



20 March 2014

DRDC-RDDC-2014-L101 **DISTRIBUTION LIST**

Scientific Letter

Deck paint failure on HMCS GLACE BAY

The Dockyard Laboratory (A) was asked by Canadian Fleet Atlantic HQ to examine the non-skid deck surface on HMCS GLACE BAY. The coating was relatively new, having been applied in June 2012, but it was already lifting off in large patches on parts of the ship's foc's'le.

An on-site inspection confirmed the deterioration of the coating in at least three regions on the foc's'le (Figure 1). The major damage was localized in patches having areas on the order of a few square feet each. There was no apparent peripheral wear that would be attributed to high foot traffic, nor was the damage in locations that would immediately seem prone to such use. The coating around the affected spots was still attached to the steel substrate, but it could be easily pried up in large pieces with a small lab spatula. In other area, small cracks and pinholes appeared to be leaking rust from the steel deck below. Representative samples of the paint were taken back to the laboratory for further examination.

A cursory microscopic survey of the coating did not reveal any surface problems that could be ascribed to mechanical damage, e.g., gouges caused by ice chipping. There were, however, a number of microscopic cracks having morphological features consistent with shrinkage (Figure 2), i.e., mud cracking. Fourier transform infrared (FTIR) spectroscopy showed no evidence of compositional anomalies such as amine blooming.

Randomly chosen cross-sections of the lifted paint were mounted, polished, and examined microscopically. A selection of images is shown in Figure 3. Consistently, the primer layer was thinner than the 125–150 μm (Ref. [1], page 5-8-16) thickness specified for product C420. Epoxy Primer for Epoxy Non-Skid (for which International Intershield 300 is an approved product per Ref. [1], page 5A-25). The topcoat also exhibited overall problems with thickness. The specified thickness should be 750–1000 µm (Ref. [1], page 5-8-16), although the manufacturer does note that the surface profile should exhibit a uniformly rough appearance, with ridges 1.5-2.4 mm high, and no thinner than 0.030" (760 µm) at the thinnest point (Ref. [2]). It is clear in Figure 3 that the thicknesses of both the primer and the top coat are not within specification. In fact, the combined coating was so thin in some spots that pinholes had formed. Figure 4 shows light coming through such a pinhole.

In addition to thin regions and pinholes, there are many voids in the topcoat (e.g., Figure 3f). While there is no mention of voids in either Ref. [1] or [2], it is generally true that voids indicate deteriorated or poorly-handled product (e.g., at or past its usable pot life), or improper application. Furthermore, such voids usually represent a weakness in the material.

The inconsistent thickness of the topcoat could account for the cracking noted in Figure 2. The International 6GV application guide (Ref. [2], § 5.7.2) cautions that "thick, carelessly applied coats will result in minimum coverage and be subject to mud-cracking and/or blistering." The morphology of the cracks and the observed thickness discrepancies point strongly to an improperly-applied top coat. The pinholes indicate improperly-applied top coat and primer.

The daily inspection reports were obtained from the primary contractor. They are compiled in Annex A and summarized in Table 1 along with the historical weather data recorded at Environment Canada's Shearwater station, approximately 6 km away. A few points worth noting:

- (a) The sheets are, overall, lacking in detail; they do not clearly indicate which part of the ship was being painted on that day.
- (b) Overall, there is a good correspondence between the weather conditions recorded on the sheets and the historical data. On a few occasions (Rows 2, 3, 8, 22, 23, and 32) there was evidence of precipitation. It is unknown how this might have affected that day's work.





- (c) The application guidelines for the primer, Intershield 300, indicates a maximum permitted temperature of 40°C for the surface (Ref. [3], § 2.3.6). On several occasions, this temperature limit was evidently surpassed (Rows 6, 8, and 10).
- (d) Similarly, the product datasheets (Refs. [4] and [5]) specify that the coating must be applied at a temperature at least 3°C beyond the dew point. There were occasions (Rows 3, 14, 20, and 21) where this was or nearly was violated.
- (e) The batch numbers were not always properly filled out, and on three consecutive days (Rows 9–12) a digit was missing. This was presumably the result of having copied the previous day's batch number from the sheet, instead of having recorded the information directly from the container.

The batch numbers were deciphered according to International's system. The first letter denotes the year sequence (M=2011, N=2012, etc.), and the second the month (B=February, C=March, etc.). In each case the letters *I* and *O* are omitted to avoid confusion. The following series of four digits forms a sequence number, and the final two letters indicate the manufacturing location. All the products were used well within their 12-month shelf life.

The Daily Inspection Reports (DIRs) also do not show any evidence that dry film thickness (DFT) measurements were performed on the primer coat during the course of its application. The PMS2O instructions § 12.2 (Annex B, page 41) mandate such readings along a 2-meter grid. None is recorded, though the final page of the PMS2O Instructions (Annex B, page 45) does include an unclear reference to such measurements, dated July 9th. The only three DIRs for the topcoat 6GV (Table 1, rows 14, 20, and 27) each indicate a DFT of exactly 0.030", meeting the nominal minimum thickness. This however, is not consistent with the cross-sectional thickness determined microscopically and discussed earlier (Figure 3).

Furthermore, it is not clear from the information on hand that the Ships Paint Manual requirement that "A Certified NACE CIP Level 2 inspector shall carry out all preservation and coating application inspections" was fulfilled. The signature on the DIR sheets matches that of the Service Provider Supervisor (Annex B, page 40). If the subcontractor supervisor is also the NACE inspector, that would suggest a conflict of interest.

To summarize, there is no evidence of chemical deficiency in the coatings, nor of mechanical damage to the surface. While the DIRs are lacking in detail overall, they do suggest some coatings were applied under less than ideal conditions. Microscopic measurements of paint taken from the affected area clearly show that both the primer and top coat were not applied to the specified thickness. Finally, it is reasonable to conclude that the premature failure of the coating can be ascribed entirely to this improper application.

Prepared by Colin G. Cameron, DRDC – Atlantic Research Centre.







Figure 1: Photographs of the foc's'le deck on HMCS GLACE BAY: (a,b) two regions showing widespread coating lift-off, (c) one of many small cracks around 1 cm long found at random locations on the deck, and (d) flakes of coating that were easily pried off with a small spatula, revealing a pristine surface underneath.









Figure 2: Microscopic images of the surface of the deck coating. The cracks are consistent with the tearing-apart failure of a material that had shrunk and developed internal stresses. No signs of mechanical damage (i.e., gouges or tool marks) were detected.





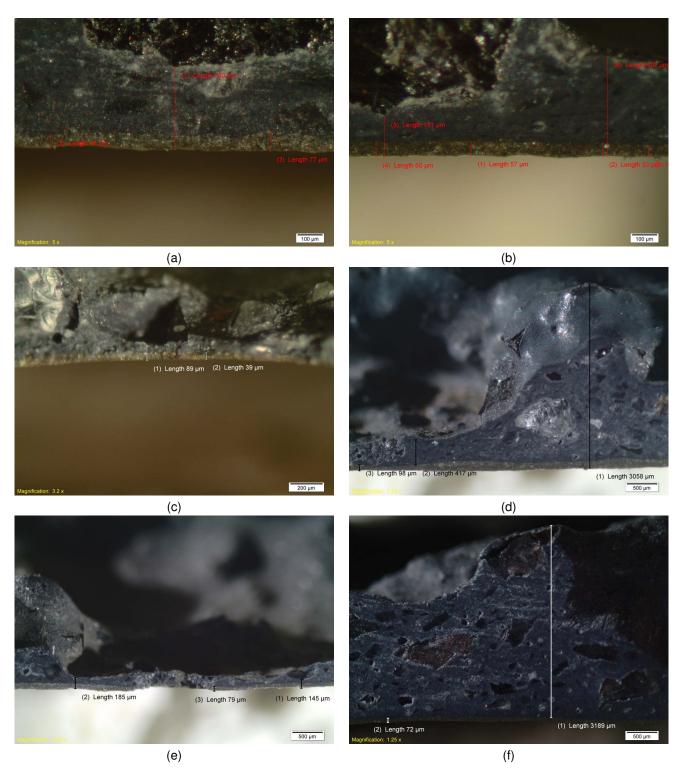


Figure 3: Assorted microscopic images of coating cross sections. The thinner, silver-gold layer is Intershield 300 primer, while the thicker blue-grey layer is the Intershied 6GV topcoat.







Figure 4: A pinhole in the coating, allowing light to shine through from behind.





Table 1: Tabulated paint application data reported by the contractor, along with the 2012 Environment Canada historical weather data recorded at the Halifax-Shearwater station. The actual sheets are reproduced in Annex A.

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^b Surface temperature near or at the minimum below dew point difference (3 $^{\circ}$ C). $^{\circ}$ Dew point recalculated to be 11 $^{\circ}$ C. d Dew point recalculated to be 12 $^{\circ}$ C. g Batch listed as NG631UH. Assumed to be NC6371UH.





References

- [1] (2009), Specification for Maintenance Painting of HMC Ships, Department of National Defence. D-23-003-005/SF-002.
- [2] (2012), Application Guidelines Exterior Deck System Intershield 6LV & Intershield 6GV, International / AkzoNobel. Revision 7.
- [3] (2012), Application Guidelines Cargo Holds Intershield 300, International / AkzoNobel. Revision 10.
- [4] (2012), Intershield 300 Datasheet, International / AkzoNobel. Publication code 223.
- [5] (2012), Intershield 6GV Datasheet, International / AkzoNobel. Publication code 1939.





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Attachments

Annex A Daily Inspection Reports

Annex B PMS2O Instructions





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Annex A Daily Inspection Reports





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ı	Preparation Equipmen	at: (Circle One) Bla	ster – <u>Blast-Trac - Ha</u>	nd & Power Tool - Hydro B	aster - Metalizing
	Surface Profile Averag			Spray	
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Testex www.tspleading	PRESS-O-FILM	HT To	Stex PRESS-O-FIL	M TM H¥ -Coarse - So 45 mi - So 15 mi - So 15 mi - Marin Lan -	





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Peintir	ng Contractors Ltd.	Approved:	President	Date: 08/01/30	
	Charles # 0164 D			Customer: SNC	
		1 1		Owo	
		•		SP-7 SP-10 SP-11	
	-			Silica Sand Aluminum O	•
		it: (Circle One) Blas		& Power Tool - Hydro Bir	
	Coating Application:		A inless Sp	ıray	
	PRODUCT APPLICA		- Cities Sh	T at a second	
	Coat #		nation: 436		
				ND7395UH	
	•		Cure Batch #	ND 434304	DFT
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TIME	WEATHER	AIR TEMP	SURFACE TEMP,	HUMIDITY	DEW POINT
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9W	ith & McCarthy	Daily Inspec	tion Report	DOC: Form-056	REV: D
Paintin	g Contractors Ltd.	Approved:	President	Date: 08/01/30	
	1		**************************************		
	Our Job # 3354 D	ate: Junt 16-12 R	eport#	Customer: SNC	
	Job Name: Chac	CRAY	Work Location:_	עטס	
	Surface Preparation:	(Circle One) SP-	1 SP-3 SP-5 SP-6	SP-7 SP-10 SP-11	WJ \$2
				Sitica Sand Aluminum C	
;	Preparation Equipment Surface Profile Average	nt: (Circle One) Bla	ester - Blast-Trac Han	d & Power Tool - Hydro Bl	aster - Metalizing
,	Coating Application:	Brush / Roller	Airless S	pray	
1	PRODUCT APPLICA	TION DATA:			
. •	Coat#l	_ Time of Appli	cation: <u>3</u>		
				NO7395UH	-1
1	Base Batch #	631UH	Cure Batch #		DFT
. ,	Coat# 2	Time of Appli	cation: 933	Bridge Too	+ Bridge wi
E		3/0//	Cure Batch #	COLUMN TO THE PROPERTY OF THE	DFT
TIME	WEATHER	AIR TEMP	SURFACE TEMP.	HUMIDITY	DEW POINT
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300	Sunny				
			Three Foxel	Lauge + etcan	Budee top
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V.	Vork Completed Today POLY (FOO) PRINT BLING erified By: PRESS-O-FILM B.Wing	Bloost Paris S Pari	PRESS No. Ster Heiseling 41111 Good as 20 mile	FILM Made in USA NEWARK, DE 1976	Budge top





						
1	Smith & McCarthy	Daily Inspect	ion Report	DOC: Form-056	REV: D	
Pair	nting Contractors Ltd.	Approved:	President	Date: 08/01/30		
	The state of the s				,	
	Our Job # 3354 D	ate: <u>June / /8//2</u> Re	port #	Customer: SNC		
	4 * .	•		(10C)		
	Surface Preparation:	(Circle One) SP-1	SP-3 SP-5 SP-6	SP-7. SP-10 SP-11	WJ	
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	Preparation Equipment Surface Profile Average	nt: (Circle One) Blas	ster - Blast-Trac - Hand	& Power Tool Hydro Bi	aster - Metalizing	
	Coating Application:		Airless Spi	ray		
	PRODUCT APPLICA	TION DATA:		No Hail State & Common State & Commo		
			ation: 466			
				NC7676UF	_	
	Base Batch #	C7637 UH	Cure Batch #		DFT	•
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			Cure Batch #			
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gnithi e ^t	Contractors Ltd.	Approved:	President	Date: 08/01/30	
1	Dur Job# <u>3354</u> [D	ate: <u>June/19/12</u> Re	port # <u> 2 </u>	Customer: SNC	an conference of the conferenc
. 4	Job Name: GINCC	Вру	Work Lecation:	DWD	A-12-4 SA-MEN ATTER AND
5	Surface Preparation:	(Circle One) SP-1	SP-3 SP-5 SP-	6 SP-7 SP-10 SP-11	wn
	Abrasive /Grade: (Ci	cle One) Steel	Shot Pure Grit	Silica SandAluminum	Oxide
	Preparation Equipmen Surface Profile Averag		ster – Blast-Trac - Ha	nd & Power Tool – Hydro B	laster - Metalizing
	Coating Application:		Airless	Spray	
¥	PRODUCT APPLICA	TION DATA:			
C	Coat#	_ Time of Applic	ation:		
F	Product: ThierShi	eld 6 GV	Batch #	NC7676UH	
E	Base Batch # <u>L/C (</u>	37/011	Cure Batch #		DFT Soruk
C	Coat #	_ Time of Applic	ation:	tech-constitute and the state of the	
P	roduct:		Batch #		Wandille
28	Base Batch #		Cure Batch #		DFT
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	n & McCarthy	Daily Inspecti	on Report	DOC: Form-056	REV: D
Painting	Contractors Ltd.	Approved:	President	Date: 08/01/30	
o	ur Joh # <u>3354</u> Ds	ite: <u>done / 1/19</u> Rep	ort#	Customer: SNC	
		CBRY		114 .	
Se	urface Preparation:	(Circle One) SP-1	SP-3 SP-5 SP-	6 SP-7 SP-10 SP-11	WJ
				_ Silica Sand Aluminum C	•
Pr Su	reparation Equipmen Irface Profile Averag	t: (Circle One) Blase e:	er - Blast-Trac - Ha	nd & Power Too! - Hydro Bl	aster - Metalizing
Co	pating Application: I	Brush / Roller	Airless	Spray	
PF	RODUCT APPLICA	TION DATA:			
Co	oat# <u>L</u>	Time of Applica	tion: 430	· ·	
				NE76760H	
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		Time of Applica			
TIME I	WEATHER	AIR TEMP	SURFACE	HUMIDITY	DFT
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()()	Sunny	73.6	- d 8	54:2	73.7
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Smith & McCarthy	Daily Inspect	ion Report	DOC: Form-056	REV: D	
Painting Contractors Ltd.	Approved:	President	Date: 08/01/30		
Our Job # 336 4 D	nte: <u> </u>	part #	Customer: 500	۷	
Job Name: 67 las	" spend	Work Location:	ana		
			SP-7 SP-10 SP-11		
Abrasive/Grade: (Ci	rcle One) Steel	Shot Pure Grit	Silica Sand Aluminum C	Dxide	
	nt: (Circle One) Bla:		l & Power Tool – Hydro Bl		
Coating Application:	Brush / Roller	Airless S _I	oray No.		
PRODUCT APPLICA	TION DATA:				
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Product: Eng	300 320	oner Barch #	na-		
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,		SURFACE TEMP.	HUMIDITY	DEW POINT .	
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Paintin	g Contractors Ltd.	Approved:	President	Date: 08/01/30	novikki ka 1888 ka kalenda en Browill de Allija (Allada, de Agenda y Lendonda y Lagonda) e sake e sake e sake			
·	Our Job # <u>3354</u> Dz	ne: June/21/12 Roj	port #	Customer: SuC	erone minoralization vo			
	Job Name: GACCE	Вау	Work Location:	DNO	male states for the out-of-the state of the			
!	Surface Preparation: ((Circle One) SP-1	SP-3 SP-5 SP-6	SP-7 SP-10 SP-11	wJ			
	Abrasive /Grade: (Cir	rele One) Steel	Shot Pure Grit S	Silica Sand Aluminum O	xide			
1	Preparation Equipmen Surface Profile Averag	nt: (Circle One) Blas	ter – Blast-Trac - Hand	i & Power Tool Hydro Bla	ster - Metalizing			
•	Coating Application: I	Brush / Roller	Airless Sp	ray				
	PRODUCT APPLICA							
(Coat #	Time of Applica	ation: *330					
				NOTI 8OUH	, .			
E	Base Batch # #83	802-1X	Cure Batch #	·	DFT			
(Coat #	Time of Applica	ation:	marin de marin de proposition de la producción de la produción de la produ				
F	Product:Batch #							
E	lase Batch #		Cure Batch #		DFT			
TIME	WEATHER	AIR TEMP	SURFACE TEMP.	HUMIDITY	DEW POINT			
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	nith & McCarthy	Daily Inspecti	on Report	DOC: Form-056	REV: D
Painti	ng Contractors Ltd.	Approved:	President	Date: 08/01/30	
e de la companya de l	Job Name: <u>Calva C</u> Surface Preparation: (Abrasive/Grade: (Cir	(Circle One) SP-1 cle One) Steel S clt: (Circle One) Blass e: Crush / Roller	Work Location: SP-3 SP-5 SP-6 Shot Pure Grit ter - Blast-Trac - Hand		WJ Oxide
				NC 76760	/
	Base Batch #	4042723	Cure Batch #		DFT
	Coat#				
1E		AIR TEMP	SURFACE	HUMIDITY	
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Our Job # 3354 Date: Dre 22/12 Report # Customer: SNC Job Name: Classe Bacy Work Location: Dro Surface Preparation: (Circle One) SP-1 SP-3 SP-5 SP-6 SP-7 SP-10 SP-11 WJ Abrasive / Grade: (Circle One) Steel Shot Pure Grit Silica Sand Aluminum Oxide Preparation Equipment: (Circle One) Blaster - Blast-Trac - Hand & Power Tool - Hydro Blaster - Metalizing Surface Profile Average: Coating Application: Brush / Roller Airless Spray PRODUCT APPLICATION DATA: Coat # 1 Time of Application: 63 C) Product: Total Skield Cov Batch # NC 76 76 U H Base Batch # NC 77 / VII Cure Batch # DFT 30 mills Coat # 2 Time of Application: NO 73 95 U f Product: Total Skield 3 Cov Batch # DFT 30 mills Coat # 2 Time of Application: NO 73 95 U f Product: Total Skield 3 Cove Batch # DFT 50 mills Base Batch # DC 3 U f f Cure Batch # DFT 50 mills Coat # 2 Time Of Application: NO 73 95 U f f Coat # 2 Time Of Application: NO 73 95 U f f DFT 50 mills Coat # DF	Our Job # 2354 Date: \textstyle=127/12 Report # / Customer: \(\sum_{\textstyle=127/12} \) Report # / Customer: \(\sum_{\textstyle=127/127} \) Report # / Customer: \(\sum_{\textstyle=127/127/127/127/127/127/127/127/127/127/	Smith & McCarthy	Daily Inspec	tion Report	DOC: Form-056	REV: D
Surface Preparation: (Circle One) SP-1 SP-3 SP-5 SP-6 SP-7 SP-10 SP-11 WJ	Job Name: Chale bay Work Location: Dr.O Surface Preparation: (Circle One) SP-1 SP-3 SP-5 SP-6 SP-7 SP-10 SP-11 WJ	ainting Contractors !	.td. Approved:	President	Date: 08/01/30	
Surface Preparation: (Circle One) SP-1 SP-3 SP-5 SP-6 SP-7 SP-10 SP-11 WJ	Job Name: Chale bay Work Location: Dr.O Surface Preparation: (Circle One) SP-1 SP-3 SP-5 SP-6 SP-7 SP-10 SP-11 WJ	Our Job # <u>-3354</u>	1 Date: \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	eport #	Customer: SNC	
Surface Preparation: (Circle One) SP-1 SP-3 SP-5 SP-6 SP-7 SP-10 SP-11 WJ	Surface Preparation: (Circle One) SP-1 SP-3 SP-5 SP-6 SP-7 SP-10 SP-11 WJ		•			
Abrasive/Grade: (Circle One) Steel ShotPure GritSilica SandAluminum Oxide Preparation Equipment: (Circle One) Blaster - Blast-Trac - Hand & Power Tool Hydro Blaster - Metalizing Surface Profile Average: Coating Application: Brush / Roller Airless Spray PRODUCT APPLICATION DATA: Coat #	Abrasive / Grade: (Circle One) Steel Shot Pure Grit Silica Sand Aluminum Oxide Preparation Equipment: (Circle One) Blaster - Blast-Trac - Hand & Power Tool Hydro Blaster - Metalizing Surface Profile Average: Coating Application: Brush / Roller Airless Spray PRODUCT APPLICATION DATA: Coat #		}			
Surface Profile Average: Coating Application: Brush / Roller Airless Spray PRODUCT APPLICATION DATA: Coat # Time of Application:	Surface Profile Average: Coating Application: Brush / Roller				•	
PRODUCT APPLICATION DATA: Coat # _ L	PRODUCT APPLICATION DATA: Coat # _ Time of Application: &3 &>	Preparation Equi Surface Profile A	ipment: (Circle One) Bla	nster – Blast-Trac - Has	nd & Power Tool Hydro Bl	aster - Metalizing
Coat # 1 Time of Application: 630 Product: Intershiped & W Batch # NC 76 76 UH Base Batch # NC 637 1011 Cure Batch # DFT 30 roll Coat # 2 Time of Application: NO 73 95 UH Product: Intershiped 30 Batch # DFT Base Batch # NC 63 UH Cure Batch # DFT	Coat # 1 Time of Application: 630 Product: Total Shield 66 W Batch # NC 76 76 U H Base Batch # NC 637 1071 Cure Batch # DFT 30 m lb Coat # 2 Time of Application: NO 73 95 U f Product: Total Shield 30 Batch # DFT WEATHER AIR TEMP SURFACE HUMIDITY DEW POINT Sunay Cloud 15.8°C 16°C 73.6°C 11.6°C	Coating Applicat	ion: Brush / Roller	Airless S	pray	
Product: Intershield Cov Batch # NC7676UH Base Batch # NC677 1541 Cure Batch # DFT 30mb Cost # 2 Time of Application; NO7395Uf(Product: Intershield 3 0 Batch # DFT Base Batch # NC631UF1 Cure Batch # DFT	Product: Total Shield Law Batch # NC 76 76 UH Base Batch # NC 677 1111 Cure Batch # DFT 30 ev lb Cont # 2 Time of Application; NO 73 95 Uf (Product: Total Shield 3 0 Batch # DFT Base Batch # NC 63 Uf (Cure Batch # DFT WEATHER AIR TEMP SURFACE HUMIDITY DEW POINT TEMP. Suney 61000 15.8°C /6°C 73.6°C //6°C	PRODUCT APPI	LICATION DATA:			
Base Batch # NCL 37 /VF/ Cure Batch # DFT 30 mult Cont # 2 Time of Application; NO7395UF/ Product: Tn +US hold 3 0 Batch # DFT Base Batch # NCL 3/UF/ Cure Batch # DFT	Base Batch # UCCTT /UT/ Cure Batch # DFT 30 roll Cont # 2 Time of Application; NOT3 95 UT/ Product: Tn tels hold 3 0 Batch # DFT Base Batch # UCC3 UT/ Cure Batch # DFT WEATHER AIR TEMP SURFACE HUMIDITY DEW POINT TEMP. Sunsy/Cloud 15,8°C /6°C 73.6°C //6°C	Coat #	Time of Appli	ication: <u>630</u>	ala kanana alampa an ani masada di kantum ngayaga	
Coat # 2 Time of Application: NO7395UF(Product: Tn 1615 h 10 3 0 Batch # Base Batch # DFT DFT	Coat # 2 Time of Application: NO7395UF(Product: Tn4US hold 3 D Batch # DFT Base Batch # DC (3/UF) Cure Batch # DFT WEATHER AIR TEMP SURFACE HUMIDITY DEW POINT TEMP. 15.8°C /6°C 73.6°C //6°C	Product:	atershield 6	Batch #	NC 76760H	
Product: Triters hold 3 d Batch # Base Batch # DEC 310 F1 Cure Batch # DFT	Product: Tn 1615 h 161 d 3 d Batch # DFT Base Batch # DC (310 F1 Cure Batch # DFT WEATHER AIR TEMP SURFACE HUMIDITY DEW POINT TEMP. Sunay/Cloud 15.8°C /6°C 73.6°C //6°C	Base Batch #	UC637 1471	Cure Batch#		DFT 30 to 11
Base Batch # NC (3/UF1 Cure Batch # DFT	Base Batch # DC (310 F1 Cure Batch # DFT DEW POINT TEMP. Sunay Cloud 15,8°C /6°C 73.6°C //6°C	Cont # 2	Time of Appli	cation:	95011	
	WEATHER AIR TEMP SURFACE HUMIDITY DEW POINT Sunay/Cloud 15.8°C /6°C 73.6°C //.6°C	Product:	tershiold 30	Batch #	· · · · · · · · · · · · · · · · · · ·	
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Painting	Contractors Ltd.	Approved:	President	Date: 08/01/30	
		•		Customer: SNC	
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	-			SP-7 SP-10 SP-11	
				Silica Sand Aluminum (
5	Preparation Equipme Surface Profile Avera;	nt: (Circle One) Blas ge:	iter – Blast-Trac - Han	id & Power Tool - Hydro Bl	aster - Metalizing
C	Coating Application:	Brush / Roller	Airtess S	pray	
P	PRODUCT APPLICA	TION DATA:			
C	Cost #1	Time of Applic	ation: 1000	PA 170 Mile & Aprilia de companye	
P	roduct: Inkity	e 990	Batch #	ND718004	
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			ation: Loc		
				NOTIBOUH	
В	lase Batch # 20	838027x	Cure Batch #		DFT
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Smith	6 McCarthy	Daily Inspect	tion Report	DOC: Form-056	REV: D
	Contractors Ltd.	Approved:	President	Date: 08/01/30	
	*		*		
			eport # 2		
			Work Location:		
	•		SP-3 SP-5 SP-6		,
			Shot Pure Grit S	•	
Pr Su	eparation Equipment reace Profile Alegag	it: (Circle One) Bla ic:	ster – Blast-Trac - Hand	& Power Tool Hydra I	Blaster - Metalizing
Co	ating Application:	Brush / Roller	Airless Spi	'яу	
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			Cure Batch #		DFT
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Pro	duct: Tolect	ac Ships	ide Batch#		
• • • •	444				
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Bas	se Batch #	AIR TEMP	Cure Batch #SURFACE		DEW POINT
Bas	weather	AIR TEMP	Cure Batch #SURFACE	HUMIDITY	DEW POINT
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Bac Boo	WEATHER Cloudy Swong	AIR TEMP	Cure Batch #	HUMIDITY 81.7°C	DEW POINT
Bac Boo	WEATHER Cloudy Swong	AIR TEMP	Cure Batch #SURFACE	HUMIDITY 81.7°C	DEW POINT
Bac Boo	WEATHER Cloudy Swong	AIR TEMP	Cure Batch #	HUMIDITY 81.7°C	DEW POINT
Bac Boo	WEATHER Cloudy Swong	AIR TEMP	Cure Batch #	HUMIDITY 81.7°C	DEW POINT
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'ainting Cor	ntractors Ltd.	Approved:	President	Date: 08/01/30	Andread to decreasible in process proc
Our J	Joh N <u>835 Y</u> D	ateniunczijii Re	port #	Customer: Sale	
Job N	dame: Claci	Loas	Work Locations	סטס	
				6 SP-7 SP-10 SP-11	
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		Brush / Roller	Airless 5	Spray	
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	Job Name:	ite: Jose 19/4 Rep (Circle One) SP-1 cle One) Steel t: (Circle One) Blase TION DATA: Time of Application o	Work Location: SP-3 SP-5 SP-6 Shot Pure Grit S ter Blast-Trac - Hand Airless Spr ation: (200) Batch # Cure Batch #	Customer:SAME	WJ
*			Batch #		 DFT
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Painting	g Contractors Ltd.	Approved:	President	Date: 08/01/30	
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				Customer: SMC	
		,		020	
				SP-7 SP-10 SP-11	***************************************
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(Coating Application: I	Brush / Roller	Airless Spi	·ay	•
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	Smi	ith & McCarthy	Daily Inspection	on Report	DOC: Form-056	REV: D
	Paintin	g Contractors Ltd.	Approved:	President	Date: 08/01/30	
		Job Name: 61 Pro Surface Preparation: (Circ Preparation Equipmen Surface Profile Average Coating Application: E PRODUCT APPLICAT Coat # 2 Product: 1116114 Base Batch # 1833	Circle One) SP-1 cle One) Steel S t: (Circle One) Blast cirush / Roller TION DATA: Time of Applica	Work Location: SP-3 SP-5 SP-6 Shot Pure Grit Si	OD 7 1800 K	WJ
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	Sm	ith & McCarthy	Daily Inspecti	on Report	DOC: Form-056	REV: D	
	Paintin	g Contractors Ltd.	Approved:	President	Date: 08/01/30		
, mark		Job Name:	(Circle One) SP-1 cle One) Steel S nt: (Circle One) Blass ge: Brush / Roller TION DATA: Time of Applica	Work Location: SP-3 SP-5 SP-6 Shot Pure Grit Ster - Blast-Trac - Hand Airless Sp ation: 23 8 Batch # Gure-Batch-#		WJ	
	A111111111111111111			Cure Batch #		DFT	 , .
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Annex B PMS20 Instructions

Note: some pages are missing





JUL/12/2012/THU 10:58 AM SCN LAVALIN DEFENCE

FAX No. 9024685304

P. 001

SNC-Lavalin Defence Programs Inc. Unit 1 - 130 John Savage Ave Dartmouth Nova Scotia

Canada B3B 0C9 Telephone (902) 480-7550 Fax (902) 468-5304



Work Completion Form

WEAF Number: OTT-0312C

Ship: Glace Bay

Contractor: Smith & McCarthy Painting Contractors Ltd. - Mount Uniacke NS B0N 120

Job Description

Related Doos: OCL-2510 (MWAV2) OTT-0021 (MWAV3) Subject: 80M PMS

Action: Carry out the following 60M PM in accordance with the specification to complete the work that has not been done in Shelburne Ship Repair during Docking:
PMS2O Ship Index HY005-03 (2) - Exterior Decks
Spec will be for 100% of upper deck including all ISO sockets, which seating's crane seating's, locker seating's, gun mount seating, area Aft of funnel port side. GP crane deck area. Pilotage deck pedestals for Inmarsat and Sat TV. All vents from deck to flange.

Deviations to the above job description including all arisings, as agreed to by SNC-Lavalin

Comments and All Readings Taken (clearances,	pressures, voltages, ranges etc.) and observations made.
HOUR METER READING:	
Was callbrated equipment	nent used to conduct checks?
If so, date of last calibration:	and Serial No.
or ISO 9001:2008 Reg N	do
or ISO 9001:2008 Reg N SNC-Lavalin INC.	Service Provider's confirmation that all work that will
	Service Provider's confirmation that all work that will billed for this WEAF is complete as identified above
SNC-Lavalin INC.	Service Provider's confirmation that all work that will billed for this WEAF is complete as identified above
SNC-Lavatin INC.	Service Provider's confirmation that all work that will billed for this WEAF is complete as identified above

Momber of the SNC + LAVALTN Group

Form WCF(E)-00120518

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SHIP	PMS20 INSTRUCTIONS	SHIP INDEX	
HMCS GLACE BAY		HY005-03 (2)	
SYSTEM	EQUIPMENT	FLEET INDEX	
HL - Hull	Exterior Decks	H026/CIDN(1)-0067-00	

JOB No	FREQUENCY	TYPE	LOCATION	ALLOCATION	DEPT	PAGE	OF
1	60M	PAINT	IN DOCK	CONTRACTOR		3	14
			·				

Photographs

 Take approximately 10 representative photographs of the decks as specified by the ISSC On-Site Representative.

Preparation

- General. Take the following precautions prior to and while pressure washing and track blasting:
 - 3.1. Confirm that all items identified in HY005-03 (1) are indeed properly covered and taped.
 - 3.2. Confirm that all external openings are completely sealed.
 - 3.3. If the lockers and equipment on the weatherdecks are in place remove them. For bld purposes assume the lockers are in place.

Pressure Wash

- Pressure wash the deck as follows:
 - 4.1. On completion of pressure washing the superstructure, wash the weather deck to clean salt deposits, <u>loose paint</u>, and adherent rust in <u>bare areas</u>. Collect and dispose of the effluent in accordance with the instructions in HY005-03 "Underwater and Above Water Hulf".
 - 4.2. Degrease <u>areas being cleaned to bare metal and areas with extreme rust stains</u> then rinse with fresh water law SSPC SP1.
- 5. Conduct a chloride test: law Ref.5 and note 7

Deliverable - Chloride tests on the Exterior Decks (prior to blasting)

Date: 99may 12 Receiving Signature:

Track Blast

- Grit blast the decks as follows:
 - 6.1. Ensure 100% hoarding in is accomplished prior to proceeding with track blasting ships decks.
 - 6.2. Weather deck blasting is best done with the Z drive Portable Plates HY005-15 removed and the protection in place. Power tool clean the lip of the Z-drive Portable Plate coaming in accordance with SSPC-SP-11—"Power Tool Cleaning to Bare Metal".
 - 6.3. Remove the guard over the hydraulic lines for the capstan on the sweep deck

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Smith & McCarthy Painting 902-866-0381

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SHIP HMCS GLACE BAY	PMS20 INSTRUCTIONS	SHIP INDEX HY005-03 (2)
SYSTEM	EQUIPMENT	FLEET INDEX
HL- Hull	Exterior Decks	H026/CDN(1)-0067-00

JOB No	FREQUENCY	TYPE	LOCATION	ALLOCATION	DEPT	PAGE	OF
1	MOB	PAINT	IN DOCK	CONTRACTOR	•	4	14

- 6.4. . Hand tool clean, in accordance with SSPC-SP2 the steel deck up to 4 in. on superstructure, coamings and bulwarks, including pilotage deck support structures.
- 6.5, The abrasive mixture shall consist of a mix of sufficient size to achieve the required profile and shall be clean and free of contaminants. Surface profile shall be law paint manufacturers' specification. Take surface profile measurements, using replica tape in accordance with NACE Standard RP0287-95 - "Field measurement of Surface Profile of Abrasive Blast Clean Steel Surfaces Using a Replica Tape. Record readings in Hold Point Data Form.
- Power tool clean, in accordance with SSPC-SP11 "Power Tool Cleaning to Bare Metal" 6.6. those areas that cannot be track blasted. Roughen the surface to produce a surface profile greater than 25.4 microns. Surface cleanliness is verified using SSPC-VIS 3 93-04 – "Visual Standard for Hand and Power Tool Cleaning". Record readings in Hold Point Data Form.
- 6.7. Feather edges of intact coatings bordering areas cleaned to bare metal.
- 6.8. Collect the blast and grinding debris, separate it from other debris and dispose.
- 6.9. On completion of blast cleaning, visually inspect for cleanliness. Verify cleanliness by placing a clear adhesive tape pressed on the surface at several locations representative of the entire area. Remove tape and check that it is free from dust, dirt or other contamination and record results. If test fails, degrease deck using biodegradable cleaner/degreaser. The ISSC On-Site Representative shall witness test.
- 6.10. Prior to painting, carry out MPI on both pedestals (foundations) for the MMS crane and the General Purpose crane.

Hold Point:		
Surface Profile Measurements and Deck Cleanliness	ISSC On-Site Representative	Service Provider Supervisor
Date: Edul W	W(26)	What Hook
Deliverables Record surface prof	ile data on Hold Point Data Form.	

6.11. Conduct a chloride test: Ref.5 and note 7

SNC-Lavalin	Form : MMS 025	Revision : Rev 0	Revision Date: 03-Apr-2012	Issued By : SNC-Lavalin
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SHIP HMCS GLACE BAY	PMS20 INSTRUCTIONS	SHIP INDEX HY005-03 (2)
SYSTEM	EQUIPMENT	FLEET INDEX
HL- Hull	Exterior Decks	H026/CDN(1)-0067-00

JOB No	FREQUENCY	TYPE	LOCATION	ALLOCATION	DEPT	PAGE	OF
1	60M	PAINT	IN DOCK	CONTRACTOR	*	7	14
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- 11.3. In consultation with the ISSC On-Site Representative, lay out a grid for DFT readings where these are called for in this specification. Record DFT readings in accordance with SSPC-PA-2.
- 11.4. Provide the manufacturer's product information sheet complete with batch numbers prior to painting.
- 11.5. Apply the workmanship standards as detailed at the end of this work instruction.
- 12. Paint the weather decks as follows:
 - 12.1. Stripe Coat/Sealer Coat
 - 12.1.1. Brush apply stripe coat to all edges, corners, welds, weld seams and the 4 inch vertical waterways on the superstructure with one coat of paint code <u>C420</u> to achieve paint manufacturers recommended DFT per coat. Include edges as well as at least one-inch border outside each edge.
 - 12.1.2. Inaccessible areas in way of foundations, vent heads, etc that cannot be blast cleaned 100% to bare metal shall be power tool cleaned to SSPC-SP-11 shall be treated with one coat paint code <u>C420</u> to achieve paint manufacturers recommended DFT per coat.
 - 12.2. Primer Coat
 - 12.2.1. Apply one (1) primer coat to all Stripe Coated and bared metal areas with one coat of paint code C420 to achieve paint manufacturers recommended DFT per coat.
 - 12.2.2. In consultation with ISSC On-Site Representative, lay out a 2-meter grid.
 - 12.2.3. Record DFD readings at 2 meter spaces in accordance with SSPC-PA-2.

Hold Point:
Inspect Primer Coat

Date:
Deliverables: Hold Point Data Entry Forms.

12.2.4. The maximum and minimum cure times before application of subsequent coats shall be in accordance with the manufacturer's recommendation found on the "Product Data Sheet".

SNC-Lavalin Form: Revision: Revision Date: Issued By: 03-Apr-2012 SNC-Lavalin

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Smith & McCarthy Painting 902-866-0381

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İ	SYSTEM	EQUIPMENT	FLEET INDEX
	HL- Hull	Exterior Decks	H026/GDN(1)-0067-00
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JOB No	FREQUENCY	TYPE	LOCATION	ALLOGATION	DEPT	PAGE	OF
1	BOM	PAINT	IN DOCK	CONTRACTOR	*	8	14

12.3. Non-Skid (Traffic Area)

12.3.1. Verify the surface is clean. The ISSC On-Site Representative shall witness.

Hold Point:	ISSC On Sile Description	
Traffic Areas	ISSC On-Site Representative	Service Provider Foreman
Date: 6 Jul 12	W20/	

- 12.3.2. Overcoat the primed area with non-skid deck coating within 48 hours to avoid undue surface contamination.
- 12.3.3. Take surface temperature, ambient temperature and relative humidity readings at the beginning, approximate middle and end of each day's work (or when the hold point is reached and when environmental conditions change. Record readings in Hold Point Data Entry Form.
- 12.3.4. Apply Non-Skid to deck area, leaving approx_3_inch waterways around deck edges and around equipment foundations as well a 4-inch vertical waterway around the superstructure. Leave a 3 inch waterway around the deck markings adjacent to the deck sockets for accommodation pod.
- 12.3.5. Apply the non-skid paint with a roller as per DND non-skid application procedure in reference 5.
- 12.3.6. Coat with Non-slip Epoxy primer using code C420 then use code C419 for Epoxy Non-Skid product. Colour US Fed-Std-595B #36076, flat dark grey. Actual coverage rate shall be 28-32 sq.ft/US gallons to achieve a DFT of 750-1000 microns.

Hold Point:	1000 O- 64- D	
Traffic Areas	ISSC On-Site Representative	Service Provider Foreman
Date: 6 Gull	W192	VII I Mak

12.3.7. On completion of the coating application, record DFT measurements at 2-meter spaces in accordance with SSPC-PA2. In the space provided on the Hold Point Data Entry Form, draw diagram of area painted and record DFT measurements.

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SNC-Lavalin	Form : MMS 025	Revision : Rev 0	Revision Date: 03-Apr-2012	issued By : SNC-Lavalin

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SHIP HMCS GLACE BAY	PMS20 INSTRUCTIONS	SHIP INDEX HY005-03 (2)
SYSTEM	EQUIPMENT	FLEET INDEX
HL - Hull	Exterior Decks	H026/CDN(1)-0067-00

JOB No	FREQUENCY	TYPE	LOCATION	ALLOCATION	DEPT	PAGE	OF
1	60M	PAINT	IN DOCK	CONTRACTOR	-	9	14

12.4. Waterways

- 12.4.1. Apply one coat of paint code C045 (Tle Coat) to achieve paint manufacturers recommended DFT per coat.
- 12.4.2. Apply two coats of paint code C061 colour Grey US Fed-Std-595B code 16076 to achieve the paint manufacturers recommended DFT per coat, to weather deck waterways, including 4 Inch vertical waterway (on superstructure), and around equipment foundations.

12.5. Vertical Replenishment Area Circle

- 12.5.1. Apply one (1) coat of paint code C177, colour (Yellow) US Fed-Std-595B code 33538 to Vertical replentshment area circle.
- 12.5.2. The configuration and painting of the area circle shall be law Paint Plan DWG 9558974 Rev H.
- 12.5.3. The ISSC On-Site Representative shall inspect upon completion of treatment.

Hold Point: inspect Waterways and Vertrep Circle	ISSC On-Site Representative	Service Provider Foreman
Vertrep Circle		
Date: (2 Call	612	Mich Vanh
		7/1-6

Miscellaneous Items

13. Treat the miscellaneous items as follows:

Note: For bid purposes assume 100% of all surfaces identified in the following paragraphs will require blast cleaning to bare metal SSPC SP10, near-white blast clean or SSPC SP11, Power Tool cleaning to bare metal.

13.1,

Deck machinery, batches/coamings, bulwarks, guard-raits/stanchions, storm raits, ladders, stairways, yent plenums, yent trunking, mushroom yents,

- 13.1.1. For bare metal areas, apply one (1) coat paint code C171 to achieve paint manufacturers recommended DFT per coat. (If 100% cleaned to SP10) or C183 (if cleaned to SP11) to a DFT law paint manufacturers recommendations.
- 13.1.2. Apply one (1) tie coat of paint code C045 to a DFT DFT law paint manufacturers recommendations.

SNC-Lavalin	Form : MMS 025	Revision : Rev 0	Revision Date: 03-Apr-2012	tesued By ; SNC-Lavalin

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SHIP	PMS20 INSTRUCTIONS	SHIP INDEX
HMCS GLACE BAY		HY005-03 (2)
SYSTEM	EQUIPMENT	FLEET INDEX
HL - Huli	Exterior Decks	H028/CDN(1)-0067-00
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JOB No	FREQUENCY	TYPE	LOCATION	ALLOCATION	DEPT	PAGE	OF
1	60M	PAINT	IN DOCK	CONTRACTOR	4	12	14

Hold Point: Miscellaneous Items	ISSC On-Site Representative	General-Contractor-On- Site-Foreman
Date:		,

Completion

- The work is deemed completed when the following has been accomplished
 - 14.1. Provide all deliverables identified in this specification.
 - 14.2. In company with the ISSC On-Site Representative, perform a complete inspection of the ship's paint work.

Photographs

15. On completion of the inspection digitally photograph the same items as taken for item 2 above.

Notes:

- 16. Workmanship Standards.
 - 16.1.1. Uniformly apply all coatings without sags, foreign materials, or other blemishes. As directed by the ISSC On-Site Representative, remove and repair such defects before proceeding with another coat.
 - 16.1.2. Supply all coating materials for the selected system of the same manufacturer. Keep differing lots of materials to a minimum.
 - 16.1.3. Supply paint to the site in new unopened containers. Do not accept product older than the manufacturer's published life or in damaged containers.
 - 16.1.4. Provide, upon request from the ISSC On-Site Representative, a 1 litre size sample of each lot of material complete with certified copies of the manufacturer's quality control testing records.

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JOB No	FREQUENCY	т	YPE	LOCATI	ON	ALLOCATION	DEPT	PAGE	OF
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	Ship Name	2	item: Manufac	becks turer Name	Pr 10	Componer oduct Used.	l hveld		(

Following space to sketch diagram and denote DFT readings, surface profile and/or chloride lons levels data.

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50°C

250

57.5°L

1000

300

2066

46.100

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400

Shan 3

I verify that the above readings are correct and the job has been performed as per SNC-Lavalin environmental and technical requirements.

igned: of fice of Marion (Service Provider)

Date: <u>Tuli, 00,-13</u>

Return to the ISSC On-Site Representative on completion of job.

SNC-Lavalin Form: Revision: Revision Date: Issued By: 800 03-Apr-2012 SNC-Lavalin

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Time of Reading

Surface Temp

Ambient Temp

Relative Humidity

DFT over entire area

Chloride ions levels

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