NORSOK M-501

QUESTION:

We need to make a specification to a customer, and it has to be based on NORSOK M-501. What is NORSOK and which coating systems can we specify?

ANSWER:

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 the offshore field developments and operation.

The NORSOK M-501 standard gives the requirements for selection of coating materials, surface preparation, application procedures and inspection for protective coatings to be applied during the construction and installation of offshore installations and associated facilities.
The standard cover paints, thermally sprayed metallic coatings and application of passive fire protective coatings.

The standard contains strict requirements to steel quality, the quality of the steel work and to the actual surface preparation and paint application. Also the inspection requirements are described in great detail.

There are also a number of qualification requirements for products and personnel to be used when working in accordance with the NORSOK standard:

- Coating systems for a number of areas needs to be so-called pre-qualified - for the remaining areas they have to be generically in accordance with the standard.
- Personnel involved also need to be qualified in accordance with certain levels and standards. The Painter must be able to document qualification to tradesman level or he has to pass a certain test on-site.
- The paint inspector must be certified according to NS 476 (FROSIO) or NACE.

The NORSOK standards are all available on the INTERNET and can be found on:
Http://www.standard.no

Click on Petroleum and Materials **-** M-501 is the one concerning painting!
The above is intended as an indication of what the NORSOK is covering, but it also stresses that the part covering coatings is not just a matter of the correct selection of coating systems and having the proper pre-qualification testing carried out.
The substrate, the work, the inspection etc., all have to be in compliance with NORSOK M-501.

But back to the Coating Systems - NORSOK M-501 defines 9 main areas out of which 3 main area and in addition 1 sub area require pre-qualification testing.
Pre-qualification requires severe and long-term testing at an independent laboratory - the testing typically takes about 7 months and the price is rather high.
The acceptance criteria are very stringent and only few specially selected coating systems can pass.

Hempel's recommended coating system for NORSOK M-501 can be found in the attachment.

In June 2004 revision 5 of NORSOK M-501 was issued, the main changes are as follows:

1) ISO 20340 is adopted as pre qualification test standard for coatings. Pre qualification according to earlier versions of the standard are still valid, provided the testing was started before this new revision was issued. See also the FAQ on ISO 20340.
2) Minimum number of coats have been introduced for system 1 (min. 3 coats) and system 7 (minimum 2 coats).
3) DNV (former Marintek) classification note 33.1 class B 1 is accepted as pre qualification for Ballast tanks (system 3B).
4) ISO 19840 has been adopted as normative reference - see note in the attachment

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24/01/2007

HEMPEL'S RECOMMENDED COATING SYSTEMS FOR NORSOK M-501

System 1.
Carbon steel with operating temperature below 120 °C:
Pre-qualification required

NORSOK SYSTEM 1 (Hempel Systems pre-qualified with shopprimer) **Surface Preparation: Abrasive blasting to Sa 2½.**			
No.	**Coating System**		**Remarks**
1-1	**20 µm** **50 µm** **210 µm** **75 µm**	**HEMPEL'S SHOPPRIMER ZS 15890** **HEMPADUR ZINC 17360** **HEMPADUR MASTIC 45880** **HEMPATHANE TOPCOAT 55910**	**Report no.** **36028 KA03** **(Tested according to rev. 3)**
1-2	**20 µm** **50 µm** **210 µm** **75 µm**	**HEMPEL'S SHOPPRIMER ZS 15890** **HEMPADUR ZINC 17360** **HEMPADUR MASTIC 45880** **HEMPEL'S OXIDUR 55850**	**Report no.** **36028 KA02** **(Tested according to rev. 3)**
1-3	**20 µm** **40 µm** **125 µm** **125 µm** **50 µm**	**HEMPEL'S SHOPPRIMER ZS 15890** **HEMPADUR ZINC 17360** **HEMPADUR FAST DRY 15560** **HEMPADUR FAST DRY 15560** **HEMPATHANE TOPCOAT 55210**	**Report no.** **39882 KA08** **(Tested according to rev. 4)**
1-4	**20 µm** **70 µm** **110 µm** **60 µm**	**HEMPEL'S SHOPPRIMER ZS 15890** **HEMUDUR ZINC 18560** **HEMUDUR 18504** **HEMUCRYL ENAMEL 58040**	**Report no.** **410-02-0017 MT04** **(Tested according to rev. 4)** **Secondary surface preparation:** **Sweepblasting**

NORSOK SYSTEM 1 (Hempel Systems pre-qualified with Zinc-epoxy primer - no shopprimer) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
1-5	70 µm 110 µm 60 µm	HEMUDUR ZINC 18560 HEMUDUR 18504 HEMUCRYL ENAMEL 58040	Report no. 50327 MK01 (Tested according to rev. 4)
1-6	60 µm 175 µm 75 µm	HEMPADUR ZINC 17380 HEMPADUR MASTIC 45880 HEMPEL'S OXIDUR 55850	Report no. 410-03-0167 M02 (Tested according to rev. 4)
1-7	60 µm 150 µm 100 µm	HEMPADUR ZINC 17380 HEMPADUR MASTIC 45880 HEMPAXANE 55000	Report no. 410-03-0167 M01 (Tested according to rev. 4)
1-8	60 µm 200 µm 50 µm	HEMPADUR ZINC 17380 HEMPADUR PRO 45603 HEMPATHANE TOPCOAT 55210	Report no. 410-03-0167 M03 (Tested according to rev. 4)
1-9	60 µm 200 µm 50 µm	HEMPADUR ZINC 17360 HEMPADUR MASTIC 45880 HEMPATHANE TOPCOAT 55210	Report no. LB04-0133-RAP (Tested according to rev. 4)
1-10	60 µm 140 µm 80 µm	HEMPADUR PRO ZINC 17380 HEMPADUR MASTIC 45880 HEMPATHANE HS 55610	Report no. P 504710b (Tested according to rev. 5)
1-11	60 µm 140 µm 80 µm	HEMPADUR PRO ZINC 17380 HEMPADUR MASTIC 4588W HEMPEL'S PRO ACRYLIC 55880	Report no. P 602896 (Tested according to rev. 5)
1-12	60 µm 120 µm 100 µm	HEMPADUR PRO ZINC 17380 HEMPADUR MASTIC 4588W HEMPAXANE CLASSIC 55000	Report no. LAB08-290-REP (Tested according to rev. 5)

NORSOK SYSTEM 1 (Hempel Systems pre-qualified with Zinc-silicate primer - no shopprimer) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
1-13	70 µm 100 µm 125 µm 50 µm	HEMPEL'S GALVOSIL 15700 HEMPADUR 45230 HEMPADUR 45143 HEMPATHANE TOPCOAT 55210	Report no. 39882 KA09 (Tested according to rev. 4)
1-14	70 µm 200 µm 50 µm	HEMPEL'S GALVOSIL 15700/2 HEMPADUR MASTIC 45880 HEMPATHANE TOPCOAT 55210	Report nos. 410-02-0017 MT01 and LB02-872-RAP (Tested according to rev. 4)
1-15	70 µm 125 µm 125 µm	HEMPEL'S GALVOSIL 15700 HEMPADUR MASTIC 45880 HEMPADUR MASTIC 45880 (shade 19000)	Report no. LB02-873-RAP (Tested according to rev. 4)
1-16	75 µm 125 µm	HEMPEL'S GALVOSIL 1571A HEMPAXANE 55000	Report no. 410-02-0017 MT02 (Tested according to rev. 4) NB! Two coat systems are not allowed according to rev.5.
1-17	75 µm 125 µm 125 µm	HEMPEL'S GALVOSIL 1571A HEMPADUR 47140 HEMPAXANE 55000	Report no. 410-02-0102 MT01 (Tested according to rev. 4)
1-18	75 µm 150 µm 50 µm	HEMPEL'S GALVOSIL 15700 HEMPADUR 47140 HEMPATHANE TOPCOAT 55210	Report no. 3410-04-0086 MT01 (Tested according to rev. 5)
1-19	75 µm 200 µm 50 µm	HEMPEL'S GALVOSIL 15700 HEMPADUR MASTIC 45880 HEMPATHANE TOPCOAT 55210	Report no. 3410-04-0086 MT03 (Tested according to rev. 5)
1-20	60 µm 160 µm 60 µm	HEMPEL'S GALVOSIL 15700 HEMPADUR MASTIC 4588W HEMPATHANE HS 55610	Report no. P703164-H-02 (Tested according to rev. 5)
1-21	60 µm 160 µm 60 µm	HEMPEL'S GALVOSIL 15700 HEMPADUR MASTIC 4588W HEMPEL'S PRO ACRYLIC 55883	Report no. P703164-H-01 (Tested according to rev. 5)

Note: According to NORSOK M-501 revision 4 and 5, clause 10.1, the topcoat may be substituted with another topcoat that has also passed the test; provided that the new topcoat is applied in same film thickness and that the intermediate coat is the same.

System 2.
Areas with operating temperatures above 120 °C and/or areas under insulation etc.:

System 2A consist of 200 µm thermally sprayed aluminium or alloys of aluminium top coated with sealer.
The sealers should have a solids content of maximum 15 %!
Hempel do not market products with only 15 % solids, but recommend thinning of standard products in order to get the low viscosity and saturation of the surface only.

System 2B consist of 100 µm thermally sprayed zinc or alloys of zinc - top coated with a coating system. System 2B is mainly an alternative to system 1 and Hempel do not recommend the use of system 2B under insulation especially if hot water can be trapped under the insulation material.

Pre-qualification not required

NORSOK SYSTEM 2 (Generic match to requirement)			
No.	**Coating System**		**Remarks**
2A-1	**25 µm**	**HEMPADUR 15570 (Diluted)**	**Sealer for Thermally Sprayed Aluminium. Service temperature below 120°C.**
2A-2	**25 µm**	**HEMPADUR 15280 (Diluted)**	**Sealer for Thermally Sprayed Aluminium. Service temperature below 120°C.**
2A-3	**25 µm**	**HEMPEL'S SILICONE ALUMINIUM 56910 (Diluted)**	**Sealer for Thermally Sprayed Aluminium. Service temperature above 120°C.**
2A-4	**150 µm** **150 µm**	**HEMPADUR 85671** **HEMPADUR 85671**	**Alternative to Thermal Sprayed Aluminium for insulated surfaces at Service temperatures below 120°C.**
2B-1	**125 µm** **75 µm**	**HEMPADUR MASTIC 45880** **HEMPATHANE TOPCOAT 55210**	**Applied on top of 100 µm Thermal Sprayed Zinc and alloys of Zinc. Not recommended for use under Insulation.**
2B-2	**125 µm** **100 µm**	**HEMPADUR 47140** **HEMPAXANE 55000**	**Applied on top of 100 µm Thermal Sprayed Zinc and alloys of Zinc. Not recommended for use under Insulation.**
2B-3	**125 µm** **75 µm**	**HEMPADUR 47140** **HEMPEL'S OXIDUR 55850**	**Applied on top of 100 µm Thermal Sprayed Zinc and alloys of Zinc. Not recommended for use under Insulation.**

System 3.
Internal surface of carbon steel vessels:

3A. Potable water tanks:
Coating system to be selected depending on requirement for certificates, but Hempel recommend following 2 alternatives:

Pre-qualification not required

NORSOK SYSTEM 3A (Generic match to requirement) **Surface Preparation: Abrasive blasting to Sa 2½.**			
No.	**Coating System**		**Remarks**
3A-1	**100 µm** **100 µm** **100 µm**	**HEMPADUR 85671** **HEMPADUR 85671** **HEMPADUR 85671**	**Approved for use in potable water tanks by:** **Water Research Centre, UK.** **NSF, USA.** **Norsk Folkehelse**
3A-2	**300 µm** **300 µm**	**HEMPADUR MULTI-STRENGTH 35530** **HEMPADUR MULTI-STRENGTH 35530**	**Approved for use in potable water tanks by:** **Water Research Centre, UK.**

3B. Ballast tanks

Pre-qualification required

NORSOK SYSTEM 3B (Hempel's Pre-qualified systems) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
3B-1	**125 µm**	**HEMPEL'S GALVOSIL 15700**	**Report no. 50327 MK02 (Tested according to rev. 4)**
3B-2	**100 µm 100 µm 100 µm**	**HEMPADUR 85671 HEMPADUR 85671 HEMPADUR 85671**	**Report no. LB03-0376-RAP (Tested according to rev. 4)**
3B-3	**15-20 µm 150 µm 150 µm**	**Zinc-silicate shopprimer HEMPADUR 15130 HEMPADUR 15130**	**Report no. Part report 2.III.22 Marintek (DNV) classification B 1.**
3B-4	**15-20 µm 150 µm 150 µm**	**Zinc-silicate shopprimer HEMPADUR 17630 HEMPADUR 17630**	**Report no. 78.1076.02 Marintek (DNV) classification B 1.**
3B-5	**15 µm 150 µm 150 µm**	**HEMPEL'S SHOPPRIMER ZS 15890 HEMPADUR MULTI-STRENGTH 45751 HEMPADUR MULTI-STRENGTH 45751**	**Report no. BGN-R2702055 DNV classification B 1.**
3B-6	**15 µm 150 µm 150 µm**	**HEMPEL'S SHOPPRIMER ZS 15890 HEMPADUR MULTI-STRENGTH 45753 HEMPADUR MULTI-STRENGTH 45753**	**Report no. BGN-R2701002 DNV classification B 1.**
3B-7	**20 µm 150 µm 150 µm**	**HEMPEL'S SHOPPRIMER ZS 15890 HEMPADUR PRO 45601 HEMPADUR PRO 45601**	**Report no. BGN-R2705263 DNV classification B 1.**
3B-8	**20 µm 150 µm 150 µm**	**HEMPEL'S SHOPPRIMER ZS 15890 HEMPADUR PRO 45603 HEMPADUR PRO 45603**	**Report no. BGN-R2705264 DNV classification B 1.**
3B-9	**20 µm 150 µm 150 µm**	**HEMPEL'S SHOPPRIMER ZS 15890 HEMPADUR FIBRE 47601 HEMPADUR FIBRE 47601**	**Report no. BGN-R2705266 DNV classification B 1.**
3B-10	**20 µm 150 µm 150 µm**	**HEMPEL'S SHOPPRIMER ZS 15890 HEMPADUR FIBRE 47603 HEMPADUR FIBRE 47603**	**Report no. BGN-R2705267 DNV classification B 1.**

3C. Tanks for stabilised crude, diesel and condensate.
A specification of the product is required (temperature, content of water, aromates, methanol, sulphur etc.) for the correct selection of coating system. The recommendations listed below are based on normal conditions.

Pre-qualification not required

NORSOK SYSTEM 3C (Generic match to requirement) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
3C-1	**150 µm 150 µm**	**HEMPADUR 17630/3 HEMPADUR 17630/3**	**Content of Aromates should be less than 15 %. If a water phase is present, then the maximum service temperature is 40°C. Otherwise maximum service temperature is 65°C. Loading and offloading up to 85°C.**
3C-2	**100 µm 100 µm 100 µm**	**HEMPADUR 85671 HEMPADUR 85671 HEMPADUR 85671**	**For service temperatures up to 90°C - with or without water phase.**

3D. Process vessels < 3 bar, < 75 °C.

Pre-qualification not required

NORSOK SYSTEM 3D (Generic match to requirement) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
3D-1	**100 µm 100 µm 100 µm**	**HEMPADUR 85671 HEMPADUR 85671 HEMPADUR 85671**	

3E. Process vessels < 70 bar, < 80 °C.:

Pre-qualification not required

NORSOK SYSTEM 3E (Generic match to requirement) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
3E-1	**100 µm 100 µm 100 µm**	**HEMPADUR 85671 HEMPADUR 85671 HEMPADUR 85671**	

3F. Process vessels < 30 bar, < 130 °C.:

Pre-qualification not required

NORSOK SYSTEM 3F (Generic match to requirement)		
No.	**Coating System**	**Remarks**
At present Hempel do not offer any coating systems suitable for this service		

3G. Vessels for storage of methanol, MEG etc.:

Pre-qualification not required

NORSOK SYSTEM 3B (Hempel's Pre-qualified systems) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
3G-1	**100 µm**	**HEMPEL'S GALVOSIL 15700**	

System 4.
Walkways, escape routes and lay down areas:

Pre-qualification required

NORSOK SYSTEM 4 (Hempel's Pre-qualified systems) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
4-1	**3000 µm**	**HEMPADUR SPRAY-GUARD 35490**	**Report no. 31681 KA02 (Tested according to rev. 3)**
4-2	**3000 µm**	**HEMPADUR SPRAY-GUARD 35493**	**Report no. 31681 KA03 (Tested according to rev. 3)**
4-3	**40 µm 3000 µm**	**HEMPADUR 15590 HEMPADUR SPRAY-GUARD 35493**	**Report no. 410-02-0017 MT05 (Tested according to rev. 4)**
4-4	**20 µm* 3000 µm**	**HEMPADUR 15590 HEMPADUR SPRAY-GUARD 35493**	**Report no. 3410-05-0018 MT04 (Tested according to rev. 5)**
4-5	**70 µm 125 µm 125 µm**	**HEMPEL'S GALVOSIL 15700 HEMPADUR MASTIC 45880 ANTI-SKID HEMPADUR MASTIC 45880**	**Report no. LB02-875-RAP (Tested according to rev. 4)**

*According to ISO 19840

System 5.
Passive fire protection:
Hempel do not supply passive fire protection, but Hempel coatings are approved by several suppliers of Passive fire protection, for use as primers and intermediates under the passive fire protecting layers.

The passive fire protection system must be pre-qualified.

5A. Epoxy based fire protection.
The coating system under the fire protection must be approved by the supplier of the fireproofing.

Pre-qualification not required for the primer

NORSOK SYSTEM 5A (Examples of Hempel primers for Epoxy based fire protection) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
5A-1	**50 µm**	**HEMPADUR 15570**	
5A-2	**60 µm**	**HEMPADUR ZINC 17360**	

5B. Cement based fire protection

The coating system under the fire protection must be approved by the supplier of the fireproofing.

Pre-qualification not required for the primer system

NORSOK SYSTEM 5B (Example of Hempel primer system for Cement based fire protection) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
5B-1	**60 µm** **200 µm**	**HEMPADUR ZINC 17360** **HEMPADUR MASTIC 45880**	

System 6.
Other metals:

Pre-qualification not required

NORSOK SYSTEM 6 (Generic match to requirement) Surface Preparation: Abrasive Sweep blasting.			
No.	**Coating System**		**Remarks**
6-1	**50 µm** **125 µm** **50 µm**	**HEMPADUR 15570 /15553** **HEMPADUR MASTIC 45880** **HEMPATHANE TOPCOAT 55210***	**Uninsulated stainless steel, aluminium and galvanised steel. HEMPADUR 15553 to be used for areas where abrasive sweep blasting is not an option.**
6-2	**125 µm** **125 µm**	**HEMPADUR 85671** **HEMPADUR 85671**	**Insulated stainless steel piping and vessels at temperatures less than 120°C.**

*5521 may be substituted with 55000, 55610, 55880 or 55850.

System 7.
Submerged carbon and stainless steel including the splash zone:

Pre-qualification required

NORSOK SYSTEM 7 (Hempel Systems pre-qualified with shopprimer) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
7-1	**25 µm** **225 µm** **225 µm**	**HEMPEL'S SHOPPRIMER ZS 15890** **HEMPADUR 17630** **HEMPADUR 17630**	**Report no.** **39882 KA12** **(Tested according to rev. 4)** **Below Splash zone only.**

NORSOK SYSTEM 7 (Hempel Systems pre-qualified without shopprimer) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
7-2	100 µm 350 µm	HEMPADUR 85671 HEMPADUR MULTI-STRENGTH 45540	Report no. 39882 KA10 (Tested according to rev. 4) Below Splash zone only.
7-3	225 µm 225 µm	HEMPADUR MULTI-STRENGTH 45540 HEMPADUR MULTI-STRENGTH 45540	Report no. 39882 KA11 (Tested according to rev. 4) Below Splash zone only.
7-4	750 µm 750 µm	HEMPEL'S POLYESTER GF 35920 HEMPEL'S POLYESTER GF 35920	Report no. LB02-876-RAP (Tested according to rev. 4) See note 1
7-5	225 µm 225 µm	HEMPADUR MULTI-STRENGTH 45751 HEMPADUR MULTI-STRENGTH 45751	Report no. LB02-877-RAP (Tested according to rev. 4) Below Splash zone only.
7-6	225 µm 225 µm	HEMPADUR MULTI-STRENGTH 45753 HEMPADUR MULTI-STRENGTH 45753	Report no. LB04-0130-RAP (Tested according to rev. 4)
7-7	175 µm 175 µm 175 µm	HEMPADUR MULTI-STRENGTH 45753 HEMPADUR MULTI-STRENGTH 45753 HEMPADUR MULTI-STRENGTH 45753	Report no. LB04-0129-RAP (Tested according to rev. 4)
7-8	500 µm 500 µm	HEMPADUR MULTI-STRENGTH GF 35870 HEMPADUR MULTI-STRENGTH GF 35870	Report no. LB04-0132-RAP (Tested according to rev. 4) See note 1
7-9	225 µm 175 µm	HEMPADUR MULTI-STRENGTH 45753 HEMPADUR MASTIC 45880	Report no. LB04-0127-RAP (Tested according to rev. 4)
7-10	100 µm 175 µm 175 µm	HEMPADUR PRO 45601 HEMPADUR PRO 45601 HEMPADUR PRO 45601	Report no. LB04-0128-RAP (Tested according to rev. 4)
7-11	125 µm 175 µm 175 µm	HEMPADUR MULTI-STRENGTH 45701 HEMPADUR MULTI-STRENGTH 45751 HEMPADUR MULTI-STRENGTH 45751	Report no. LB04-0615-RAP (Tested according to rev. 4)

NORSOK SYSTEM 7 (Hempel Systems pre-qualified without shopprimer) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
7-12	**150 µm** **350 µm**	**HEMPADUR MULTI-STRENGTH 45701** **HEMPADUR MULTI-STRENGTH GF 35870**	**Report no.** **3410-04-0086 MT04** **(Tested according to rev. 5)** **Below Splash zone only.**
7-13	**175 µm** **175 µm**	**HEMPADUR MULTI-STRENGTH 45703** **HEMPADUR MULTI-STRENGTH 45753**	**Report no.** **3410-04-0086 MT05** **(Tested according to rev. 5)** **Below Splash zone only.**
7-14	**175 µm** **175 µm**	**HEMPADUR MULTI-STRENGTH 45703** **HEMPADUR MASTIC 45880**	**Report no.** **3410-04-0086 MT06** **(Tested according to rev. 5)** **Below Splash zone only.**
7-15	**20 µm*** **3000 µm**	**HEMPADUR 15590** **HEMPADUR SPRAY-GUARD 35493**	**Report no.** **3410-06-0011 MT01** **(Tested according to rev. 5)** **See note 1**

*According to ISO 19840

Note 1:
According to NORSOK M-001 Rev. 4, Aug. 2004, the corrosion allowance in steel thickness may be reduced in the splash zone if an abrasion resistant thick film coating system is used. A thick film coating system is defined as a system applied in minimum 1000 µm in minimum 2 coats.

System 8.

Structural steel with operating temperature < 80 °C in internal, fully dry and well ventilated areas:

Pre-qualification is not required

NORSOK SYSTEM 8 (Generic match to requirement)			
No.	**Coating System**		**Remarks**
8-1	**150 µm**	**HEMPADUR MASTIC 45880**	
8-2	**60 µm** **25 µm**	**HEMPADUR ZINC 17360** **HEMPADUR 15570 (Diluted 20 %)**	**May be top coated if specific colours are required**

System 9.
Bulk supplied carbon steel valves with operating temperatures up to 150 °C.

Pre-qualification is not required

NORSOK SYSTEM 9 (Generic match to requirement) Surface Preparation: Abrasive blasting to Sa 2½.			
No.	**Coating System**		**Remarks**
9-1	**150 µm** **150 µm**	**HEMPADUR 85671** **HEMPADUR 85671**	**For continuous temperatures above 150°C Thermal Sprayed Aluminium should be used.**

NOTE:
Film thickness (ISO 19840):
In NORSOK M501 - revision 5 of June 2004, ISO 19840 has been introduced as normative standard.
According to ISO 19840 the surface profile must be taken into account when making measurements of dry film thickness. With e.g. a roughness profile of medium according to ISO 8503 and with normal calibration on smooth steel, then 20 µm should be deducted from all dry film thickness readings - to compensate for the roughness.
Important!
Unless otherwise stated then the roughness has been taken into account in the above specifications and the deduction is not required.
If ISO 19840 will be used for the inspection anyway, then the correction factors of ISO 19840 should be deducted the thickness of the first coat (not shopprimer) and the total DFT in each of the above specifications - prior to the film thickness measurements.

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