

Certificate Of Fire Approval

This is to certify that the product detailed below will be accepted for compliance with the applicable Lloyd's Register Rules and Regulations and with the International Convention for the Safety of Life at Sea, (SOLAS), 1974, as amended, for use on ships and offshore installations classed with Lloyd's Register, and for use on ships and offshore installations when authorised by contracting governments to issue the relevant certificates, licences, permits etc.

Manufacturer	Morgan Advanced Materials, Thermal Ceramics
Address	Tebay Road, Bromborough, Wirral, Merseyside, CH62 3PH, United Kingdom
Type	Structural Steel Hydrocarbon Fire Protection System
Description	Structural Steel Open Sections ('I' Sections or 'H' Sections) protected with "FireMaster Marine Plus Blanket" insulation (Nominal Density: 128kg/m ³) for Hydrocarbon Fire Exposures for up to 240 minute durations
Trade Name	FireMaster Marine Plus Blanket
Specified Standard	BS EN 13381-4:2013 "Test methods for determining the contribution to the fire resistance of structural members Part 4: Applied passive protection to steel members" and BS EN 1363-2:1999 "Fire Resistance Tests – Part 2 Alternative and Additional Procedures"

71 Fenchurch Street, London, EC3M 4BS, UK

Keith Taylor

Team Lead, Fire & Safety to Lloyd's Register
EMEA
A member of the Lloyd's Register Group

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This certificate is not valid for equipment, the design or manufacture of which has been varied or modified from the specimen tested. The manufacturer should notify Lloyd's Register EMEA of any modification or changes to the equipment in order to obtain a valid Certificate.

The Design Appraisal Document and its supplementary Type Approval Terms and Conditions form part of this Certificate.

This certificate remains valid unless cancelled or revoked, provided the conditions in the attached Design Appraisal Document are complied with and the equipment remains satisfactory in service.

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ATTACHMENT TO CERTIFICATE OF TYPE APPROVAL No. LR1900616SF

This Design Appraisal Document forms part of the Certificate.

This Certificate is a replacement of previous Lloyd's Register EMEA Certificate of Fire Approval No: SAS F140159.

APPROVAL DOCUMENTATION

1. BRE Global, Watford, UK, Test Report No's: 279979, 279980, and 279981, all dated 12 March 2012
2. BRE Global, Watford, UK, Assessment Report No. CC 292428, dated 13 March 2014

CONDITIONS OF CERTIFICATION

1. Evaluation of the Hydrocarbon Fire Test Results for Open Sections ('I' Sections or 'H' Sections), are given in Appendices 1 to 6 attached to this certificate
2. Consisting of: Various layers of 128kg/m³ density "FIREMASTER MARINE PLUS BLANKET" fibre insulation retained to a steel structural Open Sections ('I' Section or 'H' Section members) by 2.8mm dia. welded steel pins and 38mm diameter steel washers spaced at 150mm maximum centres and 75mm from insulation joints. At least two layers of insulation to be provided with the lesser thicknesses positioned on the outside, with staggered or compressed joints where possible and butt joints overlapped by 300mm
3. Application in each case to be approved by Lloyd's Register at the design stage
4. Production items are to be manufactured in accordance with a quality control system which shall be maintained to ensure that items are of the same standard as the approved prototype
5. The Certificate holder is solely responsible for the products supplied under this Certificate and to ensure that their products, whether manufactured by themselves or their licensee manufacturers, if agreed by Lloyd's Register, are fully compliant with the relevant statutory regulations and Lloyd's Register Class Rules as applicable and designed and manufactured to the same quality and specifications as the prototype tested, including components that are designed and manufactured by third parties

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PLACES OF PRODUCTION

Thermal Ceramics
Lieu-dit Les Plantées St.
Marcellin-en-Forez
F-42680
France

Thermal Ceramics
2102 Old Savannah Road
Augusta
GA 30906
United States of America (USA)

Thermal Ceramics
Cerrada de la Paz No. 101
Zona Industrial la Paz
CP. 4218
Mineral de la Reforma Hidalgo
México

Thermal Ceramics
1-31 Bookdong,
Non Gong Eup Dal Sung-Gun,
Dae Gui-Shi
711 855
Korea

Morgan Thermal Ceramics
(Shanghai) Co., Ltd.
18 Kang An Road
Kangqiao Industrial Zone
Pudong, Shanghai
201315
China

Murugappa Morgan Thermal Ceramics Ltd.
Plots No. 681 Village Moti Bhojan
Kalol-sanand Road,
Dist. Gandhinagar,
Pin 382 721, Gujarat
India

M/S Murugappa Morgan Thermal Ceramics Ltd.
Plot No. 26 & 27 SIPCOT Industrial Complex
Ranipet 632 403
Vellore District Tamil Nadu
India

Morgan Kailong (Jingmen) Thermal
Ceramics Co., Ltd.
No. 20-1, Quankou Road
Jingmen City
Hubei Province
448032
China

Morgan Advanced Materials
Industries Limited
PO Box 146109
Plot No. KHIA4-07A
Khalifa Industrial Zone
Abu Dhabi
United Arab Emirates (UAE)

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Keith Taylor
Team Lead
Fire & Safety, Statutory Discipline Team
UK&I Technical Support Office, Marine & Offshore
Lloyd's Register EMEA

Supplementary Type Approval Terms and Conditions

This certificate and Design Appraisal Document relates to type approval, it certifies that the prototype(s) of the product(s) referred to herein has/have been found to meet the applicable design criteria for the use specified herein, it does not mean or imply approval for any other use, nor approval of any products designed or manufactured otherwise than in strict conformity with the said prototype(s).

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Appendix 1

Minimum thickness (mm) of "FIREMASTER MARINE PLUS BLANKET" (128kg/m³ density) applied to a structural steel open section ('I' Section or 'H' Section) necessary to restrict the mean temperature rise of the steel cores to the specified temperature (°C) at **30 minutes**, as a function of the cross sectional area and shape of the structural element represented by the Hp/A value.

Where: 'Hp' is the perimeter of the member exposed to the hydrocarbon fire (m); and
 'A' is the cross-sectional area of the member exposed to the hydrocarbon fire (m²).

Structural Element Hp/A (m ⁻¹)	Minimum thickness (mm) at Design Temperature (°C)					
	150	200	250	300	350	400
70	50	50	50	50	50	50
75	50	50	50	50	50	50
80	50	50	50	50	50	50
85	50	50	50	50	50	50
90	50	50	50	50	50	50
95	50	50	50	50	50	50
100	51	50	50	50	50	50
105	51	50	50	50	50	50
110	52	50	50	50	50	50
115	53	50	50	50	50	50
120	54	50	50	50	50	50
125	54	50	50	50	50	50
130	55	50	50	50	50	50
135	56	50	50	50	50	50
140	56	50	50	50	50	50
145	57	50	50	50	50	50
150	57	50	50	50	50	50
155	58	51	50	50	50	50
160	58	51	50	50	50	50
165	59	52	50	50	50	50
170	59	52	50	50	50	50
175	60	53	50	50	50	50
180	60	53	50	50	50	50
185	61	54	50	50	50	50

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Structural Element Hp/A (m ⁻¹)	Minimum thickness (mm) at Design Temperature (°C)					
	150	200	250	300	350	400
190	61	54	50	50	50	50
195	62	54	50	50	50	50
200	62	55	50	50	50	50
205	63	55	50	50	50	50
210	63	56	50	50	50	50
215	63	56	50	50	50	50
220	64	56	50	50	50	50
225	64	57	50	50	50	50
230	64	57	50	50	50	50
235	65	58	50	50	50	50
240	65	58	51	50	50	50
245	65	58	51	50	50	50
250	66	59	51	50	50	50
255	66	59	52	50	50	50
260	66	59	52	50	50	50
265	67	59	52	50	50	50
270	67	60	53	50	50	50
275	67	60	53	50	50	50
280	67	60	53	50	50	50
285	68	61	54	50	50	50
290	68	61	54	50	50	50
295	68	61	54	50	50	50
300	68	61	54	50	50	50
305	69	62	55	50	50	50
310	69	62	55	50	50	50
315	69	62	55	50	50	50
320	69	62	55	50	50	50
325	70	63	56	50	50	50
330	70	63	56	50	50	50
335	70	63	56	50	50	50
340	70	63	56	50	50	50
345	70	64	57	51	50	50
350	71	64	57	51	50	50
355	71	64	57	51	50	50
360	71	64	57	51	50	50

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Appendix 2

Minimum thickness (mm) of "FIREMASTER MARINE PLUS BLANKET" (128kg/m³ density) applied to a structural steel open section ('I' Section or 'H' Section) necessary to restrict the mean temperature rise of the steel cores to the specified temperature (°C) at **60 minutes**, as a function of the cross sectional area and shape of the structural element represented by the Hp/A value.

Where: 'Hp' is the perimeter of the member exposed to the hydrocarbon fire (m); and
 'A' is the cross-sectional area of the member exposed to the hydrocarbon fire (m²).

Structural Element Hp/A (m ⁻¹)	Minimum thickness (mm) at Design Temperature (°C)					
	150	200	250	300	350	400
70	68	57	50	50	50	50
75	70	59	50	50	50	50
80	73	61	50	50	50	50
85	74	62	51	50	50	50
90	76	64	53	50	50	50
95	78	66	54	50	50	50
100	80	67	56	50	50	50
105	81	69	57	50	50	50
110	83	70	59	50	50	50
115	85	72	60	50	50	50
120	86	73	61	51	50	50
125	87	74	63	52	50	50
130	89	76	64	54	50	50
135	90	77	65	55	50	50
140	91	78	66	56	50	50
145	92	79	67	57	50	50
150	94	80	68	58	51	50
155	95	81	69	59	52	50
160	96	83	70	60	53	50
165	97	84	71	61	54	50
170	98	85	72	62	55	50
175	99	85	73	63	56	51
180	100	86	74	64	57	52
185	101	87	75	64	58	52
190	102	88	76	65	59	53

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Structural Element Hp/A (m ⁻¹)	Minimum thickness (mm) at Design Temperature (°C)					
	150	200	250	300	350	400
195	102	89	77	66	60	54
200	103	90	77	67	60	55
205	104	91	78	68	61	56
210	105	91	79	68	62	56
215	106	92	80	69	63	57
220	106	93	80	70	63	58
225	107	94	81	71	64	58
230	108	94	82	71	65	59
235	108	95	82	72	65	60
240	109	96	83	73	66	60
245	110	96	74	73	67	61
250	110	97	84	74	67	61
255	111	98	85	74	68	62
260	112	98	86	75	68	63
265	112	99	86	76	69	63
270	113	99	87	76	69	64
275	113	100	87	77	70	64
280	114	101	88	77	71	65
285	114	101	88	78	71	65
290	115	102	89	78	72	66
295	115	102	89	79	72	66
300	116	103	90	79	73	67
305	116	103	90	80	73	67
310	117	104	91	80	74	68
315	117	104	91	81	71	68
320	118	105	92	81	74	69
325	118	105	92	82	75	69
330	119	105	93	82	75	69
335	119	106	93	82	76	70
340	119	106	93	83	76	70
345	120	107	94	83	77	71
350	120	107	94	84	77	71
355	121	108	95	84	77	71
360	121	108	95	85	78	72



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Appendix 3

Minimum thickness (mm) of "FIREMASTER MARINE PLUS BLANKET" (128kg/m³ density) applied to a structural steel open section ('I' Section or 'H' Section) necessary to restrict the mean temperature rise of the steel cores to the specified temperature (°C) at **90 minutes**, as a function of the cross sectional area and shape of the structural element represented by the Hp/A value.

Where: 'Hp' is the perimeter of the member exposed to the hydrocarbon fire (m); and
 'A' is the cross-sectional area of the member exposed to the hydrocarbon fire (m²).

Structural Element Hp/A (m ⁻¹)	Minimum thickness (mm) at Design Temperature (°C)					
	150	200	250	300	350	400
70	92	76	62	50	50	50
75	95	79	65	52	50	50
80	98	82	67	55	50	50
85	101	84	69	57	50	50
90	104	87	72	59	51	50
95	107	89	74	61	53	50
100	109	92	76	63	55	50
105	112	94	78	65	57	50
110	114	96	80	67	59	52
115	116	98	82	69	61	53
120	118	100	84	71	62	55
125	120	102	86	72	64	57
130	122	104	87	74	66	58
135	124	106	89	76	67	60
140	126	107	91	77	69	61
145	128	109	92	79	70	63
150	130	111	94	80	71	64
155	131	113	95	82	73	65
160	133	114	97	83	74	67
165	135	116	98	84	75	68
170	136	117	100	86	77	69
175	138	118	101	87	78	70
180	139	120	102	88	79	71
185	140	121	104	89	80	72
190	142	122	105	91	81	73

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Structural Element Hp/A (m ⁻¹)	Minimum thickness (mm) at Design Temperature (°C)					
	150	200	250	300	350	400
195	143	124	106	92	82	74
200	144	125	107	93	84	76
205	146	126	108	94	85	76
210	147	127	109	95	86	77
215	148	128	110	96	87	78
220	149	129	111	97	88	79
225	150	131	112	98	88	80
230	-	132	113	99	89	81
235	-	133	114	100	90	82
240	-	134	115	101	92	83
245	-	135	116	102	92	84
250	-	136	117	103	93	84
255	-	136	118	103	84	85
260	-	137	119	104	94	86
265	-	138	120	105	95	87
270	-	139	121	106	96	87
275	-	140	121	107	97	88
280	-	141	122	107	97	89
285	-	142	123	108	98	89
290	-	142	124	109	99	90
295	-	143	125	110	100	91
300	-	144	125	110	100	91
305	-	145	126	111	101	92
310	-	145	127	112	102	93
315	-	146	127	112	102	93
320	-	147	128	113	103	94
325	-	147	129	114	103	94
330	-	148	129	114	104	95
335	-	149	130	115	105	96
340	-	149	131	115	105	96
345	-	150	131	116	106	97
350	-	-	132	117	106	97
355	-	-	132	117	107	98
360	-	-	133	118	107	98



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Appendix 4

Minimum thickness (mm) of "FIREMASTER MARINE PLUS BLANKET" (128kg/m³ density) applied to a structural steel open section ('I' Section or 'H' Section) necessary to restrict the mean temperature rise of the steel cores to the specified temperature (°C) at **120 minutes**, as a function of the cross sectional area and shape of the structural element represented by the Hp/A value.

Where: 'Hp' is the perimeter of the member exposed to the hydrocarbon fire (m); and
 'A' is the cross-sectional area of the member exposed to the hydrocarbon fire (m²).

Structural Element Hp/A (m ⁻¹)	Minimum thickness (mm) at Design Temperature (°C)					
	150	200	250	300	350	400
70	115	95	78	64	55	50
75	120	99	81	67	58	50
80	124	102	84	70	60	52
85	128	106	88	73	63	55
90	131	109	91	76	66	57
95	135	113	93	78	68	60
100	138	116	96	81	71	62
105	142	119	99	83	73	65
110	145	122	102	86	76	67
115	148	124	104	88	78	69
120	-	127	107	90	80	71
125	-	130	109	93	82	73
130	-	132	111	95	84	75
135	-	135	113	97	86	77
140	-	137	116	99	88	78
145	-	139	118	101	90	80
150	-	141	120	103	92	82
155	-	143	122	104	93	83
160	-	145	124	106	95	85
165	-	147	125	108	97	87
170	-	149	127	110	98	88
175	-	-	129	111	100	90
180	-	-	131	113	101	91
185	-	-	132	114	103	92
190	-	-	134	116	104	94

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Structural Element Hp/A (m ⁻¹)	Minimum thickness (mm) at Design Temperature (°C)					
	150	200	250	300	350	400
195	-	-	135	117	105	95
200	-	-	137	119	107	96
205	-	-	138	120	108	97
210	-	-	140	122	109	99
215	-	-	141	123	111	100
220	-	-	143	124	112	101
225	-	-	144	125	113	102
230	-	-	145	127	114	103
235	-	-	147	128	115	104
240	-	-	148	129	116	105
245	-	-	149	130	118	106
250	-	-	150	131	119	107
255	-	-	-	132	120	108
260	-	-	-	133	121	109
265	-	-	-	135	122	110
270	-	-	-	136	123	111
275	-	-	-	137	124	112
280	-	-	-	138	124	113
285	-	-	-	138	125	114
290	-	-	-	139	126	114
295	-	-	-	140	127	115
300	-	-	-	141	128	116
305	-	-	-	142	129	117
310	-	-	-	143	130	118
315	-	-	-	144	130	118
320	-	-	-	145	131	119
325	-	-	-	145	132	120
330	-	-	-	146	133	120
335	-	-	-	147	133	121
340	-	-	-	148	134	122
345	-	-	-	149	135	122
350	-	-	-	149	136	123
355	-	-	-	150	136	124
360	-	-	-	-	137	124



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Appendix 5

Minimum thickness (mm) of "FIREMASTER MARINE PLUS BLANKET" (128kg/m³ density) applied to a structural steel open section ('I' Section or 'H' Section) necessary to restrict the mean temperature rise of the steel cores to the specified temperature (°C) at **180 minutes**, as a function of the cross sectional area and shape of the structural element represented by the Hp/A value.

Where: 'Hp' is the perimeter of the member exposed to the hydrocarbon fire (m); and
 'A' is the cross-sectional area of the member exposed to the hydrocarbon fire (m²).

Structural Element Hp/A (m ⁻¹)	Minimum thickness (mm) at Design Temperature (°C)					
	150	200	250	300	350	400
70	-	133	109	91	79	69
75	-	139	114	96	83	73
80	-	144	119	100	87	77
85	-	149	124	104	91	80
90	-	-	128	108	95	84
95	-	-	133	112	99	87
100	-	-	137	116	102	90
105	-	-	141	120	106	94
110	-	-	145	123	109	97
115	-	-	148	126	112	100
120	-	-	-	130	115	102
125	-	-	-	133	118	105
130	-	-	-	136	121	108
135	-	-	-	139	124	110
140	-	-	-	142	126	113
145	-	-	-	145	129	115
150	-	-	-	147	131	118
155	-	-	-	150	134	120
160	-	-	-	-	136	122
165	-	-	-	-	139	124
170	-	-	-	-	141	126
175	-	-	-	-	143	128
180	-	-	-	-	145	130
185	-	-	-	-	147	132
190	-	-	-	-	149	134

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Structural Element Hp/A (m ⁻¹)	Minimum thickness (mm) at Design Temperature (°C)					
	150	200	250	300	350	400
195	-	-	-	-	-	136
200	-	-	-	-	-	138
205	-	-	-	-	-	139
210	-	-	-	-	-	141
215	-	-	-	-	-	143
220	-	-	-	-	-	144
225	-	-	-	-	-	146
230	-	-	-	-	-	147
235	-	-	-	-	-	149
240	-	-	-	-	-	150
245	-	-	-	-	-	-
250	-	-	-	-	-	-
255	-	-	-	-	-	-
260	-	-	-	-	-	-
265	-	-	-	-	-	-
270	-	-	-	-	-	-
275	-	-	-	-	-	-
280	-	-	-	-	-	-
285	-	-	-	-	-	-
290	-	-	-	-	-	-
295	-	-	-	-	-	-
300	-	-	-	-	-	-
305	-	-	-	-	-	-
310	-	-	-	-	-	-
315	-	-	-	-	-	-
320	-	-	-	-	-	-
325	-	-	-	-	-	-
330	-	-	-	-	-	-
335	-	-	-	-	-	-
340	-	-	-	-	-	-
345	-	-	-	-	-	-
350	-	-	-	-	-	-
355	-	-	-	-	-	-
360	-	-	-	-	-	-

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Appendix 6

Minimum thickness (mm) of "FIREMASTER MARINE PLUS BLANKET" (128kg/m³ density) applied to a structural steel open section ('I' Section or 'H' Section) necessary to restrict the mean temperature rise of the steel cores to the specified temperature (°C) at **240 minutes**, as a function of the cross sectional area and shape of the structural element represented by the Hp/A value.

Where: 'Hp' is the perimeter of the member exposed to the hydrocarbon fire (m); and
 'A' is the cross-sectional area of the member exposed to the hydrocarbon fire (m²).

Structural Element Hp/A (m ⁻¹)	Minimum thickness (mm) at Design Temperature (°C)					
	150	200	250	300	350	400
70	-	-	141	118	104	91
75	-	-	148	124	109	96
80	-	-	-	130	114	101
85	-	-	-	136	119	106
90	-	-	-	141	124	110
95	-	-	-	146	129	114
100	-	-	-	-	134	119
105	-	-	-	-	138	123
110	-	-	-	-	142	127
115	-	-	-	-	146	130
120	-	-	-	-	150	134
125	-	-	-	-	-	137
130	-	-	-	-	-	141
135	-	-	-	-	-	144
140	-	-	-	-	-	147
145	-	-	-	-	-	150
150	-	-	-	-	-	-
155	-	-	-	-	-	-
160	-	-	-	-	-	-
165	-	-	-	-	-	-
170	-	-	-	-	-	-
175	-	-	-	-	-	-
180	-	-	-	-	-	-
185	-	-	-	-	-	-
190	-	-	-	-	-	-



ATTACHMENT TO CERTIFICATE OF TYPE APPROVAL No. LR1900616SF

Structural Element Hp/A (m ⁻¹)	Minimum thickness (mm) at Design Temperature (°C)					
	150	200	250	300	350	400
195	-	-	-	-	-	-
200	-	-	-	-	-	-
205	-	-	-	-	-	-
210	-	-	-	-	-	-
215	-	-	-	-	-	-
220	-	-	-	-	-	-
225	-	-	-	-	-	-
230	-	-	-	-	-	-
235	-	-	-	-	-	-
240	-	-	-	-	-	-
245	-	-	-	-	-	-
250	-	-	-	-	-	-
255	-	-	-	-	-	-
260	-	-	-	-	-	-
265	-	-	-	-	-	-
270	-	-	-	-	-	-
275	-	-	-	-	-	-
280	-	-	-	-	-	-
285	-	-	-	-	-	-
290	-	-	-	-	-	-
295	-	-	-	-	-	-
300	-	-	-	-	-	-
305	-	-	-	-	-	-
310	-	-	-	-	-	-
315	-	-	-	-	-	-
320	-	-	-	-	-	-
325	-	-	-	-	-	-
330	-	-	-	-	-	-
335	-	-	-	-	-	-
340	-	-	-	-	-	-
345	-	-	-	-	-	-
350	-	-	-	-	-	-
355	-	-	-	-	-	-
360	-	-	-	-	-	-

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