

PPG System Guide

NORSOK M-501 standard coating solutions

Our compliant protective coatings for offshore structures.



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We have published this brochure to introduce you to the PPG products and systems that comply with the surface preparation and protective coating standard described in NORSOK M-501.

NORSOK standards were developed in 1994 by the Norwegian petroleum industry and today serve as a global reference for ensuring the safety, added value and cost effectiveness of protective coatings used within challenging offshore environments.

NORSOK M-501 outlines the requirements for the selection of coating materials, surface preparation, application procedures and the inspection of paints, metallic coatings and passive fire protection systems. The aim of this standard is to obtain a coating system that ensures:

- Optimum protection of the installation with minimum need for maintenance
- Use of products that are application and maintenance friendly
- Health, safety, and environmental impacts are evaluated and documented

The tables published within this brochure highlight examples of PPG's protective coating systems that comply with the pre-qualification requirements established by NORSOK. Coatings systems that satisfy the defined exposure conditions are also included.

NORSOK M-501 standard system classifications

NORSOK M-501 requires a surface preparation of ISO 8501-1 Sa 2½ and roughness ISO 8503 Grade Medium (G). All coatings systems listed comply with this except for those listed for systems 6A, B and C on galvanized and stainless steel. The Product Data Sheet of the proposed products should be CHECKED for the appropriate pre-treatment for these systems. The latest version of NORSOK (rev. 6) refers to ISO 20340, where relevant, as the pre-qualification test standard for coating materials. As ISO 20340 is now replaced by ISO 12944-9:2018, we will refer to the latter in this brochure.

The PPG protective coatings systems detailed in this guide have passed the rigorous laboratory testing described for each NORSOK system, where applicable.

Please contact your local PPG Protective Coatings representative for further information on available coatings systems.

Pre-qualification tests

Atmosphere

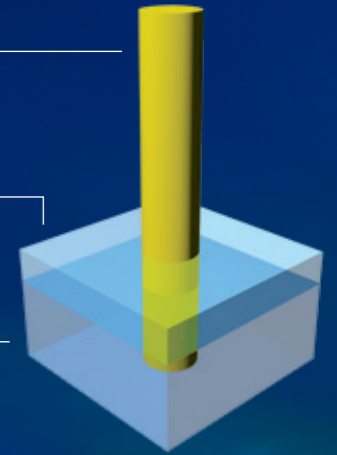
- Cyclic aging (ISO 12944-9)

Splash/tidal zone

- Cyclic aging test
- Cathodic disbonding (CD)
- Seawater immersion

Immersed

- Cathodic Disbonding (CD)
- Seawater immersion



NORSOK Standard M-501 coating systems

Only pre-qualified systems require prior testing

System 1 (pre-qualified)	Carbon steel with maximum operating temperature < 120°C (248°F) • Structural steel • Exteriors of equipment, vessels, piping and valves (not insulated)
System 2A	Carbon steel surfaces. Thermally sprayed aluminum or alloys of aluminum at 200 µm / 8.0 mils
System 2B	Carbon steel surfaces. Thermally sprayed zinc or alloys of zinc at 100 µm / 4.0 mils
System 3A-3G (System 3B pre-qualified)	Internal surface of carbon steel tanks
System 4 (pre-qualified)	Walkways, escape routes and lay down areas
System 5A (pre-qualified)	Epoxy-based fire protection
System 5B (pre-qualified)	Cement-based fire protection
System 6A	Uninsulated stainless steel when painting is required. Aluminum when painting is required
System 6B	Hot-dipped, galvanized 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 maximum operating temperature ≤ 80°C (176°F) in internal and fully dry and ventilated areas
System 9	Bulk-supplied carbon steel valves with maximum operating temperature up to 150°C (302°F)

Reference PPG's Global Product Offering brochure for dual branding options available.

NORSOK System 1 (pre-qualified) Carbon steel with maximum operating temperature < 120°C (248°F)

System #	Description	PPG Coating System	DFT µm	DFT Mils
1.1	Zinc Rich Epoxy Primer Fast Dry Epoxy Coating Polyurethane Topcoat	PPG SIGMAZINC 68 SP	60	2.4
		PPG SIGMAFAST 278	170	6.8
		PPG SIGMADUR 550	50	2.0
			280	11.2
1.2	Zinc Rich Epoxy Primer Fast Dry Epoxy Coating Polysiloxane Topcoat	PPG SIGMAZINC 68 SP	60	2.4
		PPG SIGMAFAST 278	140	5.6
		PPG PSX 700	80	3.2
			280	11.2
1.3	Zinc Rich Silicate Primer Fast Dry Epoxy Coating Polyurethane Topcoat	PPG DIMETCOTE 9	60	2.4
		PPG SIGMAFAST 278	170	6.8
		PPG SIGMADUR 550	50	2.0
			280	11.2
1.4	Zinc Rich Silicate Primer Fast Dry Epoxy Coating Polysiloxane Topcoat	PPG DIMETCOTE 9	60	2.4
		PPG SIGMAFAST 278	140	5.6
		PPG PSX 700	80	3.2
			280	11.2
1.5	Zinc Rich Epoxy Primer Epoxy Midcoat Polyurethane Topcoat	PPG SIGMAZINC 68 SP	60	2.4
		PPG SIGMACOVER 410	170	6.8
		PPG SIGMADUR 550	50	2.0
			280	11.2

ZnR: zinc-rich primer containing > 80% by mass in dry film. Other pre-qualified topcoats are available, please contact your PPG representative for details.

NORSOK System 1 (pre-qualified) Carbon steel with maximum operating temperature < 120°C (248°F)

System #	Description	PPG Coating System	DFT µm	DFT Mils
1.6	Zinc Rich Epoxy Primer Epoxy Midcoat Polysiloxane Topcoat	PPG SIGMAZINC 68 SP	60	2.4
		PPG SIGMACOVER 410	140	5.6
		PPG PSX 700	80	3.2
			280	11.2
1.7	Zinc Rich Silicate Primer Epoxy Midcoat Polyurethane Topcoat	PPG DIMETCOTE 9	60	2.4
		PPG SIGMACOVER 410	170	6.8
		PPG SIGMADUR 550	50	2.0
			280	11.2
1.8	Zinc Rich Silicate Primer Epoxy Midcoat Polysiloxane Topcoat	PPG DIMETCOTE 9	60	2.4
		PPG SIGMACOVER 410	140	5.6
		PPG PSX 700	80	3.2
			280	11.2

Zinc Rich: zinc dust content is ≥ 80% by mass in dry film. Other pre-qualified topcoats are available, please contact your PPG representative for details.

NORSOK System 2A Carbon steel surfaces | Thermally sprayed aluminum or alloys of aluminum at 200 µm / 8.0 mils

< Up to 200 °C - Not for under insulation

System #	Description	PPG Coating System	DFT µm	DFT Mils
2A.1	Epoxy MIO Tie-coat	PPG SIGMACOVER 522	25	1
			25	1

NORSOK System 2B Carbon steel surfaces | Thermally sprayed zinc or alloys of zinc at 100 µm / 4.0 mils

< 120°C (248°F) - Not for use under insulation

System #	Description	PPG Coating System	DFT µm	DFT Mils
2B.1	Epoxy MIO Tie-coat Epoxy Midcoat Polyurethane Topcoat	PPG SIGMACOVER 522	25	1.0
		PPG SIGMACOVER 410	125	5.0
		PPG SIGMADUR 550	50	2.0
			200	8.0
2B.2	Fast Dry Epoxy Mist Coat Fast Dry Epoxy Coating Polyurethane Topcoat	PPG SIGMAFAST 278 MIST COAT*	25	1.0
		PPG SIGMAFAST 278	125	5.0
		PPG SIGMADUR 550	50	2.0
			200	8

Other topcoats pre-qualified as coating system no. 1 are available, please contact your PPG representative for details.

* See product datasheet for substrate pre-treatment and thinning information for application on Thermally Sprayed Metal (TSM).

NORSOK System 3A Potable Water Tanks

System #	Description	PPG Coating System	DFT μm	DFT Mils
3A.1	Solvent-free, Epoxy Lining for Potable Water Service	PPG SIGMAGUARD CSF 585	300	12
			300	12

Please consult your PPG Protective Coatings representative for further information with regards to regional drinking water certification requirements.

NORSOK 3B (pre-qualified) Ballast water tanks/internal seawater-filled compartments based on IMO-PSPC testing

System #	Description	PPG Coating System	DFT μm	DFT Mils
3B.1	Universal Epoxy Primer Universal Epoxy Primer	PPG SIGMAPRIME 200	160	6
		PPG SIGMAPRIME 200	160	6
			320	12
3B.2	High Solids Universal Epoxy Primer High Solids Universal Epoxy Primer	PPG SIGMAPRIME 700	160	6
		PPG SIGMAPRIME 700	160	6
			320	12
3B.3	Low VOC Epoxy Primer Low VOC Epoxy Primer	PPG SIGMACOVER 380	160	6
		PPG SIGMACOVER 380	160	6
			320	12

All systems were tested with and without shopprimer.

NORSOK System 3C Tanks for stabilized crude, diesel and condensate

< 60°C (140°F)

System #	Description	PPG Coating System	DFT μm	DFT Mils
3C.1	Solvent-free, Epoxy Lining	PPG SIGMAGUARD CSF 650	300	12
			300	12

> 60°C (140°F)

System #	Description	PPG Coating System	DFT μm	DFT Mils
3C.2	Solvent-free, Novolac Phenolic Epoxy Lining	PPG NOVAGUARD 840	300	12
			300	12
3C.3	Solvent-free, Novolac Phenolic Epoxy Lining	PPG NOVAGUARD 890	300	12
			300	12

Please consult your PPG Protective Coatings representative with full details of the cargo and operating conditions to ensure the correct specification is used.

NORSOK System 3D Process vessels < 3.0 MPa < 75°C (167°F)

System #	Description	PPG Coating System	DFT μm	DFT Mils
3D.1	Novolac Phenolic Epoxy Primer Solvent-free, Novolac Phenolic Epoxy Lining	PPG NOVAGUARD 260	75	3
		PPG NOVAGUARD 840	300	12
			375	15
3D.2	Novolac Phenolic Epoxy Primer Solvent-free, Novolac Phenolic Epoxy Lining	PPG NOVAGUARD 260	75	3
		PPG NOVAGUARD 890	300	12
			375	15

Please consult your PPG representative with full details of the cargo and operating conditions to ensure the correct specification is used.

NORSOK System 3E Process vessels < 7.0 MPa < 80°C (176°F)

System #	Description	PPG Coating System	DFT μm	DFT Mils
3E.1	Novolac Phenolic Epoxy Primer Solvent-free, Novolac Phenolic Epoxy Lining	PPG NOVAGUARD 260	75	3
		PPG NOVAGUARD 840	300	12
			375	15
3E.2	Novolac Phenolic Epoxy Primer Solvent-free, Novolac Phenolic Epoxy Lining	PPG NOVAGUARD 260	75	3
		PPG NOVAGUARD 890	300	12
			375	15

Please consult your PPG Protective Coatings representative with full details of the cargo and operating conditions to ensure the correct specification is used.

NORSOK System 3F Process vessels < 3.0 MPa < 130°C (266°F)

System #	Description	PPG Coating System	DFT μm	DFT Mils
3F.1	Glass Flake Reinforced Vinyl Ester Coating Glass Flake Reinforced Vinyl Ester Coating	PPG NOVAGUARD 4801	600	24
		PPG NOVAGUARD 4801	600	24
			1200	48

Please consult your PPG Protective Coatings representative with full details of the cargo and operating conditions to ensure the correct specification is used.

NORSOK System 3G Vessels for storage of methanol, mono ethyl glycol etc

System #	Description	PPG Coating System	DFT μm	DFT Mils
3G.1	Zinc Rich Silicate Primer	PPG DIMETCOTE 9	75	3
			75	3

Please consult your PPG Protective Coatings representative with full details of the cargo and operating conditions to ensure the correct specification is used.

NORSOK System 4 (pre-qualified) Walkways, escape routes and lay down areas

Medium to Heavy Duty

System #	Description	PPG Coating System	DFT' μm	DFT' Mils
4.1	Surface Tolerant High Solids Epoxy Coating Anti-skid Additive Non-isocyanate Topcoat	PPG SIGMASHIELD 880	800	32
		PPG 888 ANTI-SKID ADDITIVE*	1100-1200	
		PPG PSX700	75	3
			Appr. 2000	Appr. 80
4.2	Glass Flake Reinforced High Solids Epoxy Coating Anti-skid Additive Polyurethane Topcoat	PPG SIGMASHIELD 880 GF	800	16
		PPG 888 ANTI-SKID ADDITIVE*	1100-1200	
		PPG SIGMADUR 520	75	3
			Appr. 2000	Appr. 80

* Blend of 16 and 36 mesh aluminium oxide (average 24 mesh). Can be applied after mixing with wet paint using hopper gun. (20 kg of PPG 888 Anti-skid additive + 10 liter of PPG SIGMASHIELD 880 or 880GF) or can apply it with conventional application method for anti-skid (1st coat and spread anti-skid aggregate + 2nd coat + top coat).

¹ DFT excludes non-slip aggregate.

Heavy Duty

System #	Description	PPG Coating System	DFT' μm	DFT' Mils
4.3	Universal Epoxy Primer Epoxy Cladding Coating	PPG SIGMAPRIME 200	75	3
		PPG SIGMASHIELD 1090	3,000	120
			3,075	123

¹ DFT excludes non-slip aggregate.

NORSOK System 5A, 5B (both pre-qualified) Epoxy-based fire protection (System 5A)

Please contact your local PPG representative for more details on epoxy-based fire protection.

NORSOK System 6A Un-insulated stainless steel when painting is required

System #	Description	PPG Coating System	DFT μm	DFT Mils
6A.1	Universal Epoxy Primer Universal Epoxy Primer Polyurethane Topcoat	PPG SIGMAPRIME 200	75	3
		PPG SIGMAPRIME 200	100	4
		PPG SIGMADUR 550	50	2
			225	9
6A.2	High Solids Universal Epoxy Primer High Solids Universal Epoxy Primer Polyurethane Topcoat	PPG SIGMAPRIME 700	75	3
		PPG SIGMAPRIME 700	100	4
		PPG SIGMADUR 550	50	2
			225	9
6A.3	Fast Dry Epoxy Coating Fast Dry Epoxy Coating Polyurethane Topcoat	PPG SIGMAFAST 278	75	3
		PPG SIGMAFAST 278	100	4
		PPG SIGMADUR 550	50	2
			225	9
6A.4	High Solids Epoxy Coating High Solids Epoxy Coating Polyurethane Topcoat	PPG AMERLOCK 2/400	75	3
		PPG AMERLOCK 2/400	100	4
		PPG SIGMADUR 550	50	2
			225	9

Other topcoats pre-qualified as coating system no. 1 are available, please contact your PPG representative for details.

NORSOK System 6B Hot-dipped, galvanized steel when painting is required*

System #	Description	PPG Coating System	DFT μm	DFT Mils
6B.1	Universal Epoxy Primer Universal Epoxy Primer Polyurethane Topcoat	PPG SIGMAPRIME 200	75	3
		PPG SIGMAPRIME 200	100	4
		PPG SIGMADUR 550	50	2
			225	9
6B.2	High Solids Universal Epoxy Primer High Solids Universal Epoxy Primer Polyurethane Topcoat	PPG SIGMAPRIME 700	75	3
		PPG SIGMAPRIME 700	100	4
		PPG SIGMADUR 550	50	2
			225	9
6B.3	Fast Dry Epoxy Coating Fast Dry Epoxy Coating Polyurethane Topcoat	PPG SIGMAFAST 278	75	3
		PPG SIGMAFAST 278	100	4
		PPG SIGMADUR 550	50	2
			225	9

Other topcoats pre-qualified as coating system no. 1 are available, please contact your PPG representative for details.

* Please refer to the Product Data Sheet of the products for the appropriate pre-treatment for this substrate.

NORSOK System 6C Insulated stainless steel piping and vessels at temperatures < 150°C (302°F)

System #	Description	PPG Coating System	DFT μm	DFT Mils
6C.1	Phenolic Epoxy Coating Phenolic Epoxy Coating	PPG SIGMAGUARD 730	125	5
		PPG SIGMAGUARD 730	125	5
			250	10
6C.2	High-build, Heat-resistant Epoxy Phenol Novolac Coating High-build, Heat-resistant Epoxy Phenol Novolac Coating	PPG SIGMATHERM 230	125	5
		PPG SIGMATHERM 230	125	5
			250	10

Please refer to the Product Data Sheet of the products for the appropriate pre-treatment for this substrate.

NORSOK System 7A (pre-qualified) Carbon steel and stainless steel in splash zone

System #	Description	PPG Coating System	DFT μm	DFT Mils
7A.1	Universal Epoxy Primer Glass Flake Reinforced High Solids Epoxy Coating	PPG SIGMAPRIME 200	100	4
		PPG SIGMASHIELD 880 GF	500	20
			600	24
7A.2	Surface Tolerant High Solids Epoxy Aluminum Primer Surface Tolerant High Solids Epoxy Coating	PPG SIGMASHIELD 880 ALU	300	12
		PPG SIGMASHIELD 880	300	12
			600	24
7A.3	Abrasion Resistance Solvent-free Novolac Epoxy Coating Abrasion Resistance Solvent-free Novolac Epoxy Coating	PPG SIGMASHIELD 1200	400	16
		PPG SIGMASHIELD 1200	400	16
			800	32
7A.4	Glass Flake Reinforced Vinyl Ester Coating Glass Flake Reinforced Vinyl Ester Coating	PPG NOVAGUARD 4801	600	24
		PPG NOVAGUARD 4801	600	24
			1200	48

NORSOK System 7B (pre-qualified)
Submerged carbon and stainless steel ≤ 50°C (122°F)

System #	Description	PPG Coating System*	DFT μm	DFT Mils
7B.1	Universal Epoxy Primer	PPG SIGMAPRIME 200	175	7
	Universal Epoxy Primer	PPG SIGMAPRIME 200	175	7
			350	14
7B.2	High Solids Universal Epoxy Primer	PPG SIGMAPRIME 700	175	7
	High Solids Universal Epoxy Primer	PPG SIGMAPRIME 700	175	7
			350	14
7B.3	Surface Tolerant High Solids Epoxy Aluminum Primer	PPG SIGMASHIELD 880 ALU	175	7
	Surface Tolerant High Solids Epoxy Coating	PPG SIGMASHIELD 880	175	7
			350	14

* Approvals based on revision 5.

NORSOK System 7C (pre-qualified)
Submerged carbon and stainless steel > 50°C (122°F)

Up to 90°C (193°F)

System #	Description	PPG Coating System	DFT μm	DFT Mils
7C.1	Surface Tolerant High Solids Epoxy Aluminum Primer	PPG SIGMASHIELD 880 ALU	175	7
	Surface Tolerant High Solids Epoxy Coating	PPG SIGMASHIELD 880	175	7
			350	14

Up to 150°C (302°F)

System #	Description	PPG Coating System	DFT μm	DFT Mils
7C.2	Novolac Epoxy Primer	PPG PHENGUARD 930	100	4
	Novolac Epoxy Midcoat	PPG PHENGUARD 935	125	5
	Novolac Epoxy Topcoat	PPG PHENGUARD SUBSEA 780	125	5
			350	14

Up to 180°C (356°F)

System #	Description	PPG Coating System	DFT μm	DFT Mils
7C.3	Novolac Epoxy Aluminum Primer	PPG PHENGUARD SUBSEA 610	175	7
	Novolac Epoxy Topcoat	PPG PHENGUARD SUBSEA 780	175	7
			350	14

NORSOK System 8A
Structural carbon steel with maximum operating temperature ≤ 80°C (176°F)
in fully dry and ventilated areas

System #	Description	PPG Coating System	DFT μm	DFT Mils
8A.1	Universal Epoxy Primer	PPG SIGMAPRIME 200	150	6
			150	6
8A.2	High Solids Universal Epoxy Primer	PPG SIGMAPRIME 700	150	6
			150	6
8A.3	Fast Dry Epoxy Coating	PPG SIGMAFAST 278	150	6
			150	6

NORSOK System 8B
Structural carbon steel with maximum operating temperature ≤ 80°C (176°F)
in fully dry and ventilated areas

System #	Description	PPG Coating System	DFT μm	DFT Mils
8B.1	Zinc Rich Epoxy Primer	PPG SIGMAZINC 68 SP	60	2.4
	Epoxy MIO Tie-coat	PPG SIGMACOVER 522	25	1
			85	3

NORSOK System 9
Bulk-supplied carbon steel valves with maximum operating temperature up to 150°C (302°F)

System #	Description	PPG Coating System	DFT μm	DFT Mils
9.1	Phenolic Epoxy Coating	PPG SIGMAGUARD 730	150	6
	Phenolic Epoxy Coating	PPG SIGMAGUARD 730	150	6
			300	12
9.2	High-build, Heat-resistant Epoxy Phenol Novolac Coating	PPG SIGMATHERM 230	150	6
	High-build, Heat-resistant Epoxy Phenol Novolac Coating	PPG SIGMATHERM 230	150	6
			300	12

More PPG coating systems are available

Please contact your local PPG representative for more information.



Visit ppgpmc.com or contact:

Asia Pacific ☎ +86-21-6025-2688 ✉ ppgpmc.ap@ppg.com

Europe, Middle East and Africa ☎ +32-3-3606-311 ✉ customers@ppg.com

Latin America ☎ +57-1-8764242 ext. 201 ✉ ppgpmcandean-ca@ppg.com

North America (US & Canada) ☎ +1-888-9PPGPMC ✉ PMCMarketing@ppg.com



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