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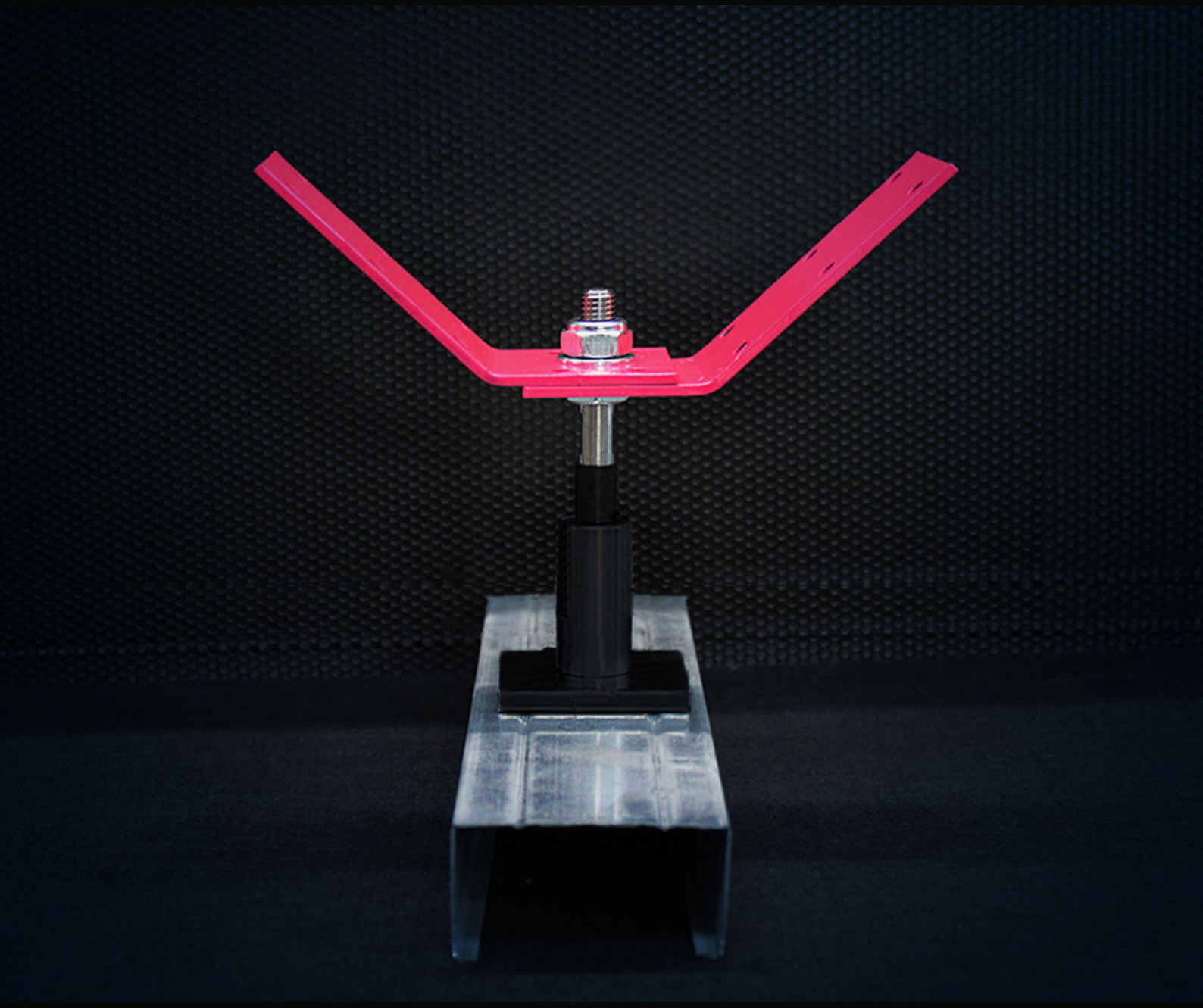
VertiBrace®

A new standard in partition restraint



DESIGN GUIDE

NEW ZEALAND

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CONTENTS

Prepared by:

MOTOVATED Engineering Your Vision

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1. Assumptions

The span tables presented in this document have been prepared using the following assumptions.

- Walls to be installed are either internal partitions or intertenancy walls
- Walls are designed to a 50-year design life
- Maximum wall heights of 3m
- Wall Elevation is the height above ground of the connection between the brace arms and overhead structure
- Bottom half of the wall is supported by the bottom track, and the top half is supported by both the Vertibrace and any return walls present

1.1. Means of Compliance

Standards used:
AS/NZS 1170.0 series, Notably 1170.2-2021 and 1170.5-2004
NZS3604-2011
AS/NZS 4600-2018
AS/NZS 1664.1-1997

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2. Design Overview

General Design Steps for Partition Walls

Inputs Required

- Building importance level (as per AS/NZS1170 series, examples given in 2.2)
- Building location
- Wall elevation height
- Wall mass in kg per square metre
- Intertenancy or internal partition wall
- Windspeed group (L, M, H, VH, EH)
- Limit State of design (ULS or SLS)

Design Steps

1. Work through Section 3 and Table 1 to determine the wind pressure group
2. Work through Section 4 and Table 2 to determine the seismic pressure group
3. Select the higher of the two pressure groups
4. Use Section 6 to find the resultant maximum brace spacing dependent on the head track used
5. Use Section 7 to find the appropriate brace arms & anchors
6. Install braces according to drawings from Sections 8 & 9

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Building Importance Level

Building Importance is as described in the AS/NZS1170 series of standards. The information below can be used as an indicator of what kinds of structures fall into Importance Levels 2 & 3, which is what the design guide is intended to be used for.

TABLE 3.2

IMPORTANCE LEVELS FOR BUILDING TYPES—NEW ZEALAND STRUCTURES

Importance level	Comment	Examples
1	Structures presenting a low degree of hazard to life and other property	Structures with a total floor area of <30 m^2 Farm buildings, isolated structures, towers in rural situations Fences, masts, walls, in-ground swimming pools
2	Normal structures and structures not in other importance levels	Buildings not included in Importance Levels 1, 3 or 4 Single family dwellings Car parking buildings
3	Structures that as a whole may contain people in crowds or contents of high value to the community or pose risks to people in crowds	Buildings and facilities as follows: (a) Where more than 300 people can congregate in one area (b) Day care facilities with a capacity greater than 150 (c) Primary school or secondary school facilities with a capacity greater than 250 (d) Colleges or adult education facilities with a capacity greater than 500 (e) Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities (f) Airport terminals, principal railway stations with a capacity greater than 250 (g) Correctional institutions (h) Multi-occupancy residential, commercial (including shops), industrial, office and retailing buildings designed to accommodate more than 5000 people and with a gross area greater than 10 000 m^2 (i) Public assembly buildings, theatres and cinemas of greater than 1000 m^2 Emergency medical and other emergency facilities not designated as post-disaster Power-generating facilities, water treatment and waste water treatment facilities and other public utilities not designated as post-disaster Buildings and facilities not designated as post-disaster containing hazardous materials capable of causing hazardous conditions that do not extend beyond the property boundaries

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3. Wind Wall Pressure

3.1. Wind Zone determination

The wind zone of a building is as determined by NZS3604:2011 Timber Framed Buildings. The maximum windspeed for each zone is given below:

	Windspeed category from NZS3604 (Table 5.4)				
Wind Zone	Low	Medium	High	Very High	Extremely High
ULS Windspeed (m/s)	32	37	44	50	55

Methods of determining site Wind Zone are listed in descending order of preference:

1. Site-specific wind zone calculation
2. Read directly from site drawings
3. Read from an up-to-date local council wind zone map

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3.2. Wind Wall pressure

Based on the determined wind zone & the class of wall, determine the wall pressure group:

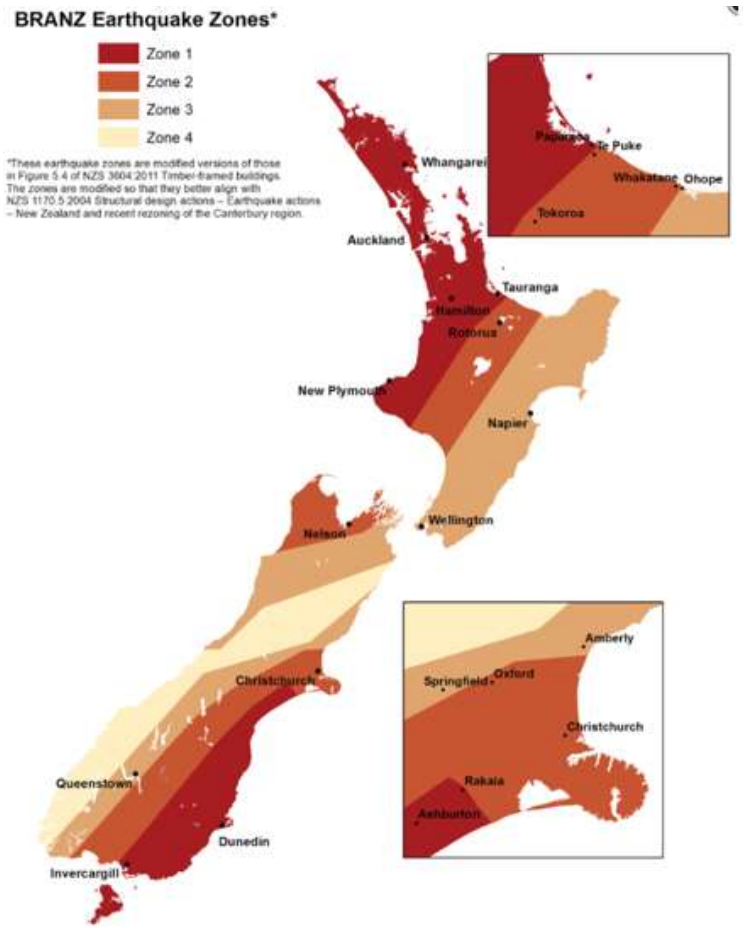
Pressures Groups (Wind, up to IL3)											
Wall Elevation	Wall Type	Windspeeds									
		L (Low)		M (Medium)		H (High)		VH (Very High)		EH (Extremely High)	
		Limit State		Limit State		Limit State		Limit State		Limit State	
		ULS	SLS1	ULS	SLS1	ULS	SLS1	ULS	SLS1	ULS	SLS1
<10m	Intertenancy Wall	PG2	PG2	PG3	PG2	PG3	PG3	PG4	PG3	PG4	PG4
	Internal Partition	PG1	PG1	PG2	PG1	PG2	PG2	PG3	PG2	PG3	PG3
<15m	Intertenancy Wall	PG3	PG2	PG3	PG3	PG4	PG3	PG4	PG3	PG5	PG4
	Internal Partition	PG2	PG1	PG2	PG2	PG3	PG2	PG3	PG2	PG3	PG3
<20m	Intertenancy Wall	PG3	PG2	PG3	PG3	PG4	PG3	PG5	PG4	PG5	PG4
	Internal Partition	PG2	PG1	PG2	PG2	PG3	PG2	PG3	PG3	PG3	PG3
<50m	Intertenancy Wall	PG3	PG3	PG4	PG3	PG5	PG4	PG5	PG4	PG6	PG5
	Internal Partition	PG2	PG2	PG3	PG2	PG3	PG3	PG3	PG3	PG4	PG3

Pressure Range (Pa)	Pressure Groups
250	PG1
500	PG2
1000	PG3
1500	PG4
2000	PG5
2500	PG6

4. Seismic Wall Pressure

4.1. Seismic Zone Determination

Determine Seismic zone of site based on BRANZ classifications. See map & table below. Table is not an exhaustive list- if site is not within locations below use the BRANZ online map



BRANZ Zones			
Zone 1	**Zone 2**	**Zone 3**	**Zone 4**
Auckland	Rotorua	Queenstown	Arthur's Pass
Northland	Christchurch	Blenheim	Hanmer Springs
Timaru	Nelson	Wellington	
Dunedin	Taupo	Gisborne	
Tauranga		Napier	
Hamilton		Greymouth	
New Plymouth		Hastings	
Invercargill		Kaikoura	
		Masterton	

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4.2. Seismic pressure derivation

Use the Elevation, Seismic Zone, Importance Level, & wall weight to determine relevant seismic pressure group.

Seismic Pressures (Pa)										
Wall Elevation	Importance Level	Wall Weight	Branz Seismic Zone							
			Zone 1		Zone 2		Zone 3		Zone 4	
			Limit State		Limit State		Limit State		Limit State	
			ULS	SLS1	ULS	SLS1	ULS	SLS1	ULS	SLS1
Up to 6m	IL2	Light Weight	PG2	PG1	PG2	PG1	PG3	PG1	PG3	PG1
		Medium Weight	PG3	PG1	PG3	PG1	PG4	PG2	PG5	PG3
	IL3	Light Weight	PG2	PG1	PG3	PG1	PG3	PG1	PG3	PG1
		Medium Weight	PG3	PG1	PG4	PG1	PG4	PG2	PG5	PG2
Above 6m	IL2	Light Weight	PG2	PG1	PG3	PG1	PG3	PG1	PG4	PG2
		Medium Weight	PG3	PG1	PG4	PG2	PG5	PG2	PG6	PG3
	IL3	Light Weight	PG3	PG1	PG3	PG1	PG4	PG1	PG4	PG2
		Medium Weight	PG4	PG1	PG5	PG2	PG6	PG2	PG6	PG3

For Seismic pressure groups 4 & above & where interstory drift is greater than 20mm, Seismic Detailing required around Return Walls.

Wall Designation	Max Weight	Example
Lightweight	30 kg/m^2	Typical steel stud wall with 13mm plasterboard lining both sides, no heavy attachments
Mediumweight	60 kg/m^2	Steel stud wall with 2x 13mm or 1x 19mm plasterboard lining both sides. 5 kg/m^2 allowed for attachments such as shelving
Heavyweight	>60 kg/m^2	Timber stud wall with 2x13mm Noiseline each side, 10kg/m^2 allowed for attachments. Walls with significant shelving or large units.

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5. Design Capacity

The design displacement at SLS based on the capacities below is 10mm.
Minimum thickness for steel head tracks is 1.15BMT.

Glazing:

The design capacity of the VertiBrace for use on Glazing headtracks with ULS loads is:

1.48kN

with SLS load is:

0.82kN

*The capacity has been determined by carrying out 10 tests to failure with the following test setup:
Headtrack type: AE010-A with AE016 Clip in filler
Brace arms: 64mm x 0.5BMT lipped stud.

64mm Headtrack:

The design capacity of the VertiBrace for use on 64mm Aluminium and Steel headtracks with ULS loads is:

2.00kN

with SLS load is:

1.20kN

*The capacity has been determined by carrying out 10 tests to failure with the following test setup:
Headtrack type: 64 x 0.75 BMT steel
Brace arms: 64mm x 0.5BMT lipped stud

92mm Headtrack:

The design capacity of the VertiBrace for use on 92mm Aluminium, Steel and Timber headtracks with ULS loads is:

2.39kN

with SLS load is:

1.20kN

*The capacity has been determined by carrying out 10 tests to failure with the following test setup:
Headtrack type: 92 x 0.75 BMT steel
Brace arms: 64mm x 0.5BMT lipped stud

The design capacity has been determined by applying a sampling factor to the minimum tested capacity, as specified in AS/NZS 1170.0:2002 - Appendix B.

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6. Span Tables

Using the larger of the pressure group developed from the evaluations above, find the appropriate brace spacing for a given head track. All span dimensions in following tables are in mm. Table 3 below shows the spans for 92 and 64 mm steel headtracks for SLS1 loads. Table 4 shows the same tables for ULS loads.

Table 3: SLS Span Table for steel Headtracks

Pressure Group	Pressure (kPa)	Headtrack span (mm)	
		64x30x1.15	92x30x1.15
PG1	0.25	2,590	3,421
PG2	0.50	1,454	1,455
PG3	1.00	1,448	1,448
PG4	1.50	966	970
PG5	2.00	727	727
PG6	2.50	579	582

Table 4: ULS Span Table for steel Headtracks

Pressure Group	Pressure (kPa)	Headtrack span (mm)	
		64x30x1.15	92x30x1.15
PG1	0.25	3,500	3,500
PG2	0.50	2,424	2,897
PG3	1.00	1,212	1,448
PG4	1.50	1,471	1,856
PG5	2.00	1,212	1,448
PG6	2.50	970	1,159

“Orange” entries indicate the usage of 2 Vertibraces at each brace location, effectively doubling the capacity. This was done to increase spans that were primarily limited by brace capacity rather than headtrack capacity

Span tables for aluminium headtracks under SLS loads are given below in Table 5. These are for plasterboard walls. The span tables for aluminium headtracks under ULS loads for plasterboard walls are given in Table 6.

Table 5: SLS Span table for aluminium headtracks on plasterboard walls

Pressure Group	Pressure (kPa)	Headtrack span (mm)	
		64mm AE010A	92mm AE310
PG1	0.25	3,024	3,203
PG2	0.50	1,601	1,601
PG3	1.00	1,601	1,601
PG4	1.50	1,068	1,068
PG5	2.00	801	801
PG6	2.50	641	641

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Table 6: ULS Span table for aluminium headtracks on plasterboard walls

Pressure Group	Pressure (kPa)	Headtrack span (mm)	
		64mm AE010A	92mm AE310
PG1	0.25	3,500	3,500
PG2	0.50	2,873	3,186
PG3	1.00	2,032	2,927
PG4	1.50	1,659	2,124
PG5	2.00	1,437	1,593
PG6	2.50	1,275	1,275

Span tables for aluminium headtracks on glazed partitions under SLS loads are given below in Table 7. The span tables for aluminium headtracks on glazed partitions under ULS loads is given in Table 8.

Table 7: Span table for aluminium headtracks on glazed partitions under SLS loads

Pressure Group	Pressure (kPa)	Headtrack span (mm)		
		45mm AE004	64mm AE010A	92mm AE310
PG1	0.25	1,390	2,197	2,197
PG2	0.50	1,099	1,099	1,099
PG3	1.00	876	1,099	1,099
PG4	1.50	732	732	732
PG5	2.00	549	549	549
PG6	2.50	439	439	439

Table 8: Span table for aluminium headtracks on glazed partitions under ULS loads

Pressure Group	Pressure (kPa)	Headtrack span (mm)		
		45mm AE004	64mm AE010A	92mm AE310
PG1	0.25	1,358	3,175	3,500
PG2	0.50	881	1,973	1,973
PG3	1.00	484	1,392	1,973
PG4	1.50	N/A	1,101	1,316
PG5	2.00	N/A	933	987
PG6	2.50	N/A	789	789

Again, “Orange” entries indicate the usage of 2 Vertibraces at each brace location, effectively doubling the capacity. This was done to increase spans that were primarily limited by brace capacity rather than headtrack capacity.

The AE004 sections are not appropriate for use in Pressure Groups 4, 5, & 6 under ULS loads. This is the case even if using 2 Vertibraces per location, as the track is limiting. The T&R Vertibrace has been verified for use with the Eclipse Aluminium sections & steel sections given above only. Capacities of other headtracks has not been verified.

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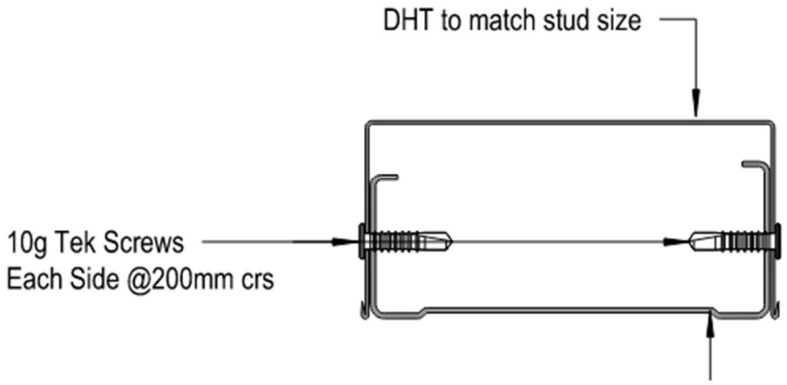
7. Brace Height Table

7.1. Maximum plenum height

Refer to drawing SE3-205, in Section 8.

Brace Arm Stud Size	Maximum Brace Height (mm)	
	2.39 kN Load & 2.00 kN Load	1.48 kN Load (Glazed Partitions)
64mm 0.50 BMT lipped stud	1300	1300
64mm 0.75 BMT lipped stud	1500	1500
92mm 0.55 BMT lipped stud	1500	1500
64mm 0.50 BMT boxed stud	2500	2750
92mm 0.75 BMT boxed stud	2750	2750

Boxed detail below



Notes:

- Brace arm sizes above are to be installed at 40-50 degrees from horizontal.
- All brace arms to be continuous lengths of steel stud. Capacity of spliced steel stud has not been verified.
- Maximum brace heights have been determined using the compressive capacity of steel studs calculated with AS/NZS 4600:2018. It has been assumed that each brace arm carries half of the total load. Testing has been carried out to verify stud capacity.

For purlin bridging connections, there are two possible cases. Either the brace arms run parallel to purlins or they run perpendicular to the purlins. The maximum bridging distance for each case is given below.

Brace arm direction relative to Purlin	Bridging section	Maximum bridging distance (mm)
Parallel	92x0.75 boxed stud, angled as shown	2000
Perpendicular	92x0.75 back-to-back stud	1600
	92x1.15 back-to-back stud	2000

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7.2. Fixings

The table below refers to the anchorage of the top connections of the brace.

Steel	1x M10 Grade 4.6	Fix to web of purlins
	4x 12g tek screws	Fix to web of purlins, 10mm minimum edge spacing
Stud Bridging	4x 10g tek screws	10mm minimum edge spacing
Timber	Min 12mm Coach Screw	65mm embedment, 50mm edge distance
	1x M10 Grade 4.6 bolt	35 x 35 x 3 washer to be used, 40mm edge distance
Concrete	Hilti HUS-3 H10	85mm embedment
	Hilti HST3-10	80mm embedment

All anchors to be installed as per manufacturers specifications.

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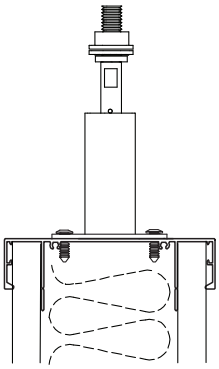
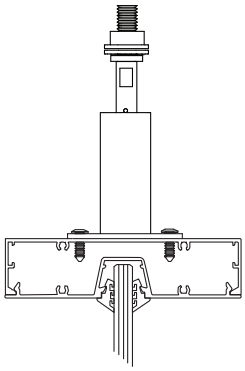
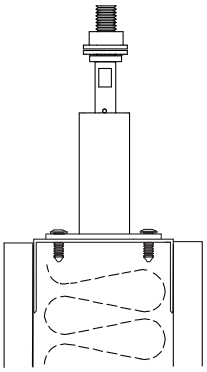
8. Head Track Connection examples



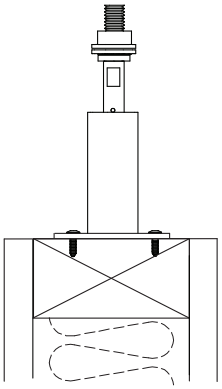
64mm Aluminium Headtrack



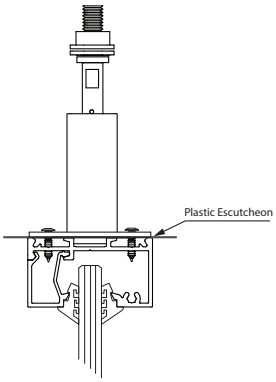
Pocket Headtrack



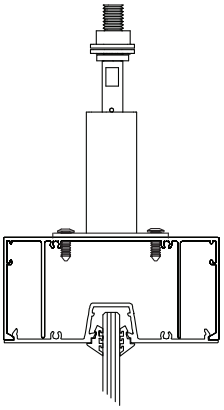
Steel Headtrack



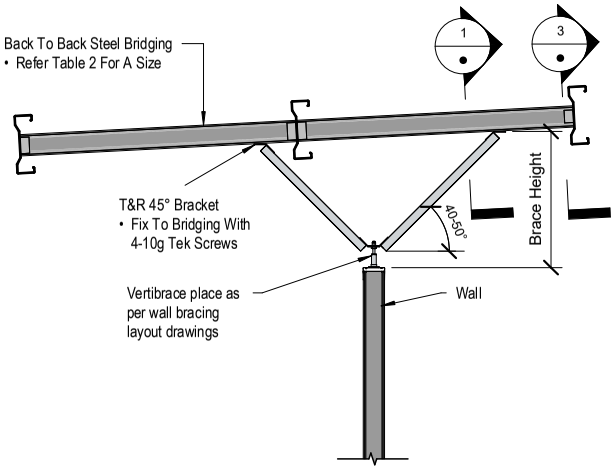
Timber Headtrack



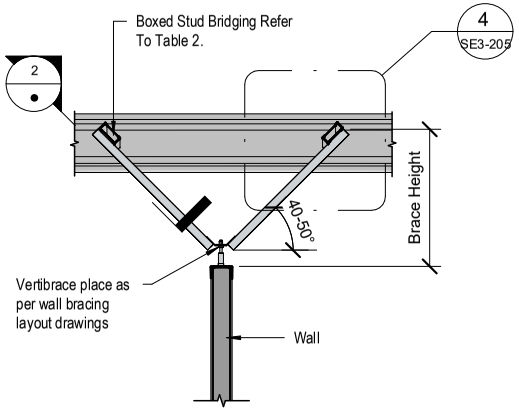
45mm Headtrack



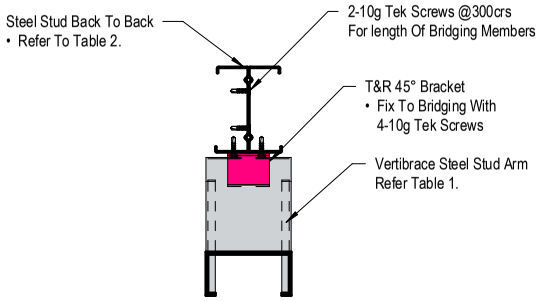
Seismic Pocket Headtrack



VERTIBRACE ELEVATION - BACK TO BACK BRIDGING



VERTIBRACE ELEVATION - BOXED BRIDGING



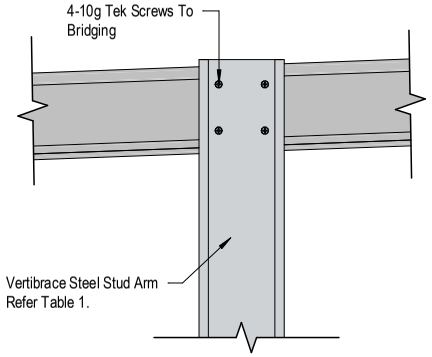
1 VERTIBRACE BRACKET SECTION

Table 1.

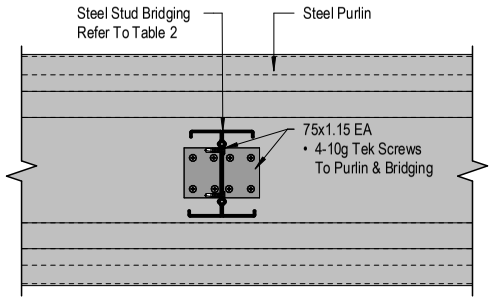
Brace Arm Stud Size	Maximum Brace Height (mm)	
	2.39 kN Load & 2.00 kN Load	1.48 kN Load (Glazed Partitions)
64mm 0.50 BMT lipped stud	1300	1300
64mm 0.75 BMT lipped stud	1500	1500
92mm 0.55 BMT lipped stud	1500	1500
64mm 0.50 BMT boxed stud	2500	2750
92mm 0.75 BMT boxed stud	2750	2750

Table 2.

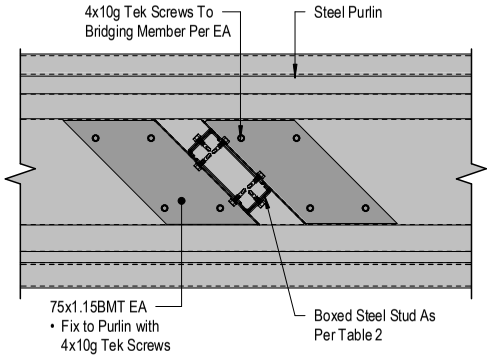
Brace arm direction relative to Purlin	Bridging section	Maximum bridging distance (mm)
Parallel	92x0.75 boxed stud, angled as shown	2000
Perpendicular	92x0.75 back-to-back stud	1600
	92x1.15 back-to-back stud	2000



2 VERTIBRACE TO BOXED BRIDGING CONNECTION



3 VERTIBRACE BRIDING CONNECTION



4 VERTIBRACE BRIDGING

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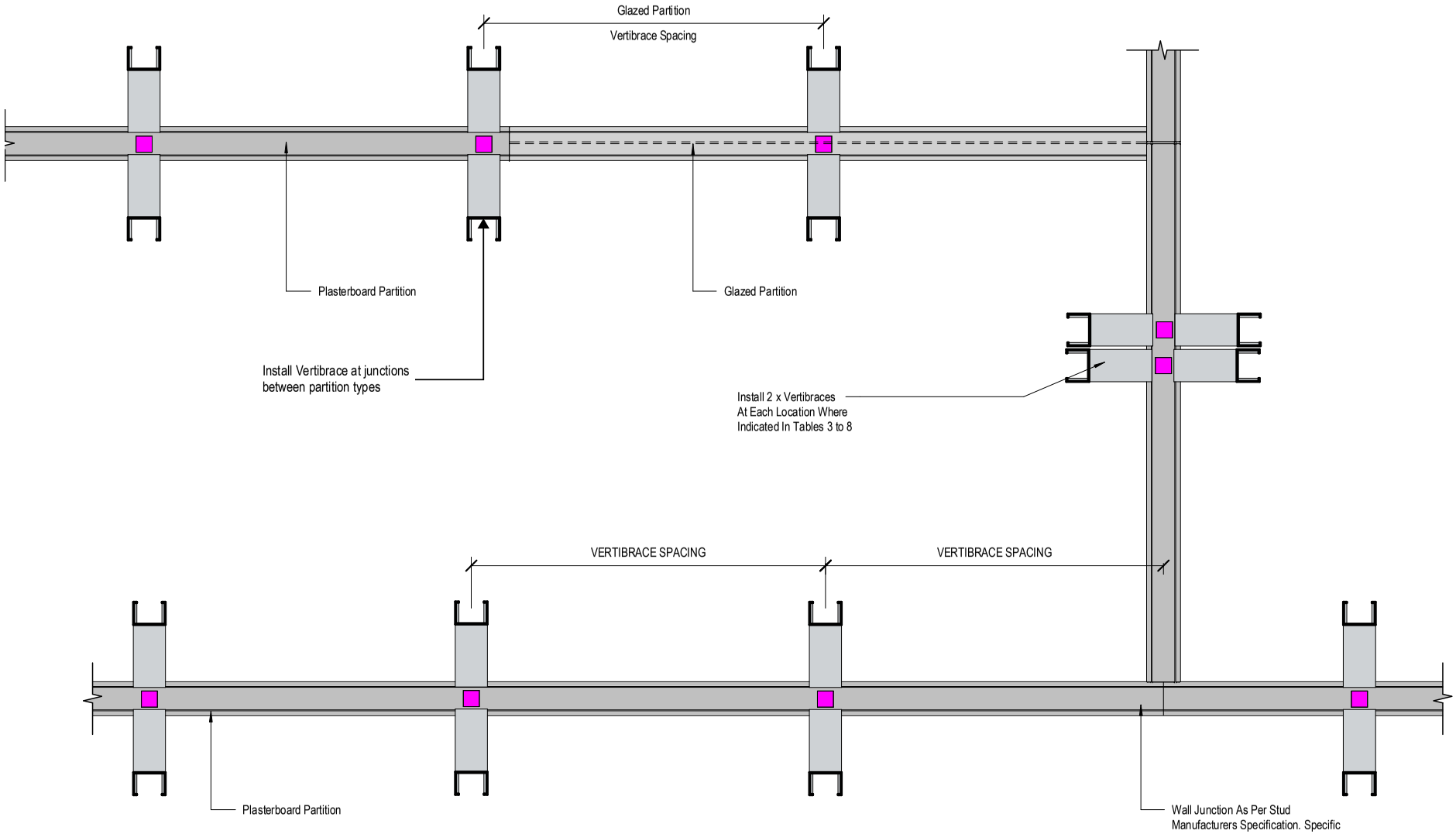
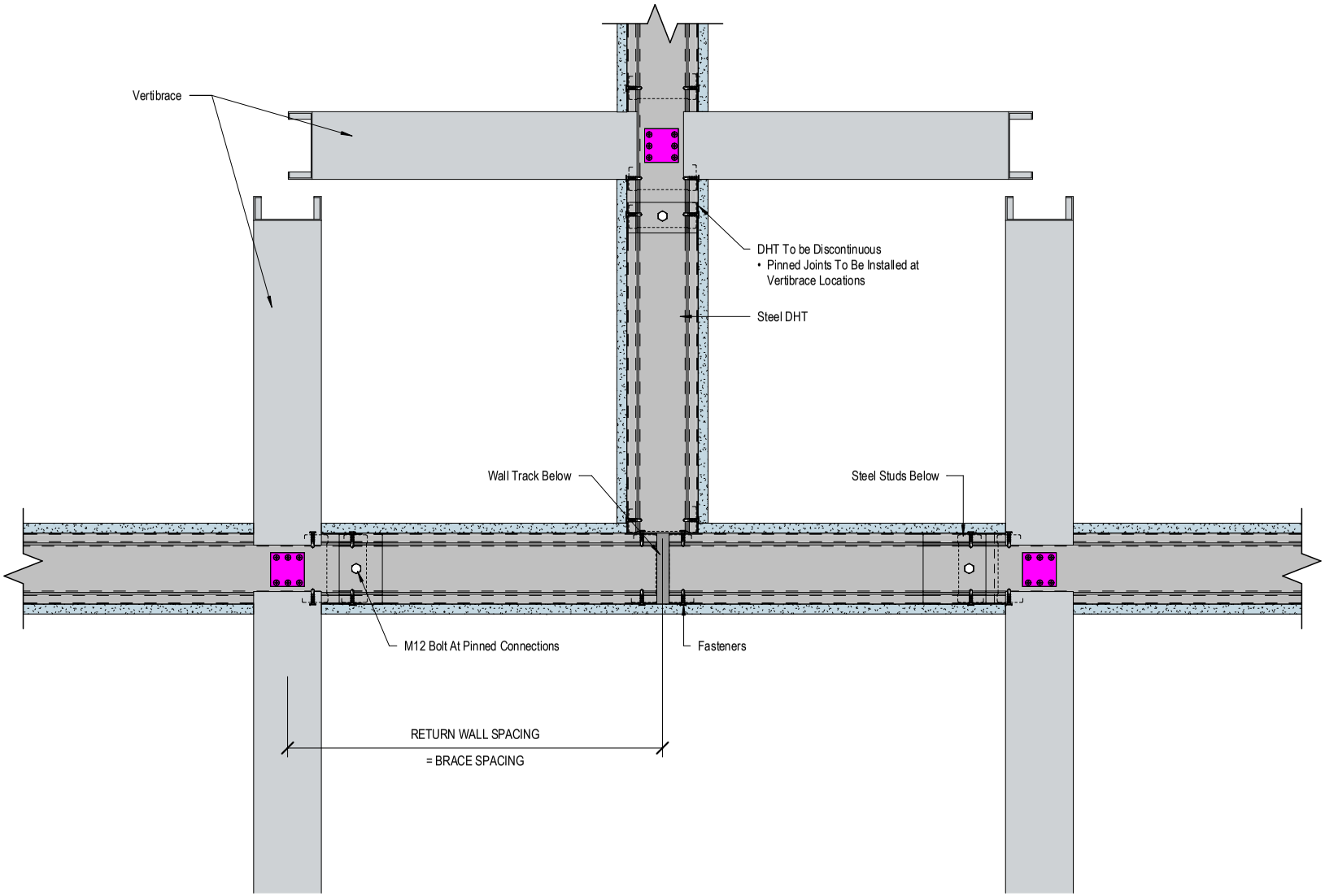
9. VertiBrace & return wall layout

Return Wall Layout overleaf. All dimensions relative to the brace spacing calculated in Tables 3-8.



VERTIBRACE SPACING & SETOUT DETAILS



RETURN WALL INTERSECTION SEISMIC DETAIL