

Our Ref: FCO-1299

L & A Fazzini Manufacturing Pty Ltd  
23-25 Wentworth Street  
Greenacre NSW 2190

Attention: Mr Lorenzo Fazzini

VERMITEX 'AF', 'DX', 'TH' and 'HX' SYSTEMS FOR FIRE-RESISTANCE PROTECTION OF STEEL

Assessment Number FCO-1299  
Your email dated 14<sup>th</sup> December.

INTRODUCTION

We have re-examined the information referenced by you on the likely performance of your sprayed insulation systems when applied to various steel sections including, but not limited to:

Universal Beams & Columns, Welded Beams & Columns, Square and Rectangular Hollow Sections, Equal and Unequal Angles, Flat Plate members and Parallel as well as Taper Flange Channels.

The information you have referred to includes:

- Sponsored investigation report numbered BS 64/2/332(L) dated 9 January 1964 for Vermitex sprayed on Celdek;
- CSIRO full-scale test report numbered FSH 0230 dated April 1993 on Ductwork, Slab and Steel Plates;
- CSIRO full-scale test report numbered FSH 0007 for test conducted in May 1989 on loadbearing and non-loadbearing steel beams and angles;
- CSIRO full-scale test report numbered FSH 0026 for test conducted in September 1989 on universal columns.
- CSIRO full-scale test report numbered FSH 0649 for test conducted in December 1998 on Rectangular Hollow Sections supporting your Trimesh vertical & horizontal systems.

We have retained these documents and information.

You wish to establish the likely upgrading of the fire performance of various steel sections by the application of various thickness of Vermitex 'AF', 'DX', 'TH' and 'HX' spray applied materials.

ANALYSIS

The strength of steel exposed to fire is related to its temperature and this in turn is related to the temperature of the fire and the mass of the steel relative to the exposed area. In order to improve the fire performance of structural steel members, an insulating material, such as Vermitex 'AF', 'DX', 'TH' and 'HX', can be applied to the exposed surfaces of the steel in order to reduce the temperature of the steel under any given fire exposure.

THIS ASSESSMENT SUPERSEDES ASSESSMENT FCO-1299 DATED 23 JANUARY 2013

The performance of this applied insulation can be measure against its ability to insulate and its ability to remain in place, termed 'stickability', during the duration of the fire exposure.

As noted by the list of supporting data above, this Division has conducted numerous tests to evaluate the insulation and 'stickability' of Vermitex 'AF', 'DX', 'TH' and 'HX' as related to the surface area-to-mass ratio of steel sections. The testing has ranged from flat steel plates that have a very high surface area-to-mass ratio and very large unsupported steel areas to Universal columns that have low surface area-to-mass ratios and a web and flange configuration that supports the sprayed insulation and improves stickability. This range of testing, which included Universal Beams, Square Hollow Sections, Rectangular Hollow Sections, Equal Angles, Unequal Angles, Flat Plate members and Universal Columns has proven the 'stickability' and allowed the Vermitex 'AF', 'DX', 'TH' and 'HX' to be purely assessed against the applied thickness and the surface area-to-mass ratio of the steel sections.

A linear regression analysis of the Vermitex 'AF' sprayed insulation was reported in our reports FSH 0007 and FSH 0026 based on procedure detailed in Australian Standard 4100 and test information obtained from nine beam sections, nine angle sections and six column sections which exceed the minimum of nine specimens specified by that Australian standard. The beams were subjected to three-sided exposure while the angle and column sections were exposed on all four sides. The analysis is based on the premise that once you have established that the protective material will remain in place for the full rating period then the steel temperature, and thus the failure time, can be assessed as a function of the insulation thickness and the steel member's physical dimensions.

#### ASSESSMENT/CONCLUSION

Based on the proven performance of your Vermitex 'AF', 'DX', 'TH' and 'HX' sprayed protection systems, during standard fire tests to AS 1530.4, it is the opinion of the Division that, the protection thickness tables (refer Appendices 1 and 2) resulting from linear regression analysis performed as an appendix to our reports, numbered FSH 0007 and FSH 0026, would also comply with the performance requirements of BS-476, ISO-834 and ASTM E119 for steel elements comprising but not limited to:

Universal Beams & Columns, Welded Beams & Columns, Square and Rectangular Hollow Sections, Equal and Unequal Angles, Flat Plate members and Parallel as well as Taper Flange Channels.

#### TERM OF VALIDITY

This assessment report will lapse on 31 July 2017. Should you wish us to re-examine this report with a view to the possible extension of its term of validity, would you please apply to us three to four months before the date of expiry. This Division reserves the right at any time to amend or withdraw this assessment in the light of new knowledge.

Yours sincerely,



Brett Roddy  
Team Leader, Fire Testing and Assessments

20<sup>th</sup> December 2016

## APPENDIX 1 - Vermitex 'AF', 'HX', 'TH' and 'DX' spray thickness for critical temperature of 540°C

Hp/A (m <sup>-1</sup> )	Fire Resistance Period (minutes)					Fire Resistance Period (minutes)				
	Three/sided Exposure					Three or Four/sided Exposure				
	60	90	120	180	240	60	90	120	180	240
Up to 47.1	8	8	11	21	30	n/a	n/a	n/a	n/a	n/a
55.0	8	9	14	24	33	12	12	12	19	30
62.8	8	10	15	25	35	12	12	12	22	34
70.7	8	11	16	26	36	12	12	13	25	36
78.5	8	12	17	27	37	12	12	15	27	38
86.4	8	12	17	28	38	12	12	17	29	40
94.2	8	13	18	28	38	12	12	18	30	42
102.1	8	13	19	29	39	12	13	19	31	43
109.9	8	14	19	29	40	12	14	20	31	44
117.8	9	14	19	30	41	12	15	21	33	45
125.6	9	14	20	30	41	12	16	22	34	46
133.5	9	15	20	31	41	12	17	23	35	47
141.3	9	15	20	31	42	12	17	23	35	48
149.2	10	15	20	31	42	12	18	24	36	48
157.0	10	15	21	31	42	12	18	24	37	49
164.9	10	15	21	32	42	13	19	25	37	49
172.7	10	16	21	32	43	13	19	25	37	50
180.6	10	16	21	32	43	13	19	26	38	50
188.4	10	16	21	32	43	14	20	26	38	51
196.3	10	16	21	32	43	14	20	26	39	51
204.1	11	16	22	32	43	14	20	27	39	51
212.0	11	16	22	33	44	14	21	27	39	52
219.8	11	16	22	33	44	15	21	27	39	52
227.7	11	16	22	33	44	15	21	27	40	52
235.5	11	16	22	33	44	15	21	28	40	52
243.4	11	17	22	33	44	15	21	28	40	53
251.2	11	17	22	33	44	15	22	28	40	53
259.1	11	17	22	33	44	16	22	28	41	53
266.9	11	17	22	33	44	16	22	28	41	53
274.8	11	17	22	33	44	16	22	28	41	54
282.6	11	17	22	34	45	16	22	29	41	54
290.5	n/a	n/a	n/a	n/a	n/a	16	23	29	41	54
298.3	n/a	n/a	n/a	n/a	n/a	16	23	29	41	54
306.2	n/a	n/a	n/a	n/a	n/a	16	23	29	42	54
314.0	n/a	n/a	n/a	n/a	n/a	17	23	29	42	54
321.9	n/a	n/a	n/a	n/a	n/a	17	23	29	42	54
329.7	n/a	n/a	n/a	n/a	n/a	17	23	29	42	55
337.6	n/a	n/a	n/a	n/a	n/a	17	23	30	42	55
345.4	n/a	n/a	n/a	n/a	n/a	17	23	30	42	55
353.3	n/a	n/a	n/a	n/a	n/a	17	23	30	42	55
361.1	n/a	n/a	n/a	n/a	n/a	17	24	30	42	55
369.0	n/a	n/a	n/a	n/a	n/a	17	24	30	43	55
376.8	n/a	n/a	n/a	n/a	n/a	17	24	30	43	55
384.7	n/a	n/a	n/a	n/a	n/a	18	24	30	43	55
392.5	n/a	n/a	n/a	n/a	n/a	18	24	30	43	55
400.4	n/a	n/a	n/a	n/a	n/a	18	24	30	43	56
408.2	n/a	n/a	n/a	n/a	n/a	18	24	30	43	56
416.1	n/a	n/a	n/a	n/a	n/a	18	24	30	43	56
423.9	n/a	n/a	n/a	n/a	n/a	18	24	31	43	56
431.8	n/a	n/a	n/a	n/a	n/a	18	24	31	43	56
439.6	n/a	n/a	n/a	n/a	n/a	18	24	31	43	56

### APPENDIX 2 – Restrained Assembly Systems

For fire tests associated with floor or roof assembly systems, ASTM E119 identifies two types of classification for the assemblies namely Restrained Assemblies and Un-restrained Assemblies. The code specifies conditions of acceptance for temperature criteria for the restrained assemblies as per clauses 31.1.1, 31.1.2, 31.1.3 and 31.1.4.

Restrained assembly systems shall be identified in accordance with table X3.1 of ASTM E119. Engineering assessments shall be carried out in assessing various floor/roof assemblies for the restrained conditions.

The below table illustrates the accepted temperature criteria for the restrained assembly systems in accordance with ASTM E119.

The required rating for a restrained assembly can be interpreted with reference to the results obtained from testing of materials on un-restrained condition.

<b>*Restrained Assembly rating (minutes)</b>	<b>Un-restrained Assembly rating (minutes)</b>
60	60
90	60
120	60
180	90
240	120

\*The table provided below is been prepared in accordance with ASTM E119, Clauses 31.1.3 and 32.1.3.

\*Restrained systems shall be assessed in accordance with the conditions provided in ASTM E119 –ANNEX-table X3.1

#### **Vermitex 'AF', 'HX', 'TH' and 'DX' Thickness Table**

Critical temperature = 593 Degree Celsius

The table provided below is been prepared as per the above mentioned criteria for restrained systems and with reference to the table provided on FCO 1299.

A minimum of 10mm thickness shall be applied to maintain the integrity of the sprayed materials.

<b>Vermitex 'AF', 'HX', 'TH' and 'DX'</b>											
		<b>Thickness required for Three Sided Exposure</b>					<b>Thickness required for Three or Four Sided Exposure</b>				
<b>Hp/A</b>	<b>ESA/ M</b>	<b>FRL 60</b>	<b>FRL 90</b>	<b>FRL 120</b>	<b>FRL 180</b>	<b>FRL 240</b>	<b>FRL 60</b>	<b>FRL 90</b>	<b>FRL 120</b>	<b>FRL 180</b>	<b>FRL 240</b>
Up to 47.1	6	8	8	8	11	11	NA	NA	NA	NA	NA
55	7	8	8	8	14	14	12	12	12	12	12
62.8	8	8	8	8	15	15	12	12	12	12	12
70.7	9	8	8	8	16	16	12	12	12	13	13
78.5	10	8	8	8	17	17	12	12	12	15	15

VermiteX 'AF', 'HX', 'TH' and 'DX'											
		Thickness required for Three Sided Exposure (cont'd)					Thickness required for Three or Four Sided Exposure (cont'd)				
Hp/A	ESA/M	FRL 60	FRL 90	FRL 120	FRL 180	FRL 240	FRL 60	FRL 90	FRL 120	FRL 180	FRL 240
86.4	11	8	8	8	17	17	12	12	12	17	17
94.2	12	8	8	8	18	18	12	12	12	18	18
102.1	13	8	8	8	19	19	12	12	12	19	19
109.9	14	8	8	8	19	19	12	12	12	20	20
117.8	15	9	9	9	19	19	12	12	12	21	21
125.6	16	9	9	9	20	20	12	12	12	22	22
133.5	17	9	9	9	20	20	12	12	12	23	23
141.3	18	9	9	9	20	20	12	12	12	23	23
149.2	19	10	10	10	20	20	12	12	12	24	24
157	20	10	10	10	21	21	12	12	12	24	24
164.9	21	10	10	10	21	21	13	13	13	25	25
172.7	22	10	10	10	21	21	13	13	13	25	25
180.6	23	10	10	10	21	21	13	13	13	26	26
188.4	24	10	10	10	21	21	14	14	14	26	26
196.3	25	10	10	10	21	21	14	14	14	26	26
204.1	26	11	11	11	22	22	14	14	14	27	27
212	27	11	11	11	22	22	14	14	14	27	27
219.8	28	11	11	11	22	22	15	15	15	27	27
227.7	29	11	11	11	22	22	15	15	15	27	27
235.5	30	11	11	11	22	22	15	15	15	28	28
243.4	31	11	11	11	22	22	15	15	15	28	28
251.2	32	11	11	11	22	22	15	15	15	28	28
259.1	33	11	11	11	22	22	16	16	16	28	28
266.9	34	11	11	11	22	22	16	16	16	28	28
274.8	35	11	11	11	22	22	16	16	16	28	28
282.6	36	11	11	11	22	22	16	16	16	29	29
290.5	37	NA	NA	NA	NA	NA	16	16	16	29	29
298.3	38	NA	NA	NA	NA	NA	16	16	16	29	29
306.2	39	NA	NA	NA	NA	NA	16	16	16	29	29
314	40	NA	NA	NA	NA	NA	17	17	17	29	29
321.9	41	NA	NA	NA	NA	NA	17	17	17	29	29
329.7	42	NA	NA	NA	NA	NA	17	17	17	29	29
337.6	43	NA	NA	NA	NA	NA	17	17	17	30	30
345.4	44	NA	NA	NA	NA	NA	17	17	17	30	30
353.3	45	NA	NA	NA	NA	NA	17	17	17	30	30
361.1	46	NA	NA	NA	NA	NA	17	17	17	30	30
369	47	NA	NA	NA	NA	NA	17	17	17	30	30
376.8	48	NA	NA	NA	NA	NA	17	17	17	30	30
384.7	49	NA	NA	NA	NA	NA	18	18	18	30	30
392.5	50	NA	NA	NA	NA	NA	18	18	18	30	30
400.4	51	NA	NA	NA	NA	NA	18	18	18	30	30
408.2	52	NA	NA	NA	NA	NA	18	18	18	30	30
416.1	53	NA	NA	NA	NA	NA	18	18	18	30	30
423.9	54	NA	NA	NA	NA	NA	18	18	18	31	31
431.8	55	NA	NA	NA	NA	NA	18	18	18	31	31
439.6	56	NA	NA	NA	NA	NA	18	18	18	31	31