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Tuesday, 12 May 2020

Greg Meyer
Modinex Group
PO Box 3131,
West Ipswich
Qld 4305

RE: Report on Seismic Capacity of Austratus Rail Cladding System

We have pleasure in presenting the enclosed report and certification to you with respect to the Seismic Capacity of Austratus Rail Cladding System.

Should you have any queries with regard to the contents of the report, please do not hesitate to contact us.

Yours Faithfully

Ron Bell
Summermore Pty Ltd

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RE: Report on Seismic Capacity of Austratus Rail Cladding System

The purpose of this letter is to formulate and certify the Seismic Capacity of Austratus Rail Cladding System

Reference Documents:

AS/NZS1170.0:2002:	Structural Design Actions—Part 0: General principles
AS1170.4:2007:	Structural Design Actions—Part 4: Earthquake Actions in Australia
NZS1170.5:2004:	Structural Design Actions—Part 5: Earthquake Actions-New Zealand
AS1720.1:2010	Timber Structures

Austratus Rail Cladding System Design Certification 18-13783

Certification:

We, Summermore Pty Ltd, being registered Structural and Civil Engineers, hereby confirm that the Austratus Rail Cladding System, when supported by the Studco Rail System and Directly Fixed to a Timber Framed Substrate has a capacity greater than the most extreme seismic loads for New Zealand and Australia

This certificate is limited to the compliance with the requirements of the published codes of practice listed and should not be used for any other purpose. Summermore Pty Ltd accepts no responsibility for information that has not been expressly identified as part of this certification. This certificate can only be relied upon by the addressee and cannot be relied upon by any third party. Summermore Pty Ltd accepts no responsibility for any third party that seeks to rely upon this certificate.

If we can be of any further assistance in this matter please do not hesitate to contact this office.

Certified by

Ronald Bell
FIEAust (891940), CMEngNZ (1027605), CPEng, NER, APEC Engineer, IntPE(Aus).
Director
Summermore Pty Ltd

ENGINEERS AUSTRALIA

REGISTERED Building Practitioner

Proud Member of: CONSULT AUSTRALIA Representing Engineering Excellence

Seismic Capacity of Austratus Rail Cladding System

REPORT

COMPILED FOR

Modinex

BY SUMMERMORE PTY LTD

May 2020

1. Introduction

The aim of this report is to investigate the Seismic Capacity of Austratus Rail Cladding System.

1.1. Objectives

The objective of the report is to provide information that will cover the Seismic Capacity of Austratus Rail Cladding System in order to move towards attaining Codemark certification of the product.

1.2. Scope & Limitations

The current work was limited to:

- Seismic Capacity of Austratus Rail Cladding System for New Zealand and Australia.
- Timber and Aluminium 6060-T5 Profiles up to 6000mm in length and ≤10kg per piece.
- Direct Fixing only to a Timber Substrate.
- Fixing to the Studco Rail System.

2. Reference Documents for Compliance

The Standards used for reference and analysis are:

AS1170.4:2007: Structural Design Actions—Part 4: Earthquake Actions in Australia
NZS1170.5:2004: Structural Design Actions—Part 5: Earthquake Actions-New Zealand

3. Investigation of NZS1170.5

In order to determine the suitability of the product it is necessary to first determine the most severe load case.

Given that the product is a cladding material it is to be considered as a 'part' and Table 8.1 specifies that the it is Category P.7 with a risk factor R_p=1.0 and Limit State SLS1 shall be adopted.

The equation for design response coefficient is given as equation 8.1(1)

$C_p(T_p) = C(0)\ C_{Hi}\ C_i(T_p)$ Equation 8.2(1)

$C(0) = 1.33$ (Worst Case) Table 3.1

$C_{Hi} = 3.0$ (Worst Case) Clause 8.3

$C_i(T_p) = 2.0$ (Worst Case) Clause 8.4

$C_p(T_p) = 1.33 * 3.0 * 2.0 = 7.98$

Horizontal Design Action

$F_{ph} = C_p(T_p)\ C_{ph}\ R_p\ W_p \leq 3.6\ W_p$ Equation 8.5(1)

$C_{ph} = 1.0$ Clause 8.6

$R_p = 1.0$

$W_p = 0.1$ kN

$F_{ph} = 7.98 * 1 * 1 * 0.1 = .798$ kN , but

$3.6\ W_p = 0.36$ kN, so

$F_{ph} = 0.36$ kN
Vertical Design Action

$F_{pv} = C_{pv}\ C_{vd}\ R_p\ W_p \leq 2.5\ W_p$ Equation 8.5(2)

C_{pv} = 1.0 Clause 8.6

C_{vd} = 0.7 * 7.98 = 5.59

R_p = 1.0

W_p = 0.1 kN

F_{pv} = 1 * 5.59 * 1 * 0.1 = .559 kN , but

2.5 W_p = 0.25 kN, so

F_{ph} = 0.25 kN

Nett Design Action

$F_p = \sqrt{(F_{ph}^2 + F_{pv}^2)} = 0.438$ kN

4. Investigation of AS1170.4

In order to determine the suitability of the product it is necessary to first determine the most severe load case.

Given that the product is a cladding material it is to be considered as a 'component' and Clause 8.3 shall be adopted.

The equation for horizontal earthquake force is given as equation 8.3

$F_c = [k_p Z C_h(0)] a_x [I_c a_c / R_c] W_c$, but > 0.05 W_c

$I_c = 1.0$ Clause 8.2

$a_c = 1.0$ Clause 8.2

$R_c = 1.0$ Clause 8.2

$W_c = 0.1$ kN

$k_p = 1.0$ Table 3.1

$Z = 0.6$ (worst case) Table 3.2

$C_h(0) = 1.3$ (worst case) Table 6.4

$a_x = 3.0$ (worst case) Clause 8.3

$F_c = [1.0 * 0.6 * 1.3] * 3.0 * [1.0 * 1.0 / 1.0] * 0.1 = 0.234$ kN

5. Worst Load Case

The worst load case across both standards considered is 0.438kN for a 10kg length of Austratus Rail Cladding System (approximately 6000mm long)

6. Resistance of Design Load

The Austratus Rail Cladding System design certification for the direct fix application requires that the product is fixed at a maximum of 1200 millimetre to a timber substrate with minimum grade of JD5 with Type 17 C/S – 6 Rib SQ Drive #12-12x50mm Screws.

6.1. **Fixing to Timber Substrate**

The shear value of a #12 screw in JD5 substrate is:

$Nd,j = \Phi$ k1 k13 k14 k16 k17 n Qk = 0.85 * 1.14 * 1.0 * 1.0 * 1.0 * 1 * 1790 = 1.734 kN

For the worst possible load case, a profile of up to 6000mm in length with a maximum distance of 1200mm between fixings the provided capacity would be = 6000mm / 1200mm = 5 fixings * 1.734kN = 8.67kN Capacity.

6.2. Fixing to Studco Rail System

Austratus Profile	Type of Profile (Fin/Flat)	Material Used	Maximum Length of Profile (Limited to 10kg/piece and Maximum 6m Length) (m)	Minimum Number of Clips on the Member for Given Rail Spacing		
				600mm Rail Spacing	900mm Rail Spacing	1200mm Rail Spacing
90 x 19	Flat	Hemlock	6.00	10	5	5
		Cedar	6.00	10	5	5
90 x 19 Aluminium	Flat	Aluminium 6060	6.00	10	5	5
30 x 90	Fin	Hemlock	5.02	8	4	4
		Cedar	6.00	10	5	5
30 x 90 Aluminium	Fin	Aluminium 6060	6.00	10	5	5
30 x 60	Fin	Hemlock	6.00	10	5	5
		Cedar	6.00	10	5	5
30 x 60 Alumnium	Fin	Aluminium 6060	6.00	10	5	5
30 x 60 Angled	Fin	Hemlock	6.00	10	5	5
		Cedar	6.00	10	5	5
30 x 60 Angled Aluminium	Fin	Aluminium 6060	6.00	10	5	5
30 x 40	Fin	Hemlock	6.00	10	5	5
		Cedar	6.00	10	5	5
30 x 40 Aluminium	Fin	Aluminium 6060	6.00	10	5	5

For the worst case the smallest number of clips on a member with a maximum weight of 10kg is 4 clips for a 30x90 Profile in Hemlock.

Capacity of Clip = 0.172kN (Hemlock Fin Profile) Austratus Rail Design Certification Ref 17-13783-S01. Plastic Ceiling Clip Capacities

4 Clips * 0.172kN = 0.688kN

For the worst case of clips with the lowest strength capacity on a Cedar Fin Profile with a minimum of 5 clips.

Capacity of Clip = 0.103kN (Cedar Fin Profile) Austratus Rail Design Certification Ref 17-13783-S01. Plastic Ceiling Clip Capacities

5 Clips * 0.103kN = 0.515kN

7. Design Load Vs Capacity

The Austratus Rail Cladding System, whether supported on the Studco Rail or Direct Fixed to a Timber Substrate has a capacity greater than the most extreme seismic loads for New Zealand and Australia.

Ronald Bell
FIEAust (891940), CMEngNZ (1027605), CPEng, NER, APEC Engineer, IntPE(Aus).
Director
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