



# Hempel NORSOK coating systems

#### NORSOK M-501 approved systems from Hempel

Hempel is a world leader in the supply of marine and protective coatings to a wide variety of industry segments, including:

- Oil & Gas Upstream
- Oil & Gas Downstream
- Petrochemical
- Civil Infractructure
- Power
- Marine
- Transport

Our global capabilities allow us to supply our tailored coating solutions anywhere in the world, helping you protect your investment from corrosion. With 28 factories globally and operations in over 80 countries, wherever your next project takes you, you're never far from Hempel.

However, we recognise that our technologically advanced product ranges make up only half the story. Our people make the difference. With a global network of experienced personnel and trained coating advisors to help you deliver your project on time and to specification, Hempel's technical service is second to none.

We recognise that choosing a coatings' supplier is often a tough choice. We are here to make that choice easier.

#### What is NORSOK M-501?

The NORSOK standards are a series of standards developed by the Norwegian petroleum industry. The purpose of these industry standards is to replace the individual oil company specifications and to add value, reduce cost and lead time and to remove unnecessary activities in offshore field developments and operation.

#### About this guide

NORSOK M-501 mandates a series of systems based on generic coating type and minimum scheme thicknesses. In addition, for some systems, testing requirements are also necessary for pre-qualification to this standard. A full list of the systems within NORSOK can be found in the table on the following page.

The tables published in this brochure provide examples of Hempel-recommended schemes, corresponding to the different systems within NORSOK M-501. Where a system requires pre-qualification, this is clearly stated and Hempel systems listed will have been subjected to all of the necessary pre-qualification testing. Where pre-qualification isn't mandatory, a series of recommended schemes are listed. This document covers only those systems appropriate to edition 5 and/or 6 of the NORSOK M-501 standard.

For further advice on additional schemes and regional availability, please contact your local Hempel representative at protective@hempel.com.

# Exposure conditions Atmosphere C5M • Cyclic testing (ISO 20340) • Three-coat, zinc-rich system requires ≤ 3 mm scribe creep Splash/tidal zone C5M + IM2 • Cyclic testing • Cathodic Protection (CP) • Water immersion Immersed IM2 • Cathodic Protection (CP)

#### System 1 (pre-qualified)

Carbon steel with operating temperature below 120°C/248°F

- Structural steel
- Exteriors of equipment, vessels, piping and valves (not insulated

#### System 2

Areas with operating temperatures above 120°C/248°F and/or areas under insulation etc

#### System 3A-3G (System 3B pre-qualified)

Internal surface of carbon steel vessels

#### System 4 (pre-qualified)

Walkways, escape routes and lay down areas

#### System 5A (pre-qualified)

Passive fire protection

#### System 5B (pre-qualified)

Cement-based fire protection

#### System 6A

Uninsulated stainless steel when painting is required Aluminium when painting is required

#### System 6B

Hot-dipped, galvanised steel when painting is required

#### System 6C

Insulated stainless steel piping and vessels at temperatures < 150°C/302°F

#### System 7A (pre-qualified)

Carbon and stainless steel in the splash zone

#### System 7B (pre-qualified)

Submerged carbon and stainless steel ≤ 50°C/122°F

#### System 7C (pre-qualified)

Submerged carbon and stainless steel > 50°C/122°F

#### System 8

Structural carbon steel with an operating temperature of 80°C/176°F in internal, fully dry and well ventilated areas

#### System 9

Bulk supplied carbon steel valves with operating temperatures up to 150°C/302°F





#### System 1: Operating temperature < 120°C

Pre-qualification is required

#### Zinc epoxy

Product	DFT (µm)
Hempadur Pro Zinc 17380	60
Hempadur Mastic 45880	140
Hempathane HS 55610	80
Total	280

Product	DFT (µm)
Hempadur Pro Zinc 17380	60
Hempadur Mastic 4588W	120
Hempaxane 55000	100
Total	280

Product	DFT (µm)
Hempadur Pro Zinc 17380	60
Hempadur Mastic 4588W	160
Hempaxane Classic 55030	60
Total	280

Product	DFT (µm)
Hempadur Avantguard 750	60
Hempadur Mastic 45880	140
Hempathane DTM 55620	80
Total	280

Product	DFT (µm)
Hempadur Pro Zinc 17380	60
Hempadur Mastic 4588W	175
Hempel's Pro Acrylic 558580	75
Total	310

Product	DFT (µm)
Hempadur Pro Zinc 17380	60
Hempadur Quattro 17634	160
Hempathane HS 55610	60
Total	280

Product	DFT (µm)
Hempadur Avantguard 750	60
Hempadur Quattro XO 17770	140
Hempathane DTM 55620	80
Total	280

Product	DFT (µm)
Hempadur Avantguard 770	60
Hempadur 47300	160
Hempathane HS 55610	60
Total	280



Product	DFT (µm)
Hempadur Avantguard 750	60
Hempadur 47300	140
Hempathane DTM 55620	80
Total	280

Product	DFT (µm)
Hempadur Avantguard 770	60
Hempadur Mastic 4588W	200
Hempathane DTM 55620	80
Total	340

Product	DFT (µm)
Hempadur Avantguard 750	60
Hempadur 47300	160
Hempathane HS 55610	60
Total	280

Product	DFT (µm)
Hempadur Avantguard 770	60
Hempadur 45880	140
Hempathane HS 55610	80
Total	280

Product	DFT (µm)
Hempadur Avantguard 770	60
Hempadur 4774D	160
Hempathane HS 55610	60
Total	280

Product	DFT (µm)
Hempadur Avantguard 770	60
Hempadur XO Quattro 17870	160
Hempathane HS 55610	60
Total	280

Product	DFT (µm)
Hempadur Avantguard 750	60
Hempadur XO Quattro 17870	160
Hempel's Pro Acrylic 55883	60
Total	280

#### System 1: Operating temperature < 120°C

Pre-qualification is required

#### Zinc silicate

Product	DFT (µm)
Hempel's Galvosil 15700	75
Hempadur 47140	150
Hempathane Topcoat 55210	50
Total	275

Product	DFT (µm)
Hempel's Galvosil 15700	75
Hempadur Mastic 45880	200
Hempathane Topcoat 55210	50
Total	325

Product	DFT (µm)
Hempel's Galvosil 15700	60
Hempadur Mastic 4588W	160
Hempathane HS 55610	60
Total	280

Product	DFT (µm)
Hempel's Galvosil 15700	60
Hempadur Mastic 4588W	160
Hempel's Pro Acrylic 55883	60
Total	280

Product	DFT (µm)
Hempel's Galvosil 15750	60
Hempadur Mastic 45880	140
Hempathane HS 55610	80
Total	280

# Product DFT (μm) Hempel's Galvosil 15700 60 Hempadur XO Quattro 17760 25 Hempadur XO Quattro 17760 135 Hempel's Pro Acrylic 55883 60 Total 280

Product	DFT (µm)
Hempel's Galvosil 15700	60
Hempadur XO Quattro 17870	25
Hempadur XO Quattro 17870	135
Hempel's Pro Acrylic 55883	60
Total	280

Product	DFT (µm)
Hempel's Galvosil 15700	60
Versiline CUI 56990	150
Versiline CUI 56990	150
Total	360

#### System 1: Operating temperature < 120°C

Pre-qualification is required

#### Non-zinc<sup>2</sup>

Product	DFT (µm)
Hempel's Polyester GF 35990	500
Hempel's Polyester GF 35990	500
Total	1000

- Note 1 = Subject to owner approval, a pre-qualified topcoat may be substituted for another topcoat if the topcoat thickness and the intermediates remain the same.

  The topcoat listed is the one tested. Commonly used topcoats, which may be substituted include Hempathane HS 55610, Hempathane DTM 55620,

  Hempathane Topcoat 55210, Hempel's Pro Acrylic 55883 and Hempaxane 55030. This note applies to all of the above systems.
- Note 2 = Specialized coating systems with at least two coats and without zinc rich primers, may be selected for particularly exposed areas on installations provided the coating system is pre-qualified in accordance with 10.1, the coating thickness is > 1000 µm DFT and provided relevant successful field experience is documented. This note applies to the systems listed under non zinc.
- Note 3 = Systems with a chalking rating of 1 shall be preferred. Contact Hempel for further details. This note applies to all of the above systems.

Areas with operating temperatures above 120°C/248°F and/or areas under insulation

System 2A: Consists of 200 µm thermally sprayed aluminium or alloys of aluminium top coated with the following systems

Pre-qualification is not required

Product	DFT (µm)
Hempadur 15570 (diluted) < 120°C	25
Total	25

Product	DFT (µm)
Hempadur Sealer 05990 < 120°C	25
Total	25

Product	DFT (µm)
Hempel's Silicone Aluminium 56913/4	25
Total	25

As alternative to thermally sprayed aluminium for areas with service temperature < 120°C phenolic epoxy can be used

Hempadur 85671	150
Hempadur 85671	150
Total	300



## System 2B: Consists of 100 $\mu m$ thermally sprayed zinc or alloys of zinc top coated with the following systems

Pre-qualification is required for intermediate and topcoat as per System 1

Product	DFT (µm)
Hempadur Mastic 45880	125
Hempathane HS 55610	75
Total	200

Product	DFT (µm)
Hempadur XO Quattro 17770	125
Hempathane HS 55610	75
Total	200

Product	DFT (µm)
Hempadur Mastic 4588W	125
Hempathane HS 55610	75
Total	200

Product	DFT (µm)
Hempadur 47300	125
Hempathane HS 55610	75
Total	200

Product	DFT (µm)
Hempadur Mastic 47140	125
Hempathane HS 55610	75
Total	200

Product	DFT (µm)
Hempadur Mastic 4774D	125
Hempathane HS 55610	75
Total	200

Product	DFT (µm)
Hempadur XO Quattro 17870	125
Hempathane HS 55610	75
Total	200

- Note 1 = Other commonly used topcoats may be used as replacement for Hempathane HS 55610 including Hempathane DTM 55620, Hempathane Topcoat 55210, Hempel's Pro Acrylic 55883 and Hempaxane 55030. This note applies to all of the above systems.
- Note 2 = As pre-qualification is not required additional systems may also be recommended. Contact your Hempel representative for further details. This note applies to all of the above systems.
- Note 3 = An optional tie-coat may be specified to avoid popping. Typically, 25µm Hempadur 15590 (diluted) or 25µm of the specified epoxy (diluted, mist coat technique) can be used. Contact your Hempel representative for further details. This note applies to all of the above systems.



Internal surface of carbon steel vessels

#### System 3A: Potable water tanks

Pre-qualification is not required

Product	DFT (µm)
Hempadur 35560 WRC, NORSK, NSF	300
Hempadur 35560	300
Total	600

Product	DFT (µm)
Hempadur Multi-Strength 35530 WRC, NORSK, NSF	300
Hempadur Multi-Strength 35530	300
Total	600

Product	DFT (µm)
Hempadur 35600 wrc 60°C	300
Hempadur 35600	300
Total	600

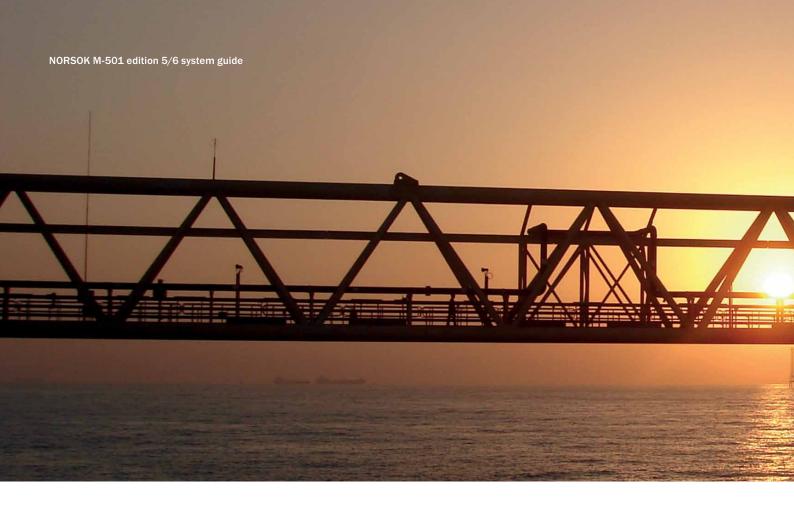
WRC = Water Research Centre (UK).

WRC 60°C = Water Research Centre, UK (Hot potable water max temp 60°C/140°F).

NORSK = Norsk Folkehelse.

NSF = National Sanitation Foundation (US).





#### System 3B: Ballast tanks

Pre-qualification is required

Product	DFT (µm)
Shop primer	20
Hempadur Quattro XO 17870	160
Hempadur Quattro XO 17870	160
Total	340

Product	DFI (µm)
Shop primer	20
Hempadur Quattro Alu 45604	160
Hempadur Quattro 17634	160
Total	340

Product	DFT (µm)
Shop primer	20
Hempadur Quattro XO 17820	160
Hempadur Quattro XO 17820	160
Total	340

Product	DFT (µm)
Shop primer	20
Hempadur Quattro Fibre 47604	160
Hempadur Quattro 17634	160
Total	340

Product	DFT (µm)
Shop primer	20
Hempadur Quattro XO 17720	160
Hempadur Quattro XO 17720	160
Total	340

Product	DFT (µm)
Shop primer	20
Hempadur Uniq 47741	160
Hempadur Uniq 47741	160
Total	340

Product	DFT (µm)
Shop primer	20
Hempadur Quattro XO 17760	160
Hempadur Quattro XO 17760	160
Total	340

Product	DFT (µm)
Shop primer	20
Hempadur Uniq 47743	160
Hempadur Uniq 47743	160
Total	340

Product	DFT (µm)
Shop primer	20
Hempadur Quattro XO 17770	160
Hempadur Quattro XO 17770	160
Total	340

Product	DFT (µm)
Shop primer	20
Hempadur Quattro 17634	160
Hempadur XO 35790	160
Total	340



Product	DFT (μm)
Shop primer	20
Hempadur 15600	160
Hempadur 15600	160
Total	340

Product	DFT (µm)
Shop primer	20
Hempadur Quattro 17630	160
Hempadur Quattro 17630	160
Total	340

Product	DFT (µm)
Shop primer	20
Hempadur Quattro 17634	160
Hempadur Quattro 17634	160
Total	340

Product	DFT (µm)
Shop primer	20
Hempadur 35750	160
Hempadur 35750	160
Total	340

- Note 1 = Various optional shop primers are approved contact Hempel for details. This note applies to all of the above systems in System 3B.

  Note 2 = Coating system 3B for ballast water tanks approved to IMO MSC.215 (82) shall be considered as qualified. This note applies to all of the above systems in System 3B.
- Note 3 = Care should be taken to avoid excessive temperature gradients from adjacent storage areas. For temperature gradients above 15°C contact Hempel technical support. This note applies to all of the above systems in System 3B.

#### System 3C: Tanks for stabilised crude, diesel and condensate

Pre-qualification is not required

Product	DFT (µm)
Shop primer <sup>1</sup>	20
Hempadur Quattro XO 17870 <sup>2,3</sup>	160
Hempadur Quattro XO 17870	160
Total	340

Product	DFT (µm)
Shop primer <sup>1</sup>	20
Hempadur Quattro XO 17720 <sup>2,3</sup>	160
Hempadur Quattro XO 17720	160
Total	340

Product	DFT (µm)
Shop primer <sup>1</sup>	20
Hempadur 15600 <sup>2,4</sup>	160
Hempadur 15600	160
Total	340

Product	DFT (µm)
Hempadur Quattro XO 17820 <sup>2,3</sup>	160
Hempadur Quattro XO 17820	160
Total	320

Product	DFT (µm)
Shop primer <sup>1</sup>	20
Hempadur Quattro 17634 <sup>2,3</sup>	160
Hempadur Quattro 17634	160
Total	340

Product	DFT (µm)
Hempadur 85671	160
Hempadur 85671	160
Total	320

Product	DFT (µm)
Shop primer <sup>1</sup>	20
Hempadur Uniq 47741 <sup>2,3</sup>	160
Hempadur Uniq 47741	160
Total	340

- Note 1 = Various optional shop primers are approved contact Hempel for further details. This note applies to all of the above systems in System 3C where shop primer is listed
- Note 2 = Approved to IMO Resolution MSC.288 (87):2010 Annex II test procedures for coating qualification for cargo oil tanks of crude oil tankers.
- Note 3 = Content of aromates should be less than 15%. If a water phase is present, then the maximum service temperature is 40°C/104°F. Otherwise maximum service temperature is 65°C/149°F. Loading and offloading up to 85°C/185°F.
- Note 4 = Content of aromates should be less than 15%. If a water phase is present, then the maximum service temperature is 65°C/140°F. Loading and offloading up to 85°C/185°F.
- Note 5 = Care should be taken to avoid excessive temperature gradients from adjacent storage areas. For temperature gradients above 15°C contact Hempel technical support. This note applies to all of the above systems in System 3C.

#### System 3D: Process vessels < 3 bar, < 75°C/167°F

Pre-qualification is not required

Product	DFT (µm)
Hempadur 85671	100
Hempadur 85671	100
Hempadur 85671	100
Total	300

Product	DFT (µm)
Hempadur 35900 <sup>2</sup>	250
Hempadur 35900	250
Total	500

#### System 3E: Process vessels < 70 bar, < 80°C/176°F

Pre-qualification is not required

Product	DFT (µm)
Hempadur 85671	100
Hempadur 85671	100
Hempadur 85671	100
Total	300

Product	DFT (µm)
Hempadur 35900 <sup>2</sup>	250
Hempadur 35900	250
Total	500

#### System 3F: Process vessels < 30 bar, < 130°C/266°F

Pre-qualification is not required

Product	DFT (µm)
Hempadur 85671	100
Hempadur 85671	100
Hempadur 85671	100
Total	300

Note 1 = Suitability is subject to confirmation of actual operating conditions. This note applies to all systems in System 3D, 3E and 3F.

Note 2 = Solvent free. This note applies to systems 3D and 3E.

#### System 3G: Vessels for storage of methanol, MEG etc

Pre-qualification is not required

Product	DFT (µm)
Hempel's Galvosil 15700	100
Total	100

Walkways, escape routes and lay down areas

#### System 4: Decks

Pre-qualification is required

Product	DFT (µm)
Hempadur 15590 (diluted) < 120°C1	20
Hempadur Spray-Guard 35493	3000
Total	3020

Product	DFT (µm)
Hempadur Spray-Guard 35493	1500
Hempadur Spray-Guard 35493	1500
Total	3000

Note 1 = The use of Hempadur 15590 is optional.

Note 2 = Coating systems pre-qualified according to NORSOK M-501 System 1 may be used for other deck areas with the addition of a non-skid aggregate (Hempel 67500). This note applies to all of the above systems.



#### Passive fire protection

#### System 5A: Epoxy based passive fire protection

Pre-qualification is required

Product	DFT (µm)
Hempadur Avantguard 750 1736G	60
Total	60

Product	DFT (µm)
Hempadur 15570	60
Total	60

Product	DFT (µm)
Hempadur Avantguard 770 17382	60
Total	60

Product	DFT (µm)
Hempadur 17380	60
Total	60

Product	DFT (µm)
Hempel's Galvosil 15700	60
Total	60

Product	DFT (µm)
Hempadur 17360	60
Total	60

Note 1 = Hempel do not supply passive fire protection, although Hempel coatings are approved by several suppliers of Passive fire protection, for use as primers and intermediates under the passive fire protecting layers.

#### System 5B: Cement based passive fire protection

Pre-qualification is required

Product	DFT (µm)
Hempadur Avantguard 750	60
Hempadur 45880/1/W	100
Total	160

Product	DFT (µm)
Hempadur 15570	60
Hempadur 45880/1/W	100
Total	160

Product	DFT (µm)
Hempadur Avantguard 770	60
Hempadur 45880/1/W	100
Total	160

Product	DFT (µm)
Hempadur 17380	60
Hempadur 45880/1/W	100
Total	160

Product	DFT (µm)
Hempel's Galvosil 15700	60
Hempadur 45880/1/W	100
Total	160

Note 1 = Hempel do not supply passive fire protection, although Hempel coatings are approved by several suppliers of Passive fire protection, for use as primers and intermediates under the passive fire protecting layers.

Stainless steel and aluminium when painting is required

#### System 6A: Other metals

Pre-qualification is not required

Product	DFT (µm)
Hempadur 15570	50
Hempadur Mastic 45880	100
Hempathane HS 55610	75
Total	225

### System 6B: Hot dip galvanized steel when painting is required

Pre-qualification is not required

Product	DFT (µm)
Hempadur 15553	50
Hempadur Mastic 45880	100
Hempathane HS 55610	75
Total	225

System 6C: Insulated stainless steel piping and vessels at temperatures < 150°C when painting is required

Pre-qualification is not required

Product	DFT (µm)
Hempadur 85671	100
Hempadur 85671	100
Total	200

Note 1 = As pre-qualification is not required additional systems may also be recommended. Contact your Hempel representative for further details. This note applies to all of the above systems.

Note 2 = Only topcoats pre-qualified in coating system no. 1 shall be used for System 6A and System 6B.

Note 3 = When coating stainless steel with a maximum operating temperature 150°C a high temperature modified coating suitable for the operating temperatures shall be used. This note applies to System ©C only.





#### System 7A: Carbon and stainless steel in the splash zone

Pre-qualification is required

Product	DFT (µm)
Hempadur 15590 <sup>1</sup>	20
Hempadur Spray-Guard 35493	3000
Total	3020

Product	DFT (µm)
Hempel's Polyester GF 35990	500
Hempel's Polyester GF 35990	500
Total	1000

Product	DFT (µm)
Hempadur 35560	300
Hempadur 35560	300
Total	600

Product	DFT (µm)
Hempadur 15590	50
Hempadur Multi-Strength 35460	300
Hempadur Multi-Strength 35460	300
Total	650

Product	DFT (µm)
Hempadur Multi-Strength 35620	300
Hempadur Multi-Strength 35620	300
Total	600

Product	DFT (μm)
Hempadur 35600	300
Hempadur 35600	300
Total	600

Product	DFT (µm)
Hempadur Multi-Strength 45703	300
Hempadur Multi-Strength 45753	300
Hempathane HS 55610	60
Total	660

Product	DFT (µm)
Hempadur Multi-Strength 35620	275
Hempadur Multi-Strength 35620	275
Hempathane HS 55610	60
Total	610

Product	DFT (µm)
Hempel's Polyester GF 35990	750
Hempel's Polyester GF 35990	750
Total	1500

Product	DFT (µm)
Avantguard 770	60
Hempadur Multi-Strength 35620	240
Hempadur Multi-Strength 35620	240
Hempathane HS 55610	60
Total	600

Product	DFT (µm)
Hempadur 35900	300
Hempadur 35900	300
Total	600



#### System 7B: Submerged carbon and stainless steel ≤ 50°C/122°F

#### Pre-qualification is required

Product	DFT (µm)
Hempadur Multi-Strength 45701	150
Hempadur Multi-Strength 35870	350
Total	500

Duadorat	DET (es)
Total	350
Hempadur Multi-Strength 45753	175
nempadur Multi-Strength 45703	1/3

DFT (µm)

Product	DFT (µm)
Hempadur Multi-Strength 45703	175
Hempadur Mastic 45880	175
Total	350

Product	DFT (µm)
Hempadur Quattro Fibre 47604	175
Hempadur Mastic 45881	175
Total	350

Product	DFT (µm)
Hempadur Mastic 4588W - Shade 19000	175
Hempadur Mastic 4588W	175
Total	350

Product	DFT (µm)
Hempadur XO Quattro 17760 (19530)	175
Hempadur XO Quattro 17760	175
Total	350

Note 1 = Optional

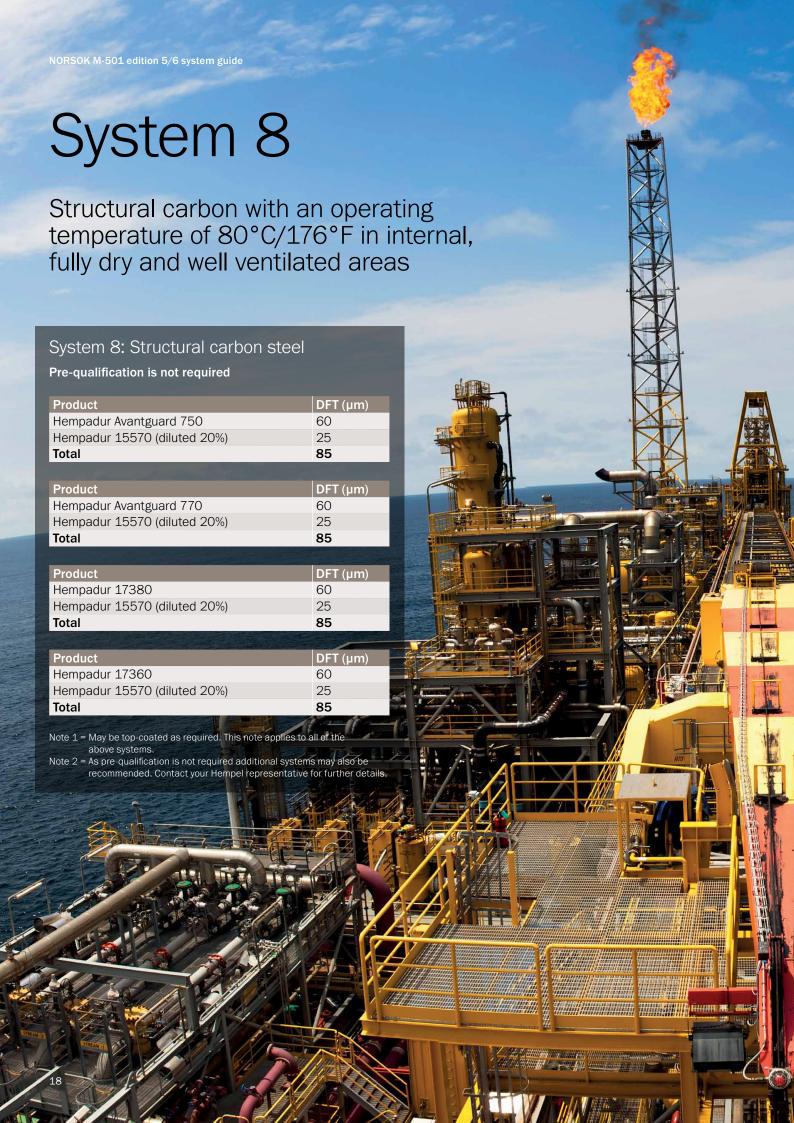
Note 2 = Systems approved for System 7A shall also meet the requirements for System 7B if applied at the film thickness for which System 7A approval was granted. This note applies to System 7A.

#### System 7C: Submerged carbon and stainless steel > 50°C/122°F

#### Pre-qualification is required

Product	DFT (µm)
Hempadur 35900 <sup>3</sup>	250
Hempadur 35900 <sup>3</sup>	250
Total	500

Note 3 = Pre-qualified for steel temperatures up to 120 °C. This note applies to System 7C.



Bulk supplied carbon steel valves with operating temperatures up to 150°C/302°F

#### System 9: Valves

Pre-qualification is not required

Product	DFT (µm)
Hempadur 85671	150
Hempadur 85671	150
Total	300

Product	DFT (µm)
Hempel's Galvosil 15700 <sup>2</sup>	75
Hempadur 85671	160
Total	235

Product	DFT (µm)
Hempel's Galvosil Fibre 15750 <sup>2</sup>	75
Hempadur 85671	160
Total	235

- Note 1 = For temperatures above  $150^{\circ}\text{C}$  thermally sprayed aluminium shall be used. This note applies to all of the above systems.
- Note 2 = An alternative system if agreed with the purchaser may be 1 x 75  $\mu$ m Zinc ethyl silicate and an epoxy tie coat in accordance with System 1. Final coating shall then be done after insulation. Hempel recommend that this is used for uninsulated items only.

#### hempel.com

Since 1915 Hempel has been producing protective coatings that help customers to safeguard their assets whilst keeping them looking their best. Today we are a world-leading supplier of trusted solutions in the Protective, Decorative, Marine, Container and Yacht markets. Employing over 5,000 people, across 80 countries worldwide, with 28 factories and more than 150 stock points globally. This includes many recognised brands like Crown Paints, Schaepman and Jones-Blair.

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