

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Structural Fire Protection

with type designation(s)

CHARREX PFP-1000 - I sections

Issued to

SAMHWA PAINTS INDUSTRIAL CO., LTD.

Ansan-si Gyeonggi-do, Republic of Korea

is found to comply with

DNV GL offshore standards

Application :

Approved for use as a system for fire protection of structural steel I sections.

This Certificate is valid until **2021-11-26**.

Issued at **Høvik** on **2016-11-27**

DNV GL local station: **Seoul**

for **DNV GL**

Approval Engineer: **Helge Bjørnarå**

Petter Langnes
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Job Id:
Certificate No: **TAF00000DC**

Product description

"CHARREX PFP-1000" - I-sections
system for fire protection of structural steel elements, I sections, consisting of a primer and a two component epoxy intumescent coating "CHARREX PFP-1000".

The materials are manufactured at the following locations:

- SAMHWA PAINTS INDUSTRIAL CO., LTD., Ansan-si, Gyeonggi-do, Korea

Application/Limitation

The thickness of "CHARREX PFP-1000" system to be applied to avoid temperatures to rise on the steel substrate less than 250 °C, 300 °C, 350 °C, 400 °C, 427 °C, 450 °C, 500 °C, 538 °C, 550 °C, 600 °C and 650 °C for I sections, are given in appendix table 1-11.

The protective coating is not defined as non-combustible and should not be used in accommodation or in enclosed areas.

Relative density of "CHARREX PFP-1000" is 1.0 g/cm³.

The approval refers only to the fire resistance properties of the system.

The application of the protective coating is to be performed in accordance with the manufacturer's application manual. Alternative primers and topcoats may be used provided they have been tested and approved by the manufacture.

Each product is to be supplied with its manual for installation/application and maintenance.

Type Approval documentation

Certification in accordance with Class Programme DNVGL-CP-0338, October 2015.

Doc. No. SH-F-001, Rev.1, CHARREX PFP-1000 Application Manual from manufacturer

Test reports No. 350977, dated 14 July 2015 from Exova Warringtonfire, Warrington, UK
Test reports No. 350976, dated 14 July 2015 from Exova Warringtonfire, Warrington, UK
Test reports No. 350975, dated 14 July 2015 from Exova Warringtonfire, Warrington, UK
Test reports No. 350972, dated 14 July 2015 from Exova Warringtonfire, Warrington, UK
Test reports No. 350970, dated 14 July 2015 from Exova Warringtonfire, Warrington, UK
Test reports No. 350966, dated 14 July 2015 from Exova Warringtonfire, Warrington, UK

Assessment report No. 366989 dated 7 July 2016 from Exova Warringtonfire, Warrington, UK

Tests carried out

Tested according to BS 476: Part 20 and 21: 1987 with HC-curve according to ISO 834-3.

Marking of product

The product or packing is to be marked with name of manufacturer and type designation.

Periodical assessment

DNV GL's surveyor is to be given permission to perform Periodical Assessments at any time during the validity of this certificate and at least every second year. The arrangement is to be in accordance with procedure described in Class Programme DNVGL-CP-0338, Section 4.

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Table 1: Thickness of "CHARREX PFP-1000" system for fire protection of *I* sections for a critical temperature rise of **250 °C**:

Hp/A	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
[m ⁻¹]								
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Hp/A	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
[m ⁻¹]								
215								
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The maximum thickness of protection material up to the required Hp/A [m⁻¹] shall be used.

Hp/A = Ratio between Heat perimeter and cross sectional Area of the section, [m⁻¹]

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Table 2: Thickness of "CHARREX PFP-1000" system for fire protection of *I* sections for a critical temperature rise of **300 °C**:

Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
40								
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Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
215								
220								
225								
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235								
240								
245								
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The maximum thickness of protection material up to the required Hp/A [m⁻¹] shall be used.

Hp/A = Ratio between Heat perimeter and cross sectional Area of the section, [m⁻¹]

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Table 3: Thickness of "CHARREX PFP-1000" system for fire protection of *I* sections for a critical temperature rise of **350 °C**:

Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
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Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
215								
220								
225								
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The maximum thickness of protection material up to the required Hp/A [m⁻¹] shall be used.

Hp/A = Ratio between Heat perimeter and cross sectional Area of the section, [m⁻¹]

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Table 4: Thickness of "CHARREX PFP-1000" system for fire protection of *I* sections for a critical temperature rise of **400 °C**:

Hp/A	Fire resistance time in minutes, Thickness in mm							
[m ⁻¹]	30	45	60	90	105	120	150	180
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Hp/A	Fire resistance time in minutes, Thickness in mm							
[m ⁻¹]	30	45	60	90	105	120	150	180
215								
220								
225								
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235								
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245								
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The maximum thickness of protection material up to the required Hp/A [m⁻¹] shall be used.

Hp/A = Ratio between Heat perimeter and cross sectional Area of the section, [m⁻¹]

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Table 5: Thickness of "CHARREX PFP-1000" system for fire protection of I sections for a critical temperature rise of **427 °C**:

Hp/A	Fire resistance time in minutes, Thickness in mm							
[m ⁻¹]	30	45	60	90	105	120	150	180
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Hp/A	Fire resistance time in minutes, Thickness in mm							
[m ⁻¹]	30	45	60	90	105	120	150	180
215								
220								
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The maximum thickness of protection material up to the required Hp/A [m⁻¹] shall be used.

Hp/A = Ratio between Heat perimeter and cross sectional Area of the section, [m⁻¹]

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Table 6: Thickness of "CHARREX PFP-1000" system for fire protection of I sections for a critical temperature rise of **450 °C**:

Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
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Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
215								
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The maximum thickness of protection material up to the required Hp/A [m⁻¹] shall be used.

Hp/A = Ratio between Heat perimeter and cross sectional Area of the section, [m⁻¹]

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Table 7: Thickness of "CHARREX PFP-1000" system for fire protection of I sections for a critical temperature rise of **500 °C**:

Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
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Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	
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The maximum thickness of protection material up to the required Hp/A [m⁻¹] shall be used.

Hp/A = Ratio between Heat perimeter and cross sectional Area of the section, [m⁻¹]

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Table 8: Thickness of "CHARREX PFP-1000" system for fire protection of I sections for a critical temperature rise of **538 °C**:

Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
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Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	
215								
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The maximum thickness of protection material up to the required Hp/A [m⁻¹] shall be used.

Hp/A = Ratio between Heat perimeter and cross sectional Area of the section, [m⁻¹]

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Table 9: Thickness of "CHARREX PFP-1000" system for fire protection of I sections for a critical temperature rise of **550 °C**:

Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
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Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
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The maximum thickness of protection material up to the required Hp/A [m⁻¹] shall be used.

Hp/A = Ratio between Heat perimeter and cross sectional Area of the section, [m⁻¹]

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Table 10: Thickness of "CHARREX PFP-1000" system for fire protection of I sections for a critical temperature rise of **600 °C**:

Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
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Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	
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The maximum thickness of protection material up to the required Hp/A [m⁻¹] shall be used.

Hp/A = Ratio between Heat perimeter and cross sectional Area of the section, [m⁻¹]

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Table 11: Thickness of "CHARREX PFP-1000" system for fire protection of I sections for a critical temperature rise of **650 °C**:

Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	180
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Hp/A [m ⁻¹]	Fire resistance time in minutes, Thickness in mm							
	30	45	60	90	105	120	150	
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The maximum thickness of protection material up to the required Hp/A [m⁻¹] shall be used.

Hp/A = Ratio between Heat perimeter and cross sectional Area of the section, [m⁻¹]