



# Hexavalent-Chromium-Free Aluminum Sacrificial Paint Validation

## Alseal 5KGT

Brad Wiley    Materials Technology Center



# Test Plan and Results Summary

Success!

Table 1a: Results Summary of Aseal 5KGT Testing		
Test Category	Test Names	Result
Quality	Visual Inspection Criteria	Pass
Corrosion	USN/LF CRD (Cyclic Synthetic Sea Water Salt Spray / Heat / Humidity)	Pass
	Salt Spray, Continuous Neutral	Pass
	Cyclic Salt Spray / Heat ("Bi-Cyclic")	Pass
	Cyclic Salt Spray / Humidity / Heat ("Tri-Cyclic")	Pass
	Throwing Power	Info
Heat Resistance	Bake + Salt Spray	Info
Fluid Resistance	Hydraulic Fluid	Pass
	Fuel	Pass
	Oil	Pass

Adhesion	Cross Cut Tape	Pass
	Bend	Pass
Electrical Properties	Conductivity	Pass
	Resistivity	Pass
Metallography	Cross Section	Info
Fatigue Debit	RR Moore Rotating Beam	Info
Thickness of panel coating	ISO 2808 or ASTM B244 or ASTM D1005 or RRMS 30037-5	Info

Table 1b: Other Data Summary

Coating Touch-Up Method	Info
Coating Strip Method	Info



# Process Change

## Reaction Coat

Traditional/Legacy Coating Processing		Candidate Alseal 5KGT (using Reaction Coat Burnish method)	
Step	Details	Step	Details
Prepare for Base Coat	cleaning and masking	Prepare for Base Coat	cleaning and masking
Apply Base Coat	and unmask and cure and re-mask	Apply Base Coat	and unmask and cure and re-mask
		Apply Reaction Coat	aka 1 <sup>st</sup> application of Seal Coat; and unmask and cure and re-mask
Burnish Base Coat	Burnish not required if high temp cure (1,000° F); and unmask and cure and re-mask	Burnish Reaction Coat	until Base Coat is Conductive; and unmask and cure and re-mask
Apply Seal Coat	And unmask and cure <end>	Apply Seal Coat	And unmask and cure <end>



# Test Matrix

## Panels tested



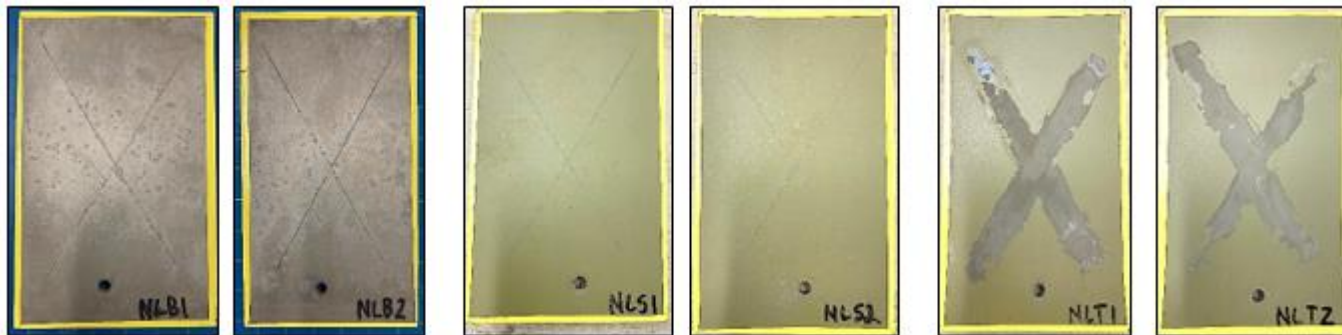
	Qual	Corrosion Tests						Fluid Resistance			Adhesion		Electrical		Met	Panel sub-tota	
		Navy CRD <sup>1</sup>	SS	BiCyc	TriCyc	TP	Heat	Hyd	Fuel	Oil	Xcut	Bend	Cond	Res			
		3.2	3.3.1	3.3.2	3.3.3	3.3.4	3.3.5	3.4	3.5.1	3.5.2	3.5.3	3.6.1	3.6.2	3.7.1			3.7.2
Report Section:	3.2	3.3.1	3.3.2	3.3.3	3.3.4	3.3.5	3.4	3.5.1	3.5.2	3.5.3	3.6.1	3.6.2	3.7.1	3.7.2	3.8	Panel sub-tota	
Coating Config	Panel ID																
Base Scribed	all	NLB1 NLB2	**	**	**	**	**	**	**	**	**	**	(NLB1 NLB2) b4 CRD	**	**	2N	
Base + Seal Scribed	all	NLS1 NLS2	**	**	**	**	**	LH850 LH900 LH950 LH1000 LH1050 LH1100 LH1150 LH1200	**	**	**	**	**	(NLS1 NLS2) b4 CRD	(extra)	2N + 8Q	
Base + Seal Scribed & Touched-up	all	NLT1 NLT2	**	**	**	**	**	**	**	**	**	**	**	**	**	2N	
Base Not Scribed	all	**	**	**	**	**	**	**	**	**	**	**	CBCo	**	**	1Q	
Base + Seal Not Scribed	all	**	**	**	**	**	TP1 TP2	**	**	**	**	**	**	**	**	2Q	
Base + Seal Scribed	all	NCS1 NCS2 NCS3 NCS4	17CS1 17CS2 17CS3 17CS4	Bi1 Bi2 Bi3	Tri1 Tri2 Tri3	**	**	CH850 CH900 CH950 CH1000 CH1050 CH1100 CH1150 CH1200	HF1 HF2	F1 F2	TO1 TO2	AD1 AD2	AD1 AD2	**	(NCS1 NCS2) b4 CRD	(AD1 AD2)	4N + 26Q
Base + Seal Scribed & Touched-up	all	NCT1 NCT2	17CT1 17CT2	**	**	**	**	**	**	**	**	**	**	**	**	2N + 2Q	
Panels sub-total:	0	12N <sup>1</sup>	6Q <sup>2</sup>	3Q	3Q	2Q	16Q	2Q	2Q	2Q	1Q	1Q	1Q	0Q	0Q	12N +	



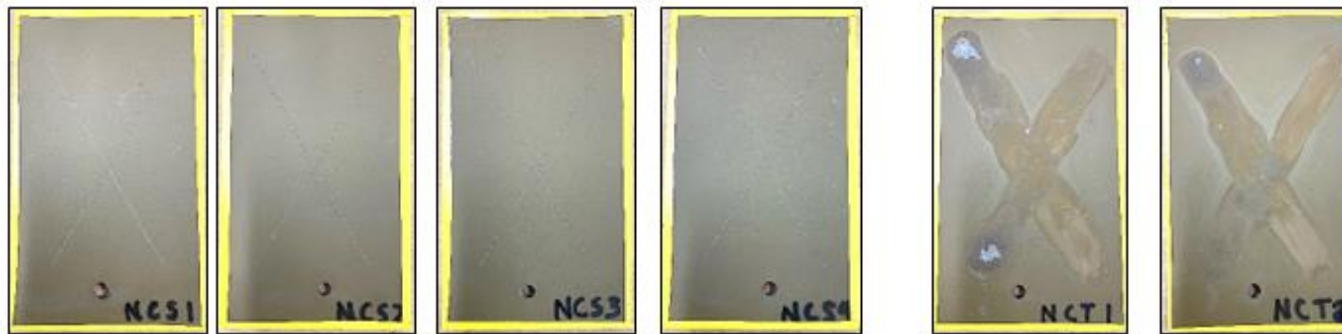
# Navy Cyclic Synthetic Seawater Corrosion Testing

50-day exposure  
(comparative)

- Legacy coating



- Alseal 5KGT

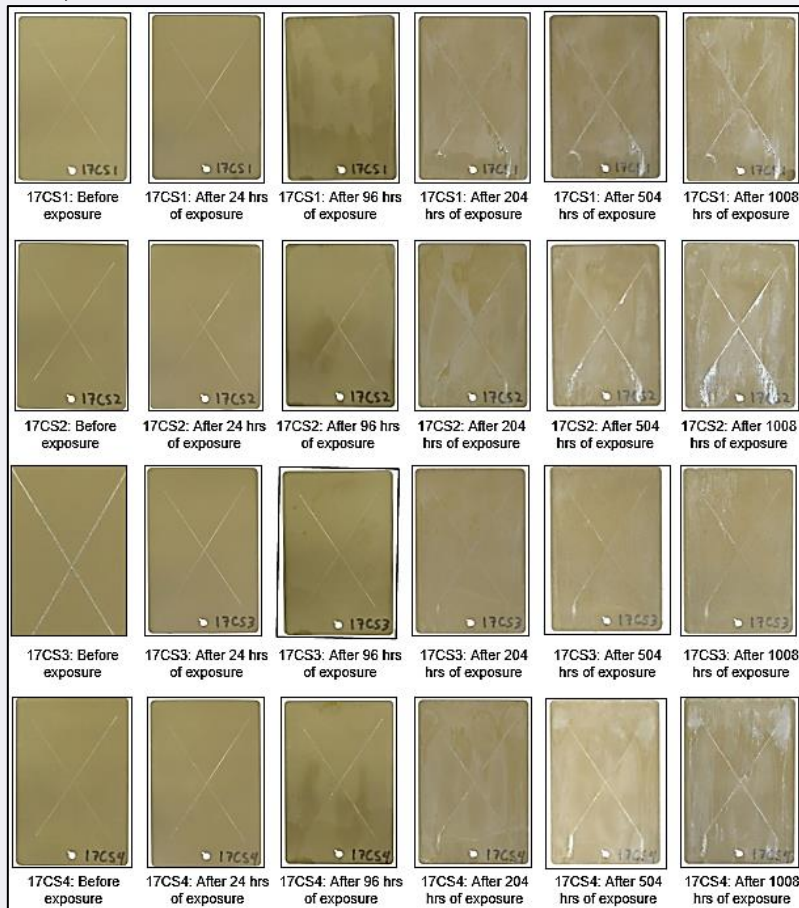




# Continuous Neutral Salt Spray

- Alesal 5KGT, scribed

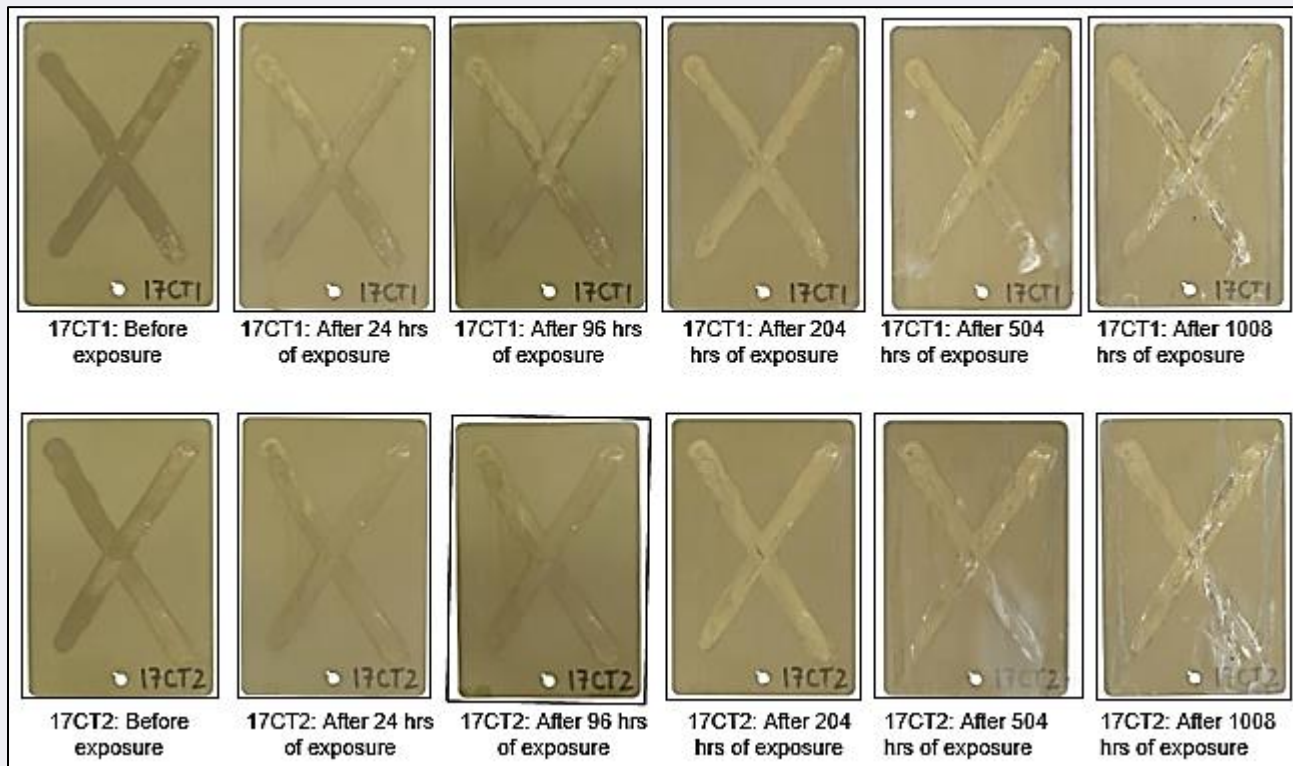
42-day exposure



# Continuous Neutral Salt Spray

- Alesal 5KGT, scribed, touched up

42-day exposure

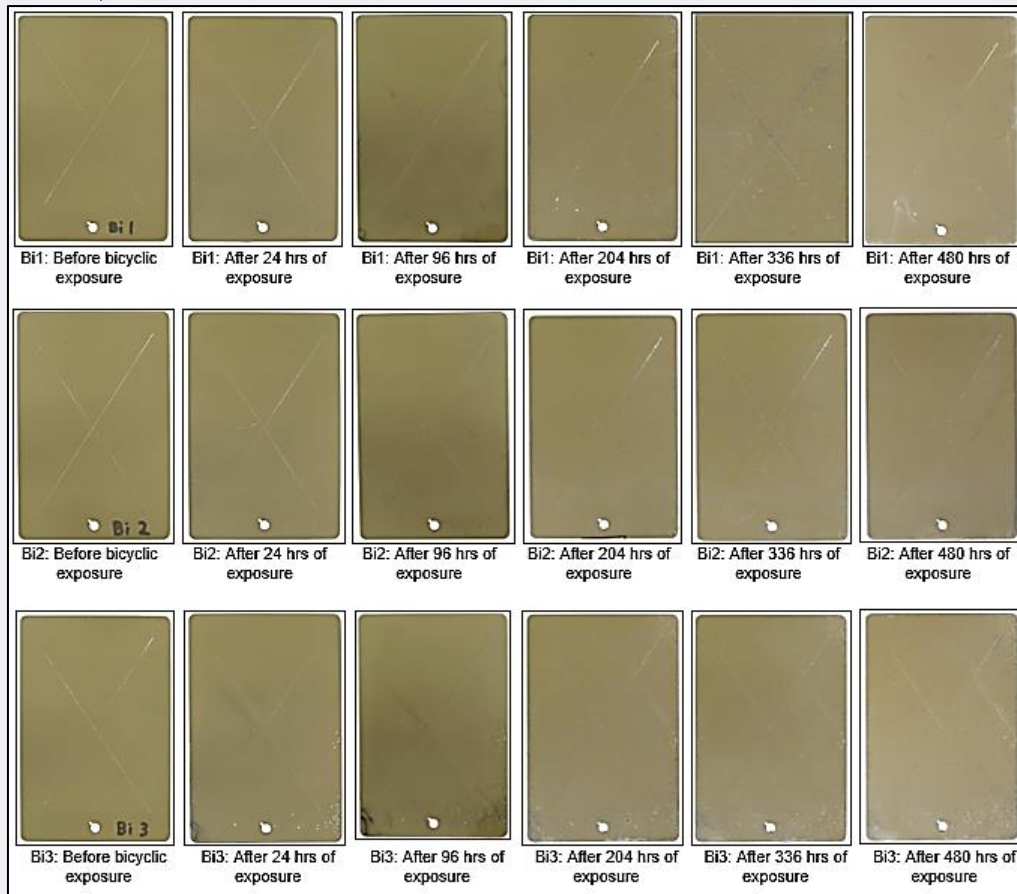




# “Bicyclic”

- Aseal 5KGT, scribed

20-day exposure







# “Tricyclic”

- Aseal 5KGT, scribed

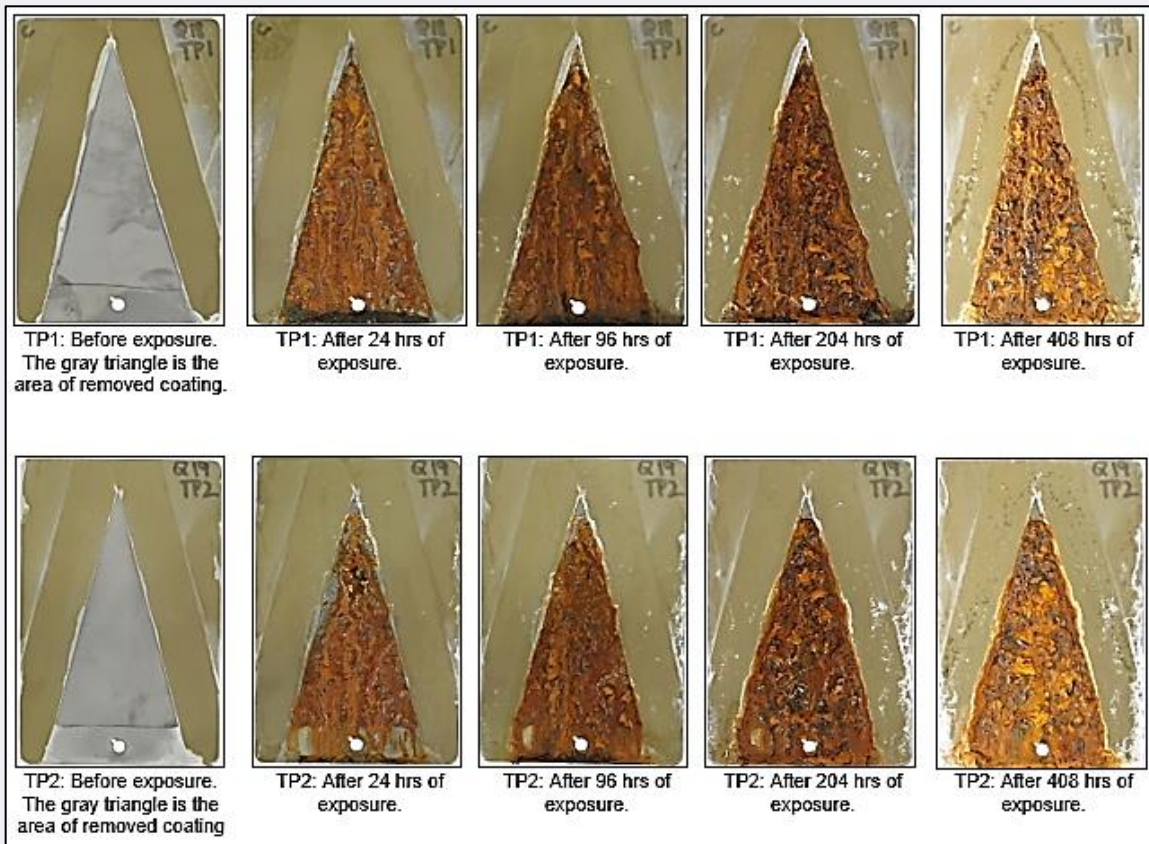
10-day exposure



# Throwing Power

- Aseal 5KGT removed in triangle  
(to attempt to show protection to adjacent bare coating)

17-day exposure



# Throwing Power

- Aseal 5KGT removed in triangles

3-day exposure



Q42 prior to throwing power testing.  
The gray triangle is the area of removed coating.



Q42 after 2 hrs of exposure



Q42 after 72 hrs of exposure



Close up of left apexes of Q42  
after 72 hrs of exposure



Close up of right of Q42 after 72  
hrs of exposure



Close up of far left apex of Q42 after  
72 hrs of exposure

# Throwing Power

- Aseal 5KGT removed in various width columns

3-day exposure



Legacy coating after 26 hours of salt spray exposure.



Aseal 5KGT after 26 hours of salt spray exposure.

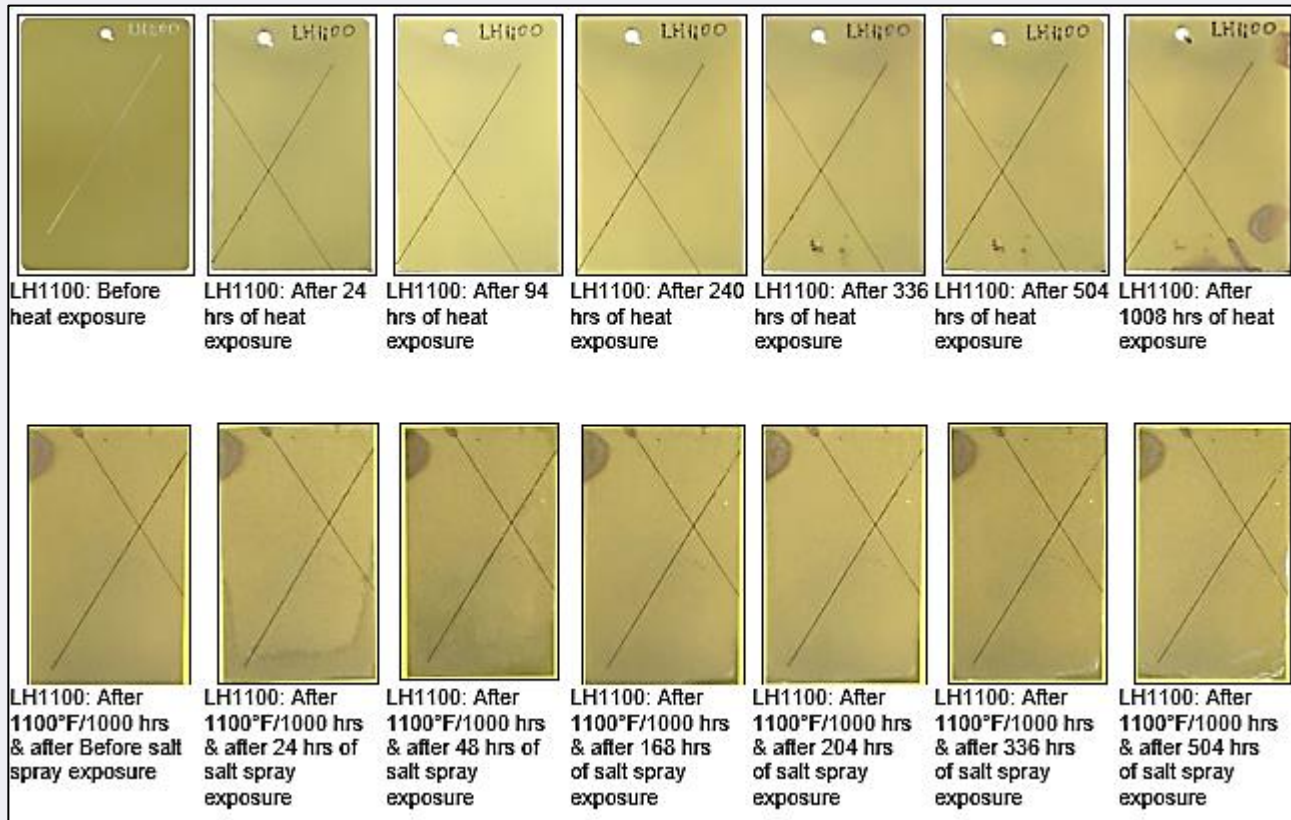


# Thermal Resistance

- Legacy coating 1,100°F

42-day thermal exposure

21-day CNSS exposure



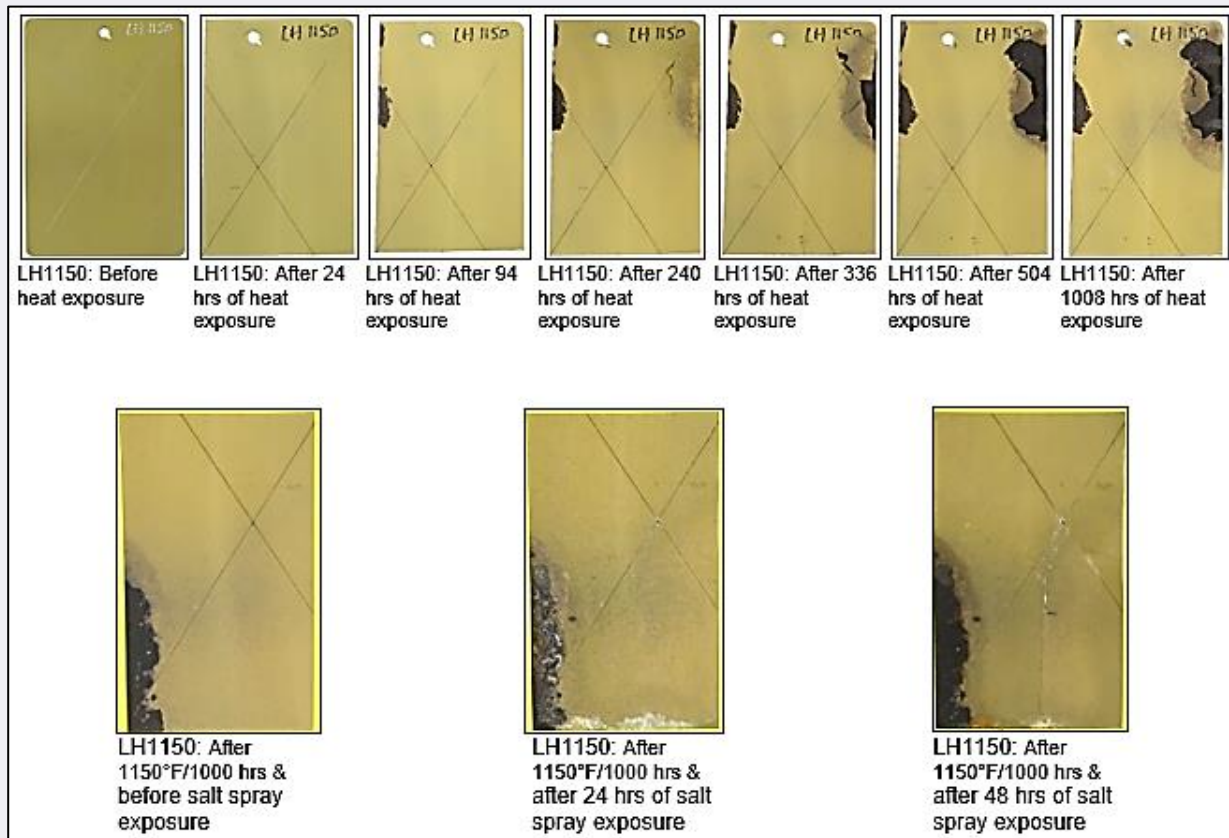


# Thermal Resistance

- Legacy coating 1,150°F

42-day thermal exposure

CNSS exposure halted at 2 days



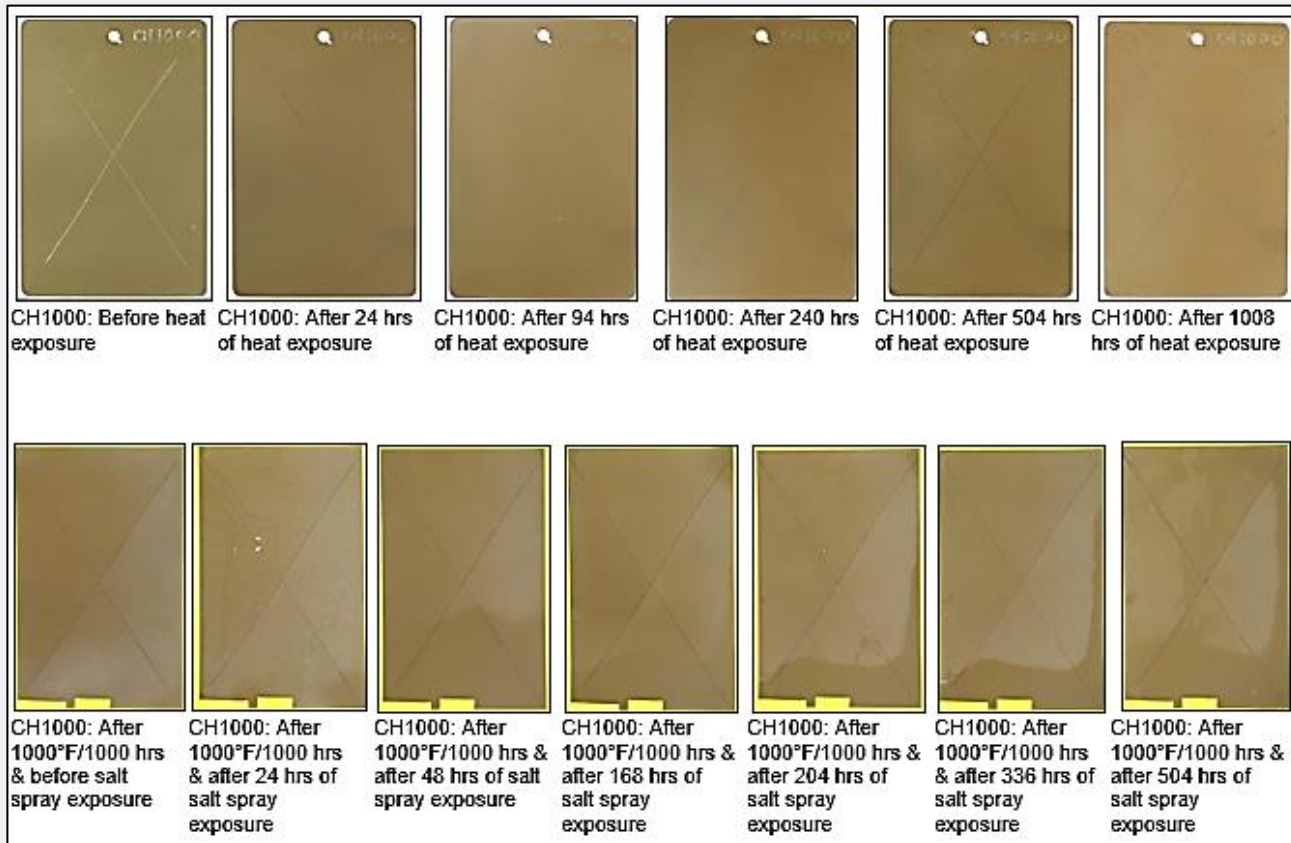


# Thermal Resistance

- Alesal 5KGT coating 1,000°F

42-day thermal exposure

21-day CNSS exposure



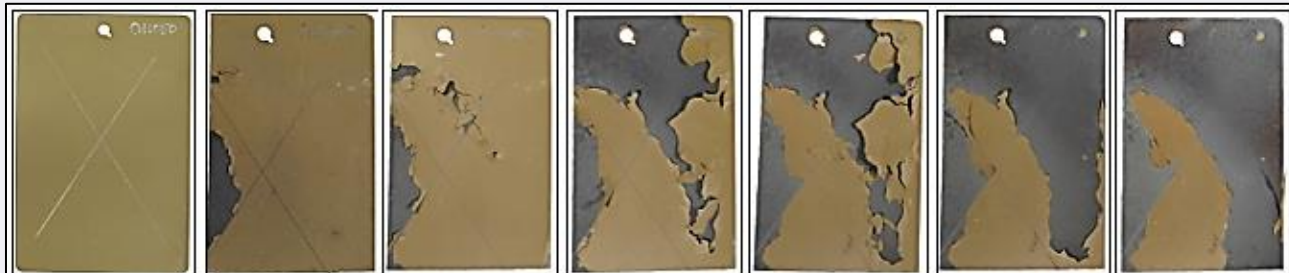


# Thermal Resistance

- Alseal 5KGT coating 1,050°F

42-day thermal exposure

CNSS exposure halted at 2 days



CH1050: Before heat exposure

CH1050: After 24 hrs of heat exposure

CH1050: After 94 hrs of heat exposure

CH1050: After 240 hrs of heat exposure

CH1050: After 336 hrs of heat exposure

CH1050: After 504 hrs of heat exposure

CH1050: After 1008 hrs of heat exposure



CH1050: After 1050°F/1000 hrs & before salt spray exposure



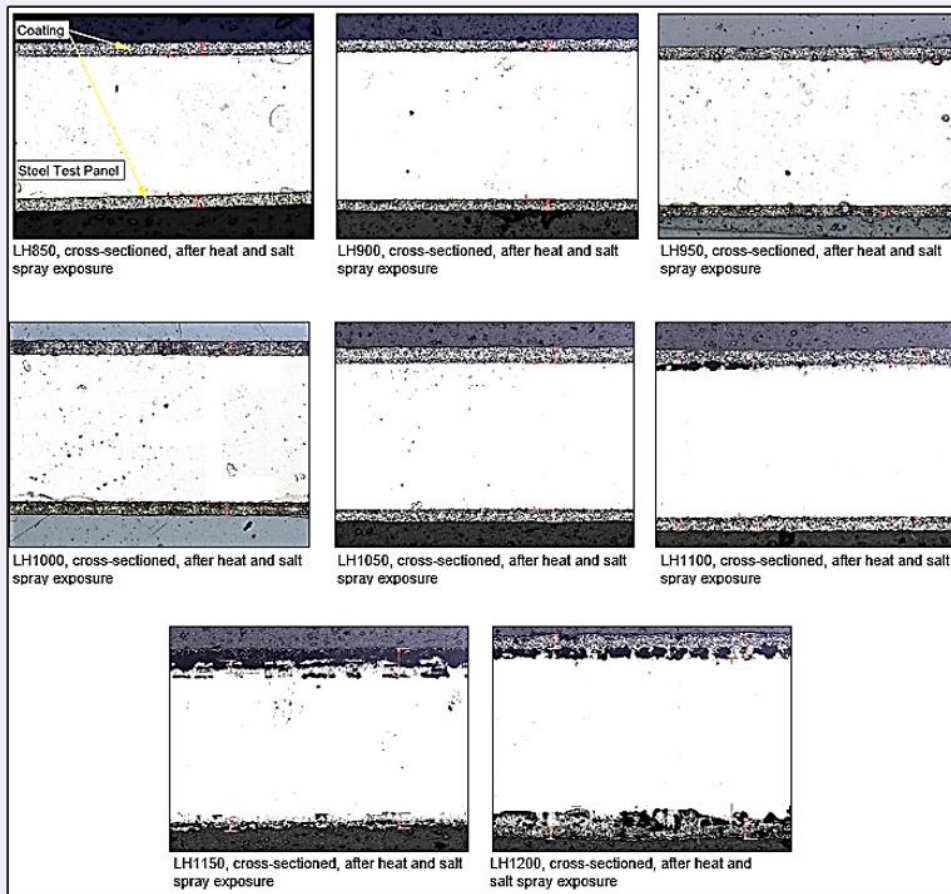
CH1050: After 1050°F/1000 hrs & after 24 hrs of salt spray exposure



# Thermal Resistance Metallography

- Legacy coating

## Post-thermal exposure evaluation



# Thermal Resistance Metallography

- Alesal 5KGT coating

## Post-thermal exposure evaluation





# Adhesion

- Alesal 5KGT coating

## ASTM D 3359 Bend

