



# NORSOK PPG Coating systems

M-501 system guide



**PPG Protective &  
Marine Coatings**

Bringing innovation to the surface.™

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## M-501 system guide

**PPG Protective & Marine Coatings (PPG) is a world leader in protective and marine coatings.**

Our global capabilities and respected protective coatings brands enable us to provide our customers with exceptional products, performance and service. Our proven and trusted products protect a wide range of assets for the most demanding markets and environments, including:

- Civil Infrastructure
- Marine
- Mining
- Offshore
- Petrochemical
- Power
- Rail

PPG has the scale and resources to deliver outstanding support with well-established operations in over 60 countries. Continuous development ensures that we provide optimum solutions for asset owners, contractors, fabricators and applicators across the globe, helping our customers to meet the challenges they face today and tomorrow.

**Experience, innovation and integrity – that is what makes PPG the ideal coatings partner.**

### Introduction

This NORSOK Systems Guide has been published to assist in selecting the PPG products and systems that comply with the surface preparation and protective coating standard, as described in NORSOK STANDARD M-501.

The NORSOK standards were developed in 1994 by the Norwegian petroleum industry to ensure the adequate safety, added value and cost-effectiveness of protective coating systems for petroleum industry developments and operations. NORSOK standards are intended for oil company specifications and serve as references for regulating authorities.

The NORSOK M-501 standard states the requirements for the 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. It covers paints, metallic coatings and application of passive fire protective coatings.

The aim of the NORSOK M-501 standard is to obtain a coating system which ensures:

- optimal protection of the installation with minimum need for maintenance
- the coating system is application and maintenance-friendly
- health, safety, and environmental impacts are evaluated and documented

The tables published in this brochure highlight examples of PPG's Protective Offering for coating systems that have been tested to and comply with the pre-qualification requirements established by Norsok; recommended systems that satisfy the defined exposure conditions are also included. Please contact your local PPG Protective Coatings representative for further advice on coating recommendations.

### NORSOK M-501 standard system classifications

The NORSOK M-501 standard was developed for challenging offshore environments and has since become the predominant standard in the offshore industry. NORSOK M-501 covers surface preparation and the application of protective coatings, as well as passive fire protection. Since NORSOK M-501 requires a surface preparation of Sa 2½, all coatings systems listed may be assumed to be Sa 2½ prepared. The latest versions of NORSOK (rev. 5 and 6) adopt ISO20340, where relevant, as the pre-qualification test standard for coating materials. All recommended PPG systems have passed the rigorous laboratory testing described for each NORSOK system, where applicable.

### NORSOK M-501 testing

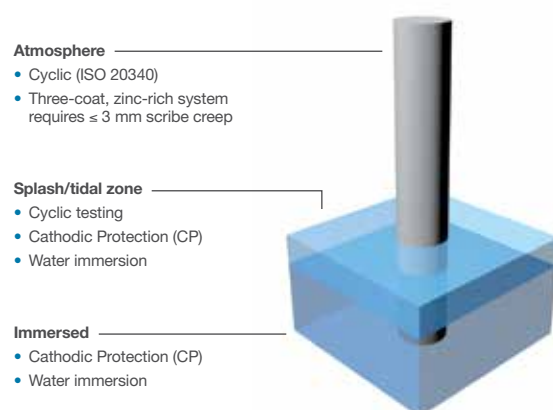


Figure 1: Exposure Conditions



### 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) <ul style="list-style-type: none"> <li>• Structural steel</li> <li>• Exteriors of equipment, vessels, piping and valves (not insulated)</li> </ul>
System 2	Carbon steel surfaces exposed to operating temperatures > 120°C (248°F)
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)

## Zinc Epoxy Systems

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
1.1	SIGMAZINC 68 SP	60	2
	SIGMAFAST 278	140	6
	SIGMADUR 550 H or PSX 700	80	3
		<b>280</b>	<b>11</b>
1.2	SIGMAZINC 68 SP	60	2
	SIGMAFAST 278	170	7
	SIGMADUR 540 or SIGMADUR 550	50	2
		<b>280</b>	<b>11</b>
1.3	SIGMAZINC 68 SP	60	2
	SIGMACOVER 410	140	6
	SIGMADUR 550 H or PSX 700	80	3
		<b>280</b>	<b>11</b>
1.4	SIGMAZINC 68 SP	60	2
	SIGMACOVER 410	170	7
	SIGMADUR 520 or SIGMADUR 540 or SIGMADUR 550	50	2
		<b>280</b>	<b>11</b>
1.5	SIGMAZINC 9	60	2
	SIGMACOVER 410	170	7
	SIGMADUR 520 or SIGMADUR 540 or SIGMADUR 550	50	2
		<b>280</b>	<b>11</b>
1.6	SIGMAZINC 9	60	2
	SIGMACOVER 410	140	6
	SIGMADUR 550 H or PSX 700	80	3
		<b>280</b>	<b>11</b>
1.7	SIGMAZINC 9	60	2
	SIGMAFAST 278	170	7
	SIGMADUR 540 or SIGMADUR 550	50	2
		<b>280</b>	<b>11</b>
1.8	SIGMAZINC 9	60	2
	SIGMAFAST 278	140	6
	SIGMADUR 550 H	80	3
		<b>280</b>	<b>11</b>
1.9	AMERCOAT 68 HS	60	2
	AMERCOAT 370	160	6
	AMERCOAT 450 H	60	3
		<b>280</b>	<b>11</b>

# NORSOK System 2A

Carbon steel surfaces

Thermally sprayed aluminum or alloys of aluminum

< 120°C (248°F)

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
2A.1	THERMALLY SPRAYED ALUMINIUM SIGMACOVER 522	200	8
		25	1
		<b>225</b>	<b>9</b>

> 120°C (248°F)

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
2A.2	THERMALLY SPRAYED ALUMINIUM SIGMATHERM 540	200	8
		25	1
		<b>225</b>	<b>9</b>

# NORSOK System 2B

Carbon steel surfaces

Thermally sprayed zinc or alloys of zinc

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

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
2B.1	THERMALLY SPRAYED ZINC SIGMACOVER 522 SIGMACOVER 410 SIGMADUR 520 or SIGMADUR 540 or SIGMADUR 550 or SIGMADUR 550 H	100	4
		25	1
		125	5
		75	3
		<b>325</b>	<b>13</b>
2B.2	THERMALLY SPRAYED ZINC SIGMACOVER 522 SIGMAFAST 278 SIGMADUR 540 or SIGMADUR 550 or SIGMADUR 550 H	100	4
		25	1
		125	5
		75	3
		<b>325</b>	<b>13</b>

# NORSOK System 3A

## Potable Water Tanks

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
3A.1	SIGMAGUARD CSF 585	300	12
		<b>300</b>	<b>12</b>

Please consult your PPG Protective Coatings representative for further advice and coating recommendations.

# NORSOK 3B (pre-qualified)

## Ballast water tanks/internal seawater-filled compartments based on IMO-PSPC testing

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
3B.1	SIGMAPRIME 700	160	6
	SIGMAPRIME 700	160	6
		<b>320</b>	<b>12</b>
3B.2	SIGMAPRIME 200	160	6
	SIGMAPRIME 200	160	6
		<b>320</b>	<b>12</b>
3B.3	SIGMACOVER 240	160	6
	SIGMACOVER 240	160	6
		<b>320</b>	<b>12</b>
3B.4	SIGMACOVER 380	160	6
	SIGMACOVER 380	160	6
		<b>320</b>	<b>12</b>

All systems were tested with and without shopprimer.

# NORSOK System 3C

## Tanks for stabilized crude, diesel and condensate

### < 60°C (140°F)

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
3C.1	SIGMAGUARD CSF 650	300	12
		<b>300</b>	<b>12</b>

### > 60°C (140°F)

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
3C.2	NOVAGUARD 840	300	12
		<b>300</b>	<b>12</b>

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 < 0,3 MPa < 75°C (167°F)

System #	PPG Coating System	DFT µm	DFT Mils
3D.1	SIGMAGUARD 260	75	3
	NOVAGUARD 840	300	12
		<b>375</b>	<b>15</b>

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 3E

Process vessels < 7,0 MPa < 80°C (176°F)

System #	PPG Coating System	DFT µm	DFT Mils
3E.1	SIGMAGUARD 260	75	3
	NOVAGUARD 840	300	12
		<b>375</b>	<b>15</b>

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 #	PPG Coating System	DFT µm	DFT Mils
3F.1	SIGMASHIELD 4801	600	24
	SIGMASHIELD 4801	600	24
		<b>1200</b>	<b>48</b>

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 #	PPG Coating System	DFT µm	DFT Mils
3G.1	SIGMAGUARD 750	75	3
		<b>75</b>	<b>3</b>

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 #	PPG Coating System	DFT <sup>1</sup> µm	DFT <sup>1</sup> Mils
4.1	SIGMASHIELD 880	800	32
	ANTI-SLIP AGGREGATE	-	-
	SIGMADUR 520 or SIGMADUR 540 or SIGMADUR 550 or PSX 700	75	3
		<b>875</b>	<b>35</b>
4.2	SIGMASHIELD 880 GF	800	32
	ANTI-SLIP AGGREGATE	-	-
	SIGMADUR 520 or SIGMADUR 540 or SIGMADUR 550 or PSX 700	75	3
		<b>875</b>	<b>35</b>

## Heavy Duty

System #	PPG Coating System	DFT <sup>1</sup> µm	DFT <sup>1</sup> Mils
4.3	SIGMAPRIME 200	75	3
	ANTI-SLIP AGGREGATE	-	-
	SIGMASHIELD 1090	3,000	120
		<b>3,075</b>	<b>123</b>

<sup>1</sup> 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 #	PPG Coating System	DFT µm	DFT Mils
6A.1	SIGMAPRIME 200 or SIGMAPRIME 700	75	3
	SIGMAPRIME 200 or SIGMAPRIME 700	100	4
	SIGMADUR 540 or SIGMADUR 550	50	2
		<b>225</b>	<b>9</b>
6A.2	SIGMACOVER 280	50	2
	SIGMAFAST 278	100	4
	SIGMADUR 540 or SIGMADUR 550 or SIGMADUR 550 H or PSX 700	75	3
		<b>225</b>	<b>9</b>
6A.3	SIGMACOVER 280	50	2
	SIGMACOVER 410	100	4
	SIGMADUR 520 or SIGMADUR 540 or SIGMADUR 550 or SIGMADUR 550 H or PSX 700	75	3
		<b>225</b>	<b>9</b>
6A.4	AMERLOCK 2/400 SERIES	50	2
	AMERLOCK 2/400 SERIES	100	4
	AMERCOAT 450 or AMERCOAT 550 H	75	3
		<b>225</b>	<b>9</b>



# NORSOK System 6B

Hot-dipped, galvanized steel when painting is required\*

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
6B.1	SIGMAPRIME 200 or SIGMAPRIME 700	75	3
	SIGMAPRIME 200 or SIGMAPRIME 700	100	4
	SIGMADUR 540 or SIGMADUR 550	50	2
		<b>225</b>	<b>9</b>
6B.2	SIGMACOVER 280	50	2
	SIGMAFAST 278	100	4
	SIGMADUR 540 or SIGMADUR 550 or SIGMADUR 550 H or PSX 700	75	3
		<b>225</b>	<b>9</b>
6B.3	SIGMACOVER 280	50	2
	SIGMACOVER 410	100	4
	SIGMADUR 520 or SIGMADUR 540 or SIGMADUR 550 or SIGMADUR 550 H or PSX 700	75	3
		<b>225</b>	<b>9</b>
6B.4	AMERLOCK 2/400 SERIES	50	2
	AMERLOCK 2/400 SERIES	100	4
	AMERCOAT 450 or AMERCOAT 550 H	75	3
		<b>225</b>	<b>9</b>

\* Sweep blasting of the substrate is required prior to application.

# NORSOK System 6C

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

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
6C.1	SIGMAGUARD 730	125	5
	SIGMAGUARD 730	125	5
		<b>250</b>	<b>10</b>
6C.2	SIGMATHERM 230	125	5
	SIGMATHERM 230	125	5
		<b>250</b>	<b>10</b>

# NORSOK System 7A (pre-qualified)

Carbon steel and stainless steel in splash zone

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
7A.1	SIGMAPRIME 200	100	4
	SIGMASHIELD 880 GF	500	20
		<b>600</b>	<b>24</b>
7A.2	SIGMASHIELD 1200	400	16
	SIGMASHIELD 1200	400	16
		<b>800</b>	<b>32</b>
7A.3	SIGMASHIELD 4801	600	24
	SIGMASHIELD 4801	600	24
		<b>1200</b>	<b>48</b>

# NORSOK System 7B (pre-qualified)

Submerged carbon and stainless steel  $\leq 50^{\circ}\text{C}$  ( $122^{\circ}\text{F}$ )

System #	PPG Coating System*	DFT $\mu\text{m}$	DFT Mils
7B.1	SIGMAPRIME 700	175	7
	SIGMAPRIME 700	175	7
		<b>350</b>	<b>14</b>
7B.2	SIGMASHIELD 880	300	12
	SIGMASHIELD 880	300	12
		<b>600</b>	<b>24</b>
7B.3	AMERLOCK 2	175	7
	AMERLOCK 2	175	7
		<b>350</b>	<b>14</b>
7B.4	AMERCOAT 385	200	8
	AMERCOAT 385	150	6
		<b>350</b>	<b>14</b>

\* Approvals based on revision 5.

# NORSOK System 7C (pre-qualified)

Submerged carbon and stainless steel  $> 50^{\circ}\text{C}$  ( $122^{\circ}\text{F}$ )

**150°C (302°F)**

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
7C.1	PHENGUARD 930	100	4
	PHENGUARD 935	125	5
	PHENGUARD SUBSEA 780 (SIGMALINE 780)	125	5
		<b>350</b>	<b>14</b>

# NORSOK System 8A

Structural carbon steel with maximum operating temperature  $\leq 80^{\circ}\text{C}$  ( $176^{\circ}\text{F}$ )  
in fully dry and ventilated areas

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
8A.1	SIGMAPRIME 200 or SIGMAPRIME 700	150	6
		<b>150</b>	<b>6</b>
8A.2	AMERLOCK 2/400 SERIES	150	6
		<b>150</b>	<b>6</b>

# NORSOK System 8B

Structural carbon steel with maximum operating temperature  $\leq 80^{\circ}\text{C}$  ( $176^{\circ}\text{F}$ )  
in fully dry and ventilated areas

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
8B.1	SIGMAZINC 68 SP	60	2
	SIGMACOVER 522 or SIGMACOVER 577	25	1
		<b>85</b>	<b>3</b>
8B.2	AMERCOAT 68 SP	75	3
	AMERLOCK 2/400 SERIES	100	4
		<b>175</b>	<b>7</b>

# NORSOK System 9

Bulk-supplied carbon steel valves with maximum operating temperature  
up to  $150^{\circ}\text{C}$  ( $302^{\circ}\text{F}$ )

System #	PPG Coating System	DFT $\mu\text{m}$	DFT Mils
9.1	SIGMAGUARD 730	150	6
	SIGMAGUARD 730	150	6
		<b>300</b>	<b>12</b>
9.2	SIGMATHERM 230	150	6
	SIGMATHERM 230	150	6
		<b>300</b>	<b>12</b>

**More PPG coating systems are available**

Please contact your local PPG representative for more information.



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pmc@ppg.com  
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