Tank Coating System Evolution **Tank Coating and CIR History** (Last updated: May 2025)	Uncoated	Coating System #1 (NRL thin-film polyurethane)		Coating System #2* (NRL thin-film polyurethane + flame-sprayed aluminum on tank bottom)	Coating System #3 2-Part Epoxy with Fluoropolyurethane Top Coat (Prior to application, sandblasting was performed to remove previous coating on top of flame-sprayed aluminum and any and residual aluminum)	Coating System #4 2-Part Low VOC Polysulfide (PMNE)	Coating System #4 2-Part Low VOC Polysulfide (PMNE)
Application		Full Tank		Full Tank	Lower Dome and Tank Floor Repairs	Lower Dome and Extension Ring	Tank Bottom and Shell
UFGS Standard	N/A	N/A		N/A	09970 --> 09 97 13.15 --> 09 97 13.17	09 97 13.15	09 97 13.15
Time Period	**1940-1960**	**1961-1965**	**1966-1978**	**1979-1993**	**1994-2015**	**2016-2021**	**2016-2021**
Tank 1				Last CIR (1982)	Last used (1997) Partial CIR (2006) Perm Closed (2007)		
Tank 2					Last CIR (2008)		
Tank 3				Last CIR (1982) NO ALUMINUM APPLIED TO TANK BOTTOM**			
Tank 4				Last CIR (1982) NO ALUMINUM APPLIED TO TANK BOTTOM**			
Tank 5						Last CIR (2019)	
Tank 6					Last CIR (2007)		
Tank 7					Last CIR (1998)		
Tank 8					Last CIR (1998)		
Tank 9					Last CIR (1996)		
Tank 10					Last CIR (1998)		
Tank 11				Last CIR (1983)			
Tank 12					Last CIR (1995)		
Tank 13						Last CIR (2021)	
Tank 14						Partial CIR (2021)	
Tank 15					Last CIR (2006)		
Tank 16					Last CIR (2006)		
Tank 17						Last CIR (2021)	
Tank 18		Last CIR (1968)				Partial CIR (2021)	
Tank 19					Last CIR (1999) Perm Closed (2007)		
Tank 20					Last CIR (2008)		
ST-1			1978				Last CIR (2021) - 1978 coating removed. Re-coated with PMNE.
ST-2			1978				TBD
ST-3			1978				Last CIR (2021) - 1978 coating removed. Re-coated with PMNE
ST-4			1978		Install secondary bottom and re-coat floor (2005)		Last CIR (2021) - 1978 coating removed. Re-coated with PMNE

*From ~1985 - 1993 (post TKs 1-16 coating and before switching to Coating System #3), a modified PTFE-pigmented fluoropolyurethane topcoat was used.

** Per Red Hill Administrative Order on Consent, Attachment A Scope of Work Deliverable Section: 5.2 1 *Corrosion and Metal Fatigue Practices Report p. 8*

Standards

UFGS-09900	Polyurethane coating spec (a.k.a. "1960 Urethane" and "Navy Special" (same system between 1961-1962 and 1978-1982 application)
UFGS-09901	Metallized coating spec (not used in Tan ks 17-20 during the 1961-1962 application)
UFGS-09902	Surge Tank floor lining spec (only relevant to Surge Tank 2 as others have had new bottoms installed). The walls of Surge Tank 2 are still coated in the 09900 coating.
UFGS-09970 (superceded 09872)	Coating spec bridging NRL and Epoxy/Fluoropolyurethane system: *Interior Coating of Welded Steel Petroleum Fuel Tanks*
UFGS-099713.15	As of Feb. 2010: *Epoxy/Fluoropolyurethane Interior Coating of Welded Steel Petroleum Fuel Tanks* In 2015: Became *Low VOC Polysulfide Interior Coating of Welded Steel Petroleum Fuel Tanks*
UFGS-099713.17	After 2015, *Epoxy/Fluoropolyurethane Interior Coating of Welded Steel Petroleum Fuel Tanks* was re-assigned to this standard

Red Hill Tank Coating Systems
(Last updated: May 2025)

Coating System	Steps	Constituents	% by weight	CAS number	Source
Coating System #1 (NRL 4-step thin-film polyurethane)	Polyvinyl coat wash primer (DoD Spec P-15328C, Formula 117-b (blue)) - Resin component (80%) - Acid component (20%)	Resin Component: Polyvinyl-butyral resin Zinc chromate Magnesium silicate (MIL-P-15173) Lampblack (TT-L-70) Butyl alcohol (TT-B-846) **Ethyl alcohol** Acid Component: Phosphoric acid **Ethyl alcohol**	-	-	Product Specification
	Polyurethane primer (Part A and B): Part A: DESMOPHEN 1100 (polyester) with Zinc Chromate (ASTM-D478) Part B: Mondur 75 (Only found information for MB 75)	DESMOPHEN 800: Trimethylolpropane DESMOPHEN 1100 Zinc chromate Chromium oxide green (pigment) Mondur 75: - 4'4'-Diphenylmethane Diisocyanate (MDI) - Diphenylmethane Diisocyanate (MDI) mixed isomers	3-7% 100% ≤ 100% 100% ≥ 95% 1-5%	77-99-6 9072-09-7 13530-65-9 1308-38-9 101-68-8 26447-40-5	SDS, PDS
	Intermediate coating (Part A and B): Part A: DESMOPHEN 1100 and 800 (polyesters) with Chrome Oxide green pigment (ASTM-D263) Part B: Mondur 75				
	Polyurethane top coat (Part A and B): Part A: DESMOPHEN 1100 and 800 (polyesters, equal split) with Chrome Oxide green pigment (ASTM-D263) Part B: Mondur 75				
Coating System #2 (NRL 4-step thin-film polyurethane with flame-sprayed aluminum on tank bottom)	Polyvinyl coat wash primer (DoD Spec P-15328D, Formula 117.. Superceded P-15328C on 25Apr1968). - Resin component (80%) - Acid component (20%)	Resin Component: Polyvinyl-butyral resin Zinc chromate Magnesium silicate (MIL-P-15173) Lampblack (ASTM D209) Butyl alcohol **Isopropyl alcohol** Acid Component: Phosphoric acid **Isopropyl alcohol**	-	-	DoD Spec P-15328D
	Polyurethane primer (Part A and B): Part A: DESMOPHEN 1100 (polyester) with Zinc Chromate (ASTM-D478) Part B: Mondur 75 (Only found information for MB 75)	DESMOPHEN 800: Trimethylolpropane DESMOPHEN 1100 Zinc chromate Chromium oxide green (pigment) Mondur 75: - 4'4'-Diphenylmethane Diisocyanate (MDI) - Diphenylmethane Diisocyanate (MDI) mixed isomers	3-7% 100% ≤ 100% 100% ≥ 95% 1-5%	77-99-6 9072-09-7 13530-65-9 1308-38-9 101-68-8 26447-40-5	SDS, PDS
	Intermediate coating (Part A and B): Part A: DESMOPHEN 1100 and 800 (polyesters, equal split) with Chrome Oxide green pigment (ASTM-D263). Part B: Mondur 75				
	Polyurethane top coat (Part A and B): Part A: Equal mix of DESMOPHEN 1100 and 800 with Chrome Oxide green pigment (ASTM-D263). Part B: Mondur 75 *From ~1985 - 1993 (post TKs 1-16 coating and before switching to Coating System #3), a modified PTFE-pigmented fluoropolyurethane topcoat was used.				
Coating System #3 (2-Part Epoxy with Fluoropolyurethane top coat)	Epoxy primer (Part A and B): Part A - Epoxy primer (Mil-P-24441/29, Formula 150, Type IV, Green) Part B - Hardener Epoxy intermediate coating (Part A and B): Part A - Epoxy intermediate coat (Mil-P-24441/31, Formula 152, Type IV, White, Tinted) Part B - Hardener Top Coat (finish): Modified PTFE□Pigmented Fluoropolyurethane (White)	Talc	≥ 25 - ≤ 50 %	14807-96-6	SDS, PDS
		1-Butanol	≥ 10 - ≤ 25%	71-36-3	
		Polyamide	≥ 10 - ≤ 25%	68410-23-1	
		Iron Oxide	≤ 10%	1317-61-9	
		Phenylmethanol	≤ 10%	100-51-6	
		Amidoamino Polymer	<5%	68443-08-3	
		Triethylene Tetramine	<1%	112-24-3	
		Titanium Dioxide	≤ 1%	13463-67-7	
		Xylene, mixed isomers	<1%	1330-20-7	
Coating System #4 (2-Part Low VOC Polysulfide (PMNE))	Base (Component A): Premier Coating Systems #1100B Activator (Component B): Premier Coating Systems #1100W	Bisphenol F / Epichlorohydrin Epoxy / Novolac Resin	70-80%	28064-14-4	SDS, PDS
		Hydroxy Modified Resin	15-25%	proprietary	
		Glycidylether of (C12-C14) Alcohols	5-15%	68609-97-2	
		Siloxanes and Silicones, di-Me reaction products with silica	1-10%	67762-90-7	
		Non-Hazardous & Other Ingredients below reportable levels	balance	proprietary	
		Phenol, 4,4-(methylethylidene)bis, polymer with 5 amino-1-3,3-trimethylcyclohexanemethanamine and (chloromethyl)oxirane	10-30%	68609-08-5	
		Benzyl Alcohol	10-30%	100-51-6	
		Isophorone diamine	5-15%	2855-13-2	
		Titanium Dioxide	20-40%	13463-67-7	
		Siloxanes and Silicones, di-Me reaction products with silica	1-10%	67762-90-7	
		Non-Hazardous & Other Ingredients below reportable levels	balance	proprietary	

SDS: Safety Data Sheet
PDS: Product Data Sheet