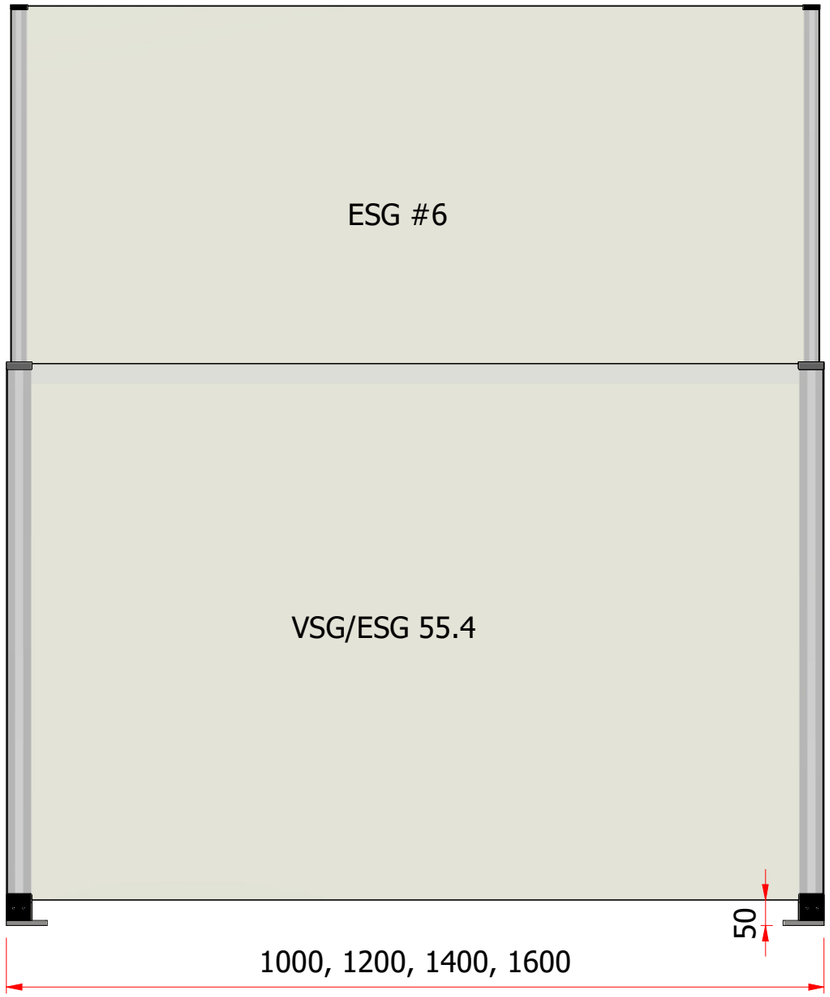
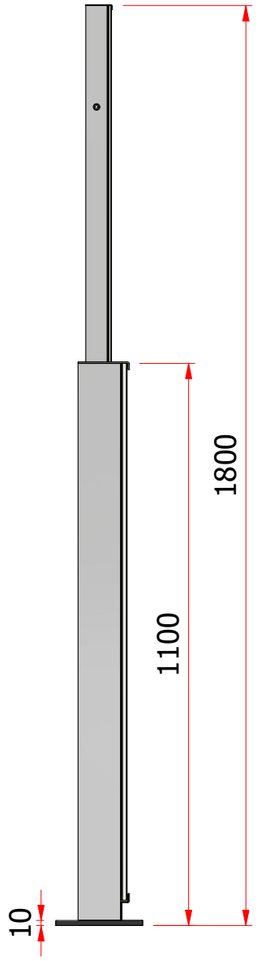
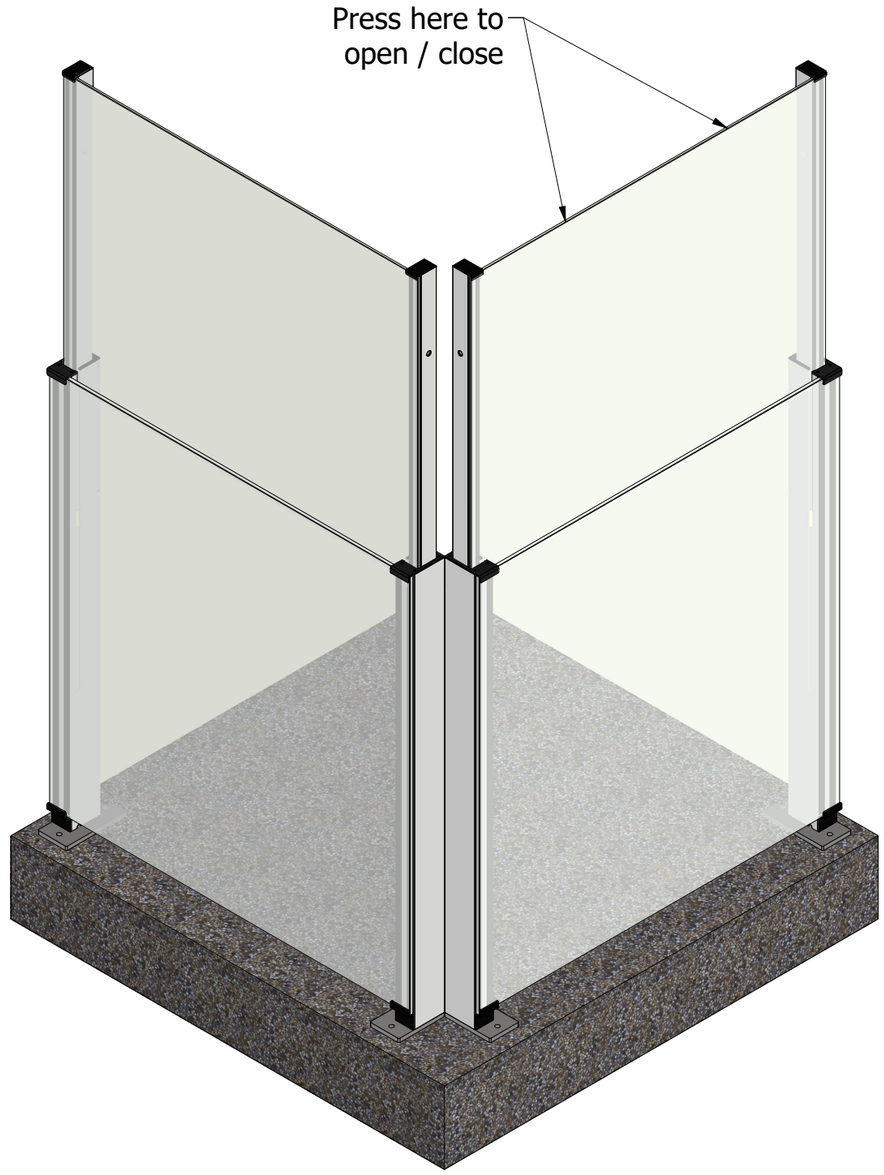
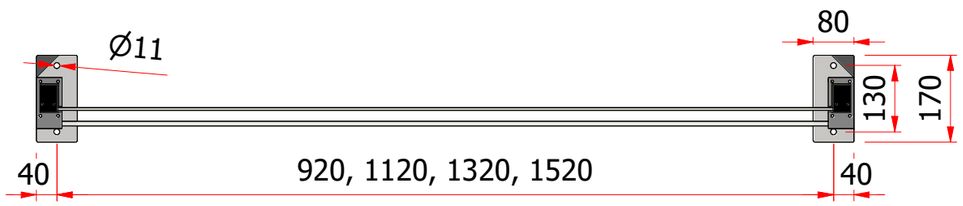
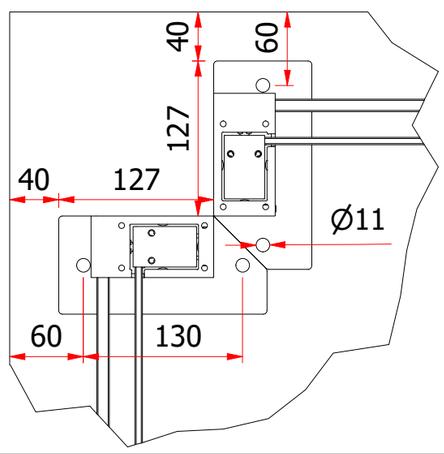






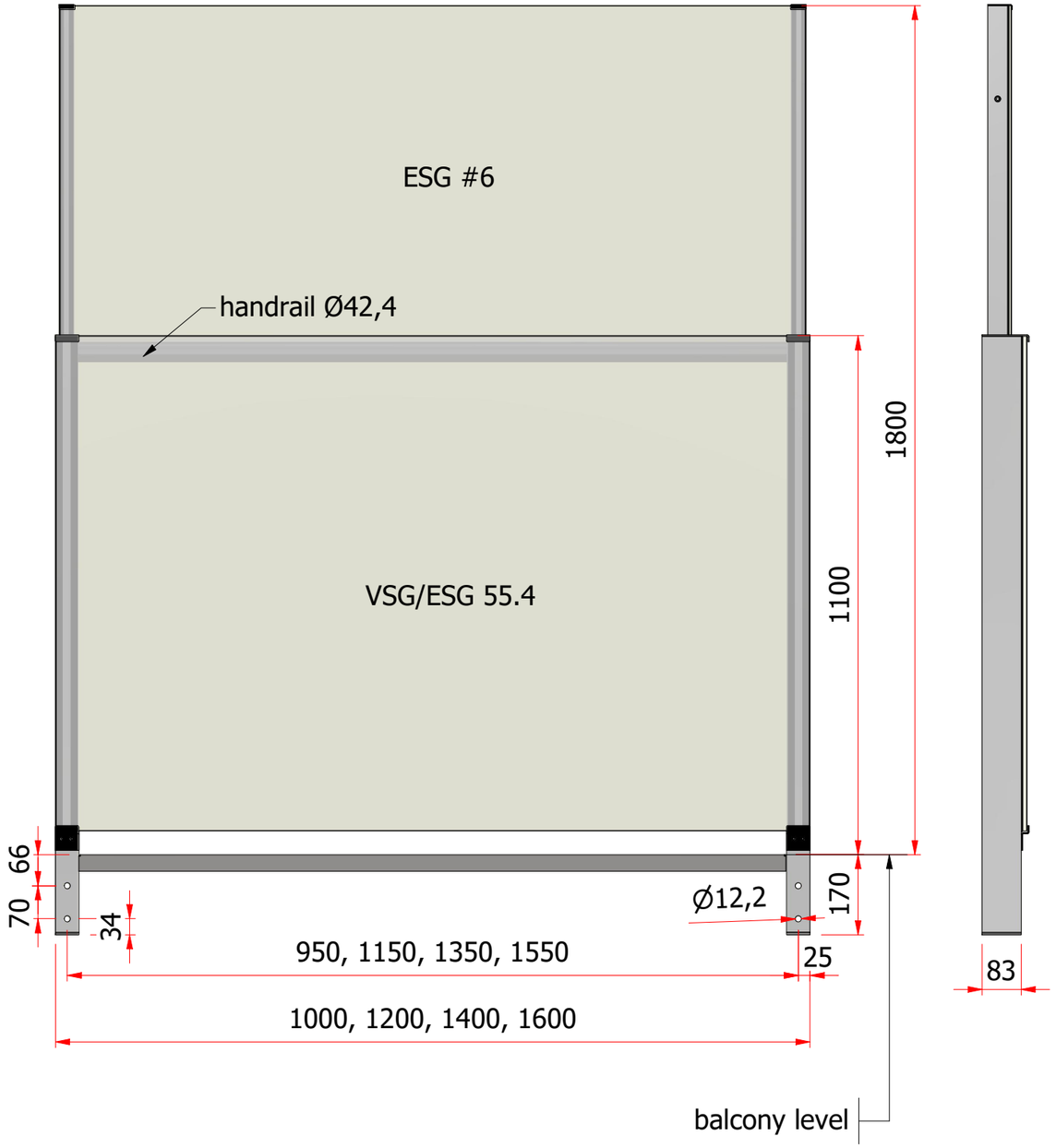


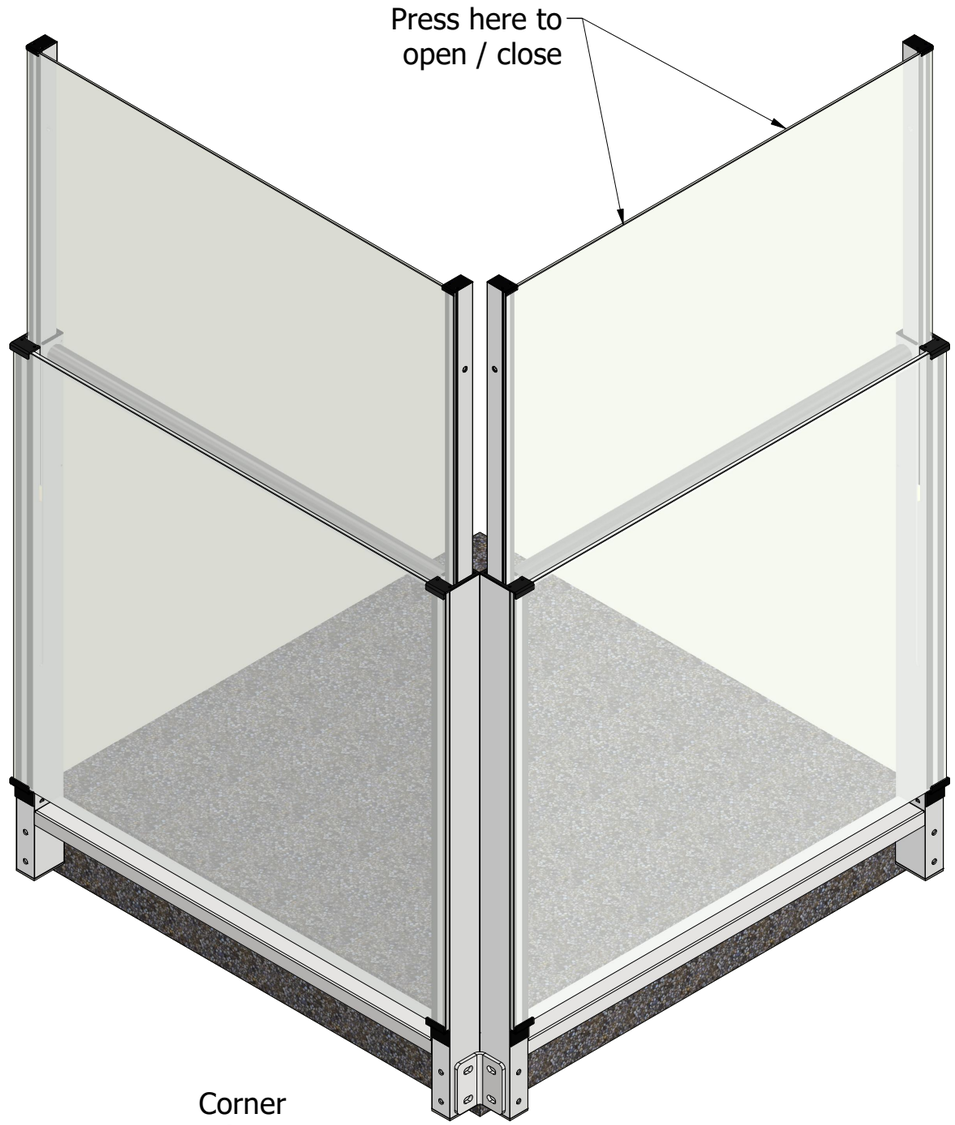
Corner
View from top



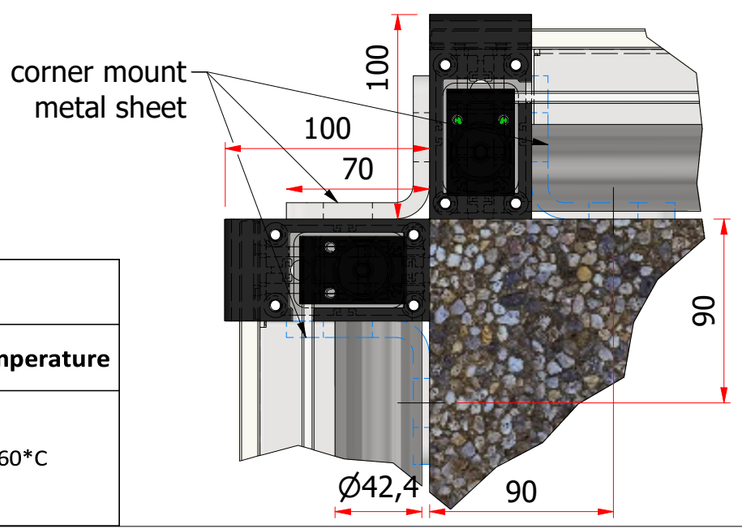
Specification of Wind-Dam balustrades						
Type of installation	**Heights**	**Material**	**Module length**	**Strength**	**Wind resistance**	**Working temperature**
From the top (M10 8.8)	1,1 - 1,8 m	Aluminium, glass, stainless steel	1 m	1 kN/m	open - 120 km/h close - 200 km/h	-20*C +60*C
			1,2 m	1 kN/m		
			1,4 m	1 kN/m		
			1,6 m	1 kN/m		

WIND-DAM	Designed by Tobiasz	Date 13.09.2022
BALU - technical datasheet		
	Size A3	Sheet 1 / 2





Corner
View from top

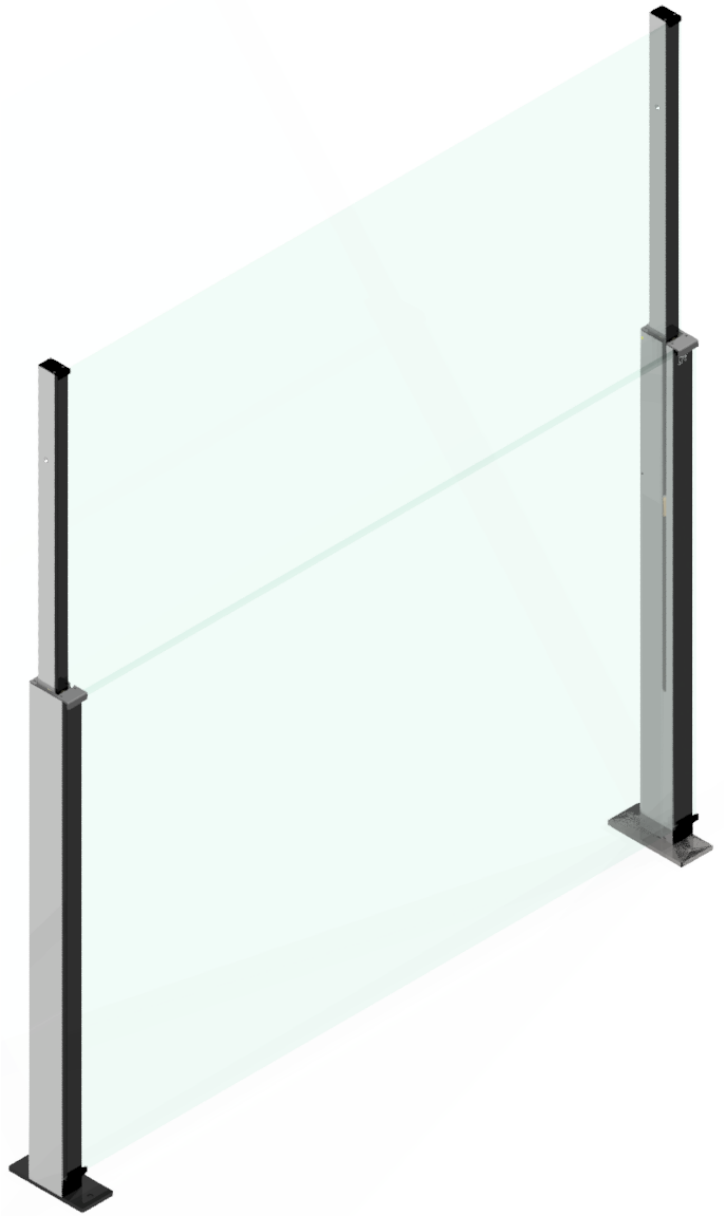


Specification of Wind-Dam balustrades						
Type of installation	**Heights**	**Material**	**Module length**	**Strength**	**Wind resistance**	**Working temperature**
Front (M12 8.8)	1,1 - 1,8 m	Aluminium, glass, stainless steel	1 m	3 kN/m	open - 120 km/h close - 200 km/h	-20*C +60*C
			1,2 m	2 kN/m		
			1,4 m	2 kN/m		
			1,6 m	2 kN/m		

WIND-DAM	Designed by Tobiasz	Date 13.09.2022
BALU - technical datasheet		
	Size A3	Sheet 2 / 2

WIND-DAM

WIND-DAM TECHNICAL REPORT



Product: Wind-dam

Type: 1,6m top mounting

Contents

1. Introduction 2
2. Test Procedure 3
2.1. Horizontal load test procedure 3
2.2. Impact test resistance procedure 3
3. Test Results 4
3.1. Horizontal load test results 4
3.2. Impact test resistance 5
4. Comments 5

1. Introduction

This is a report from an internal test conducted by Wind-dam company. It was intended to check the quality of the balustrade, and gives possibility to compare results with various standards.

2. Test Procedure

The test was performed on the longest available ***Wind-dam railing module, L= 1.6 meters***, which is the least strength version available. Balustrade was top mounted on a steel beam using M10 bolts.

2.1. Horizontal load test procedure

The test scheme is shown in the figure 1. The testing loads was determined according to PN-EN 1991-1-1:2004 Eurocode 1. The loads value used for tested balustrade is shown in the Figure 2 . A horizontal uniformly distributed linear load was applied with hydraulic actuator and a load cell to the glass (not to the posts) at a height 1.1m from the floor. The deflection was measured at the top central point of the glass pane. The load was applied and removed 3 times.

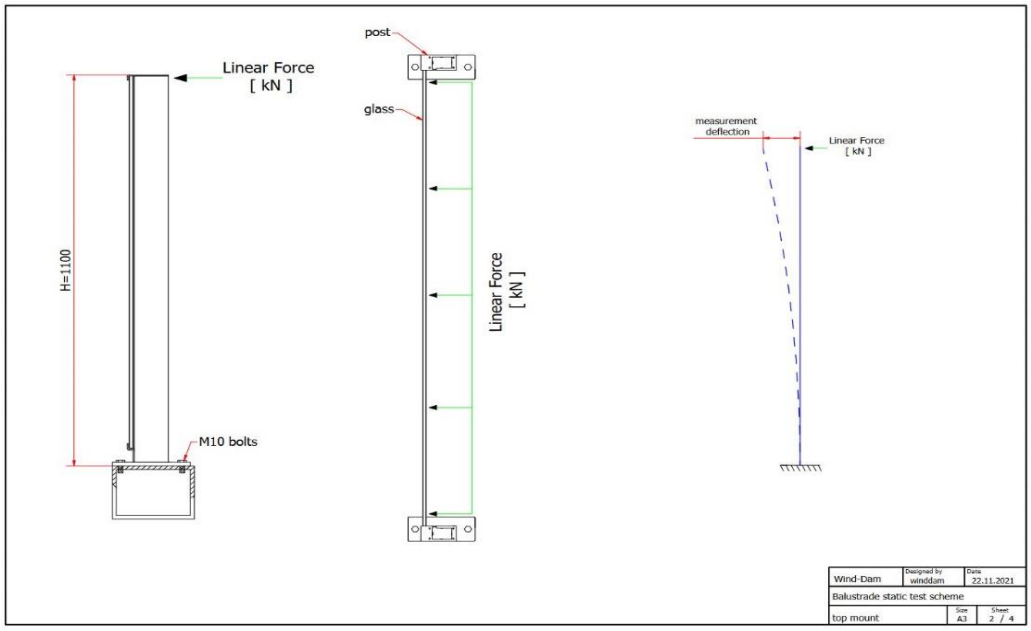


Figure 1: Scheme of static load test

balustrade lenght x force per meter in Newtons	linear force load [kN] for balustrade 1,6m
1,6m x 1kN/m	1,6
1,6m x 1,5kN/m	2,4
1,6m x 2kN/m	3,2
1,6m x 2,5kN/m	4
1,6m x 3kN/m	4,8

Figure 2: Determined load value used in test acc. to EN 1991

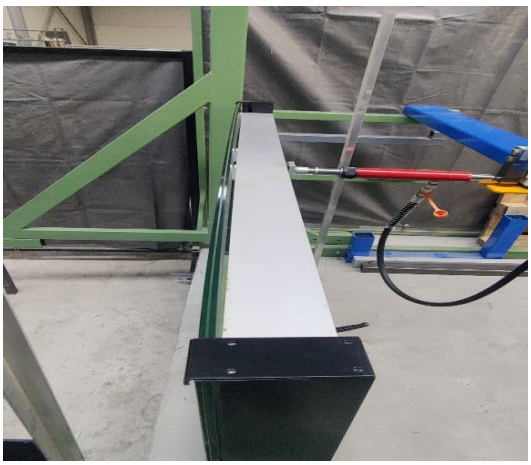


Figure 3: Balustrade during horizontal load test

2.2. Impact test resistance procedure

Soft and heavy body impact test was made according to DIN 18008-4. Used Impactor was similar to that described in EN 12600. The impact energy was 300J. The pendulum impact

test was performed in the middle of the glass pane, within the area, which is defined on scheme in fig. 4.

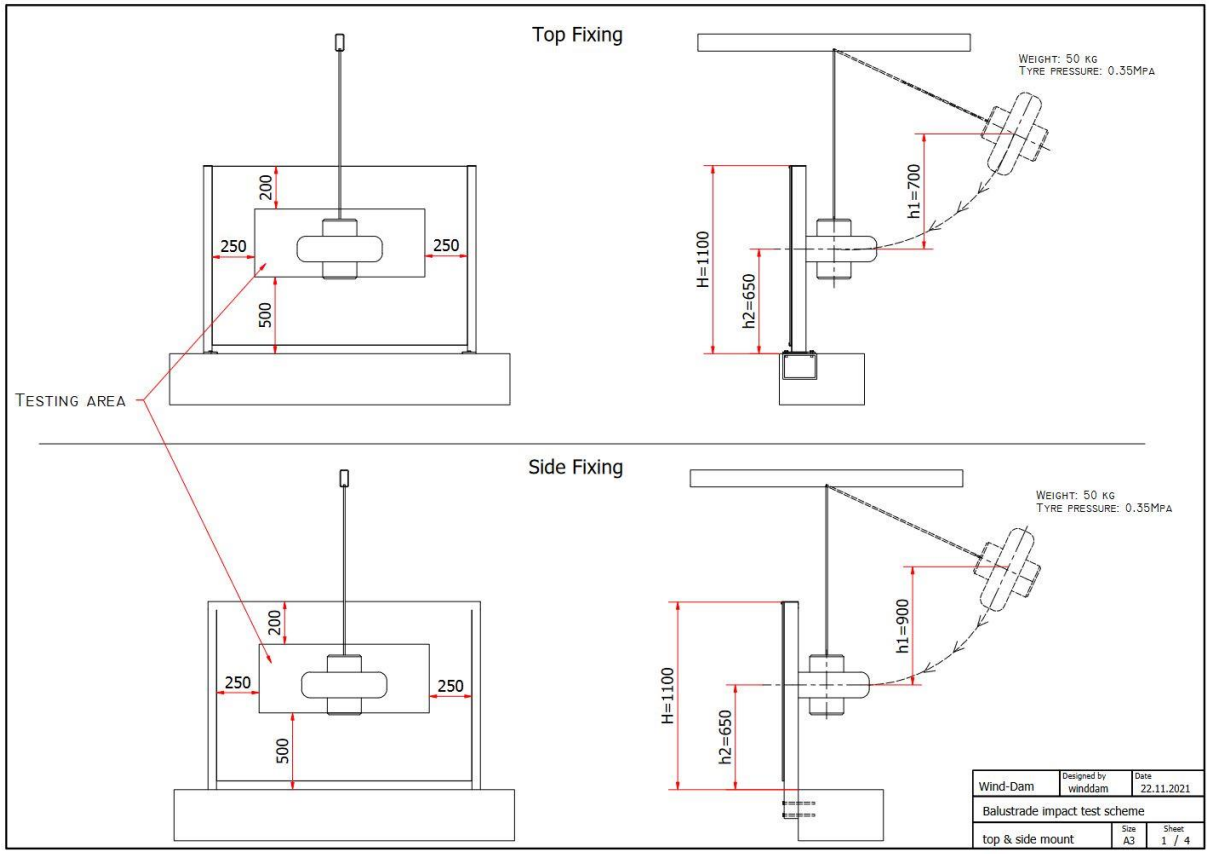


Figure 4: Impact test scheme for two type of wind-dam products

3. Test Results

3.1. Horizontal load test results

date: 31.08.2022

Wind-Dam 1,6m , top fixing 4 x M10								Observations
Linear load force [kN]	0	1,6	2,4					No any damage during the test. After removing the force, the balustrade returned to its original position, with zero residual deflection.
Measurement temporary deflection [mm]	0	19	27					

Used assesement criteria (according to procedure of Polish Building Research Institute ITB PB LK-140/1/04-2013)
Max temporary deflection ≤ H/50 [mm] = **22mm**
Max residual deflection ≤ H/100 [mm] = 11mm

Assessment criteria according to various standards	
Standard	Max temporary deflection
BS 6180	≤ 25mm
ASTM E2353	≤ 25mm
CSTB	≤ 35mm
NS 3510:2015	≤ 50mm
NBR 14718	≤ 20mm

pass
to improve

Figure 5: Results table and example criterias depending for standard

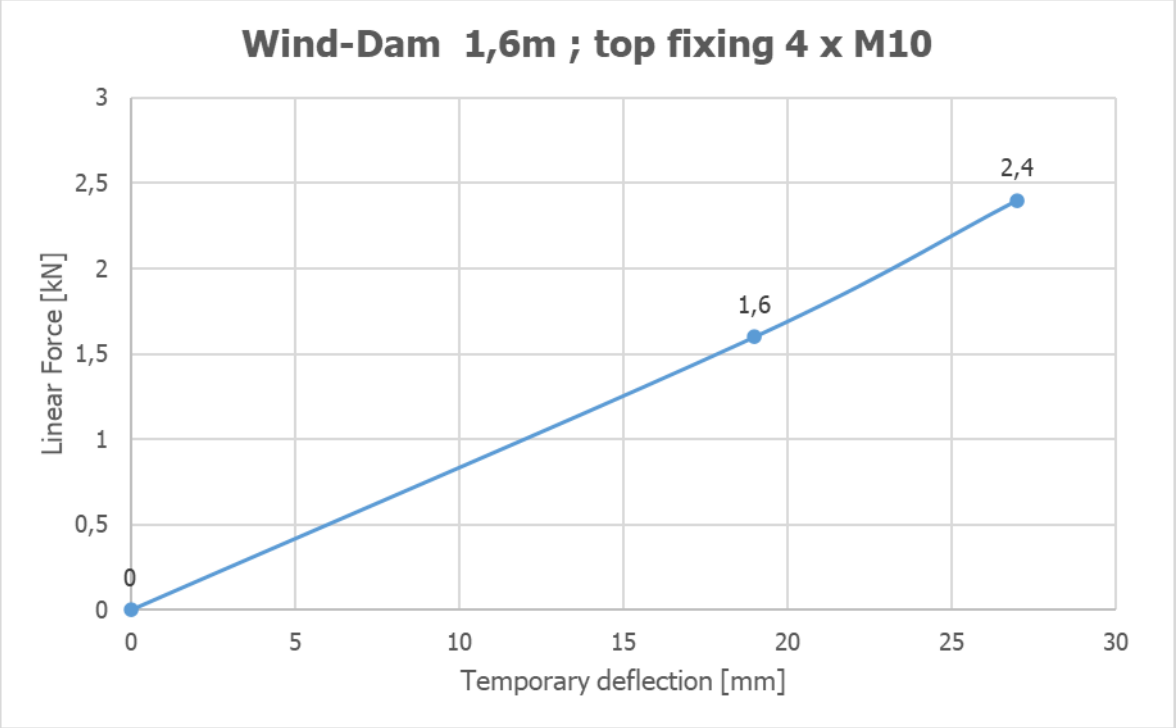


Figure 6: Results on the graph, (load to deflection ratio)

3.2. Impact test resistance

Balustrade ressisted 3 times test of soft body impact. After each hit, the whole structure was inspected for potential permanent deformation or connections damage. None was noticed.

4. Comments

The tests carried out can help in assessing the performance of the railing. In the most standards, method of testing is the same or very similar. However, there are no universal international standard for the assessment of guardrail performance. The relevant standards and laws of each country have to be followed. Don't matter what is mentioned in the report.

WIND-DAM

WIND-DAM TECHNICAL REPORT

Product: Wind-dam balcony

Type: 1,6m side mount

Contents

1. Introduction 3
2. Test Procedure 3
   2.1. Horizontal load test procedure 3
   2.2. Impact test resistance procedure 4
3. Test Results 4
   3.1. Horizontal load test results 4
   3.2. Impact test resistance 5
4. Comments 5

1. Introduction

This is a report from an internal test conducted by Wind-dam company. It was intended to check the quality of the balustrade, and gives possibility to compare results with various standards.

2. Test Procedure

The test was performed on the longest available ***Wind-dam balcony railing module, L= 1.6 meters***, which is the least strength version available. Balustrade was side mounted on a concrete block using glued-in anchors.

2.1. Horizontal load test procedure

The test scheme is shown in the figure 1. The testing loads was determined according to PN-EN 1991-1-1:2004 Eurocode 1. The loads value used for tested balustrade is shown in the Figure 2 . A horizontal uniformly distributed linear load was applied with hydraulic actuator and a load cell to the glass (not to the posts) at a height 1.1m from the floor. The deflection was measured at the top central point of the glass pane. The load was applied and removed 3 times.

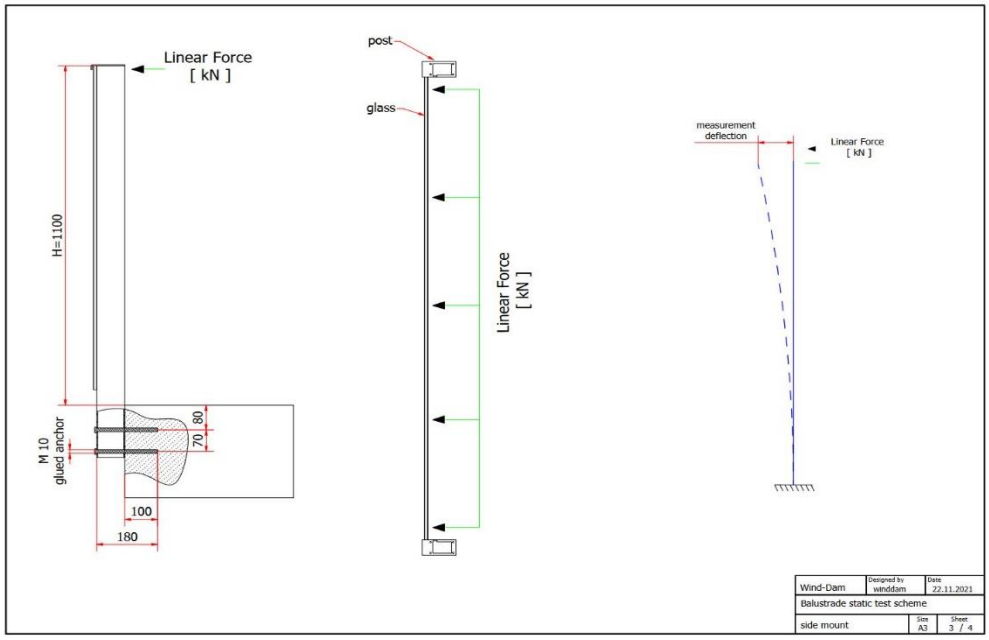


Figure 1: Scheme of static load test

balustrade lenght x force per meter in Newtons	linear force load [kN] for balustrade 1,6m
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1,6m x 2kN/m	3,2
1,6m x 2,5kN/m	4
1,6m x 3kN/m	4,8

Figure 2: Determined load value used in test acc. to EN 1991

Figure 3: Balustrade during horizontal load test

2.2. Impact test resistance procedure

Soft and heavy body impact test was made according to DIN 18008-4. Used Impactor was similar to that described in EN 12600. The impact energy was 450J. The pendulum impact test was performed in the middle of the glass pane, within the area, which is defined on scheme in fig. 4.

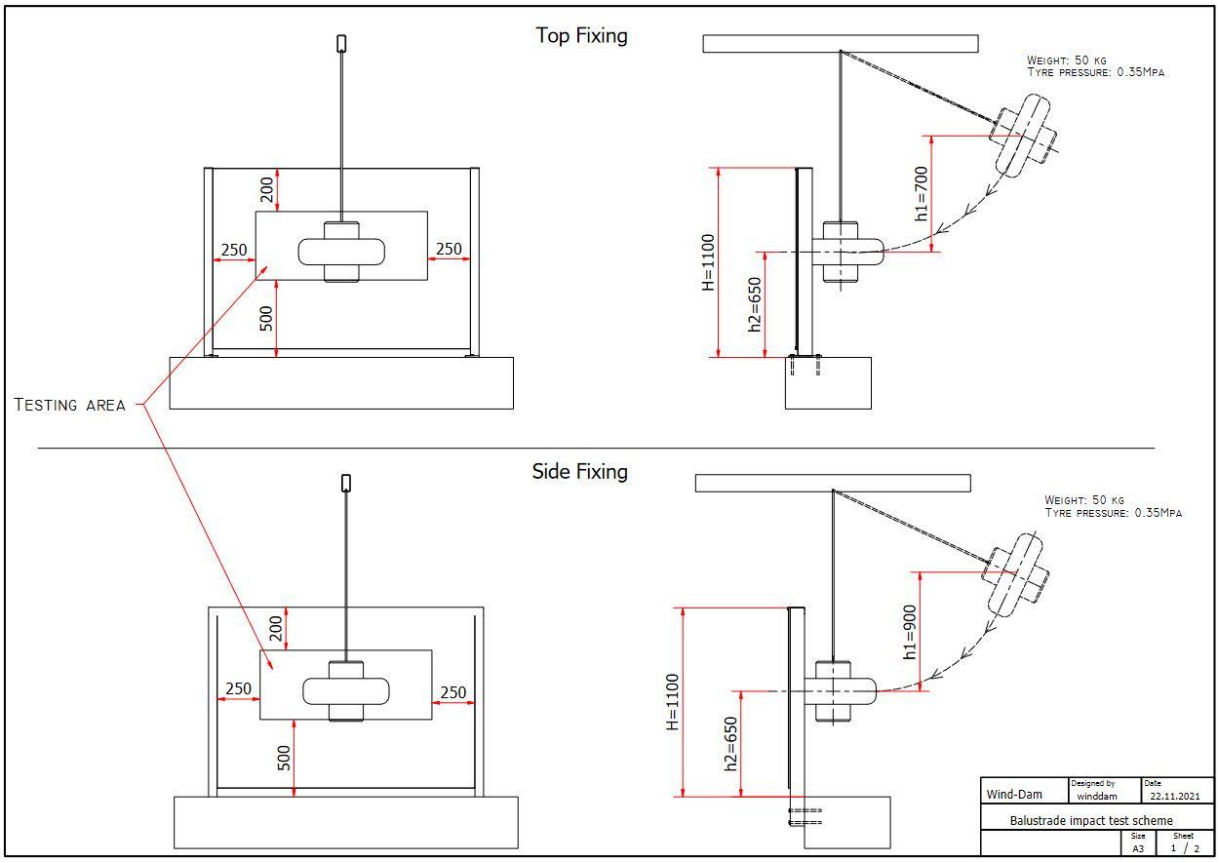


Figure 4: Impact test scheme for two type of wind-dam products

3. Test Results

3.1. Horizontal load test results

date: 24.08.2022

Wind-Dam 1,6m balcony, side fixing 4 x M10								Observations
Linear load force [kN]	0	1,6	2,4	3,2	4	4,8	0	No any damage during the test. After removing the force, the balustrade returned to its original position, with zero residual deflection.
Measurement temporary deflection [mm]	0	14	20	24	30	36	0	

Used assesement criteria (according to procedure of Polish Building Research Institute ITB PB LK-140/1/04-2013)
Max temporary deflection ≤ H/50 [mm] = **22mm**
Max residual deflection ≤ H/100 [mm] = 11mm

Assessment criteria according to various standards	
Standard	Max temporary deflection
BS 6180	≤ 25mm
ASTM E2353	≤ 25mm
CSTB	≤ 35mm
NS 3510:2015	≤ 50mm
NBR 14718	≤ 20mm

pass

to improve

Figure 5: Results table and example criterias depending for standard

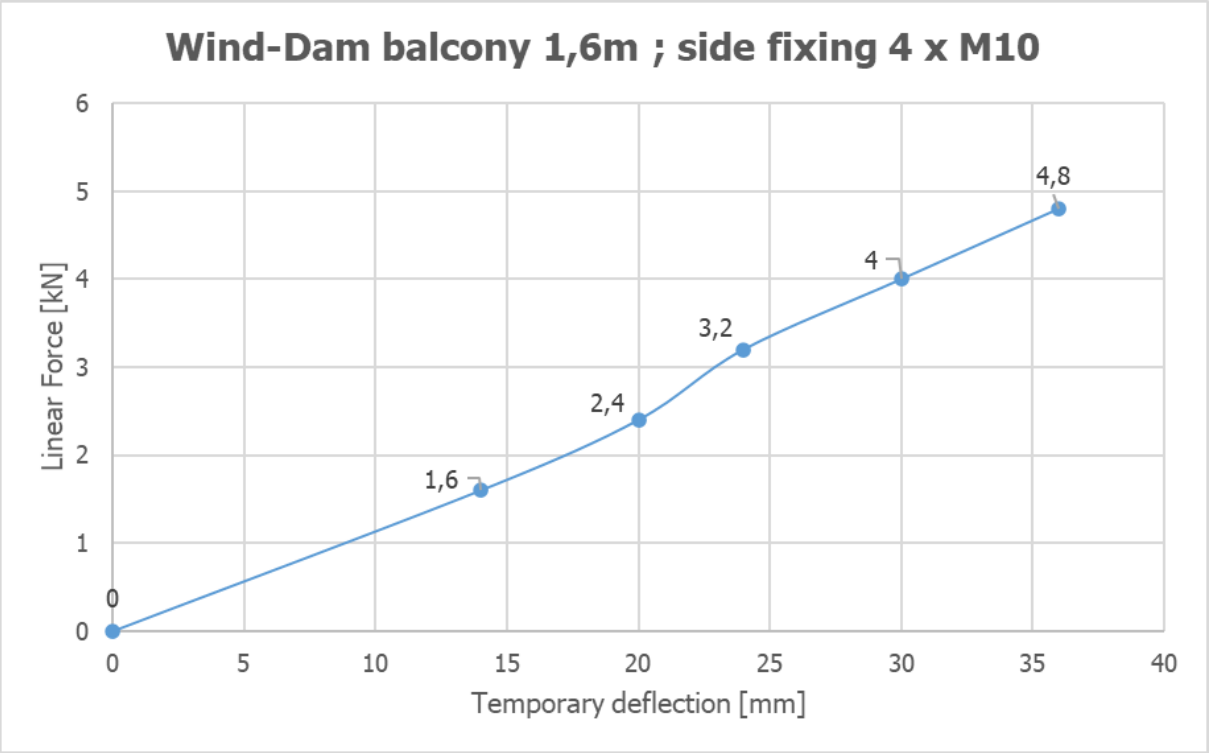


Figure 6: Results on the graph, (load to deflection ratio)

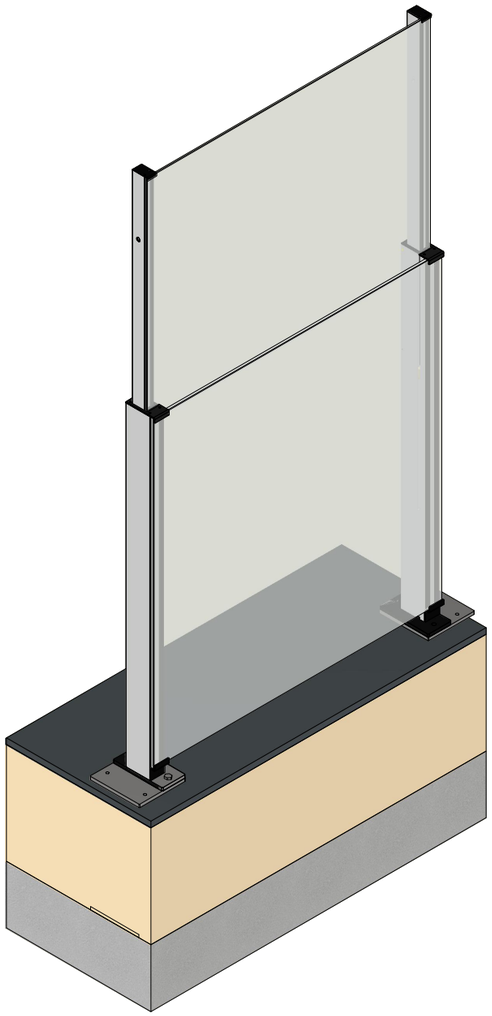
3.2. Impact test resistance

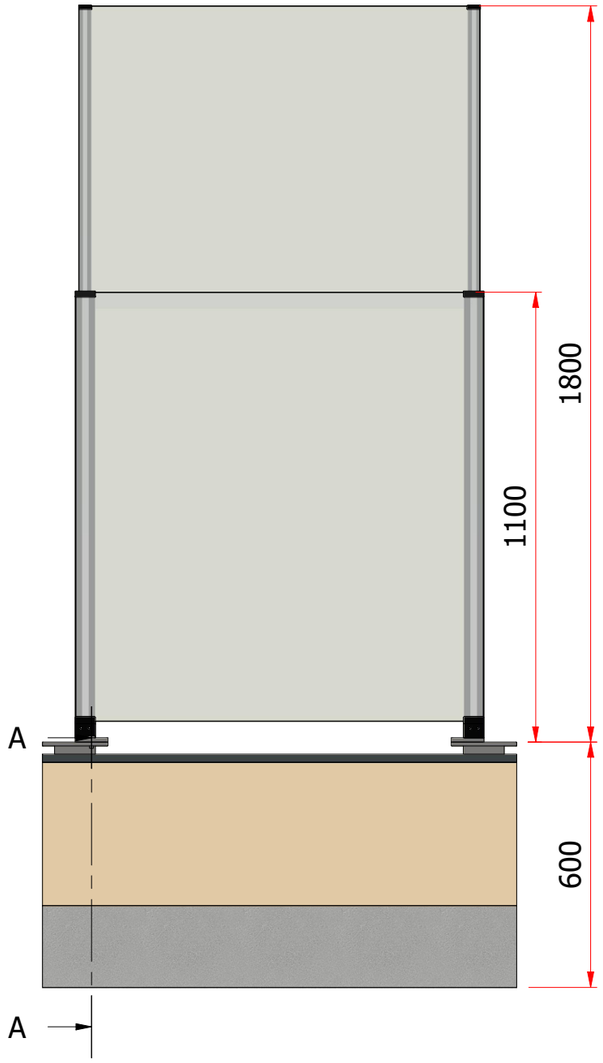
Balustrade ressisted 3 times test of soft body impact. After each hit, the whole structure was inspected for potential permanent deformation or connections damage. None was noticed.

4. Comments

The tests carried out can help in assessing the performance of the railing. In the most standards, method of testing is the same or very similar. However, there are no universal international standard for the assessment of guardrail performance. The relevant standards and laws of each country have to be followed. Don't matter what is mentioned in the report.

LIST OF PARTS		
POSITION	QUANTITY	PART NUMBER
1	1	BALU.01 1000
2	2	Screw A2, M10x25
3	1	Terrace floor
4	1	Insulation
5	2	Distance
6	4	Chemical anchor
7	1	Balcony plate





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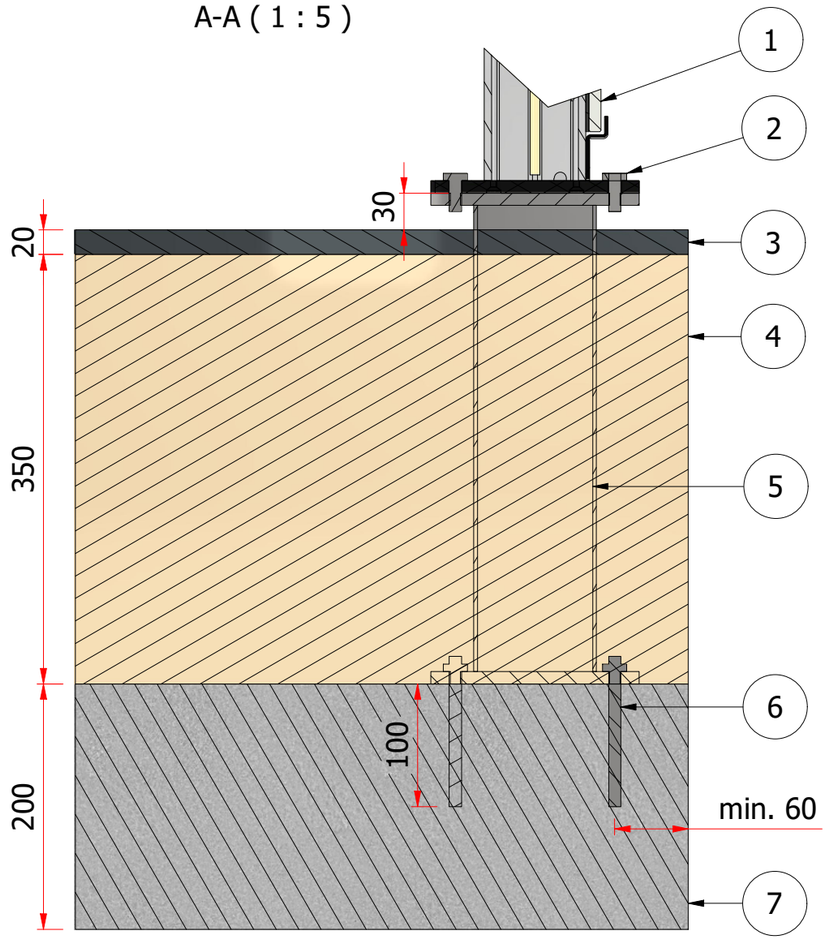

ATTENTION:
Mounting the brackets should be done before insulating the building

RAL - 9005 semi-matt

Wind-Dam	Designed by Tobiasz	Date 10.02.2023
Additional fixing with insulation		
	Size A3	Sheet 1 / 1