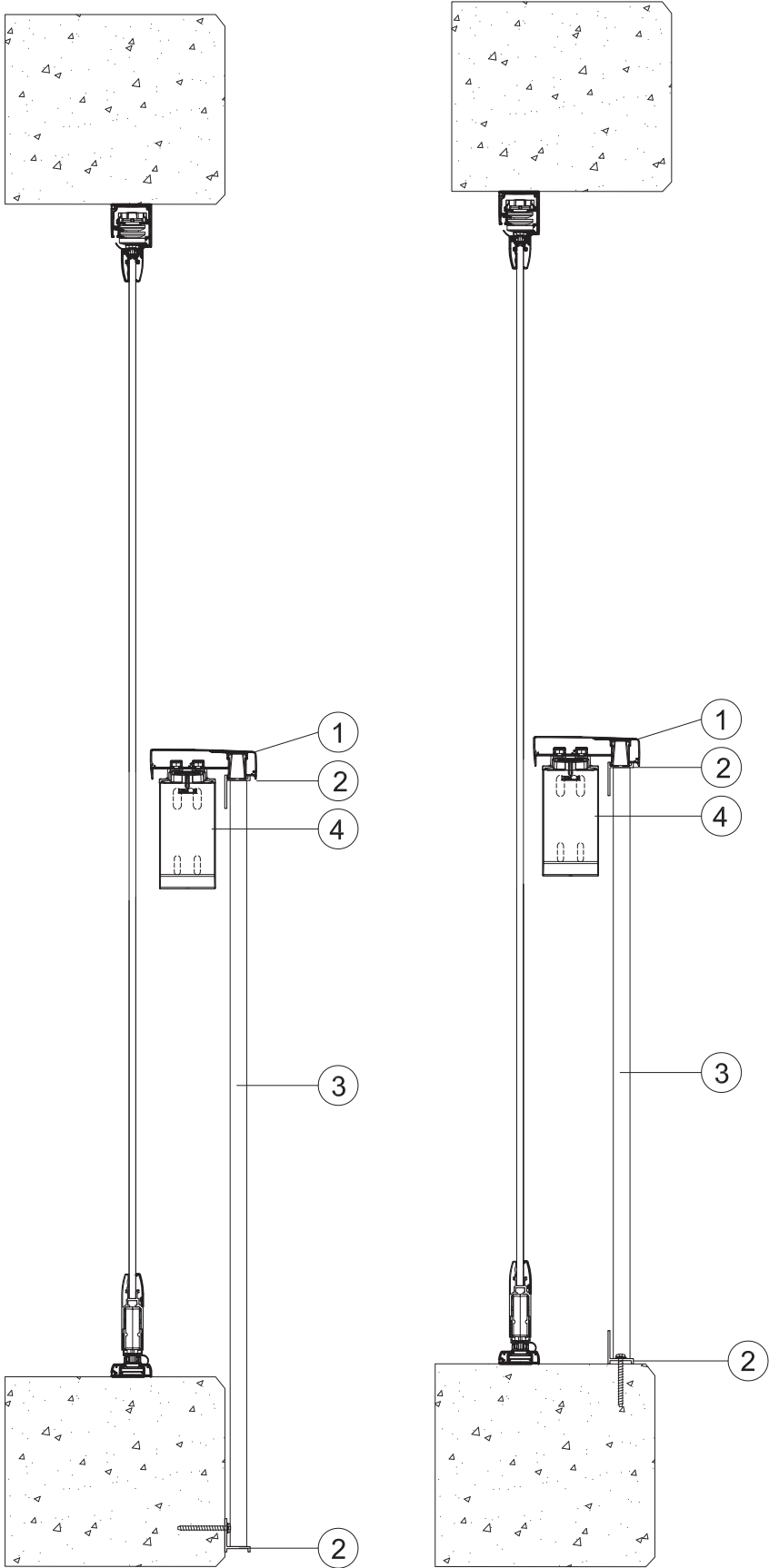


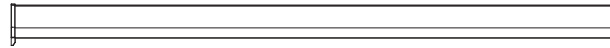
1. Handrail 225x45
2. Adjustment piece for balustrade support
3. Balustrade support
4. Cladding
5. Floor seal profile
6. Lower frame side installed
7. Facade cover profile
8. Decor profile $\varnothing 40$ + bracket
9. Decor profile $\varnothing 20$ + bracket
10. Handrail bracket Horizontal/Vertical
11. Handrail support piece



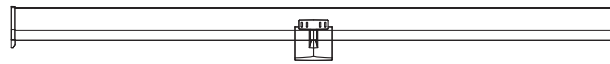
A high glazing is used with decor railing

1. Handrail 160x45
2. Decor railing profile
3. Decor profile $\varnothing 25$
4. Handrail bracket Horizontal/ Vertical

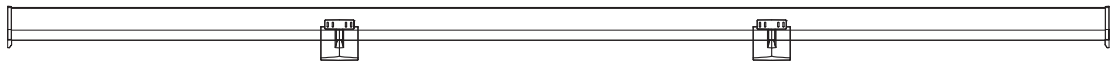




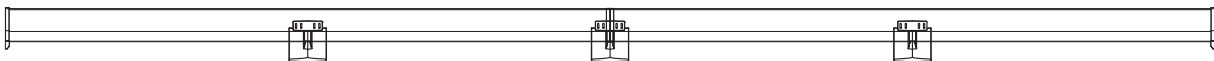
A straight balcony can be completely post free with sufficient wall mounting. The max. span of the 225mm handrail is 5m and for the 160mm handrail 3,6m (1kNm² load)



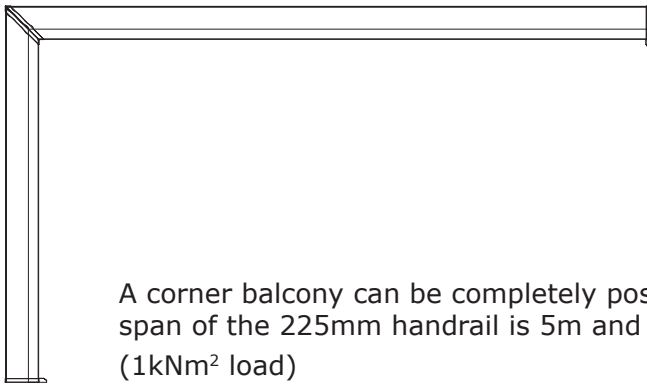
When the width of the balcony exceeds 5m with the 225mm handrail and 3,6m with the 160mm handrail, the handrail must be supported. (1kNm² load)



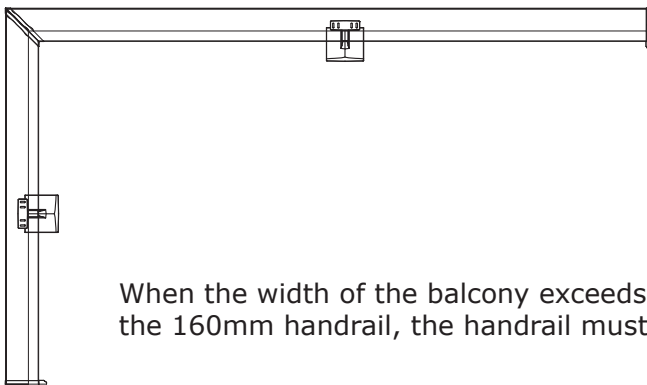
When the width of the balcony exceeds 5m with the 225mm handrail and 3,6m with the 160mm handrail, the handrail must be supported. Max span between supporting posts is 4m. (1kNm² load)



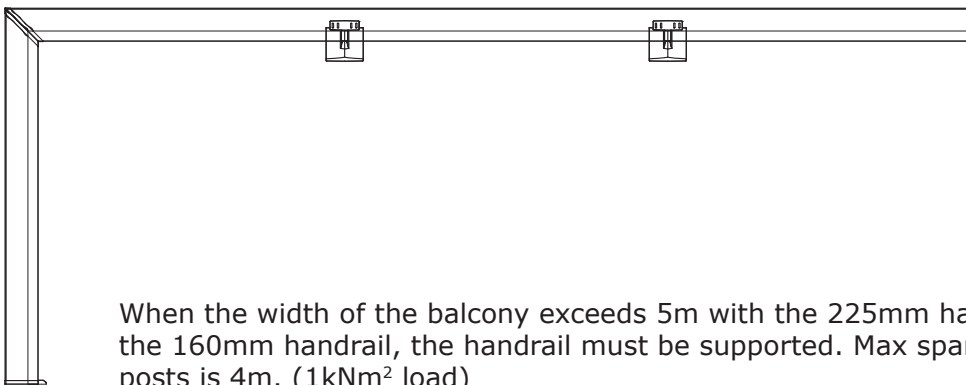
At the junction point of two handrails a support is always needed.



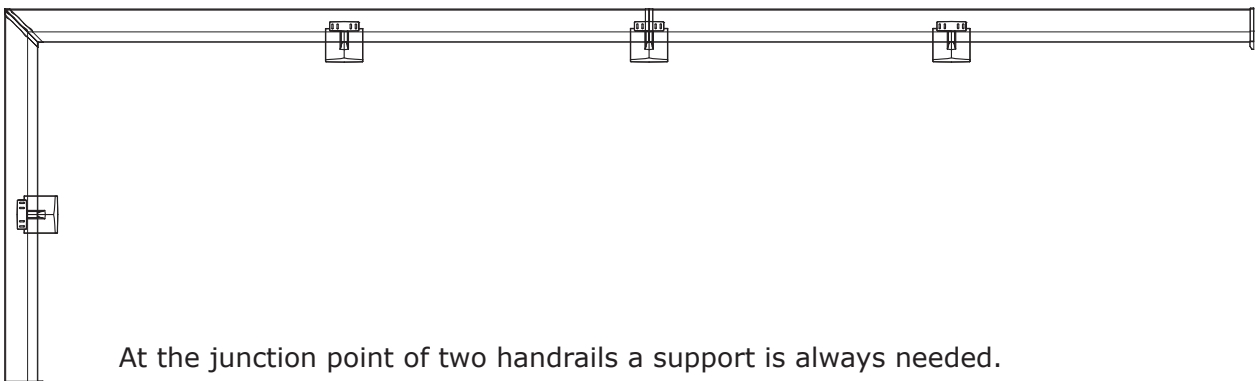
A corner balcony can be completely post free with sufficient wall mounting. The max. span of the 225mm handrail is 5m and for the 160mm handrail 3,6m (1kNm² load)



When the width of the balcony exceeds 5m with the 225mm handrail and 3,6m with the 160mm handrail, the handrail must be supported. (1kNm² load)



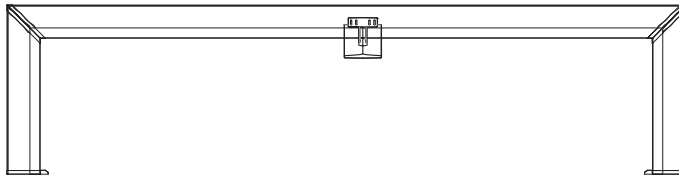
When the width of the balcony exceeds 5m with the 225mm handrail and 3,6m with the 160mm handrail, the handrail must be supported. Max span between supporting posts is 4m. (1kNm² load)



At the junction point of two handrails a support is always needed.



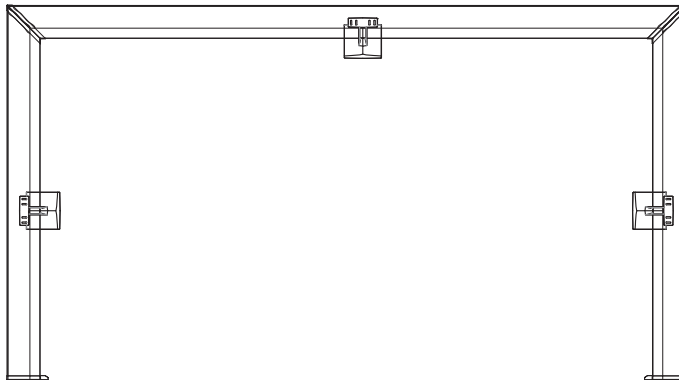
An U-balcony can be completely post free with sufficient wall mounting, if the depth of the balcony does not exceed 800mm. The max. span of the 225mm handrail is 5m and for the 160mm handrail 3,6m (1kNm² load)



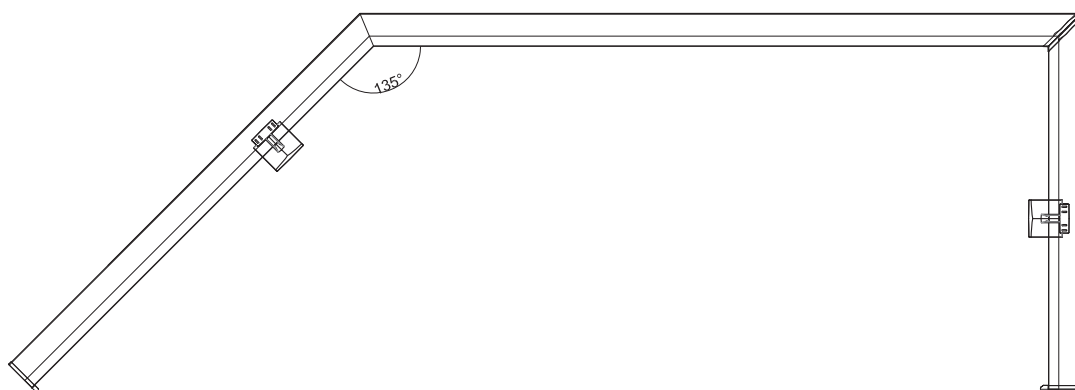
When the width of the balcony exceeds 5m with the 225mm handrail and 3,6m with the 160mm handrail, the handrail must be supported. (1kNm² load)



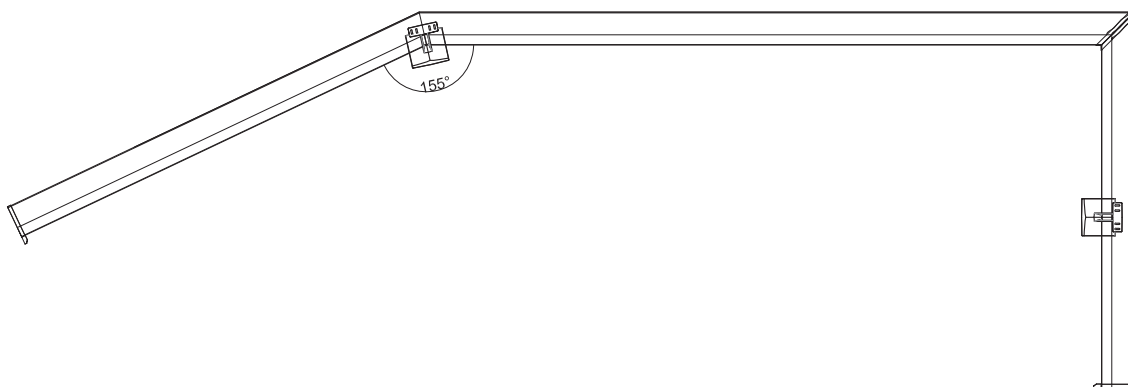
When the depth of the balcony exceeds 800mm, the handrail must be supported. The balustrade support can be placed on one or two sides. The support need not to be centered



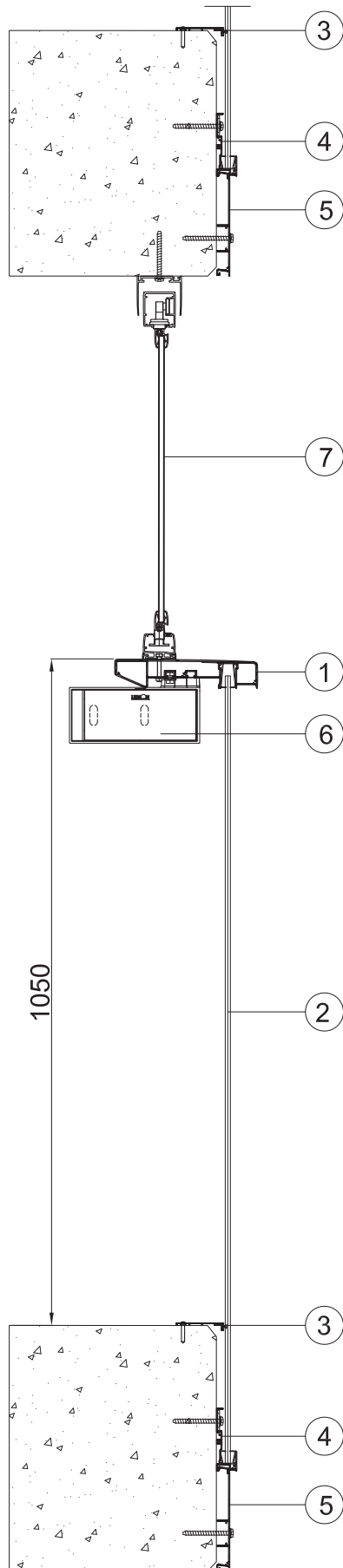
When the width of the balcony exceeds 5m with the 225mm handrail and 3,6m with the 160mm handrail, the handrail must be supported. (1kNm² load)



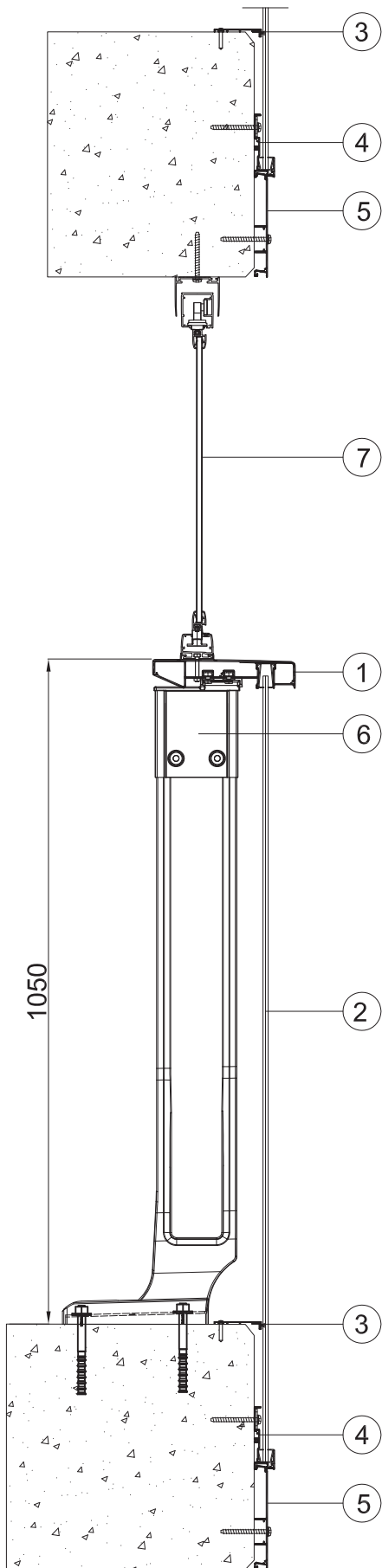
A balcony with a system angle less than 135° , is considered as an u-balcony. An U-balcony can be completely post free with sufficient wall mounting, if the depth of the balcony does not exceed 800mm. The max. span of the 225mm handrail is 5m and for the 160mm handrail 3,6m (1kNm^2 load)



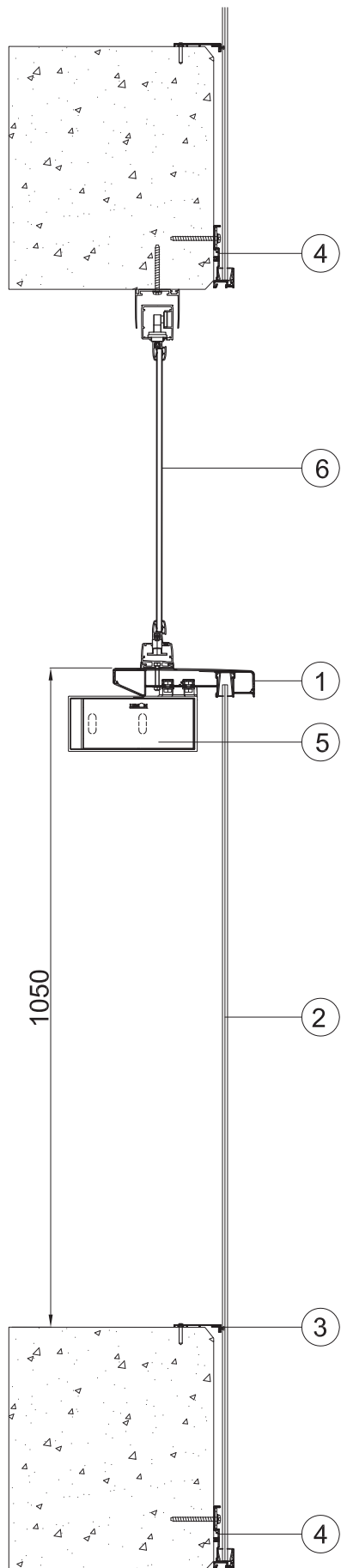
A balcony with a system angle exceeding 155° , is considered as a L-balcony. An L-balcony can be completely post free with sufficient wall mounting, if the depth of the balcony does not exceed 800mm. The max. span of the 225mm handrail is 5m and for the 160mm handrail 3,6m (1kNm^2 load). The structural strength has to be considered on a case-to-case basis



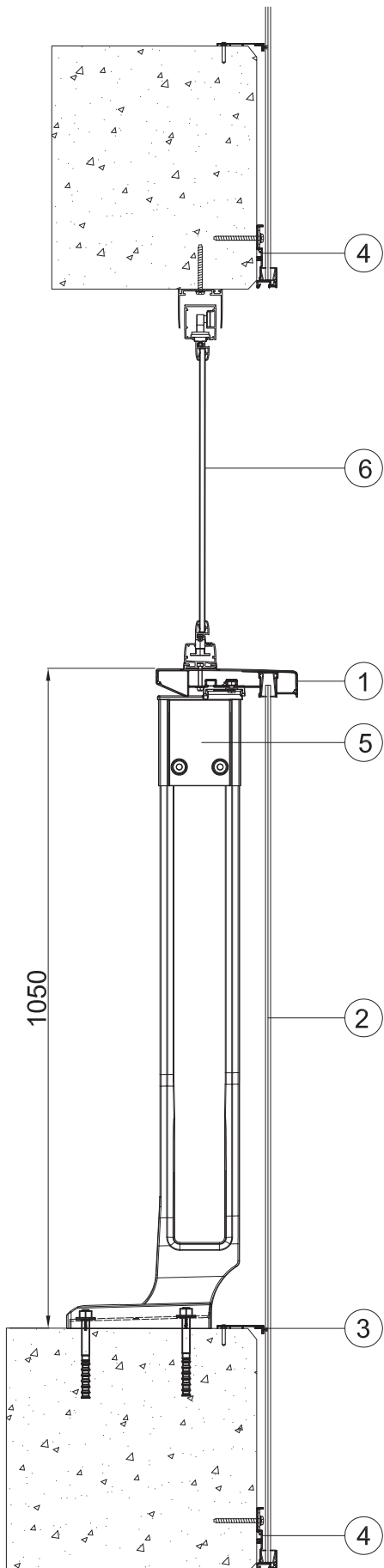
1. Handrail 225x45, 11 37 0001
2. Cladding
3. Floor seal profile, 11 37 0006
4. Side installed lower frame, 11 37 0005
5. Facade cover profile
6. Handrail bracket horizontal or vertical
7. Balcony glazing



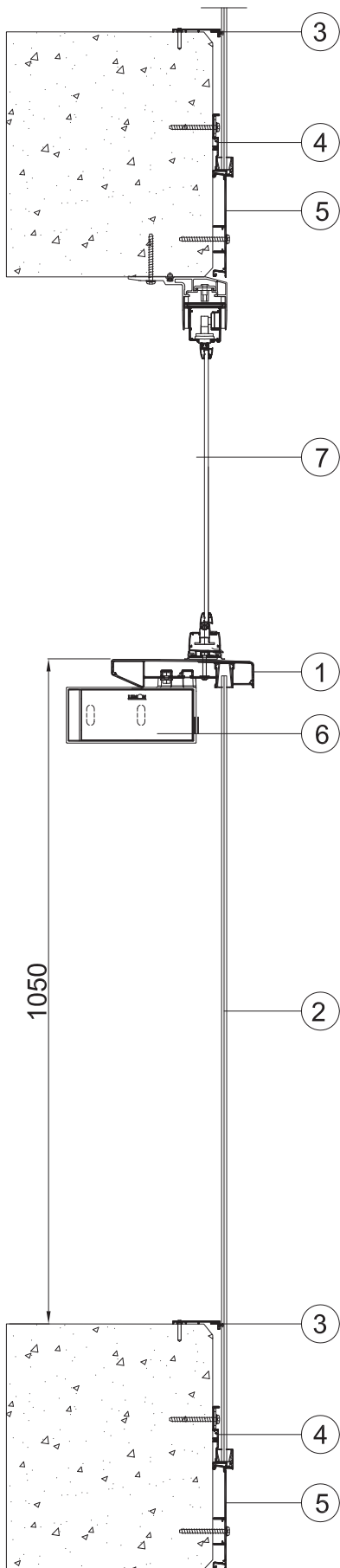
1. Handrail 225x45, 11 37 0001
2. Cladding
3. Floor seal profile, 11 37 0006
4. Side installed lower frame, 11 37 0005
5. Facade cover profile
6. Balustrade support
7. Balcony glazing



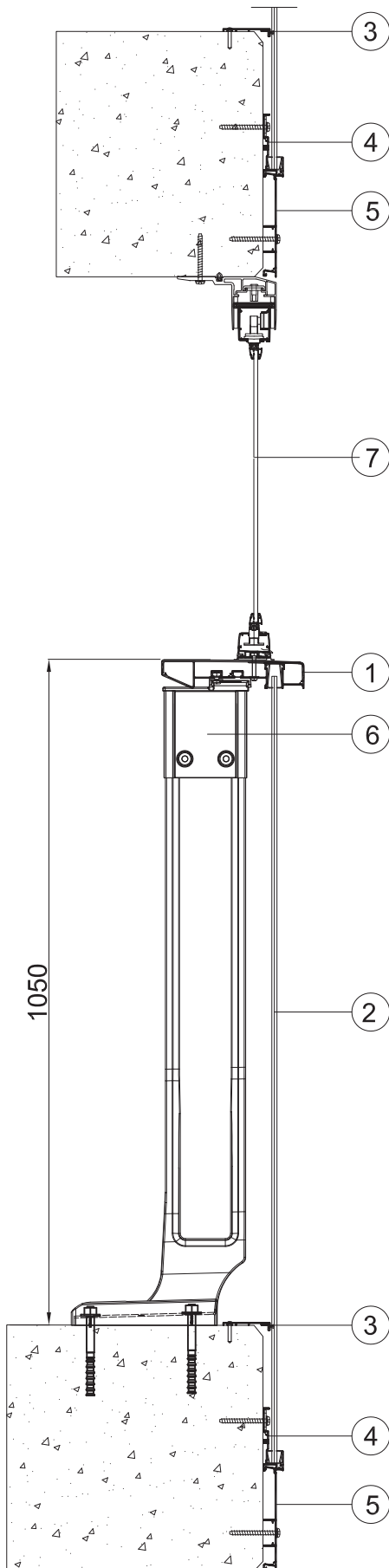
1. Handrail 225x45, 11 37 0001
2. Cladding
3. Floor seal profile, 11 37 0006
4. Side installed lower frame, 11 37 0005
5. Handrail bracket horizontal or vertical
6. Balcony glazing



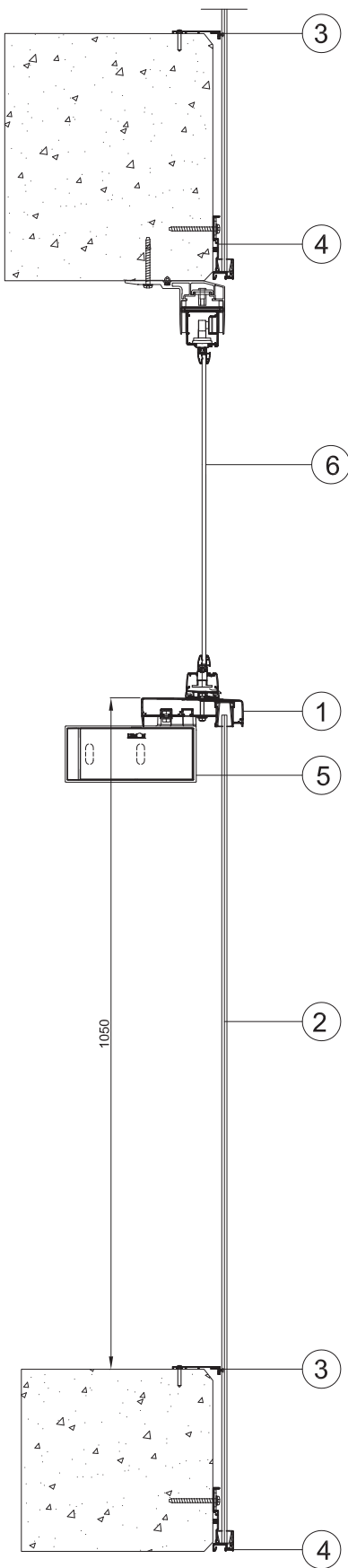
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2. Cladding
3. Floor seal profile, 11 37 0006
4. Side installed lower frame, 11 37 0005
5. Balustrade support
6. Balcony glazing



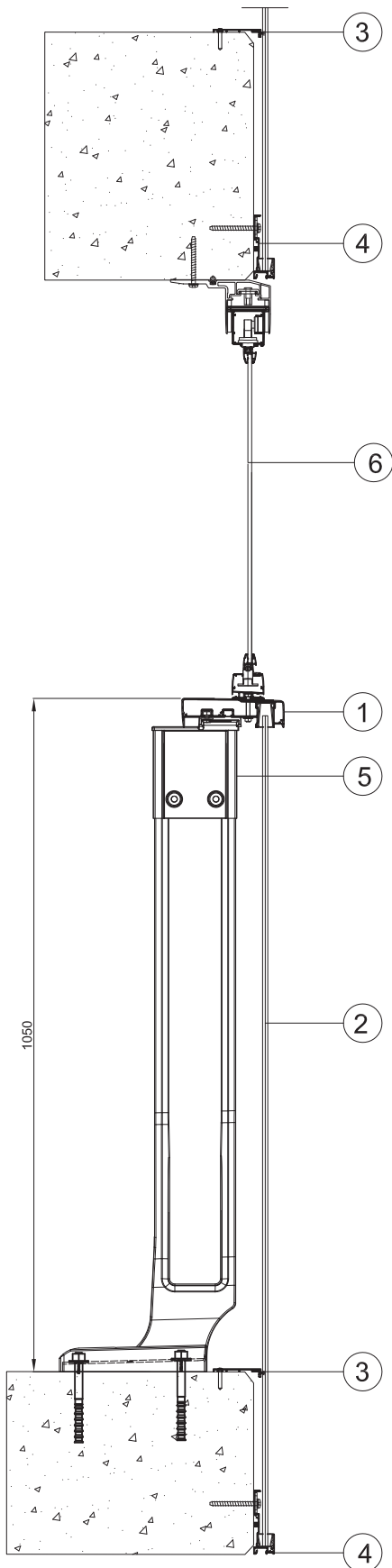
1. Handrail 225x45, 11 37 0001
2. Cladding
3. Floor seal profile, 11 37 0006
4. Side installed lower frame, 11 37 0005
5. Facade cover profile
6. Handrail bracket horizontal or vertical
7. Balcony glazing



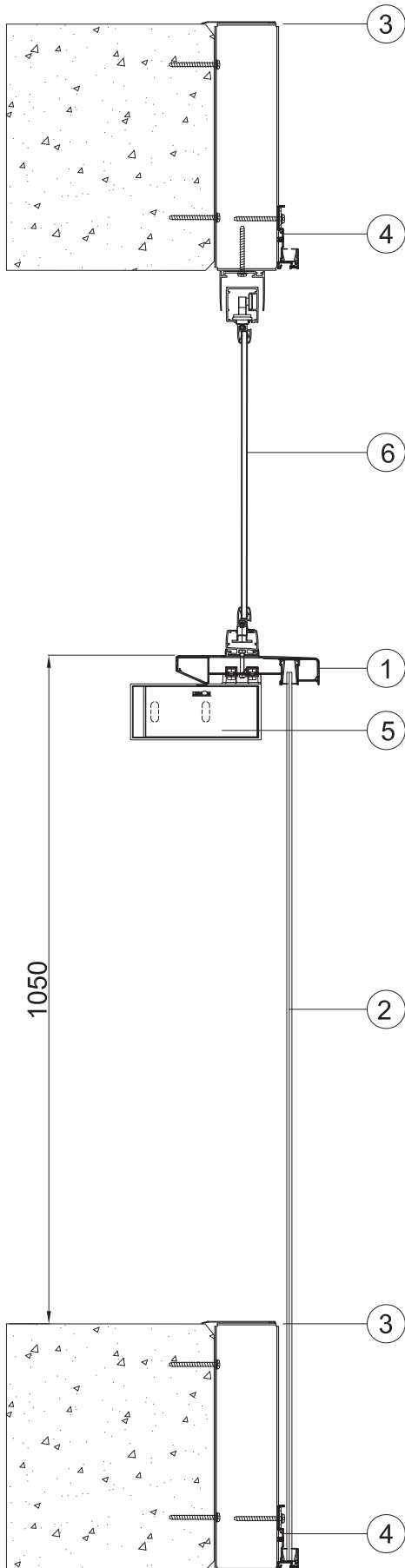
- 1. Handrail 225x45, 11 37 0001
- 2. Cladding
- 3. Floor seal profile, 11 37 0006
- 4. Side installed lower frame, 11 37 0005
- 5. Facade cover profile
- 6. Balustrade support
- 7. Balcony glazing



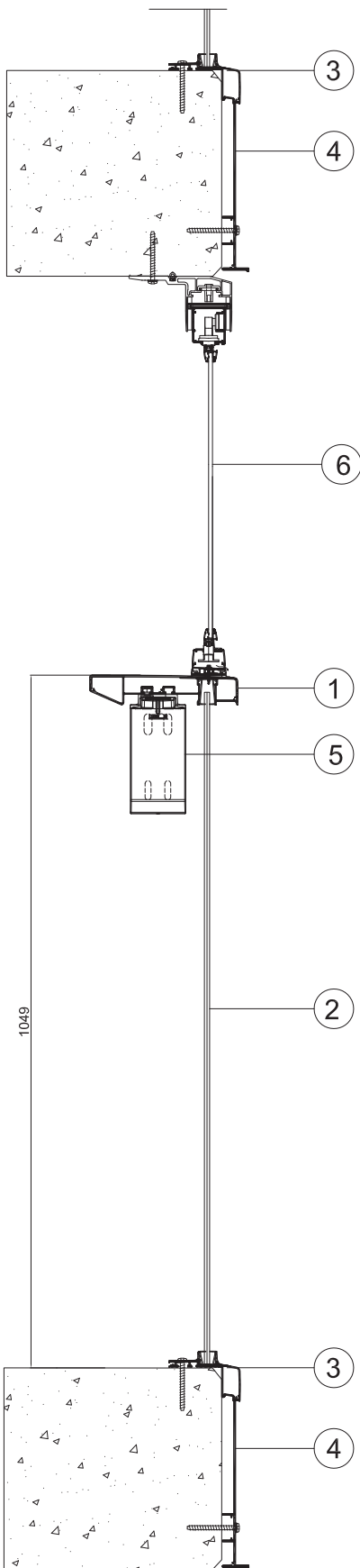
1. Handrail 160x45, 11 37 0002
2. Cladding
3. Floor seal profile, 11 37 0006
4. Side installed lower frame, 11 37 0005
5. Handrail bracket horizontal or vertical
6. Balcony glazing



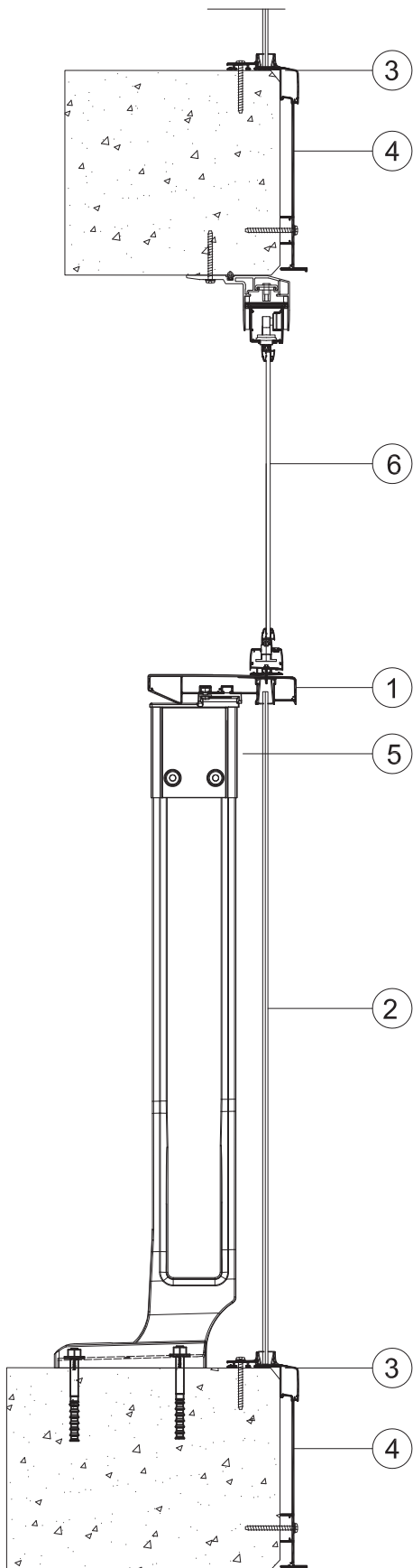
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2. Cladding
3. Floor seal profile, 11 37 0006
4. Side installed lower frame, 11 37 0005
5. Balustrade support
6. Balcony glazing



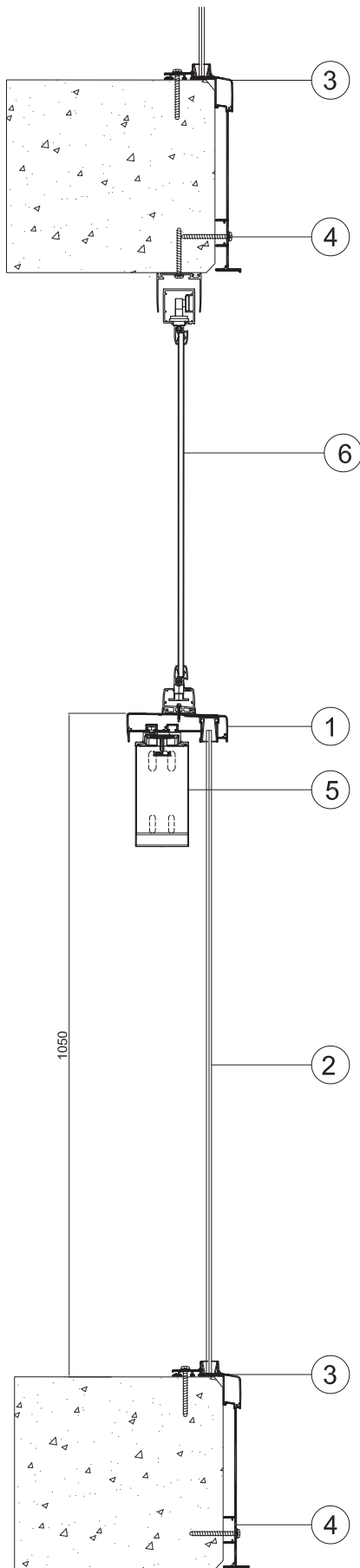
1. Handrail 225x45, 11 37 0002
2. Cladding
3. Extraction piece for side installation + cover
4. Side installed lower frame, 11 37 0005
5. Balcony glazing



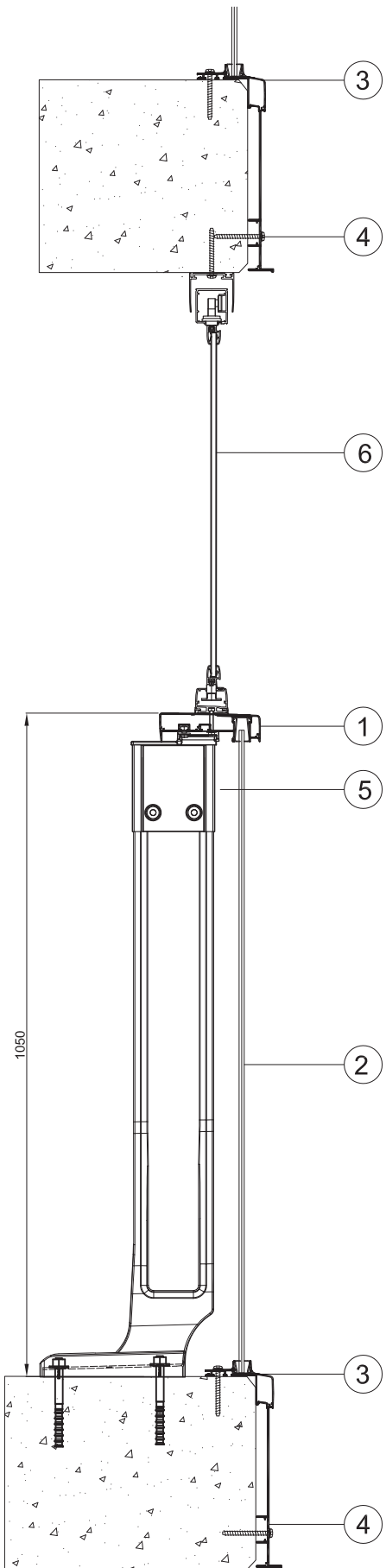
1. Handrail 225x45, 11 37 0001
2. Cladding
3. Top installed lower frame, 11 37 0004
4. Facade cover profile L, 11 37 0010
5. Handrail bracket horizontal or vertical
6. Balcony glazing



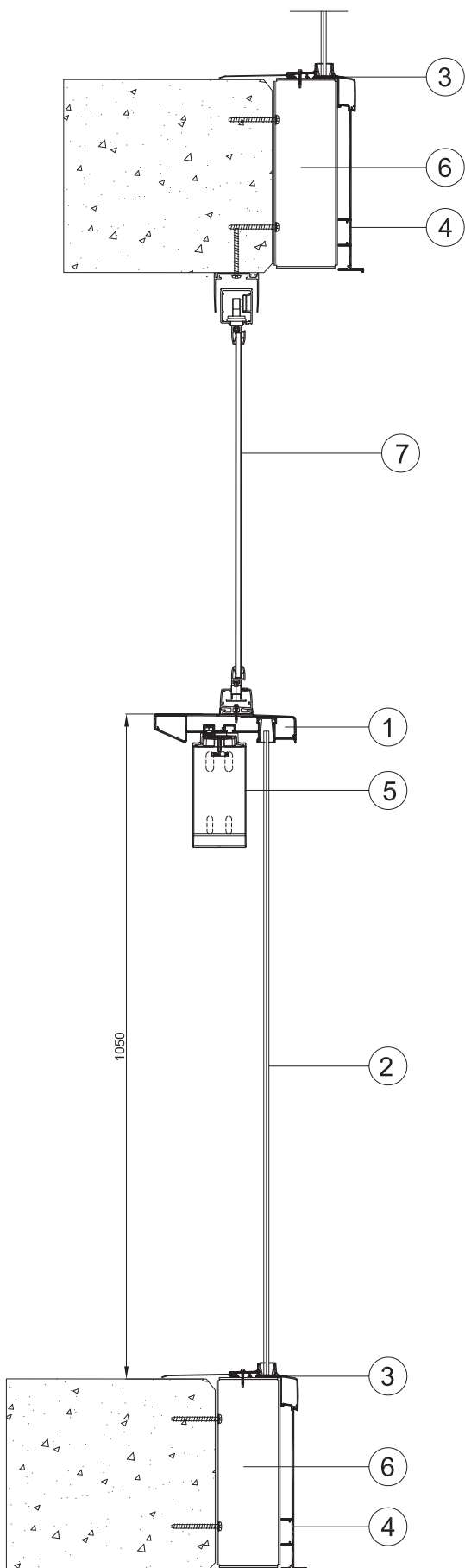
1. Handrail 225x45, 11 37 0001
2. Cladding
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5. Balustrade support
6. Balcony glazing



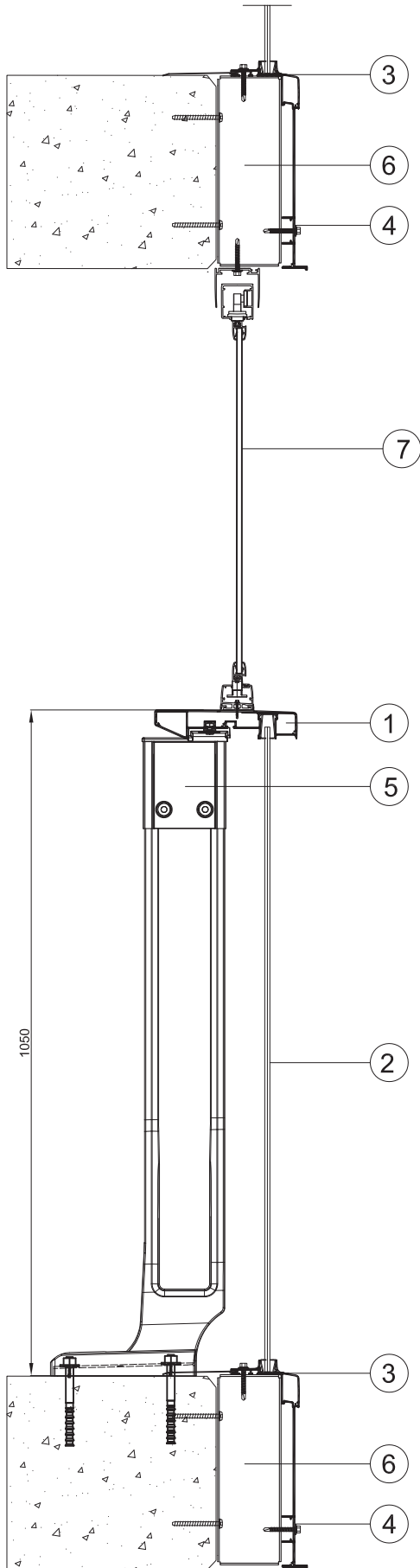
1. Handrail 160x45, 11 37 0001
2. Cladding
3. Top installed lower frame, 11 37 0004
4. Facade cover profile L, 11 37 0010
5. Handrail bracket horizontal or vertical
6. Balcony glazing



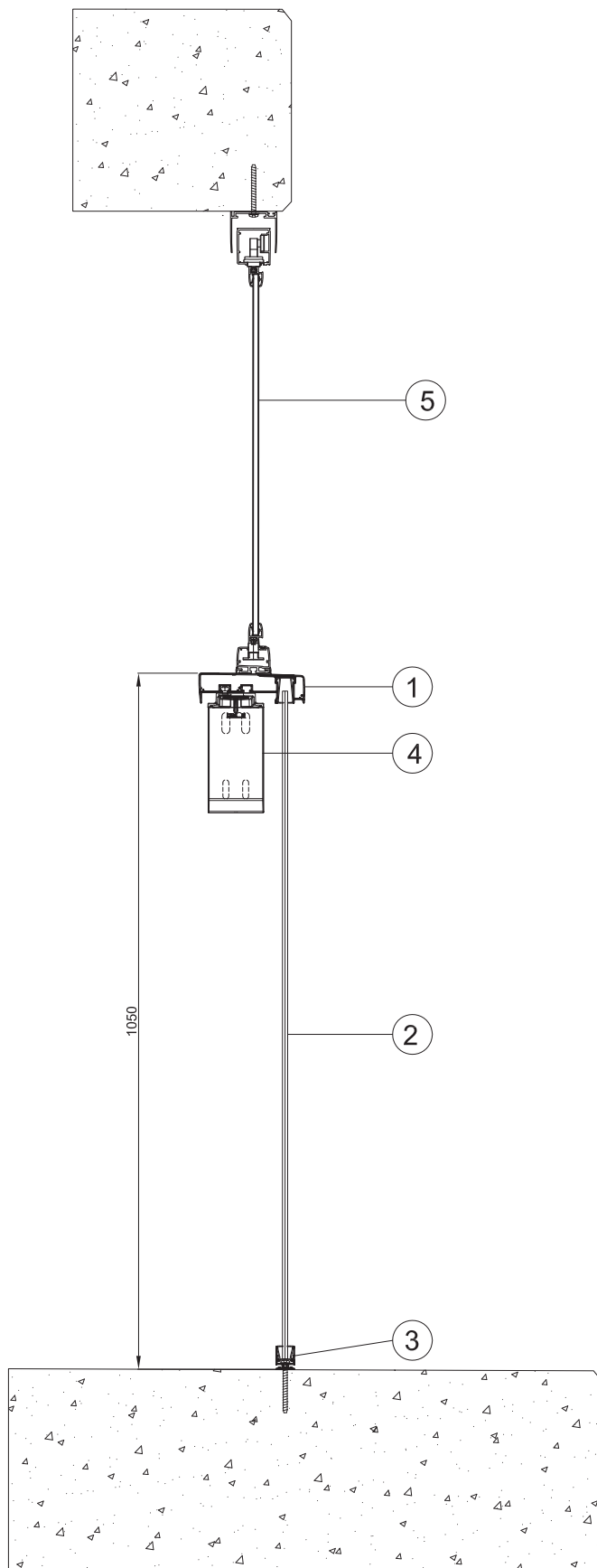
1. Handrail 160x45, 11 37 0001
2. Cladding
3. Top installed lower frame, 11 37 0004
4. Facade cover profile L, 11 37 0010
5. Balustrade support
6. Balcony glazing



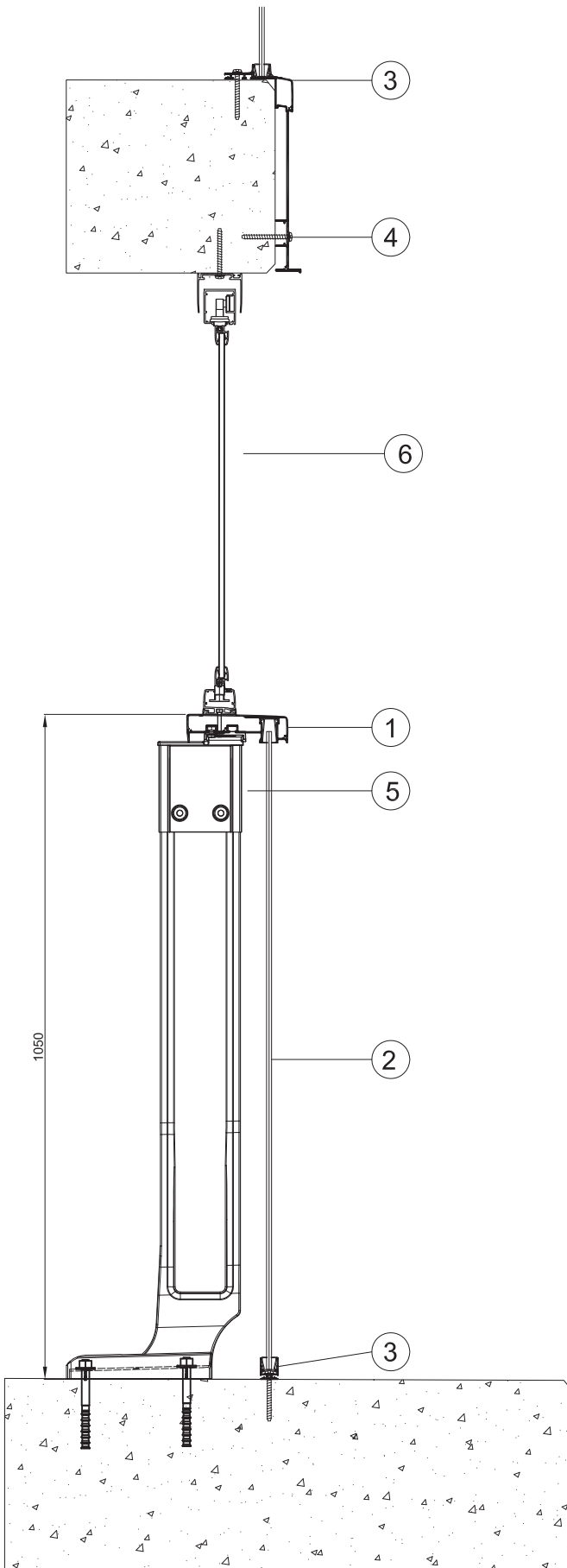
1. Handrail 160x45, 11 37 0002
2. Cladding
3. Top installed lower frame, 11 37 0004
4. Facade cover profile L, 11 37 0010
5. Handrail bracket horizontal or vertical
6. Extraction piece for top installation
7. Balcony glazing



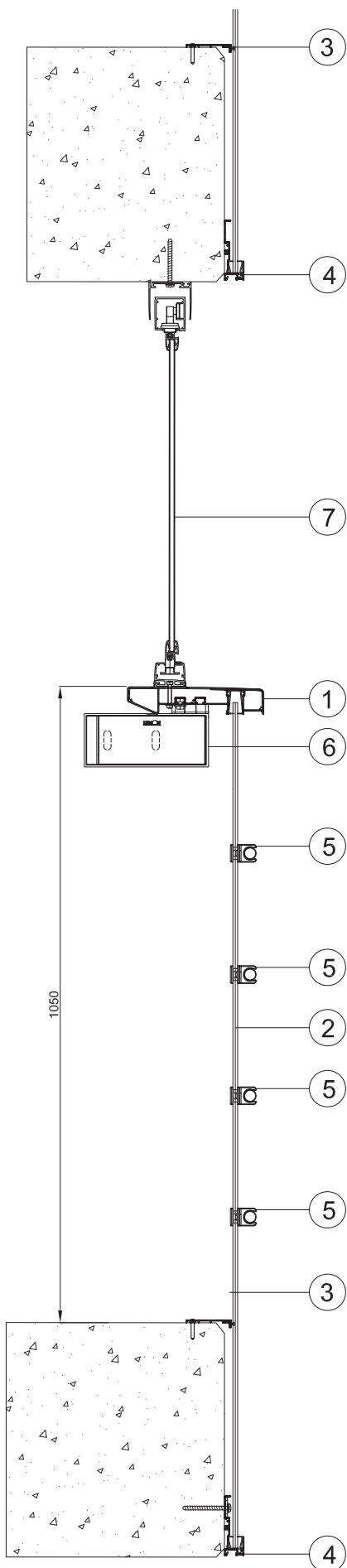
1. Handrail 225x45, 11 37 0001
2. Cladding
3. Top installed lower frame, 11 37 0004
4. Facade cover profile L, 11 37 0010
5. Balustrade support
6. Extraction piece for top installation
7. Balcony glazing



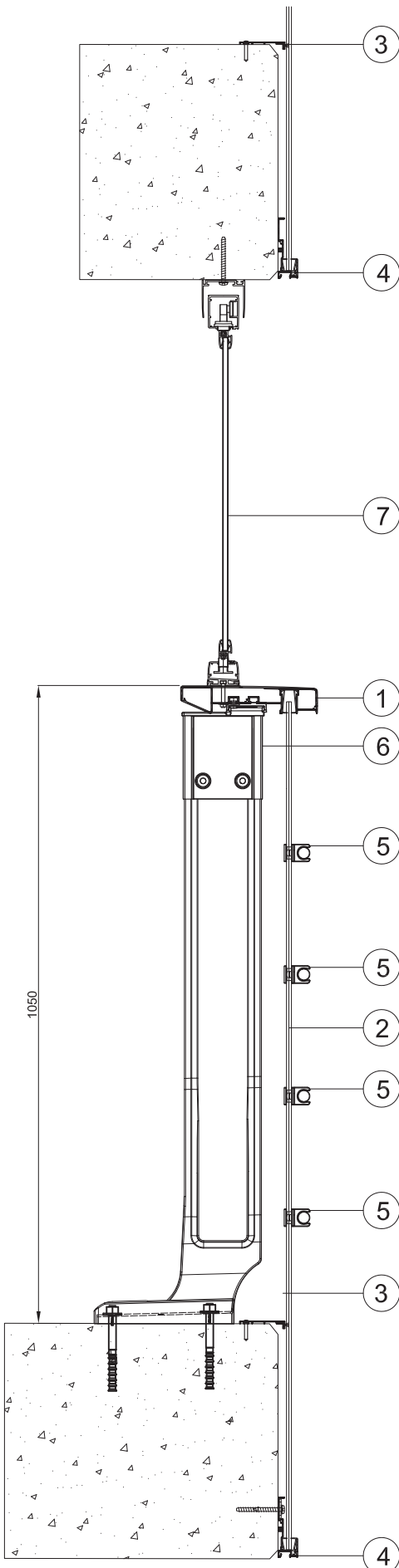
1. Handrail 160x45, 11 37 0002
2. Claddings
3. Wall frame, 11 37 0003
4. Handrail bracket horizontal or vertical
5. Balcony glazing



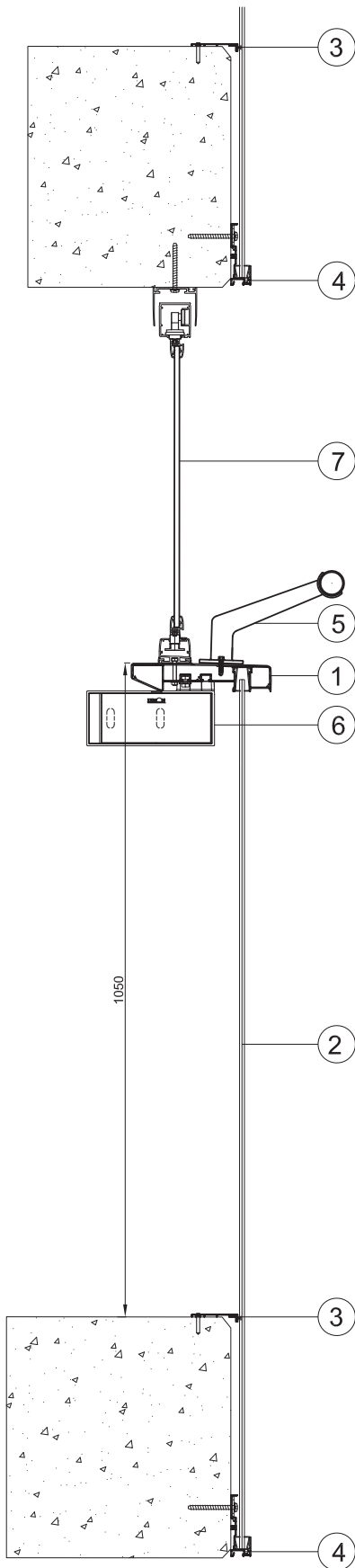
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2. Cladding
3. Wall frame, 11 37 0003
4. Facade cover profile L, 11 37 0010
5. Balustrade support
6. Balcony glazing



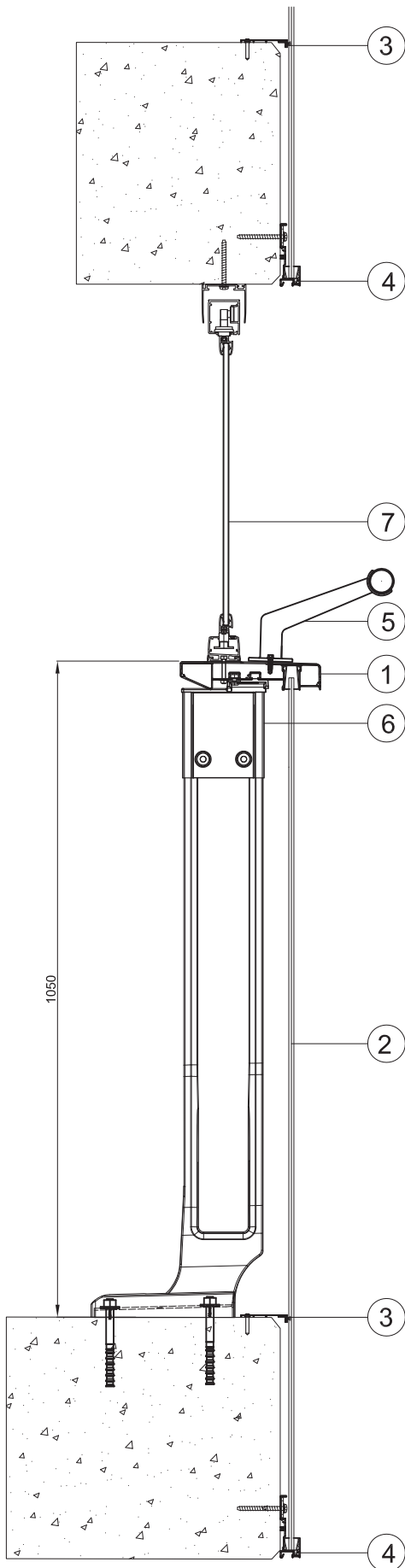
1. Handrail 225x45, 11 37 0001
2. Cladding
3. Floor seal profile, 11 37 0006
4. Side installed lower frame, 11 37 0005
5. Ø20 Decor profile+ bracket
6. Handrail bracket horizontal or vertical
7. Balcony glazing



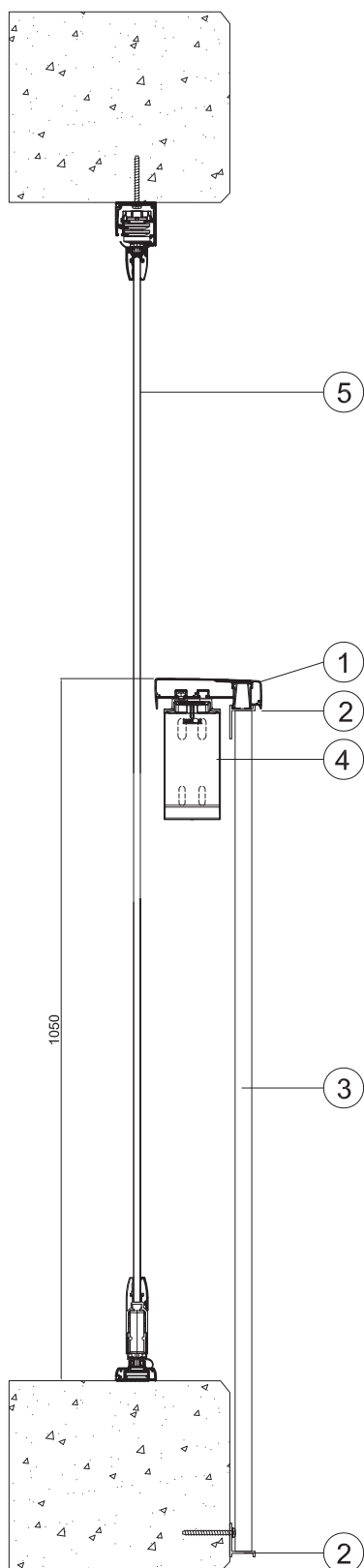
1. Handrail 225x45, 11 37 0001
2. Cladding
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4. Side installed lower frame, 11 37 0005
5. Ø20 Decor profile+ bracket
6. Balustrade support
7. Balcony glazing



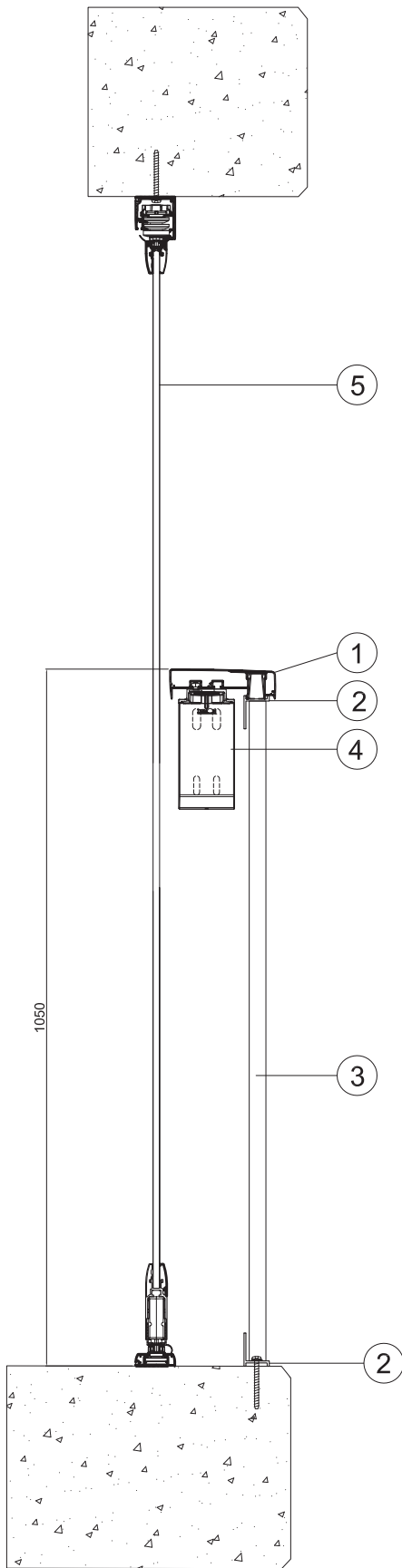
1. Handrail 225x45, 11 37 0001
2. Cladding
3. Floor seal profile, 11 37 0006
4. Side installed lower frame, 11 37 0005
5. Ø40 Decor profile+ bracket
6. Handrail bracket horizontal or vertical
7. Balcony glazing



1. Handrail 225x45, 11 37 0001
2. Cladding
3. Floor seal profile, 11 37 0006
4. Side installed lower frame, 11 37 0005
5. Ø40 Decor profile+ bracket
6. Balustrade support
7. Balcony glazing

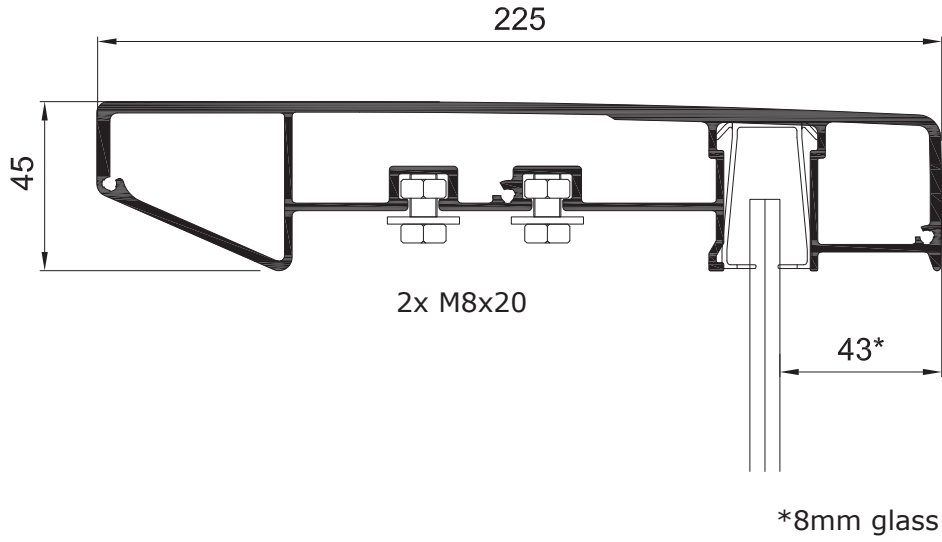


1. Handrail 160x45, 11 37 0001
2. Decorrailing profile, 11 37 0012
3. Decor profile Ø25
4. Handrail bracket horizontal or vertical
5. Balcony glazing

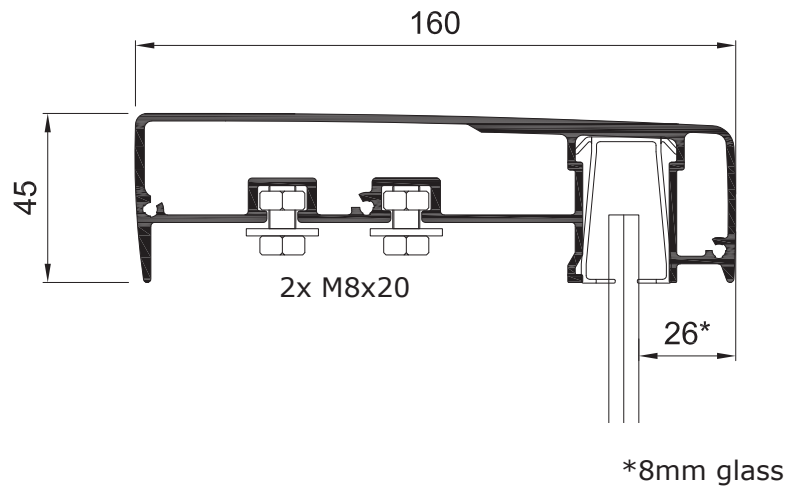


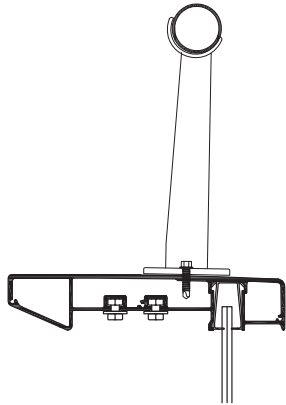
1. Handrail 160x45, 11 37 0001
2. Decorrailing profile, 11 37 0012
3. Decor profile Ø25
4. Handrail bracket horizontal or vertical
5. Balcony glazing

11 37 0001

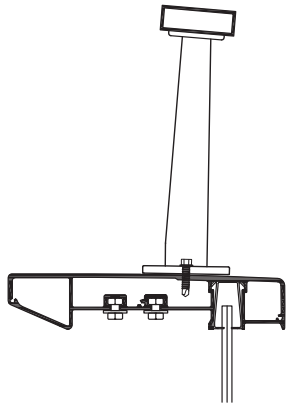


11 37 0002

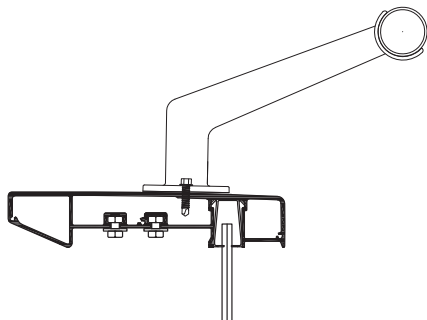




Ø40 decor profile 11 31 5304
+ bracket T4 51 31 9106



Rectangular profile 60x20
+ bracket 51 31 9109

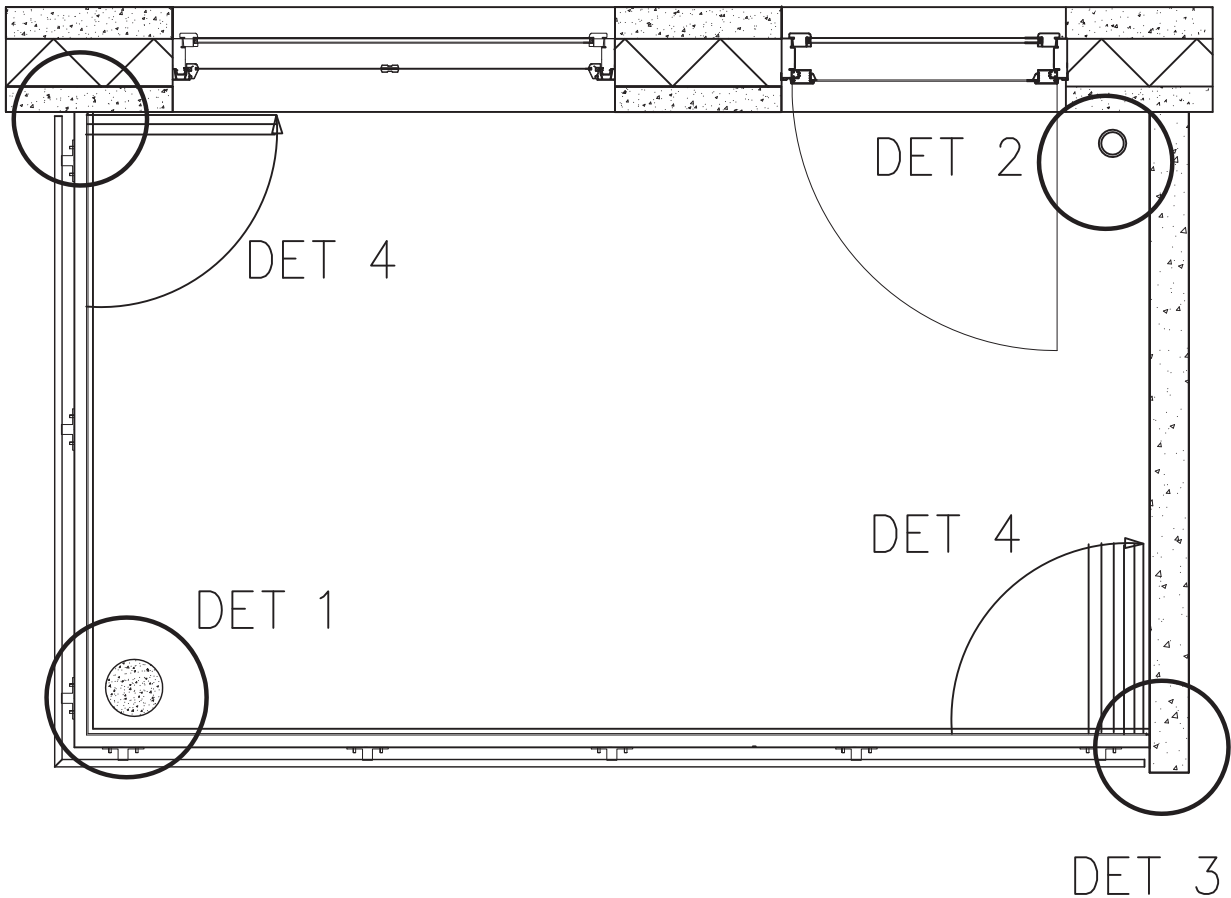


Ø40 decor profile 11 31 5304
+ bracket T3 51 31 9107



Ø20 decor profile 11 31 5301
+ bracket 50 37 0103

DET 3



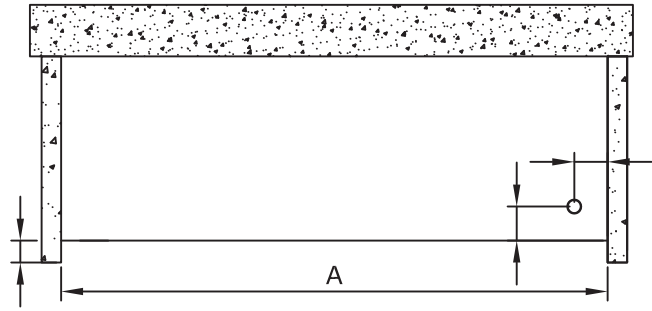
DET 1: The concrete colons of the balcony must be placed so that they do not prevent the opening of the balcony glazing system. The gap between the vertical pillar and the slab must be at least 80mm, so that the top installed lower frame fits. Without cut outs the 225 wide handrail needs 205mm, and the 160mm handrail 155 mm, between the pillar and the balustrade.

DET 2: The placing of the draining pipe must consider the opening of the balcony glazing. With balcony-specific drainage, a pipe is piercing the slab facade.

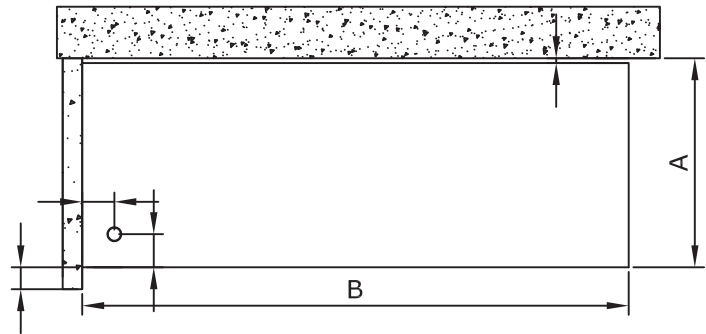
DET 3: The frame walls must be vertical and plain for functional and good looking junctions on both balustrades and balcony glazings. Profile panels, windowsills and big variations in the wall surface often need flashings to cover the interface. A 10-40mm gap is used between the frame wall and the balustrade.

DET 4: The balcony glazings are supported from the upper profile. There for the fastening must be into a stationary structure. Wood structures should be avoided.

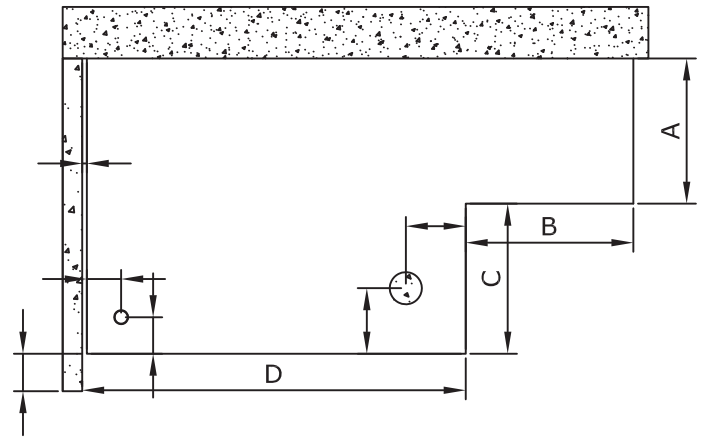
Straight balcony



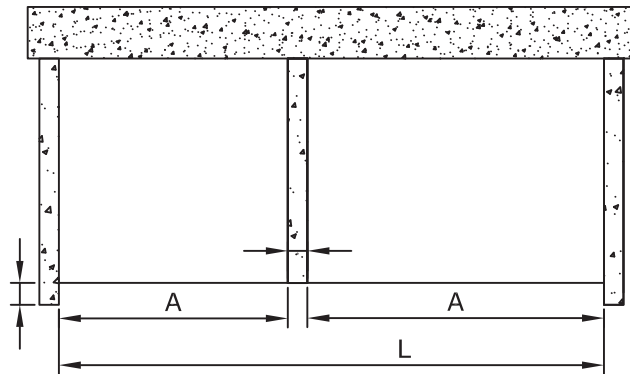
Corner balcony



Multiform balcony

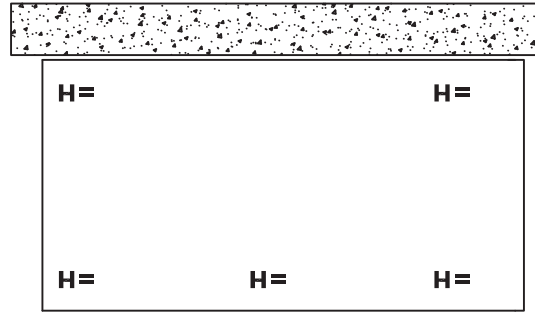
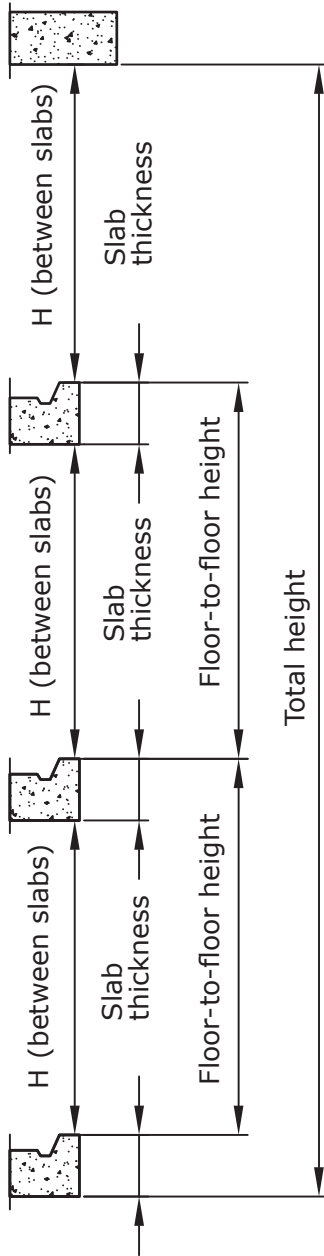


Combined balconies

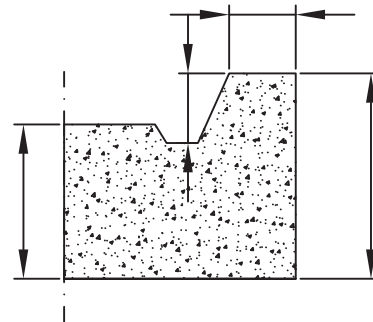


Height measurements:

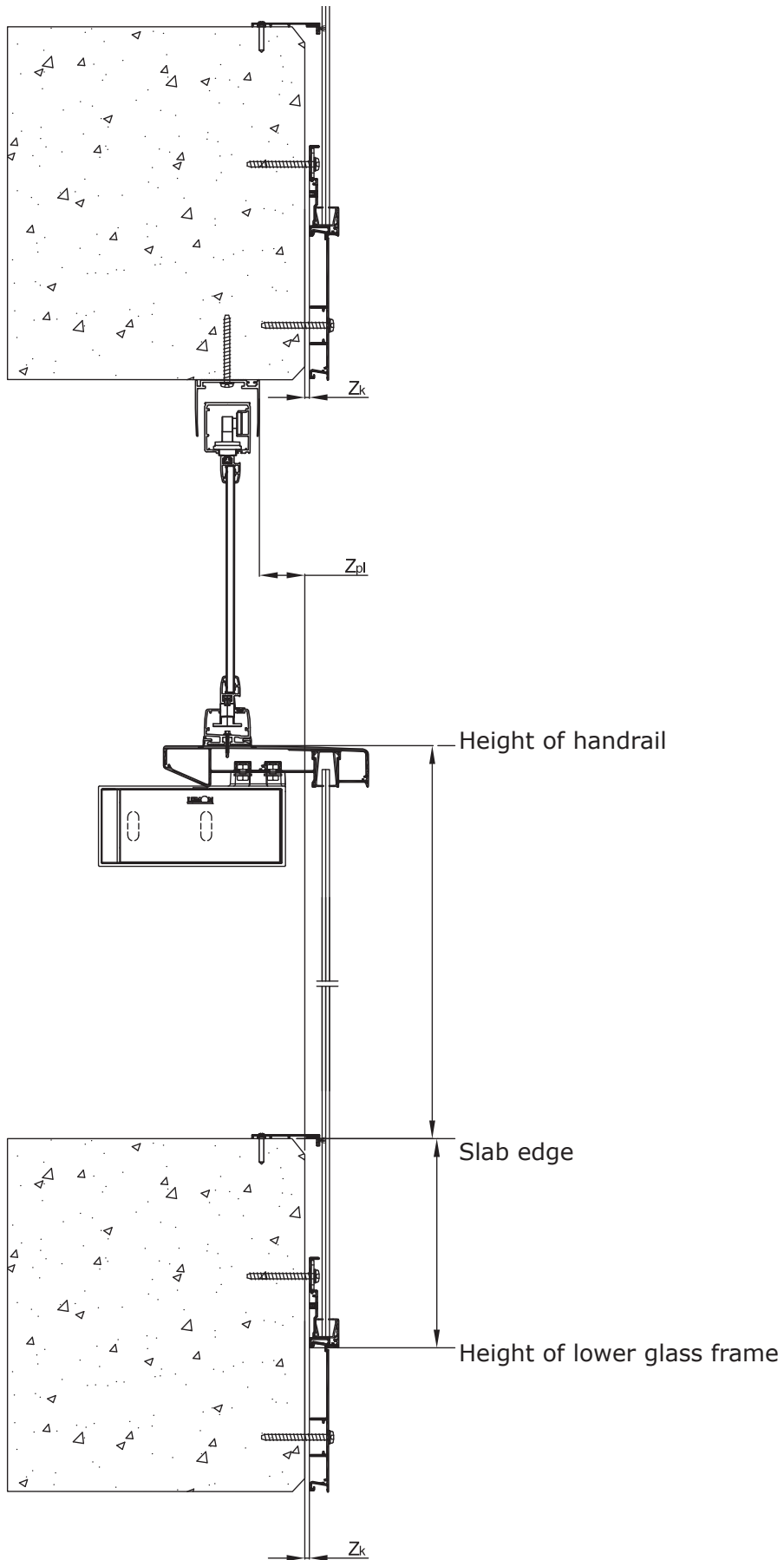
If needed (balcony glazings, high balustrades, solar screens etc.)

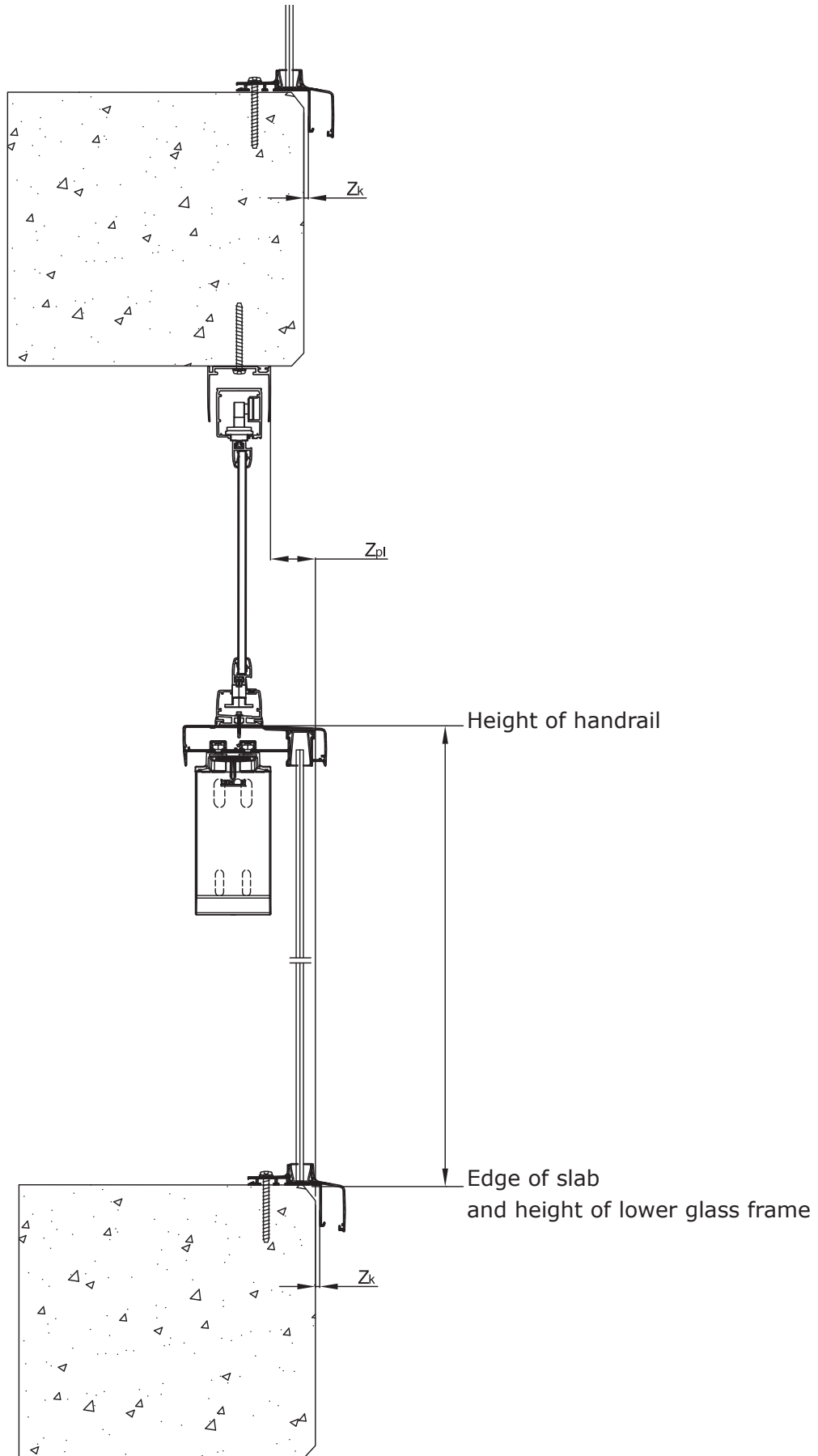


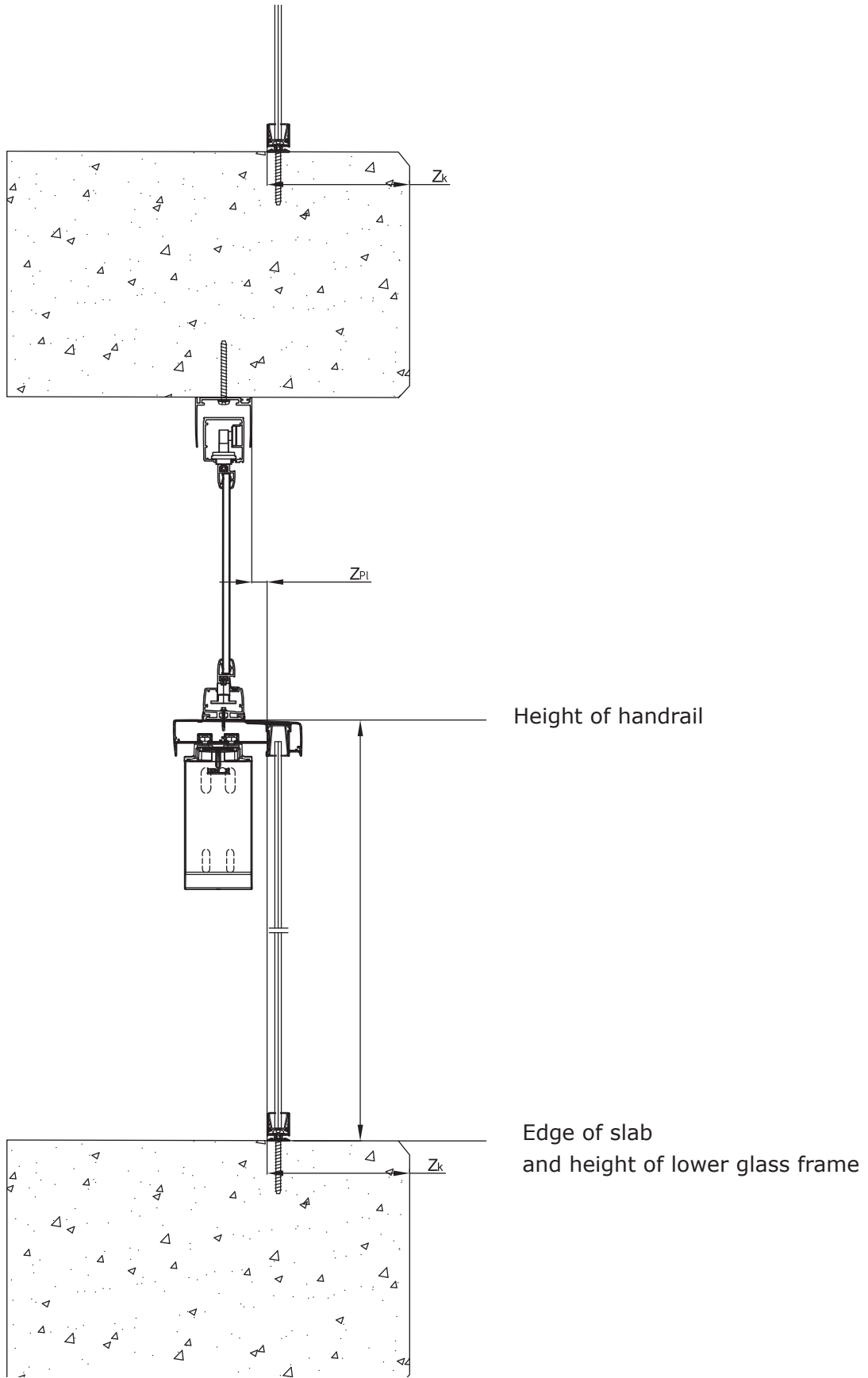
The height is measured from various points. The thickness of a wedging slab must also be measured at the same time

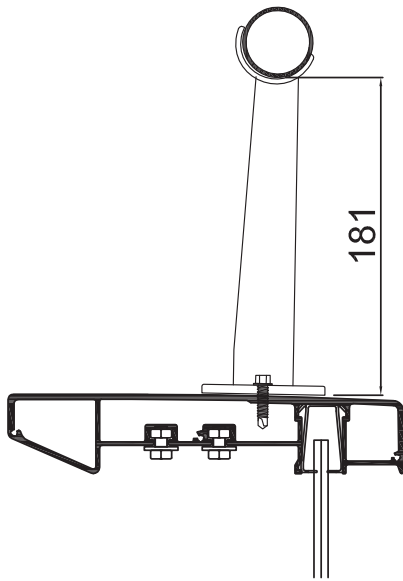


The position of the water drainage pipe must be measured if it is situated in the edge of the slab

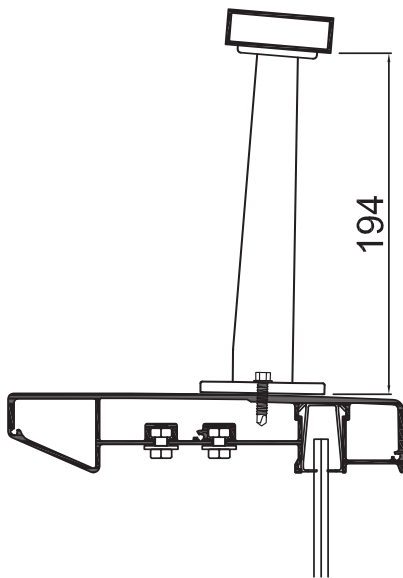




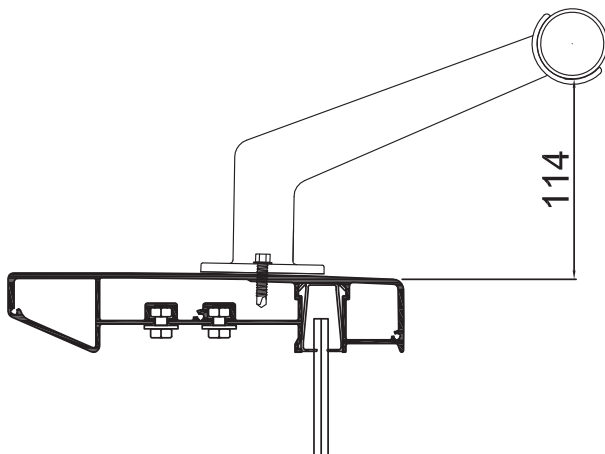




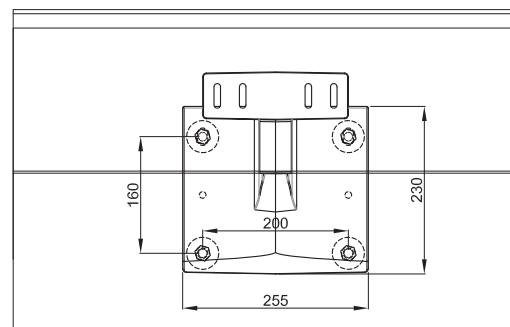
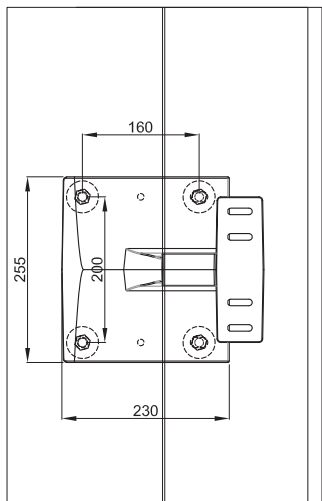
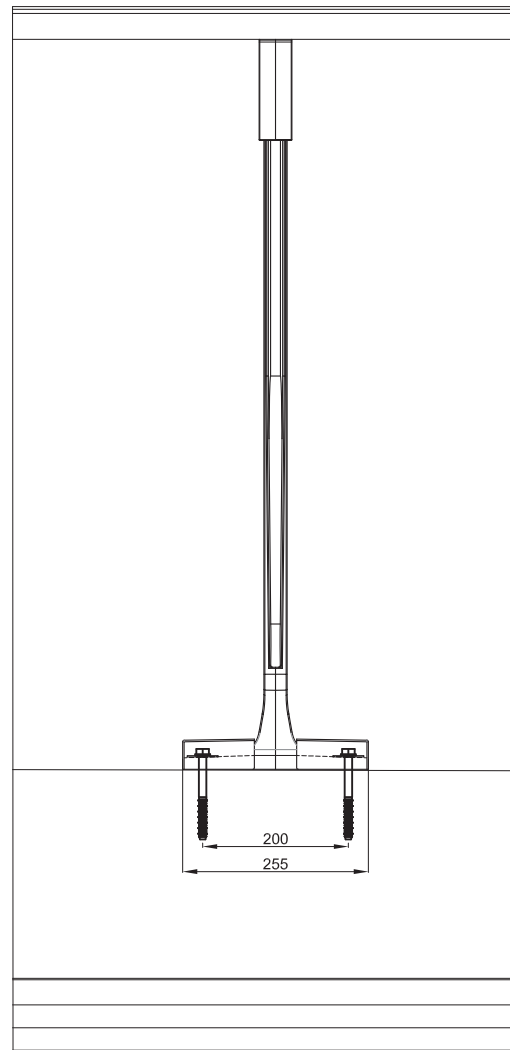
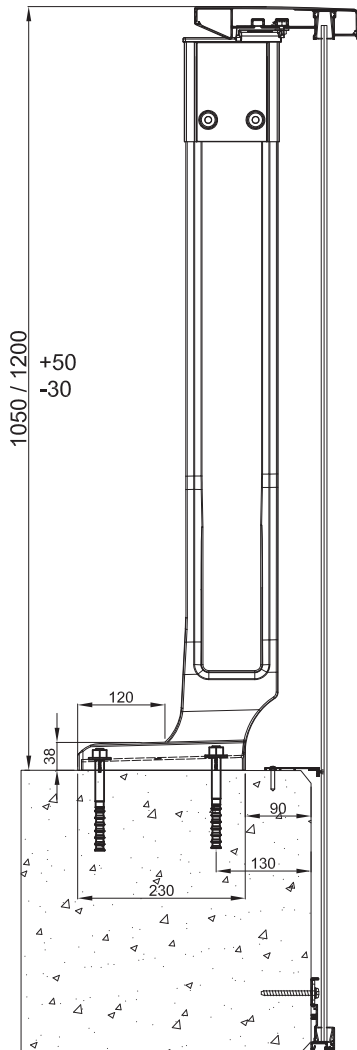
Ø40 decor profile 11 31 5304
+ bracket T4 51 31 9106

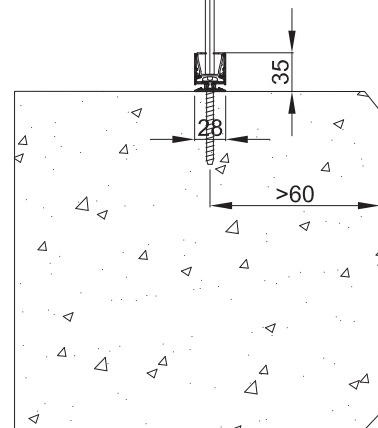
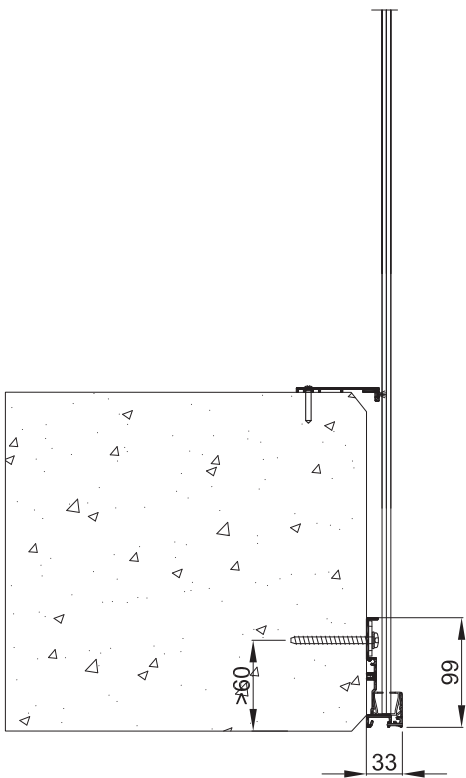
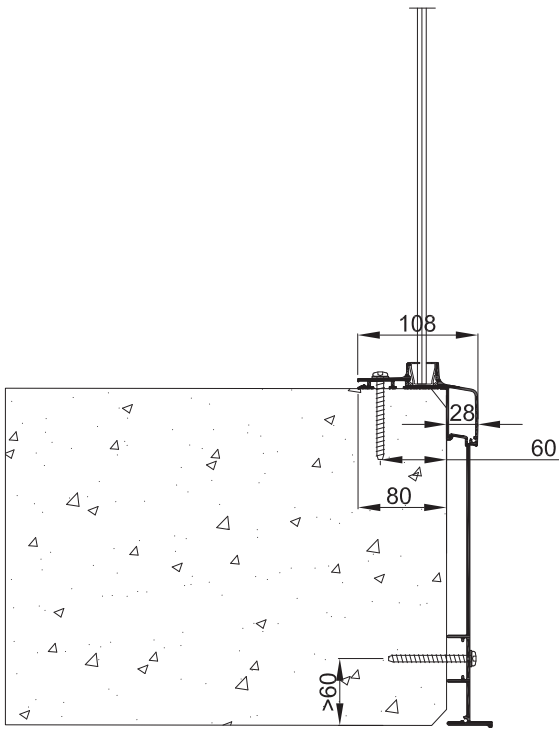


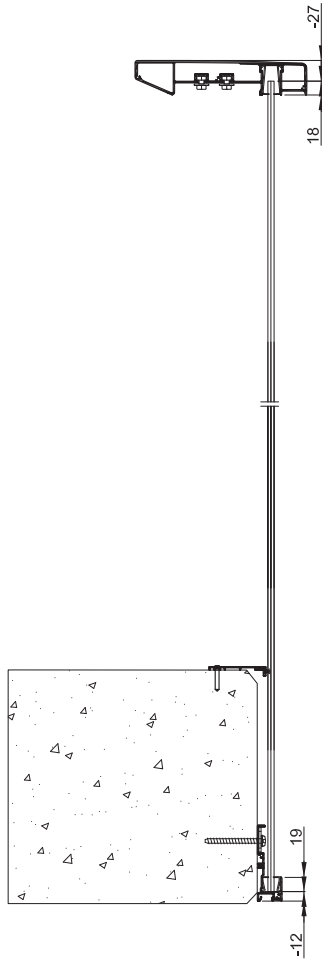
Rectangular profile 60x20
+ bracket 51 31 9109



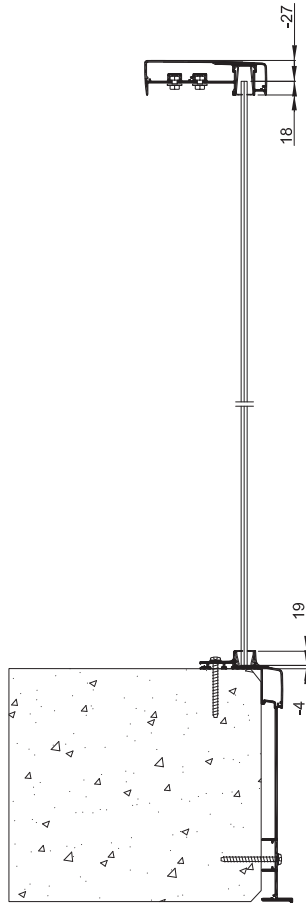
Ø40 decor profile 11 31 5304
+ bracket T3 51 31 9107



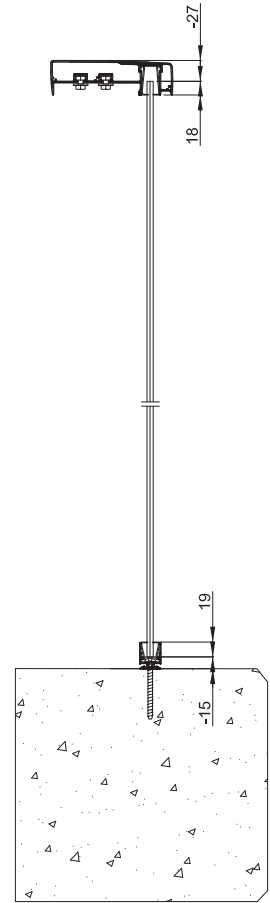




Handrail 225x45
11 37 0001
+
Side installed glass frame
11 37 0005



Handrail 160x45
11 37 0002
+
Top installed glass frame
11 37 0004



Handrail 160x45
11 37 0002
+
Wall frame
11 37 0003

The Lumon balustrade has to be fastened carefully to the surrounding structures in such a way that:

- the structures and fasteners withstand the loads to which they are subject to
- the characteristics of the glass wall system remain uncharged under design loads
- the official requirements are complied with.

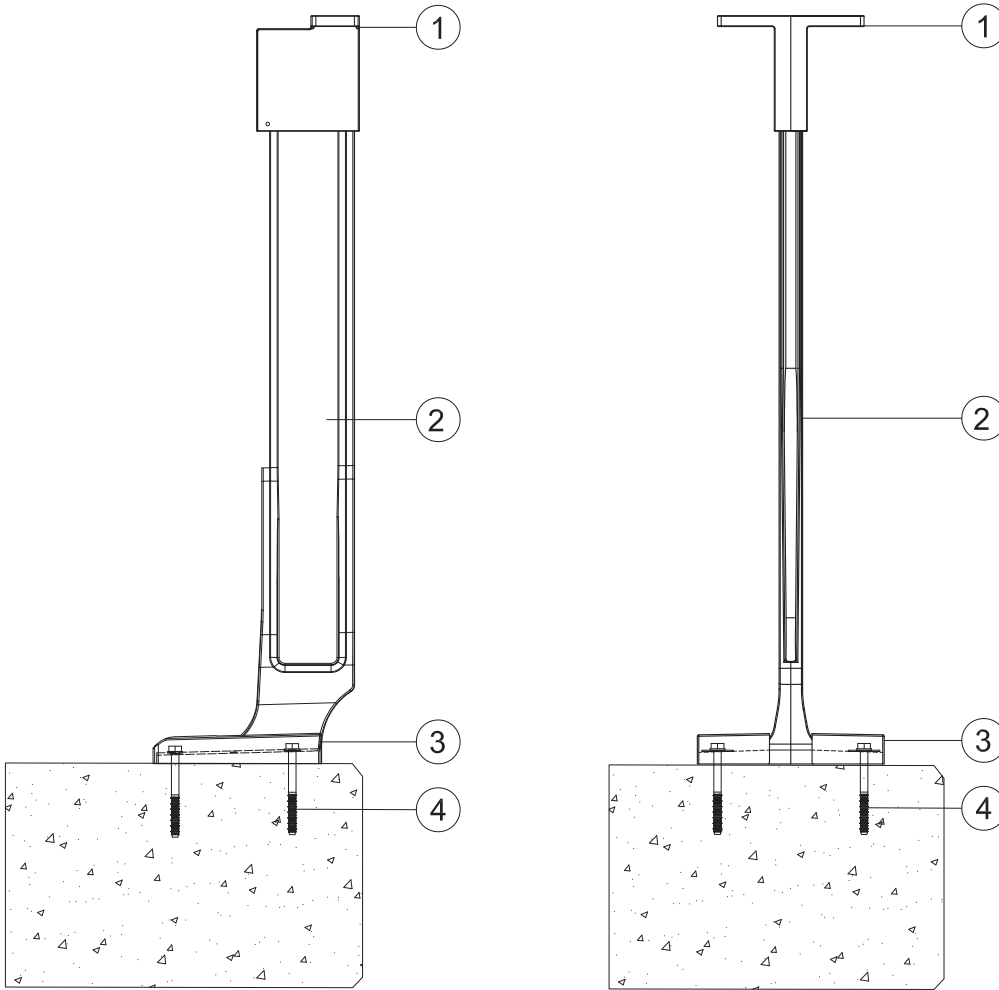
Fastening methods

- Top and facade intallation of balustrades into concrete slab with chemical anchoring or concrete screws
- Facade installation in small-houses into bearing wood structures with bolting through or as top installation with long wood screws (100mm displacement into wood). Handrails with hexagonal wood screws, balustrade supports only with through bolting

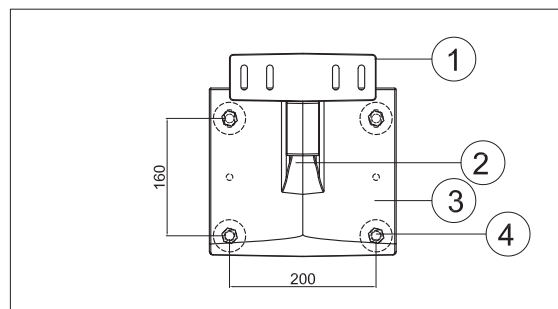
Dividing walls, decor profiles

- anchoring to concrete
- fastening to steel with screws or through bolts
- fastening to aluminum with screws or through bolts
- fastening to wood structure

Number	Name	Vertically stabilized			
		Steel	Wood	Cracked concrete	Non cracked concrete
69 98 4011	Chemical anchoring HIT-Z-R M12x105			X	X
69 98 4012	Chemical anchoring HIT-Z-R M12x140			X	X
69 98 4013	Chemical anchoring HIT-Z-R M12x196			X	X
69 98 4003	Chemical anchoring M12x140			X	X
69 98 4002	Chemical anchoring M12x180			X	X
69 98 4008	Chemical anchoring M12x220			X	X
68 98 0520	Concrete screw HUS-HR10x115			X	X
68 98 0466	Concrete screw A5 TX30, 7,5x75			X	X
68 98 0226	Hexagonal wood screw 12x100 Zn		X		
68 98 0246	Wood screw 8x80 flanged A2		X		
68 98 0241	Wood screw 8x200 flanged A2		X		
68 98 0424	Screw M12x40 DIN933 A2	X			
68 98 0006	Screw M8x40 DIN933 A2	X			



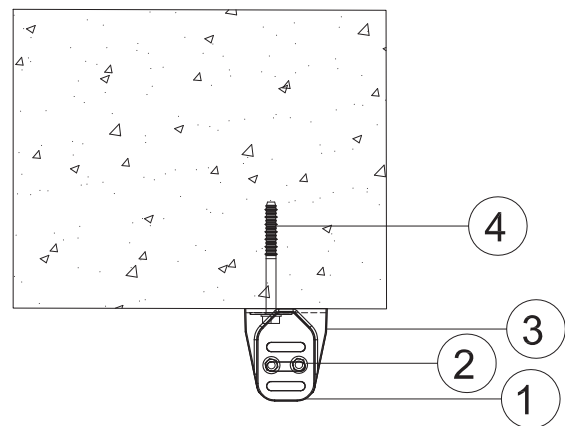
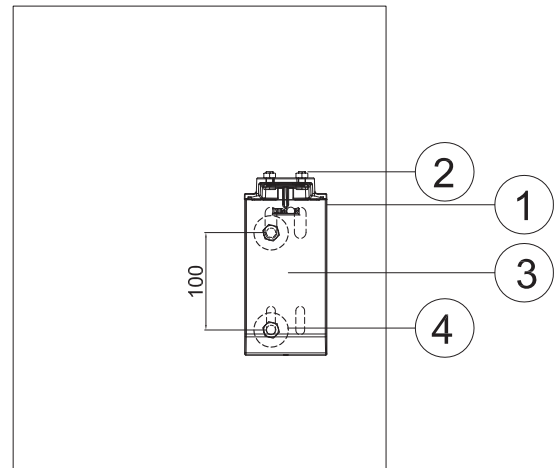
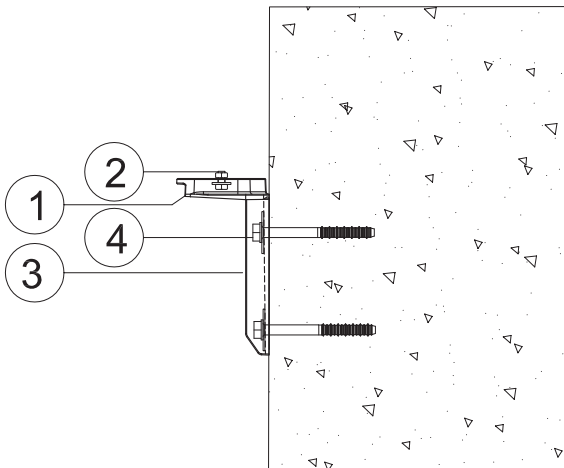
Min. edge dist. for anchor = 130mm



1. Adjustment piece for balustrade support
2. Balustrade support
3. Support cover
4. Anchor

Fastening methods:

- Chemical anchoring + threaded bar, nut and washer
- Bolting through wood

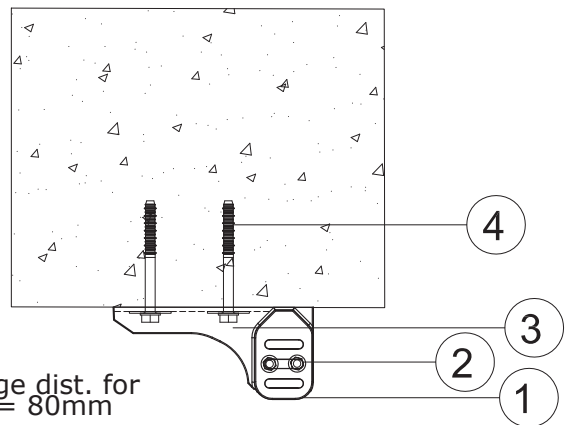
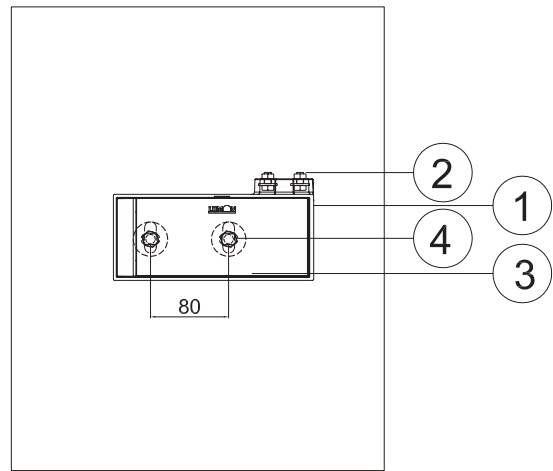
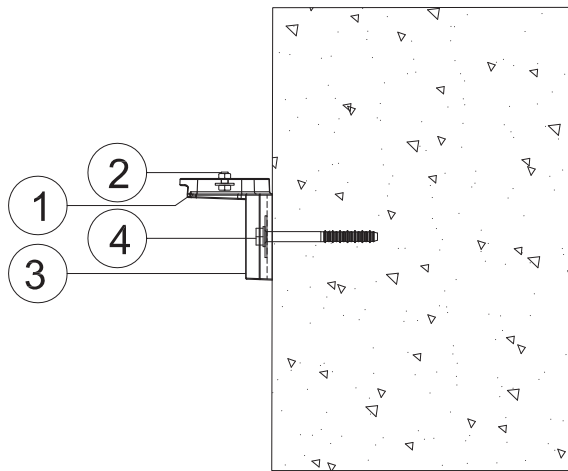


Min. edge dist. for anchor = 80mm

1. Handrail bracket vertical
2. 2x M8 to fasten handrail
3. Bracket cover vertical
4. Anchor

Fastening methods:

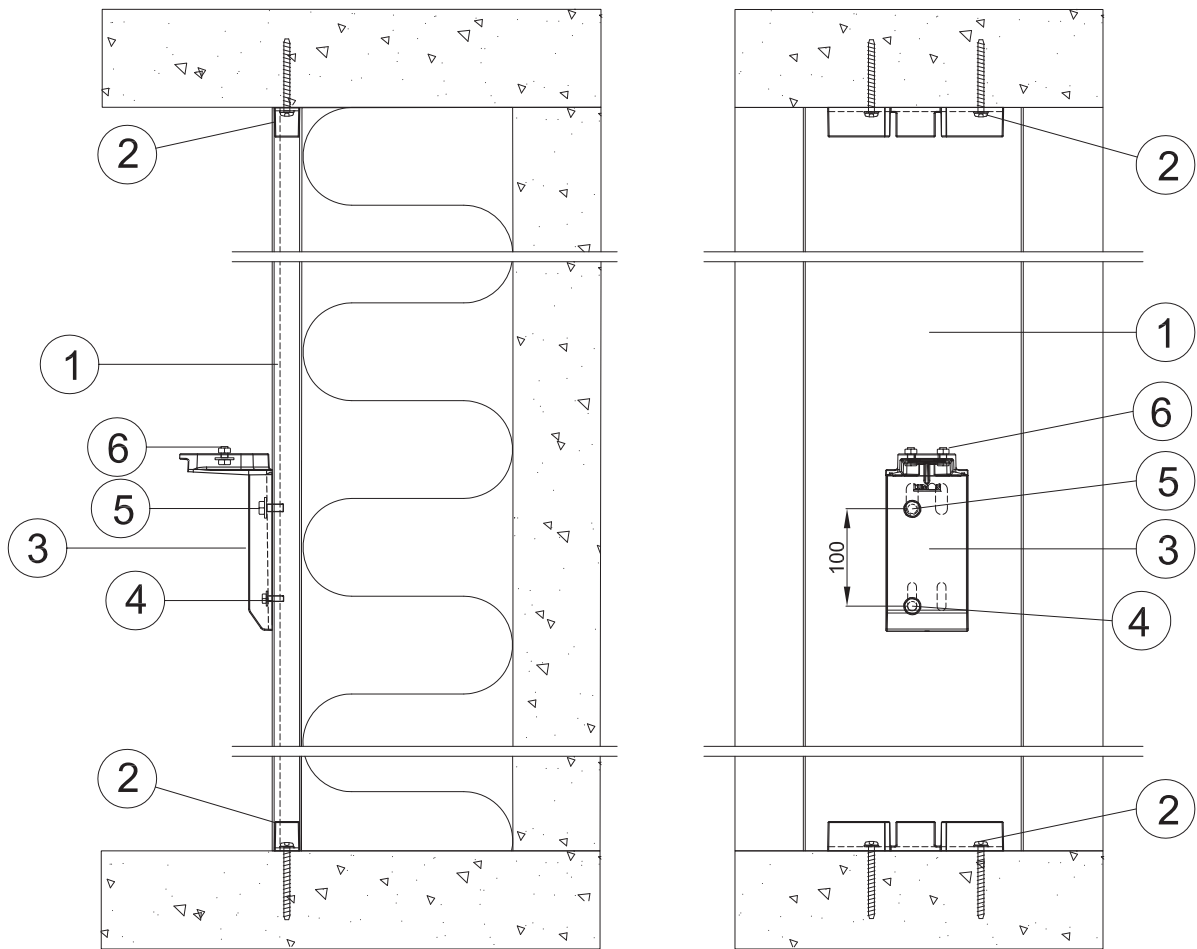
- Concrete screw HUS-HR 10x85
- Bolting through wood
- Wood screw



Min. edge dist. for anchor = 80mm

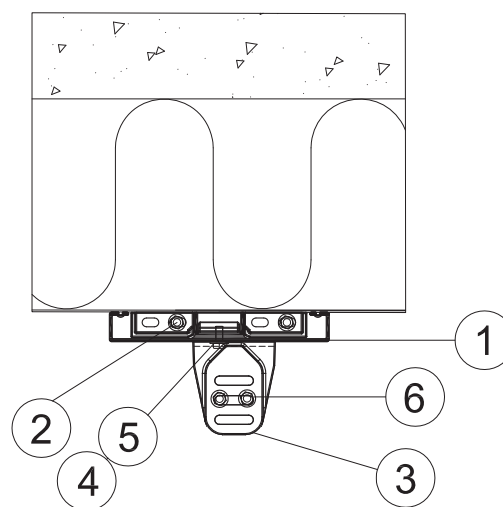
1. Handrail bracket horizontal
2. 2x M8 to fasten handrail
3. Bracket cover horizontal
4. Anchor

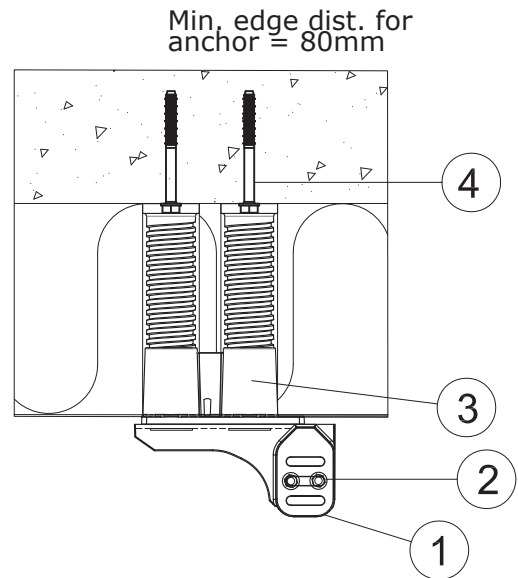
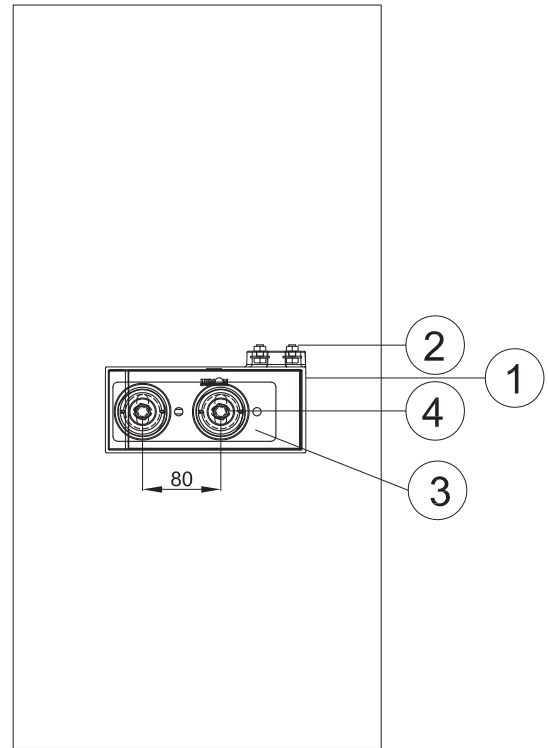
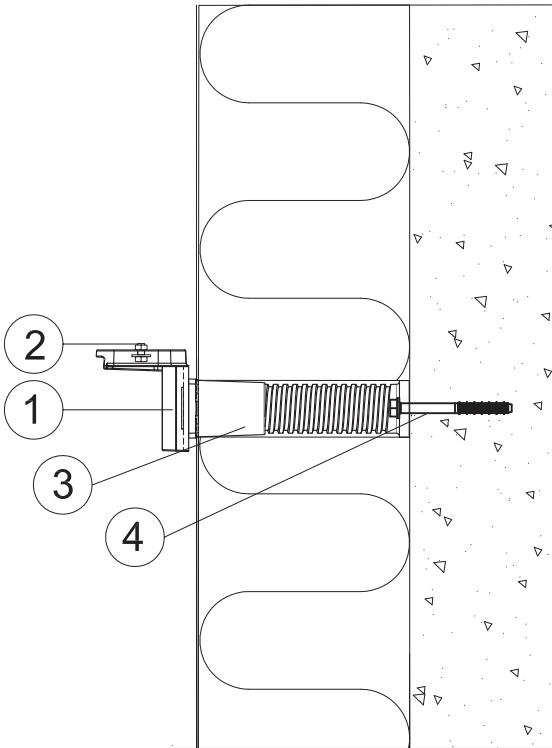
- Fastening methods:
- Concrete screw HUS-HR 10x85
 - Bolting through wood
 - Wood screw



1. Side support 30x225
2. Bracket for side support and 2x 7,5x75 concrete screw
3. Handrail bracket vertical + cover
4. Screw M8 + thread
5. Screw M10 + thread
6. 2x M8 to fasten handrail

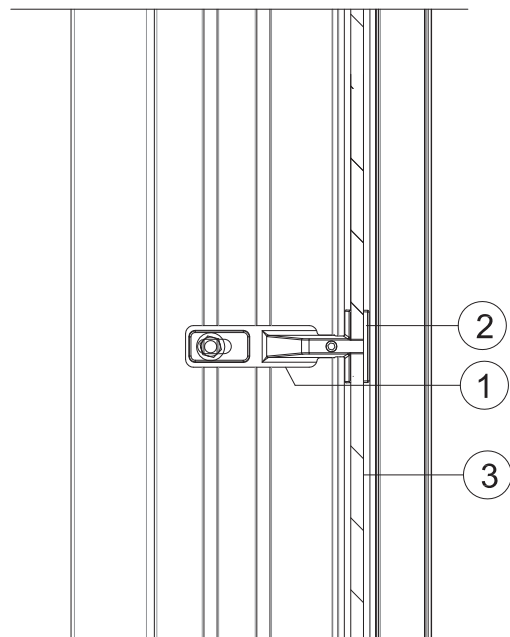
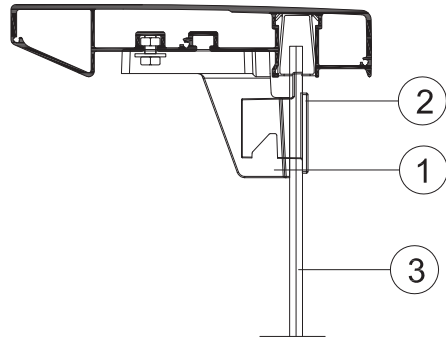
Fastening methods:
 - Concrete screw 7,5x75
 - Bolting through wood
 - Wood screw



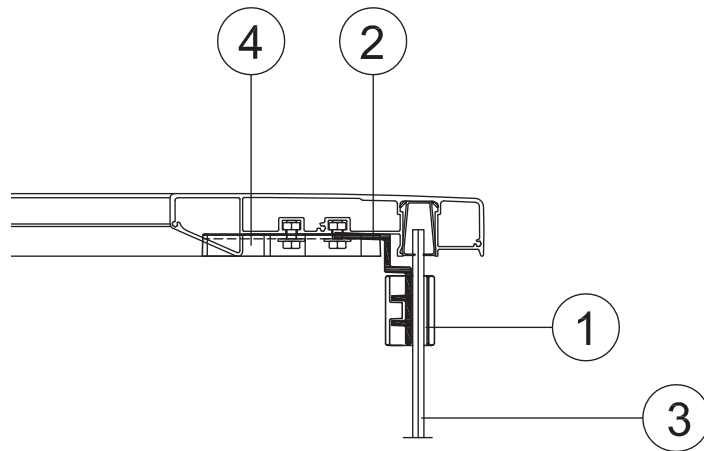
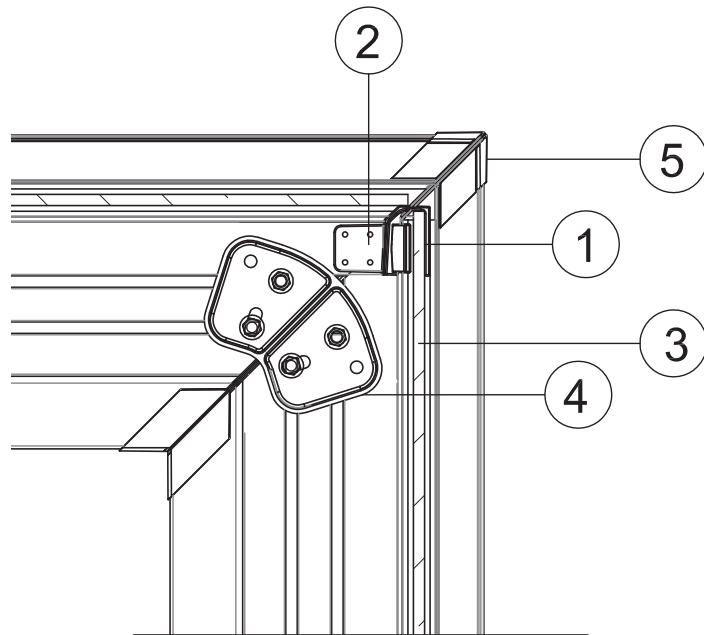


1. Handrail bracket + cover
2. 2x M8 to fasten handrail
3. Bracket frame and thread adjustment piece
4. Concrete screw

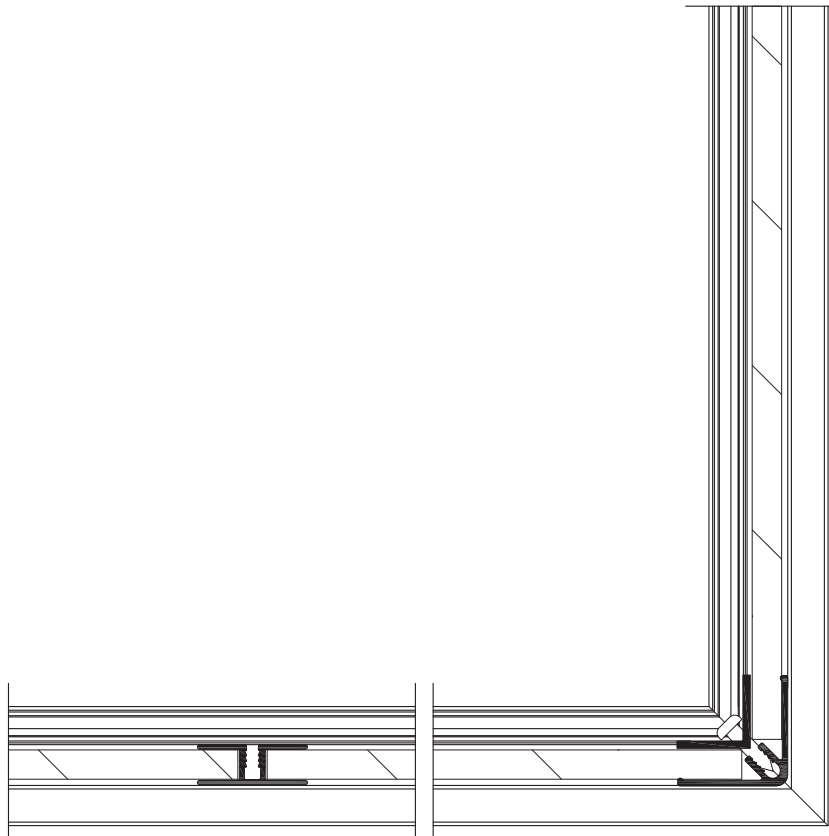
- Fastening methods:
- Concrete screw HUS-HR 10x85
 - Bolting through wood
 - Wood screw



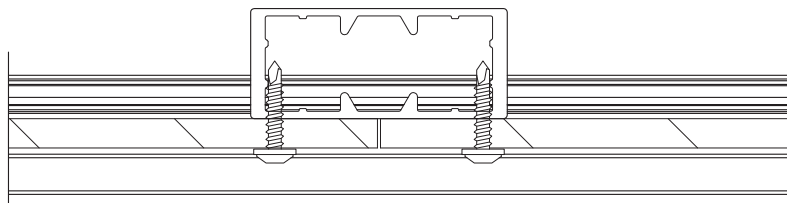
1. Handrail support piece
2. Fastening piece of handrail support
3. Glass



- 1. Corner support bracket
- 2. Handrail corner support
- 3. Glass
- 4. Corner joint piece
- 5. Corner end plug 90° 225x45

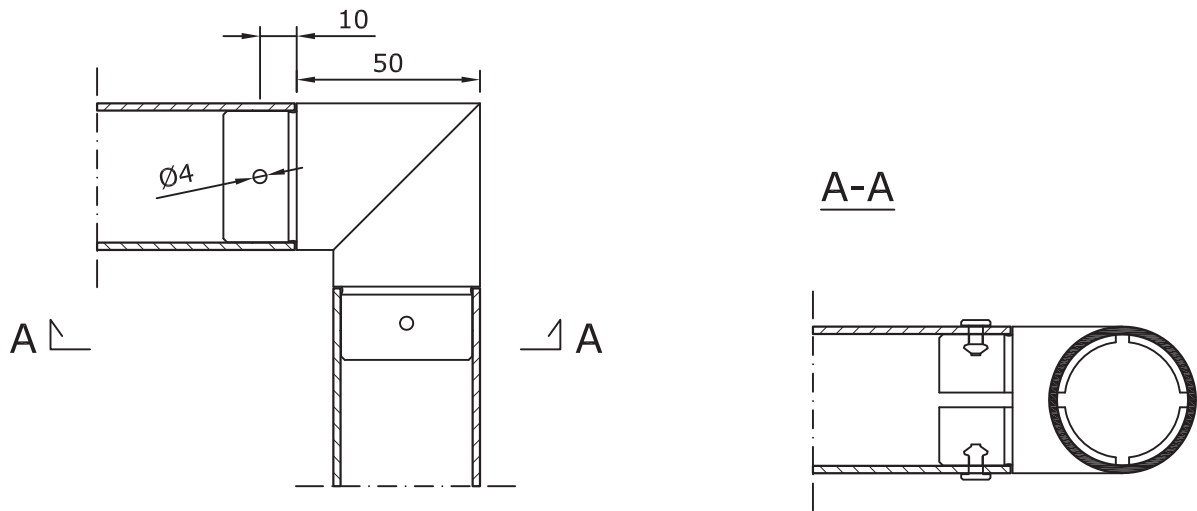


In building board claddings, a middle bead 30x30 is used to cover the gaps
 In system angles the corner is covered with a corner bead 30x30 and 20x20 L- profile

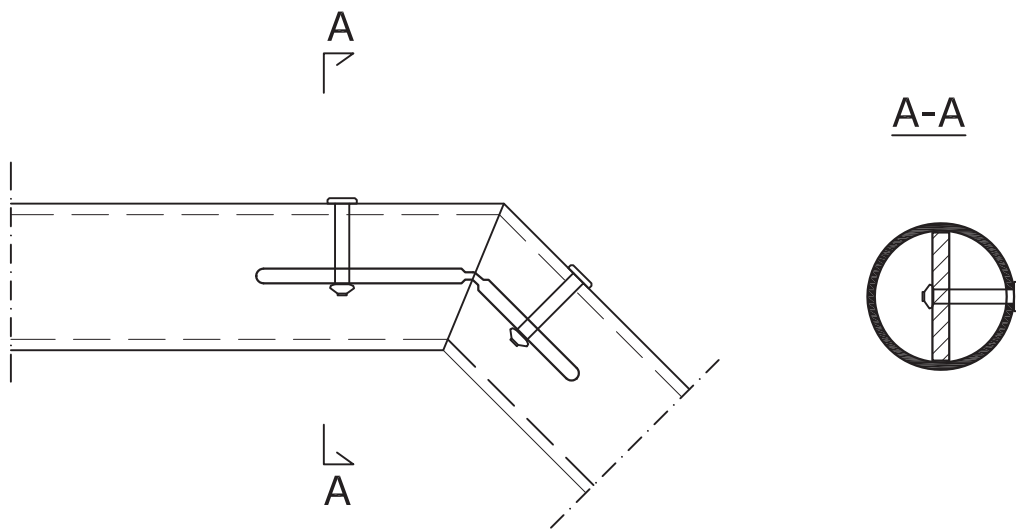


Building boards can be fitted without beads, the edges must however be supported by a profile.

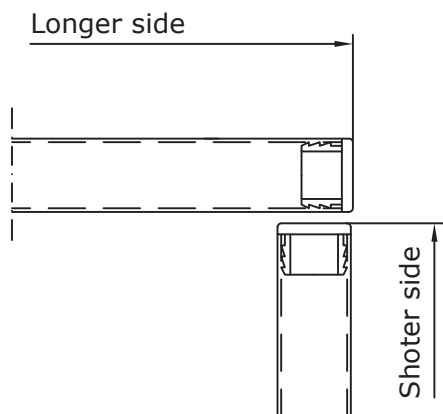
90° Corner component for Ø40 decor profile 51 36 3337



Ø40 decorprofile with adjustable joint piece 51 30 0008



Decor profile without miters





Tools and equipment required for the installation work.

Cordless Impact wrench	Drill bit for stone 6 mm, 2pcs; drilling 150mm
Cordless drill	Drill bit for stone 8 mm, 2pcs
Hammer drill	Drill bit for stone 10 mm
Toolbox with spare parts	Drill bit 9 mm, 2 pcs
Extension cord 8m (20m for projects)	Drill bit 13mm, 2 pcs
Hearing protectors	Plate shears left/right handed
Ratchet tie down strap	Plate bending pliers
Safety harness with quick release buckles	Silicone gun
Safety lanyard	Aluminium platform ladder
Reel for safety lanyard	Cross line laser
Goggles with protective case	Suction cup handles 2pcs
Tape measure 5 m	
Spirit level 600 mm	Bits torx 25
Spirit level 2000 mm	- balustade frameworks
Carpenter's hammer 20 with steel shaft	Bits torx 30 and 40
Builder's knife	- concrete screws
Carpenter's pencil	- wood screws

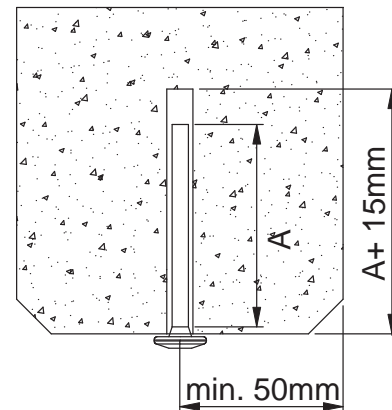
The Lumon balustrade has to be fastened carefully to the surrounding structures in such a way that:

- the structures and fasteners withstand the loads to which they are subject to
- the characteristics of the glass wall system remain uncharged under design loads
- the official requirements are complied with.

Number	Name	Horizontally stabilized			
		Steel	Wood	Cracked concrete	Non cracked concret
69 98 4011	Chemical anchoring HIT-Z-R M12x105			x	x
69 98 4012	Chemical anchoring HIT-Z-R M12x140			x	x
69 98 4013	Chemical anchoring HIT-Z-R M12x196			x	x
69 98 4003	Chemical anchoring M12x140			x	x
69 98 4002	Chemical anchoring M12x180			x	x
69 98 4008	Chemical anchoring M12x220			x	x
68 98 0520	Concrete screw HUS-HR10x115			x	x
68 98 0466	Concrete screw A5 TX30, 7,5x75			x	x
68 98 0226	Hexagonal wood screw 12x100 Zn		x		
68 98 0246	Wood screw 8x80 flanged A2		x		
68 98 0241	Wood screw 8x200 flanged A2		x		
68 98 0424	Screw M12x40 DIN933 A2	x			
68 98 0006	Screw M8x40 DIN933 A2	x			

Installing Concrete Screw to Concrete:

Drill a $\varnothing 6$ mm hole at least 15 mm deeper than the installation screw. Drilled hole will be exhausted and screw tightened. First few turns push harder and if screw is sticking, turn screw $\frac{1}{2}$ lap counterclockwise and screw up again. The top of the screw thread is equipped with gearing and it diminishes friction and at the same time it makes a groove for thread. Concrete screw is possible to use even with 50mm edge distance. At installation a percussion screwdriver must be used.



Installing with wood screw

If glazing is installed to wooden structure used full threaded wood screw which core diameter is at least 8 mm must be used. The manufacturer recommend to use laminated timber or for example heat or pressure treated wood with minimum size of 100x50 mm. The load rating of wooden structures and other requirements must be checked on case by case bases.

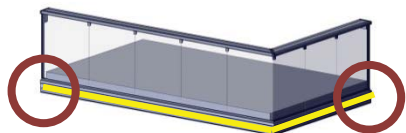
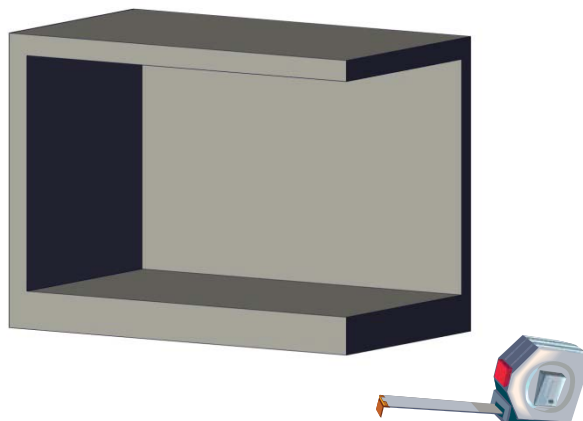
Minimum distance from wooden edge is 25 mm and 50 mm respectively.

Fastening to aluminum or steel structures with screws

Check that the material thickness is sufficient so that the structures can carry the glazing loads. Material thickness can be increased, if necessary, by attaching shims to the structure. Make sure to fasten the shims in several places. Use lubricant such as cutting oil, silicone spray on the threading.

Aluminum structures: Minimum material thickness 5 mm; pre-punched hole 5,1 mm.

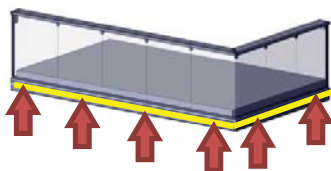
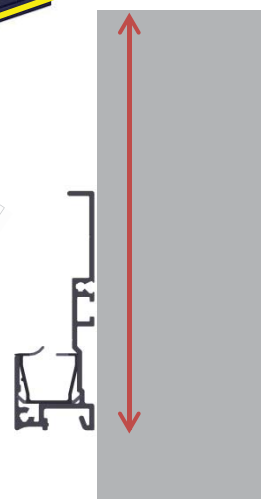
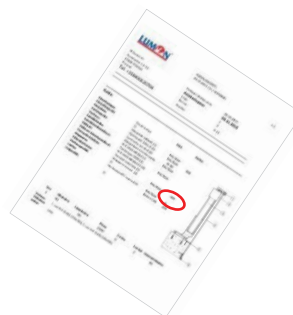
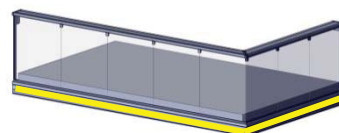
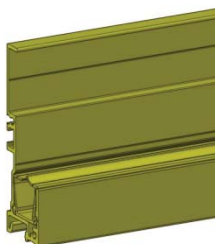
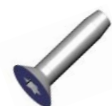
Steel structures: Minimum material thickness 4 mm; pre-punched hole 5,1-5,5 mm.



4,2x19



TX20



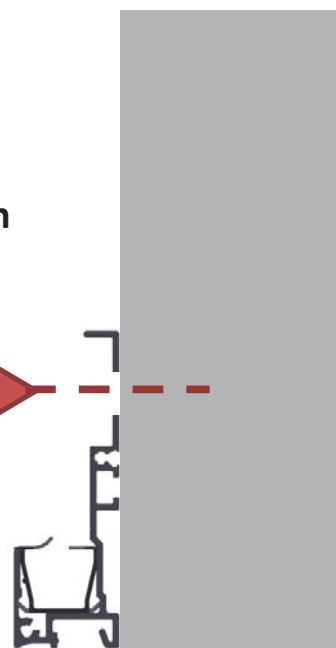
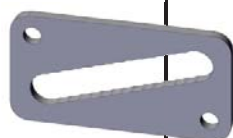
tx30
Min.7.5x60/75

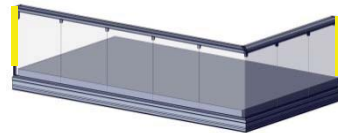
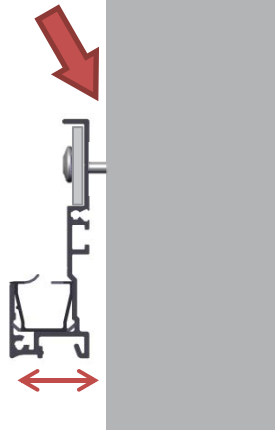
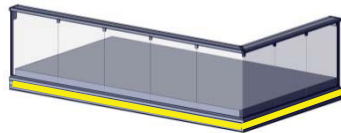
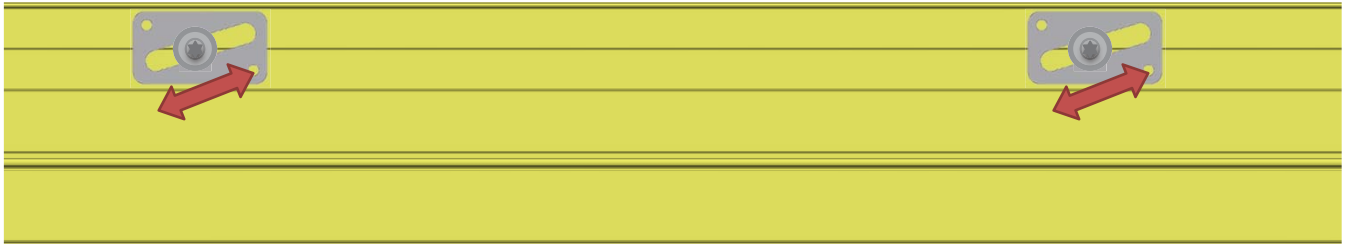
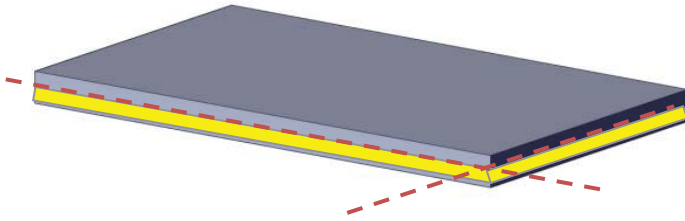


8,4x17x1,5

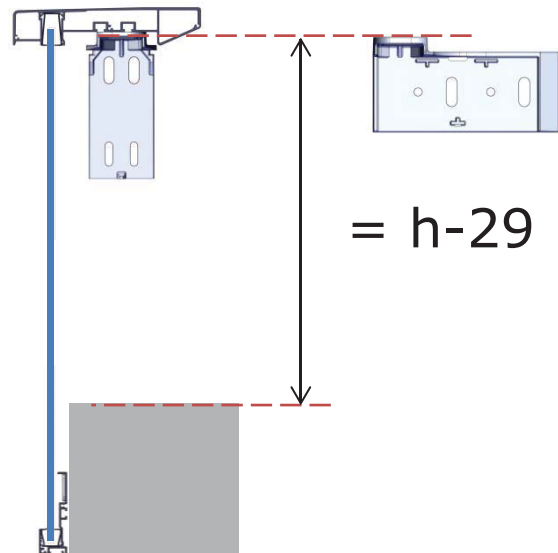
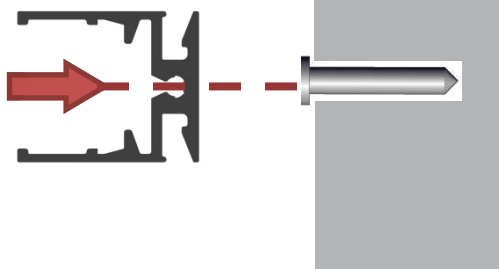
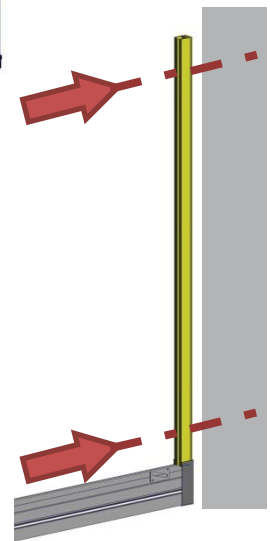


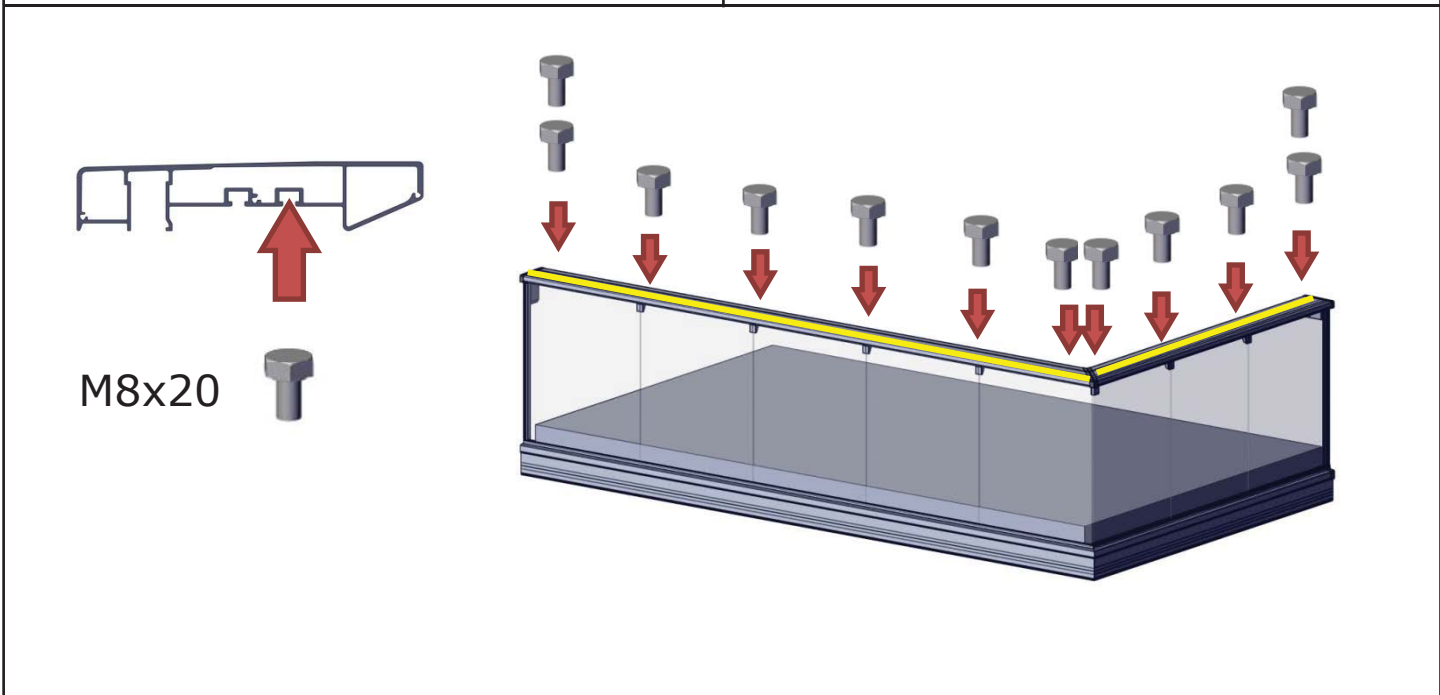
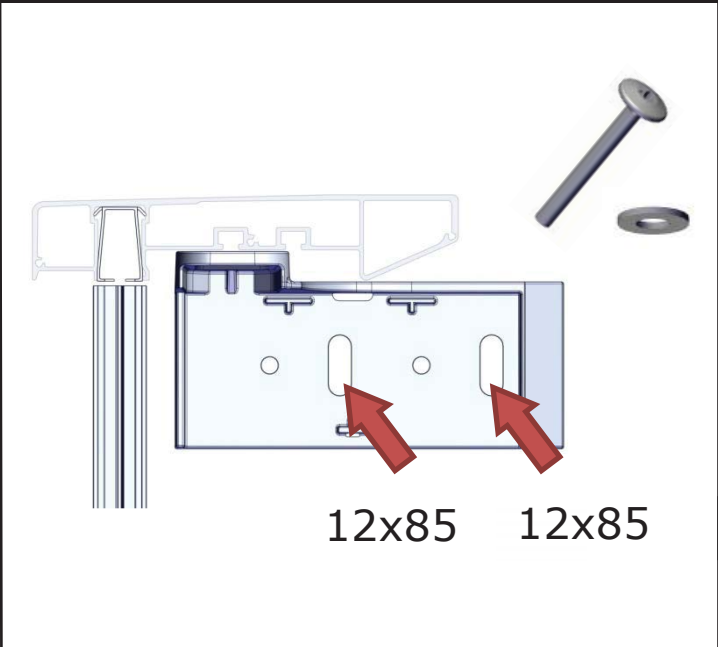
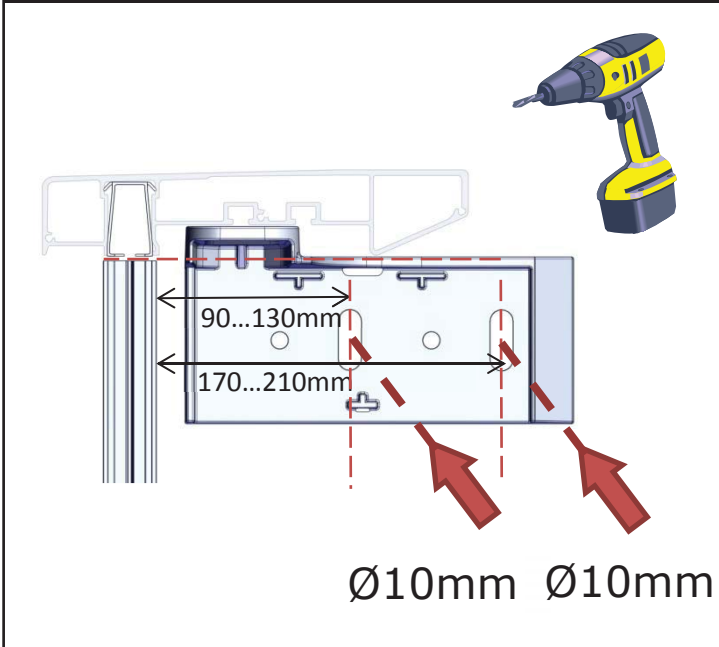
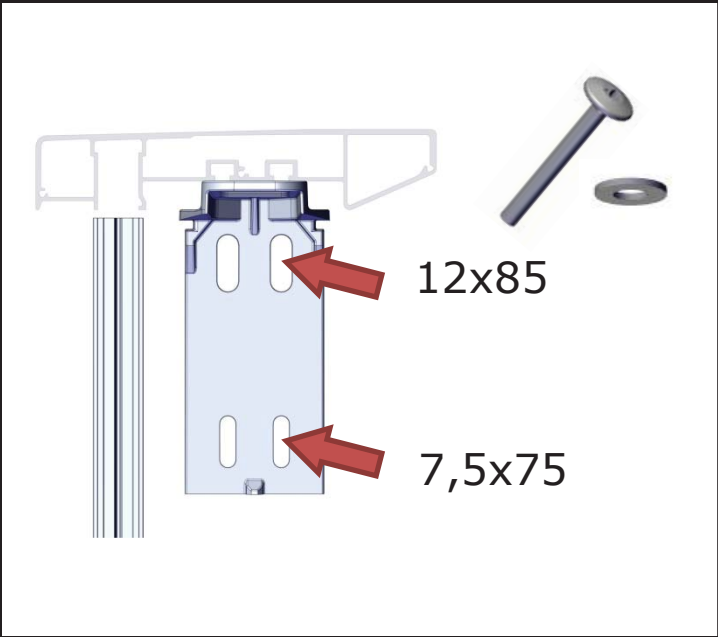
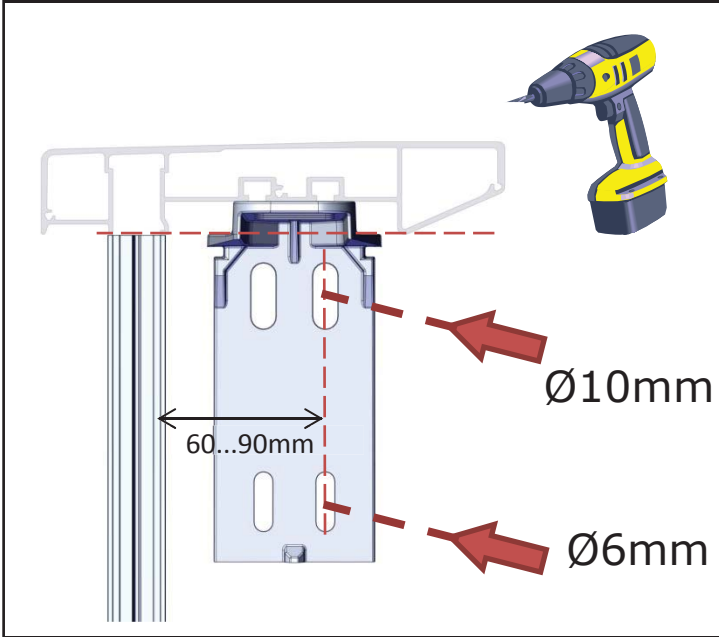
Ø6mm

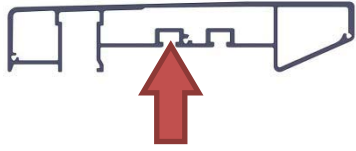




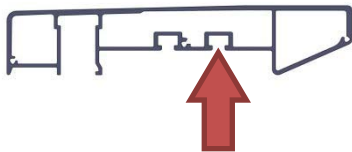
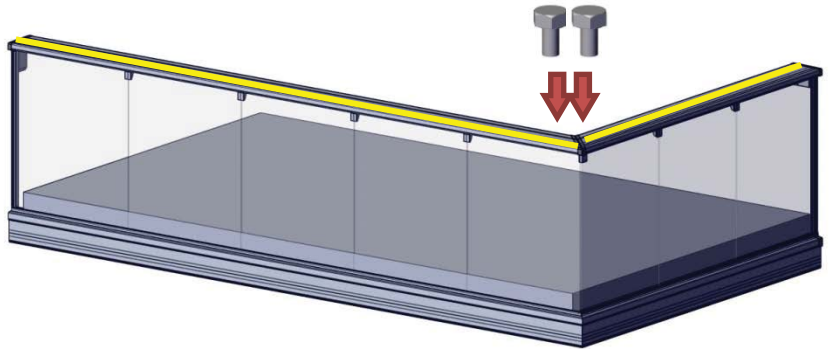
Ø 5mm



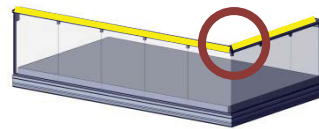
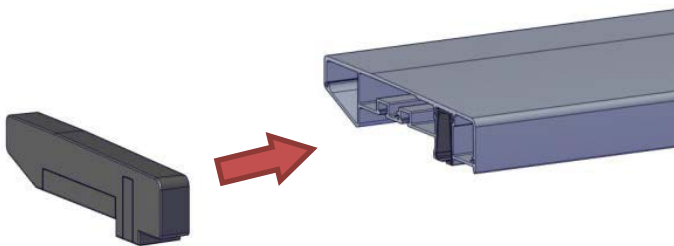
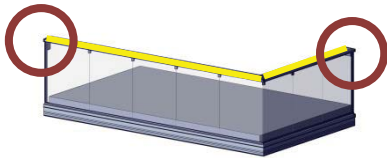
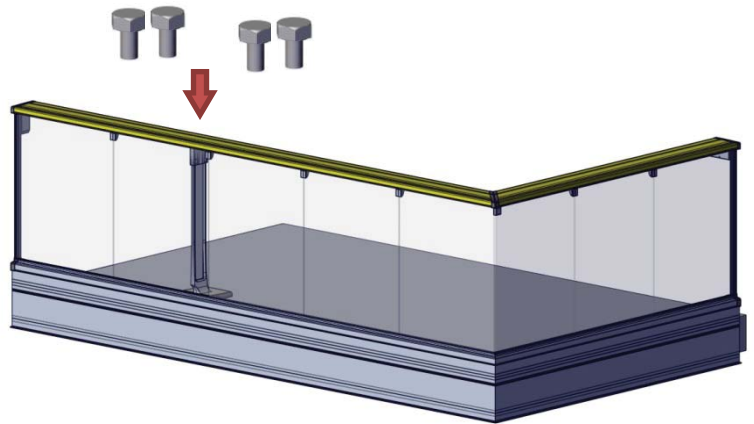




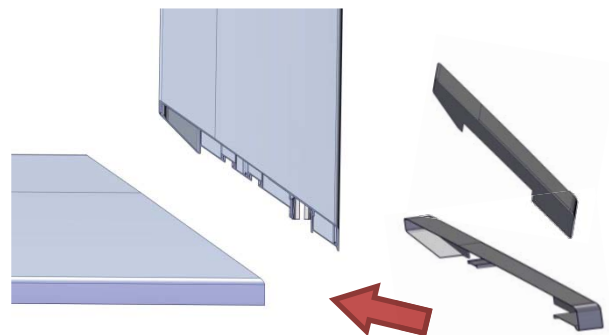
M8x20

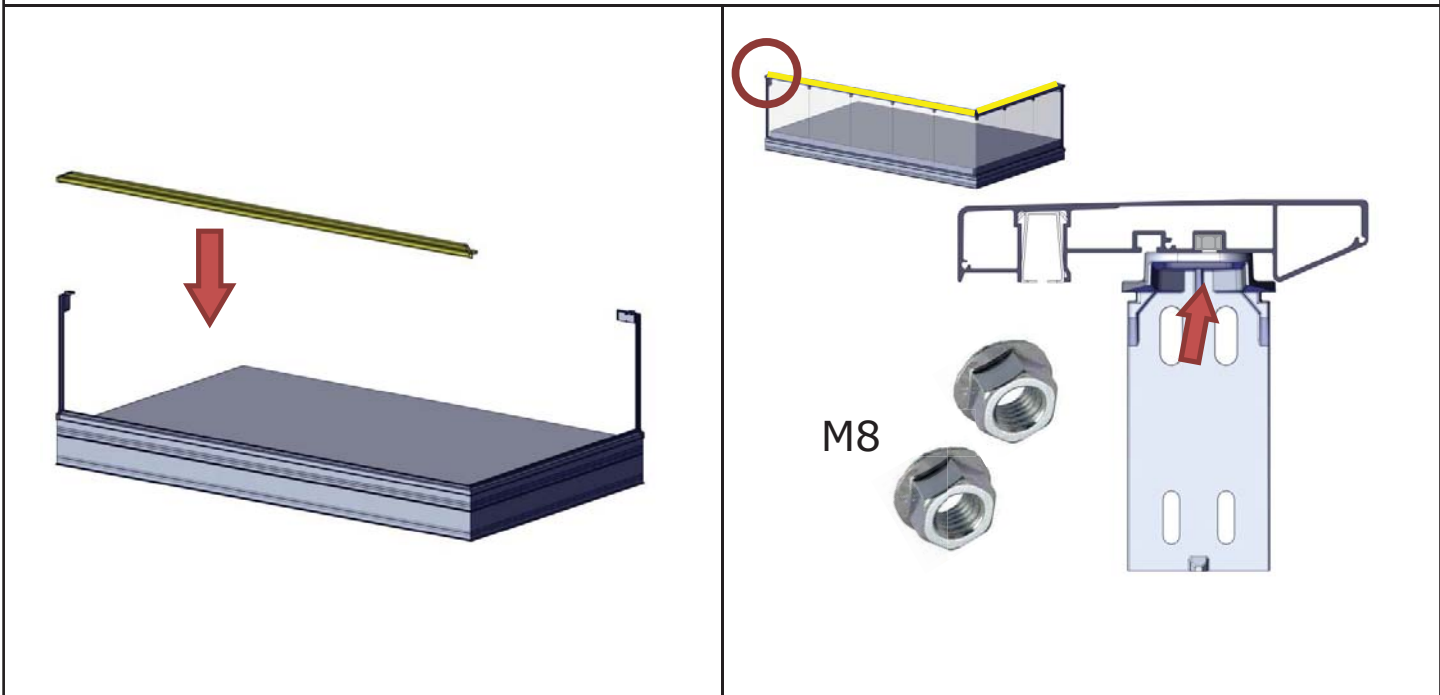
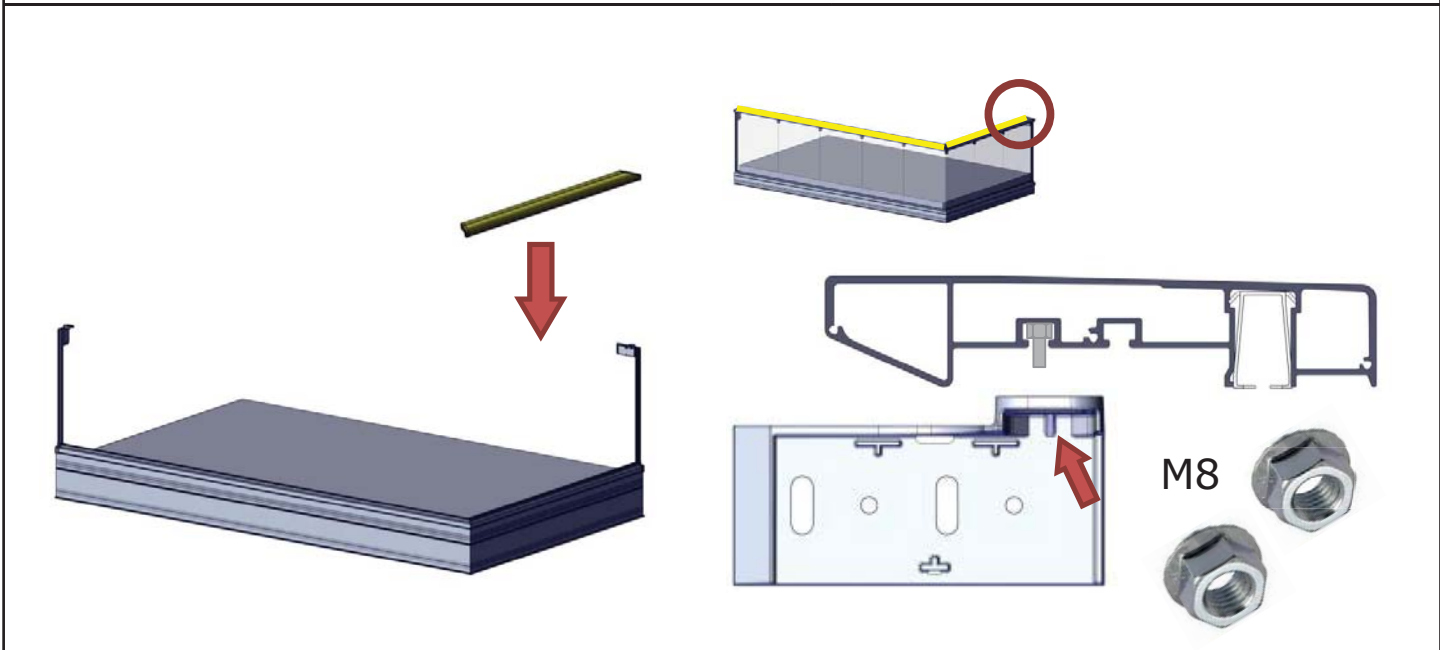
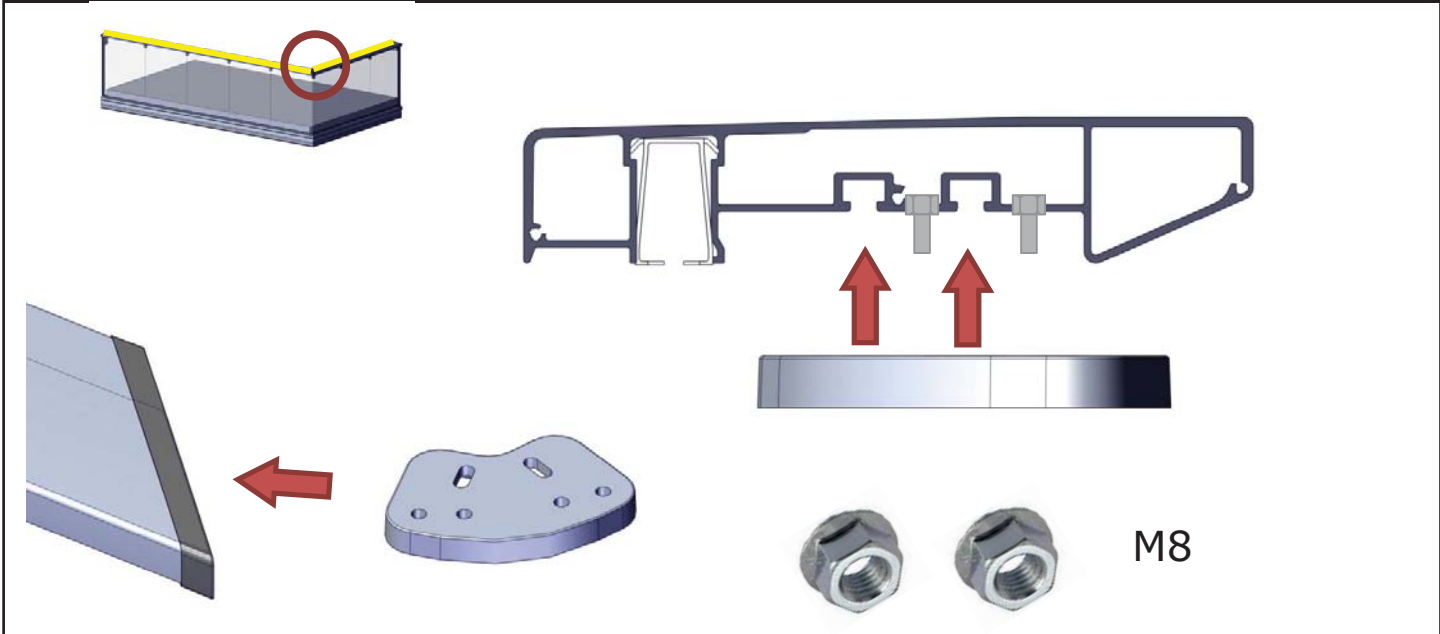


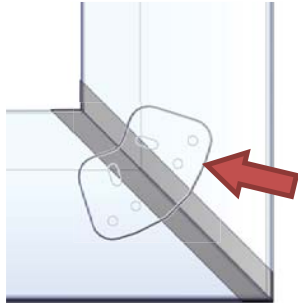
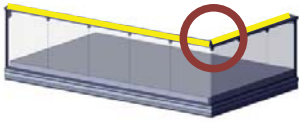
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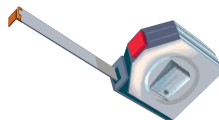
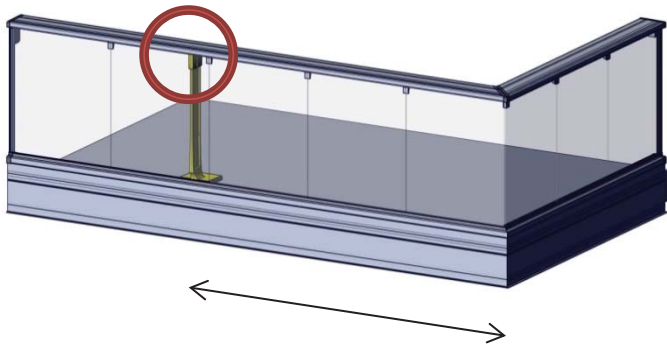
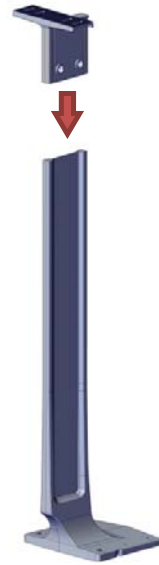
90°



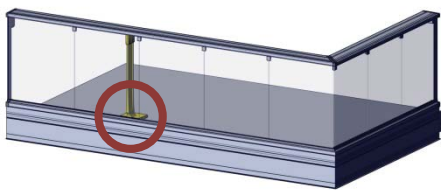
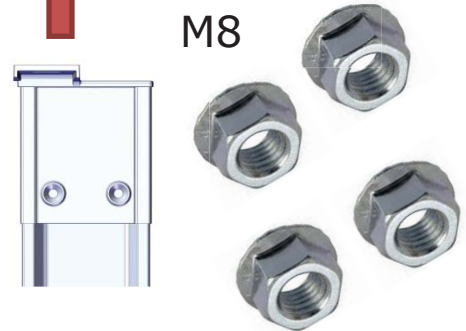




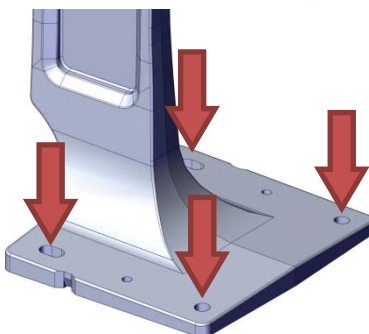
M8



M8



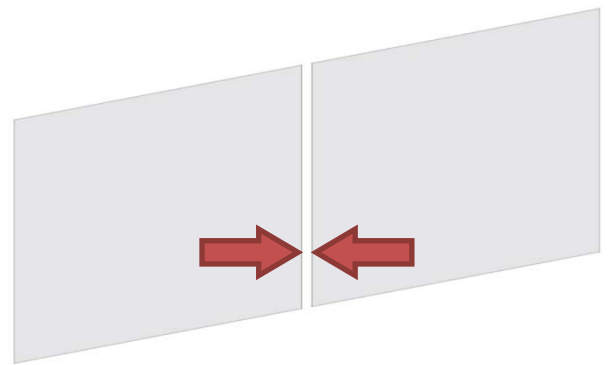
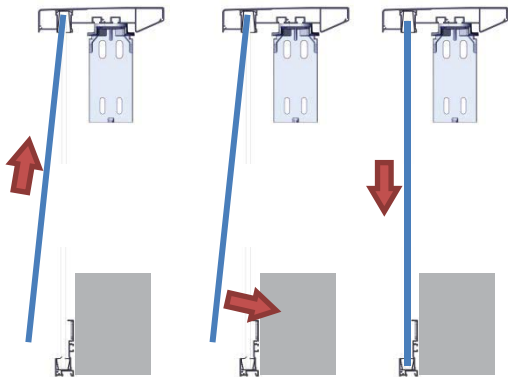
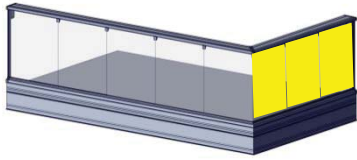
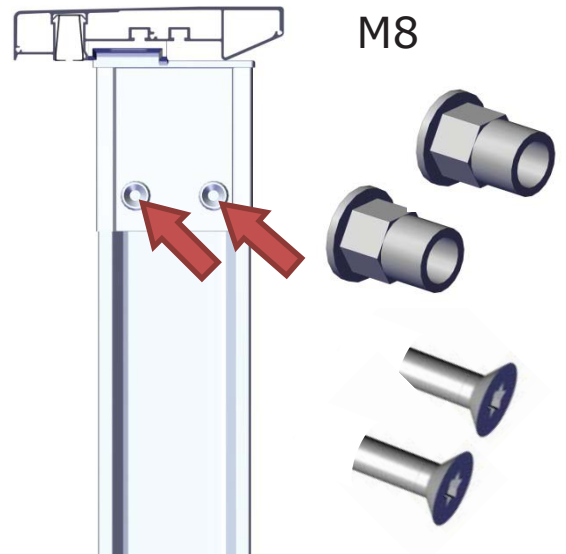
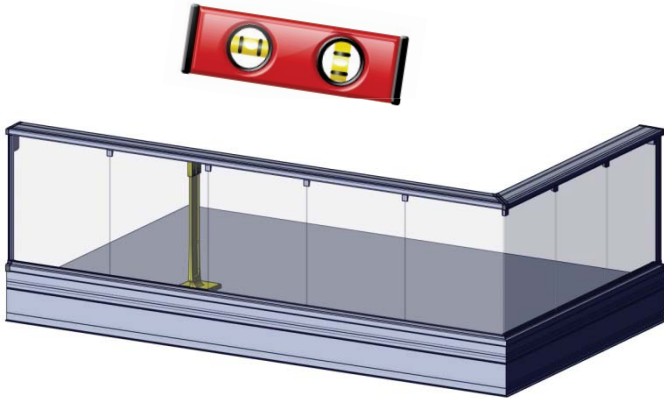
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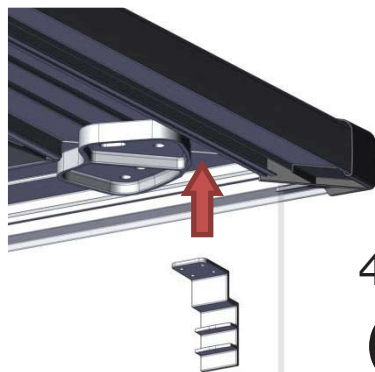
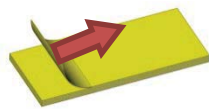
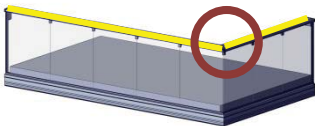
Ø14mm



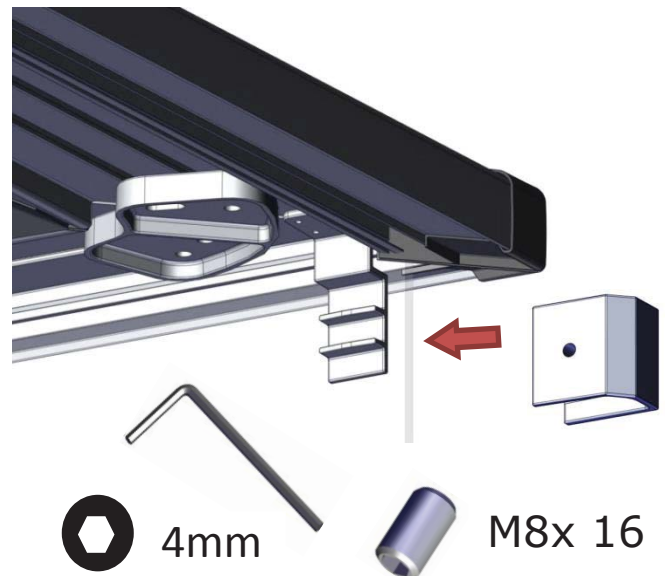
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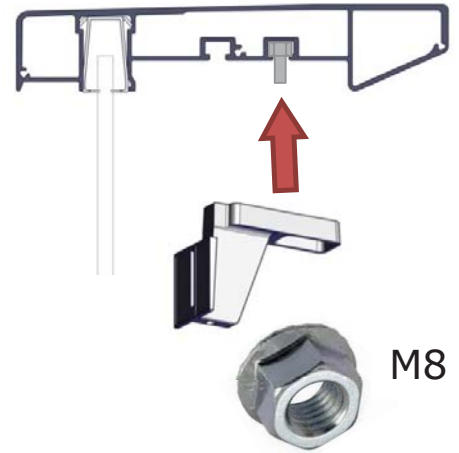
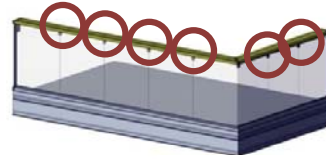
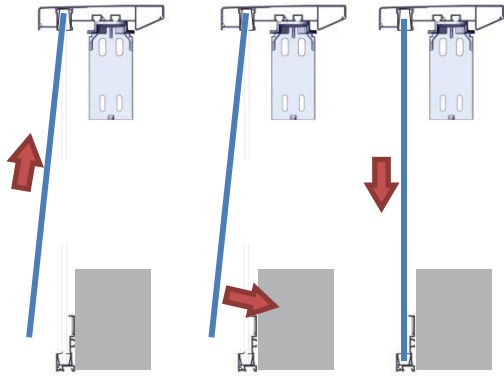
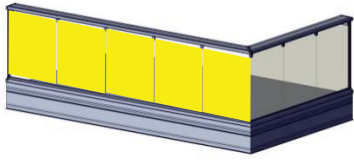


4mm

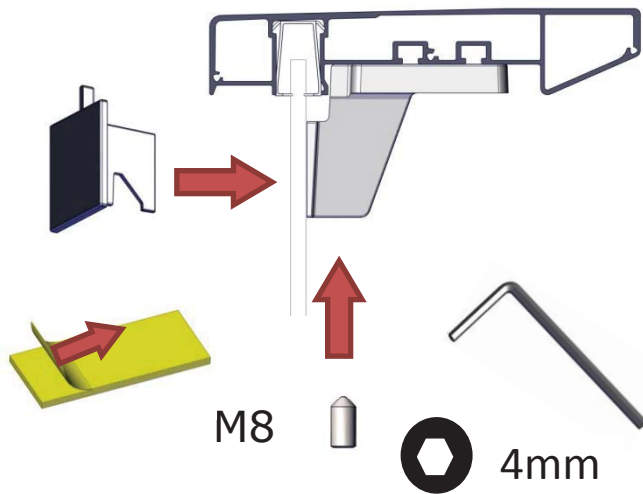


4x 3,9x19



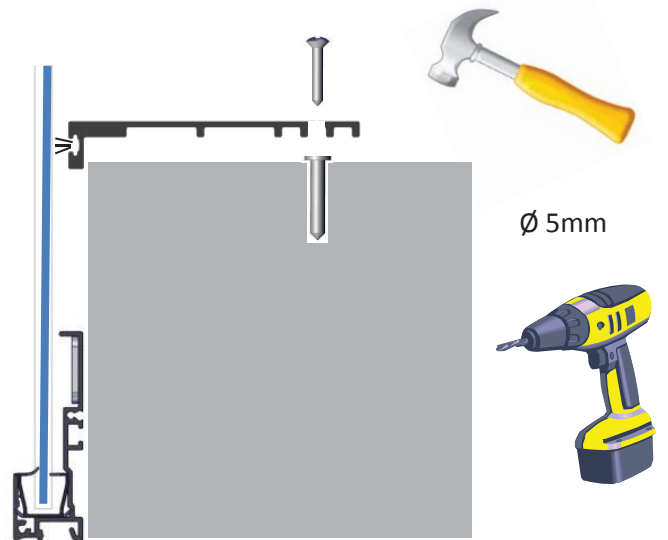


M8

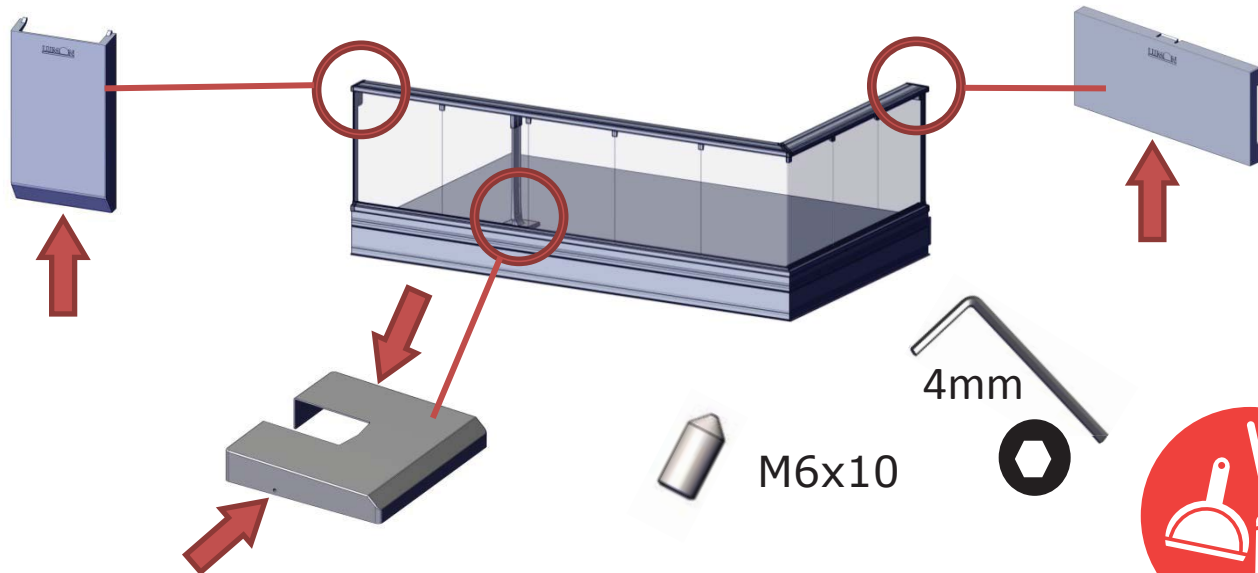


M8

4mm



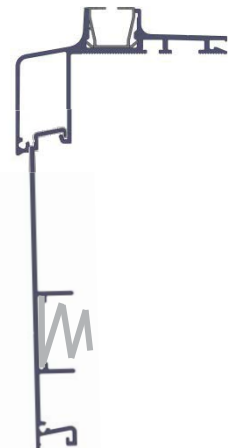
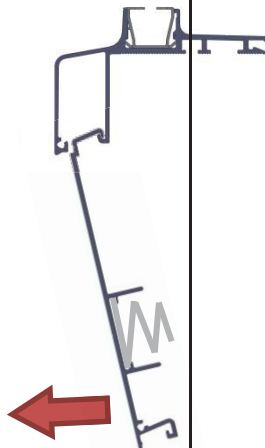
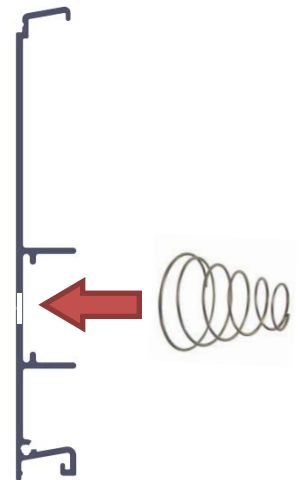
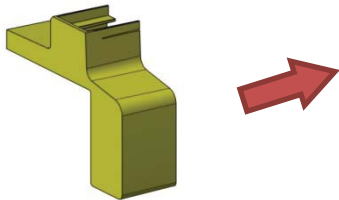
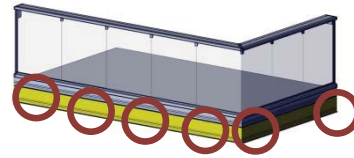
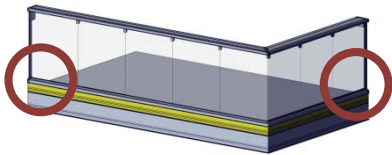
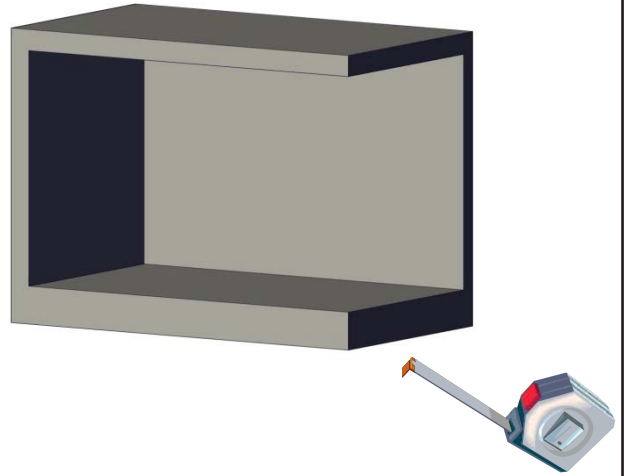
Ø 5mm

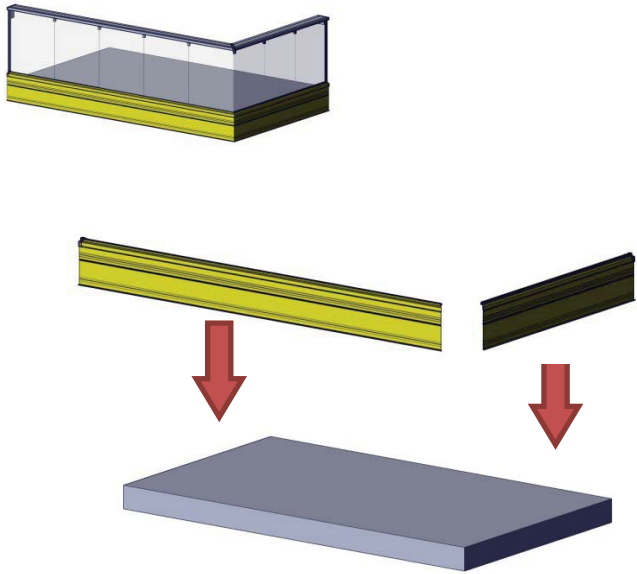


4mm

M6x10



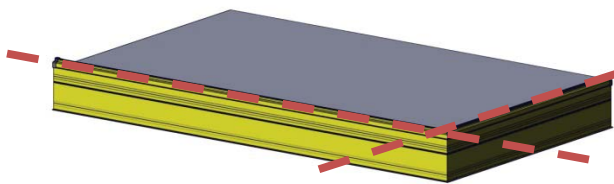
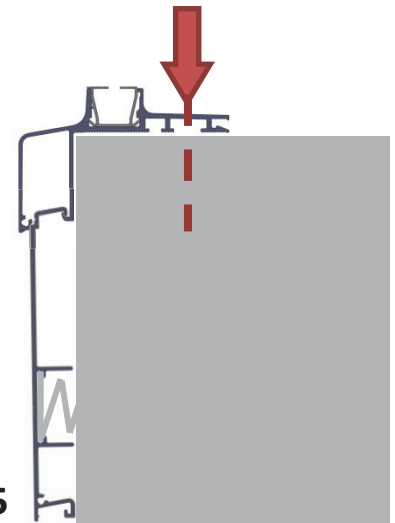




Ø6mm



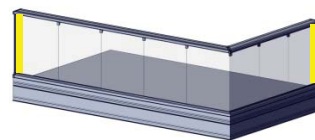
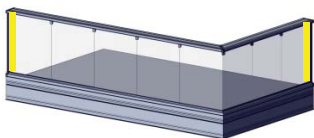
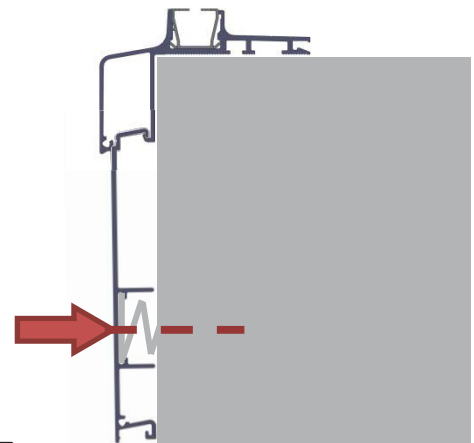
tx30
Min. 7.5x60/75



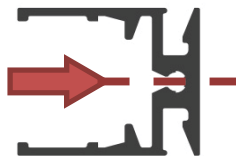
Ø6mm



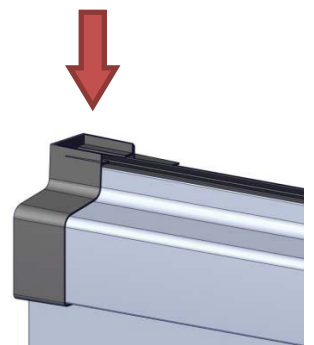
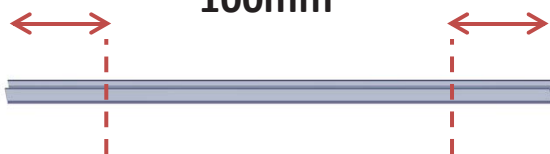
tx30
7.5x60/75

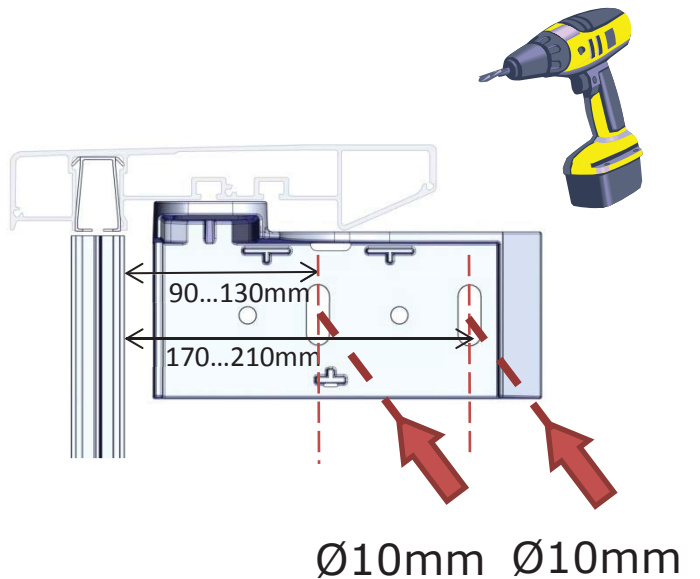
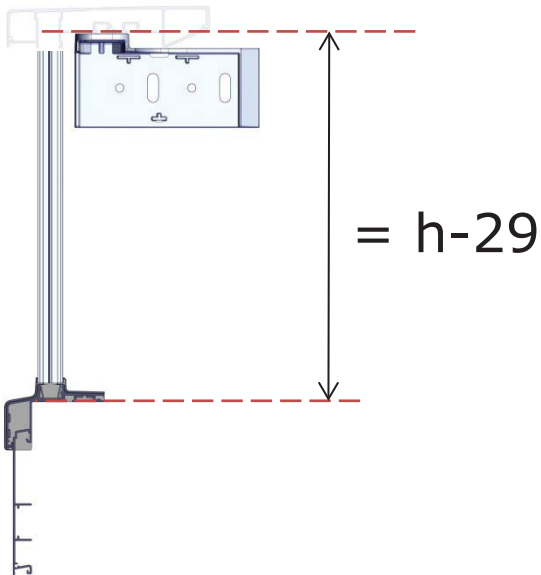
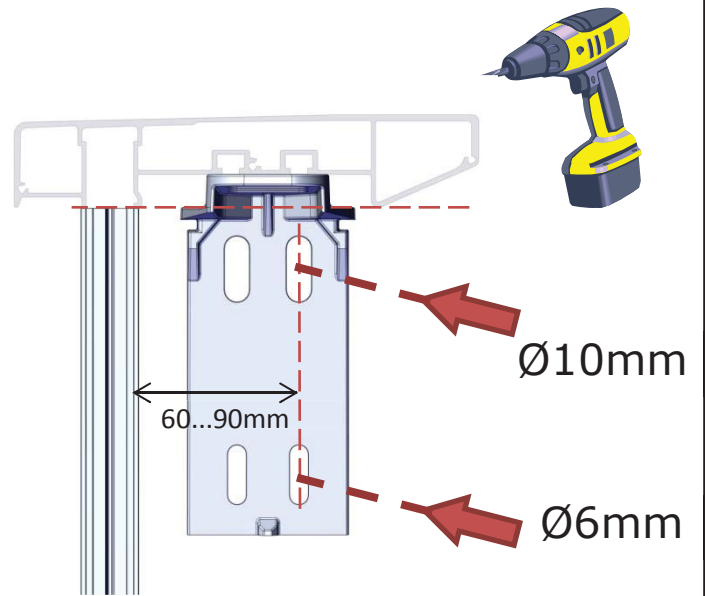
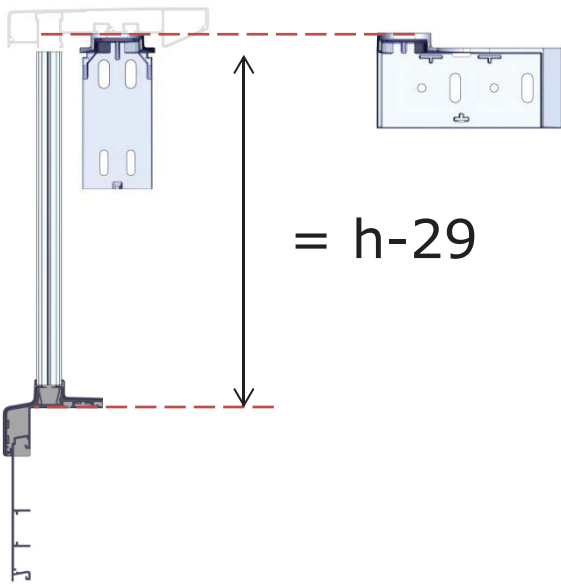
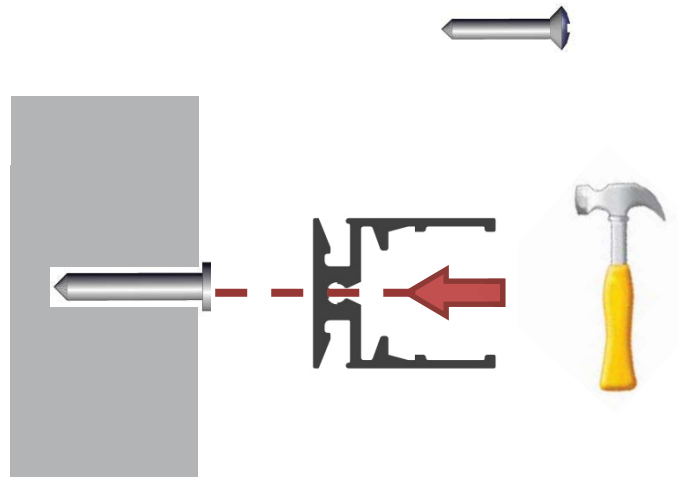
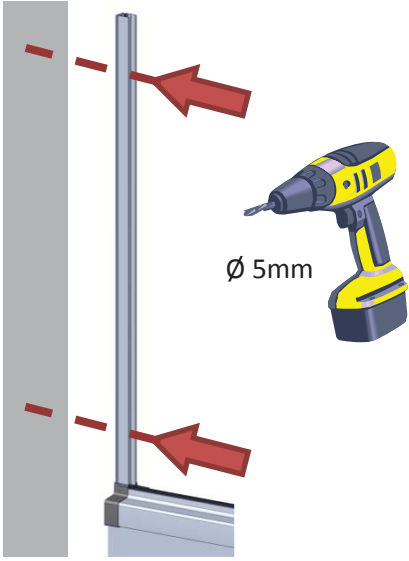


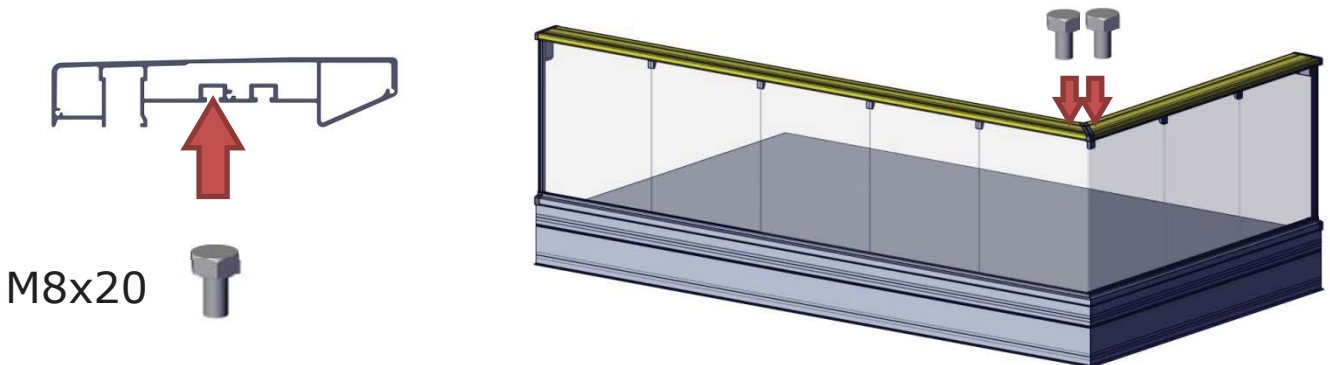
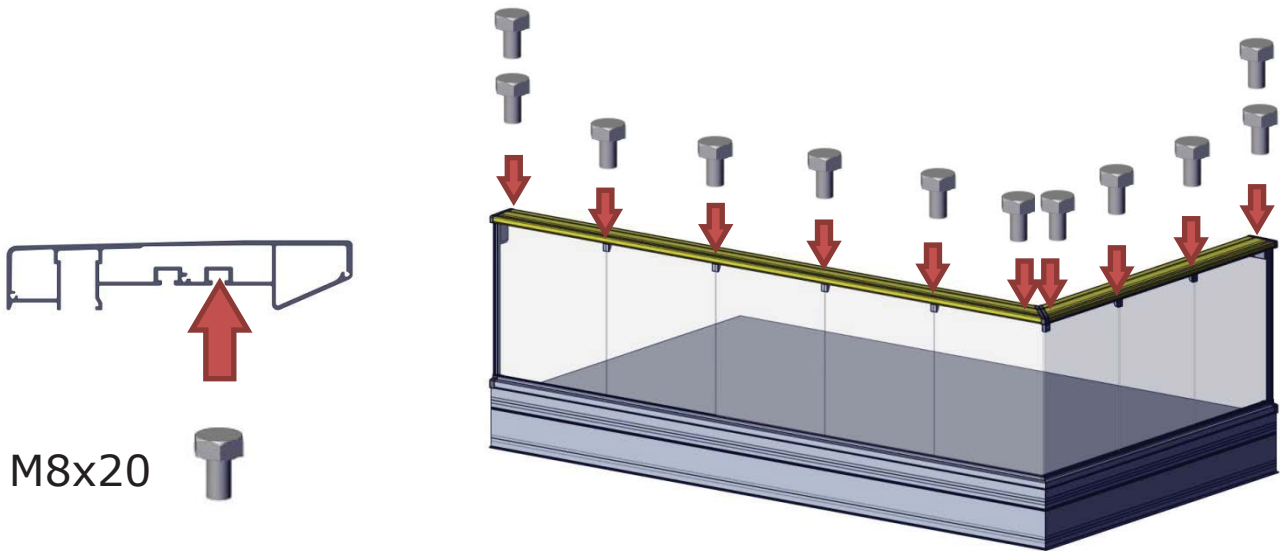
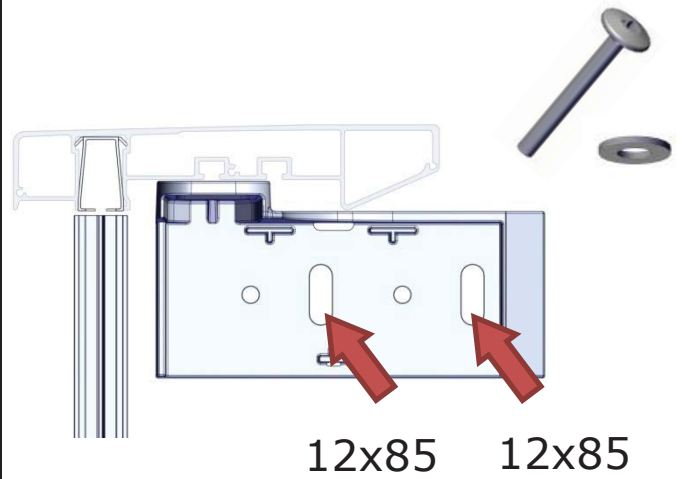
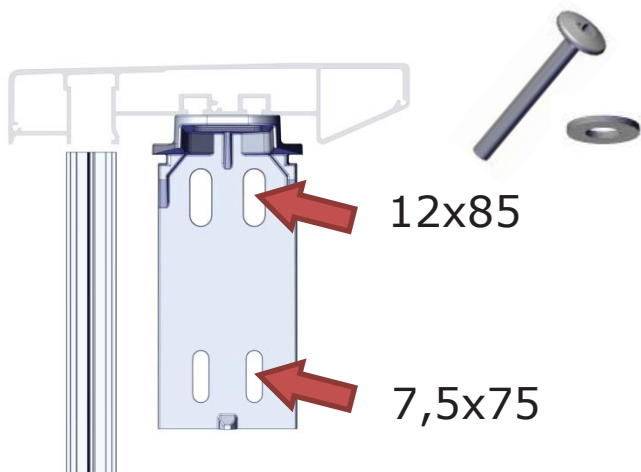
Ø7mm

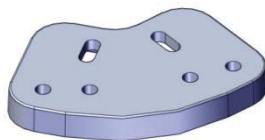
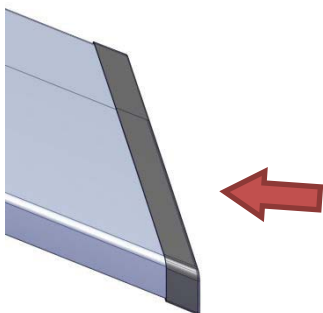
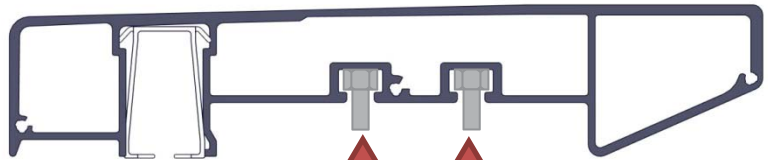
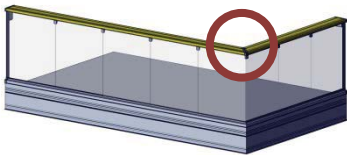
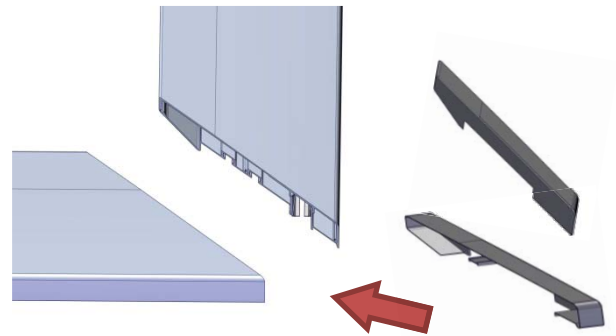
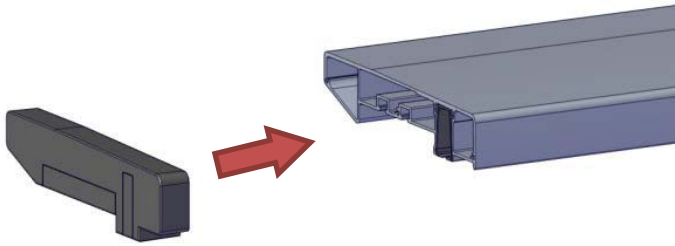
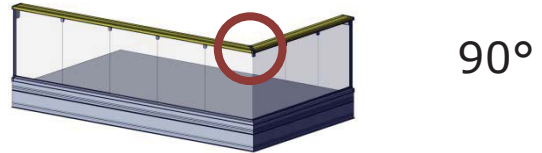
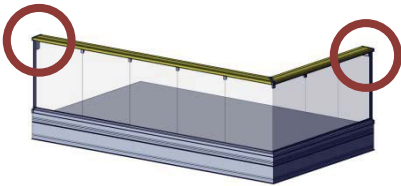
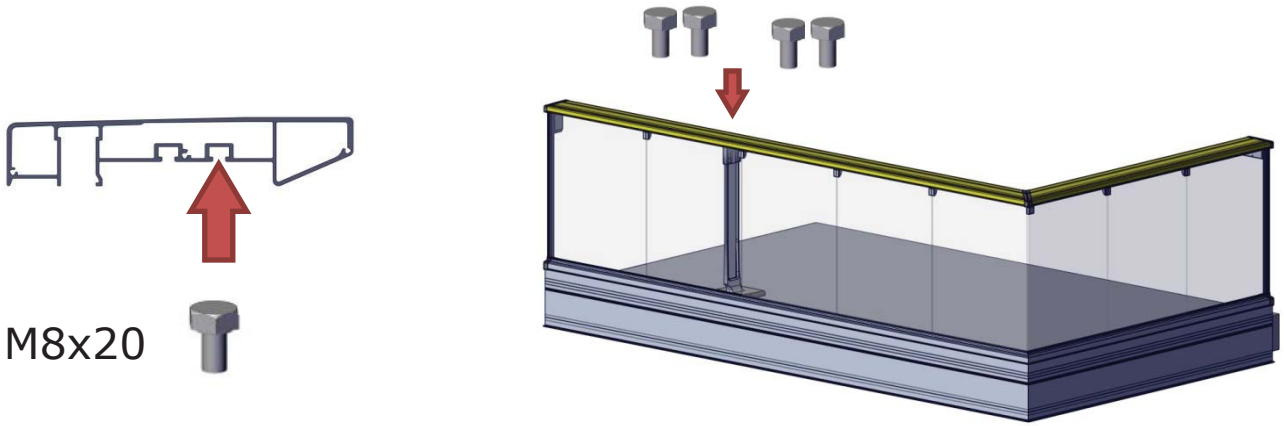


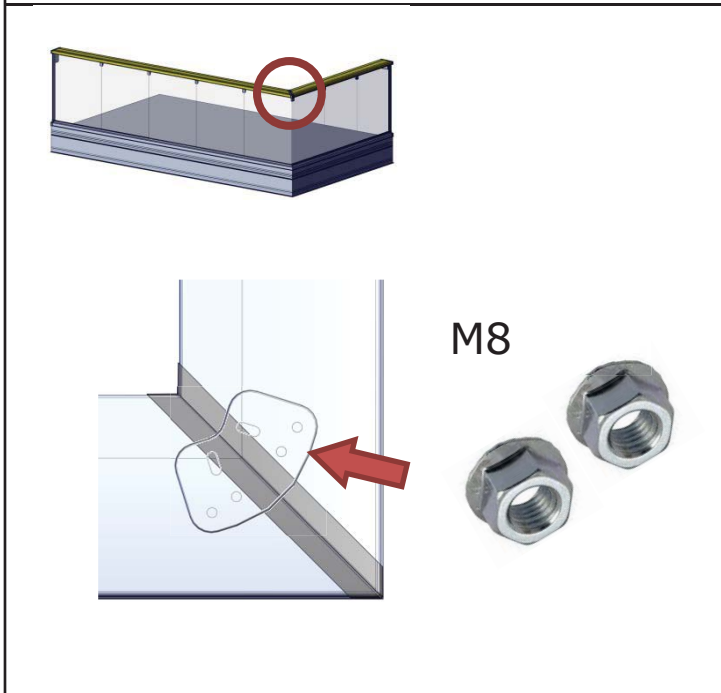
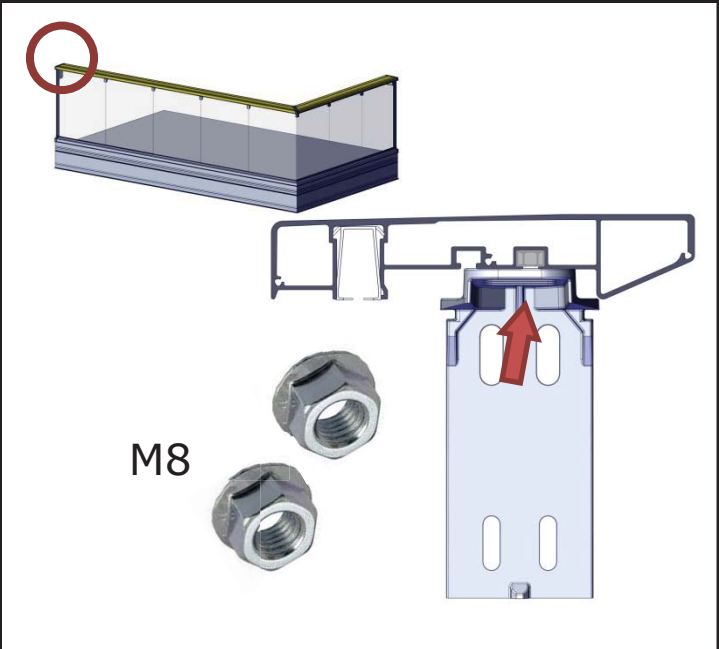
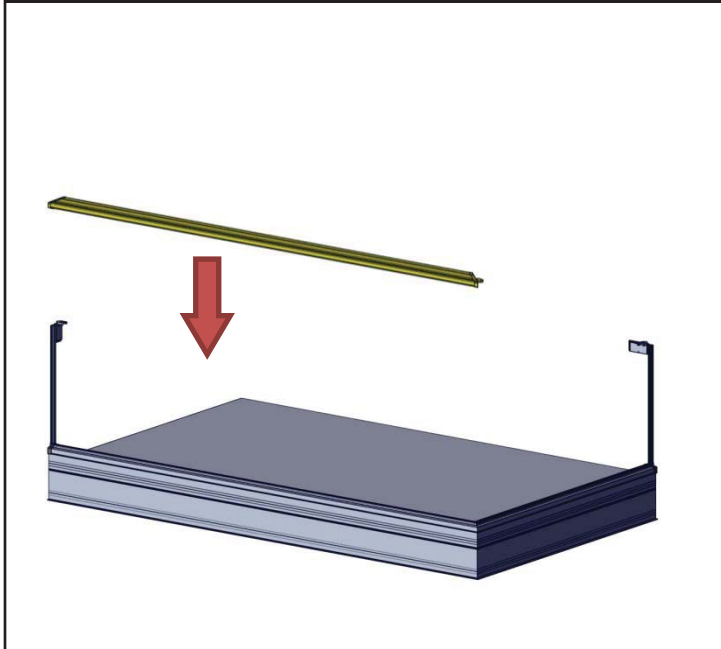
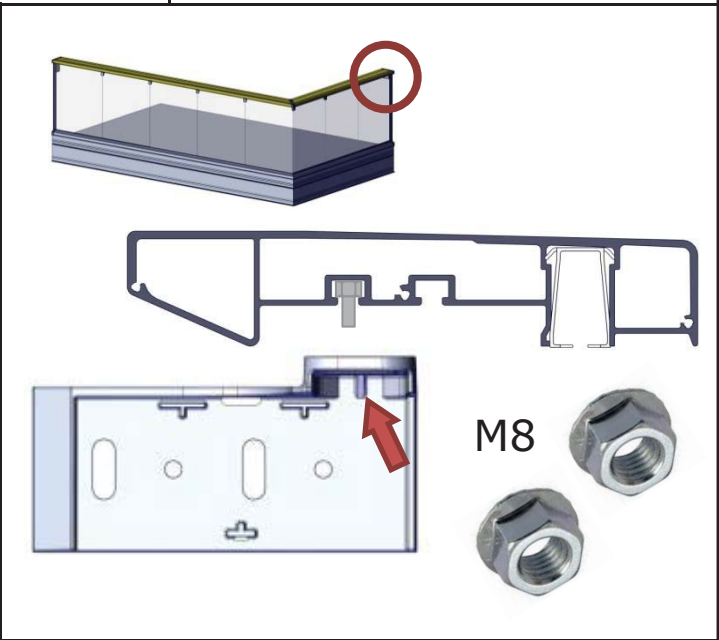
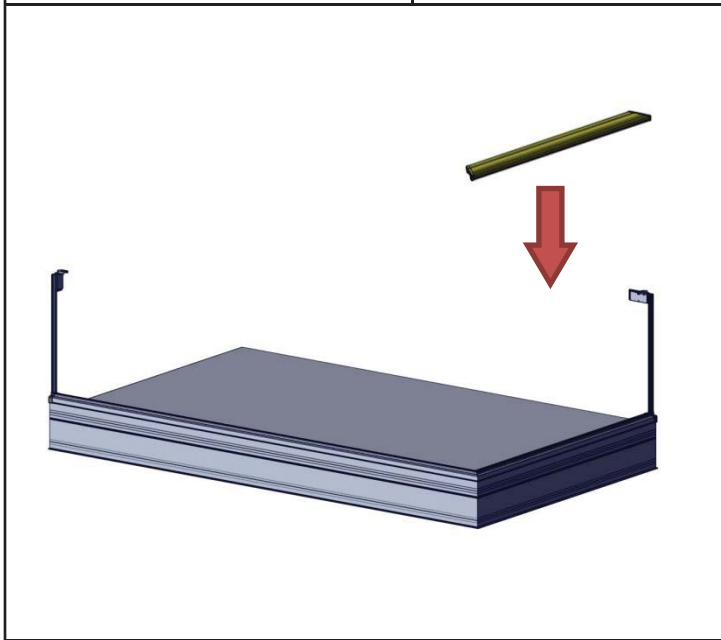
100mm

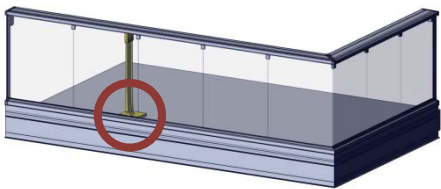
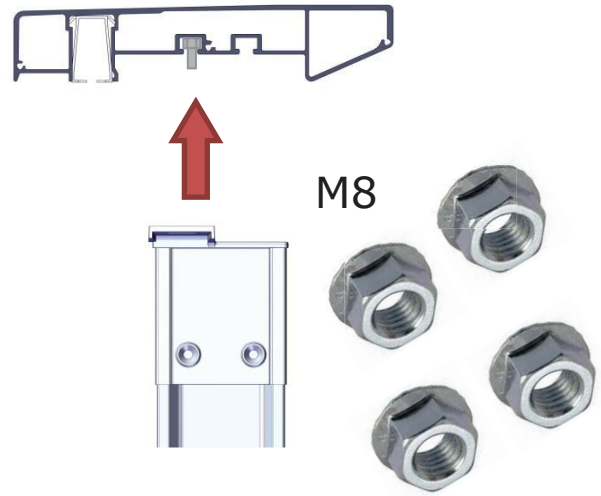
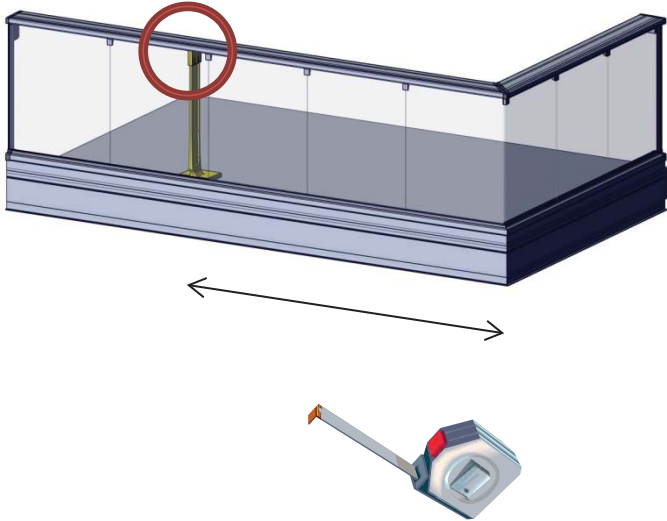




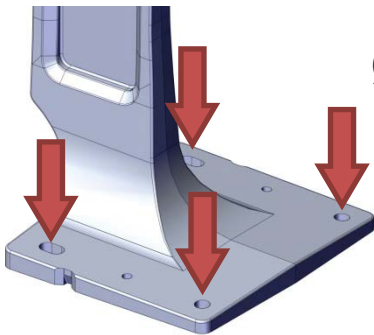








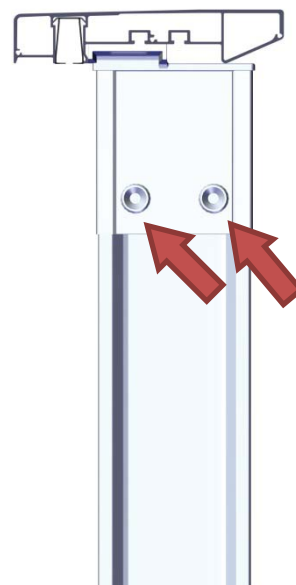
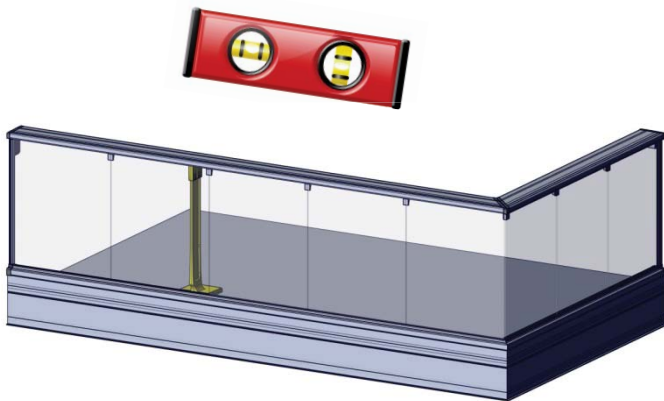
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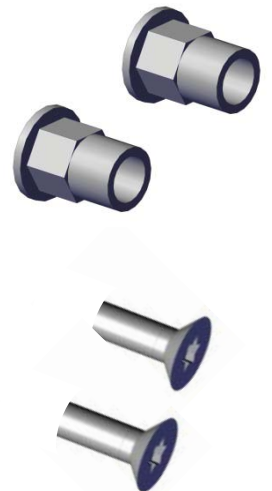
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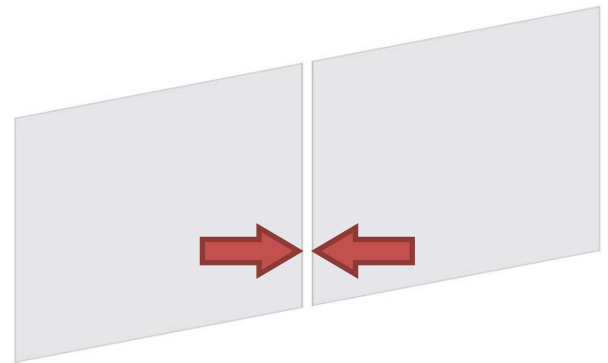
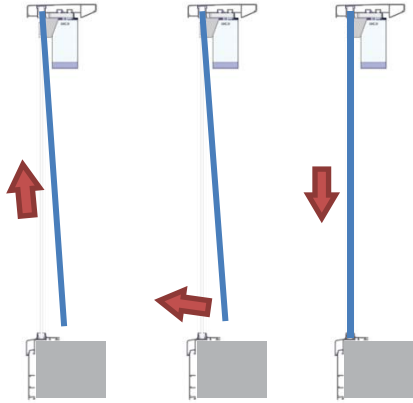
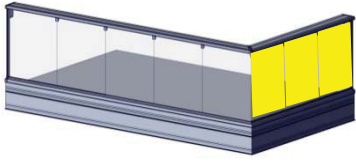


M12

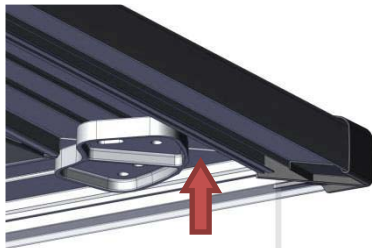
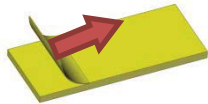
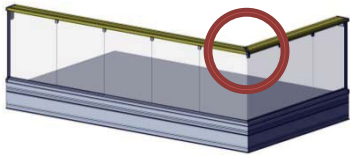


M8

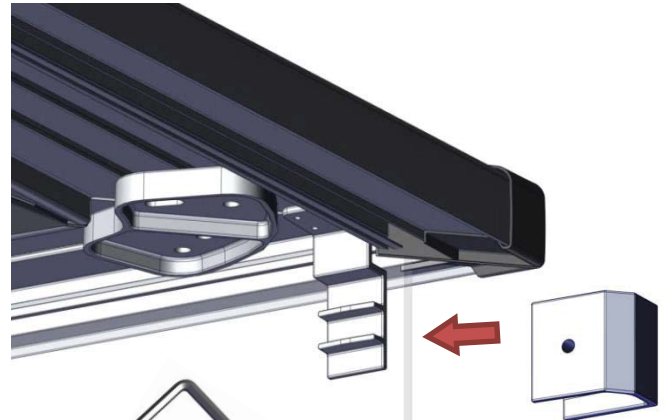




4mm



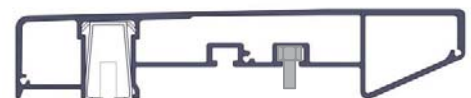
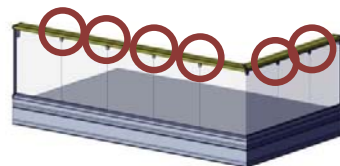
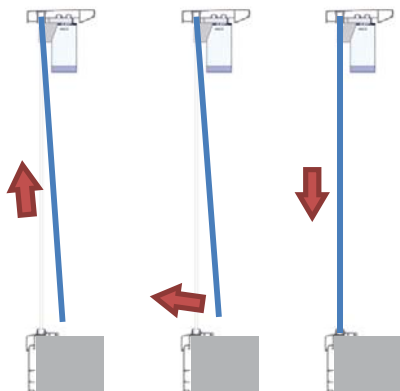
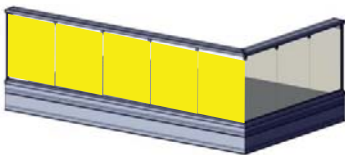
4x 3,9x19



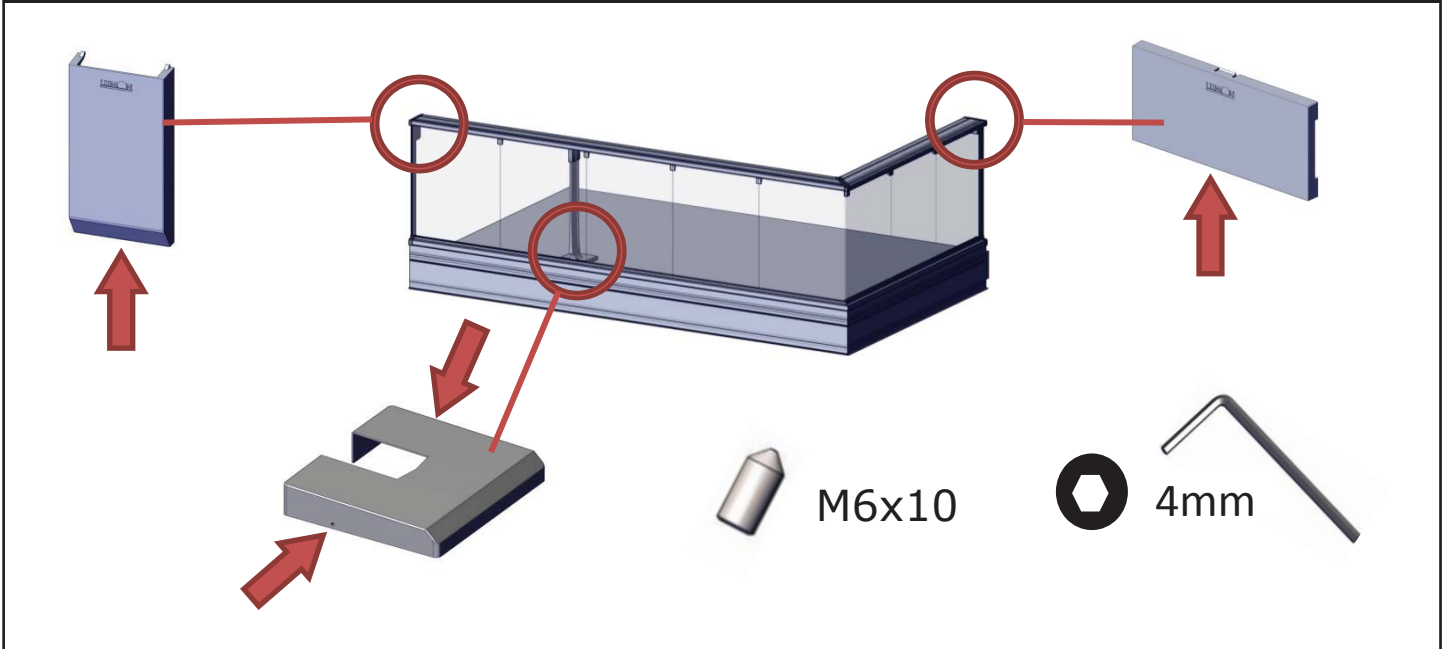
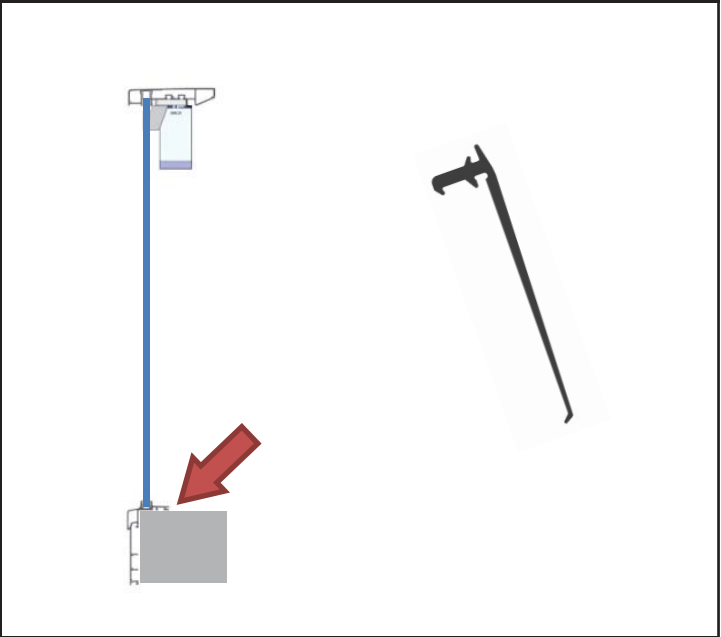
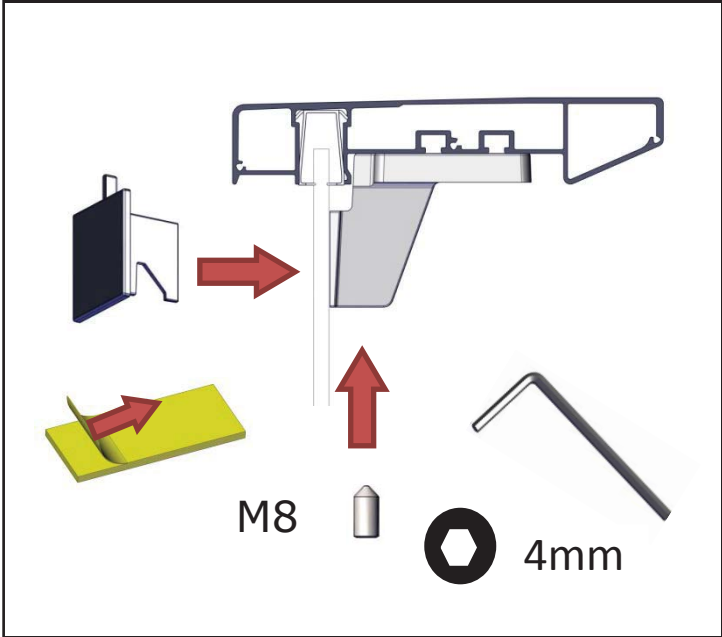
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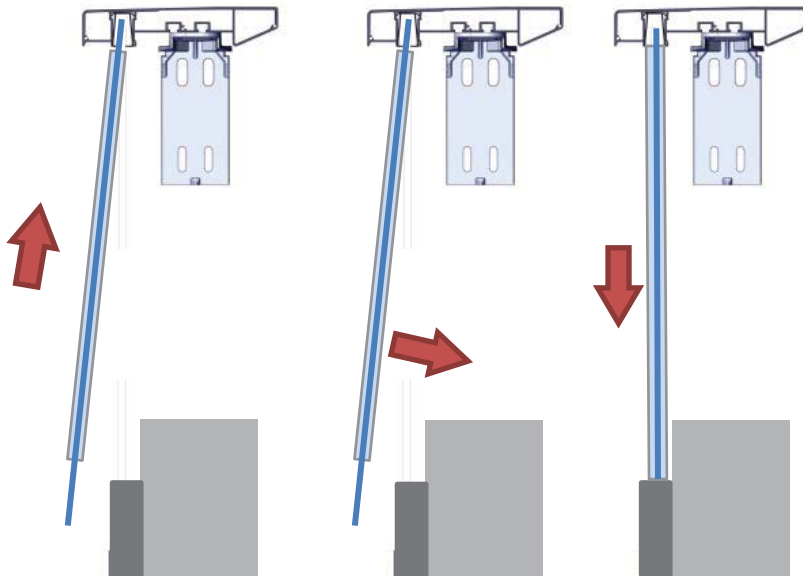
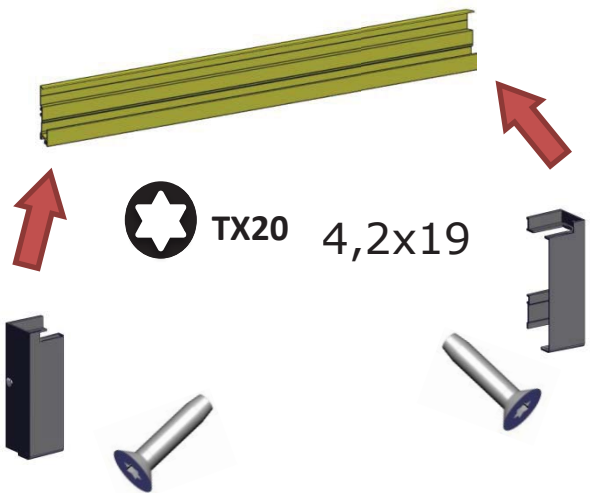
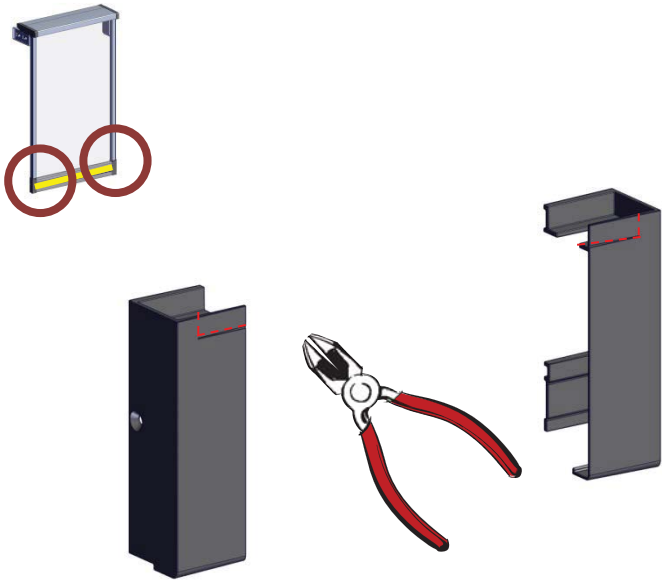
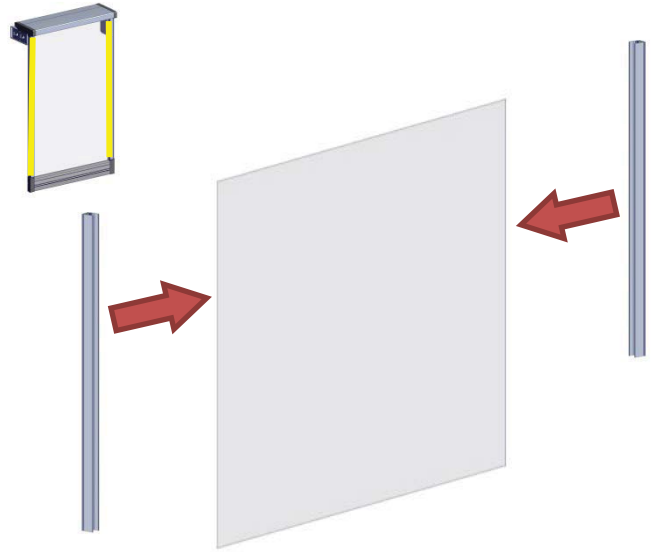
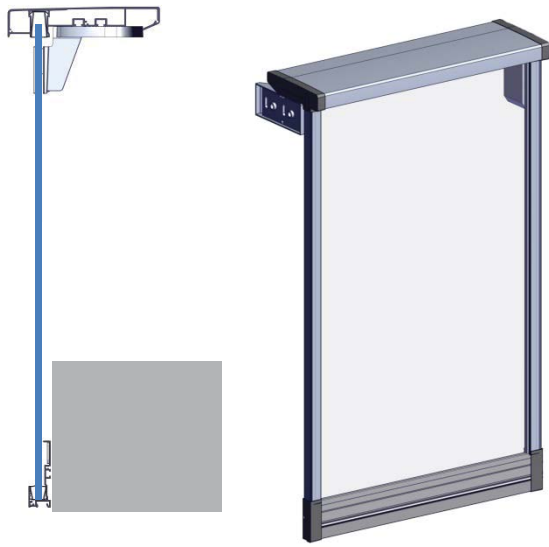


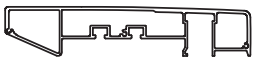

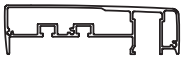

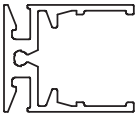

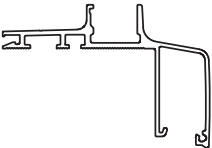



M8x 16

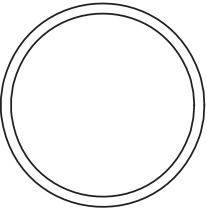
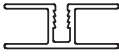
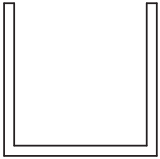
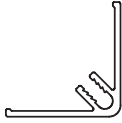
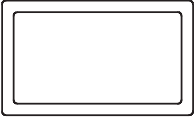
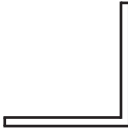
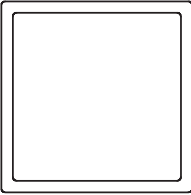



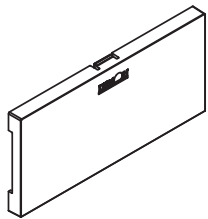
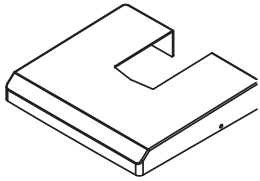
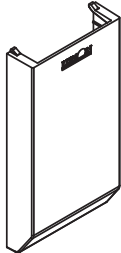
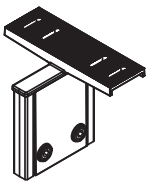
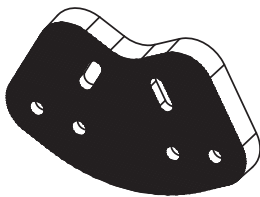
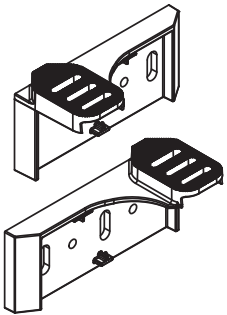
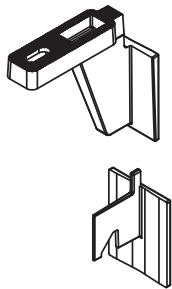
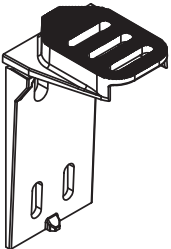
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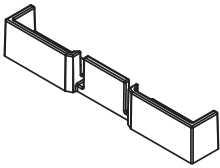
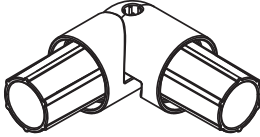
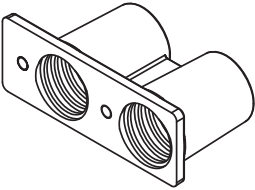
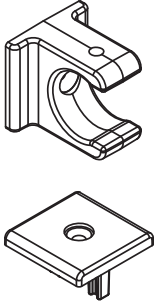

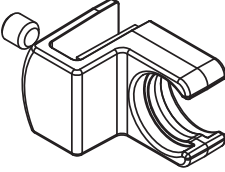
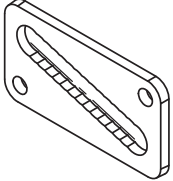
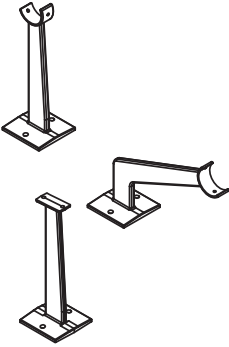
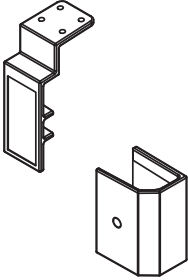
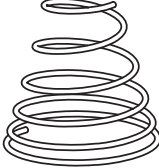


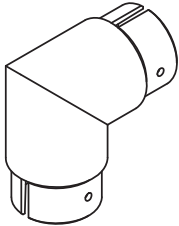
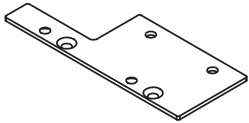
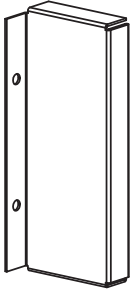
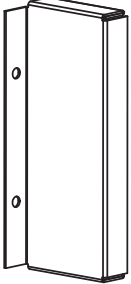
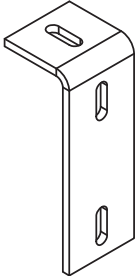


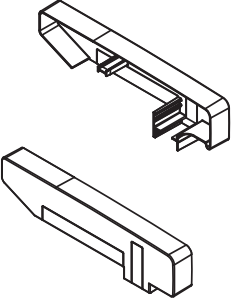
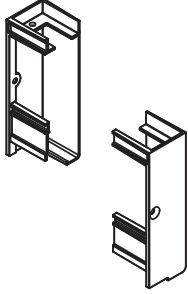
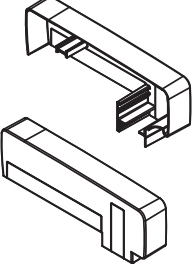
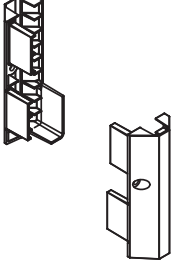
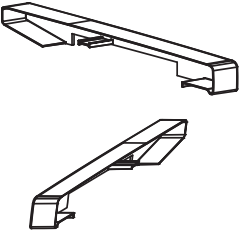
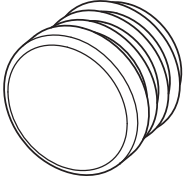
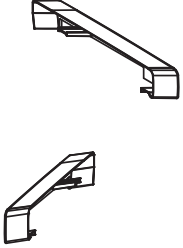
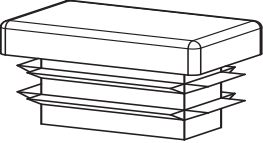
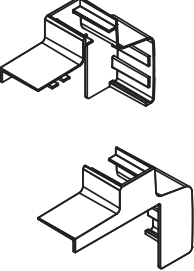
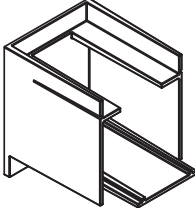
	<p>Handrail 225x45</p> <p>11 37 0001</p>		<p>Floor seal profile</p> <p>11 37 0006</p>
	<p>Handrail 160x45</p> <p>11 37 0002</p>		<p>Facade cover profile</p> <p>165mm 11 37 0007 215mm 11 37 0008 265mm 11 37 0009</p>
	<p>Wall frame</p> <p>11 37 0003</p>		<p>Facade cover profile L</p> <p>265mm 11 37 0010</p>
	<p>Top installed lower frame</p> <p>11 37 0004</p>		<p>Side support 30x225</p> <p>11 37 0011</p>
	<p>Side installed lower frame</p> <p>11 37 0005</p>		<p>Decor railing profile</p> <p>11 37 0012</p>


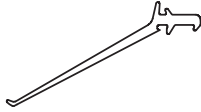
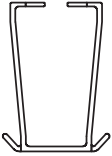


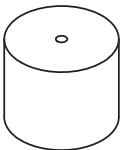
	<p>Decor profile</p> <p>20x1,0 11 31 5301 20x3,0 11 31 5305 25x1,5 11 31 5308 40x2,0 11 31 5304</p>		<p>Middle bead 30x10</p> <p>11 32 2842</p>
	<p>U-profile</p> <p>30x30x2 11 31 5516</p>		<p>Corner bead 30x30</p> <p>11 31 3100</p>
	<p>Rectangular profile</p> <p>25x15x1,5 11 31 5204 60x20x2 11 31 5221</p>		<p>L-profile 20x20x2</p> <p>11 01 0701</p>
	<p>Square profile</p> <p>25x25x1,5 11 31 5516</p>		

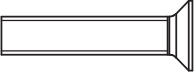
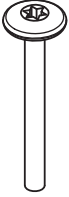
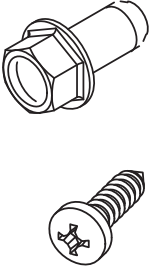

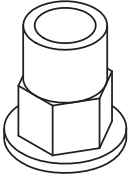
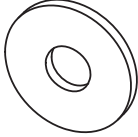

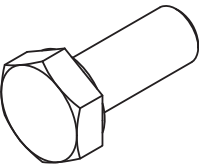
	<p>Balustrade Support</p> <p>1050mm 51 37 0002 1200mm 51 37 0003</p>		<p>Bracket cover horizontal</p> <p>50 37 0115</p>
	<p>Support cover</p> <p>51 37 0004</p>		<p>Bracket cover vertical</p> <p>50 37 0116</p>
	<p>Adjustment piece for balustrade support</p> <p>50 37 0114</p>		<p>Handrail corner joint piece</p> <p>51 37 0011</p>
	<p>Horizontal handrail bracket</p> <p>Right 51 37 0006 Left 51 37 0007</p>		<p>Handrail support piece</p> <p>50 37 0107</p>
	<p>Vertical handrail bracket</p> <p>51 37 0009</p>		

	<p>Bracket for side support</p> <p>51 37 0014</p>		<p>Corner plugs for decor profile</p> <p>53 37 0122</p>
	<p>Bracket frame</p> <p>51 37 0015</p>		<p>Bracket for decor profile</p> <p><10.5mm 50 37 0102 >10.5mm 50 37 0103</p>
	<p>Thread adjustment piece</p> <p>100mm 51 37 0016 200mm 51 37 0017</p>		<p>Corner bracket for decor profile</p> <p><10.5mm 50 37 0104 >10.5mm 50 37 0105</p>
	<p>Adjustment piece for side installed lower frame</p> <p>51 37 0018</p>		<p>Bracket for decor profile retrofit</p> <p>51 31 9106 40ø straight 51 31 9107 40ø angular 51 31 9109 Rectangular 51 31 9109</p>
	<p>Handrail corner support</p> <p>51 37 0019</p>		<p>Adjusting spring for facade cover profile</p> <p>69 37 0001</p>

	<p>Corner joint piece</p> <p>51 36 3337</p>		
	<p>Side support fixing plate</p> <p>51 37 0021</p>		
	<p>Extraction piece for side installation</p> <p>69 37 0002</p>		
	<p>Extraction piece for top installation</p> <p>69 37 0004</p>		
	<p>Handrail bracket 60xZx6</p> <p>51 37 0022</p>		

	<p>End plug for handrail 225x45</p> <p>Right 53 37 0101 Left 53 37 0102</p>		<p>End plug for side installed lower frame</p> <p>Right 53 37 0101 Left 53 37 0102</p>
	<p>End plug for handrail 160x45</p> <p>Right 53 37 0103 Left 53 37 0104</p>		<p>Corner end plug for side installed lower frame</p> <p>Right 53 37 0113 Left 53 37 0114</p>
	<p>Corner End plug for handrail 225x45</p> <p>Right 53 37 0105 Left 53 37 0106</p>		<p>End plug for decor profile black</p> <p>Ø20x1 53 33 1172 Ø40x2 53 33 1106</p>
	<p>Corner End plug for handrail 160x45</p> <p>Right 53 37 0107 Left 53 37 0108</p>		<p>Endplug</p> <p>25x15x1.5 53 33 1122 25x25x1.5 53 33 1127 60x20x2 53 33 1138</p>
	<p>End plug for top installed lower frame</p> <p>Right 53 37 0109 Left 53 37 0110</p>		<p>End plug for wall frame</p> <p>53 37 0121</p>

	<p>Balustrade seal for lower profile</p> <p>Normal 54 22 0005 High 54 22 0007</p>		<p>Smoke seal</p> <p>54 37 0111</p>
	<p>Upper glass frame seal</p> <p>≤10mm 54 37 0101 >10mm 54 37 0102</p>		
	<p>Lower glass frame seal</p> <p>≤10mm 54 37 0103 >10mm 54 37 0104</p>		
	<p>Wedge seal 30mm</p> <p>54 37 0105</p>		
	<p>Lower frame sealing piece</p> <p>54 37 0110</p>		

	<p>M8x25 Hex key Countersunk A2/A480 DIN7991</p> <p>68 98 0211</p>		<p>Concrete screw</p> <p>7,5x75 68 98 0466 7,5x115 68 98 0488 HUS-HR 10x115 68 98 0520</p>
	<p>Tapping screw</p> <p>DIN7504K 6,3x25 68 98 0413</p> <p>DIN7981 3,9x19 68 98 0487</p>		<p>Hexagon nut flanged</p> <p>M8 DIN6923 68 98 0559</p>
	<p>M8 rivet nut semi-hexagonal shaft and round pan head A2/ A4</p> <p>68 98 0567</p>		<p>Washer</p> <p>M8 DIN9021 68 98 xxxx M12 DIN125 68 98 1401 M8 DIN125 68 98 1441</p>
	<p>Set screw</p> <p>M6x10 68 98 0482 M8x16 68 98 0405</p>		<p>Chemical Anchoring</p> <p>HIT-Z-R M12x105 69 98 4011 M12x140 69 98 4012 M12x196 69 98 4013</p> <p>M12x140 69 98 4003 M12x180 69 98 4002 M12x220 69 98 4008</p>
	<p>Hexagon head screw DIN933 A2</p> <p>M10x20 68 98 0091 M8x20 68 98 0002</p>		<p>Wood screw</p> <p>Flanged A2 8x80 68 98 0246 8x200 68 98 0241</p> <p>Hex Zn 12x100 68 98 0226</p>

Balustrade claddings consist usually of laminated glass, in some cases toughened glass can be used

Weight of glass:

8 mm: 20 kg/m²

10 mm: 25 kg/m²

Laminated Glass

Laminated glass is usually 4+4 or 5+5 mm thick. Horizontal edges are Flat edge polished and vertical edges are Flat edge and arris polished. Laminated toughened glass can be used depending on local regulations

There are two color series for laminated glasses. In the Lumon IG- series there are many standard color options in different tones. By using the different shades of Vanceva Design the interlayer can be combined to produce vast variety on different alternatives.

Maximum size of the glass is 1500x3000 mm. However, the size of glass is defined case-by-case in each project.

Note! In case that laminated glass has more than one interlayer, or the other glass is a stippolyte glass of sand blasted, when placing the order it must be clearly stated which side of glass is facing outwards.

Glass tones:

IG87 clear

IG88 clear

IG65 opal

IG80 opal

IG50 green

IG56 green

IG72 green

IG73 green

IG08 brown

IG09 brown

IG28 brown

IG55 brown

IG49 blue

IG53 blue

IG70 blue

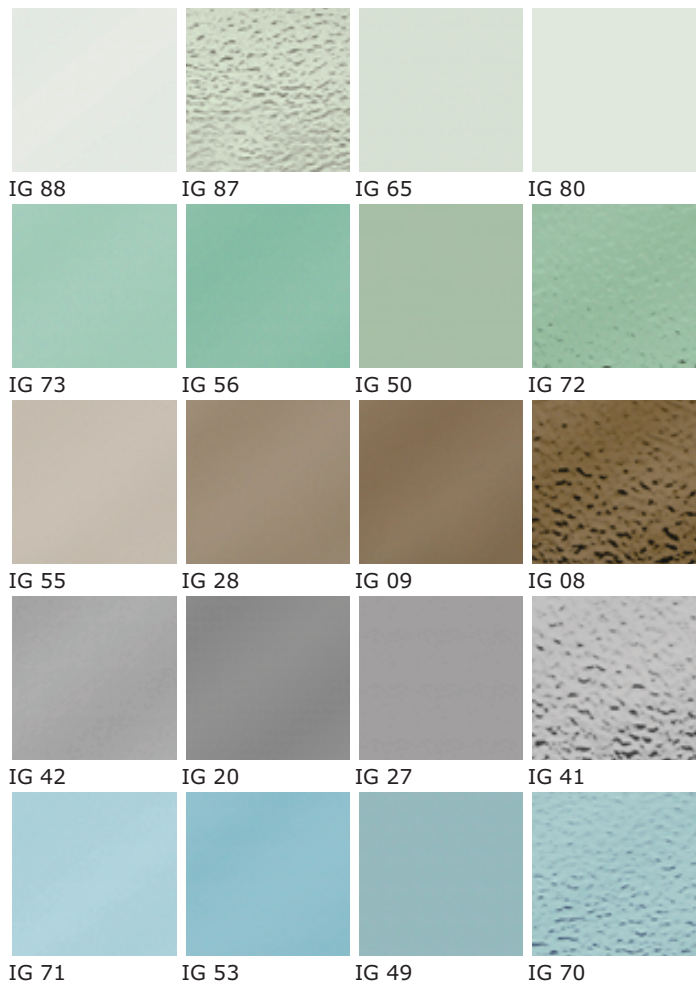
IG71 blue

IG20 grey

IG27 grey

IG41 grey

IG42 grey



The figure in the code indicates the light transmission percentage.

E.g. IG 73 = light transmission 73 %

Due to technical reasons in printing, the color tones in nature differ from the tones shown alongside.

Vanceva Design-series

Following colors are available as standard: white non-transparent Polar White 000F, blue True Blue 000D and red Deep Red 000C.

It can be combined 1-4 inter layers per lamination. There are more colors in the table below. More detailed information about the color shades is available through the survey offer. The figure after the code indicates the visible light transmission (e.g. = 0,79 means, that 79% of visible light transmit glasses and laminating films).



0001 Coral Rose
 $\tau_v = 0,76$



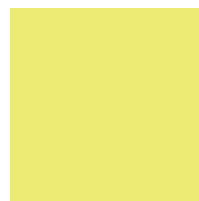
0005 Ruby Red
 $\tau_v = 0,48$



000C Deep Red
 $\tau_v = 0,15$



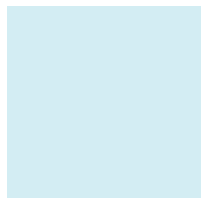
0004 Sahara Sun
 $\tau_v = 0,78$



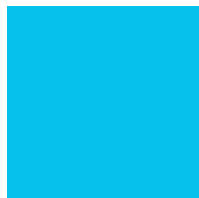
0008 Golden Light
 $\tau_v = 0,85$



000E Tangerine
 $\tau_v = 0,41$



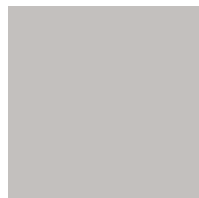
0002 Aquamarine
 $\tau_v = 0,77$



0006 Sapphire Blue
 $\tau_v = 0,52$



000D True Blue
 $\tau_v = 0,12$



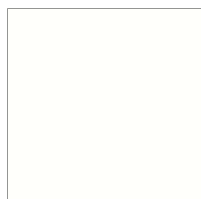
0003 Smoke Grey
 $\tau_v = 0,78$



0007 Evening Shadow
 $\tau_v = 0,49$



000G Absolute Black
 $\tau_v = 0$



000F Polar White
 $\tau_v = 0,07$



000A Cool White
 $\tau_v = 0,81$

Toughened glass

Toughened glass can be used depending on local regulations. The maximum size of the toughened glass is 1500x3000mm. Due to the requirements and processability of the application, the size of glass should be defined separately in every case.

Sandblasted and laminated or toughened glass

Frosted coverage can be obtained by sandblasting glass. After sand blasting the surface of glass is washed and sprayed with teflon three times. This process prevent from glass getting dirty. A high shine facade can be created by replacing the smooth unsandblasted surface outwards. The mat surface is placed inside for easier cleaning. The mat surface can also be placed outwards. Sandblasted surface can be placed indoors or outdoors.

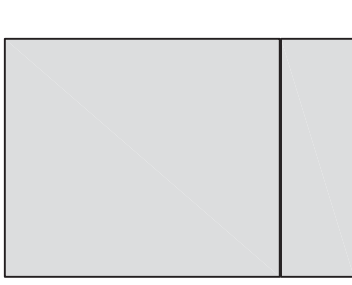
Light transmission percentage of the sandblasted glass is 50-60% depending on the intensity of the sandblast. It is also possible to sandblast only part of glass or according to a desired pattern.

Sandblasted figures

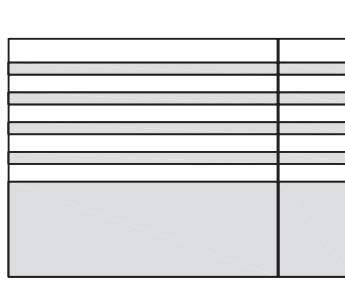
When creating figures and shapes it is suggested to choose a pattern that allows use of "mould" which is more economical than taping. The figure must be regular in order to avoid mismatches between adjacent panes. See pictures below for examples of sandblasted figures which can be created by using molding technique. Note! When placing the order it must be clearly stated which side of the glass is exterior.

Sandblasted models

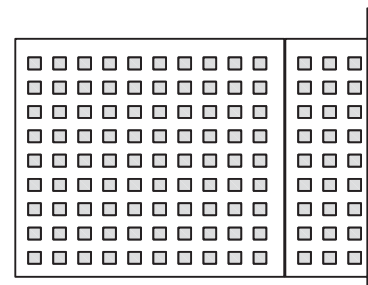
Opaque (4 bar)



The entire glass is sandblasted



The glass is partly sandblasted. The pattern overlaps the glass



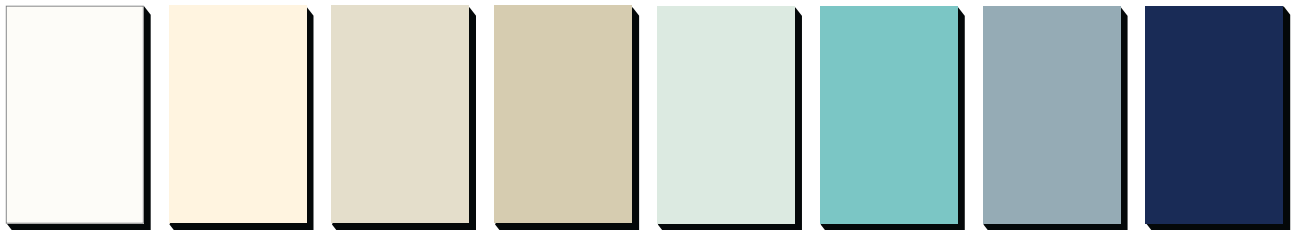
The glass is partly sandblasted

Patterns and figures can also be produced onto the glass by digital - or silk - screen printing.

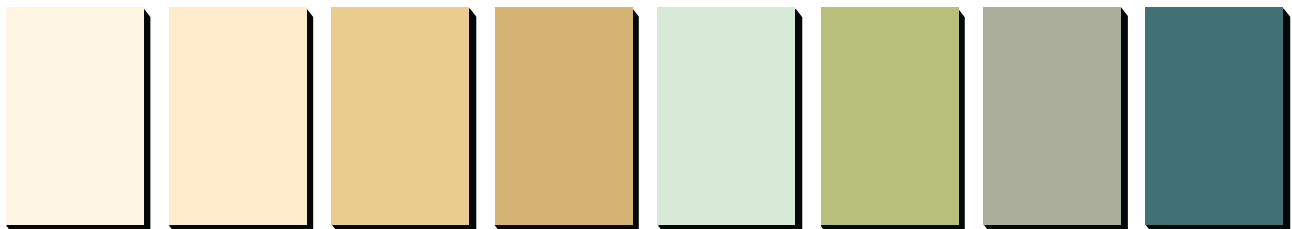
Formica Exterior Vivix combines excellent weather and Uv resistance with strong scratch resistance for enhanced durability and easy handling. Maximum board size is 3050x1270mm. Sheets of Formica Exterior Vivix installed on the same facade at the same time are guaranteed to match in colour for ten years from the date of delivery. Formica Exterior Vivix is a 8mm thick self-supporting sheet of homogenous highpressure laminate that can be installed onto wood or in an metal framing. Formica Exterior Vivix is not available in other than Formica Exterior Vivix colours:



F0949 White	K2010 Malibu	K2001 Baikal	F7927 Folkestone	F5493 Arctic Blue	F7884 China Blue	F4168 Campanula	F7851 Spectrum Blue
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K1040 Alpino	K1181 Irish Cream	F7858 Pumice	F2302 Doeskin	F5494 Aquamarine	F5347 Maui	K1998 Oslo	F7969 Navy Blue
-----------------	----------------------	-----------------	------------------	---------------------	---------------	---------------	--------------------



K1192 Porcelana	K1301 Gobi	K1902 Eldorado	K1903 Café	F2966 Opal	F3007 Pale Olive	F7853 Ocean Grey	F7846 Grotto
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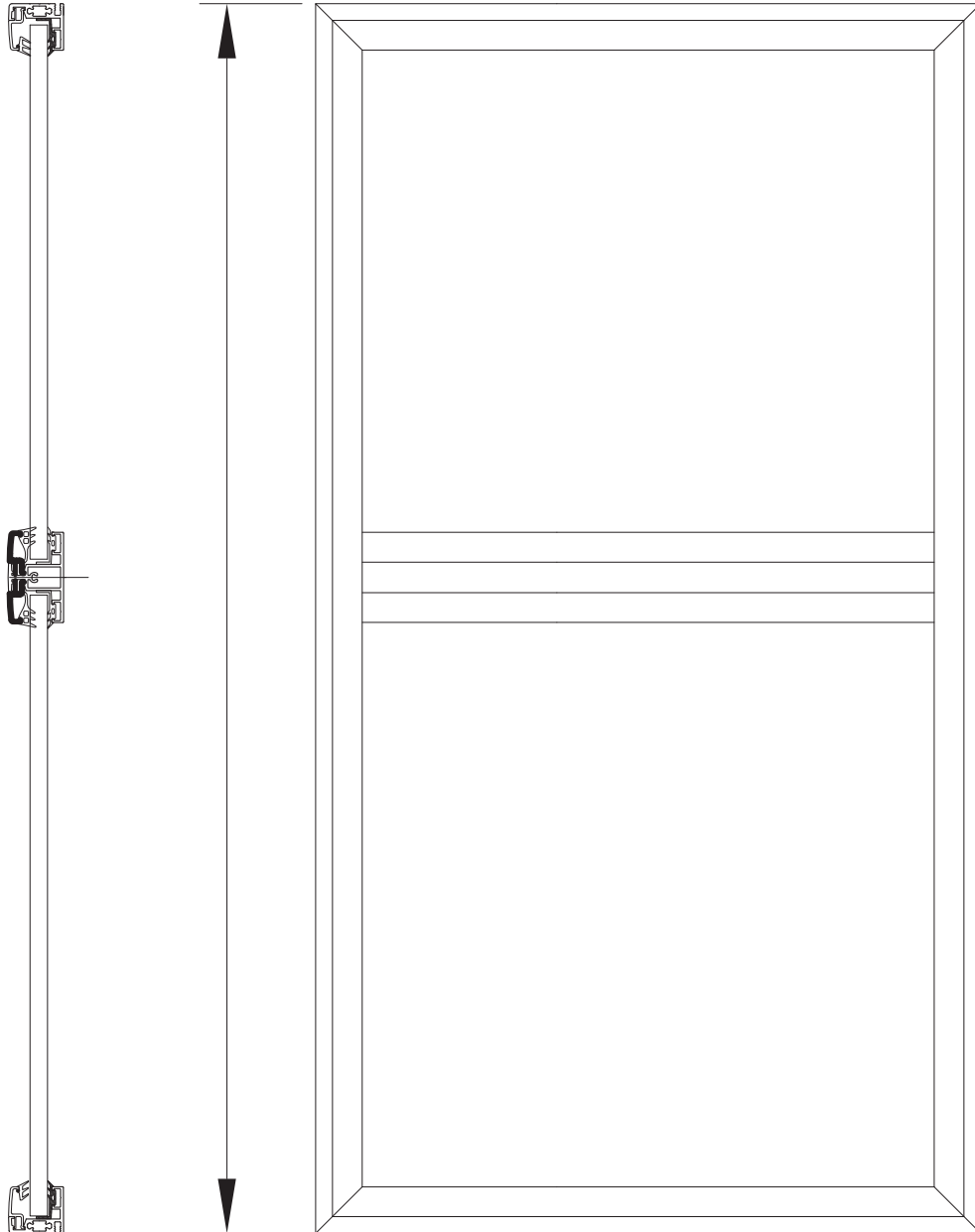
F2833 Sandstone	F8751 Mojave	K1834 Kashmir	F2200 Dark Chocolate	F2288 Peach	F7940 Spectrum Yellow	F6901 Vibrant Green	F7967 Hunter Green
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K2020 Tornado	F7912 Storm	F2297 Terril	F2253 Diamond Black	F4161 Terracotta	K1238 Carnaval	K2005 Paprika	K3734 Radon
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Framed Glass

This structure can not be used as a dividing screen on its own. Framed glass must at all times be supported on all four sides. It must be attached to a balustrade, a separate frame or support structure.



Models:

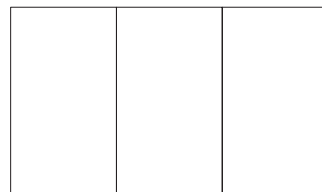
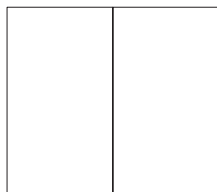
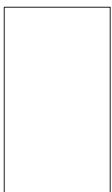
NB! No intersecting joints

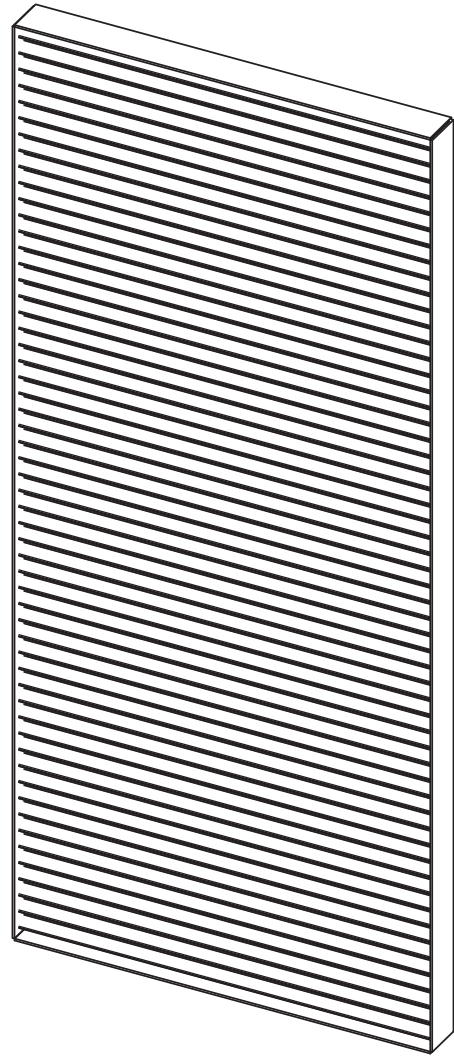
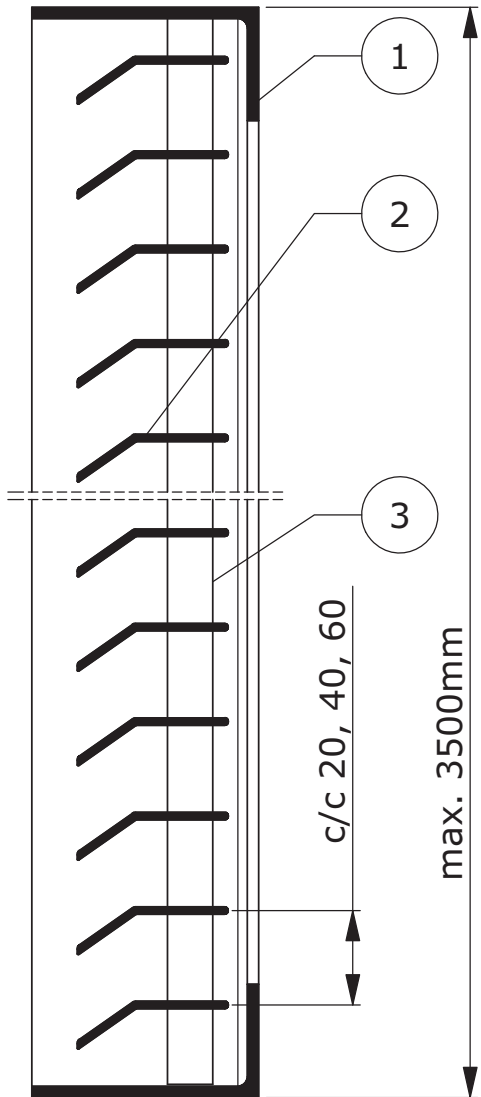
Whole structure. 4,5m²

Opening size:

Glass infill max. 2,0m²

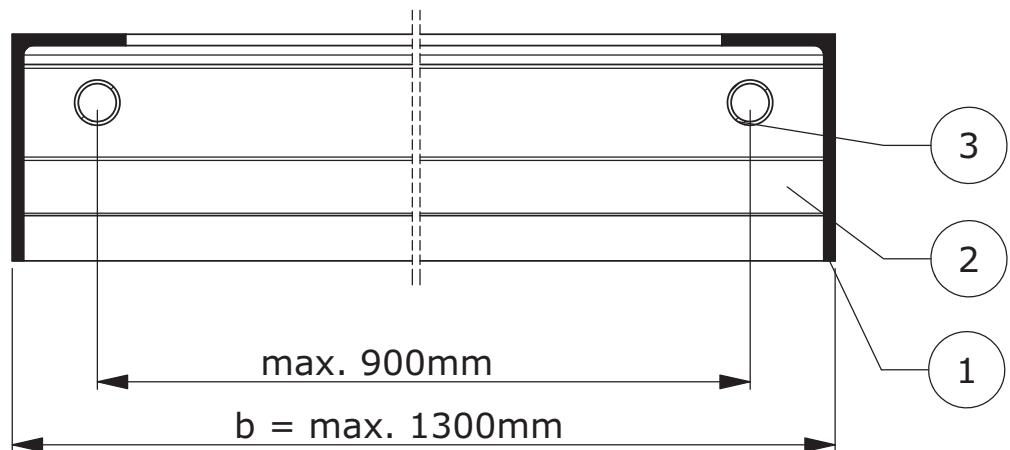
Board infill max. 1,0m²

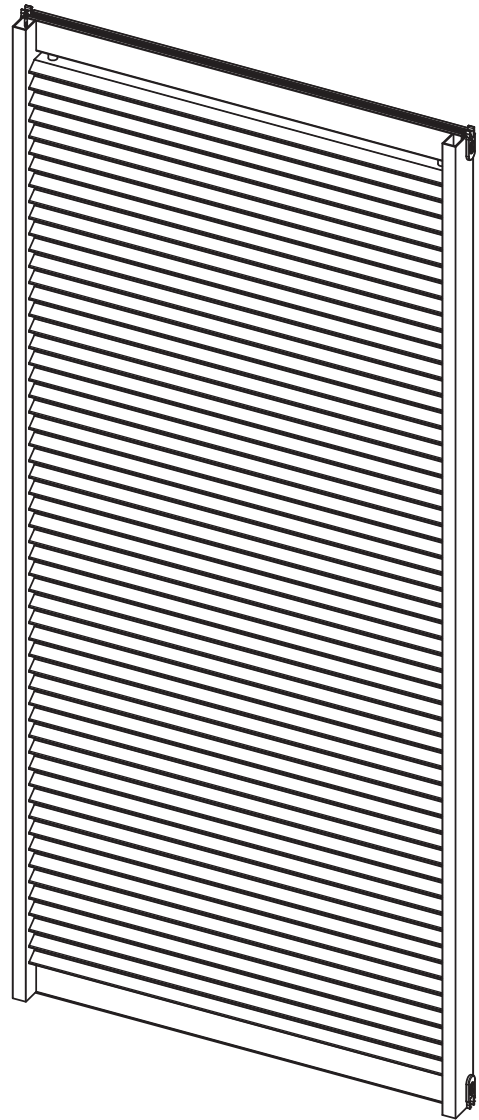
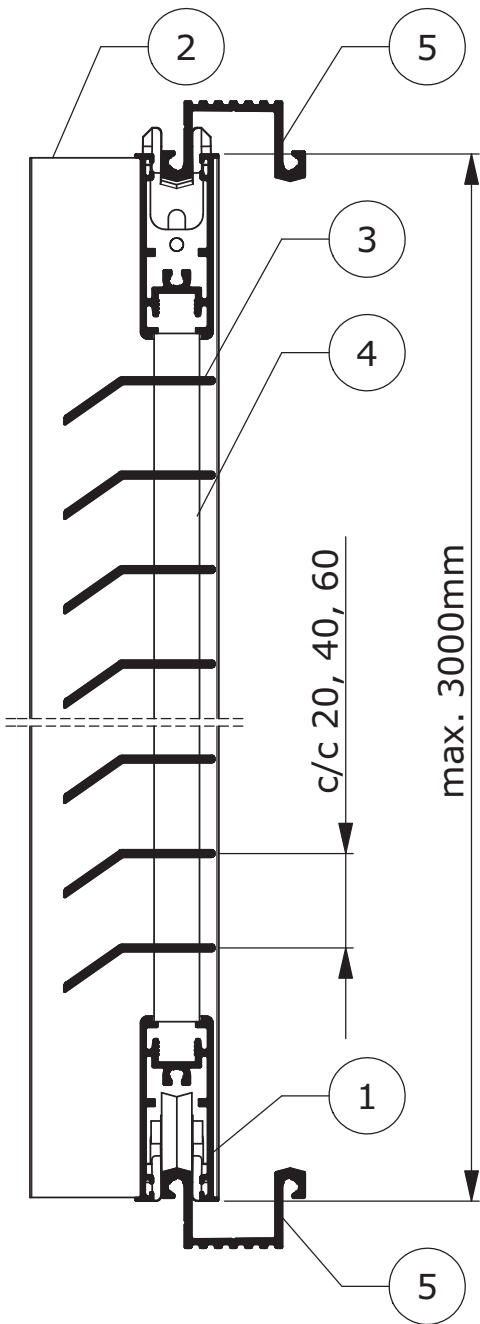




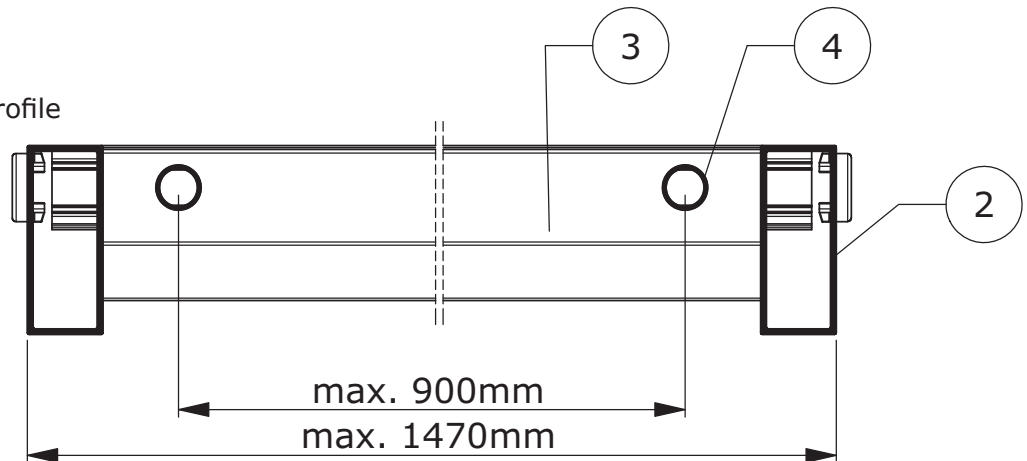
- 1. L-profile 60x30x3
- 2. Blade
- 3. Al-tube

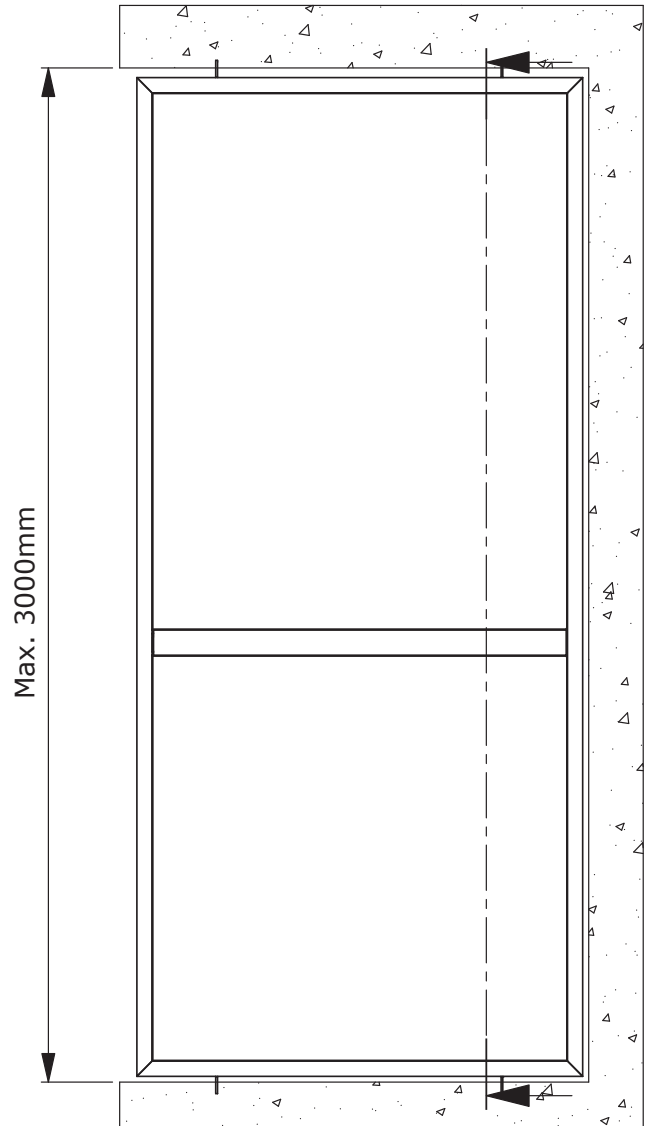
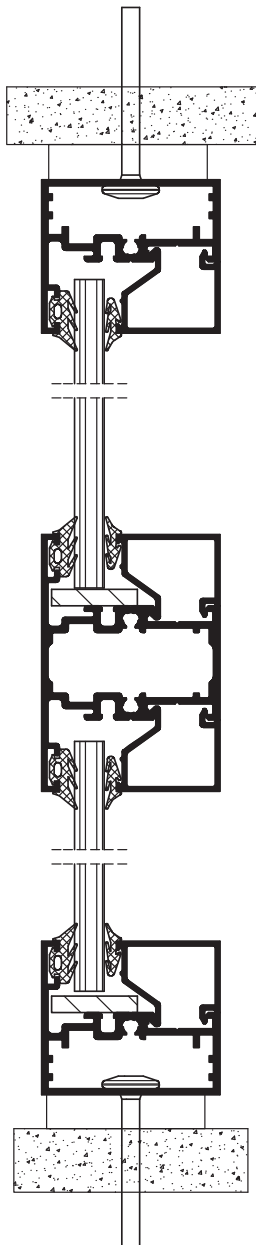
Elements can be stacked





- 1. Glazing profile
- 2. Rectangular profile 50x20x1,5 or 60x40x1,5
- 3. Blade
- 4. Al-tube
- 5. Sliding rail profile



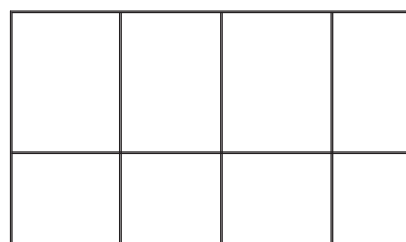
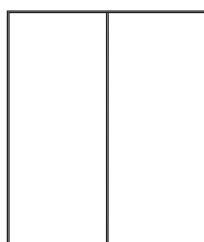
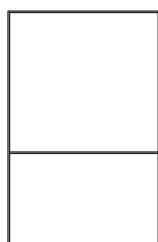
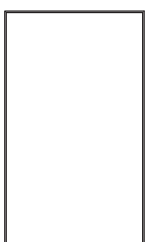


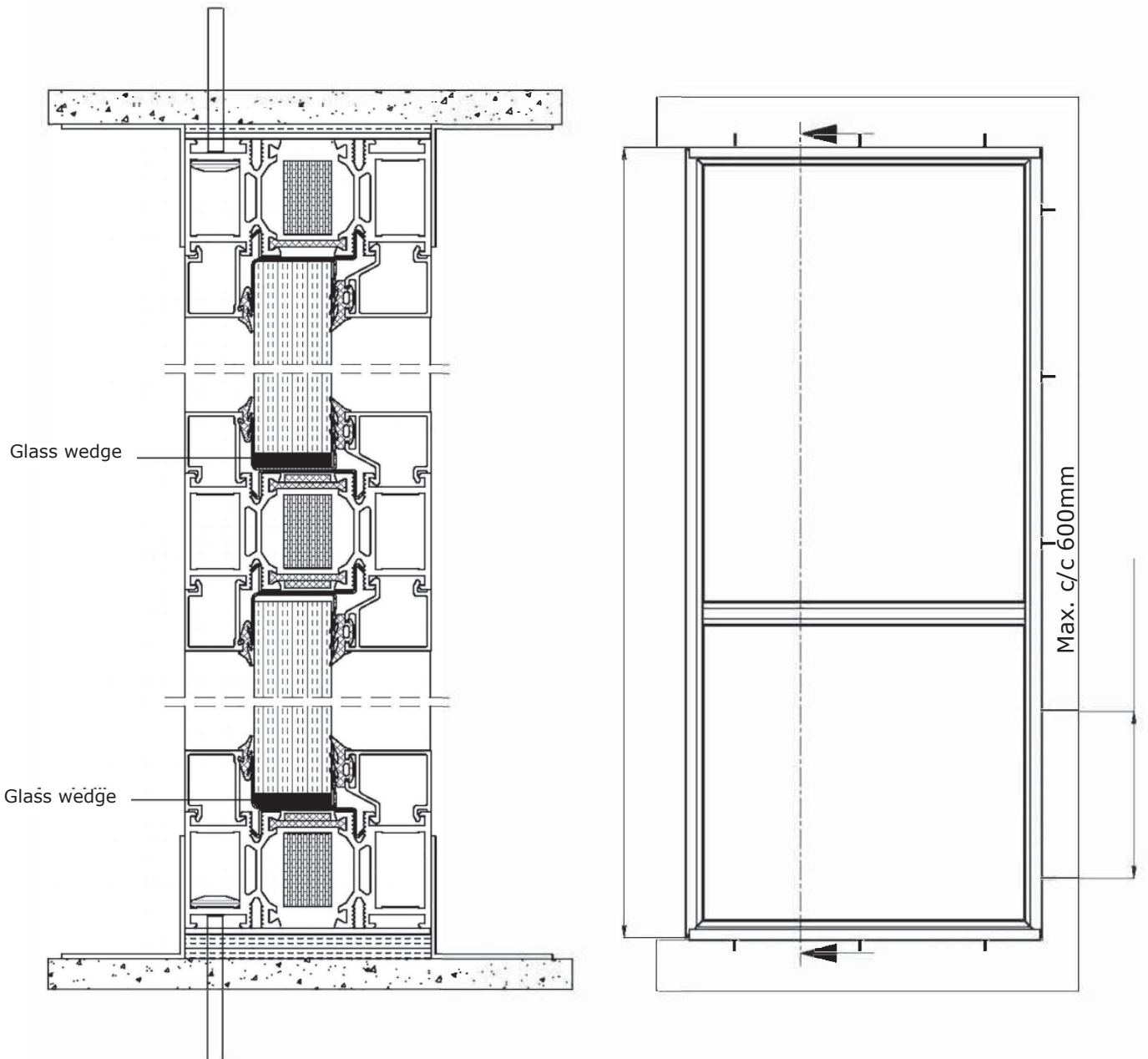
Opening size:

Board infill 3,0m²

Glass infill max 2,0m²

Models:



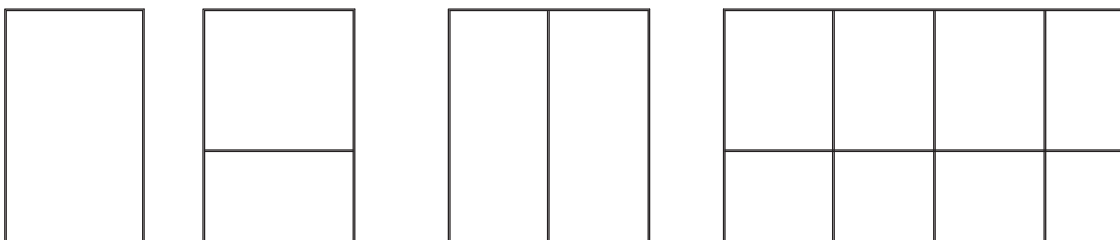


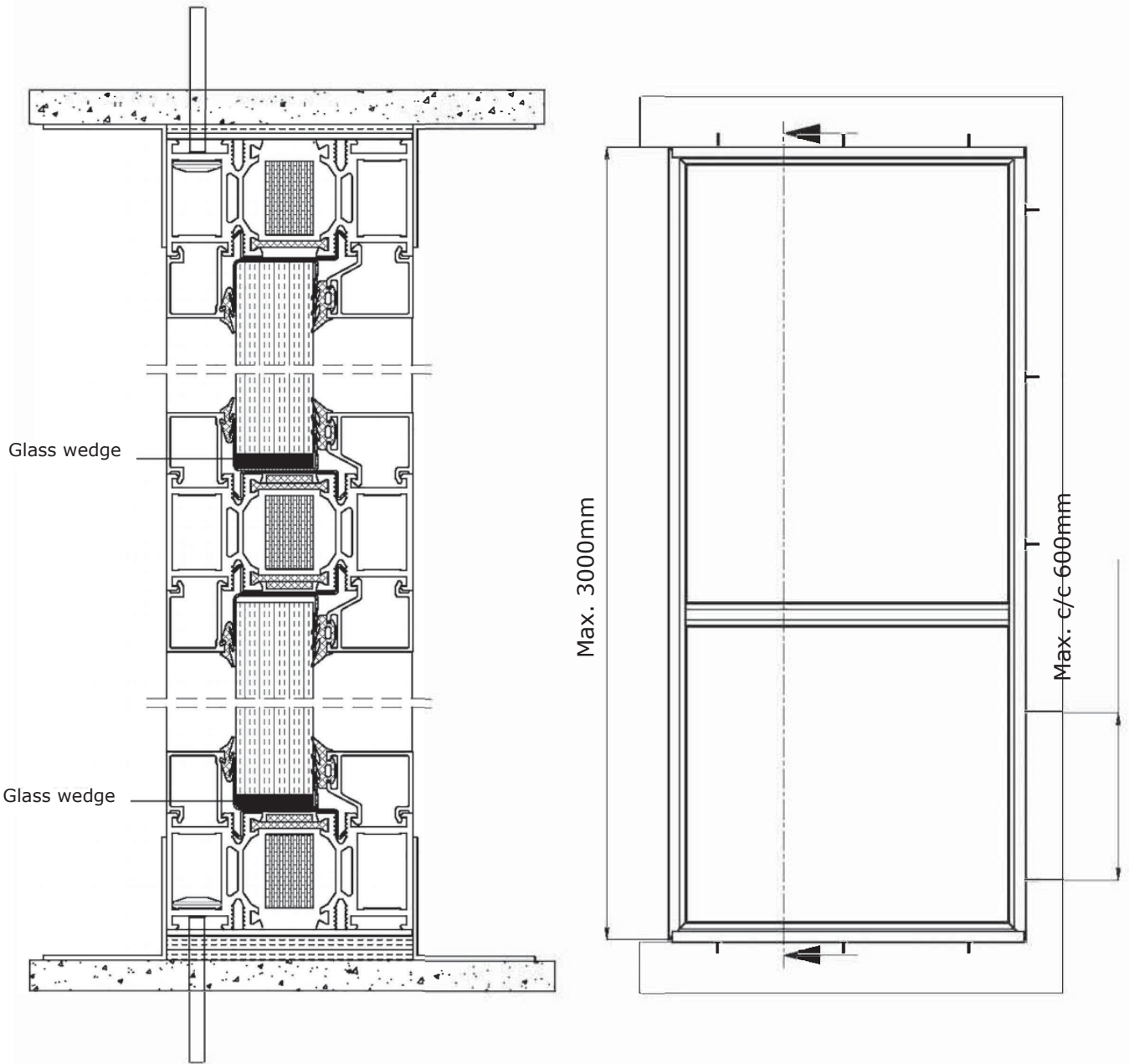
Opening size:

Board infill 1115x2850mm

Glass infill max. 2,0m²

Models:



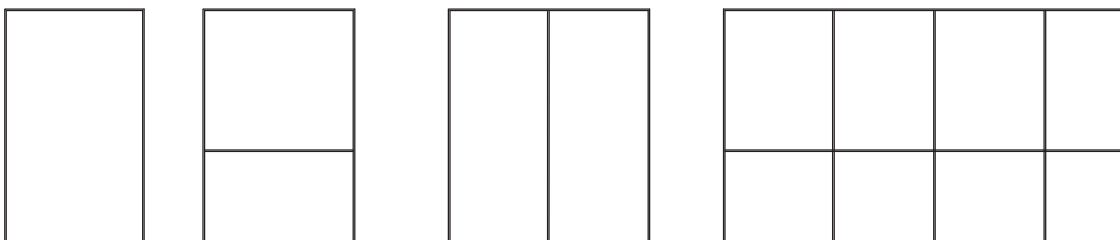


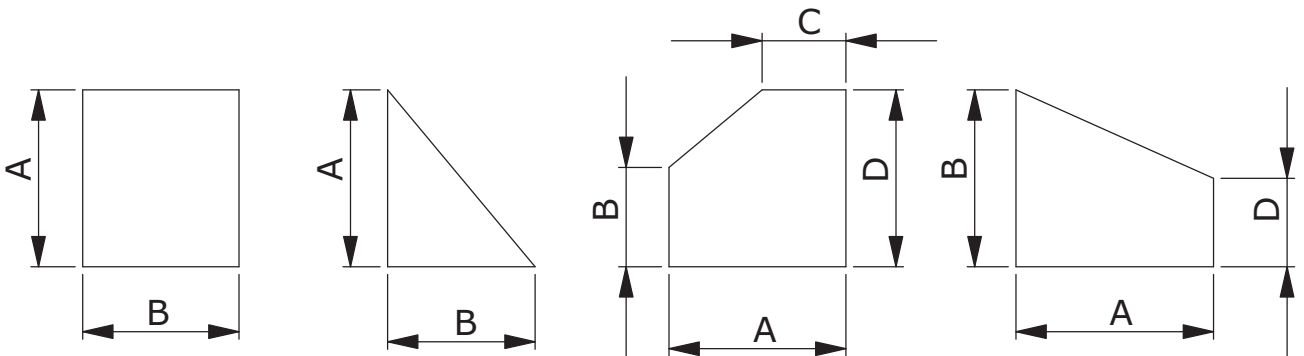
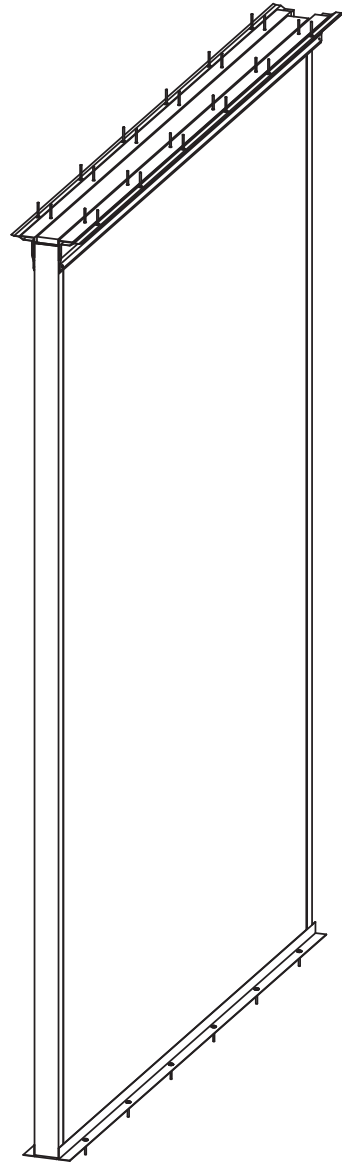
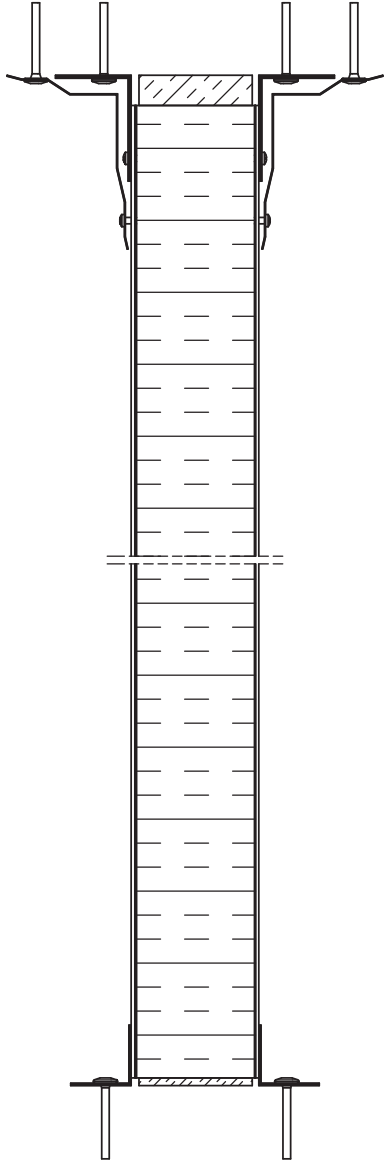
Opening size:

Board infill 1115x2850

Glass infill 1115x2500

Models:



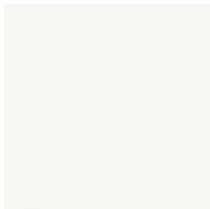


Dividing Screen Wool Panel EI 30

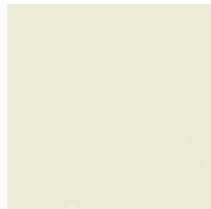
The Elements are type- approved sandwich panels with mineral wool core and PVDF- coated steel sheets for facades. All the components used for fastening is also made of steel.

The Wool Panel elements meets the requirements of modern construction; the representing appearance, the short construction time, the modularity of construction and fire safety The EI30- fire rated dividing screen is delivered ready for installation. The installer finishes connecting surfaces with non-combustible mineral wool.

Dividing Screens can be delivered with more than a 3,5m span with wind load exceeding 1, 0 kN/m². At a normal floor-to floor height the entire buildings wool panels can be made with a uniform appearance. Elements can be ordered in a selection of RR colours, as shown below. Other RR-colours are available only by special order, minimum delivery lot is 1500 m²



RR20 White
(NCS 1002 Y)



R807 Light Ivory
(RAL1015,
NCS 1010-Y20R)



RR24 Yellow
(NCS 10440-Y20R)



RR29 Red
(NCS 5040-Y80R)



RR502 Green
(RAL6011,
NCS 5030-G30Y)



RR21 Light Grey
(NCS2502-B)



RR23 Dark Grey
(NCS 7502-B)



RR34 Light Blue
(NCS 3020-R90B)



RR35 Blue
(NCS 5030-R90B)



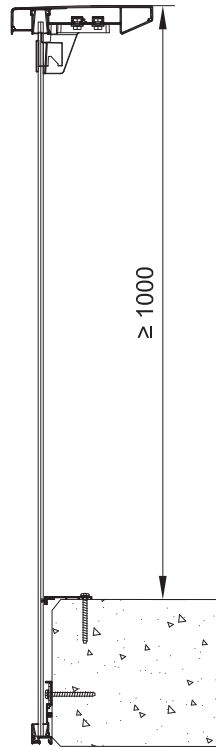
RR40 Silver



RR41 Dark Silver

Due to printing limitations colors may differ from actual color. To ensure the right colour, view a sample cut before a final decision.

Balustrade dimensioning:



Check required balustrade height according to local building codes; also height in public spaces



Construction Engineering Principles

The dimensioning is based on the standards EN 1990, EN 1991-1-1, EN 1991-1-3, EN 1991-1-4 and National Annexes.

In the durability evaluation for the structure, calculated are:

- wind loads
- max. spacing of posts
- anchor loads
- drilling points and distances from edges
- the effect of the fastening platform type to the anchoring

In addition the min. wedging height is illustrated in the plans and in the drilling images when the height is not the standard wedging height, 120 mm. The increased load for the balustrade due to the balcony glazing is always taken into account in the durability evaluation.

Wind pressure:

The wind pressures based on location and height are illustrated in the tables on the next page. The terrain classes are illustrated in table 1 and the wind pressures in different terrain classes in table 2.

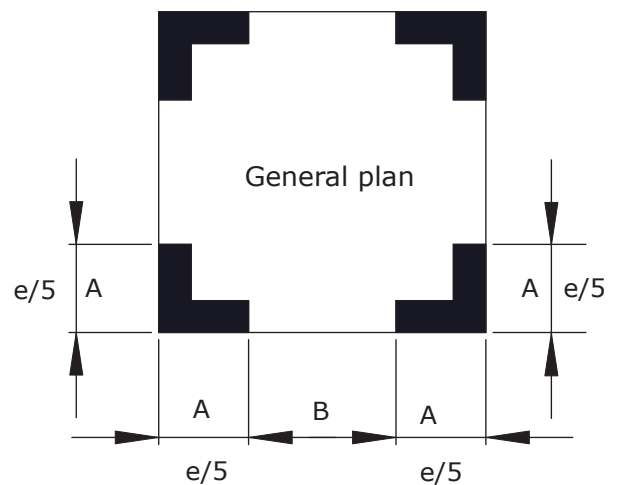
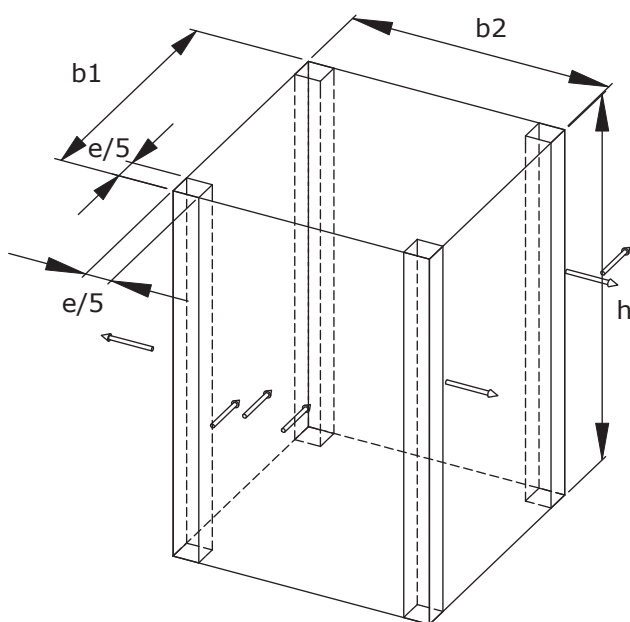
Wind suction load:

The corners of buildings, shown as "A" in the figure below, are also subject to wind suction loads.

Table 1

Zone	A	B
C _{pe10}	-1,2	±0,8

Simplified table for vertical walls

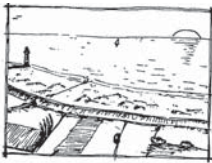



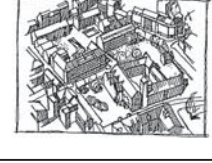


e = the smaller is selected b or 2h
for example if 2h=30m and b=25m e/5 =5m

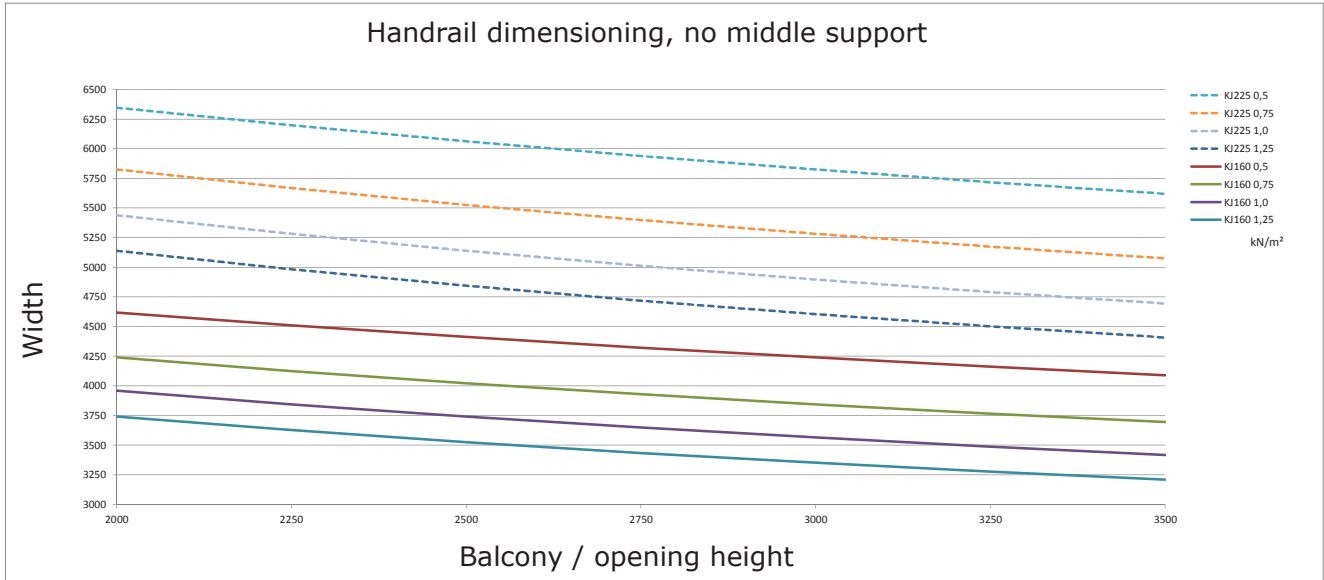
Table 2

Height h (m)	Terrain class $v_{ref 21m/s}$				
	0	I	II	III	IV
2	0,78	0,52	0,39	0,35	0,32
5	0,96	0,65	0,53	0,35	0,32
8	1,05	0,73	0,61	0,43	0,32
10	1,09	0,76	0,65	0,47	0,32
15	1,18	0,83	0,72	0,55	0,4
20	1,24	0,88	0,77	0,6	0,45
25	1,29	0,92	0,82	0,65	0,5
30	1,33	0,95	0,85	0,68	0,54
35	1,37	0,98	0,88	0,72	0,57
40	1,4	1,01	0,91	0,74	0,6

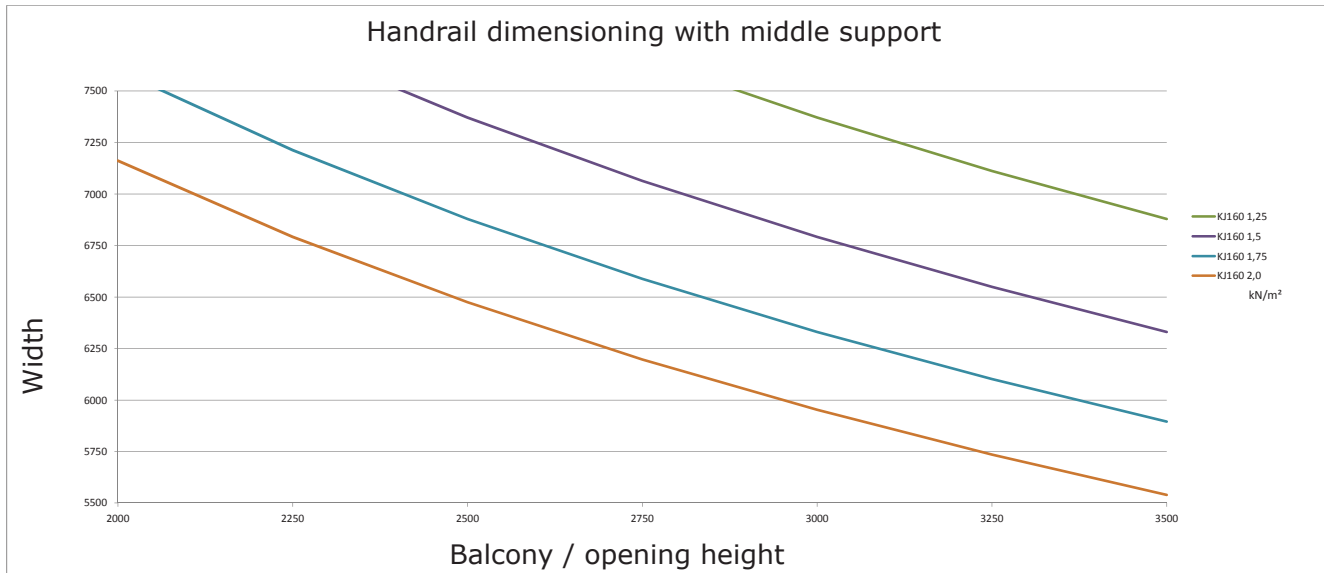
Table 3

Terrain class	Description
 0	Sea, costal area exposed to the open sea
 I	Lakes or area with negligible vegetation and without obstacles
 II	Area with low vegetation such as grass and isolated obstacles (trees, buildings) with separations of at least 20 obstacle heights
 III	Area with regular cover of vegetation or buildings or with isolated obstacles with separations of maximum 20 obstacle heights (such as villages, suburban terrain, permanent forrest)
 IV	Area in which at least 15% of the surface is covered with buildings and their average height exceeds 15 m

Handrail dimensioning table, with no middle support.



Handrail dimensioning table, with middle support. Maximum profile length is 7500mm.
An extension always needs to be supported.



Standard Colours: (Price group 1)

RAL 7024 Graphite grey
 RAL 9006 White aluminium
 RAL 9016 Traffic white

Lumon Colours: (Price group 2)

RAL 1013 Oyster white
 RAL 3003 Ruby red
 RAL 3007 Black red
 RAL 3011 Brown red
 RAL 5013 Cobalt blue
 RAL 6005 Moss green
 RAL 7031 Blue grey
 RAL 7040 Window grey
 RAL 8004 Copper brown
 RAL 8016 Mahogany brown
 RAL 8019 Grey brown
 RAL 9005 Jet black
 RAL 9010 Pure white

Other Colours: (Price group 3)

RAL 1000	RAL 2000	RAL 3000	RAL 4001	RAL 5000	RAL 6000	RAL 7000	RAL 8000
RAL 1001	RAL 2001	RAL 3001	RAL 4002	RAL 5001	RAL 6001	RAL 7001	RAL 8001
RAL 1002	RAL 2002	RAL 3002	RAL 4003	RAL 5002	RAL 6002	RAL 7002	RAL 8002
RAL 1003	RAL 2003	RAL 3004	RAL 4004	RAL 5003	RAL 6003	RAL 7003	RAL 8003
RAL 1004	RAL 2004	RAL 3005	RAL 4005	RAL 5004	RAL 6004	RAL 7004	RAL 8007
RAL 1005	RAL 2008	RAL 3009	RAL 4006	RAL 5005	RAL 6006	RAL 7005	RAL 8008
RAL 1006	RAL 2009	RAL 3012	RAL 4007	RAL 5007	RAL 6007	RAL 7006	RAL 8011
RAL 1007	RAL 2010	RAL 3013	RAL 4008	RAL 5008	RAL 6008	RAL 7008	RAL 8012
RAL 1011	RAL 2011	RAL 3014	RAL 4009	RAL 5009	RAL 6009	RAL 7009	RAL 8014
RAL 1012	RAL 2012	RAL 3015	RAL 4010	RAL 5010	RAL 6010	RAL 7010	RAL 8015
RAL 1014	RAL 2013	RAL 3016	RAL 4011	RAL 5011	RAL 6011	RAL 7011	RAL 8017
RAL 1015		RAL 3017	RAL 4012	RAL 5012	RAL 6012	RAL 7012	RAL 8022
RAL 1016		RAL 3018		RAL 5014	RAL 6013	RAL 7013	RAL 8023
RAL 1017		RAL 3020		RAL 5015	RAL 6014	RAL 7014	RAL 8024
RAL 1018		RAL 3022		RAL 5017	RAL 6015	RAL 7015	RAL 8025
RAL 1019		RAL 3027		RAL 5018	RAL 6016	RAL 7016	RAL 8028
RAL 1020		RAL 3031		RAL 5019	RAL 6017	RAL 7021	RAL 8029
RAL 1021		RAL 3032		RAL 5020	RAL 6018	RAL 7022	
RAL 1023		RAL 3033		RAL 5021	RAL 6019	RAL 7023	
RAL 1024				RAL 5022	RAL 6020	RAL 7026	RAL 9001
RAL 1027				RAL 5023	RAL 6021	RAL 7030	RAL 9002
RAL 1028				RAL 5024	RAL 6022	RAL 7032	RAL 9003
RAL 1032				RAL 5025	RAL 6024	RAL 7033	RAL 9004
RAL 1033				RAL 5026	RAL 6025	RAL 7034	RAL 9007
RAL 1034					RAL 6026	RAL 7035	RAL 9011
RAL 1035					RAL 6027	RAL 7036	RAL 9017
RAL 1036					RAL 6028	RAL 7037	RAL 9018
					RAL 6029	RAL 7038	RAL 9022
					RAL 6032	RAL 7039	RAL 9023
					RAL 6033	RAL 7042	
					RAL 6034	RAL 7043	
					RAL 6035	RAL 7044	
					RAL 6036	RAL 7045	
						RAL 7046	
						RAL 7047	
						RAL 7048	

Quality Specifications for Toughened Glass Manufactured by Lumon

1. General

Lumon Oy uses glass that conforms to the standard quality level of building glass, which is regulated with strict quality standards. The currently applied quality assurance instructions are prepared in accordance with standard EN 572-2. The instructions also take into account standard EN 572-8 for cut glass (Supplied and final cut sizes). Lumon manufactures tempered glass according to standard EN 12150-1.

2. Inspection

These instructions are for toughened or laminated glass delivered by Lumon Oy. Unless otherwise specified, the quality of glass is inspected from a distance of two meters in normal daylight, against a homogeneous background, and perpendicularly. Normal daylight refers to sunlight, however, not direct sunlight to the glass. The glass must be inspected when it's dry. Misted glass may show amorphous patterns because of surface tension.

3. Assessment of Quality

3.1 Optical Distortion

When examined in close range, slight optical distortion characteristically occurs in toughened glass. Especially distortion in the fringe areas is allowable.

3.2 Point Defects

Point defects with diameter less than 0.5mm are innate properties of glass. Two defects with diameter of 0.5-1.0 mm are allowable in any parts of the glass provided that their relative distance is not less than 500 mm. Point defects measuring over 1.0 mm in diameter are not allowable anywhere in the glass.

3.3 Scratches

Transparent scratches up to 150 mm are allowable, but not closer than within relative distance of 500 mm. Deep scratches detectable from a 2 meter distance under the specified conditions shall not be wider than 0.5 mm and/or 5 mm long. One deep scratch per glass is allowable. Scratches that are smaller than the above measurements can be characteristic to glass and therefore allowable.

3.4 Edge Finishing

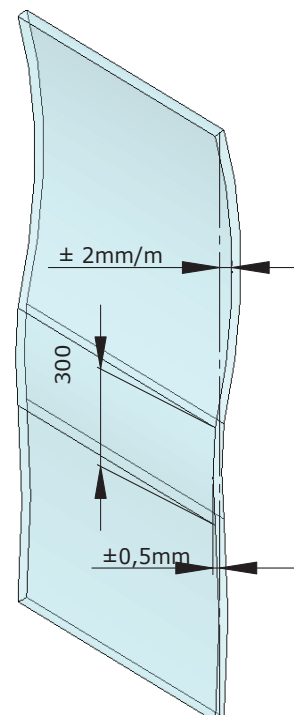
The visible edges of glass are polished to a rounded edge according to standard EN ISO 12543-1. Clearly detectable cracks totaling over 50 mm on each edge are not allowable.

3.5 Overall and Local Bow

Toughened glass has a slight innate bow. Standard EN 12150-1 allows overall bow not exceeding $\pm 3 \text{ mm/m}$. Local bow of $\pm 0.5 \text{ mm}$ can occur over length of 300 mm. Local bow is measured by using a straight 300 mm metal ruler placed on the surface of the glass. Overall bow can be determined similarly by placing a straight ruler over the entire surface of the glass. Lumon Oy has specified even stricter total dimensional tolerances for balcony glazing, which is measured at the manufacturing plant. Tempered glass delivered by Lumon Oy must have an overall bow of less than $\pm 2 \text{ mm/m}$.

3.6 Other Defects in Surface

Dimness of glass due to alkali-silicate on the surface is not allowable. Such glass has lost its polish and it is less transparent. So called anisotropy phenomenon may occur in toughened glass. This is a normal property of glass and therefore allowable. The phenomenon becomes visible in cer-



tain conditions as "leopard spots" caused by stress in the glass. Dirt and stranding are normal, but they should not be visible in a correctly cleaned glass from a distance over 2 meters. If the dirt cannot be removed, the manufacturing plant should be contacted for reference of a suitable detergent. Misting may show patterns that result from different surface tensions over the glass.

3.7 Tolerance Limits for Dimensions

The dimensional tolerance of the glass panes is determined according to standard EN 572-8:

Length of Edge	Glass Pane Thickness	
	3-6mm	8-12mm
≤ 1,5 m	±1,0mm	±1,5 mm
1,5 ≤ 3,0 m	±1,5 mm	±2,0mm

Lumon Oy has determined the following dimensional tolerances for glass panes applied in glazing system: glass pane thickness 6 mm: ±1.0 mm and glass pane thickness 8-10 mm: ±1.5 mm. Cross-dimensional tolerances for individual panes are: Glass pane thickness 6 mm: ± 2.0 mm and glass pane thickness 8-10 mm: ± 3.0 mm.

Quality Specifications for Laminated Glass Manufactured by Lumon Oy

1. General

These specifications apply to finished laminated glass panes and the defects on their see-through area.

2. Definitions

Point defects including dull spots, seeds and foreign particles, hairline defects include scratches in glass and film. Other defects include creases, stripes or contract of laminating film.

3. Defects in the See-trough Area

Point defects < 0.5 mm in laminated glass are not observed. Defects >3.0 mm are not allowable. The number of defects < 1.0 mm is not restricted provided that their relative distance is > 400 mm. One point defect measuring 1.0-3.0 mm is allowable per square meter. Hairline defects (i.e. scratches) measuring >30 mm are not allowable. Hairline defects measuring < 30 mm are allowable provided that their relative distance is not shorter than 200 mm. Any foreign particles such as hairs are not allowable in laminated glass.

4. Defects in the Fringe Area

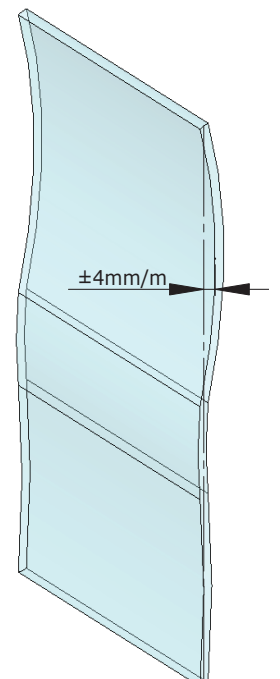
In laminated glass to be framed, 15 mm from the edge of the glass is deemed the fringe area. Point defects of 5 mm are allowable in the fringe area or around holes. Laminated glass panes not intended for framing must have finished (arised edge with blank spots or ground edge with blank spots), polished, or faceted edges according to standard EN ISO 12543-5. Thus seeds, blemishes and contract of laminating film etc. are allowable, if they are not detectable when an upright glass pane is inspected from a distance of two meters, against a pale matte-finished wall in daylight (not in direct sunlight).

5. Overall Bow in Laminated Glass

The tolerance for overall bow in laminated glass is ± 4 mm/m.

Quality Specifications for Building Boards

Quality specifications for building board panes are based on standard EN 438-6. Panes are inspected within distance of 1.5 m. The size of an individual defect shall not exceed 2 mm²/m². The allowable total number of surface defects is 20 mm²/m², and the allowable cracks on edges totals 3 mm.



Quality Requirements for Aluminium Profiles Used in Lumon Oy's Products

1. Surface Quality


Profiles must not show obtrusive surface defects when inspected from a distance of 5 m. Visible surfaces of the profile at end product must not show obtrusive defects when inspected from an arm's length (60 cm). According to GSB specifications, the thickness of paint coating shall be 60 - 120 µm.

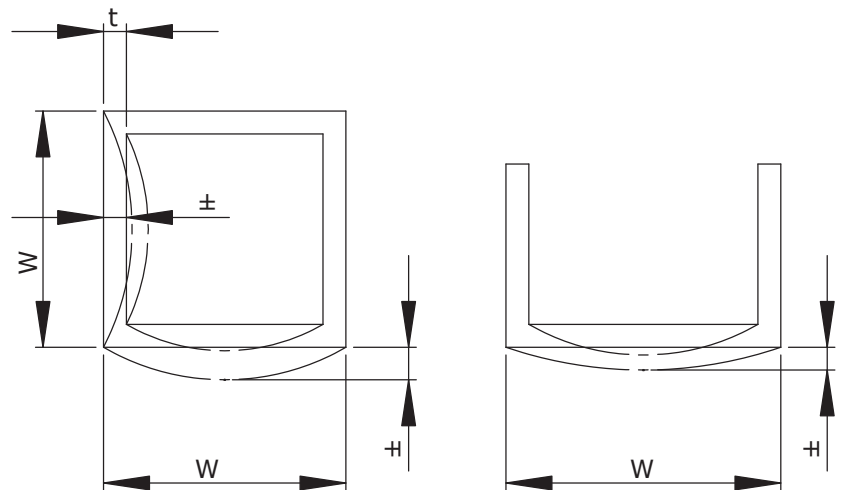
Inspection distances for finished products are:

- 1 m indoors
- 5 m outdoors.

2. Dimensional and Shape Tolerances of Aluminium Profiles

Straightness and shape tolerances for the special profiles used in the products are presented in the profile product cards. In standard profiles (L-shaped corners, rectangular profiles etc.) the overall straightness tolerance is ±1,5mm/m, and locally not more than 0,6 mm/ 300 mm. Tolerances for convexity and concavity of profiles are determined according to the shape and width of the profile. The allowable values for open profiles are presented in the last column of the table below. In closed profiles, another factor contributing to tolerance values in addition to profile width is the thickness of the profile bevel (t). Tolerances for closed profiles are presented in the middle column of the table below. W represents the width of the profile bevel.

W [mm]		t [mm]		
min.	max.	max. 5	min. 5	
0	30	±0,30	±0,20	±0,20
30	60	±0,40	±0,30	±0,30
60	100	±0,60	±0,40	±0,40
100	150	±0,90	±0,60	±0,60
150	200	±1,2	±0,80	±0,80
200	300	±1,8	±1,2	±1,2
300	400	±2,4	±1,6	±1,6



3. Tolerances for Sawing and Tooling, Dimensional Tolerances for a Finished Product

Tolerance in sawing and tooling aluminium profiles is ± 0,5 mm.

Overall dimensional tolerances of finished Lumon products are:

- Lumon balustrade ± 5 mm
- Terrace door pane ± 1 mm.

Manufacturer's Warranty Clauses for Lumon products**Warranty Preconditions**

Warranty is valid, providing that the Customer approves the delivery. If the Customer is not present at the time of installing and does not make a complaint within of seven (7) days of the installation, the delivery is considered as accepted and the warranty period begins.

Warranty Period

The warranty period for the installation work is two (2) years and for raw material and manufacturing defects five (5) years from the approved delivery or the actual introduction date. Spare parts availability is ten (10) years from the end of production. Wooden parts have a warranty period of two (2) years for raw material and manufacturing defects. For solar blinds and insect nets, the manufacturer grants a two (2) year warranty

Restrictions of Warranty**Warranty does not cover:**

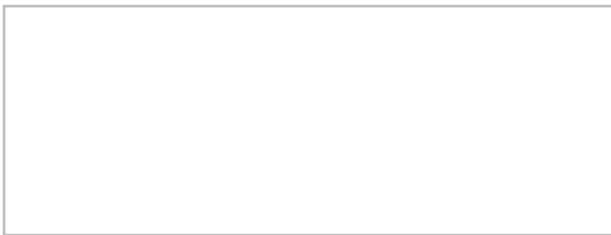
- Cleaning after the approved delivery or after the actual introduction.
- Work resulting from the glazing and the associated structures getting dirty in course of time.
- Glass breakage caused by other than a manufacturing defect.
- Breaking caused by incorrect use or vandalism
- Adjustments, repairs and spare part replacements, due to normal wear and tear, the customer or the inhabitants of improper use of, or the fact that the operating instructions have not been followed
- Damage and malfunctioning caused by subsidence of the surrounding structures, abnormal stress to the glazing, a sudden unpredictable event affecting the glazing or a natural disaster.
- Changes, repairs or re-installations that have been made without the manufacturer's or retailer's approval
- Patterns that occur on the surface of toughened glass
- Indirect costs.

Toughened safety glass must not be installed with any type of films or tapes. If the glass has been retrofitted with films or tapes, Lumon Oy is not responsible for product breakage or damage to property or persons caused by product dropping or costs caused by this.

Toughened glass is manufactured according to EN 12150-1 and EN 572-8 standards.

Laminated glass is prepared in accordance with the standard EN 12543-5-6.

A glazed balcony / terrace is a not thermally insulated space. It remains a cold outdoor space that is not fully sealed. Balustrade and balcony glazings can have 5-15 mm gaps between the glass panes. Interfaces to other structures can have 10 to 50 mm gaps. When decorating the balcony / terrace the possibility of water, snow, dust and wind entering, must be taken into account.



Valmistaja / Tillverkare / Produsent / Producent / Framleiðandi /
Producer / Fabricante / Producent / Fabricante / Fabriqué par /
Производитель

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