EXTRAMILE
consulting structural engineers

PROJECT NO.:

24042

PROJECT TITLE:

ClearVista Aluminium Post System AP54

CLIENT:

FMI Building Innovation

SITE ADRESS:

Multiple Sites

DATE:

19-Feb-25

CONTENTS:

PRODUCER STATEMENT – PS1
DESIGN

Building Code Clause(s):	B1, F2, F4	Job number: 24042
ISSUED BY: *(Engineering Design Firm)*	ExtraMile Consulting	
TO: *(Client)*	FMI Building Innovation	
TO BE SUPPLIED TO: *(Building Consent Authority)*	Relevant Territorial Building Consent Authority	
IN RESPECT OF: *(Description of building work))*	Proprietary Balustrade System	
AT: *(Address)*	Various sites within occupancy and wind limits as stated on drawings	
LEGAL DESCRIPTION	Varies	

We have been engaged by FMI Building Innovation to provide:

Proprietary Balustrade System

in respect of the requirements of the Clause(s) of the Building Code specified above for part only, as specified in the attached Schedule, of the proposed building work.

In this document SED means “Specific Engineering Design”.

The design carried out by ExtraMile Consulting has been prepared in accordance with:

✓ compliance documents issued by the Ministry of Business, Innovation & Employment (Verification method /acceptable solution): B1/AM1 and AS1

The proposed building work covered by this producer statement is described in the drawings specified in the attached Schedule, together with the specification, and other documents set out in the attached Schedule.

On behalf of ExtraMile Consulting, and subject to:

- all proprietary products meeting their performance specification requirements and application being within occupancy

and wind limits as stated on the drawings;

I believe on reasonable grounds that:

- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached Schedule, will comply with the relevant provisions of the Building Code specified above; and that
- the persons who have undertaken the design have the necessary competence to do so.

I recommend the Nil level of construction monitoring.

I, Pawel Michal Milewski, am:

- CPEng number 1021657
- and hold the following qualifications: MEng(Hons)

ExtraMile Consulting holds a current policy of Professional Indemnity Insurance no less than $200,000.

ExtraMile Consulting is not a member of ACE New Zealand.

SIGNED BY: Pawel Michal Milewski

(Signature):  Date: 15/01/2025

ON BEHALF OF: ExtraMile Consulting

Note: This statement has been prepared solely for relevant teritorial authority and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to ExtraMile Consulting only. As a condition of reliance on this statement, teritorial authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the authority in relation to this building work, whether in tort or otherwise, is limited to the sum of $200,000.

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

SCHEDULE TO PS1

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

- Engineering Drawing Set: drawings showing typical details

Limited Scope of Engagement

We have been engaged by FMI Building Innovation to provide services in respect of the requirements of the Clause(s) of the Building Code specified above for the following parts of the proposed building work:

Proprietary Balustrade System

GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on either the **ACE New Zealand** or **Engineering New Zealand** websites.

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

PS1 DESIGN: Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;
PS2 DESIGN REVIEW: Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;
PS3 CONSTRUCTION: Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 20112
PS4 CONSTRUCTION REVIEW: Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.
This must be accompanied by a statement of completion of building work (Schedule 6).
The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional

This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.
The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).
Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.
Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance

As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.
The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase

There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1-CM5 for engineers3).
The BCA is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

BCAs should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued. No design professional should be expected to provide a producer statement unless such a requirement forms part of ExtraMile Consulting's engagement.

Refer Also:

1 Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
2 NZIA Standard Conditions of Contract SCC 2011
3 Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
4 PN01 Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org

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PROJECT:	ClearVista Aluminium Post System AP54			PROJECT NO:	24042
TITLE:	Introduction			PAGE: 1	OF: 11
DATE: 19 February 2025	BY: PM	REV: 1		STATUS:	for information

ExtraMile Consulting has been appointed by FMI Building Innovation to provide structural engineering design services in relation to a proprietary balustrade system.

The system is designed around proprietary, extruded aluminium posts with toughened, 8-12.52mm thick safety glass panels spanning between them. Profile of posts includes recess that forms glazing channel for the glass to sit in. The glass is separated from the post material by proprietary neoprene gasket.

The system also includes optional top handrail in two profiles: rectangular and oval.

Posts are fixed to supporting structure by:
a) floor mounted baseplates;
b) lateral mounted brackets.

The type of fixings required is dependant on the type and material of the supporting structure. Fixing details for steel, concrete and timber are justified in this calculation set and shown on drawings. Capability of supporting structure to transfer the loads from posts is outside of the scope of this calculation and the supporting structure should be designed by others.

The strength of posts and their baseplates was determined by testing - test report is included in appendix A.

CONTENTS INDEX:

References:

-AS/NZS 1170 part 0 -Structural Design Actions - General Principles
-AS/NZS 1170 part 1 -Structural Design Actions - Permanent, imposed and other actions
-AS/NZS 1170 part 2 -Structural Design Actions - Wind actions
-AS/NZS 3603 - Timber Structures
-NZS 4221.1: 20016 Glazing in Buildings
-NZS 3404 - Steel Structures
-NZS 3101 - Concrete Structures
-NZTIF Timber Design Guide
-DBH Guidance on Barrier design, 2022

Imposed Loads:

case 1:	distributed load along the handrail - occupancy type A:	[kN/m]	0.35
	distributed load along the handrail - occupancy type C3, B, E	[kN/m]	0.75
case 2:	distributed load to the infill - occupancy type A:	[kPa]	0.50
	distributed load to the infill - occupancy type C3, B, E:	[kPa]	1.00
case 3:	point load at top - occupancy type A:		0.60
	point load at top - occupancy type C3, B, E:		0.60

Wind loads:

Design is carried out for wind speeds that correspond to Low, Medium, High, Very High and Extra High wind zones as defined in NZS3604.

Based on table 5.4 of NZS 3604, following wind speeds have been assigned to corresponding wind zones:

- Low (L)	[m/s]	32
-Medium (M)	[m/s]	37
-High (H)	[m/s]	44
-Very High (VH)	[m/s]	50
-Extra High (XH)	[m/s]	55

Taking above wind speeds into account and using net pressure coefficient of: [-] 1.30
Balustrades in various wind zones will be subject to following ultimate face loads:

- Low (L)	[kPa]	0.80
-Medium (M)	[kPa]	1.07
-High (H)	[kPa]	1.51
-Very High (VH)	[kPa]	1.95
-Extra High (XH)	[kPa]	2.36

service wind loads will be taken as 0.676 of ultimate wind loads

Calculation of post strength based on test results:

Calculation of strengths based on test results will be carried out in accordance with appendix B to AS/NZS1170.0 with reduction factors taken from table B1.

assume coefficient of variation:	[-]	10%
no of tests for each configuration:	[no]	3
therefore reduction factor, kt:	[-]	1.33

Face fix system:

min. bending moment at failure:	[kNm]	4.42
ultimate bending capacity:	[kNm]	**3.32**

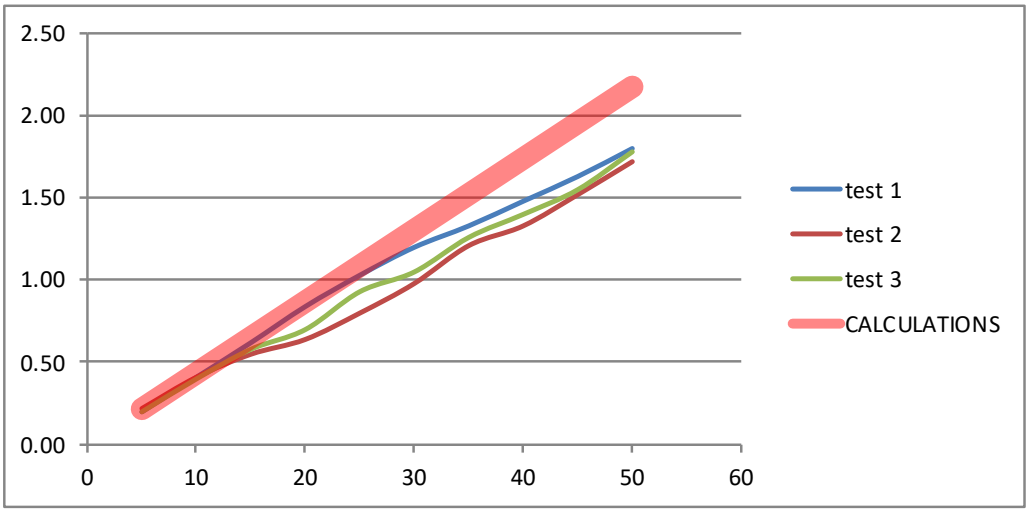
Surface Mounted System:

min. bending moment at failure:	[kNm]	2.24
ultimate bending capacity:	[kNm]	**1.68**

Calculation of post stiffness based on test results:

Face fix system:

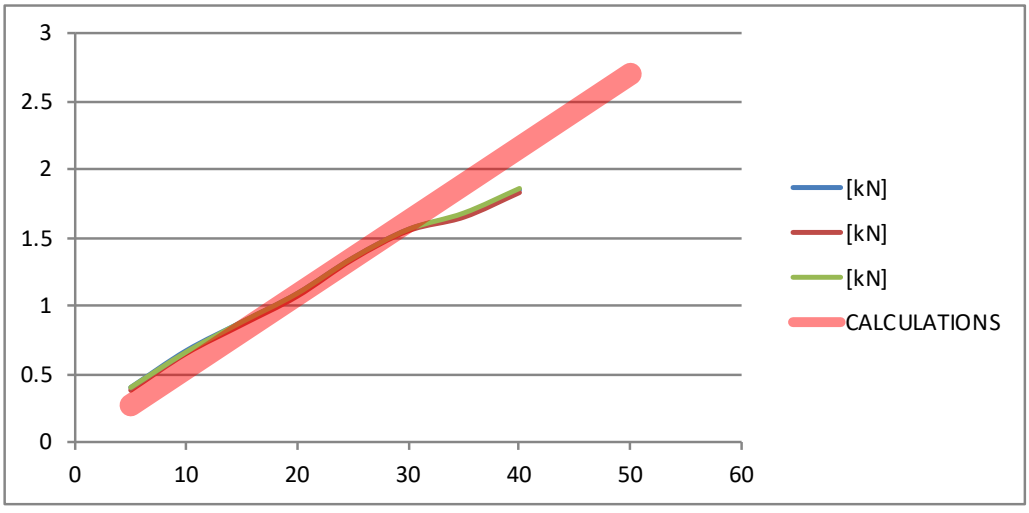
Chart with force-deflection relationship is shown below. Linear stiffness that is used in calculations is superimposed onto it:



simplified, linear approximation is based on stiffness: [kNm2] **14.50**

Surface mounted system:

Chart with force-deflection relationship is shown below. Linear stiffness that is used in calculations is superimposed onto it:



simplified, linear approximation is based on stiffness: [kNm2] **18.00**

Calculation of deflections and stresses of glass panel:

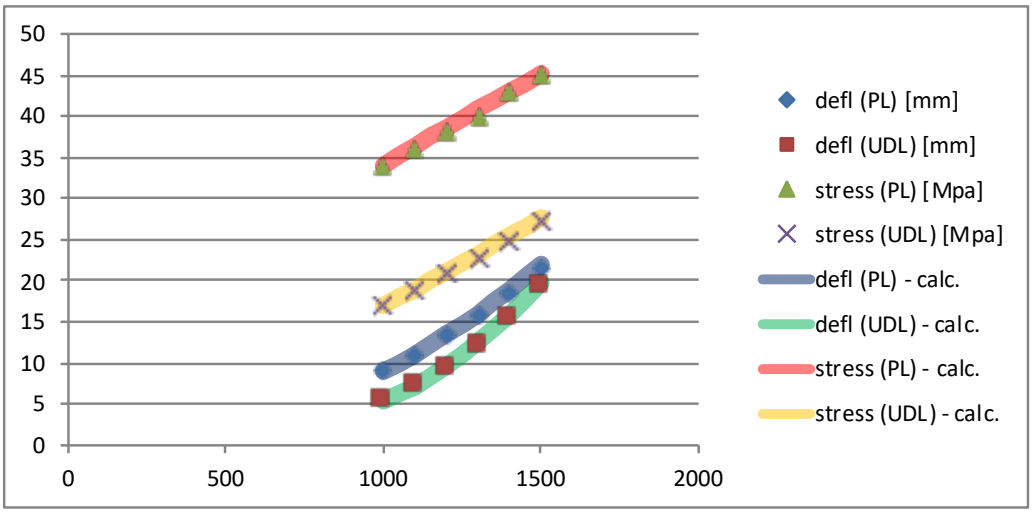
Calculation of deflection of flat elastic plate simply supported and loaded along one edge with a line or point load is complex. In order to achieve accurate results deflections were calculated by FEM for a number of panel sizes to inform development of continuous panel span-deflection relationship curve that was used in calculations.
960 high panel was considered for two load cases:

(PL) - unity point load applied to centre of top edge;
(UDL) - unity line load applied to top edge.

Results are presented in tables and on charts shown below:

width	defl (PL) [mm]	defl (UDL) [mm]	stress (PL) [Mpa]	stress (UDL) [Mpa]
1000	9.012	5.4	34	17
1100	11.001	7.25	36	18.8
1200	13.27	9.54	38	20.85
1300	15.74	12.28	40	22.78
1400	18.56	15.6	43	24.9
1500	21.62	19.5	45	27.2

Deflection-span and stress-span curves are shown on chart below:



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PROJECT:	ClearVista Aluminium Post System AP54			PROJECT NO:	24042
TITLE:	balustrade calculation			PAGE: 6	OF: 11
DATE: 19 February 2025	BY: PM	REV: 1		STATUS:	for information

This Calculation Set Justifies Following Balustrade Configurations

Assembly Type	Mounting Type	Ocupancy	Wind Zone	H	F	G	T	H-rail	Post Spacing	Style
B	S	C3_B_E	M	1100	1100	1023	12	o	***1.35***	VRF54-1-A-O
B	S	C3_B_E	H	1100	1100	1023	12	o	***1.35***	VRF54-1-A-O
B	S	C3_B_E	VH	1100	1100	1023	12	o	***1.35***	VRF54-1-A-O
B	S	C3_B_E	EH	1100	1100	1023	12	o	***1.15***	VRF54-1-A-O
B	S	C3_B_E	M	1100	1100	963	12	o	***1.35***	VRF54-1-B-O
B	S	C3_B_E	H	1100	1100	963	12	o	***1.35***	VRF54-1-B-O
B	S	C3_B_E	VH	1100	1100	963	12	o	***1.35***	VRF54-1-B-O
B	S	C3_B_E	EH	1100	1100	963	12	o	***1.15***	VRF54-1-B-O
B	S	C3_B_E	M	1100	1100	1025	12	r	***1.35***	VRF54-1-A-R
B	S	C3_B_E	H	1100	1100	1025	12	r	***1.35***	VRF54-1-A-R
B	S	C3_B_E	VH	1100	1100	1025	12	r	***1.35***	VRF54-1-A-R
B	S	C3_B_E	EH	1100	1100	1025	12	r	***1.15***	VRF54-1-A-R
B	S	C3_B_E	M	1100	1100	965	12	r	***1.35***	VRF54-1-B-R
B	S	C3_B_E	H	1100	1100	965	12	r	***1.35***	VRF54-1-B-R
B	S	C3_B_E	VH	1100	1100	965	12	r	***1.35***	VRF54-1-B-R
B	S	C3_B_E	EH	1100	1100	965	12	r	***1.15***	VRF54-1-B-R
B	S	C3_B_E	M	1230	1030	953	12	o	***1.2***	VRF54-1-C-O
B	S	C3_B_E	H	1230	1030	953	12	o	***1.2***	VRF54-1-C-O
B	S	C3_B_E	VH	1230	1030	953	12	o	***1.2***	VRF54-1-C-O
B	S	C3_B_E	EH	1230	1030	953	12	o	***0.95***	VRF54-1-C-O
B	S	C3_B_E	M	1230	1030	893	12	o	***1.2***	VRF54-1-D-O
B	S	C3_B_E	H	1230	1030	893	12	o	***1.2***	VRF54-1-D-O
B	S	C3_B_E	VH	1230	1030	893	12	o	***1.2***	VRF54-1-D-O
B	S	C3_B_E	EH	1230	1030	893	12	o	***1***	VRF54-1-D-O
B	S	C3_B_E	M	1230	1030	955	12	r	***1.2***	VRF54-1-C-R
B	S	C3_B_E	H	1230	1030	955	12	r	***1.2***	VRF54-1-C-R
B	S	C3_B_E	VH	1230	1030	955	12	r	***1.2***	VRF54-1-C-R
B	S	C3_B_E	EH	1230	1030	955	12	r	***0.95***	VRF54-1-C-R
B	S	C3_B_E	M	1230	1030	895	12	r	***1.2***	VRF54-1-D-R
B	S	C3_B_E	H	1230	1030	895	12	r	***1.2***	VRF54-1-D-R
B	S	C3_B_E	VH	1230	1030	895	12	r	***1.2***	VRF54-1-D-R
B	S	C3_B_E	EH	1230	1030	895	12	r	***1***	VRF54-1-D-R
B	S	C3_B_E	M	1100	1100	1040	12	n	***1.35***	VRF54-1-E-N
B	S	C3_B_E	H	1100	1100	1040	12	n	***1.35***	VRF54-1-E-N
B	S	C3_B_E	VH	1100	1100	1040	12	n	***1.35***	VRF54-1-E-N
B	S	C3_B_E	EH	1100	1100	1040	12	n	***1.15***	VRF54-1-E-N
B	S	C3_B_E	M	1230	1030	970	12	n	***1.2***	VRF54-1-F-N
B	S	C3_B_E	H	1230	1030	970	12	n	***1.2***	VRF54-1-F-N
B	S	C3_B_E	VH	1230	1030	970	12	n	***1.2***	VRF54-1-F-N
B	S	C3_B_E	EH	1230	1030	970	12	n	***0.95***	VRF54-1-F-N
P	S	C3_B_E	M	1230	1230	1170	12	n	***1.95***	VRF54-1-G-N
P	S	C3_B_E	H	1230	1230	1170	12	n	***1.45***	VRF54-1-G-N
P	S	C3_B_E	VH	1230	1230	1170	12	n	***1.2***	VRF54-1-G-N
P	S	C3_B_E	EH	1230	1230	1170	12	n	***0.9***	VRF54-1-G-N

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PROJECT:	ClearVista Aluminium Post System AP54			PROJECT NO:	24042		
TITLE:	balustrade calculation			PAGE:	7	OF:	11
DATE:	19 February 2025	BY:	PM	REV:	1	STATUS:	for information

This Calculation Set Justifies Following Balustrade Configurations

Assembly Type	Mounting Type	Ocupancy	Wind Zone	H	F	G	T	H-rail	Post Spacing	Style
P	S	C3_B_E	M	1230	1230	1170	12	n	***1.95***	VRF54-1-H-N
P	S	C3_B_E	H	1230	1230	1170	12	n	***1.45***	VRF54-1-H-N
P	S	C3_B_E	VH	1230	1230	1170	12	n	***1.2***	VRF54-1-H-N
P	S	C3_B_E	EH	1230	1230	1170	12	n	***0.9***	VRF54-1-H-N
W	S	C3_B_E	M	1800	1800	1740	12	n	***0.95***	VRF54-1-K-N
W	S	C3_B_E	H	1800	1800	1740	12	n	***0.65***	VRF54-1-K-N
W	S	C3_B_E	VH	1800	1800	1740	12	n	***0.55***	VRF54-1-K-N
W	S	C3_B_E	EH	1800	1800	1740	12	n	***0.4***	VRF54-1-K-N
W	S	C3_B_E	M	1800	1800	1738	12	n	***0.95***	VRF54-1-L-N
W	S	C3_B_E	H	1800	1800	1738	12	n	***0.65***	VRF54-1-L-N
W	S	C3_B_E	VH	1800	1800	1738	12	n	***0.55***	VRF54-1-L-N
W	S	C3_B_E	EH	1800	1800	1738	12	n	***0.4***	VRF54-1-L-N
W	S	C3_B_E	M	1600	1600	1540	12	r	***1.2***	VRF54-1-I-N
W	S	C3_B_E	H	1600	1600	1540	12	r	***0.85***	VRF54-1-I-N
W	S	C3_B_E	VH	1600	1600	1540	12	r	***0.7***	VRF54-1-I-N
W	S	C3_B_E	EH	1600	1600	1540	12	r	***0.55***	VRF54-1-I-N
W	S	C3_B_E	M	1600	1600	1538	12	r	***1.2***	VRF54-1-J-N
W	S	C3_B_E	H	1600	1600	1538	12	r	***0.85***	VRF54-1-J-N
W	S	C3_B_E	VH	1600	1600	1538	12	r	***0.7***	VRF54-1-J-N
W	S	C3_B_E	EH	1600	1600	1538	12	r	***0.55***	VRF54-1-J-N
B	F	C3_B_E	M	1132	1100	1023	12	o	***1.95***	VRL54-1-A1-C
B	F	C3_B_E	H	1132	1100	1023	12	o	***1.95***	VRL54-1-A1-C
B	F	C3_B_E	VH	1132	1100	1023	12	o	***1.95***	VRL54-1-A1-C
B	F	C3_B_E	EH	1132	1100	1023	12	o	***1.95***	VRL54-1-A1-C
B	F	C3_B_E	M	1132	1100	963	12	o	***1.95***	VRL54-1-B1-C
B	F	C3_B_E	H	1132	1100	963	12	o	***1.95***	VRL54-1-B1-C
B	F	C3_B_E	VH	1132	1100	963	12	o	***1.95***	VRL54-1-B1-C
B	F	C3_B_E	EH	1132	1100	963	12	o	***1.9***	VRL54-1-B1-C
B	F	C3_B_E	M	1232	1000	923	12	o	***1.95***	VRL54-1-C1-C
B	F	C3_B_E	H	1232	1000	923	12	o	***1.95***	VRL54-1-C1-C
B	F	C3_B_E	VH	1232	1000	923	12	o	***1.95***	VRL54-1-C1-C
B	F	C3_B_E	EH	1232	1000	923	12	o	***1.8***	VRL54-1-C1-C
B	F	C3_B_E	M	1232	1000	863	12	o	***1.95***	VRL54-1-D1-C
B	F	C3_B_E	H	1232	1000	863	12	o	***1.95***	VRL54-1-D1-C
B	F	C3_B_E	VH	1232	1000	863	12	o	***1.95***	VRL54-1-D1-C
B	F	C3_B_E	EH	1232	1000	863	12	o	***1.75***	VRL54-1-D1-C
B	F	C3_B_E	M	1132	1100	1025	12	r	***1.95***	VRL54-1-A1-R
B	F	C3_B_E	H	1132	1100	1025	12	r	***1.95***	VRL54-1-A1-R
B	F	C3_B_E	VH	1132	1100	1025	12	r	***1.95***	VRL54-1-A1-R
B	F	C3_B_E	EH	1132	1100	1025	12	r	***1.95***	VRL54-1-A1-R
B	F	C3_B_E	H	1132	1100	965	12	r	***1.95***	VRL54-1-B1-R
B	F	C3_B_E	H	1132	1100	965	12	r	***1.95***	VRL54-1-B1-R
B	F	C3_B_E	H	1132	1100	965	12	r	***1.95***	VRL54-1-B1-R
B	F	C3_B_E	VH	1132	1100	965	12	r	***1.95***	VRL54-1-B1-R

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consulting structural engineers

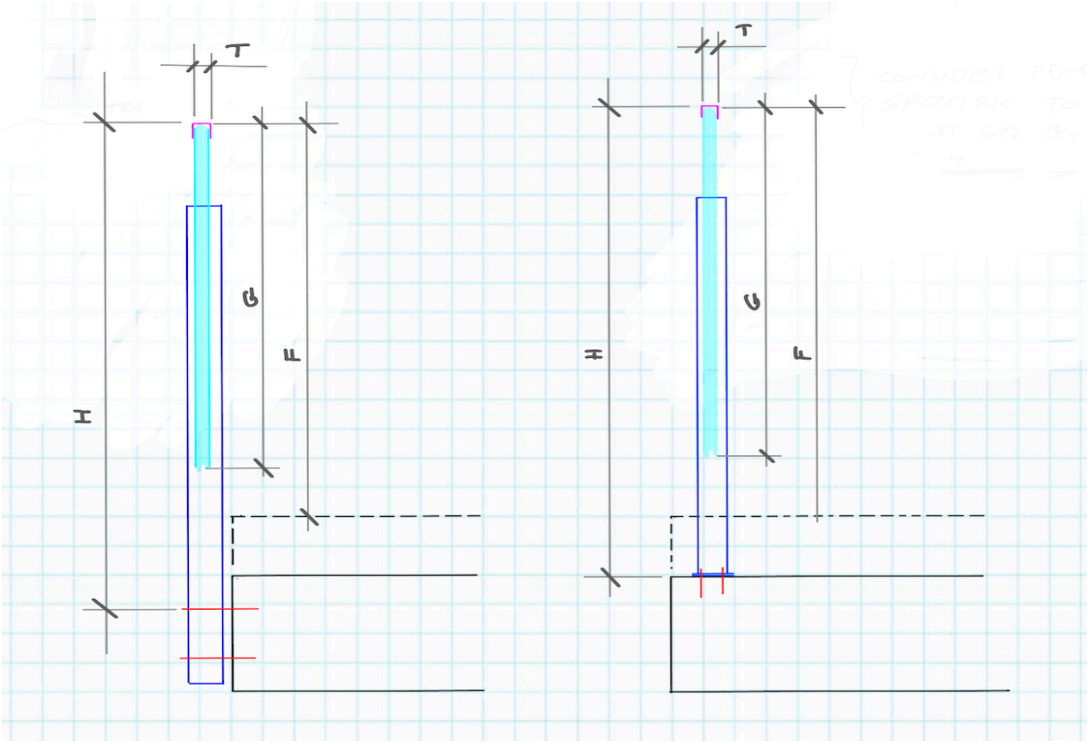
PROJECT:	ClearVista Aluminium Post System AP54			PROJECT NO:	24042		
TITLE:	balustrade calculation			PAGE:	8	OF:	11
DATE:	19 February 2025	BY:	PM	REV:	1	STATUS:	for information

This Calculation Set Justifies Following Balustrade Configurations

Assembly Type	Mounting Type	Ocupancy	Wind Zone	H	F	G	T	H-rail	Post Spacing	Style
B	F	C3_B_E	M	1232	1000	925	12	r	***1.95***	VRL54-1-C1-R
B	F	C3_B_E	H	1232	1000	925	12	r	***1.95***	VRL54-1-C1-R
B	F	C3_B_E	VH	1232	1000	925	12	r	***1.95***	VRL54-1-C1-R
B	F	C3_B_E	EH	1232	1000	925	12	r	***1.8***	VRL54-1-C1-R
B	F	C3_B_E	M	1232	1000	865	12	r	***1.95***	VRL54-1-D1-R
B	F	C3_B_E	H	1232	1000	865	12	r	***1.95***	VRL54-1-D1-R
B	F	C3_B_E	VH	1232	1000	865	12	r	***1.95***	VRL54-1-D1-R
B	F	C3_B_E	EH	1232	1000	865	12	r	***1.75***	VRL54-1-D1-R
B	F	C3_B_E	M	1132	1100	1040	12	n	***1.55***	VRL54-1-E1-N
B	F	C3_B_E	H	1132	1100	1040	12	n	***1.55***	VRL54-1-E1-N
B	F	C3_B_E	VH	1132	1100	1040	12	n	***1.55***	VRL54-1-E1-N
B	F	C3_B_E	EH	1132	1100	1040	12	n	***1.55***	VRL54-1-E1-N
B	F	C3_B_E	M	1232	1000	940	12	n	***1.45***	VRL54-1-F1-N
B	F	C3_B_E	H	1232	1000	940	12	n	***1.45***	VRL54-1-F1-N
B	F	C3_B_E	VH	1232	1000	940	12	n	***1.45***	VRL54-1-F1-N
B	F	C3_B_E	EH	1232	1000	940	12	n	***1.45***	VRL54-1-F1-N
P	F	C3_B_E	M	1262	1230	1170	12	n	***1.95***	VRL54-1-G1-N
P	F	C3_B_E	H	1262	1230	1170	12	n	***1.95***	VRL54-1-G1-N
P	F	C3_B_E	VH	1262	1230	1170	12	n	***1.95***	VRL54-1-G1-N
P	F	C3_B_E	EH	1262	1230	1170	12	n	***1.75***	VRL54-1-G1-N
P	F	C3_B_E	M	1262	1230	1168	12	n	***1.95***	VRL54-1-H1-N
P	F	C3_B_E	H	1262	1230	1168	12	n	***1.95***	VRL54-1-H1-N
P	F	C3_B_E	VH	1262	1230	1168	12	n	***1.95***	VRL54-1-H1-N
P	F	C3_B_E	EH	1262	1230	1168	12	n	***1.75***	VRL54-1-H1-N
W	F	C3_B_E	M	1832	1800	1740	12	n	***1.85***	VRL54-1-K1-N
W	F	C3_B_E	H	1832	1800	1740	12	n	***1.3***	VRL54-1-K1-N
W	F	C3_B_E	VH	1832	1800	1740	12	n	***1.1***	VRL54-1-K1-N
W	F	C3_B_E	EH	1832	1800	1740	12	n	***0.8***	VRL54-1-K1-N
W	F	C3_B_E	M	1832	1800	1738	12	n	***1.85***	VRL54-1-L1-N
W	F	C3_B_E	H	1832	1800	1738	12	n	***1.3***	VRL54-1-L1-N
W	F	C3_B_E	VH	1832	1800	1738	12	n	***1.1***	VRL54-1-L1-N
W	F	C3_B_E	EH	1832	1800	1738	12	n	***0.8***	VRL54-1-L1-N
W	F	C3_B_E	M	1632	1600	1540	12	n	***1.95***	VRL54-1-I1-N
W	F	C3_B_E	H	1632	1600	1540	12	n	***1.65***	VRL54-1-I1-N
W	F	C3_B_E	VH	1632	1600	1540	12	n	***1.35***	VRL54-1-I1-N
W	F	C3_B_E	EH	1632	1600	1540	12	n	***1.05***	VRL54-1-I1-N
W	F	C3_B_E	M	1632	1600	1538	12	n	***1.95***	VRL54-1-J1-N
W	F	C3_B_E	H	1632	1600	1538	12	n	***1.65***	VRL54-1-J1-N
W	F	C3_B_E	VH	1632	1600	1538	12	n	***1.35***	VRL54-1-J1-N
W	F	C3_B_E	EH	1632	1600	1538	12	n	***1.05***	VRL54-1-J1-N

EXTRAMILE consulting structural engineers

PROJECT:	ClearVista Aluminium Post System AP54			PROJECT NO:	24042
TITLE:	balustrade calculation			PAGE: 9	OF: 11
DATE:	19 February 2025	BY: PM	REV: 1	STATUS:	for information



Assembly Type	B - balustrade P -Pool Fence W - Wind Break
Mounting Type	S - Surface F - Face
Occupancy	A - Self Contained Dwelling, Internal C3, B, E - Stairs, External Balconies Edges of Roofs and Offices
Wind Zone	M - Medium H- High VH - Very High EH - Extra High
Handrail	n- none o- oval r- rectangle

H:
H' for calculations is measured to the top fixing which is diferent to measurements shown on the drawings

Connections - face fixed system:

In case of both face fixed and surface mounted systems the post is restrained by a pair of forces transferring the moment and shear force into supporting structure.

Max. moment to be transferred by the connection:	[kNm]	3.31
Max. coinciding force	[kN]	4.97

-concrete

concrete compressive strength:	[Mpa]	25
therefore take concrete bearing strength as:	[Mpa]	25
depth of compression zone:	[mm]	14.0
lever arm:	[mm]	143.00
bearing stress:	[Mpa]	25.4
tension in fixing:	[kN]	28.12
(including contribution of the shear force)		

Hilti HAS-U A4 threaded rod with HIT-HY 200-R V3 injection mortar with 130 mm embedment h_ef, M12, Stainless steel, Hammer drilling installation per ETA 19/0601

-steel

Use minimum 2no M16 4.6 bolts, capacity:	[kN]	50
OK by inspection		

-timber

timber bearing strength:	[Mpa]	8.5	
depth of compression zone:	[mm]	42	
lever arm:	[mm]	141.00	
bearing stress:	[Mpa]	8.6	
tension in bolt:	[kN]	28.45	ok
design capacity of 12 Screw by Spax	[N/mm]	106.40	
required embedment if two screws used:	[mm]	133.67	

use 12x200 fully treaded flat countersunk screws by SPAXwith aluminiuum csk washer by Wurth

Connections - Surface mounted system (plate lengthwise)

In case of both face fixed and surface mounted systems the post is restrained by a pair of forces transferring the moment and shear force into supporting structure.

Max. moment to be transferred by the connection:	[kNm]	1.67
Max. coinciding force	[kN]	3.38

-concrete

concrete compressive strength:	[Mpa]	25
therefore take concrete bearing strength as:	[Mpa]	25
depth of compression zone:	[mm]	9.0
lever arm:	[mm]	98.50
bearing stress:	[Mpa]	25.1
tension in fixing:	[kN]	16.95

Hilti HAS-U A4 threaded rod with HIT-HY 200-R V3 injection mortar with 119 mm embedment h_ef, M12, Stainless steel, Hammer drilling installation per ETA 19/0601

-steel

Use minimum 2no M16 4.6 bolts, capacity:	[kN]	50

OK by inspection

-timber (wet)

timber bearing strength:	[Mpa]	5.1
depth of compression zone:	[mm]	60
lever arm:	[mm]	73.00
bearing stress:	[Mpa]	5.1
tension in 2 screws/bolts:	[kN]	22.88
8 spax screw	[N/mm]	70.70
required embedment if two screws used:	[mm]	161.79

use 180x8 delta seal spax screw

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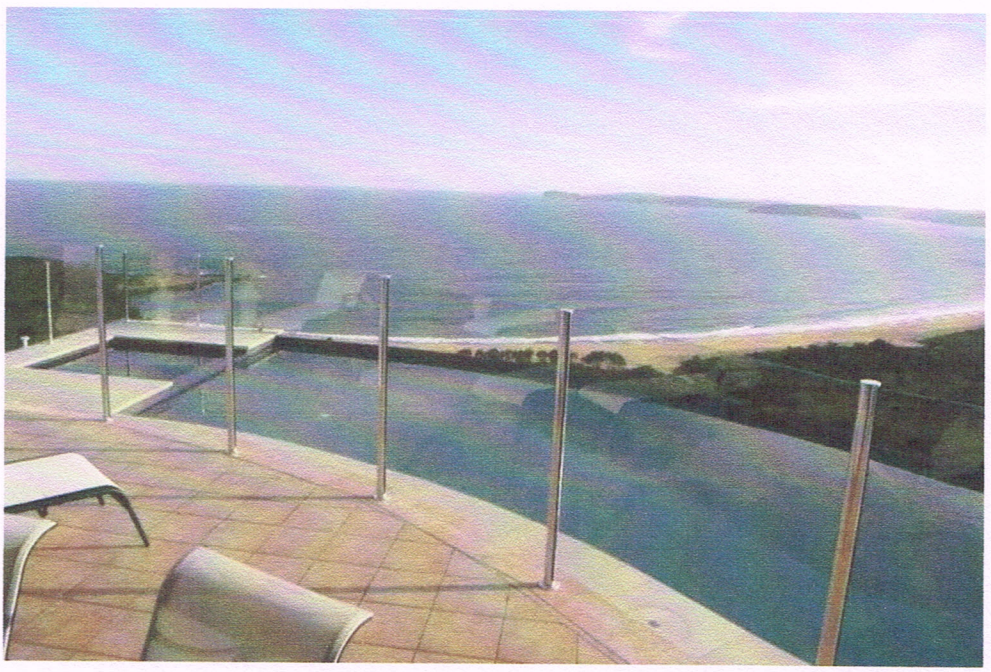
APPENDIX A

Test Report

Report from testing of proprietary extruded aluminium balustrade posts:

Background:

Glass Fittings Limited intends to introduce to the market a proprietary balustrade, pool fence and windbreak system. The system comprises a series of extruded aluminium posts with frameless glass infill spanning between them. Photograph of typical application is included below:



Components of the system include:

- 10 or 12mm thick toughened safety glass panels;
- Proprietary extruded aluminium posts;
- Fixing baseplates and brackets.

ExtraMile Consulting Ltd. has been engaged to produce typical designs for a variety of repetitive balustrade system applications.

As a part of the design process it was considered necessary to carry out physical tests of the posts and their base connections, in order to determine their strength and stiffness.

This report describes the procedure and summarises results of tests that were carried out.

Purpose of tests:

The purpose of tests was to determine:

(A) Ultimate bending strength of the post assembly;

(B) Stiffness of the post assembly.

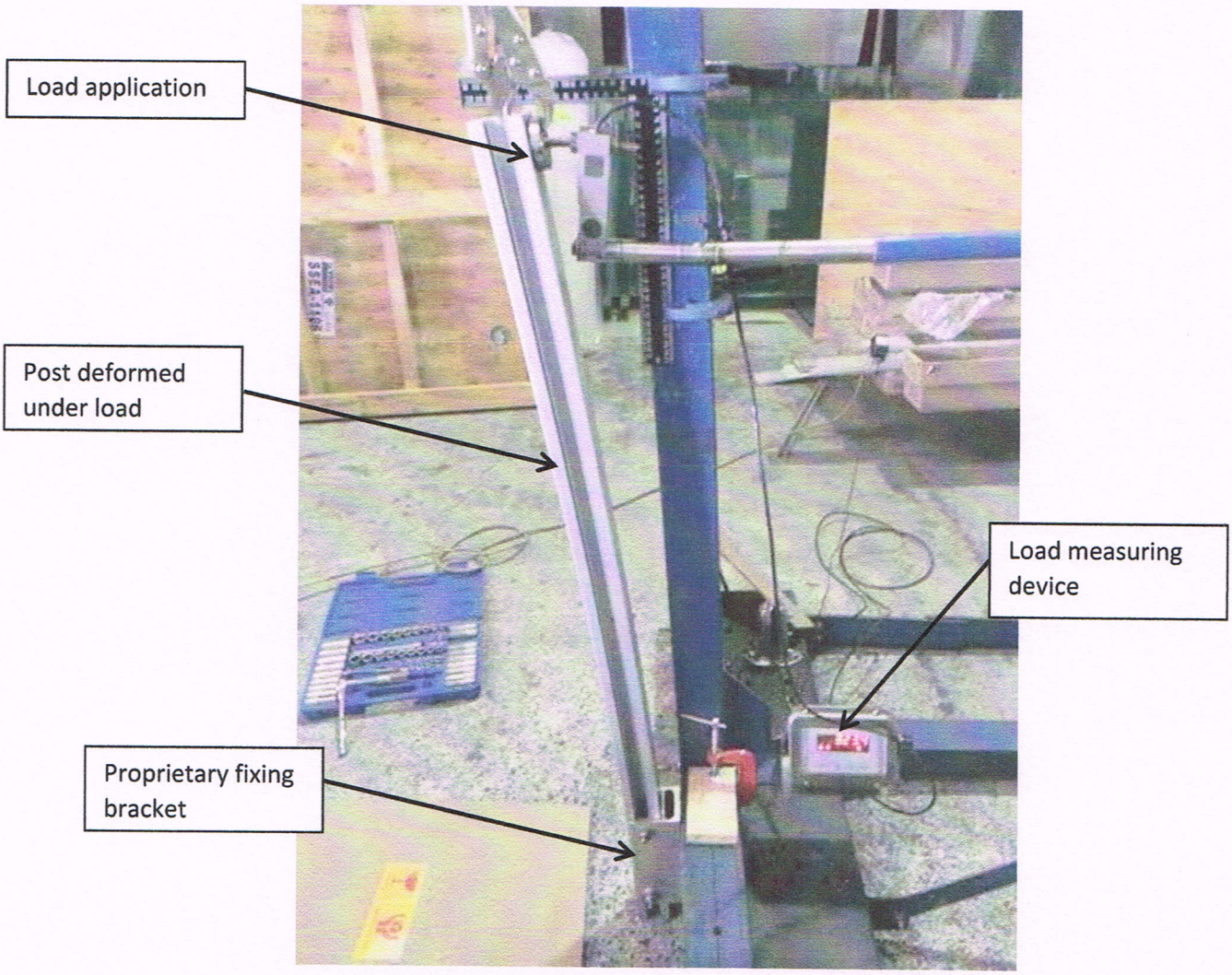
Test setup:

Tests were carried out on 1m high post assemblies.

Specimens were fixed in the testing rig in a way replicating typical system connection.

Force was applied by a hydraulic jack combined with the load measuring device.

Photograph of typical test setup is presented below:



Test procedure:

The load was applied to the top of the post gradually with the resultant deflection being constantly monitored and the load recorded at every 5mm of movement. The procedure was continued up to the failure of the specimen.

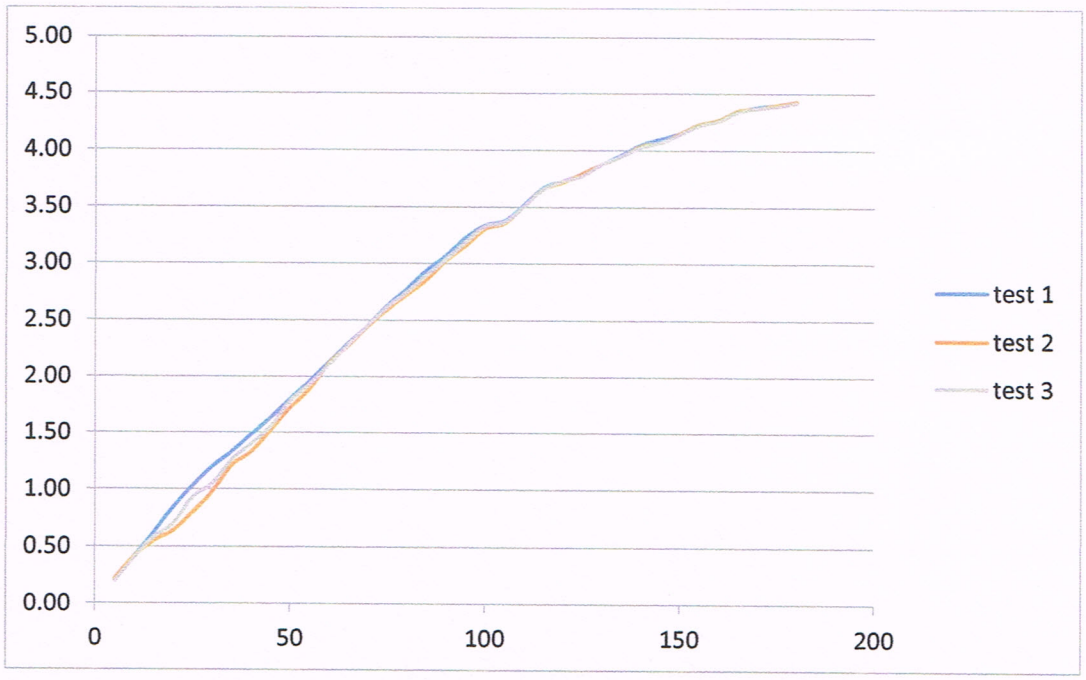
Test was repeated for 3 no specimens for surface mounted system and 3 no specimens for face fixed system.

Test results:

Results of all tests are presented in tables and on charts below:

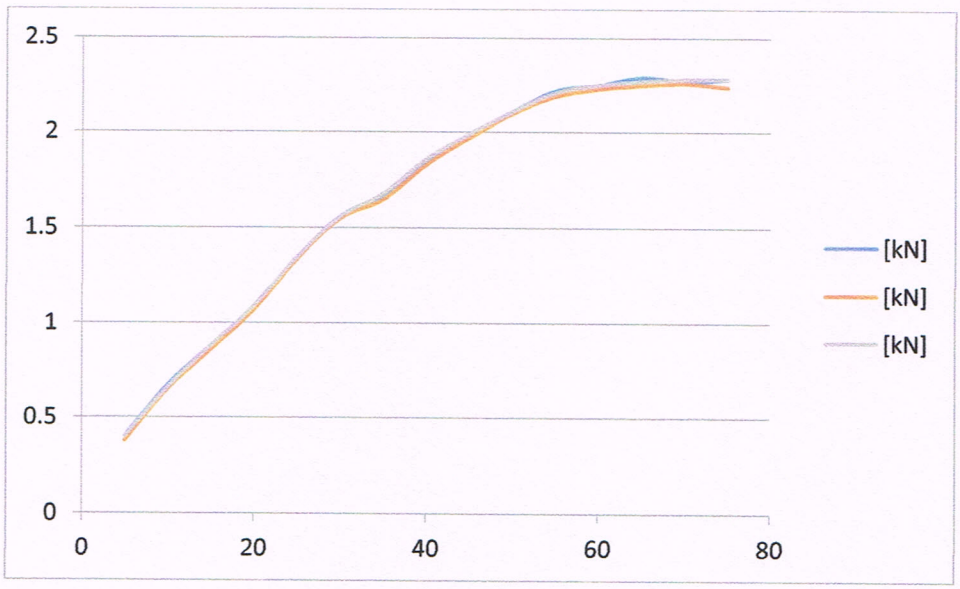
(A) Face fix system:

deflection [mm]	test 1 [kN]	test 2 [kN]	test 3 [kN]
5	0.20	0.22	0.20
10	0.41	0.41	0.40
15	0.62	0.55	0.58
20	0.84	0.64	0.70
25	1.03	0.80	0.93
30	1.20	0.98	1.05
35	1.33	1.21	1.26
40	1.48	1.33	1.40
45	1.63	1.52	1.55
50	1.80	1.72	1.78
55	1.96	1.89	1.93
60	2.13	2.12	2.11
65	2.30	2.28	2.29
70	2.46	2.45	2.46
75	2.63	2.60	2.62
80	2.78	2.73	2.75
85	2.94	2.86	2.90
90	3.07	3.03	3.04
95	3.23	3.16	3.19
100	3.34	3.31	3.33
105	3.38	3.36	3.37
110	3.52	3.51	3.51
115	3.67	3.66	3.66
120	3.73	3.72	3.73
125	3.79	3.80	3.78
130	3.88	3.88	3.88
135	3.96	3.95	3.95
140	4.05	4.04	4.03
145	4.10	4.07	4.07
150	4.15	4.15	4.14
155	4.22	4.23	4.22
160	4.26	4.27	4.26
165	4.34	4.35	4.34
170	4.38	4.37	4.37
175	4.40	4.40	4.39
180	4.42	4.43	4.42


5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
50
100
150
200
test 1
test 2
test 3

(B) Surface mounted system:

defl. [mm]	test 1 [kN]	test 2 [kN]	test 3 [kN]
5	0.4	0.38	0.4
10	***0.67***	***0.65***	***0.66***
15	***0.88***	***0.86***	***0.88***
20	***1.09***	***1.07***	***1.09***
25	***1.35***	***1.34***	***1.35***
30	***1.56***	***1.55***	***1.56***
35	***1.67***	***1.65***	***1.68***
40	***1.85***	***1.83***	***1.86***
45	***1.99***	***1.97***	***1.99***
50	***2.11***	***2.10***	***2.11***
55	***2.22***	***2.19***	***2.21***
60	***2.25***	***2.23***	***2.25***
65	***2.29***	***2.25***	***2.27***
70	***2.27***	***2.26***	***2.28***
75	***2.28***	***2.24***	***2.28***



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APPENDIX B

Concrete anchor design reports

Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	24042-face fix	Date:	7/11/2024
Fastening Point:	typical face fixed bracket		

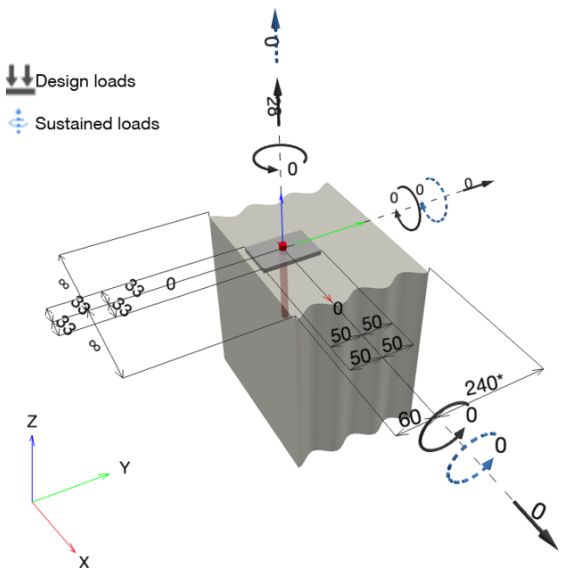
Specifier's comments: covers worst case from all configurations

1 Input data

Anchor type and size:	**HIT-HY 200-R V3 + HAS A4 M12**
Return period (service life in years):	50
Item number:	2390264 HAS A4 M12x160 (insert) / 2262131 HIT-HY 200-R V3 (mortar)
Specification text:	Hilti HAS-U A4 threaded rod with HIT-HY 200-R V3 injection mortar with 130 mm embedment hef, M12, Stainless steel, Hammer drilling installation per ETA 19/0601
Effective embedment depth:	$h_{ef,act}$ = 130.0 mm ($h_{ef,limit}$ = - mm)
Material:	A4
Approval No.:	ETA 19/0601
Issued I Valid:	29/01/2024 | -
Proof:	Design Method EN 1992-4, Chemical
Stand-off installation:	e_b = 0.0 mm (no stand-off); t = 8.0 mm
Baseplate[R]:	l_x x l_y x t = 66.0 mm x 100.0 mm x 8.0 mm; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	uncracked concrete, C25/30, $f_{c,cyl}$ = 25.00 N/mm^2; h =1,000.0 mm, Temp. short/long: 40/24 °C, User-defined partial material safety factor γ_c = 1.500
Installation:	**Hammer drilled hole, Installation condition: Dry**
Reinforcement:	No reinforcement or Reinforcement spacing >= 150 mm (any Ø) or >= 100 mm (Ø <= 10 mm)
	no longitudinal edge reinforcement

[R] - The anchor calculation is based on a rigid baseplate assumption.

Geometry [mm] & Loading [kN, kNm]



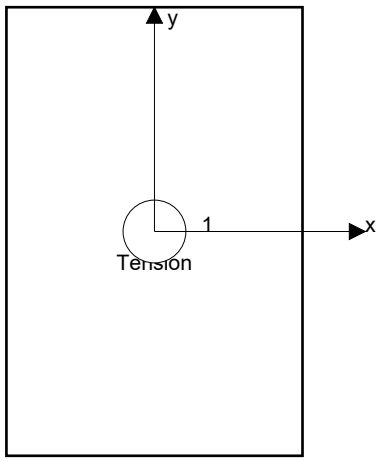
Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	24042-face fix	Date:	7/11/2024
Fastening Point:	typical face fixed bracket		

1.1 Load combination

Case	Description	Forces [kN] / Moments [kNm]	Seismic	Fire	Max. Util. Anchor [%]
1	Combination 1	N = 28.000; V_x = 0.000; V_y = 0.000; M_x = 0.000; M_y = 0.000; M_z = 0.000; N_{sus} = 0.000; $M_{x,sus}$ = 0.000; $M_{y,sus}$ = 0.000;	no	no	100
2	Combinaation 2	N = 1.000; V_x = 0.000; V_y = 0.000; M_x = 0.000; M_y = 0.000; M_z = 0.000; N_{sus} = 0.000; $M_{x,sus}$ = 0.000; $M_{y,sus}$ = 0.000;	C1	no	9

2 Load case/Resulting anchor forces

Controlling load case: 1 Combination 1



Anchor reactions [kN]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	28.000	0.000	0.000	0.000

Max. concrete compressive strain: - [‰]
Max. concrete compressive stress: - [N/mm^2]
Resulting tension force in (x/y)=(0.0/0.0): 28.000 [kN]
Resulting compression force in (x/y)=(-/-): 0.000 [kN]

Anchor forces are calculated based on the assumption of a rigid baseplate.

Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	24042-face fix	Date:	7/11/2024
Fastening Point:	typical face fixed bracket		

3 Tension load (EN 1992-4, Section 7.2.1)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel failure*	28.000	31.556	89	OK
Combined pullout-concrete cone failure**	28.000	31.697	89	OK
Concrete Breakout failure**	28.000	28.155	100	OK
Splitting failure**	28.000	41.177	68	OK

* highest loaded anchor **anchor group (anchors in tension)

3.1 Steel failure

$$N_{Ed} \leq N_{Rd,s} = \frac{N_{Rk,s}}{\gamma_{Ms}}$$ EN 1992-4, Table 7.1

$N_{Rk,s}$ [kN]	γ_{Ms}	$N_{Rd,s}$ [kN]	N_{Ed} [kN]
59.010	1.870	31.556	28.000

Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	24042-face fix	Date:	7/11/2024
Fastening Point:	typical face fixed bracket		

3.2 Combined pullout-concrete cone failure

$N_{Ed} \le N_{Rd,p} = \frac{N_{Rk,p}}{\gamma_{Mp}}$ EN 1992-4, Table 7.1

$N_{Rk,p} = N^0_{Rk,p} \cdot \frac{A_{p,N}}{A^0_{p,N}} \cdot \psi_{g,Np} \cdot \psi_{s,Np} \cdot \psi_{re,Np} \cdot \psi_{ec1,Np} \cdot \psi_{ec2,Np}$ EN 1992-4, Eq. (7.13)

$N^0_{Rk,p} = \psi_{sus} \cdot \tau_{Rk} \cdot \pi \cdot d \cdot h_{ef}$ EN 1992-4, Eq. (7.14)

$\psi_{sus} = 1$ EN 1992-4, Eq. (7.14a)

$s_{cr,Np} = 7.3 \cdot d \cdot \sqrt{\psi_{sus} \cdot \tau_{Rk}} \le 3 \cdot h_{ef}$ EN 1992-4, Eq. (7.15)

$\psi_{g,Np} = \psi^0_{g,Np} - \left(\frac{s}{s_{cr,Np}}\right)^{0,5} \cdot \left(\psi^0_{g,Np} - 1\right) \ge 1.00$ EN 1992-4, Eq. (7.17)

$\psi^0_{g,Np} = \sqrt{n} - (\sqrt{n} - 1) \cdot \left(\frac{\tau_{Rk}}{\tau_{Rk,c}}\right)^{1,5} \ge 1.00$ EN 1992-4, Eq. (7.18)

$\tau_{Rk,c} = \frac{k_3}{\pi \cdot d} \cdot \sqrt{h_{ef} \cdot f_{ck}}$ EN 1992-4, Eq. (7.19)

$\psi_{s,Np} = 0.7 + 0.3 \cdot \frac{c}{c_{cr,Np}} \le 1.00$ EN 1992-4, Eq. (7.20)

$\psi_{ec1,Np} = \frac{1}{1 + \left(\frac{2 \cdot e_{c1,N}}{s_{cr,Np}}\right)} \le 1.00$ EN 1992-4, Eq. (7.21)

$\psi_{ec2,Np} = \frac{1}{1 + \left(\frac{2 \cdot e_{c2,N}}{s_{cr,Np}}\right)} \le 1.00$ EN 1992-4, Eq. (7.21)

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\tau_{Rk,ucr,20}$ [N/mm²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]	$f_{c,cyl}$ [N/mm²]
91,363	138,128	18.00	371.7	185.8	60.0	25.00

ψ_c	$\tau_{Rk,ucr}$ [N/mm²]	k_3	$\tau_{Rk,c}$ [N/mm²]	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.023	18.41	11.000	16.63	1.000	1.000

$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
0.0	1.000	0.0	1.000	0.797	1.000

ψ^0_{sus}	α_{sus}	ψ_{sus}
0.800	0.000	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	γ_{Mp}	$N_{Rd,p}$ [kN]	N_{Ed} [kN]
90.207	47.546	1.500	31.697	28.000

Group anchor ID
1

Company:		Page:	5
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	24042-face fix	Date:	7/11/2024
Fastening Point:	typical face fixed bracket		

3.3 Concrete Breakout failure

$N_{Ed} \le N_{Rd,c} = \frac{N_{Rk,c}}{\gamma_{Mc}}$ EN 1992-4, Table 7.1

$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \psi_{s,N} \cdot \psi_{re,N} \cdot \psi_{ec1,N} \cdot \psi_{ec2,N} \cdot \psi_{M,N}$ EN 1992-4, Eq. (7.1)

$N^0_{Rk,c} = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1,5}$ EN 1992-4, Eq. (7.2)

$A^0_{c,N} = s_{cr,N} \cdot s_{cr,N}$ EN 1992-4, Eq. (7.3)

$\psi_{s,N} = 0.7 + 0.3 \cdot \frac{c}{c_{cr,N}} \le 1.00$ EN 1992-4, Eq. (7.4)

$\psi_{ec1,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{N,1}}{s_{cr,N}}\right)} \le 1.00$ EN 1992-4, Eq. (7.6)

$\psi_{ec2,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{N,2}}{s_{cr,N}}\right)} \le 1.00$ EN 1992-4, Eq. (7.6)

$\psi_{M,N} = 1$ EN 1992-4, Eq. (7.7)

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	$f_{c,cyl}$ [N/mm²]
99,450	152,100	195.0	390.0	25.00

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	z [mm]
0.0	1.000	0.0	1.000	0.792	1.000	0.0

$\psi_{M,N}$	k_1	$N^0_{Rk,c}$ [kN]	γ_{Mc}	$N_{Rd,c}$ [kN]	N_{Ed} [kN]
1.000	11.000	81.523	1.500	28.155	28.000

Group anchor ID
1

3.4 Splitting failure

$$N_{Ed} \le N_{Rd,sp} = \frac{N_{Rk,sp}}{\gamma_{Msp}}$$ EN 1992-4, Table 7.1

$$N_{Rk,sp} = N^0_{Rk,sp} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \psi_{s,N} \cdot \psi_{re,N} \cdot \psi_{ec1,N} \cdot \psi_{ec2,N} \cdot \psi_{h,sp}$$ EN 1992-4, Eq. (7.23)

$$N^0_{Rk,sp} = \min\left(N^0_{Rk,p}, N^0_{Rk,c}\right)$$

$$A^0_{c,N} = s_{cr,sp} \cdot s_{cr,sp}$$ EN 1992-4, Eq. (7.3)

$$\psi_{s,N} = 0.7 + 0.3 \cdot \frac{c}{c_{cr,sp}} \le 1.00$$ EN 1992-4, Eq. (7.4)

$$\psi_{ec1,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{N,1}}{s_{cr,sp}}\right)} \le 1.00$$ EN 1992-4, Eq. (7.6)

$$\psi_{ec2,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{N,2}}{s_{cr,sp}}\right)} \le 1.00$$ EN 1992-4, Eq. (7.6)

$$\psi_{h,sp} = \left(\frac{h}{h_{min}}\right)^{2/3} \le \max\left\{1; \left(\frac{h_{ef} + 1.5 \cdot c_1}{h_{min}}\right)^{2/3}\right\} \le 2.00$$ EN 1992-4, Eq. (7.24)

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,sp}$ [mm]	$s_{cr,sp}$ [mm]	h_{min} [mm]	$\psi_{h,sp}$	$f_{c,cyl}$ [N/mm²]
49,400	67,600	130.0	260.0	160.0	1.237	25.00

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	k_1
0.0	1.000	0.0	1.000	0.838	1.000	11.000

$N^0_{Rk,sp}$ [kN]	γ_{Msp}	$N_{Rd,sp}$ [kN]	N_{Ed} [kN]
81.523	1.500	41.177	28.000

Group anchor ID
1

4 Shear load (EN 1992-4, Section 7.2.2)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel failure (without lever arm)*	N/A	N/A	N/A	N/A
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout failure*	N/A	N/A	N/A	N/A
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* highest loaded anchor **anchor group (relevant anchors)
When the input edge distance is set to "infinity", edge breakout verification is not performed in that direction

5 Displacements (highest loaded anchor)

Short term loading:

N_{Sk} = 20.741 [kN] δ_N = 0.1270 [mm]
V_{Sk} = 0.000 [kN] δ_V = 0.0000 [mm]
δ_{NV} = 0.1270 [mm]

Long term loading:

N_{Sk} = 20.741 [kN] δ_N = 0.2539 [mm]
V_{Sk} = 0.000 [kN] δ_V = 0.0000 [mm]
δ_{NV} = 0.2539 [mm]

Comments: Tension displacements are valid with half of the required installation torque moment for uncracked concrete! Shear displacements are valid without friction between the concrete and the baseplate! The gap due to the drilled hole and clearance hole tolerances are not included in this calculation!

The acceptable anchor displacements depend on the fastened construction and must be defined by the designer!

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6 Warnings

- The anchor design methods in PROFIS Engineering require rigid baseplates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the baseplate are not considered - the baseplate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required baseplate thickness with CBFEM to limit the stress of the baseplate based on the assumptions explained above. The proof if the rigid baseplate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Checking the transfer of loads into the base material is required in accordance with EN 1992-4, Annex A!
- The design is only valid if the clearance hole in the fixture is not larger than the value given in Table 6.1 of EN 1992-4! For larger diameters of the clearance hole see section 6.2.2 of EN 1992-4!
- The accessory list in this report is for the information of the user only. In any case, the instructions for use provided with the product have to be followed to ensure a proper installation.
- For the determination of the $\psi_{re,v}$ (concrete edge failure) the minimum concrete cover defined in the design settings is used as the concrete cover of the edge reinforcement.
- Please note that this design utilizes user defined material safety factor values that differ from the default values recommended in EN1992-4. Partial Safety factor value: γ_c = 1.500
- Drilled hole cleaning must be performed according to instructions for use (blow twice with oil-free compressed air (min. 6 bar), brush twice, blow twice with oil-free compressed air (min. 6 bar)).
- Characteristic bond resistances depend on short- and long-term temperatures.
- Edge reinforcement is not required to avoid splitting failure
- The characteristic bond resistances depend on the return period (service life in years): 50

Fastening meets the design criteria!

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7 Installation data

Baseplate, steel: S 235; E = 210,000.00 N/mm^2; f_{yk} = 235.00 N/mm^2

Profile: no profile

Hole diameter in the fixture: d_f = 14.0 mm

Plate thickness (input): 8.0 mm

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and size: HIT-HY 200-R V3 + HAS A4 M12

Item number: 2390264 HAS A4 M12x160 (insert) / 2262131 HIT-HY 200-R V3 (mortar)

Maximum installation torque: 40 Nm

Hole diameter in the base material: 14.0 mm

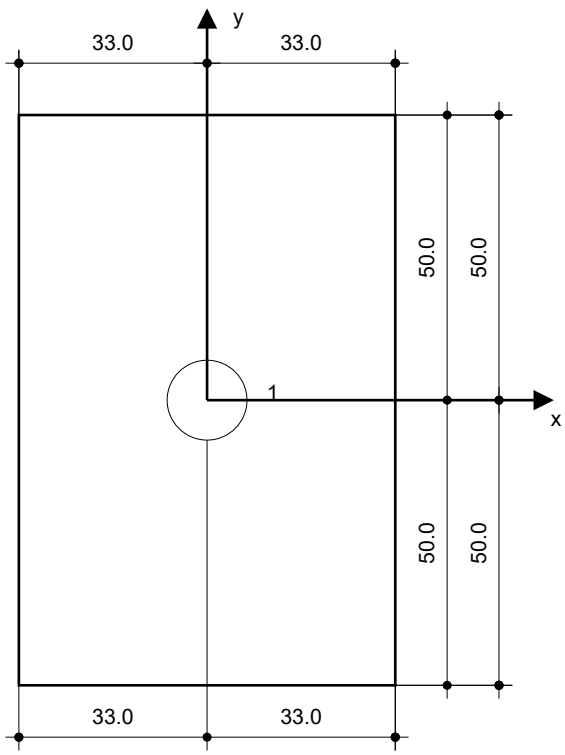
Hole depth in the base material: 130.0 mm

Minimum thickness of the base material: 160.0 mm

Hilti HAS-U A4 threaded rod with HIT-HY 200-R V3 injection mortar with 130 mm embedment hef, M12, Stainless steel, Hammer drilling installation per ETA 19/0601

7.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • For deep installations, a piston plug is necessary • Torque wrench



Coordinates Anchor [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	0.0	0.0	-	-	60.0	240.0

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8 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

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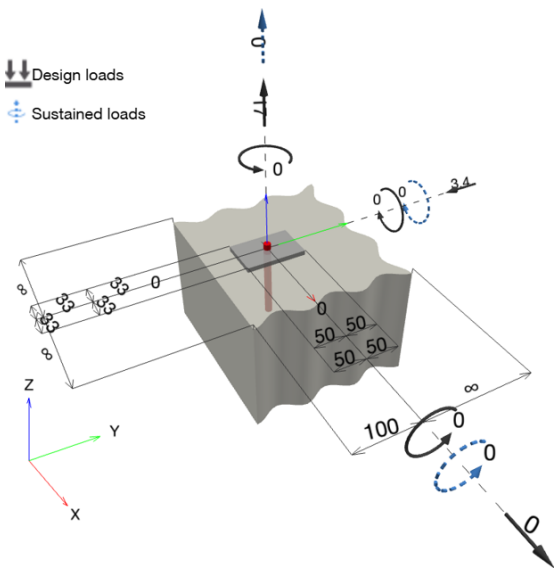
Specifier's comments:

1 Input data

Anchor type and size:	**HIT-HY 200-R V3 + HAS A4 M12**
Return period (service life in years):	50
Item number:	2390264 HAS A4 M12x160 (insert) / 2262131 HIT-HY 200-R V3 (mortar)
Specification text:	Hilti HAS-U A4 threaded rod with HIT-HY 200-R V3 injection mortar with 119 mm embedment hef, M12, Stainless steel, Hammer drilling installation per ETA 19/0601
Effective embedment depth:	$h_{ef,act}$ = 119.0 mm ($h_{ef,limit}$ = - mm)
Material:	A4
Approval No.:	ETA 19/0601
Issued I Valid:	29/01/2024 | -
Proof:	Design Method EN 1992-4, Chemical
Stand-off installation:	e_b = 0.0 mm (no stand-off); t = 8.0 mm
Baseplate[R] :	l_x x l_y x t = 66.0 mm x 100.0 mm x 8.0 mm; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, C25/30, $f_{c,cyl}$ = 25.00 N/mm^2; h =200.0 mm, Temp. short/long: 40/24 °C, User-defined partial material safety factor γ_c = 1.500
Installation:	**Hammer drilled hole, Installation condition: Dry**
Reinforcement:	No reinforcement or Reinforcement spacing >= 150 mm (any Ø) or >= 100 mm (Ø <= 10 mm)
	no longitudinal edge reinforcement

[R] - The anchor calculation is based on a rigid baseplate assumption.

Geometry [mm] & Loading [kN, kNm]



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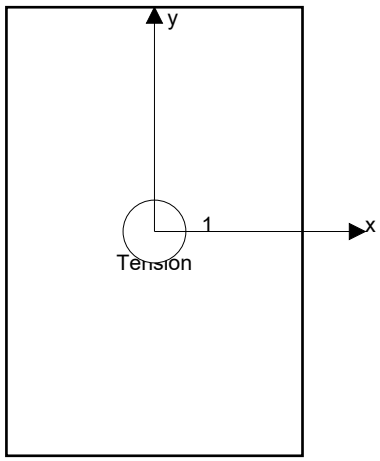
1.1 Load combination

Case	Description	Forces [kN] / Moments [kNm]	Seismic	Fire	Max. Util. Anchor [%]
1	Combination 1	N = 17.000; V_x = 0.000; V_y = -3.400; M_x = 0.000; M_y = 0.000; M_z = 0.000; N_{sus} = 0.000; $M_{x,sus}$ = 0.000; $M_{y,sus}$ = 0.000;	no	no	100
2	Combinaation 2	N = 1.000; V_x = 0.000; V_y = 0.000; M_x = 0.000; M_y = 0.000; M_z = 0.000; N_{sus} = 0.000; $M_{x,sus}$ = 0.000; $M_{y,sus}$ = 0.000;	C1	no	8

2 Load case/Resulting anchor forces

Controlling load case: 1 Combination 1



Anchor reactions [kN]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	17.000	3.400	0.000	-3.400

Max. concrete compressive strain: - [‰]
Max. concrete compressive stress: - [N/mm^2]
Resulting tension force in (x/y)=(0.0/0.0): 17.000 [kN]
Resulting compression force in (x/y)=(-/-): 0.000 [kN]

Anchor forces are calculated based on the assumption of a rigid baseplate.

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3 Tension load (EN 1992-4, Section 7.2.1)

	Load [kN]	Capacity [kN]	Utilization β_N [%]	Status
Steel failure*	17.000	31.556	54	OK
Combined pullout-concrete cone failure**	17.000	19.675	87	OK
Concrete Breakout failure**	17.000	22.563	76	OK
Splitting failure**	17.000	23.316	73	OK

* highest loaded anchor **anchor group (anchors in tension)

3.1 Steel failure

$$N_{Ed} \leq N_{Rd,s} = \frac{N_{Rk,s}}{\gamma_{Ms}}$$ EN 1992-4, Table 7.1

$N_{Rk,s}$ [kN]	γ_{Ms}	$N_{Rd,s}$ [kN]	N_{Ed} [kN]
59.010	1.870	31.556	17.000

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3.2 Combined pullout-concrete cone failure

$N_{Ed} \le N_{Rd,p} = \frac{N_{Rk,p}}{\gamma_{Mp}}$ EN 1992-4, Table 7.1

$N_{Rk,p} = N^0_{Rk,p} \cdot \frac{A_{p,N}}{A^0_{p,N}} \cdot \psi_{g,Np} \cdot \psi_{s,Np} \cdot \psi_{re,Np} \cdot \psi_{ec1,Np} \cdot \psi_{ec2,Np}$ EN 1992-4, Eq. (7.13)

$N^0_{Rk,p} = \psi_{sus} \cdot \tau_{Rk} \cdot \pi \cdot d \cdot h_{ef}$ EN 1992-4, Eq. (7.14)

$\psi_{sus} = 1$ EN 1992-4, Eq. (7.14a)

$s_{cr,Np} = 7.3 \cdot d \cdot \sqrt{\psi_{sus} \cdot \tau_{Rk}} \le 3 \cdot h_{ef}$ EN 1992-4, Eq. (7.15)

$\psi_{g,Np} = \psi^0_{g,Np} - \left(\frac{s}{s_{cr,Np}}\right)^{0,5} \cdot \left(\psi^0_{g,Np} - 1\right) \ge 1.00$ EN 1992-4, Eq. (7.17)

$\psi^0_{g,Np} = \sqrt{n} - (\sqrt{n} - 1) \cdot \left(\frac{\tau_{Rk}}{\tau_{Rk,c}}\right)^{1,5} \ge 1.00$ EN 1992-4, Eq. (7.18)

$\tau_{Rk,c} = \frac{k_3}{\pi \cdot d} \cdot \sqrt{h_{ef} \cdot f_{ck}}$ EN 1992-4, Eq. (7.19)

$\psi_{s,Np} = 0.7 + 0.3 \cdot \frac{c}{c_{cr,Np}} \le 1.00$ EN 1992-4, Eq. (7.20)

$\psi_{ec1,Np} = \frac{1}{1 + \left(\frac{2 \cdot e_{c1,N}}{s_{cr,Np}}\right)} \le 1.00$ EN 1992-4, Eq. (7.21)

$\psi_{ec2,Np} = \frac{1}{1 + \left(\frac{2 \cdot e_{c2,N}}{s_{cr,Np}}\right)} \le 1.00$ EN 1992-4, Eq. (7.21)

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\tau_{Rk,ucr,20}$ [N/mm²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]	$f_{c,cyl}$ [N/mm²]
99,424	127,449	18.00	357.0	178.5	100.0	25.00

ψ_c	$\tau_{Rk,cr}$ [N/mm²]	k_3	$\tau_{Rk,c}$ [N/mm²]	$\psi^0_{g,Np}$	$\psi_{g,Np}$
1.023	9.71	7.700	11.14	1.000	1.000

$e_{c1,N}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,N}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$	$\psi_{re,Np}$
0.0	1.000	0.0	1.000	0.868	1.000

ψ^0_{sus}	α_{sus}	ψ_{sus}
0.800	0.000	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	γ_{Mp}	$N_{Rd,p}$ [kN]	N_{Ed} [kN]
43.581	29.512	1.500	19.675	17.000

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3.3 Concrete Breakout failure

$N_{Ed} \le N_{Rd,c} = \frac{N_{Rk,c}}{\gamma_{Mc}}$ EN 1992-4, Table 7.1

$N_{Rk,c} = N^0_{Rk,c} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \psi_{s,N} \cdot \psi_{re,N} \cdot \psi_{ec1,N} \cdot \psi_{ec2,N} \cdot \psi_{M,N}$ EN 1992-4, Eq. (7.1)

$N^0_{Rk,c} = k_1 \cdot \sqrt{f_{ck}} \cdot h_{ef}^{1,5}$ EN 1992-4, Eq. (7.2)

$A^0_{c,N} = s_{cr,N} \cdot s_{cr,N}$ EN 1992-4, Eq. (7.3)

$\psi_{s,N} = 0.7 + 0.3 \cdot \frac{c}{c_{cr,N}} \le 1.00$ EN 1992-4, Eq. (7.4)

$\psi_{ec1,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{N,1}}{s_{cr,N}}\right)} \le 1.00$ EN 1992-4, Eq. (7.6)

$\psi_{ec2,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{N,2}}{s_{cr,N}}\right)} \le 1.00$ EN 1992-4, Eq. (7.6)

$\psi_{M,N} = 1$ EN 1992-4, Eq. (7.7)

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,N}$ [mm]	$s_{cr,N}$ [mm]	$f_{c,cyl}$ [N/mm²]
99,424	127,449	178.5	357.0	25.00

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	z [mm]
0.0	1.000	0.0	1.000	0.868	1.000	0.0

$\psi_{M,N}$	k_1	$N^0_{Rk,c}$ [kN]	γ_{Mc}	$N_{Rd,c}$ [kN]	N_{Ed} [kN]
1.000	7.700	49.978	1.500	22.563	17.000

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1

3.4 Splitting failure

$N_{Ed} \le N_{Rd,sp} = \frac{N_{Rk,sp}}{\gamma_{Msp}}$ EN 1992-4, Table 7.1

$N_{Rk,sp} = N^0_{Rk,sp} \cdot \frac{A_{c,N}}{A^0_{c,N}} \cdot \psi_{s,N} \cdot \psi_{re,N} \cdot \psi_{ec1,N} \cdot \psi_{ec2,N} \cdot \psi_{h,sp}$ EN 1992-4, Eq. (7.23)

$N^0_{Rk,sp} = \min\left(N^0_{Rk,p}, N^0_{Rk,c}\right)$

$A^0_{c,N} = s_{cr,sp} \cdot s_{cr,sp}$ EN 1992-4, Eq. (7.3)

$\psi_{s,N} = 0.7 + 0.3 \cdot \frac{c}{c_{cr,sp}} \le 1.00$ EN 1992-4, Eq. (7.4)

$\psi_{ec1,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{N,1}}{s_{cr,sp}}\right)} \le 1.00$ EN 1992-4, Eq. (7.6)

$\psi_{ec2,N} = \frac{1}{1 + \left(\frac{2 \cdot e_{N,2}}{s_{cr,sp}}\right)} \le 1.00$ EN 1992-4, Eq. (7.6)

$\psi_{h,sp} = \left(\frac{h}{h_{min}}\right)^{2/3} \le \max\left\{1; \left(\frac{h_{ef} + 1.5 \cdot c_1}{h_{min}}\right)^{2/3}\right\} \le 2.00$ EN 1992-4, Eq. (7.24)

$A_{c,N}$ [mm²]	$A^0_{c,N}$ [mm²]	$c_{cr,sp}$ [mm]	$s_{cr,sp}$ [mm]	h_{min} [mm]	$\psi_{h,sp}$	$f_{c,cyl}$ [N/mm²]
107,718	140,475	187.4	374.8	149.0	1.217	25.00

$e_{c1,N}$ [mm]	$\psi_{ec1,N}$	$e_{c2,N}$ [mm]	$\psi_{ec2,N}$	$\psi_{s,N}$	$\psi_{re,N}$	k_1
0.0	1.000	0.0	1.000	0.860	1.000	7.700

$N^0_{Rk,sp}$ [kN]	γ_{Msp}	$N_{Rd,sp}$ [kN]	N_{Ed} [kN]
43.581	1.500	23.316	17.000

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4 Shear load (EN 1992-4, Section 7.2.2)

	Load [kN]	Capacity [kN]	Utilization β_V [%]	Status
Steel failure (without lever arm)*	3.400	18.913	18	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout failure**	3.400	39.350	9	OK
Concrete edge failure in direction y-**	3.400	10.160	34	OK

* highest loaded anchor **anchor group (relevant anchors)
When the input edge distance is set to "infinity", edge breakout verification is not performed in that direction

4.1 Steel failure (without lever arm)

$V_{Ed} \leq V_{Rd,s} = \frac{V_{Rk,s}}{\gamma_{Ms}}$ EN 1992-4, Table 7.2

$V_{Rk,s} = k_7 \cdot V^0_{Rk,s}$ EN 1992-4, Eq. (7.35)

$V^0_{Rk,s}$ [kN]	k_7	$V_{Rk,s}$ [kN]	γ_{Ms}	$V_{Rd,s}$ [kN]	V_{Ed} [kN]
29.505	1.000	29.505	1.560	18.913	3.400

4.2 Pryout failure (bond relevant)

$V_{Ed} \le V_{Rd,cp} = \frac{V_{Rk,cp}}{\gamma_{Mc,p}}$ EN 1992-4, Table 7.2

$V_{Rk,cp} = k_8 \cdot \min\{N_{Rk,c}; N_{Rk,p}\}$ EN 1992-4, Eq. (7.39c)

$N_{Rk,p} = N^0_{Rk,p} \cdot \frac{A_{p,N}}{A^0_{p,N}} \cdot \psi_{g,Np} \cdot \psi_{s,Np} \cdot \psi_{re,Np} \cdot \psi_{ec1,Np} \cdot \psi_{ec2,Np}$ EN 1992-4, Eq. (7.13)

$N^0_{Rk,p} = \psi_{sus} \cdot \tau_{Rk} \cdot \pi \cdot d \cdot h_{ef}$ EN 1992-4, Eq. (7.14)

$\psi_{sus} = 1$ EN 1992-4, Eq. (7.14a)

$s_{cr,Np} = 7.3 \cdot d \cdot \sqrt{\psi_{sus} \cdot \tau_{Rk}} \le 3 \cdot h_{ef}$ EN 1992-4, Eq. (7.15)

$\psi_{g,Np} = \psi^0_{g,Np} - \left(\frac{s}{s_{cr,Np}}\right)^{0,5} \cdot \left(\psi^0_{g,Np} - 1\right) \ge 1.00$ EN 1992-4, Eq. (7.17)

$\psi^0_{g,Np} = \sqrt{n} - (\sqrt{n} - 1) \cdot \left(\frac{\tau_{Rk}}{\tau_{Rk,c}}\right)^{1,5} \ge 1.00$ EN 1992-4, Eq. (7.18)

$\tau_{Rk,c} = \frac{k_3}{\pi \cdot d} \cdot \sqrt{h_{ef} \cdot f_{ck}}$ EN 1992-4, Eq. (7.19)

$\psi_{s,Np} = 0.7 + 0.3 \cdot \frac{c}{c_{cr,Np}} \le 1.00$ EN 1992-4, Eq. (7.20)

$\psi_{ec1,Np} = \frac{1}{1 + \left(\frac{2 \cdot e_{c1,N}}{s_{cr,Np}}\right)} \le 1.00$ EN 1992-4, Eq. (7.21)

$\psi_{ec2,Np} = \frac{1}{1 + \left(\frac{2 \cdot e_{c2,N}}{s_{cr,Np}}\right)} \le 1.00$ EN 1992-4, Eq. (7.21)

$A_{p,N}$ [mm²]	$A^0_{p,N}$ [mm²]	$\tau_{Rk,ucr,20}$ [N/mm²]	$s_{cr,Np}$ [mm]	$c_{cr,Np}$ [mm]	c_{min} [mm]	$f_{c,cyl}$ [N/mm²]
99,424	127,449	18.00	357.0	178.5	100.0	25.00

ψ_c	$\tau_{Rk,cr}$ [N/mm²]	k_3	$\tau_{Rk,c}$ [N/mm²]	k_8	$\psi^0_{g,Np}$
1.023	9.71	7.700	11.14	2.000	1.000

$\psi_{g,Np}$	$e_{c1,V}$ [mm]	$\psi_{ec1,Np}$	$e_{c2,V}$ [mm]	$\psi_{ec2,Np}$	$\psi_{s,Np}$
1.000	0.0	1.000	0.0	1.000	0.868

$\psi_{re,Np}$	ψ^0_{sus}	α_{sus}	ψ_{sus}
1.000	0.800	0.000	1.000

$N^0_{Rk,p}$ [kN]	$N_{Rk,p}$ [kN]	$\gamma_{Mc,p}$	$V_{Rd,cp}$ [kN]	V_{Ed} [kN]
43.581	29.512	1.500	39.350	3.400

Group anchor ID
1

4.3 Concrete edge failure in direction y-

$$V_{Ed} \le V_{Rd,c} = \frac{V_{Rk,c}}{\gamma_{Mc}}$$ EN 1992-4, Table 7.2

$$V_{Rk,c} = k_T \cdot V^0_{Rk,c} \cdot \frac{A_{c,V}}{A^0_{c,V}} \cdot \psi_{s,V} \cdot \psi_{h,V} \cdot \psi_{\alpha,V} \cdot \psi_{ec,V} \cdot \psi_{re,V}$$ EN 1992-4, Eq. (7.40)

$$V^0_{Rk,c} = k_9 \cdot d_{nom}^{\alpha} \cdot l_f^{\beta} \cdot \sqrt{f_{ck}} \cdot c_1^{1,5}$$ EN 1992-4, Eq. (7.41)

$$\alpha = 0.1 \cdot \left(\frac{l_f}{c_1}\right)^{0,5}$$ EN 1992-4, Eq. (7.42)

$$\beta = 0.1 \cdot \left(\frac{d_{nom}}{c_1}\right)^{0,2}$$ EN 1992-4, Eq. (7.43)

$$A^0_{c,V} = 4.5 \cdot c_1^2$$ EN 1992-4, Eq. (7.44)

$$\psi_{s,V} = 0.7 + 0.3 \cdot \frac{c_2}{1.5 \cdot c_1} \le 1.00$$ EN 1992-4, Eq. (7.45)

$$\psi_{h,V} = \left(\frac{1.5 \cdot c_1}{h}\right)^{0,5} \ge 1.00$$ EN 1992-4, Eq. (7.46)

$$\psi_{ec,V} = \frac{1}{1 + \left(\frac{2 \cdot e_V}{3 \cdot c_1}\right)} \le 1.00$$ EN 1992-4, Eq. (7.47)

$$\psi_{\alpha,V} = \sqrt{\frac{1}{(\cos \alpha_V)^2 + (0.5 \cdot \sin \alpha_V)^2}} \ge 1.00$$ EN 1992-4, Eq. (7.48)

l_f [mm]	d_{nom} [mm]	k_9	α	β	$f_{c,cyl}$ [N/mm^2]	c_1 [mm]
119.0	12.00	1.700	0.109	0.065	25.00	100.0

$A_{c,V}$ [mm^2]	$A^0_{c,V}$ [mm^2]	$\psi_{s,V}$	$\psi_{h,V}$	$e_{c,V}$ [mm]	$\psi_{ec,V}$
45,000	45,000	1.000	1.000	0.0	1.000

α_V [°]	$\psi_{\alpha,V}$	$\psi_{re,V}$
0.00	1.000	1.000

$V^0_{Rk,c}$ [kN]	k_T	γ_{Mc}	$V_{Rd,c}$ [kN]	V_{Ed} [kN]
15.239	1.0	1.500	10.160	3.400

Group anchor ID
1

When the input edge distance is set to "infinity", edge breakout verification is not performed in that direction

Company:		Page:	10
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	24042-surface fix- plate lengthwise	Date:	7/11/2024
Fastening Point:			

5 Combined tension and shear loads (EN 1992-4, Section 7.2.3)

Steel failure

β_N	β_V	α	Utilization $\beta_{N,V}$ [%]	Status
0.539	0.180	2.000	33	OK

$\beta_N^\alpha + \beta_V^\alpha \leq 1.0$

Concrete failure

β_N	β_V	α	Utilization $\beta_{N,V}$ [%]	Status
0.864	0.335	1.500	100	OK

$\beta_N^\alpha + \beta_V^\alpha \leq 1.0$

6 Displacements (highest loaded anchor)

Short term loading:

N_{Sk} = 12.593 [kN] δ_N = 0.1965 [mm]

V_{Sk} = 2.519 [kN] δ_V = 0.1259 [mm]

δ_{NV} = 0.2334 [mm]

Long term loading:

N_{Sk} = 12.593 [kN] δ_N = 0.4491 [mm]

V_{Sk} = 2.519 [kN] δ_V = 0.2015 [mm]

δ_{NV} = 0.4922 [mm]

Comments: Tension displacements are valid with half of the required installation torque moment for uncracked concrete! Shear displacements are valid without friction between the concrete and the baseplate! The gap due to the drilled hole and clearance hole tolerances are not included in this calculation!

The acceptable anchor displacements depend on the fastened construction and must be defined by the designer!

7 Warnings

- The anchor design methods in PROFIS Engineering require rigid baseplates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the baseplate are not considered - the baseplate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required baseplate thickness with CBFEM to limit the stress of the baseplate based on the assumptions explained above. The proof if the rigid baseplate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Checking the transfer of loads into the base material is required in accordance with EN 1992-4, Annex A!
- The design is only valid if the clearance hole in the fixture is not larger than the value given in Table 6.1 of EN 1992-4! For larger diameters of the clearance hole see section 6.2.2 of EN 1992-4!
- The accessory list in this report is for the information of the user only. In any case, the instructions for use provided with the product have to be followed to ensure a proper installation.
- For the determination of the $\psi_{re,v}$ (concrete edge failure) the minimum concrete cover defined in the design settings is used as the concrete cover of the edge reinforcement.
- Please note that this design utilizes user defined material safety factor values that differ from the default values recommended in EN1992-4. Partial Safety factor value: γ_c = 1.500
- Drilled hole cleaning must be performed according to instructions for use (blow twice with oil-free compressed air (min. 6 bar), brush twice, blow twice with oil-free compressed air (min. 6 bar)).
- Characteristic bond resistances depend on short- and long-term temperatures.
- Edge reinforcement is not required to avoid splitting failure
- The characteristic bond resistances depend on the return period (service life in years): 50

Fastening meets the design criteria!

Company:		Page:	12
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	24042-surface fix- plate lengthwise	Date:	7/11/2024
Fastening Point:			

8 Installation data

Baseplate, steel: S 235; E = 210,000.00 N/mm^2; f_{yk} = 235.00 N/mm^2

Profile: no profile

Hole diameter in the fixture: d_f = 14.0 mm

Plate thickness (input): 8.0 mm

Recommended plate thickness: not calculated

Drilling method: Hammer drilled

Cleaning: Compressed air cleaning of the drilled hole according to instructions for use is required

Anchor type and size: HIT-HY 200-R V3 + HAS A4 M12

Item number: 2390264 HAS A4 M12x160 (insert) / 2262131 HIT-HY 200-R V3 (mortar)

Maximum installation torque: 40 Nm

Hole diameter in the base material: 14.0 mm

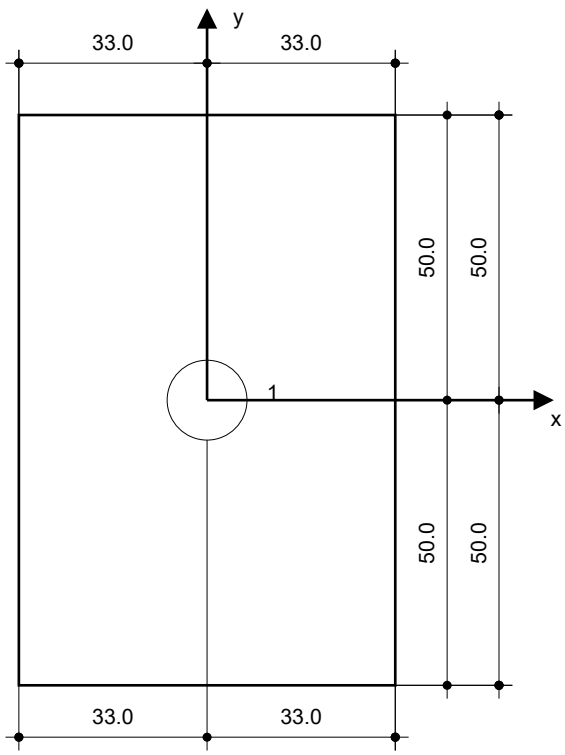
Hole depth in the base material: 119.0 mm

Minimum thickness of the base material: 149.0 mm

Hilti HAS-U A4 threaded rod with HIT-HY 200-R V3 injection mortar with 119 mm embedment hef, M12, Stainless steel, Hammer drilling installation per ETA 19/0601

8.1 Recommended accessories

Drilling	Cleaning	Setting
• Suitable Rotary Hammer • Properly sized drill bit	• Compressed air with required accessories to blow from the bottom of the hole • Proper diameter wire brush	• Dispenser including cassette and mixer • For deep installations, a piston plug is necessary • Torque wrench



Coordinates Anchor [mm]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	0.0	0.0	-	-	100.0	-

9 Remarks; Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
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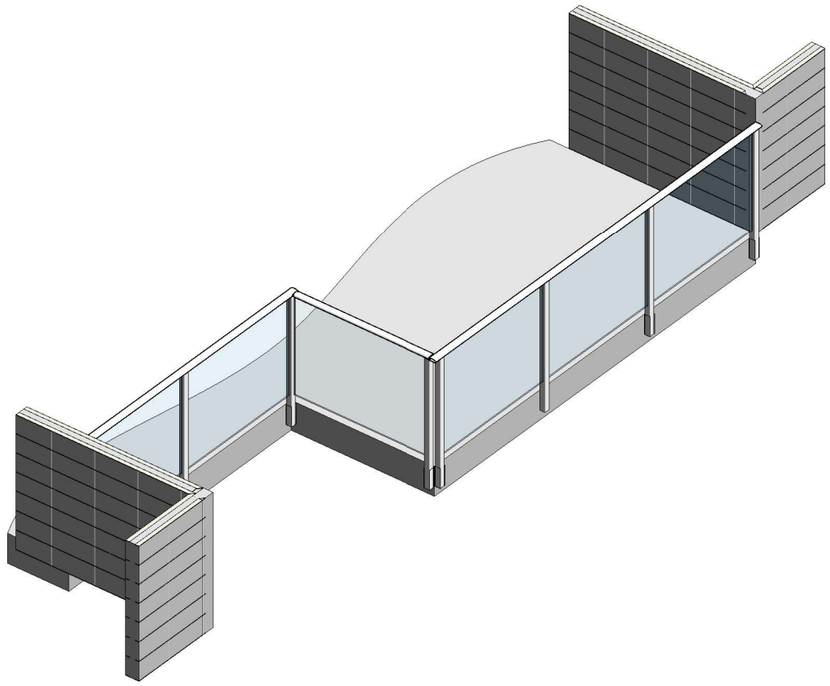
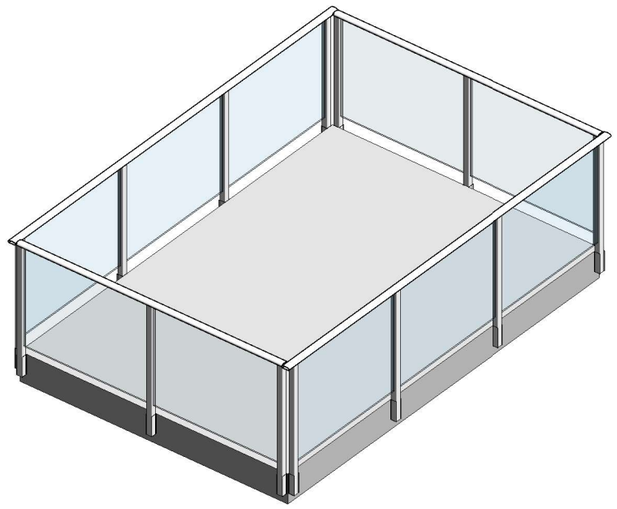
APPENDIX C

Lateral Mounted Design
Drawings and Details

Sheet Number	Sheet Name	Revision	Revision Date	Revision Description
RB01	BALUSTRADE ARRANGEMENT	R.0	2024.12.09	FOR INFORMATION
RB02	PANEL SIZES	R.0	2024.12.09	FOR INFORMATION
RB03	PANEL SIZES	R.0	2024.12.09	FOR INFORMATION
RB04	BALUSTRADE CONNECTION DETAILS	R.0	2024.12.09	FOR INFORMATION
RB05	BALUSTRADE CONNECTION DETAILS	R.0	2024.12.09	FOR INFORMATION



CONTINUOUS BALUSTRADE LINE BETWEEN STRUCTURES



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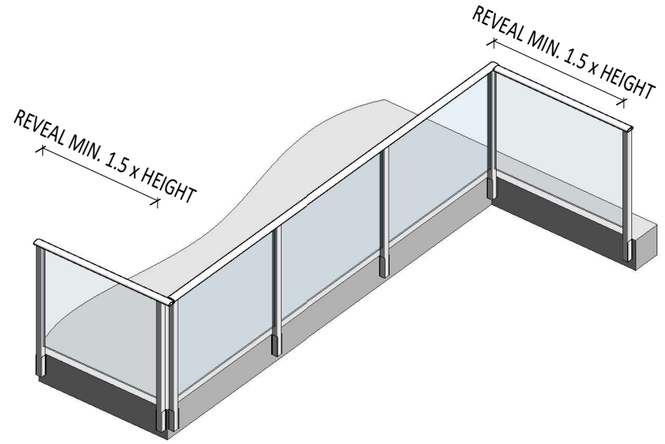

FREE STANDING WITH REVEALS OF MIN. 1.5 x BALUSTRADE HEIGHT

BALUSTRADE / POOL FENCE ARRANGEMENT HAS TO BE CONSISTENT WITH ONE OR COMBINATION OF THE PRESENTED ARRANGEMENTS TO MEET THE LOAD ASSUMPTIONS

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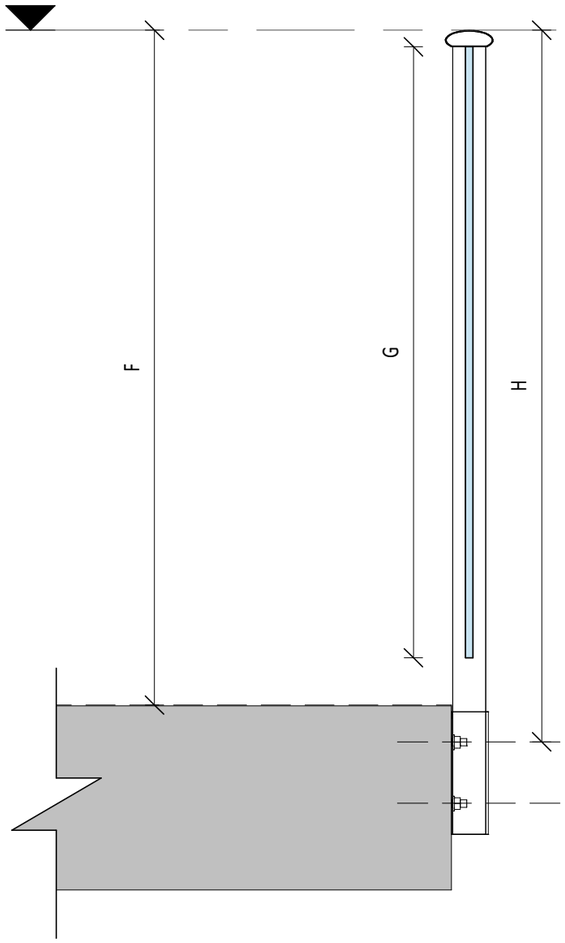
Client:
VETRO RACCORDI /
FMI BUILDING INNOVATION

Project:
SET 1 - BALUSTRADE WITH HANDRAIL
- LATERAL MOUNTED

Drawing:
BALUSTRADE ARRANGEMENT

REF.	DESCRIPTION					DATE
R.0	FOR INFORMATION					2024.12.09
scale: @A3	drawn: SN	checked: PM	status: -	project no: 24042	drg no: RB01	rev: R.0

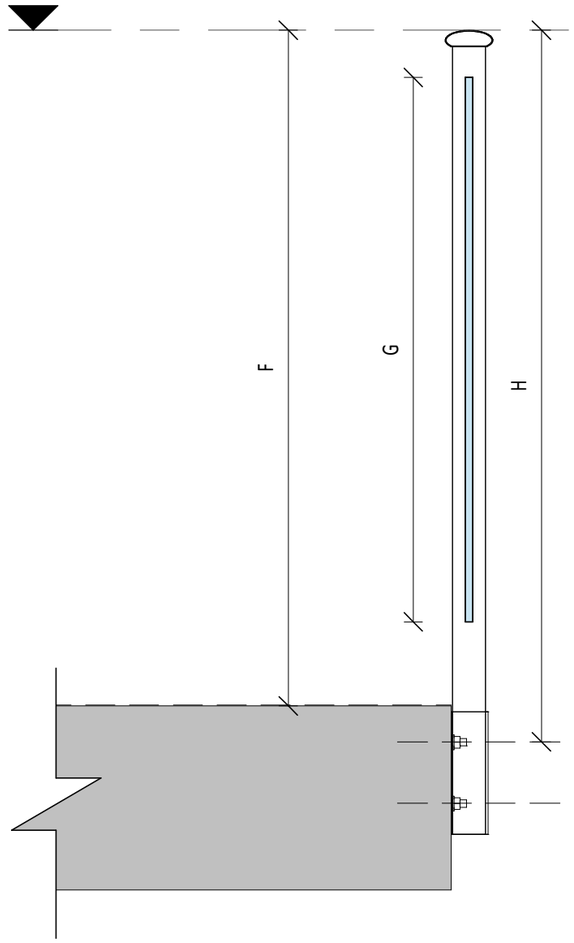
BALUSTRADE TOP LEVEL



STYLE A1 - GLASS INTO HANDRAIL MODEL

1 : 10

BALUSTRADE TOP LEVEL



STYLE B1 - GAP AT TOP OF GLASS MODEL -50mm

1 : 10

BALUSTRADE CONFIGURATIONS						
MODEL TYPE	**OCCUPANCY**	**WIND ZONE**	**HEIGHT FROM FIXING (H)**	**FFL (F)**	**MAX GLASS HEIGHT (G)**	**POST SPACING (S) mm**
STYLE A1	A, C3, B, E	M	1160	1100	1023	1950
	A, C3, B, E	H	1160	1100	1023	1950
	A, C3, B, E	VH	1160	1100	1023	1950
	A, C3, B, E	EH	1160	1100	1023	1950
STYLE B1	A, C3, B, E	M	1160	1100	963	1950
	A, C3, B, E	H	1160	1100	963	1950
	A, C3, B, E	VH	1160	1100	963	1950
	A, C3, B, E	EH	1160	1100	963	1900

GLASS NOTES:

12mm NOMINAL THICKNESS FULLY TOUGHENED GLASS.

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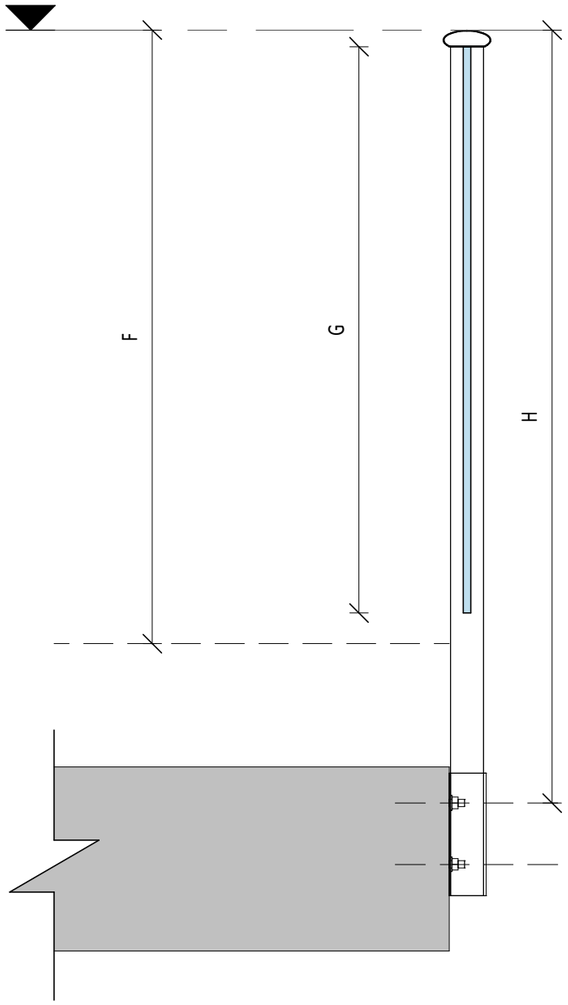
- LATERAL MOUNTED

Drawing:
PANEL SIZES

REF.	DESCRIPTION					DATE
R.0	FOR INFORMATION					2024.12.09
scale: As indicated@A3	drawn: SN	checked: PM	status: -	project no: 24042	drg no: RB02	rev: R.0

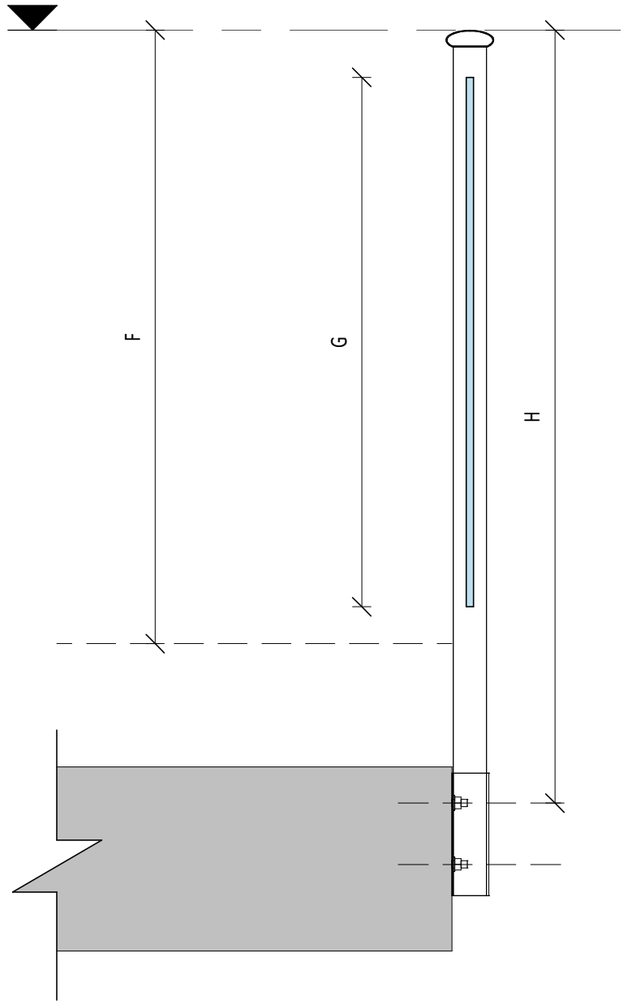
BALUSTRADE TOP LEVEL



STYLE C1 - FLOATING DECK GLASS INTO HANDRAIL MODEL

1 : 10

BALUSTRADE TOP LEVEL



STYLE D1 - FLOATING DECK GAP AT TOP OF GLASS MODEL-50mm

1 : 10

BALUSTRADE CONFIGURATIONS - FLOATING DECK						
MODEL TYPE	**OCCUPANCY**	**WIND ZONE**	**HEIGHT FROM FIXING (H)**	**FFL (F)**	**MAX GLASS HEIGHT (G)**	**POST SPACING (S) mm**
STYLE C1	A, C3, B, E	M	1260	1000	923	1950
	A, C3, B, E	H	1260	1000	923	1950
	A, C3, B, E	VH	1260	1000	923	1950
	A, C3, B, E	EH	1260	1000	923	1800
STYLE D1	A, C3, B, E	M	1260	1000	863	1950
	A, C3, B, E	H	1260	1000	863	1950
	A, C3, B, E	VH	1260	1000	863	1950
	A, C3, B, E	EH	1260	1000	863	1750

GLASS NOTES:

12mm NOMINAL THICKNESS FULLY TOUGHENED GLASS.

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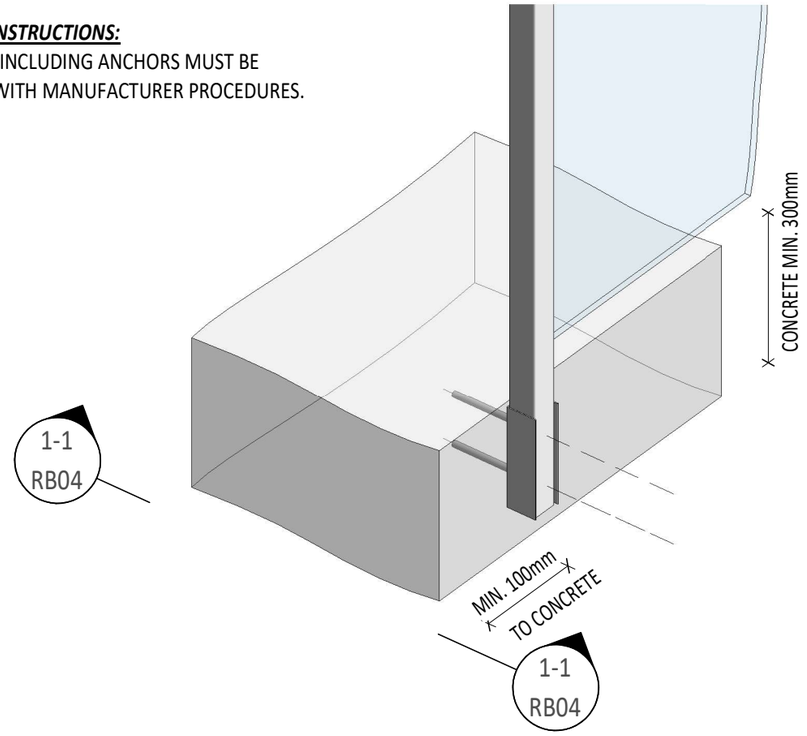
Project:
SET 1 - BALUSTRADE WITH HANDRAIL
- LATERAL MOUNTED

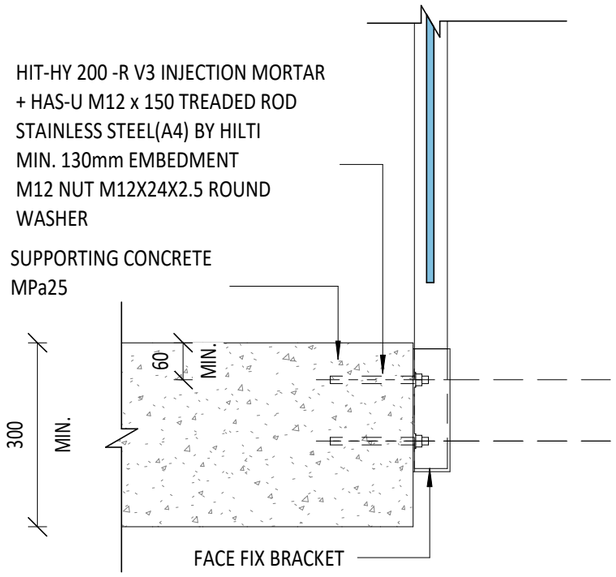
Drawing:
PANEL SIZES

REF.	DESCRIPTION					DATE
R.0	FOR INFORMATION					2024.12.09
scale: As indicated@A3	drawn: SN	checked: PM	status: -	project no: 24042	drg no: RB03	rev: R.0

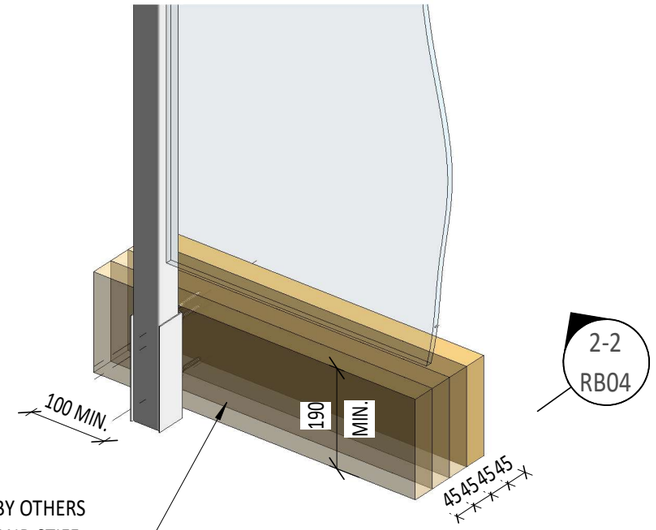
IMPORTANT INSTALLATION INSTRUCTIONS:

ALL PROPRIETARY PRODUCTS INCLUDING ANCHORS MUST BE INSTALLED IN STRICT ORDER WITH MANUFACTURER PROCEDURES.





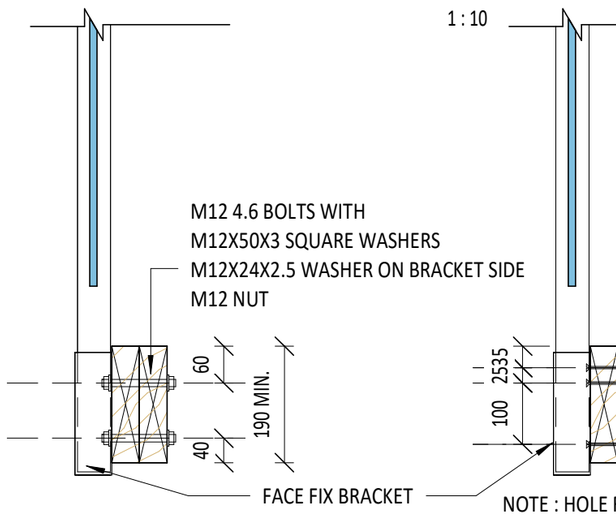
CONNECTION TO CONCRETE - FACE MOUNTED



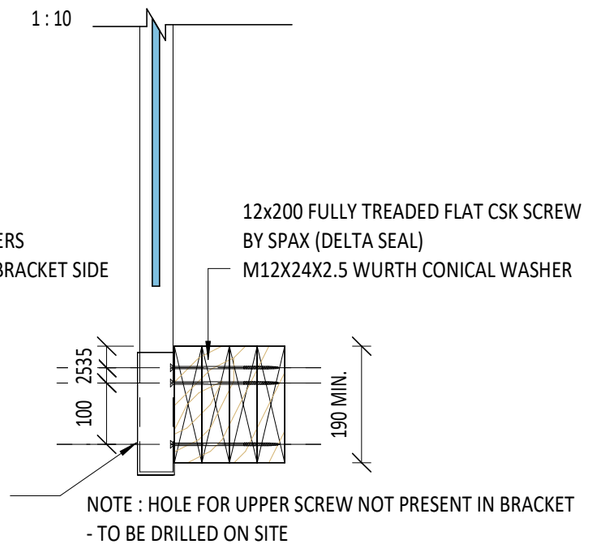
CONNECTION TO TIMBER - FACE MOUNTED

1-1

1 : 10



TIMBER OPTION 1



TIMBER OPTION 2

NOTE : ONLY OPTION 1 SUITABLE FOR WET TIMBER

2-2

1 : 10

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Project: SET 1 - BALUSTRADE WITH HANDRAIL - LATERAL MOUNTED

Drawing: BALUSTRADE CONNECTION DETAILS

REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
1:10@A3	SN	PM	-	24042	RB04	R.0

IMPORTANT INSTALLATION INSTRUCTIONS:

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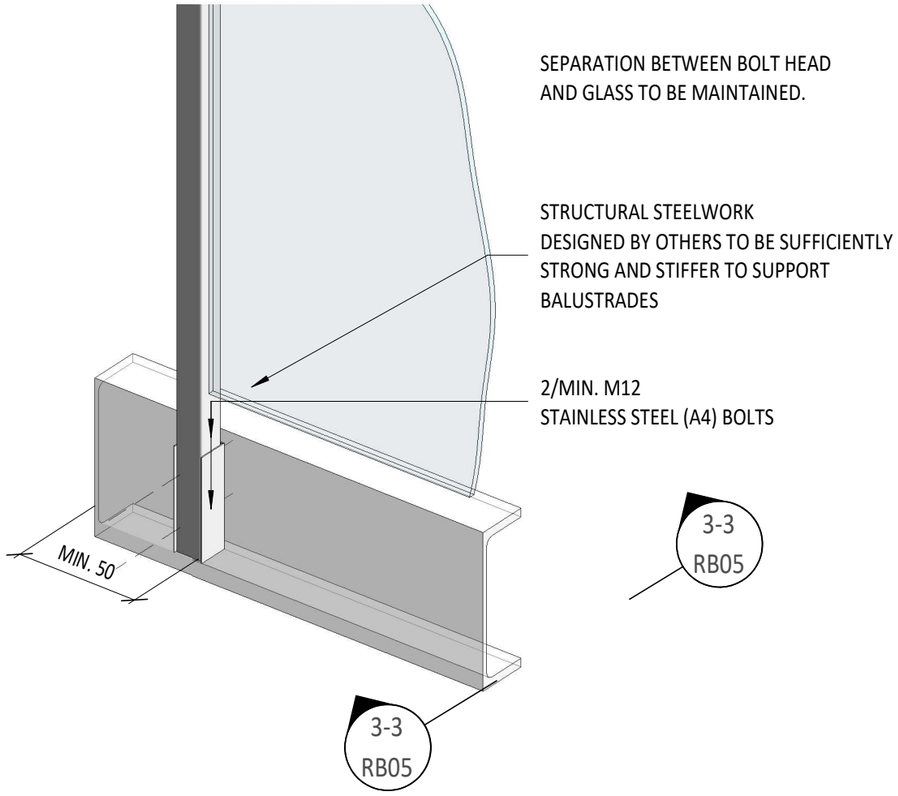

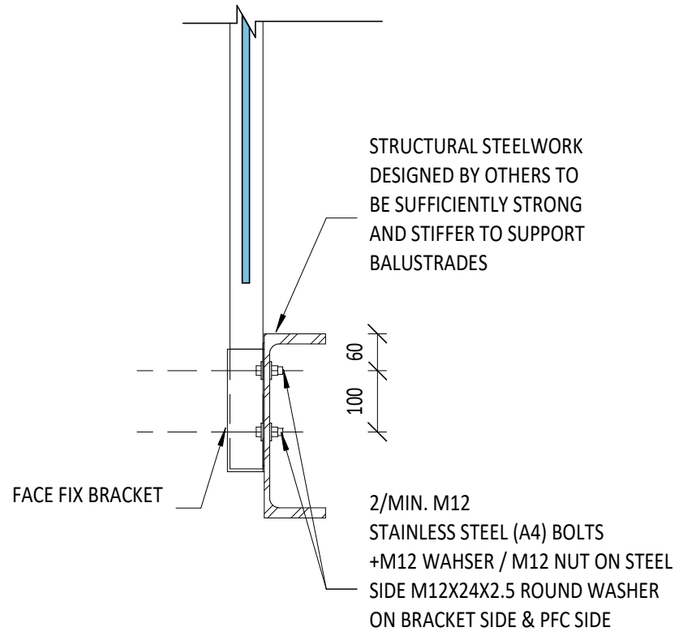

CONNECTION TO STRUCTURAL STEEL - FACE MOUNTED

3-3

1 : 10

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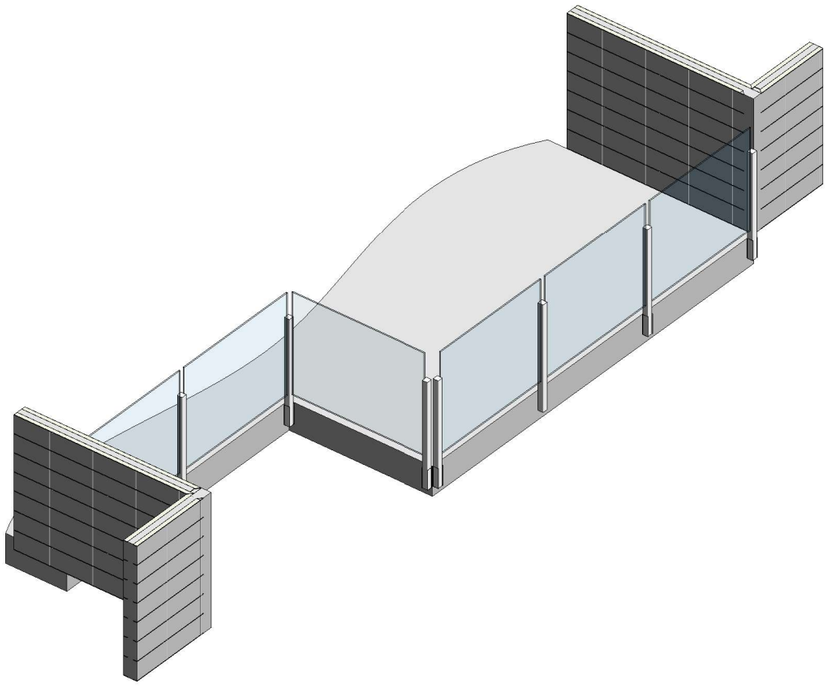
Project: SET 1 - BALUSTRADE WITH HANDRAIL - LATERAL MOUNTED

Drawing: BALUSTRADE CONNECTION DETAILS

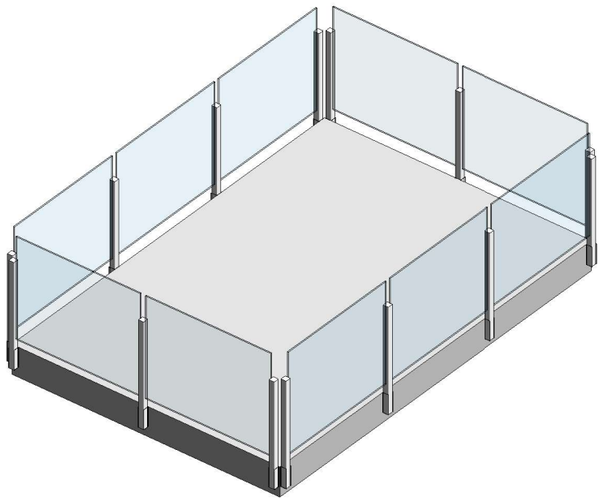
REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
1 : 10@A3	SN	PM	-	24042	RB05	R.0

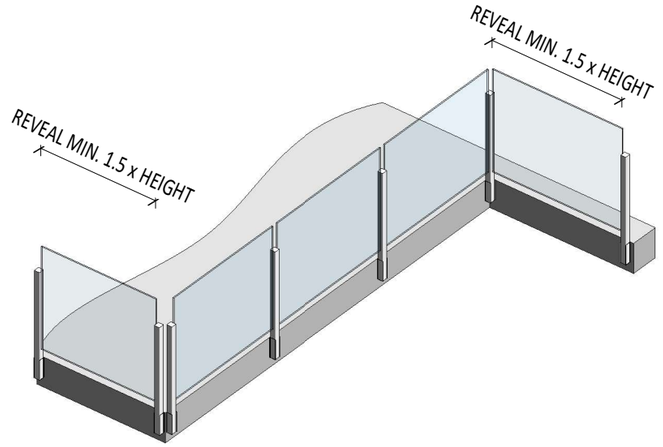
Sheet Number	Sheet Name	Revision	Revision Date	Revision Description
RB01	BALUSTRADE ARRANGEMENT	R.0	2024.12.09	FOR INFORMATION
RB02	PANEL SIZES	R.0	2024.12.09	FOR INFORMATION
RB03	BALUSTRADE CONNECTION DETAILS	R.0	2024.12.09	FOR INFORMATION
RB04	BALUSTRADE CONNECTION DETAILS	R.0	2024.12.09	FOR INFORMATION



CONTINUOUS BALUSTRADE LINE BETWEEN STRUCTURES



CLOSED PERIMETER



FREE STANDING WITH REVEALS OF MIN. 1.5 x BALUSTRADE HEIGHT

BALUSTRADE / POOL FENCE ARRANGEMENT HAS TO BE CONSISTENT WITH ONE OR COMBINATION OF THE PRESENTED ARRANGEMENTS TO MEET THE LOAD ASSUMPTIONS

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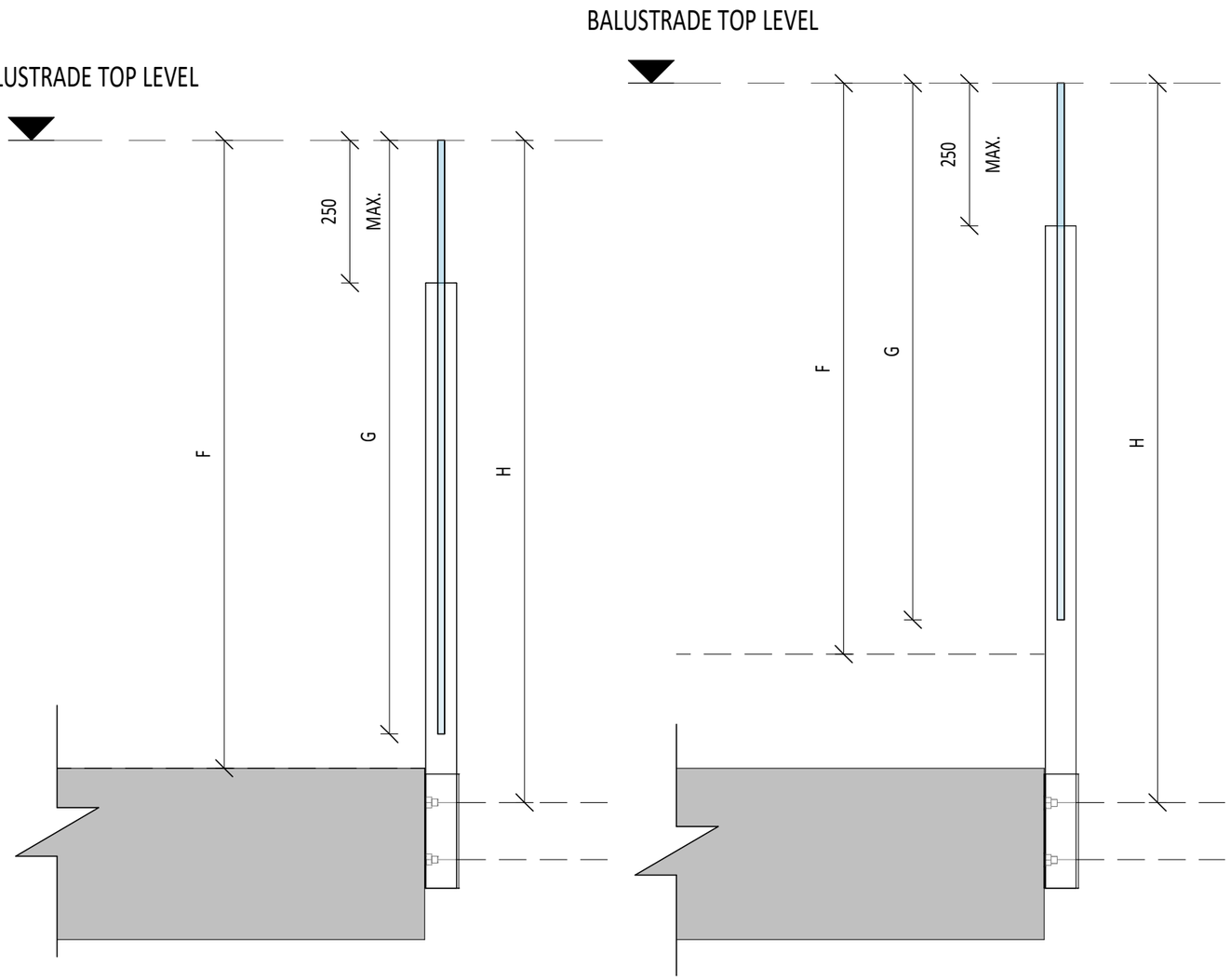
Client:
VETRO RACCORDI /
FMI BUILDING INNOVATION

Project:
SET 2 - BALUSTRADE WITH NO HANDRAIL
- LATERAL MOUNTED

Drawing:
BALUSTRADE ARRANGEMENT

REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
@A3	SN	PM	-	24042	RB01	R.0



STYLE E1 - GLASS ABOVE POST MODEL

1 : 10

STYLE F1 - FLOATING DECK GLASS ABOVE POST MODEL

1 : 10

BALUSTRADE CONFIGURATIONS						
MODEL TYPE	**OCCUPANCY**	**WIND ZONE**	**HEIGHT FROM FIXING (H)**	**FFL (F)**	**MAX GLASS HEIGHT (G)**	**POST SPACING mm**
STYLE E1	A, C3, B, E	M	1160	1100	1040	1550
	A, C3, B, E	H	1160	1100	1040	1550
	A, C3, B, E	VH	1160	1100	1040	1550
	A, C3, B, E	EH	1160	1100	1040	1550
STYLE F1	A, C3, B, E	M	1260	1000	940	1450
	A, C3, B, E	H	1260	1000	940	1450
	A, C3, B, E	VH	1260	1000	940	1450
	A, C3, B, E	EH	1260	1000	940	1450

GLASS NOTES:

12mm NOMINAL THICKNESS FULLY TOUGHENED GLASS.

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Client:
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FMI BUILDING INNOVATION

Project:
SET 2 - BALUSTRADE WITH NO HANDRAIL
- LATERAL MOUNTED

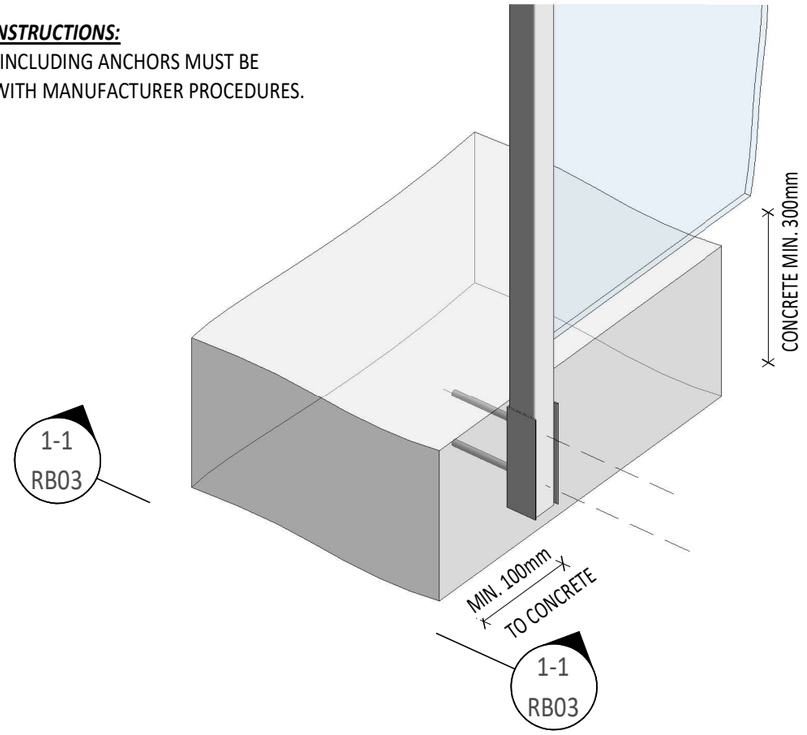
Drawing:
PANEL SIZES

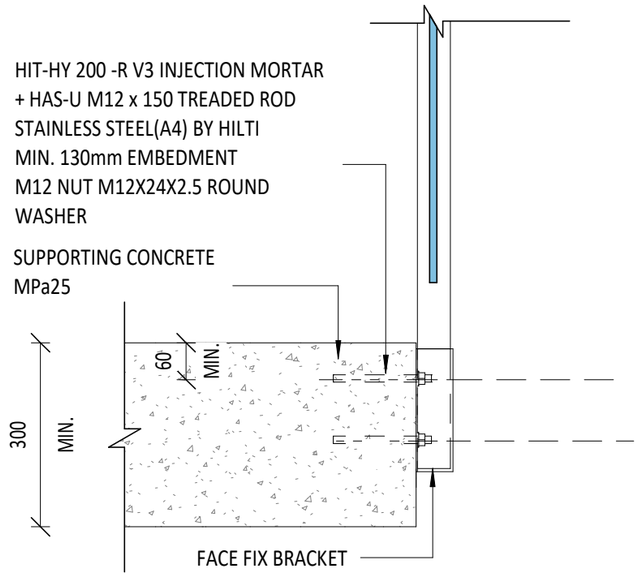
REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
As indicated@A3	SN	PM	-	24042	RB02	R.0

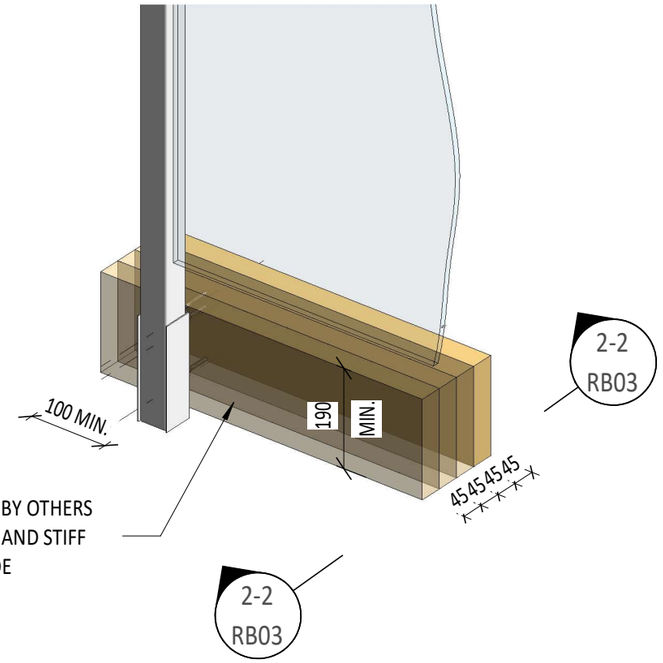
IMPORTANT INSTALLATION INSTRUCTIONS:

ALL PROPRIETARY PRODUCTS INCLUDING ANCHORS MUST BE INSTALLED IN STRICT ORDER WITH MANUFACTURER PROCEDURES.





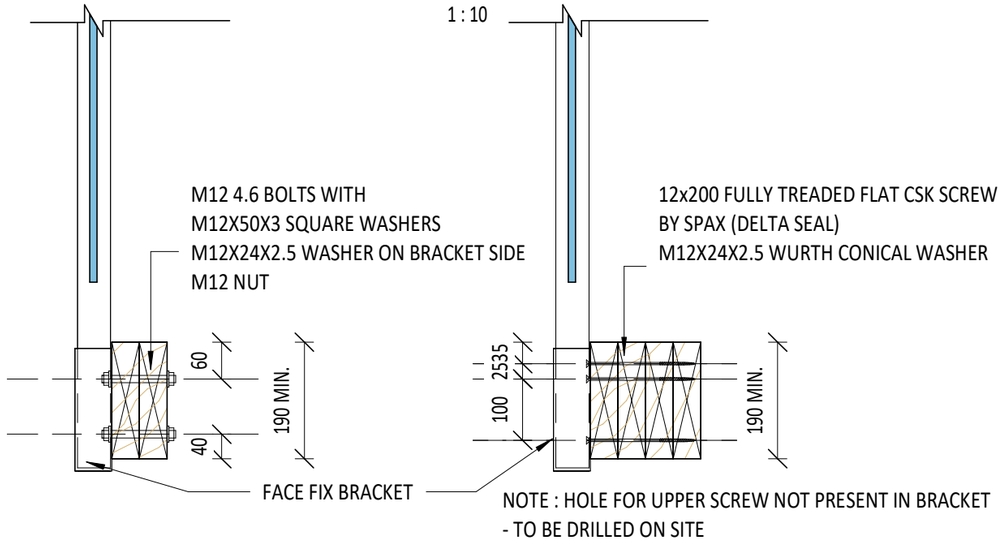
CONNECTION TO CONCRETE - FACE MOUNTED



CONNECTION TO TIMBER - FACE MOUNTED

1-1

1 : 10



TIMBER OPTION 1

TIMBER OPTION 2

NOTE : ONLY OPTION 1 SUITABLE FOR WET TIMBER

2-2

1 : 10

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FMI BUILDING INNOVATION

Project:
SET 2 - BALUSTRADE WITH NO HANDRAIL
- LATERAL MOUNTED

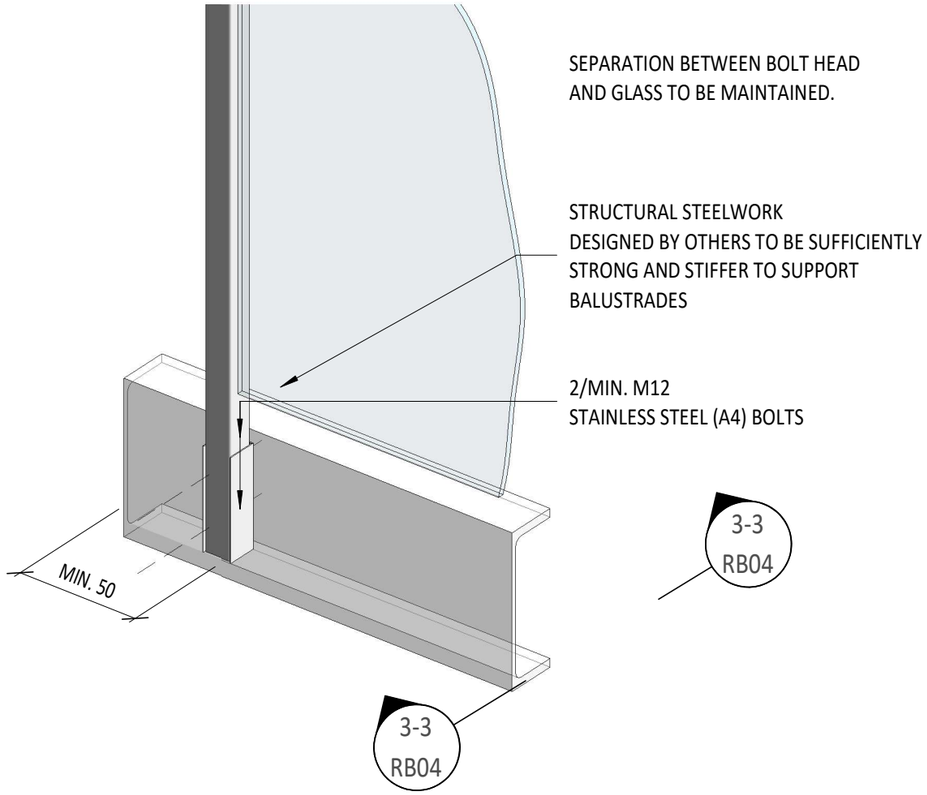
Drawing:
BALUSTRADE CONNECTION DETAILS

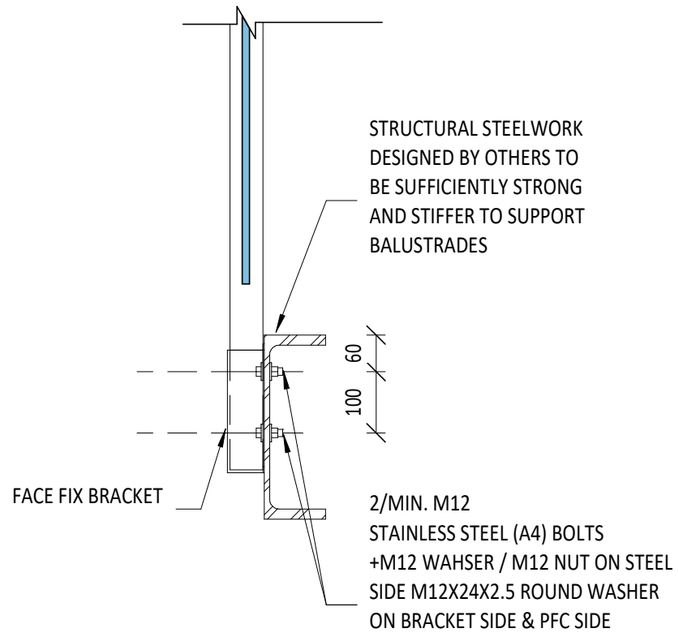
REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
1 : 10@A3	SN	PM	-	24042	RB03	R.0

IMPORTANT INSTALLATION INSTRUCTIONS:

ALL PROPRIETARY PRODUCTS INCLUDING ANCHORS MUST BE INSTALLED IN STRICT ORDER WITH MANUFACTURER PROCEDURES.





CONNECTION TO STRUCTURAL STEEL - FACE MOUNTED

3-3

1 : 10

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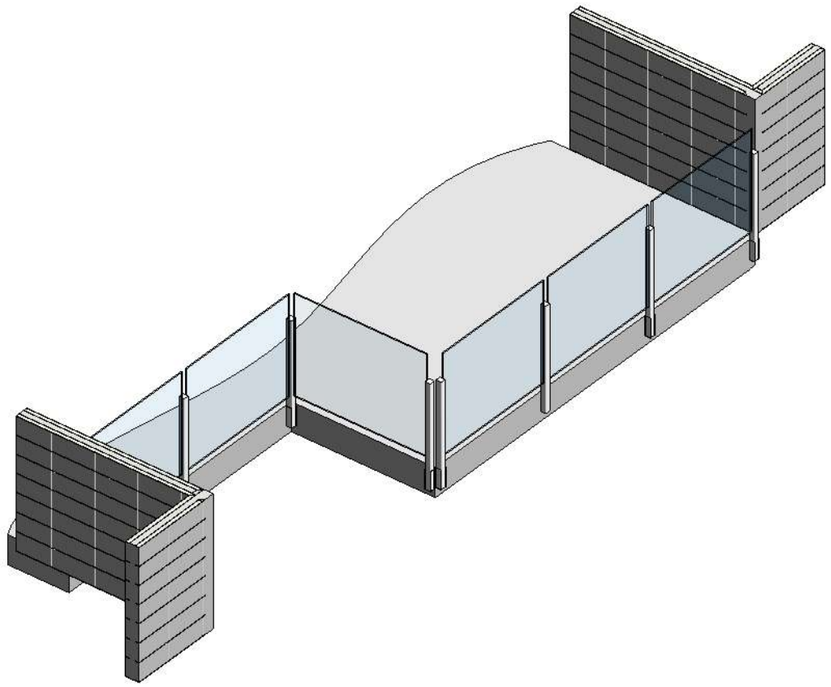
Project: SET 2 - BALUSTRADE WITH NO HANDRAIL - LATERAL MOUNTED

Drawing: BALUSTRADE CONNECTION DETAILS

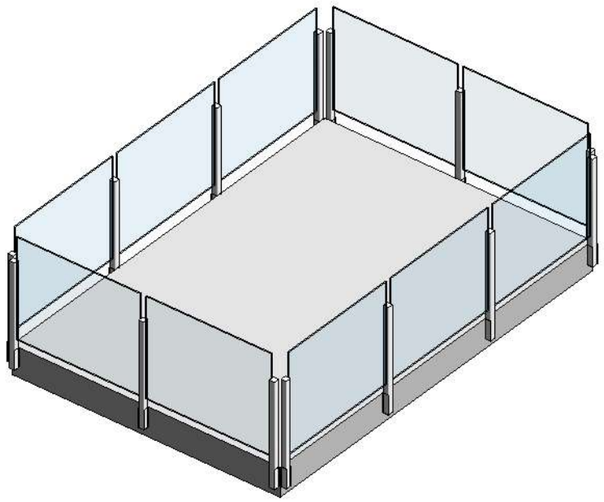
REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
1:10@A3	SN	PM	-	24042	RB04	R.0

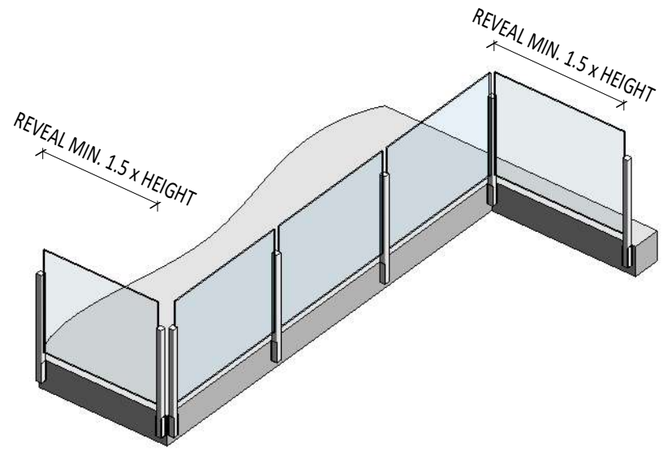
Sheet Number	Sheet Name	Revision	Revision Date	Revision Description
RF01	POOL FENCE AND WIND BREAK ARRANGEMENT	R.0	2024.12.09	FOR INFORMATION
RF02	PANEL SIZES	R.0	2024.12.09	FOR INFORMATION
RF03	PANEL SIZES	R.0	2024.12.09	FOR INFORMATION
RF04	PANEL SIZES	R.0	2024.12.09	FOR INFORMATION
RF05	POOL FENCE AND WIND BREAK CONNECTION DETAILS	R.0	2024.12.09	FOR INFORMATION
RF06	POOL FENCE AND WIND BREAK CONNECTION DETAILS	R.0	2024.12.09	FOR INFORMATION



CONTINUOUS BALUSTRADE LINE BETWEEN STRUCTURES



CLOSED PERIMETER



FREE STANDING WITH REVEALS OF MIN. 1.5 x BALUSTRADE HEIGHT

BALUSTRADE / POOL FENCE ARRANGEMENT HAS TO BE CONSISTENT WITH ONE OR COMBINATION OF THE PRESENTED ARRANGEMENTS TO MEET THE LOAD ASSUMPTIONS

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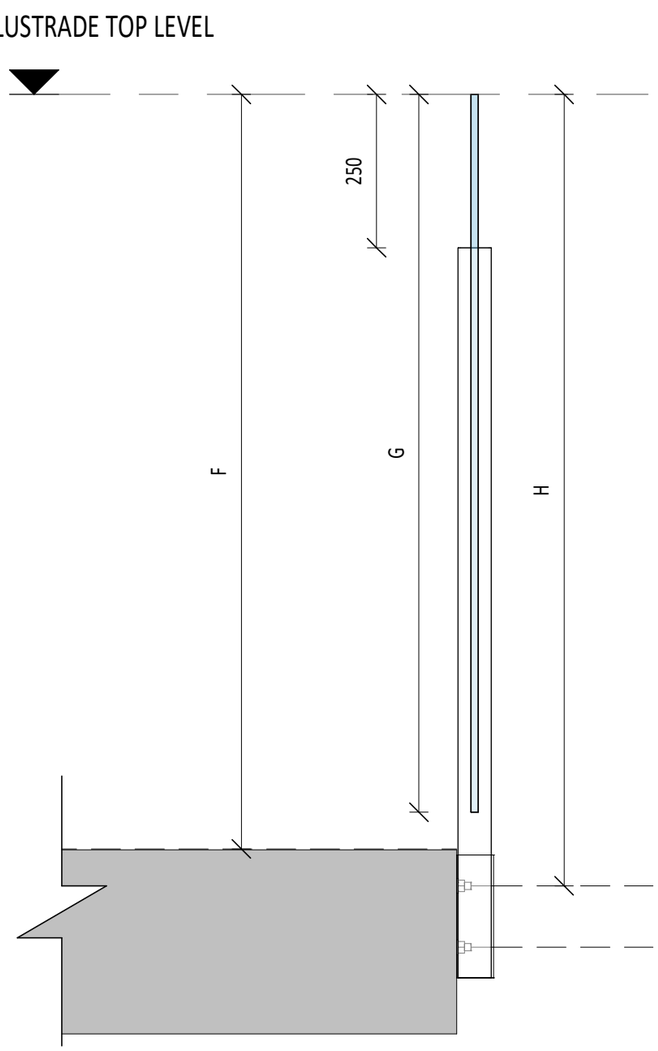
Client:
VETRO RACCORDI /
FMI BUILDING INNOVATION

Project:
SET 3 - POOL FENCE AND WIND BREAK, NO HANDRAIL - LATERAL MOUNTED

Drawing:
POOL FENCE AND WIND BREAK ARRANGEMENT

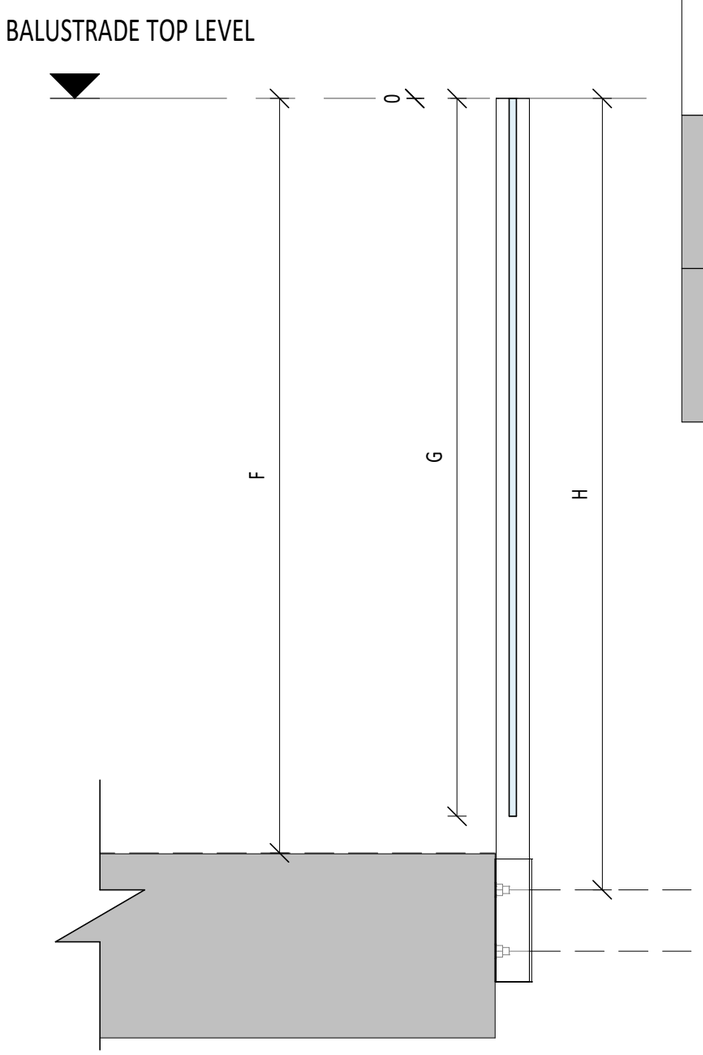
REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
@A3	SN	PM	-	24042	RF01	R.0



STYLE G1 - GLASS ABOVE POST MODEL

1 : 10



STYLE H1 - POST CAP MODEL

1 : 10

POOL FENCE CONFIGURATIONS						
MODEL TYPE	**OCCUPANCY**	**WIND ZONE**	**HEIGHT FROM FIXING (H)**	**FFL (F)**	**MAX GLASS HEIGHT (G)**	**POST SPACING mm**
STYLE G1	A, C3, B, E	M	1290	1230	1170	1950
	A, C3, B, E	H	1290	1230	1170	1950
	A, C3, B, E	VH	1290	1230	1170	1950
	A, C3, B, E	EH	1290	1230	1170	1750
STYLE H1	A, C3, B, E	M	1290	1230	1168	1950
	A, C3, B, E	H	1290	1230	1168	1950
	A, C3, B, E	VH	1290	1230	1168	1950
	A, C3, B, E	EH	1290	1230	1168	1750

GLASS NOTES:

12mm NOMINAL THICKNESS FULLY TOUGHENED GLASS.

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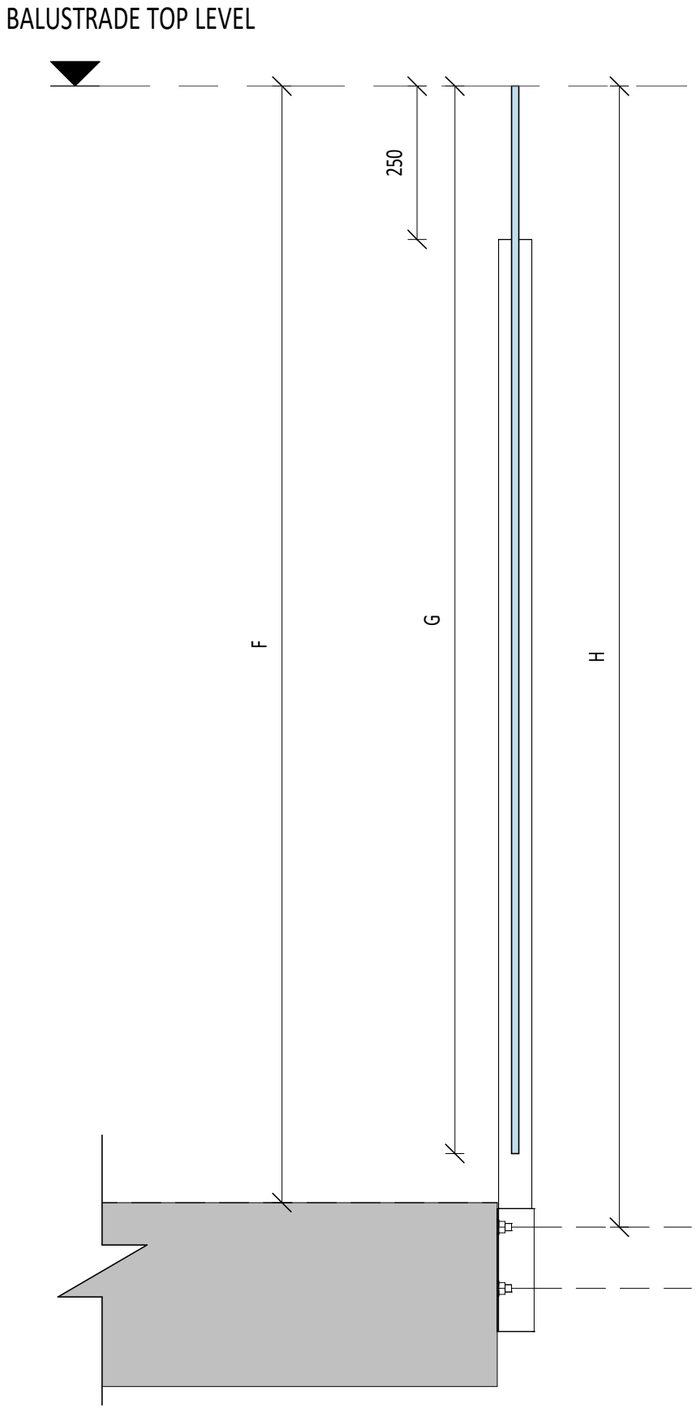
Client: VETRO RACCORDI / FMI BUILDING INNOVATION

Project: SET 3 - POOL FENCE AND WIND BREAK, NO HANDRAIL - LATERAL MOUNTED

Drawing: PANEL SIZES

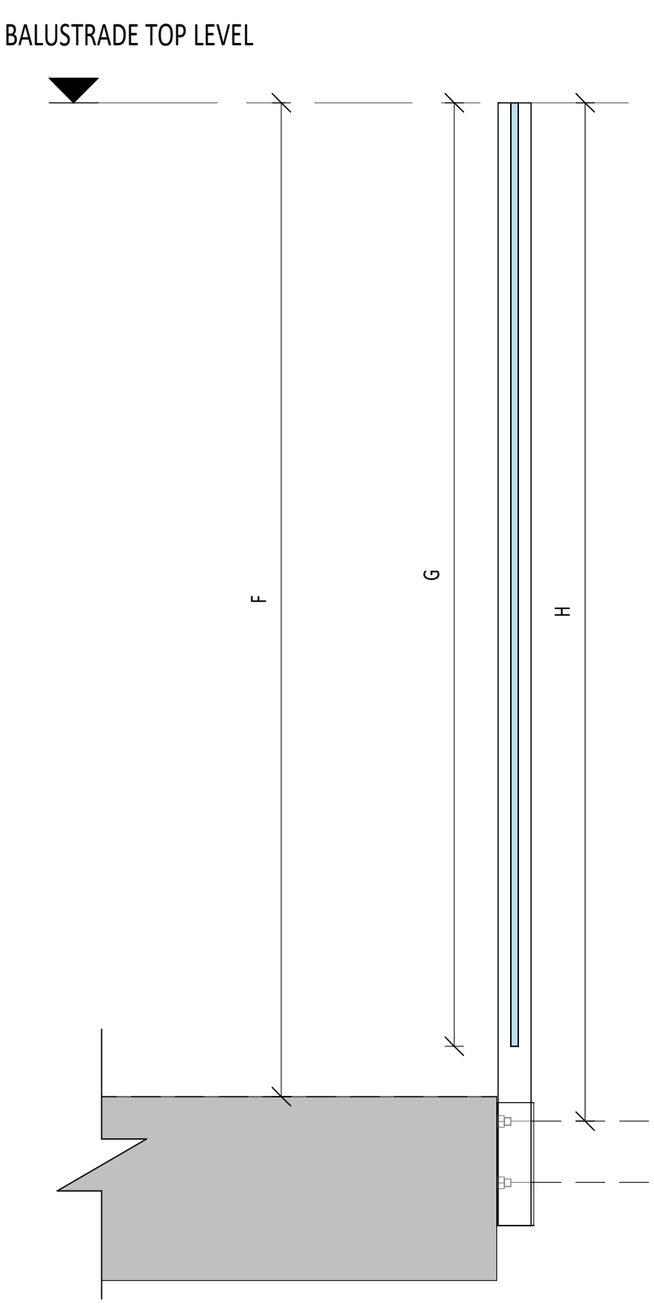
REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
As indicated@A3	SN	PM	-	24042	RF02	R.0



STYLE I1 - GLASS ABOVE POST MODEL 1600

1 : 10



STYLE J1 - POST CAP MODEL 1600

1 : 10

WIND BREAKER CONFIGURATIONS						
MODEL TYPE	**OCCUPANCY**	**WIND ZONE**	**HEIGHT FROM FIXING (H)**	**FFL (F)**	**MAX GLASS HEIGHT (G)**	**POST SPACING mm**
STYLE I1	A, C3, B, E	M	1660	1600	1540	1950
	A, C3, B, E	H	1660	1600	1540	1650
	A, C3, B, E	VH	1660	1600	1540	1350
	A, C3, B, E	EH	1660	1600	1540	1050
STYLE J1	A, C3, B, E	M	1660	1600	1538	1950
	A, C3, B, E	H	1660	1600	1538	1650
	A, C3, B, E	VH	1660	1600	1538	1350
	A, C3, B, E	EH	1660	1600	1538	1050

GLASS NOTES:

12mm NOMINAL THICKNESS FULLY TOUGHENED GLASS.

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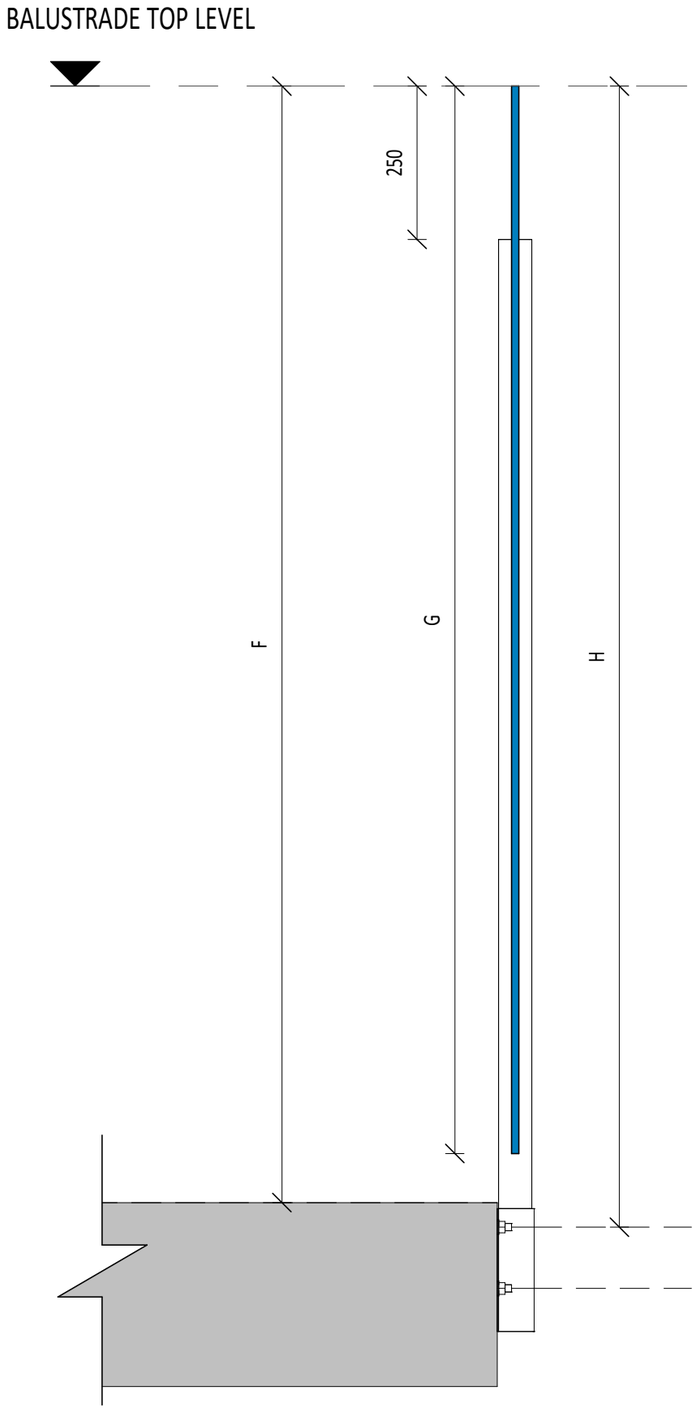
Client: VETRO RACCORDI / FMI BUILDING INNOVATION

Project: SET 3 - POOL FENCE AND WIND BREAK, NO HANDRAIL - LATERAL MOUNTED

Drawing: PANEL SIZES

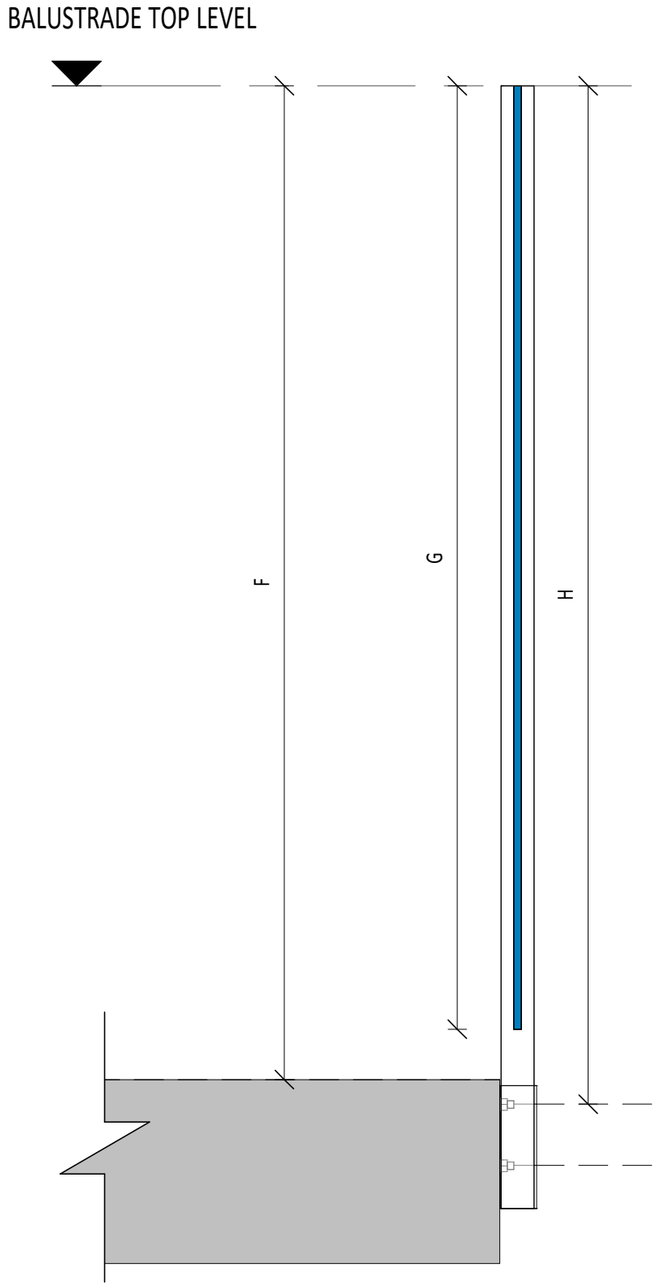
REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
As indicated@A3	SN	PM	-	24042	RF03	R.0



STYLE K1 - GLASS ABOVE POST MODEL 1800

1 : 10



STYLE L1 - POST CAP MODEL 1800

1 : 10

WIND BREAKER CONFIGURATIONS						
MODEL TYPE	**OCCUPANCY**	**WIND ZONE**	**HEIGHT FROM FIXING (H)**	**FFL (F)**	**MAX GLASS HEIGHT (G)**	**POST SPACING mm**
STYLE K1	A, C3, B, E	M	1860	1800	1740	1850
	A, C3, B, E	H	1860	1800	1740	1300
	A, C3, B, E	VH	1860	1800	1740	1100
	A, C3, B, E	EH	1860	1800	1740	0800
STYLE L1	A, C3, B, E	M	1860	1800	1738	1850
	A, C3, B, E	H	1860	1800	1738	1300
	A, C3, B, E	VH	1860	1800	1738	1100
	A, C3, B, E	EH	1860	1800	1738	0800

GLASS NOTES:

12mm NOMINAL THICKNESS FULLY TOUGHENED GLASS.

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Project: SET 3 - POOL FENCE AND WIND BREAK, NO HANDRAIL - LATERAL MOUNTED

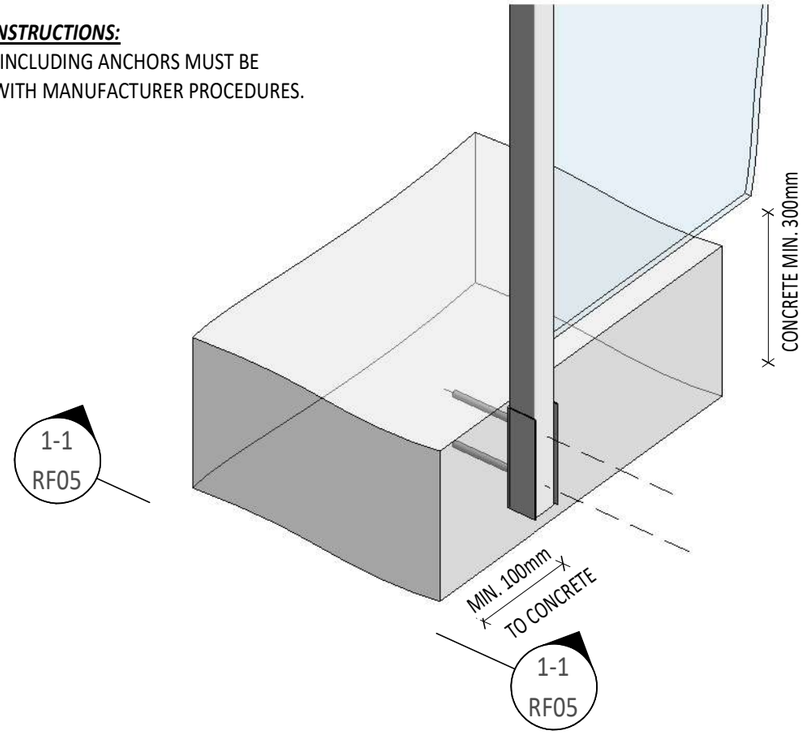
Drawing: PANEL SIZES

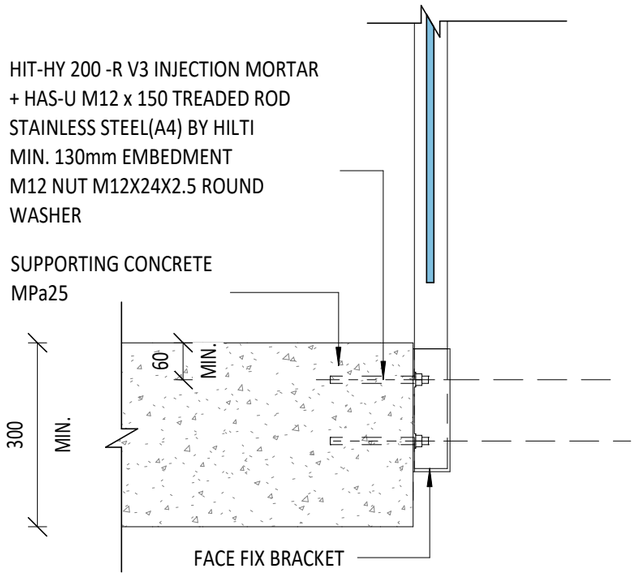
REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
As indicated@A3	SN	PM	-	24042	RF04	R.0

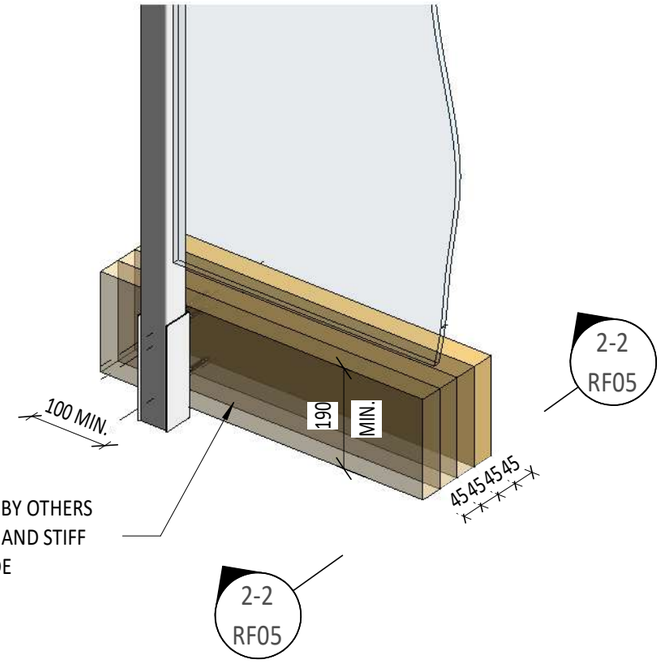
IMPORTANT INSTALLATION INSTRUCTIONS:

ALL PROPRIETARY PRODUCTS INCLUDING ANCHORS MUST BE INSTALLED IN STRICT ORDER WITH MANUFACTURER PROCEDURES.





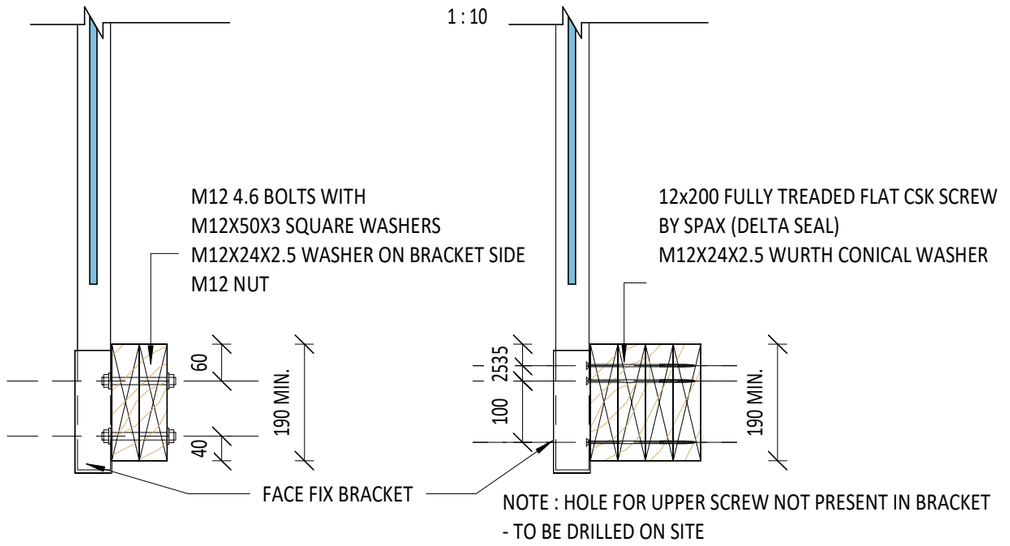
CONNECTION TO CONCRETE - FACE MOUNTED



CONNECTION TO TIMBER - FACE MOUNTED

1-1

1 : 10



TIMBER OPTION 1

TIMBER OPTION 2

NOTE : ONLY OPTION 1 SUITABLE FOR WET TIMBER

2-2

1 : 10

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FMI BUILDING INNOVATION

Project:
SET 3 - POOL FENCE AND WIND BREAK, NO HANDRAIL
- LATERAL MOUNTED

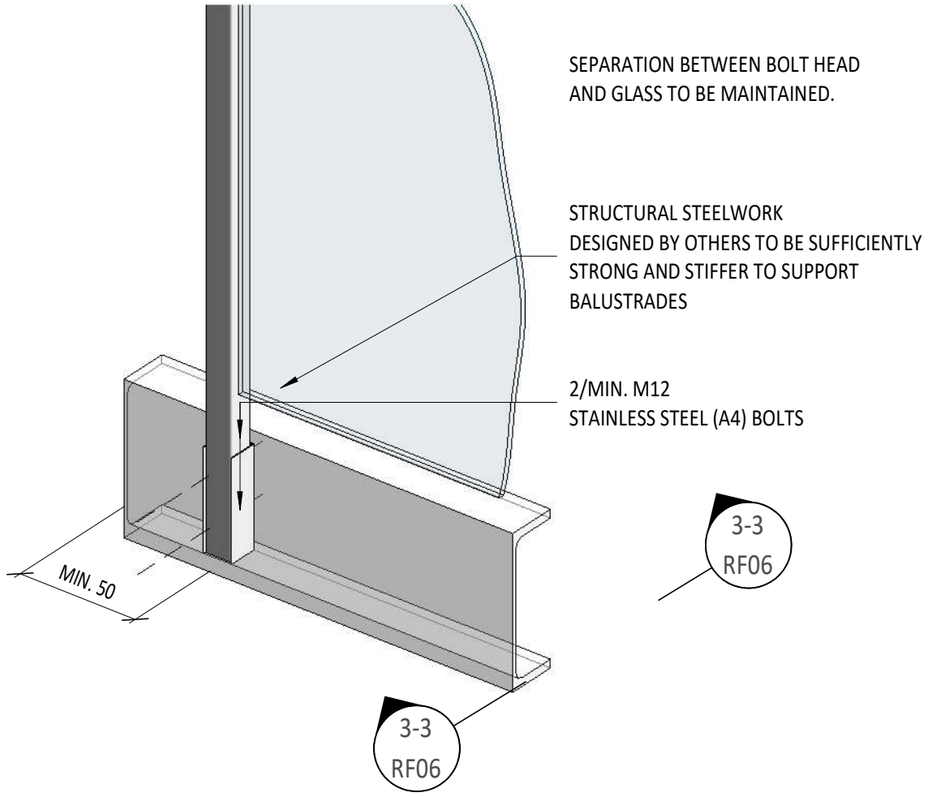
Drawing:
POOL FENCE AND WIND BREAK CONNECTION DETAILS

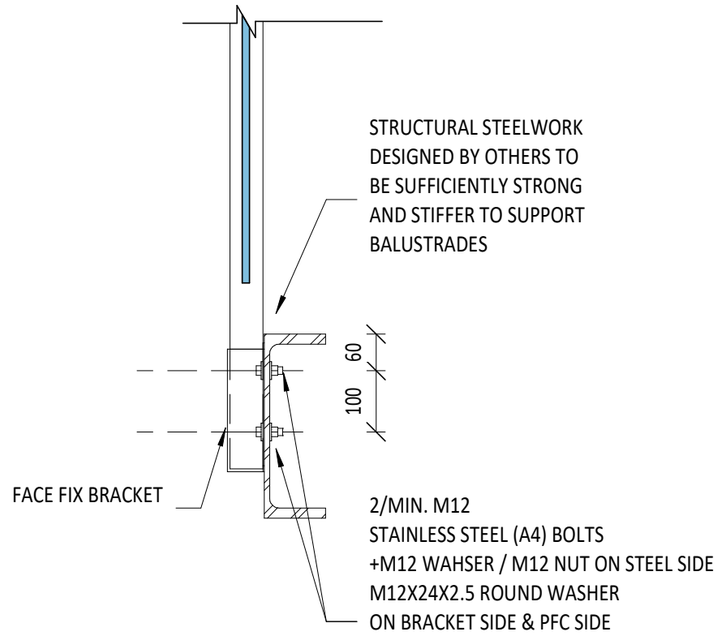
REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
1:10@A3	SN	PM	-	24042	RF05	R.0

IMPORTANT INSTALLATION INSTRUCTIONS:

ALL PROPRIETARY PRODUCTS INCLUDING ANCHORS MUST BE
INSTALLED IN STRICT ORDER WITH MANUFACTURER PROCEDURES.





CONNECTION TO STRUCTURAL STEEL - FACE MOUNTED

3-3

1 : 10

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Client:
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FMI BUILDING INNOVATION

Project:
SET 3 - POOL FENCE AND WIND BREAK, NO HANDRAIL
- LATERAL MOUNTED

Drawing:
POOL FENCE AND WIND BREAK
CONNECTION DETAILS

REF.	DESCRIPTION					DATE
R.0	FOR INFORMATION					2024.12.09
scale: 1:10@A3	drawn: SN	checked: PM	status: -	project no: 24042	drg no: RF06	rev: R.0

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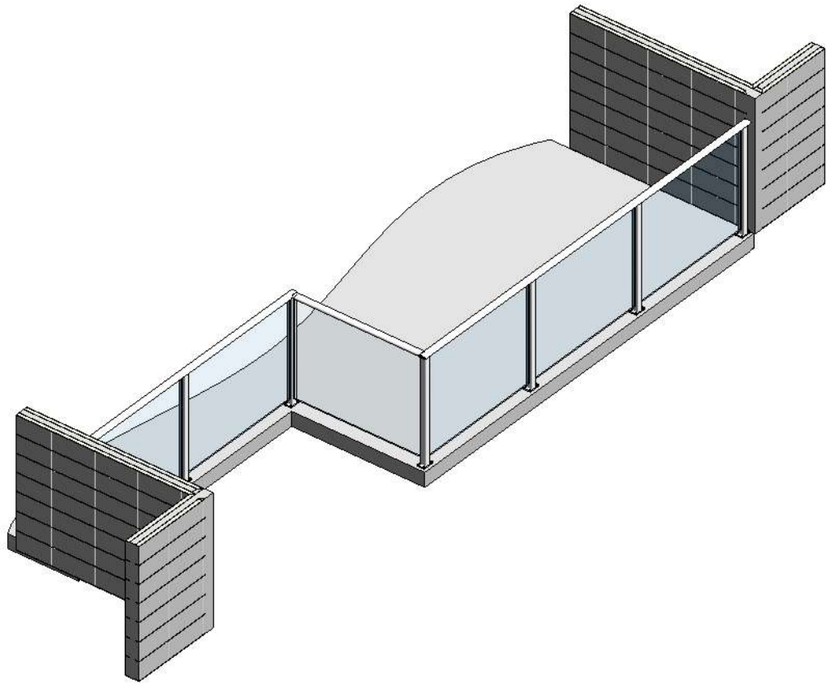
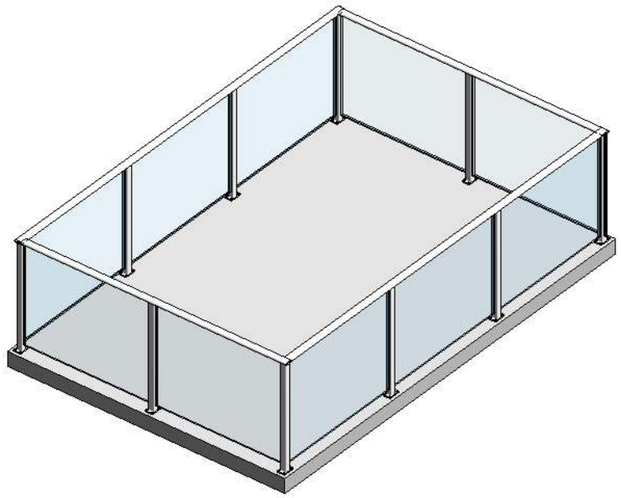
APPENDIX D

Floor Mounted Design
Drawings and Details

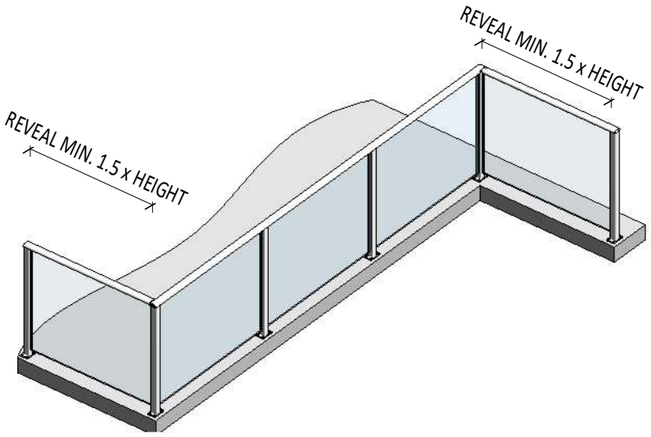
Sheet Number	Sheet Name	Revision	Revision Date	Revision Description
RB01	BALUSTRADE ARRANGEMENT	R.0	2024.12.09	FOR INFORMATION
RB02	PANEL SIZES	R.0	2024.12.09	FOR INFORMATION
RB03	PANEL SIZES	R.0	2024.12.09	FOR INFORMATION
RB04	BALUSTRADE CONNECTION DETAILS	R.0	2024.12.09	FOR INFORMATION



CONTINUOUS BALUSTRADE LINE BETWEEN STRUCTURES



CLOSED PERIMETER



FREE STANDING WITH REVEALS OF MIN. 1.5 x BALUSTRADE HEIGHT

BALUSTRADE / POOL FENCE ARRANGEMENT HAS TO BE CONSISTENT WITH ONE OR COMBINATION OF THE PRESENTED ARRANGEMENTS TO MEET THE LOAD ASSUMPTIONS

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m. 0210398833, m.0211099712
www.extra-mile.co.nz, info@extra-mile.co.nz

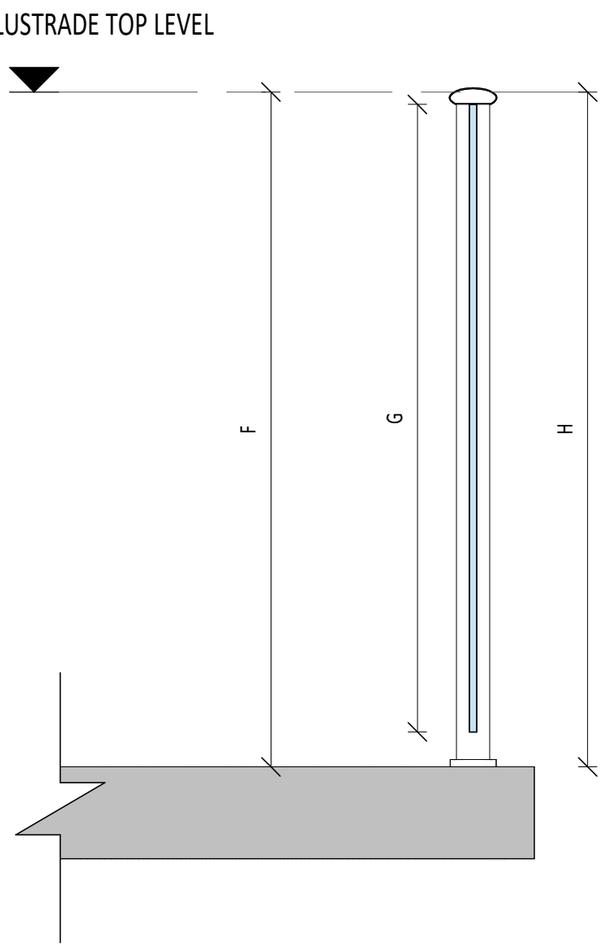
Client:
VETRO RACCORDI /
FMI BUILDING INNOVATION

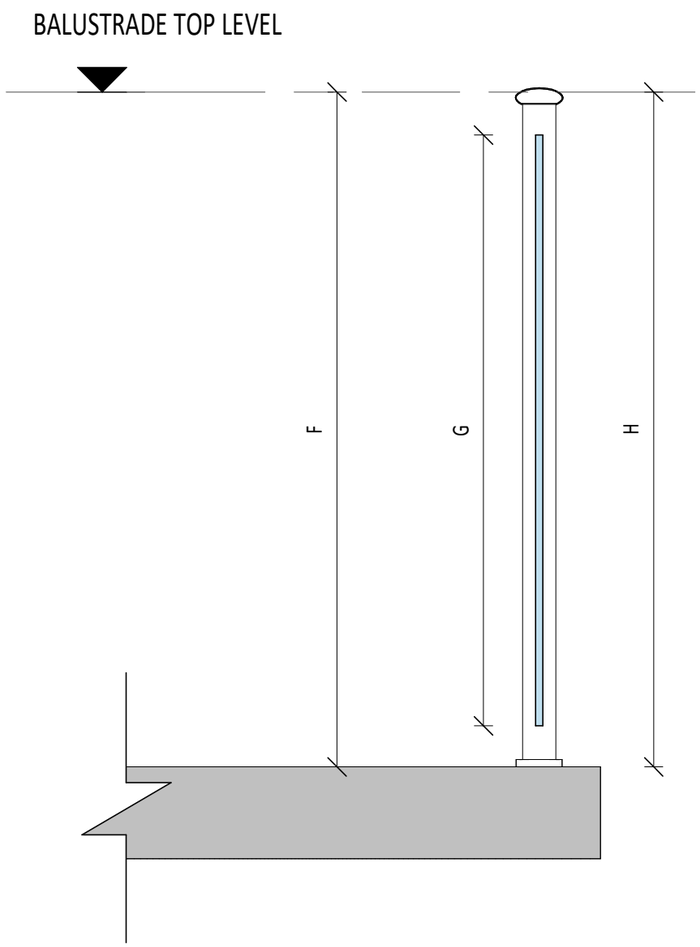
Project:
SET 4 - BALUSTER WITH HANDRAIL
- FLOOR MOUNTED

Drawing:
BALUSTRADE ARRANGEMENT

REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
@A3	SN	PM	-	24042	RB01	R.0





BALUSTRADE CONFIGURATIONS						
MODEL TYPE	**OCCUPANCY**	**WIND ZONE**	**HEIGHT FROM FIXING (H)**	**FFL (F)**	**MAX GLASS HEIGHT (G)**	**POST SPACING mm**
STYLE A	A, C3, B, E	M	1100	1100	1023	1350
	A, C3, B, E	H	1100	1100	1023	1350
	A, C3, B, E	VH	1100	1100	1023	1350
	A, C3, B, E	EH	1100	1100	1023	1150
STYLE B	A, C3, B, E	M	1100	1100	963	1350
	A, C3, B, E	H	1100	1100	963	1350
	A, C3, B, E	VH	1100	1100	963	1350
	A, C3, B, E	EH	1100	1100	963	1150

STYLE A - GLASS INTO HANDRAIL MODEL

1 : 10

STYLE B - GAP AT TOP OF GLASS MODEL-50mm

1 : 10

GLASS NOTES:

12mm NOMINAL THICKNESS FULLY TOUGHENED GLASS.

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Client:
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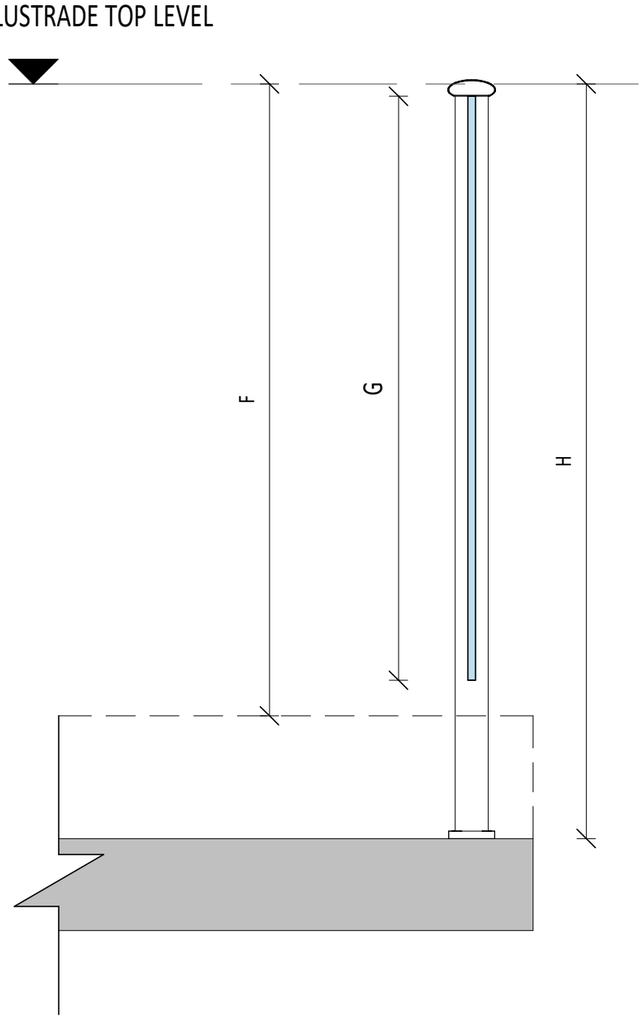
FMI BUILDING INNOVATION

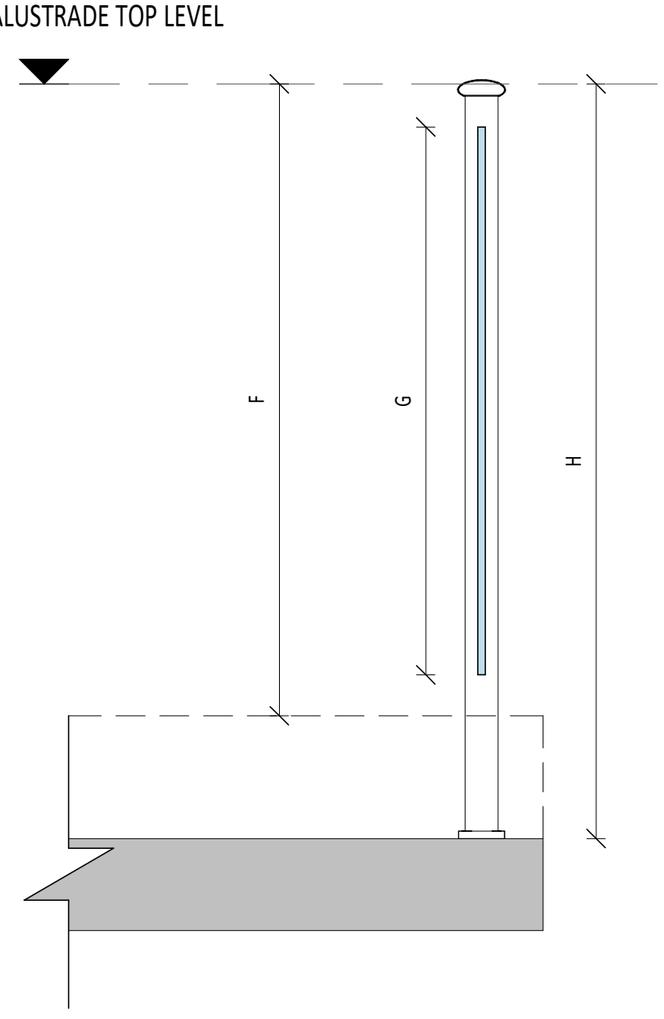
Project:
SET 4 - BALUSTER WITH HANDRAIL
- FLOOR MOUNTED

Drawing:
PANEL SIZES

REF.	DESCRIPTION					DATE
R.0	FOR INFORMATION					2024.12.09
scale: As indicated@A3	drawn: SN	checked: PM	status: -	project no: 24042	drg no: RB02	rev: R.0



STYLE C - FLOATING DECK GLASS INTO HANDRAIL MODEL
1 : 10



STYLE D - FLOATING DECK GAP AT TOP OF GLASS MODEL-50mm
1 : 10

BALUSTRADE CONFIGURATIONS - FLOATING DECK						
MODEL TYPE	**OCCUPANCY**	**WIND ZONE**	**HEIGHT FROM FIXING (H)**	**FFL (F)**	**MAX GLASS HEIGHT (G)**	**POST SPACING (S)**
STYLE C	A, C3, B, E	M	1230	1030	953	1200
	A, C3, B, E	H	1230	1030	953	1200
	A, C3, B, E	VH	1230	1030	953	1200
	A, C3, B, E	EH	1230	1030	953	0950
STYLE D	A, C3, B, E	M	1230	1030	893	1200
	A, C3, B, E	H	1230	1030	893	1200
	A, C3, B, E	VH	1230	1030	893	1200
	A, C3, B, E	EH	1230	1030	893	1000

GLASS NOTES:

12mm NOMINAL THICKNESS FULLY TOUGHENED GLASS.

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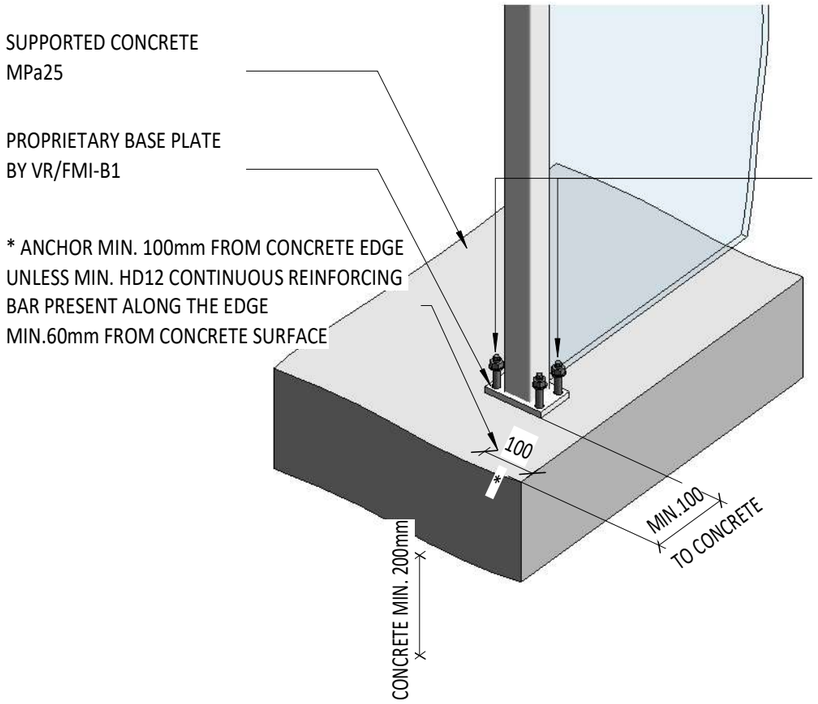
Client:
VETRO RACCORDI /
FMI BUILDING INNOVATION

Project:
SET 4 - BALUSTER WITH HANDRAIL
- FLOOR MOUNTED

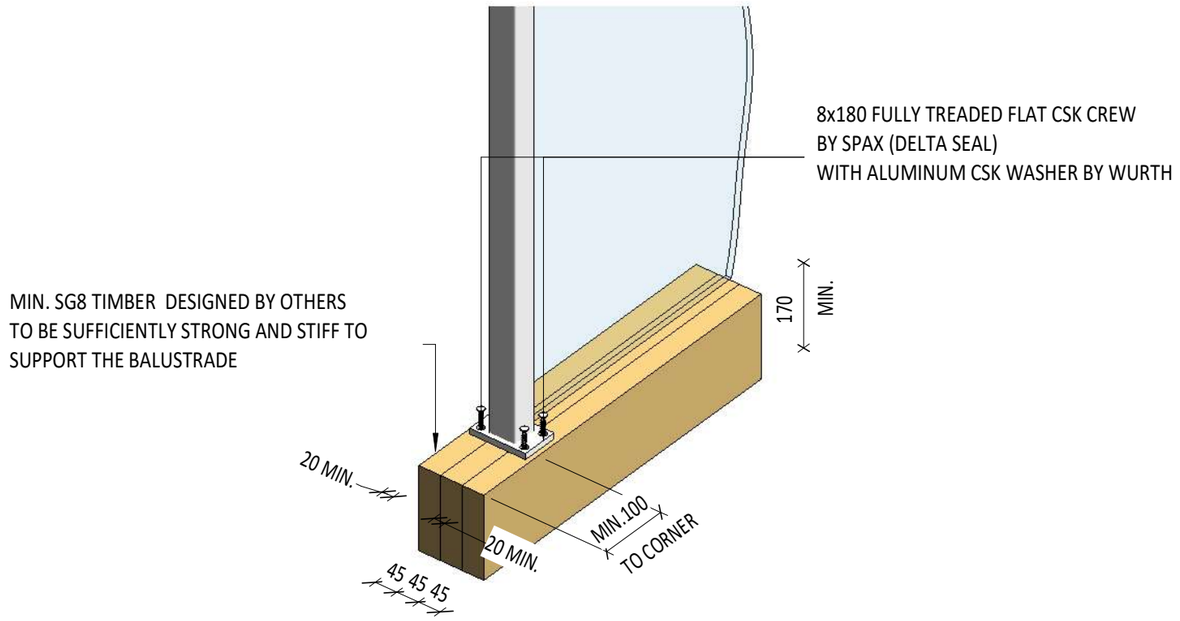
Drawing:
PANEL SIZES

REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

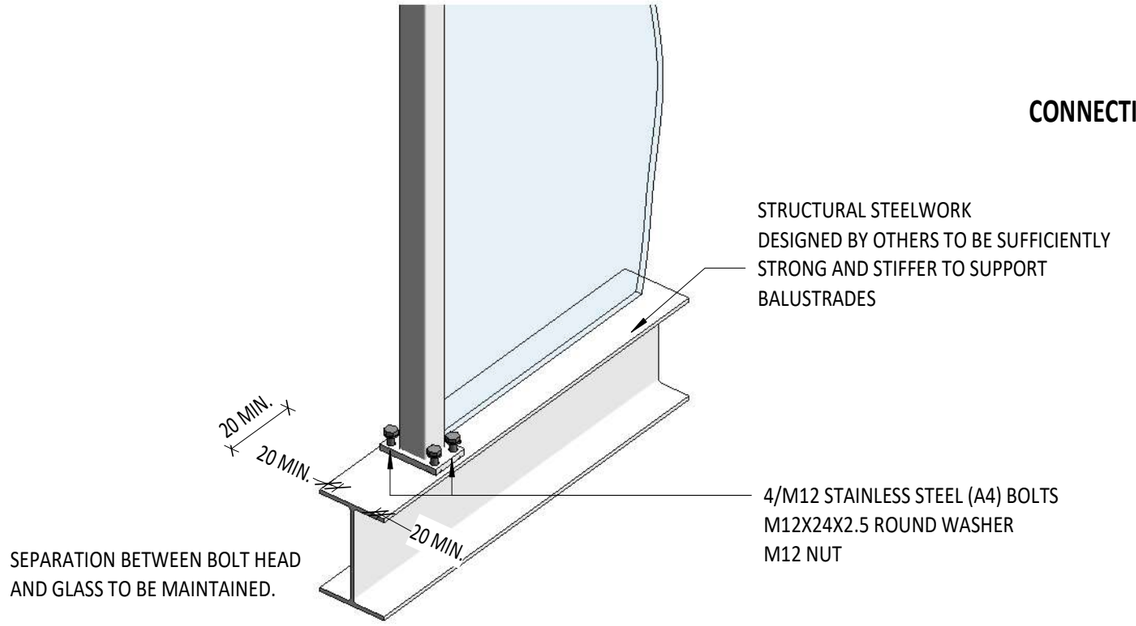
scale:	drawn:	checked:	status:	project no:	drg no:	rev:
As indicated@A3	SN	PM	-	24042	RB03	R.0



CONNECTION TO CONCRETE



CONNECTION TO TIMBER



CONNECTION TO STRUCTURAL STEEL

IMPORTANT INSTALLATION INSTRUCTIONS:

ALL PROPRIETARY PRODUCTS INCLUDING ANCHORS MUST BE INSTALLED IN STRICT ORDER WITH MANUFACTURER PROCEDURES.

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Client: VETRO RACCORDI / FMI BUILDING INNOVATION

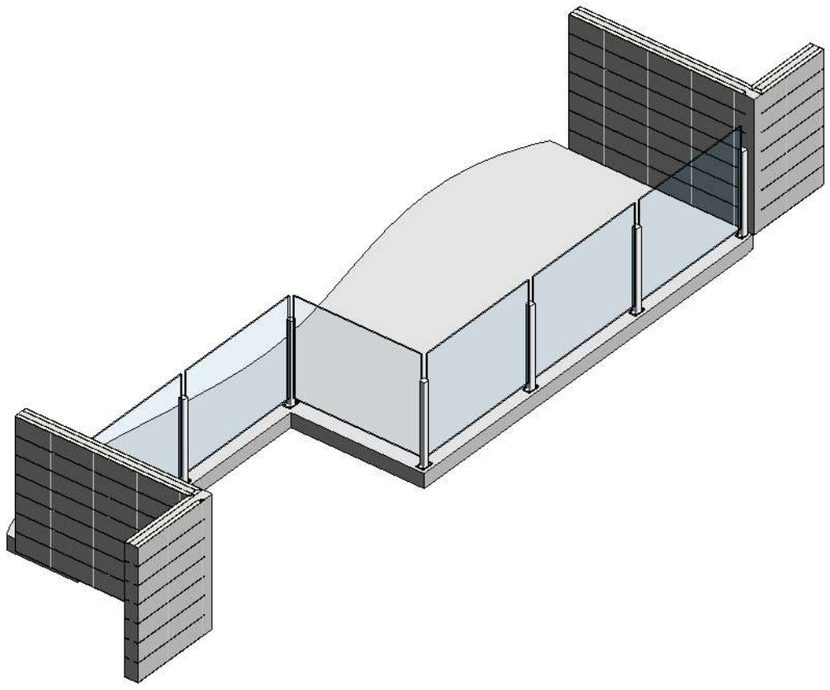
Project: SET 4 - BALUSTER WITH HANDRAIL - FLOOR MOUNTED

Drawing: BALUSTRADE CONNECTION DETAILS

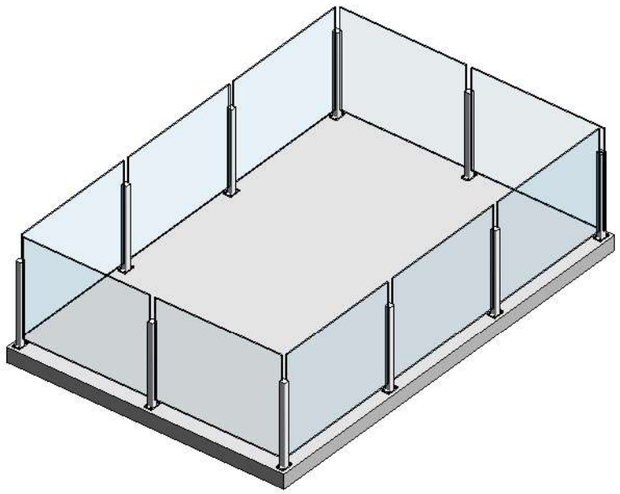
REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
@A3	SN	PM	-	24042	RB04	R.0

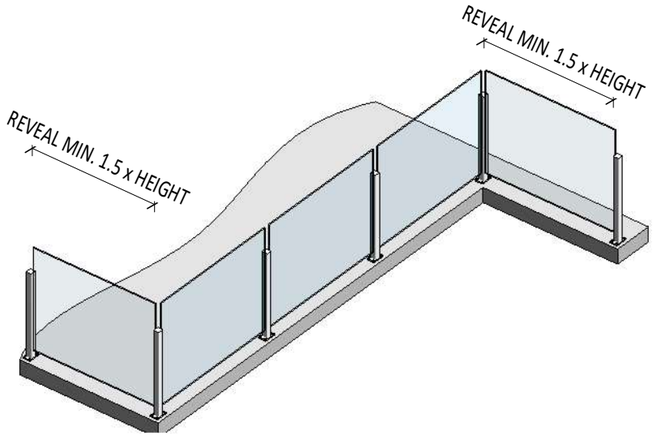
Sheet Number	Sheet Name	Revision	Revision Date	Revision Description
RB01	BALUSTRADE ARRANGEMENT	R.0	2024.12.09	FOR INFORMATION
RB02	PANEL SIZES	R.0	2024.12.09	FOR INFORMATION
RB03	BALUSTRADE CONNECTION DETAILS	R.0	2024.12.09	FOR INFORMATION



CONTINUOUS BALUSTRADE LINE BETWEEN STRUCTURES



CLOSED PERIMETER



FREE STANDING WITH REVEALS OF MIN. 1.5 x BALUSTRADE HEIGHT

BALUSTRADE / POOL FENCE ARRANGEMENT HAS TO BE CONSISTENT WITH ONE OR COMBINATION OF THE PRESENTED ARRANGEMENTS TO MEET THE LOAD ASSUMPTIONS

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Client:
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FMI BUILDING INNOVATION

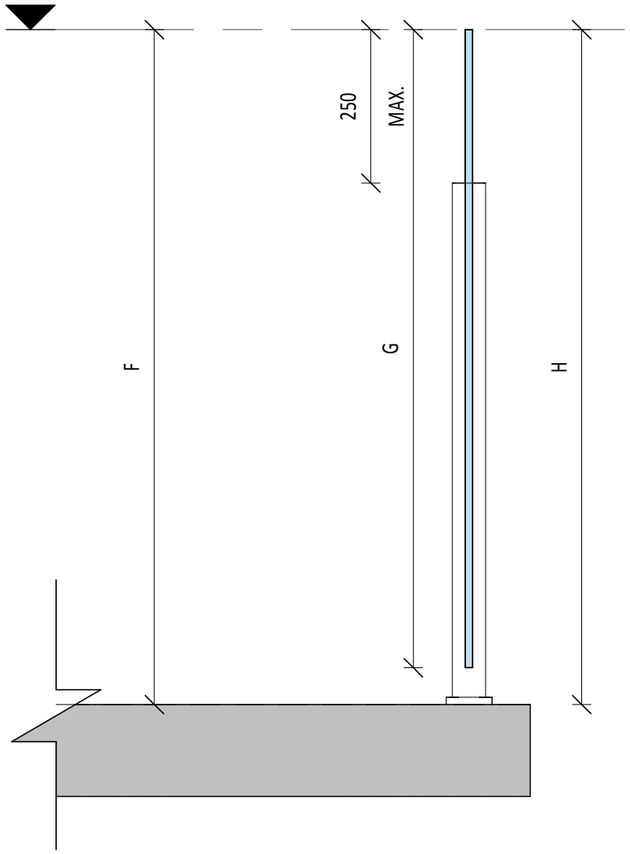
Project:
SET 5 - BALUSTER WITH NO HANDRAIL
- FLOOR MOUNTED

Drawing:
BALUSTRADE ARRANGEMENT

REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
@A3	SN	PM	-	24042	RB01	R.0

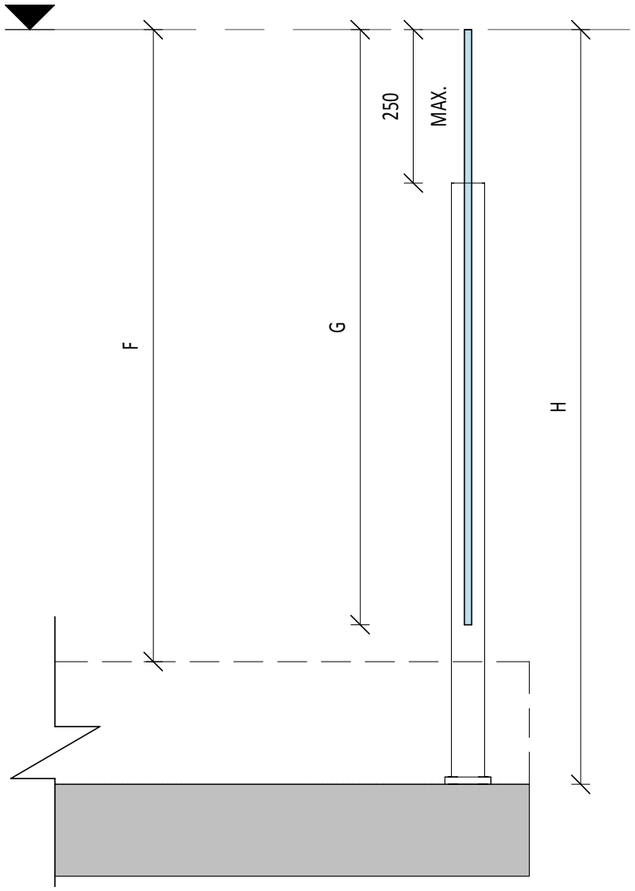
BALUSTRADE TOP LEVEL



STYLE E - GLASS ABOVE POST MODEL

1 : 10

BALUSTRADE TOP LEVEL



STYLE F - FLOATING DECK GLASS ABOVE POST MODEL

1 : 10

BALUSTRADE CONFIGURATIONS						
MODEL TYPE	**OCCUPANCY**	**WIND ZONE**	**HEIGHT FROM FIXING (H)**	**FFL (F)**	**MAX GLASS HEIGHT (G)**	**POST SPACING mm**
STYLE E	A, C3, B, E	M	1100	1100	1040	1350
	A, C3, B, E	H	1100	1100	1040	1350
	A, C3, B, E	VH	1100	1100	1040	1350
	A, C3, B, E	EH	1100	1100	1040	1150
STYLE F	A, C3, B, E	M	1230	1030	970	1200
	A, C3, B, E	H	1230	1030	970	1200
	A, C3, B, E	VH	1230	1030	970	1200
	A, C3, B, E	EH	1230	1030	970	0950

GLASS NOTES:

12mm NOMINAL THICKNESS FULLY TOUGHENED GLASS.

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Client:
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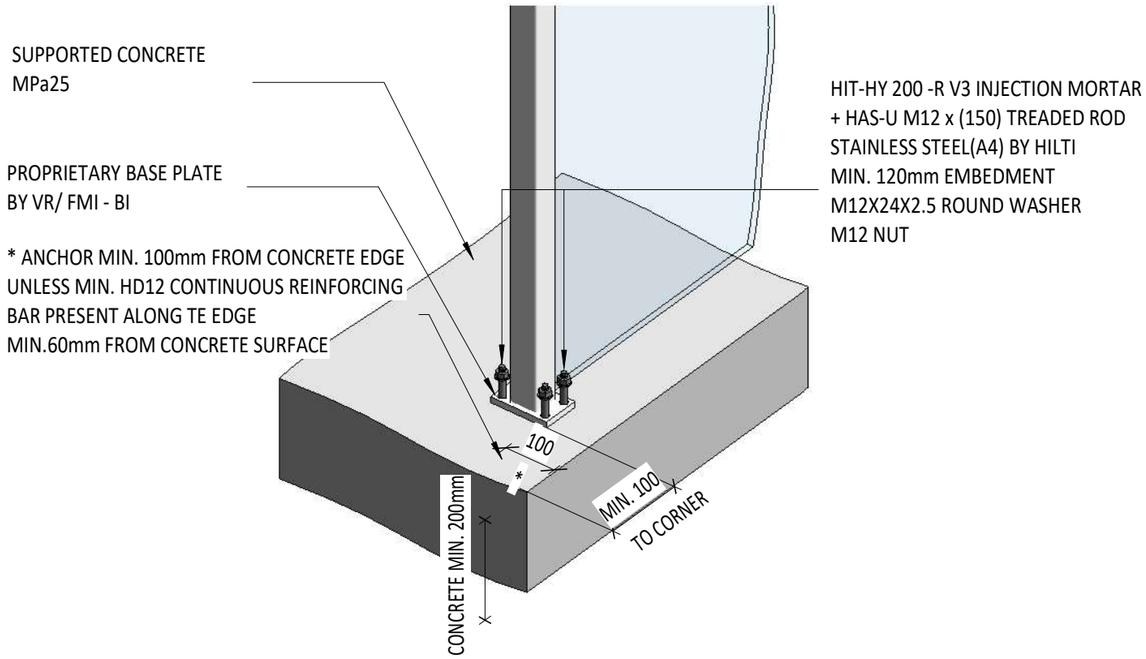
FMI BUILDING INNOVATION

Project:
SET 5 - BALUSTER WITH NO HANDRAIL
- FLOOR MOUNTED

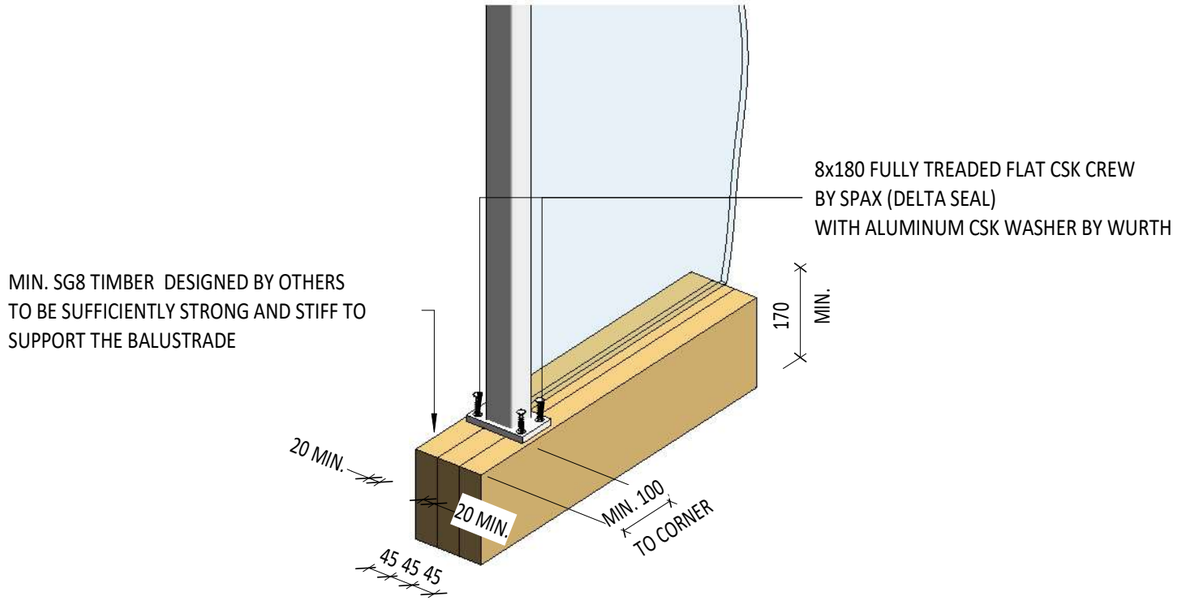
Drawing:
PANEL SIZES

REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

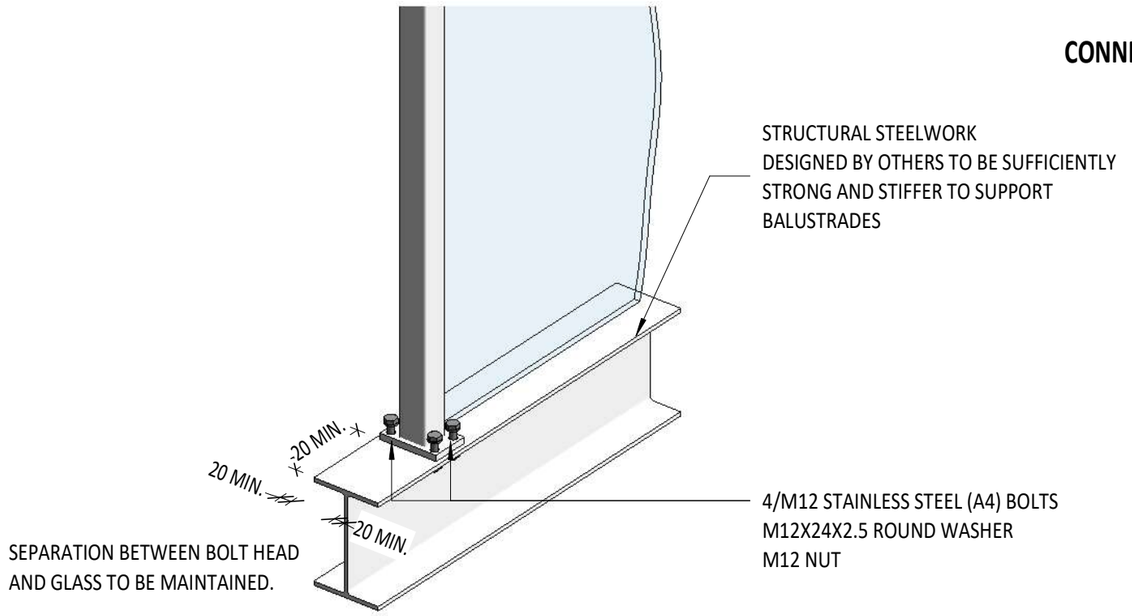
scale:	drawn:	checked:	status:	project no:	drg no:	rev:
As indicated@A3	SN	PM	-	24042	RB02	R.0



CONNECTION TO CONCRETE



CONNECTION TO TIMBER



CONNECTION TO STRUCTURAL STEEL

IMPORTANT INSTALLATION INSTRUCTIONS:

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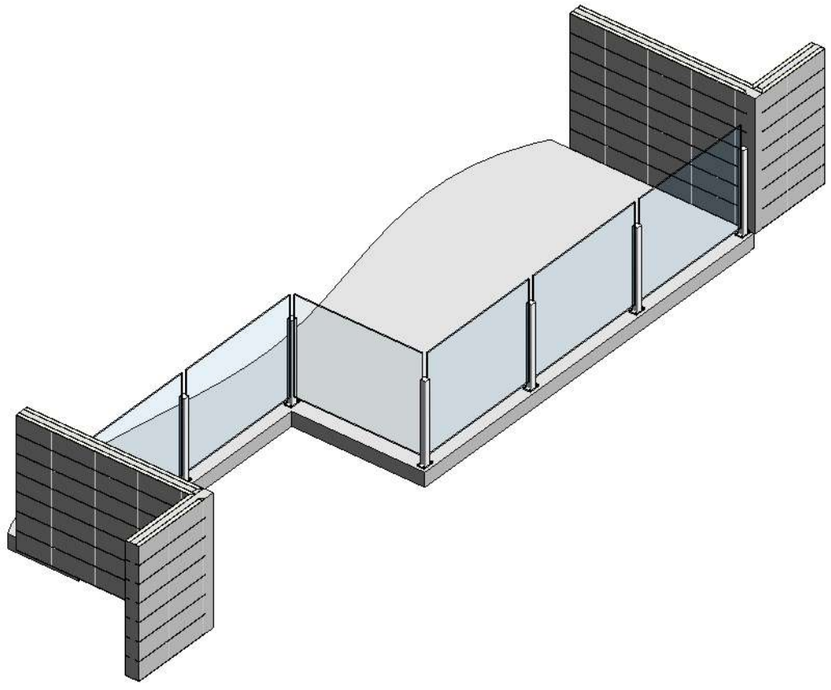
Project: SET 5 - BALUSTER WITH NO HANDRAIL - FLOOR MOUNTED

Drawing: BALUSTRADE CONNECTION DETAILS

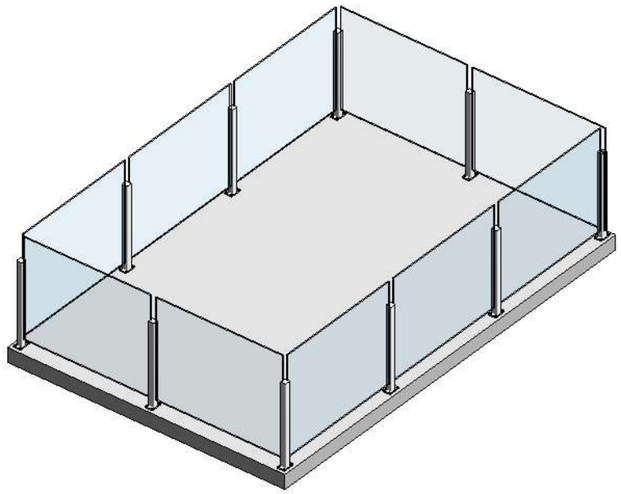
REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
@A3	SN	PM	-	24042	RB03	R.0

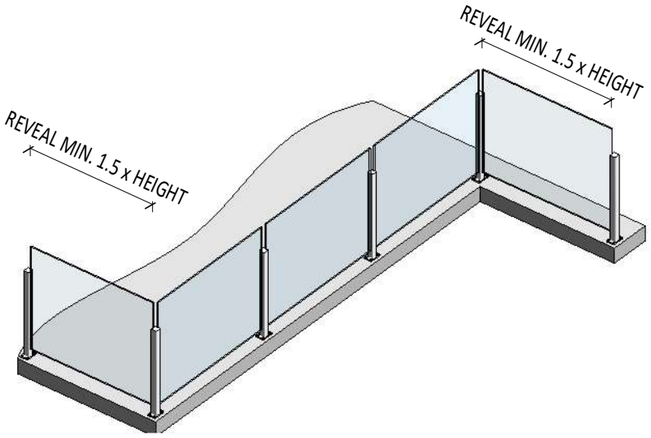
Sheet Number	Sheet Name	Revision	Revision Date	Revision Description
RF01	POOL FENCE ARRANGEMENT	R.0	2024.12.09	FOR INFORMATION
RF02	PANEL SIZES	R.0	2024.12.09	FOR INFORMATION
RF03	PANEL SIZES	R.0	2024.12.09	FOR INFORMATION
RF04	PANEL SIZES	R.0	2024.12.09	FOR INFORMATION
RF05	POOL FENCE CONNECTION DETAILS	R.0	2024.12.09	FOR INFORMATION



CONTINUOUS BALUSTRADE LINE BETWEEN STRUCTURES



CLOSED PERIMETER



FREE STANDING WITH REVEALS OF MIN. 1.5 x BALUSTRADE HEIGHT

BALUSTRADE / POOL FENCE ARRANGEMENT HAS TO BE CONSISTENT WITH ONE OR COMBINATION OF THE PRESENTED ARRANGEMENTS TO MEET THE LOAD ASSUMPTIONS

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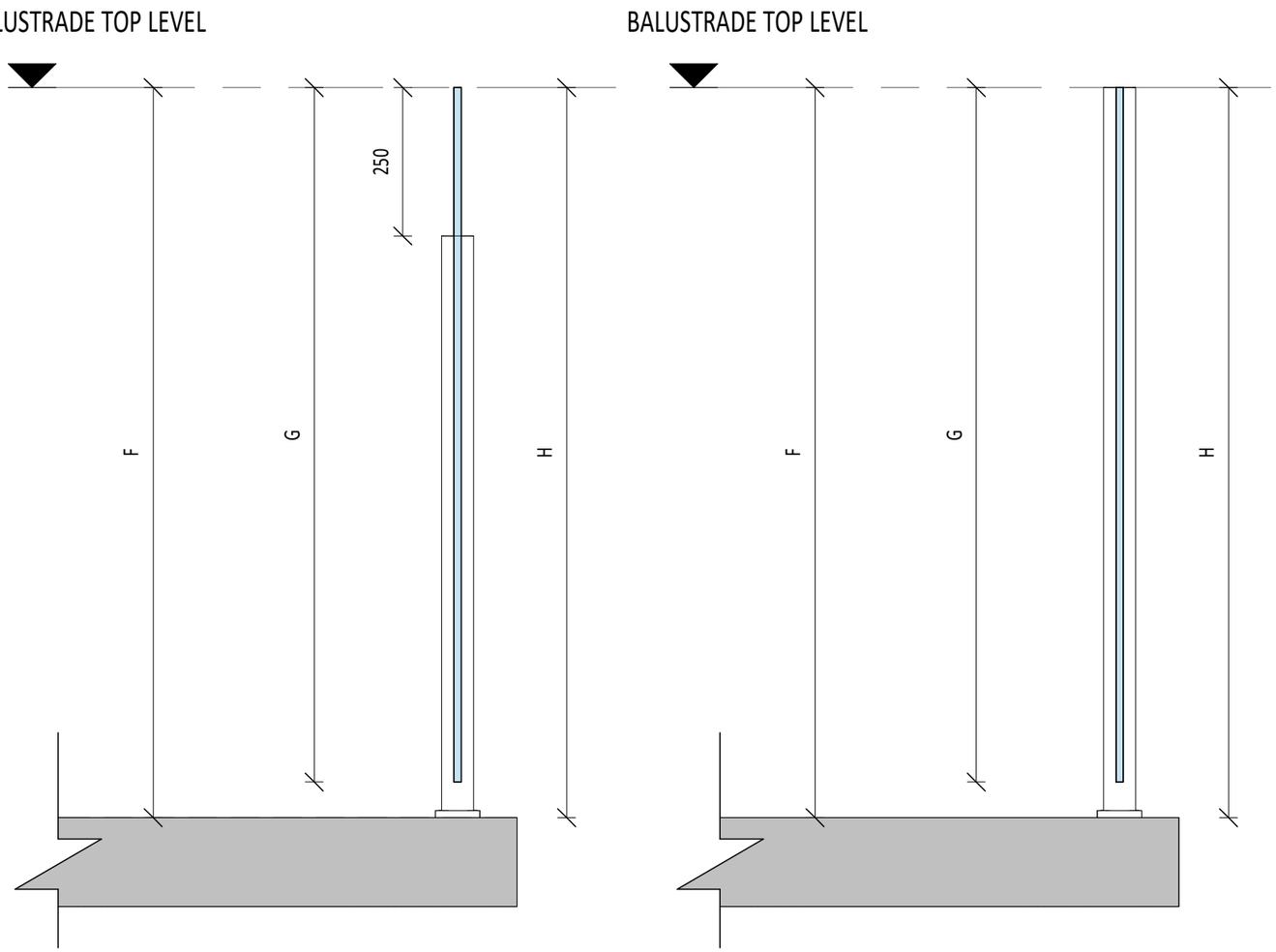
Client:
VETRO RACCORDI /
FMI BUILDING INNOVATION

Project:
SET 6 - POOL FENCE AND WIND BREAK
- FLOOR MOUNTED

Drawing:
POOL FENCE ARRANGEMENT

REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
@A3	SN	PM	-	24042	RF01	R.0



STYLE G - GLASS ABOVE POST MODEL

1 : 10

STYLE H - POST CAP MODEL

1 : 10

POOL FENCE CONFIGURATIONS						
MODEL TYPE	**OCCUPANCY**	**WIND ZONE**	**HEIGHT FROM FIXING (H)**	**FFL (F)**	**MAX GLASS HEIGHT (G)**	**POST SPACING mm**
STYLE G	A, C3, B, E	M	1230	1230	1170	1950
	A, C3, B, E	H	1230	1230	1170	1450
	A, C3, B, E	VH	1230	1230	1170	1200
	A, C3, B, E	EH	1230	1230	1170	900
STYLE H	A, C3, B, E	M	1230	1230	1170	1950
	A, C3, B, E	H	1230	1230	1170	1450
	A, C3, B, E	VH	1230	1230	1170	1200
	A, C3, B, E	EH	1230	1230	1170	900

GLASS NOTES:

12mm NOMINAL THICKNESS FULLY TOUGHENED GLASS.

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Client:
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FMI BUILDING INNOVATION

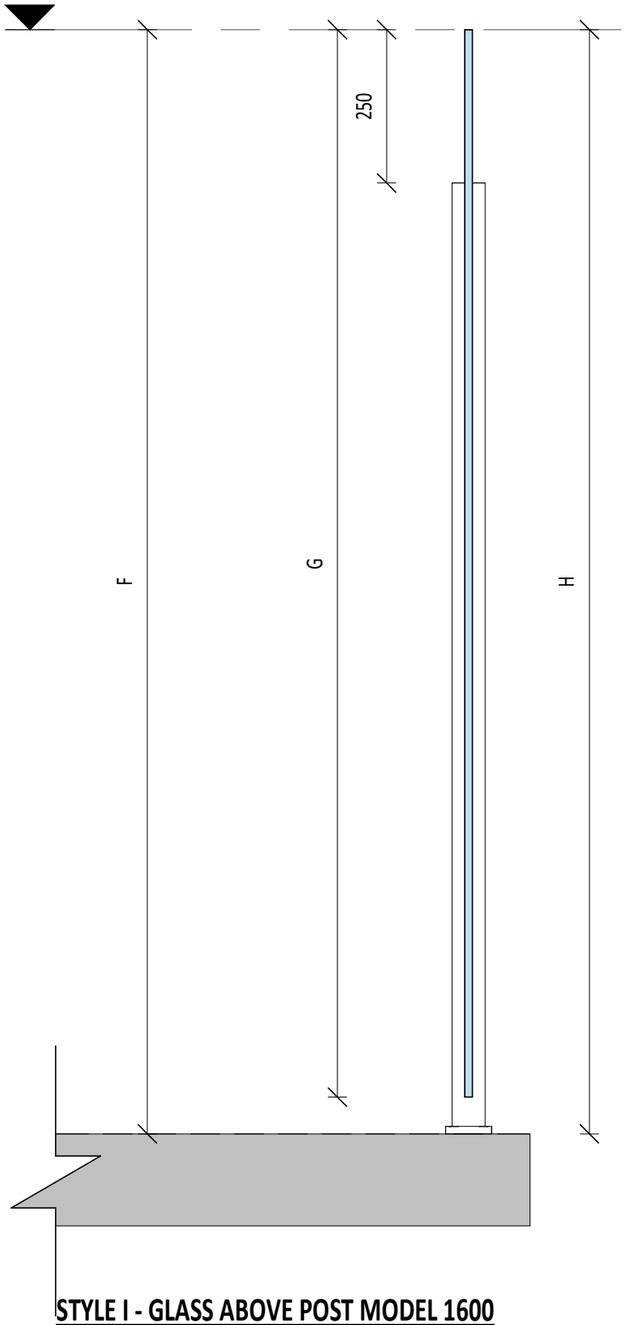
Project:
SET 6 - POOL FENCE AND WIND BREAK
- FLOOR MOUNTED

Drawing:
PANEL SIZES

REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
As indicated@A3	SN	PM	-	24042	RF02	R.0

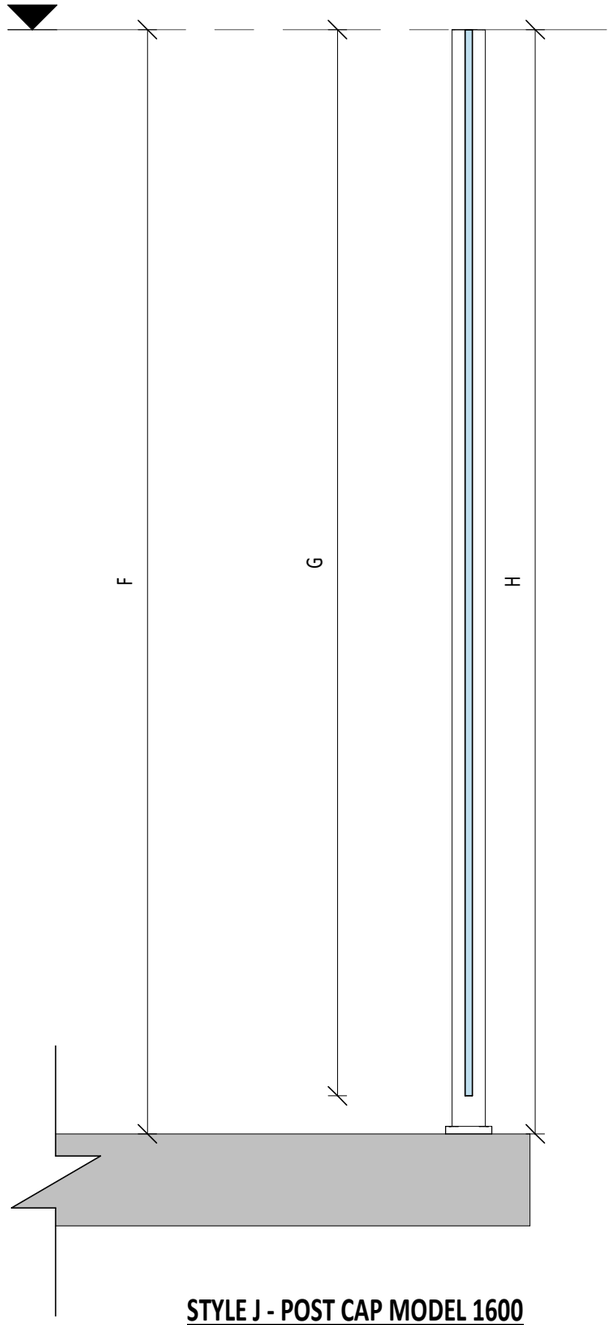
BALUSTRADE TOP LEVEL



STYLE I - GLASS ABOVE POST MODEL 1600

1 : 10

BALUSTRADE TOP LEVEL



STYLE J - POST CAP MODEL 1600

1 : 10

WIND BREAKER CONFIGURATIONS						
MODEL TYPE	**OCCUPANCY**	**WIND ZONE**	**HEIGHT FROM FIXING (H)**	**FFL (F)**	**MAX GLASS HEIGHT (G)**	**POST SPACING mm**
STYLE I	A, C3, B, E	M	1600	1600	1540	1200
	A, C3, B, E	H	1600	1600	1540	850
	A, C3, B, E	VH	1600	1600	1540	700
	A, C3, B, E	EH	1600	1600	1540	550
STYLE J	A, C3, B, E	M	1600	1600	1538	1200
	A, C3, B, E	H	1600	1600	1538	850
	A, C3, B, E	VH	1600	1600	1538	700
	A, C3, B, E	EH	1600	1600	1538	550

GLASS NOTES:

12mm NOMINAL THICKNESS FULLY TOUGHENED GLASS.

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Client:
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FMI BUILDING INNOVATION

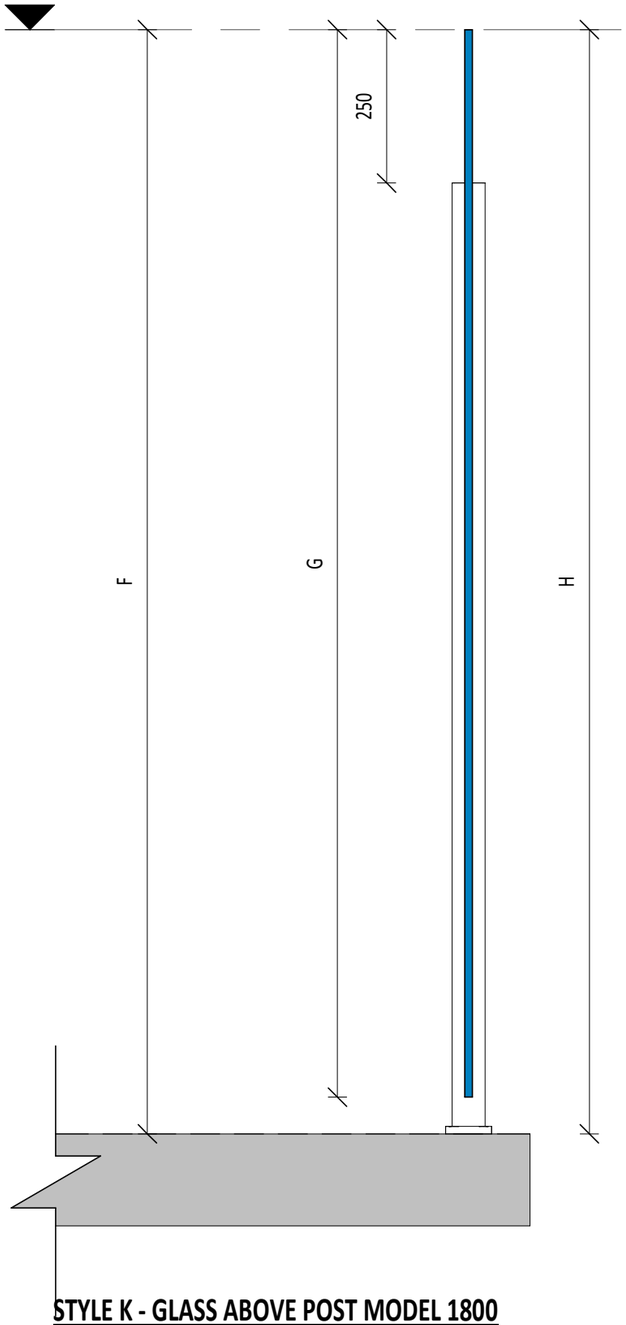
Project:
SET 6 - POOL FENCE AND WIND BREAK
- FLOOR MOUNTED

Drawing:
PANEL SIZES

REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
As indicated@A3	SN	PM	-	24042	RF03	R.0

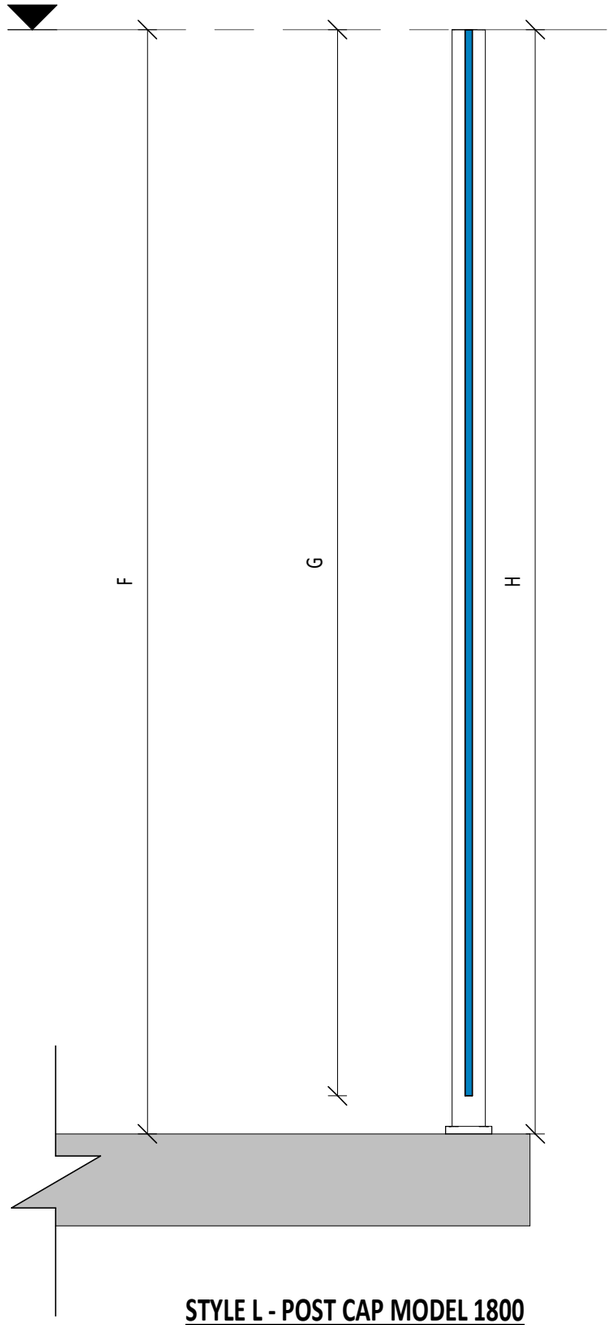
BALUSTRADE TOP LEVEL



STYLE K - GLASS ABOVE POST MODEL 1800

1 : 10

BALUSTRADE TOP LEVEL



STYLE L - POST CAP MODEL 1800

1 : 10

WIND BREAKER CONFIGURATIONS

MODEL TYPE	OCCUPANCY	WIND ZONE	HEIGHT FROM FIXING (H)	FFL (F)	MAX GLASS HEIGHT (G)	POST SPACING mm
STYLE K	A, C3, B, E	M	1800	1800	1740	950
	A, C3, B, E	H	1800	1800	1740	650
	A, C3, B, E	VH	1800	1800	1740	550
	A, C3, B, E	EH	1800	1800	1740	400
STYLE L	A, C3, B, E	M	1800	1800	1738	950
	A, C3, B, E	H	1800	1800	1738	650
	A, C3, B, E	VH	1800	1800	1738	550
	A, C3, B, E	EH	1800	1800	1738	400

GLASS NOTES:

12mm NOMINAL THICKNESS FULLY TOUGHENED GLASS.

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Client:
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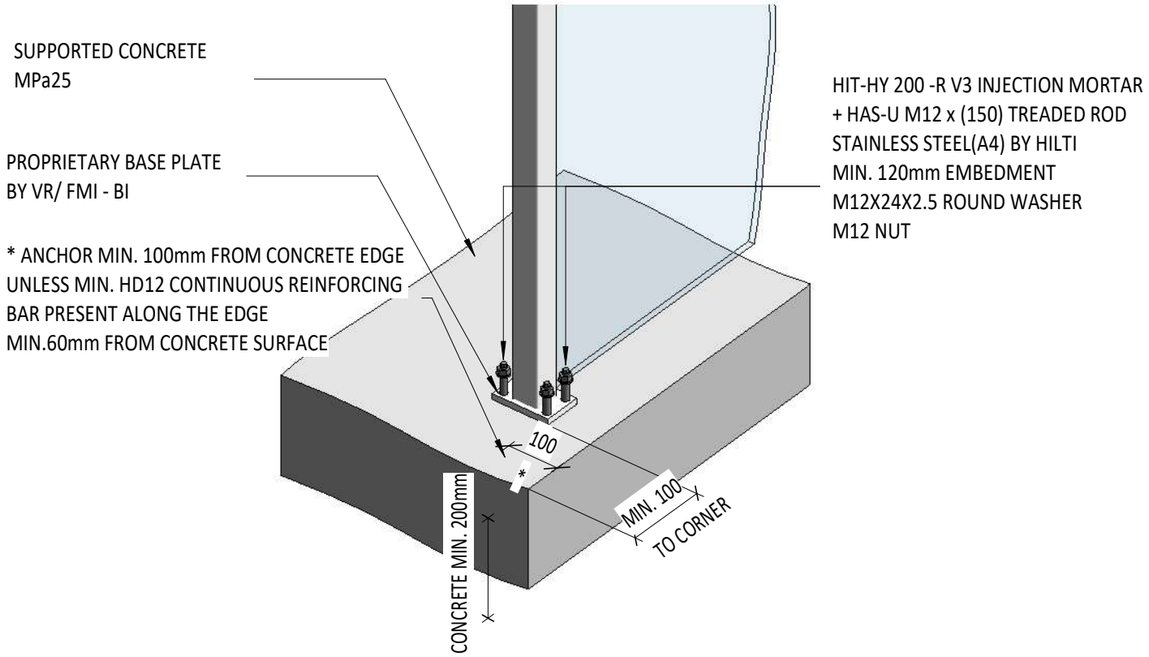
Project:
SET 6 - POOL FENCE AND WIND BREAK
- FLOOR MOUNTED

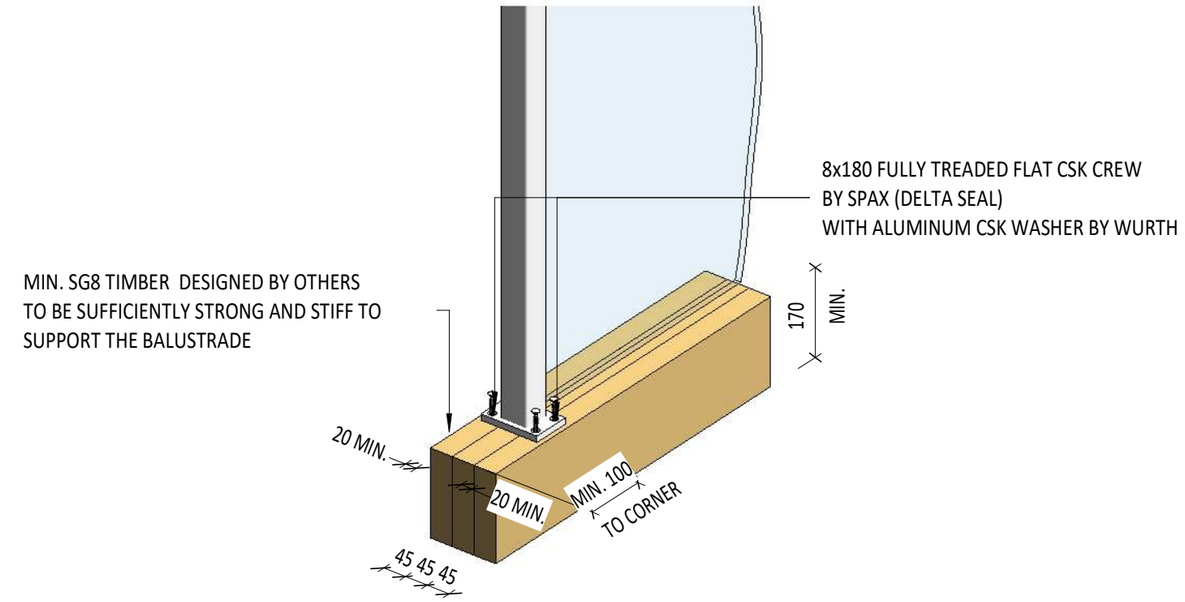
Drawing:
PANEL SIZES

REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

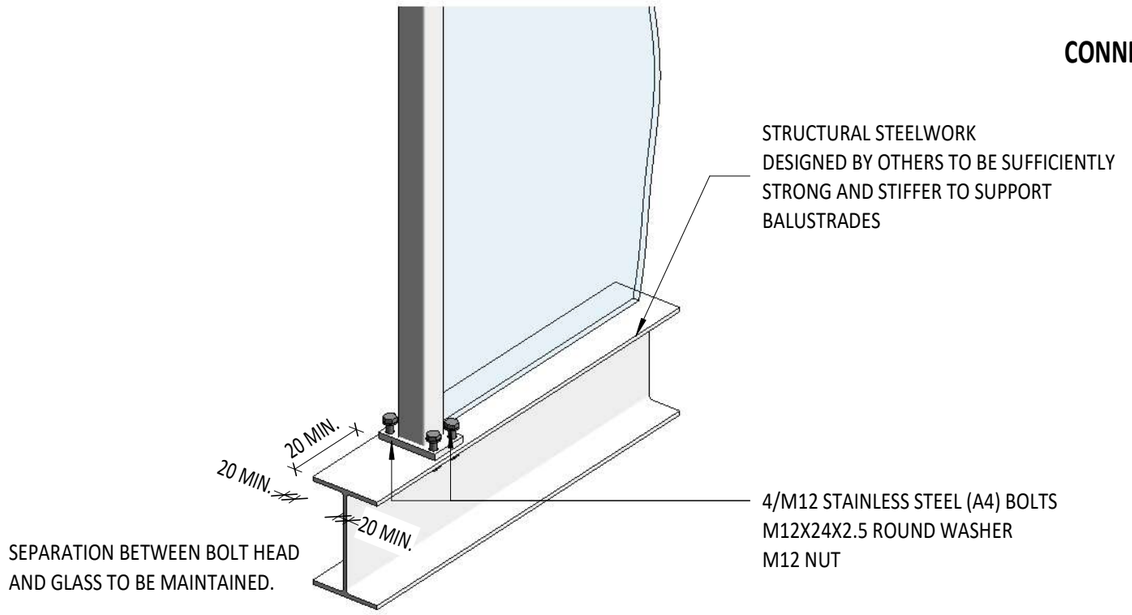
scale:	drawn:	checked:	status:	project no:	drg no:	rev:
As indicated@A3	SN	PM	-	24042	RF04	R.0



CONNECTION TO CONCRETE



CONNECTION TO TIMBER



CONNECTION TO STRUCTURAL STEEL

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Client: VETRO RACCORDI / FMI BUILDING INNOVATION

Project: SET 6 - POOL FENCE AND WIND BREAK - FLOOR MOUNTED

Drawing: POOL FENCE CONNECTION DETAILS

REF.	DESCRIPTION	DATE
R.0	FOR INFORMATION	2024.12.09

scale:	drawn:	checked:	status:	project no:	drg no:	rev:
@A3	SN	PM	-	24042	RF05	R.0