

PPG PHENGUARD™ SUBSEA

Application and Repair Guideline

The following table lists the approved subsea system for NORSOK M-501 Rev.6 System 7C:

Table 1: NORSOK M501 Rev.6 System 7C Approved System		
Coat	Product	DFT
First	PHENGUARD SUBSEA 610	175 µm (7 mils)
Second	PHENGUARD SUBSEA 780	175 µm (7 mils)

PHENGUARD SUBSEA 780 colors include a golden yellow, bright yellow, and orange (the listed colors are approximations of RAL 1004, RAL 1018, and 2004 respectively).

The above mentioned system has been tested to NORSOK M-501 Rev.6 System 7C. Application conditions for subsea equipment are greatly different to those of a tank coating. Subsea applications conditions are much better in terms of ventilation, curing temperature and solvent release. Therefore, the 2-coat PHENGUARD SUBSEA system for in-shop application can be used with the following over coating times.

The subsea system has the following over coating times per coat:

Table 2: Over coating times per coat measured DFT		
Substrate Temperature	PHENGUARD SUBSEA 610 175 µm (7 mils)	PHENGUARD SUBSEA 780 175 µm (7 mils)
10°C (50°F)	16 hours	16 hours
15°C (59°F)	6 hours	6 hours
20°C (68°F)	3 hours	3 hours
30°C (86°F)	3 hours	3 hours
40°C (104°F)	2 hours	2 hours

Application to be done at mentioned temperature followed by a 24 hour cure at same temperature with sufficient ventilation before the system can be exposed to lower temperatures.

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Pull-off adhesion curing times

In general, coating systems need to be fully cured (21 days) to exhibit their full adhesion characteristic. However, it is recognized that this practice can have an impact on process idle time for OEM applications. Therefore, PPG has modified the recommendation. Table 2 illustrates the minimum recommended cure time before conducting pull-off adhesion testing.

If the minimum pull-off value required is not achieved (min 5 MPa according to NORSOK M-501) after the above times, then the system should be left to further cure for two additional days in well ventilated conditions at a minimum of 20°C (68°F) before repeating the adhesion test.

For your convenience, PPG has developed a curing table for the complete subsea system based on the total measured DFTs.

Table 2: Curing time (*) for the total measured DFT				
Substrate Temperature	350 µm (14 mils)	400 µm (16 mils)	450 µm (18 mils)	525 µm (21 mils)
10°C (50°F)	6 days	6 days	7 days	8 days
15°C (59°F)	5 days	5 days	6 days	7 days
20°C (68°F)	3.5 days	3.5 days	4 days	5 days
30°C (86°F)	2.5 days	2.5 days	3 days	4 days
40°C (104°F)	1.5 days	1.5 days	1.5 days	2 days

(*) denotes ready for insulation with syntactic foam using a non-aggressive adhesive

The specified minimum total dry film thickness is 350 µm (14 mils) the maximum average DFT is 525 µm (21 mils) and locally the maximum DFT should not exceed 600 µm (24 mils).

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The following repair guidelines are applicable for PHENGUARD and PHENGUARD SUBSEA 780 systems with a maximum area of 100 cm² (15 in²). For larger repair areas, re-blasting is required with application of the complete subsea system.

Nature of Damaged Coatings

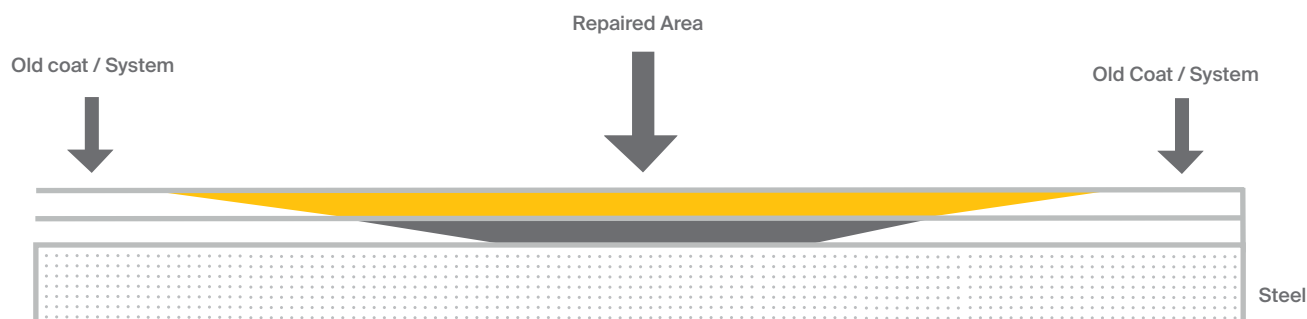
1) Damage to topcoat or down to the intermediate coat

- Remove any loose and flaking coating to a firm sound edge
- Thoroughly clean and degrease area to be repaired
- Feather back existing sound coating abraded area to be coated and surrounding area (5 cm / 1.97 in) if necessary (depends on time since application of previous coat and whether the maximum overcoating time has passed)
- Ensure surface to be coated is dry and free from any contamination immediately prior to coating (including any dust from abrading)
- Re-apply topcoat at specified DFT overlapping existing system by about 5 cm (1.97 in)

2) Damage down to substrate (bare metal)

- Remove any loose and flaking coating to a firm sound edge
- Thoroughly clean and degrease area to be repaired
- Feather back existing intact coating

Drawing - feathered spot coating repair



a) Undamaged bare metal – if the original specified standard of cleanliness and profile is undamaged

- Ensure surface to be coated is dry and free from any contamination immediately prior to coating (including any dust from abrading)
- Re apply damaged primer, intermediate and topcoats at specified DFT overlapping as existing intact system by about 5 cm (1.97 in)

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b) Damaged bare metal – if surface is corroded, damaged or original specified standard of cleanliness and profile does not exist

- For small areas – mechanically prepare to achieve ISO 8501: St3 standard of cleanliness with original specified profile. Take care not to over polish
- For large areas – re blast area to original specified standard of cleanliness and profile
- Re apply damaged primer, intermediate and topcoats at specified DFT overlapping existing intact system by about 5 cm (1.97 in)
- For areas where new work has taken place, for example welding; then the area should re blasted to original standard

Note: The preferred surface preparation of bare metal is to re-blast. We accept that in some circumstances this may not be practical. If the area has small mechanical damage; then St3 standard is acceptable; however, if there are several scattered small areas adjacent to one another, it may be quicker and more cost effective to re blast that area.

OVERCOATING AND CURING SCHEDULE FOR REPAIR COATINGS

The over coating and curing times on the respective product datasheets should be followed.

With the PHENGUARD subsea system it is acceptable to use the following over coating table for small repair areas:

Table 4: Over coating time for Repair Work		
Substrate Temperature	Minimum	Maximum
10°C (50°F)	16 hours	28 days
15°C (59°F)	6 hours	25 days
20°C (68°F)	3 hours	21 days
30°C (86°F)	3 hours	14 days
40°C (104°F)	2 hours	7 days

Note: For repair areas defined as less than 100 cm² (15 in²) the minimum over coating time in the table above will be slightly shorter compared to full application because of better control of DFT and less solvent emission from the coating.

Temperatures

If elevated temperatures are to be used on the repair areas to decrease over coating and curing times the following points should be noted:

- The product datasheets give a range of temperatures showing over coating and curing times for the products. It is acceptable to use elevated temperatures in line with the product datasheet over coating times and curing times. Exceptions to this must be authorized by the PPG.
- It is recommended that a minimum flash off time of 1 hour is allowed between coating application and elevating the temperature.

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