

IGNIS Advisory Note

Evaluation No.5043
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RESCOM STRUCTURAL STEEL PROTECTION

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1 Introduction

Ignis Solutions has been engaged by Profire WA as well as MgO Corp to review and calculate the required thickness and protection of structural steel members by ResCom Boards for various FRL requirements. The calculations consider BHP steel data.

2 Background

The properties of steel can change when it is subjected to heat. This is considered to be particularly important when steel is used to provide structural support for buildings and their features.

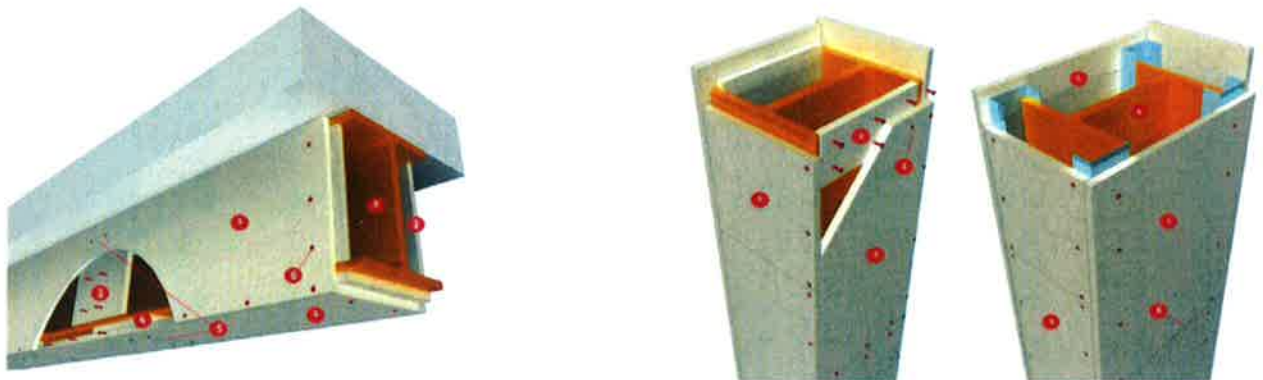
Therefore, it is imperative that the temperature of the steel is known so that adequate measures may be implemented, to the degree necessary, to ensure structural failure doesn't occur and/or affect life safety.

The calculations are based on internal first principle spread sheet based on Buchanan, A., "Structural Design for Fire Safety", John Wiley & Sons, England 2001.

The calculations consider three sided and four sided protection. The following images are extracted from the ResCom MgO General Installation Manual

FIGURE 1:

BEAM AND COLUMN PROTECTION EXAMPLE



3 Calculations

The rate at which the steel member heats up to reach its limiting temperature is dependent on the temperature of the fire. The calculations considers the standard ISO 834 time-temperature curve.

The presence of insulation causes steel to heat up more slowly than when steel is unprotected. The calculations considers the ResCom board to have a density of 1107 kg/m³, thermal conductivity of 0.44 W/mK and Specific Heat of 1200 J/kgK.

4 Summary

The following tables detail the required thickness of protection needed. The installation is to be in accordance with the ResCom General Installation Manual. Where the thickness exceeds the available single thickness, multiple layers can be applied to achieve the required thickness. I.e. 30mm can be made up of 1 layer 20mm plus 1 layer 10mm.

Benjamin Hughes-Brown FIEAust CPEng NER

Chartered Professional Engineer
CPEng, NER (Fire Safety / Mech) 2590091 RPEQ 11498,
BPB-C10-1875, EF-39394, TDJ-CC6504
MFireSafety (UWS), BEng (UTS), GradDipBushFire
(UWS), DipEngPrac (UTS), DipEng (CIT)



ResCom Board Thickness of Hollow Protected Steel (mm)

	60 mins		120 mins		180 mins		240 mins	
	3 Sided	4 Sided	3 Sided	4 Sided	3 Sided	4 Sided	3 Sided	4 Sided
	Welded Beams							
1000WB215	12	14	20	22	26	28	32	34
1000WB258	12	12	20	22	26	28	32	34
1000WB296	12	12	18	20	26	28	30	34
1000WB322	10	12	18	20	24	26	30	32
1200WB249	12	13	20	22	28	28	34	34
1200WB278	11	12	20	22	26	28	34	34
1200WB317	11	12	20	20	26	28	32	34
1200WB342	11	12	20	20	26	28	30	34
1200WB392	10	12	18	20	24	26	30	32
1200WB423	10	12	18	20	24	26	30	32
1200WB455	10	12	18	20	24	26	30	32
700WB115	12	14	20	22	26	28	32	34
700WB130	12	14	20	22	26	28	32	34
700WB150	12	14	20	22	26	28	32	34
700WB173	11	12	20	22	26	28	32	33
800WB122	14	14	22	22	28	30	34	36
800WB146	12	14	20	22	26	28	32	34
800WB168	12	14	20	22	26	28	32	34
800WB192	11	12	20	22	26	28	32	34
900WB175	12	14	20	22	26	28	32	34
900WB218	11	12	20	22	26	28	32	34
900WB257	11	12	18	20	26	28	30	34
900WB282	11	12	18	20	24	26	30	32
Welded Columns								
500WC440	10	10	14	16	18	22	22	28
500WC414	10	10	14	16	18	22	24	28
500WC383	10	10	14	16	20	22	24	28
500WC340	10	10	14	18	20	23	24	30
500WC290	10	10	16	18	20	24	26	30
500WC267	10	10	16	18	22	24	26	30
500WC228	10	12	16	18	22	26	26	30
400WC361	10	10	14	16	18	22	24	28
400WC328	10	10	14	16	20	22	24	28
400WC303	10	10	14	18	20	24	24	28
400WC270	10	10	14	18	20	24	24	30
400WC212	10	10	16	18	22	24	26	30
400WC181	10	12	16	20	22	26	26	30
400WC144	10	12	16	20	22	26	26	32
350WC280	10	10	14	16	20	22	24	28
350WC258	10	10	14	18	20	24	24	28
350WC230	10	10	14	18	20	24	24	28
350WC197	10	10	16	18	20	24	26	30



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ResCom Board Thickness of Hollow Protected Steel (mm)

	60 mins		120 mins		180 mins		240 mins	
	3 Sided	4 Sided	3 Sided	4 Sided	3 Sided	4 Sided	3 Sided	4 Sided
	Universal Beams							
610UB125	12	14	20	22	26	28	32	34
610UB113	12	14	20	22	26	28	32	34
610UB101	12	14	20	22	26	28	32	34
530UB92.4	12	14	20	22	26	28	32	34
530UB82.0	12	14	20	22	26	28	32	34
460UB82.1	12	14	20	22	26	28	32	34
460UB74.6	12	14	20	22	26	28	32	34
460UB67.1	12	14	20	22	26	28	32	34
410UB59.7	12	14	20	22	26	28	32	34
410UB53.7	13	14	20	22	26	28	32	34
360UB56.7	12	14	20	22	26	28	32	34
360UB50.7	12	14	20	22	26	28	32	34
360UB44.7	12	14	20	22	26	28	32	34
310UB46.2	12	14	20	22	26	28	30	34
310UB40.4	12	14	20	22	26	28	30	34
310UB32.0	13	14	20	22	26	28	32	34
250UB37.3	12	14	20	22	26	28	30	34
250UB31.4	12	14	20	22	26	28	30	34
250UB25.7	14	14	20	22	26	28	32	34
200UB29.8	12	14	20	22	26	28	30	34
200UB25.4	12	14	20	22	26	28	30	34
200UB22.3	12	14	20	22	26	28	30	34
200UB18.2	14	14	20	22	26	28	32	34
180UB22.2	12	14	20	22	26	28	30	34
180UB18.1	14	14	20	22	26	28	30	34
180UB16.1	14	14	20	22	26	28	30	34
150UB18.0	12	14	20	22	26	28	30	34
150UB14.0	14	14	20	22	26	28	30	34
Universal Columns								
310UC96.8	10	12	18	20	22	26	28	32
310UC158	10	11	16	18	22	26	26	30
310UC137	10	11	16	20	22	26	26	30
310UC118	10	11	16	20	22	26	26	32
250UC89.5	10	12	18	20	22	26	28	32
250UC72.9	10	12	18	20	22	26	28	32
200UC59.3	10	12	18	20	22	26	28	32
200UC52.2	10	12	18	20	24	26	28	32
200UC46.2	12	14	18	20	24	26	28	32
150UC37.2	12	14	18	20	24	26	28	32
150UC30.0	12	14	18	20	24	26	28	32
150UC23.4	12	14	18	22	24	28	28	32
100UC14.8	12	14	18	20	24	26	28	32



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ResCom Board Thickness of Hollow Protected Steel (mm)

	60 mins		120 mins		180 mins		240 mins	
	3 Sided	4 Sided	3 Sided	4 Sided	3 Sided	4 Sided	3 Sided	4 Sided
	Parallel Flange Channel	10	10	10	10	10	10	10
380*100PFC	10	10	14	16	22	24	28	32
300*90PFC	10	10	16	18	22	26	28	34
250*90PFC	10	10	16	18	22	26	30	34
230*75PFC	10	10	18	20	24	28	30	36
200*75PFC	10	10	18	20	24	30	32	38
180*75PFC	10	10	18	22	24	30	32	38
150*75PFC	10	12	18	22	26	32	32	40
125*65PFC	10	12	20	24	26	34	34	42
100*50PFC	12	14	20	26	28	36	36	44
75*40PFC	12	16	22	28	30	38	36	48
Taper Flange Beams								
125*65TFB	10	12	20	24	26	34	34	42
100*45TFB	12	14	22	26	30	36	36	46
Equal Angles								
200EA26	10	10	12	14	16	22	22	30
200EA20	10	10	12	14	16	22	22	30
200EA18	10	10	12	14	16	22	22	30
200EA16	10	10	12	14	16	22	22	30
200EA13	10	10	12	14	16	22	22	30
150EA19	10	10	14	18	20	26	26	34
150EA16	10	10	14	18	20	26	26	34
150EA12	10	10	14	18	20	26	26	34
150EA10	10	10	14	18	20	26	26	34
125EA16	10	10	16	20	22	28	28	36
125EA12	10	10	16	20	22	28	28	36
125EA10	10	10	16	20	22	28	28	36
125EA8	10	10	16	20	22	28	28	36
100EA12	10	12	18	22	24	32	30	40
100EA10	10	12	18	22	24	32	30	40
100EA8	10	12	18	22	24	32	30	40
100EA6	10	12	18	22	24	32	30	40
90EA10	10	12	18	24	26	32	32	42
90EA8	10	12	18	24	26	32	32	42
90EA6	10	12	18	24	26	32	32	42
75EA10	10	14	20	26	26	36	32	44
75EA8	10	14	20	26	26	36	32	44
75EA6	10	14	20	26	26	36	32	44
75EA5	10	14	20	26	26	36	32	44
65EA10	12	14	20	26	28	36	34	46
65EA8	12	14	20	26	28	36	34	46
65EA6	12	14	20	26	28	36	34	46
65EA5	12	14	20	26	28	36	34	46
55EA6	12	16	22	28	30	38	36	48
55EA5	12	16	22	28	30	38	36	48



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ResCom Board Thickness of Hollow Protected Steel (mm)

60 mins		120 mins		180 mins		240 mins	
3 Sided	4 Sided	3 Sided	4 Sided	3 Sided	4 Sided	3 Sided	4 Sided

Equal Angles

50EA8	12	16	22	28	30	40	36	48
50EA6	12	16	22	28	30	40	36	48
50EA5	12	16	22	28	30	40	36	48
50EA3	12	16	22	28	30	40	36	48
45EA6	12	16	22	30	30	40	36	48
45EA5	12	16	22	30	30	40	36	48
45EA3	12	16	22	30	30	40	36	48
40EA6	14	18	24	30	30	40	38	50
40EA5	14	18	24	30	30	40	38	50
40EA3	14	18	24	30	30	40	38	50
30EA6	14	20	24	32	32	42	38	52
30EA5	14	20	24	32	32	42	38	52
30EA3	14	20	24	32	32	42	38	52
25EA6	16	20	24	32	32	44	40	52
25EA5	16	20	24	32	32	44	40	52
25EA3	16	20	24	32	32	44	40	52

Unequal Angles

150*100UA12	10	10	16	20	24	30	30	38
150*100UA10	10	10	16	20	24	30	30	38
150*90UA16	10	10	16	20	24	30	30	38
150*90UA12	10	10	16	20	24	30	30	38
150*90UA10	10	10	16	20	24	30	30	38
150*90UA8	10	10	16	20	24	30	30	38
125*75UA12	10	12	18	22	26	32	32	40
125*75UA10	10	12	18	22	26	32	32	40
125*75UA8	10	12	18	22	26	32	32	40
125*75UA10	10	12	18	22	26	32	32	40
100*75UA10	10	12	18	24	26	34	32	42
100*75UA8	10	12	18	24	26	34	32	42
100*75UA6	10	12	18	24	26	34	32	42
75*50UA8	12	14	22	28	28	38	36	46
75*50UA6	12	14	22	28	28	38	36	46
75*50UA5	12	14	22	28	28	38	36	46
65*50UA8	12	16	22	28	30	38	36	46
65*50UA6	12	16	22	28	30	38	36	46
65*50UA5	12	16	22	28	30	38	36	46

Rectangular Hollow Sections

250*150*9	10	10	12	16	18	22	24	30
250*150*6	10	10	12	16	18	22	24	30
250*150*5	10	10	12	16	18	22	24	30
200*100*9	10	10	16	18	22	28	28	36
200*100*6	10	10	16	18	22	28	28	36
200*100*5	10	10	16	18	22	28	28	36
200*100*4	10	10	16	18	22	28	28	36

ResCom Board Thickness of Hollow Protected Steel (mm)

60 mins		120 mins		180 mins		240 mins	
3 Sided	4 Sided	3 Sided	4 Sided	3 Sided	4 Sided	3 Sided	4 Sided

Rectangular Hollow Sections

150*100*6	10	10	16	20	24	30	30	38
150*100*5	10	10	16	20	24	30	30	38
150*100*4	10	10	16	20	24	30	30	38
150*50*5	12	12	20	24	28	34	34	42
150*50*4	12	12	20	24	28	34	34	42
150*50*3	12	12	20	24	28	34	34	42
125*75*6	10	12	18	22	26	32	32	40
125*75*5	10	12	18	22	26	32	32	40
125*75*4	10	12	18	22	26	32	32	40
125*75*3	10	12	18	22	26	32	32	40
100*50*6	12	14	20	26	28	36	36	44
100*50*5	12	14	20	26	28	36	36	44
100*50*4	12	14	20	26	28	36	36	44
100*50*3.5	12	14	20	26	28	36	36	44
100*50*3	12	14	20	26	28	36	36	44
75*50*6	12	14	22	28	28	38	36	46
75*50*5	12	14	22	28	28	38	36	46
75*50*4	12	14	22	28	28	38	36	46
75*50*3	12	14	22	28	28	38	36	46

Square Hollow Sections

250*250*9	10	10	10	12	14	18	20	26
250*250*6	10	10	10	12	14	18	20	26
200*200*9	10	10	12	14	16	22	22	30
200*200*6	10	10	12	14	16	22	22	30
200*200*5	10	10	12	14	16	22	22	30
150*150*9	10	10	14	18	20	26	26	34
150*150*6	10	10	14	18	20	26	26	34
150*150*5	10	10	14	18	20	26	26	34
125*125*9	10	10	16	20	22	28	28	36
125*125*6	10	10	16	20	22	28	28	36
125*125*5	10	10	16	20	22	28	28	36
125*125*4	10	10	16	20	22	28	28	36
100*100*9	10	12	18	22	24	32	30	40
100*100*6	10	12	18	22	24	32	30	40
100*100*5	10	12	18	22	24	32	30	40
100*100*4	10	12	18	22	24	32	30	40
100*100*3	10	12	18	22	24	32	30	40
89*89*6	10	12	18	24	26	34	32	42
89*89*5	10	12	18	24	26	34	32	42
89*89*3.5	10	12	18	24	26	34	32	42
75*75*6	10	14	20	26	26	36	34	44
75*75*5	10	14	20	26	26	36	34	44
75*75*4	10	14	20	26	26	36	34	44
75*75*3.5	10	14	20	26	26	36	34	44

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ResCom Board Thickness of Hollow Protected Steel (mm)							
60 mins		120 mins		180 mins		240 mins	
3 Sided	4 Sided	3 Sided	4 Sided	3 Sided	4 Sided	3 Sided	4 Sided

Square Hollow Sections

75*75*3	10	14	20	26	26	36	34	44
65*65*6	12	14	20	26	28	36	34	46
65*65*5	12	14	20	26	28	36	34	46
65*65*4	12	14	20	26	28	36	34	46
65*65*3	12	14	20	26	28	36	34	46
50*50*5	12	16	22	28	30	40	36	48
50*50*4	12	16	22	28	30	40	36	48
50*50*3	12	16	22	28	30	40	36	48
40*40*4	14	18	24	30	30	40	38	50
40*40*3	14	18	24	30	30	40	38	50
35*35*3	14	18	24	32	32	42	38	50
25*25*3	16	20	24	32	32	44	40	52

