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Evaluating Corrosion Prevention Systems

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Project #: 16-049-1125.bis

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Background: Customer offers sheet/tube laser cutting, forming, machining, and welding, as well as complete manufacturing engineering assistance.

Customer has been experiencing sporadic corrosion issues, and they would like to evaluate various rust preventive systems to combat this problem. Fourteen parts were sent to Cortec Labs for evaluation. Each part will utilize a different system, and the effectiveness of each will be evaluated in accelerated corrosion testing.

Sample Received: 14 machined laser cut carbon steel parts; 8 received in VpCI-126 zip top bags, 6 received in plain polyethylene (PE) bags. Each part was stamped to denote the specific preparation method and product(s) used. This is described further below in the "Procedure" section.

Method: ASTM D-1735 Water Fog Cabinet

Materials: 14 Laser Cut parts
Plain PE zip top bags
VpCI-126 zip top bags
Laboratory grade methanol

Procedure: The following procedure was used:

1) All parts were individually stamped, with number 1-14. Parts were shipped in either VpCI-126 zip top bags or plain PE zip top bags.
2) Parts were prepared (by customer), as follows. Parts #1-3 were cleaned with methanol prior packaging. All other parts were tested as received.

Part ID	Plain PE	VpCI-126	BioPad (1"x2")	Rust Free 326	Rustlick 631	Transtore SCT 30	BioCorr
1	X						
2		X					
3		X	X				
4		X		X			
5	X			X			
6		X			X		
7	X				X		
8		X		X	X		
9	X			X	X		
10		X		X		X	
11	X			X		X	
12		X					X
13		X	X				X
14	X						X

3) After preparation, all parts were placed in the ASTM D-1735 water fog cabinet.
4) All parts were visually inspected periodically.

5) After 522 hours, all parts were removed from ASTM D-1735 testing.
6) All parts were unwrapped, visually inspected, and photographed.

Results: The following results were found:

ASTM D-1735 Testing

Part ID	Time to Corrosion (Hours)
1	<24
2	No Corrosion
3	522*
4	432
5	72
6	No Corrosion
7	168
8	No Corrosion
9	168
10	No Corrosion
11	504*
12	522*
13	No Corrosion
14	360

*Corrosion was only present on the cut edge of the panel, none on the other surfaces.

Photos: See below.

Figure 1: Part #1, after 522 hours in ASTM D-1735 testing.

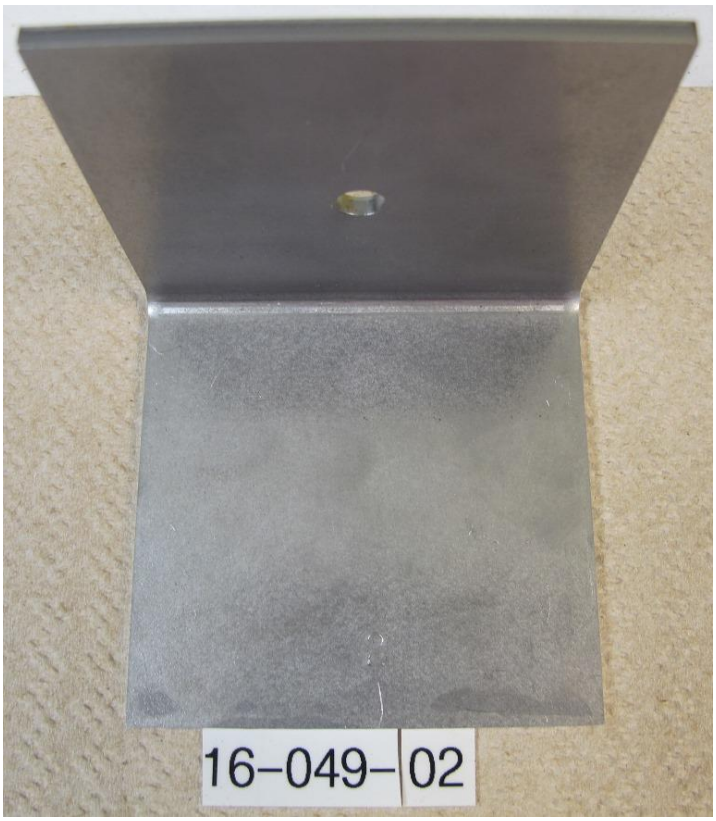

Figure 2: Part #2, after 522 hours in ASTM D-1735 testing.

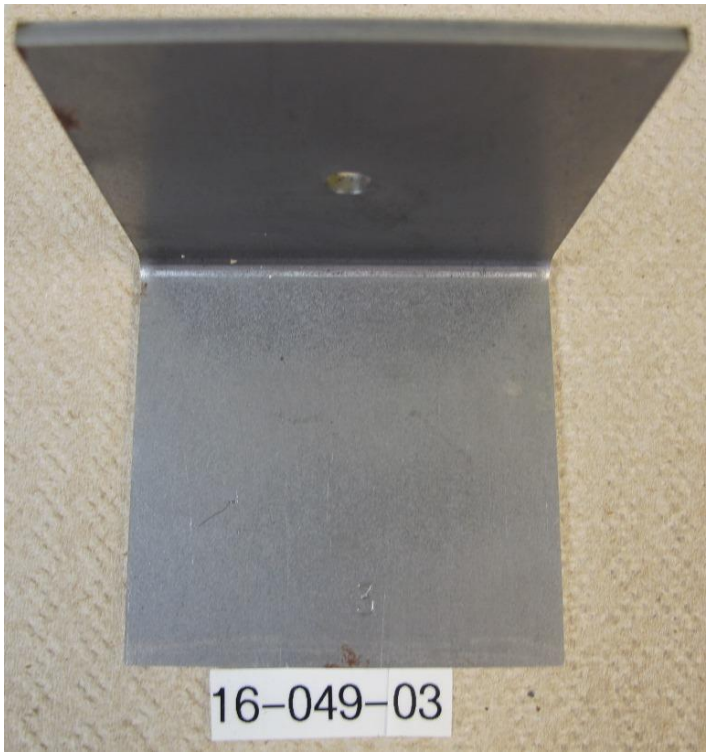

Figure 3: Part #3, after 522 hours in ASTM D-1735 testing.

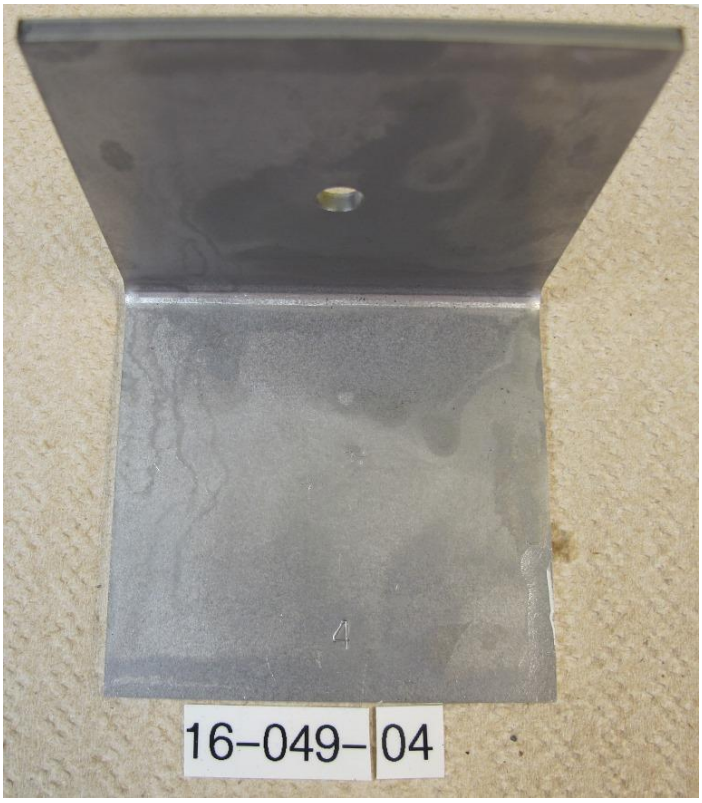

Figure 4: Part 4, after 522 hours in ASTM D-1735 testing.

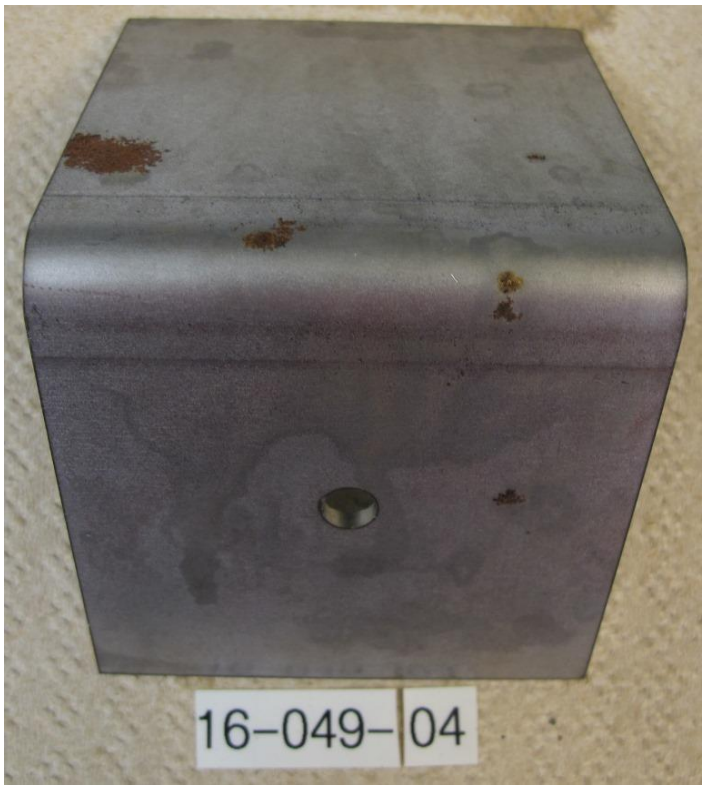

Figure 5: Part 4 (opposite side), after 522 hours in ASTM D-1735 testing.

Figure 6: Part 5, after 522 hours in ASTM D-1735 testing.

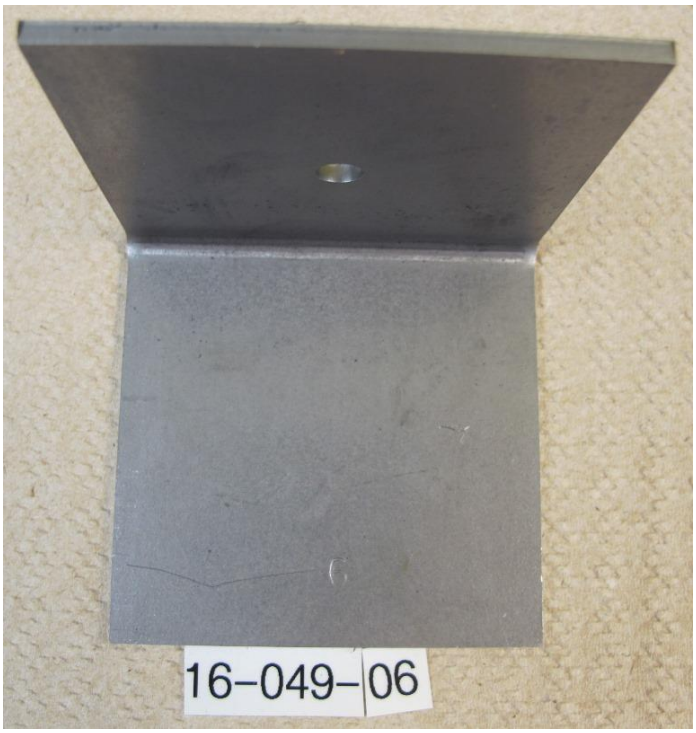

Figure 7: Part 6, after 522 hours in ASTM D-1735 testing.

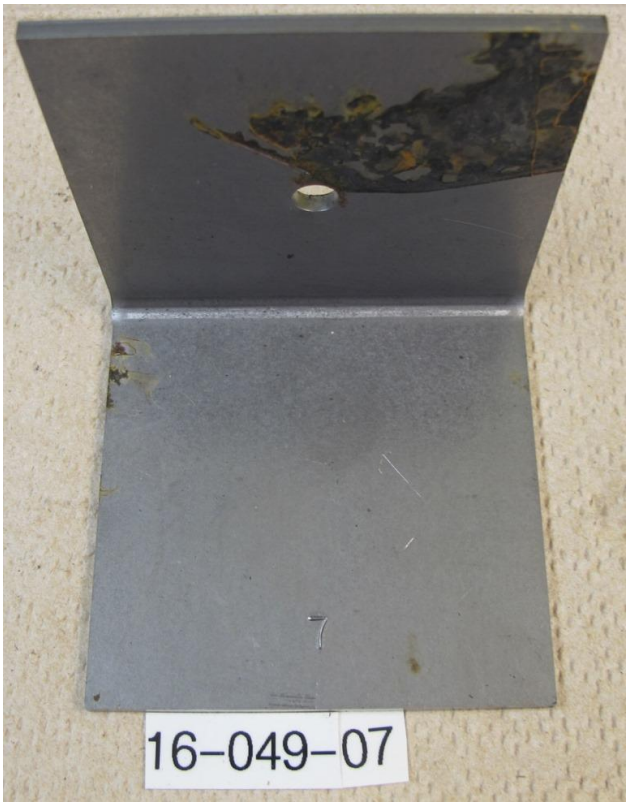

Figure 8: Part 7, after 522 hours in ASTM D-1735 testing.

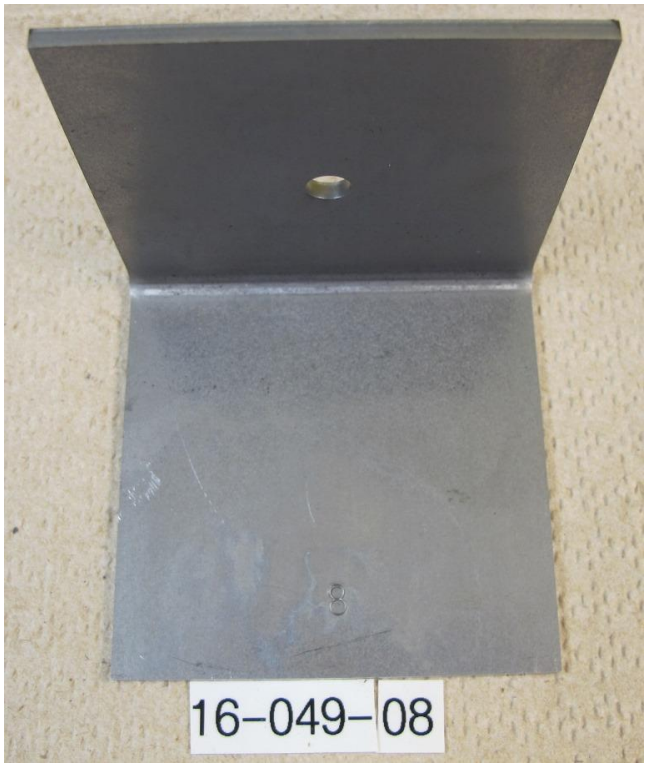

Figure 9: Part 8, after 522 hours in ASTM D-1735 testing.

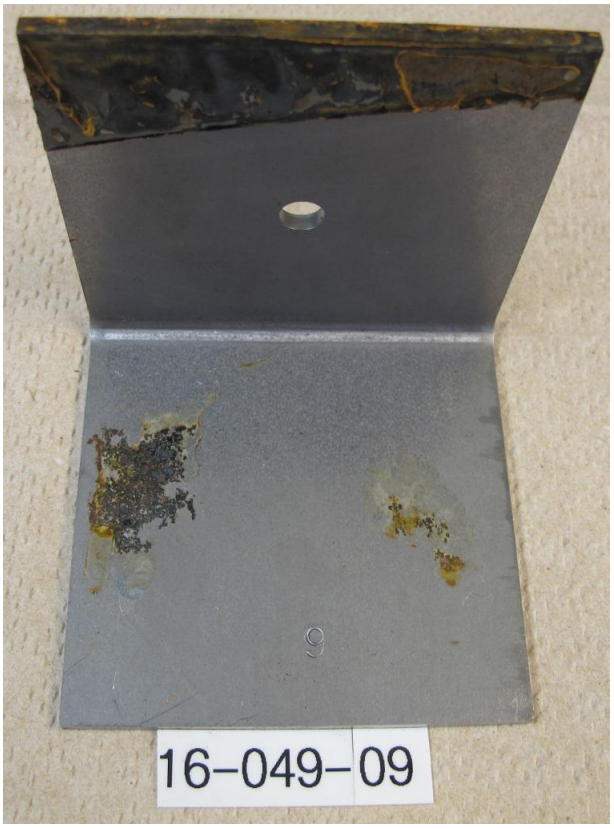

Figure 10: Part 9, after 522 hours in ASTM D-1735 testing.

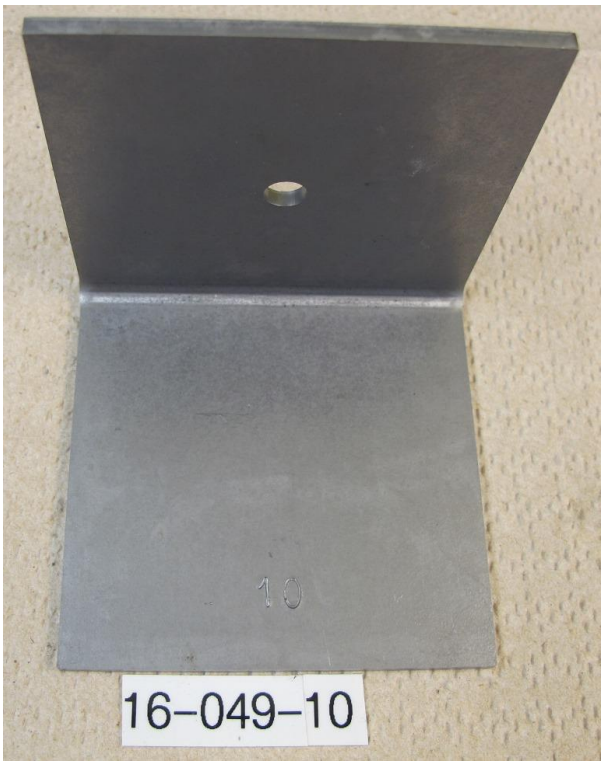

Figure 11: Part 10, after 522 hours in ASTM D-1735 testing.

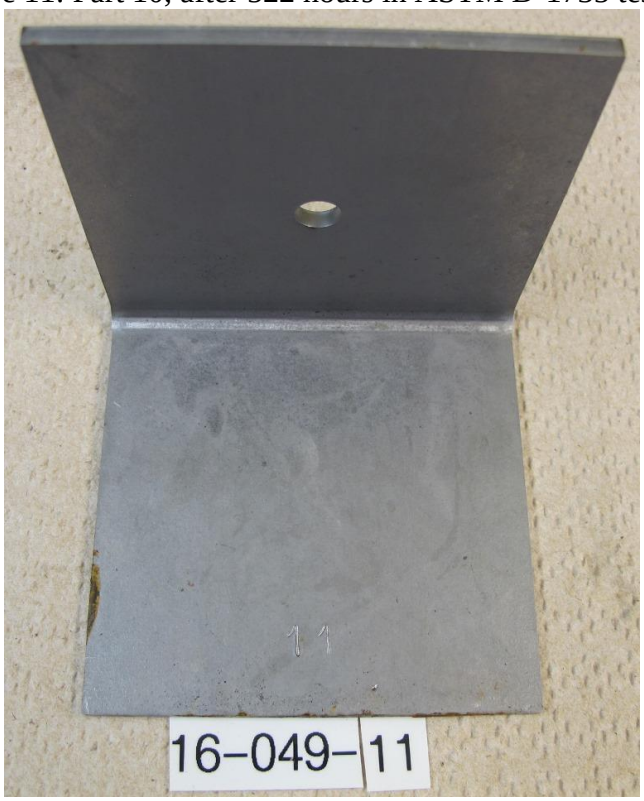

Figure 12: Part 11, after 522 hours in ASTM D-1735 testing.

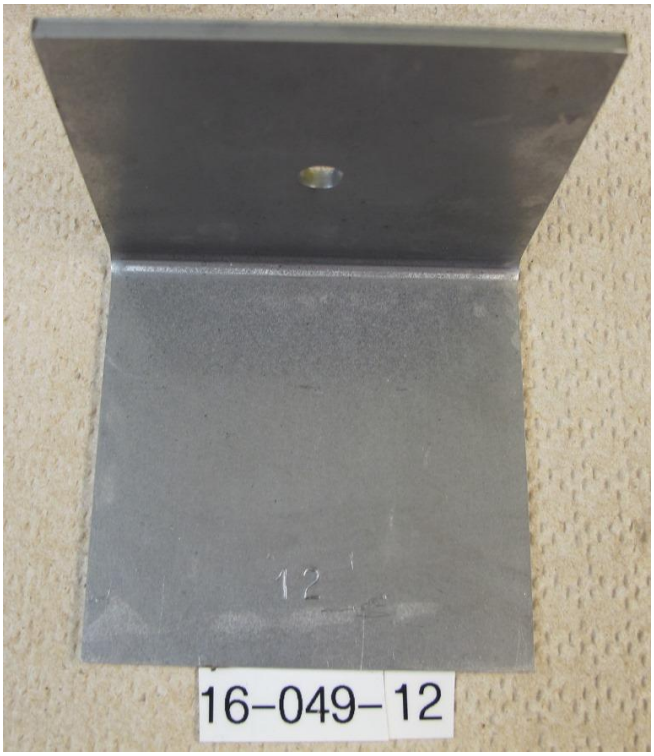

Figure 13: Part 12, after 522 hours in ASTM D-1735 testing.

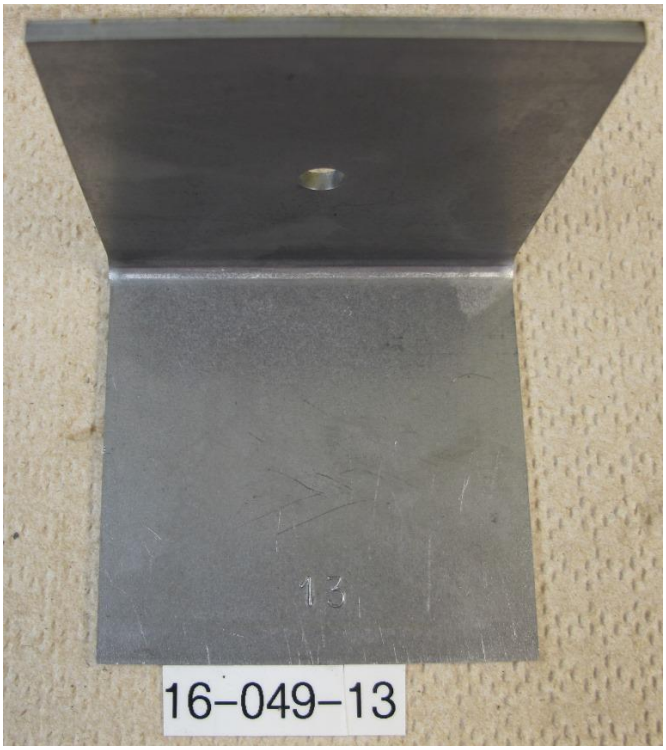

Figure 14: Part 13, after 522 hours in ASTM D-1735 testing.

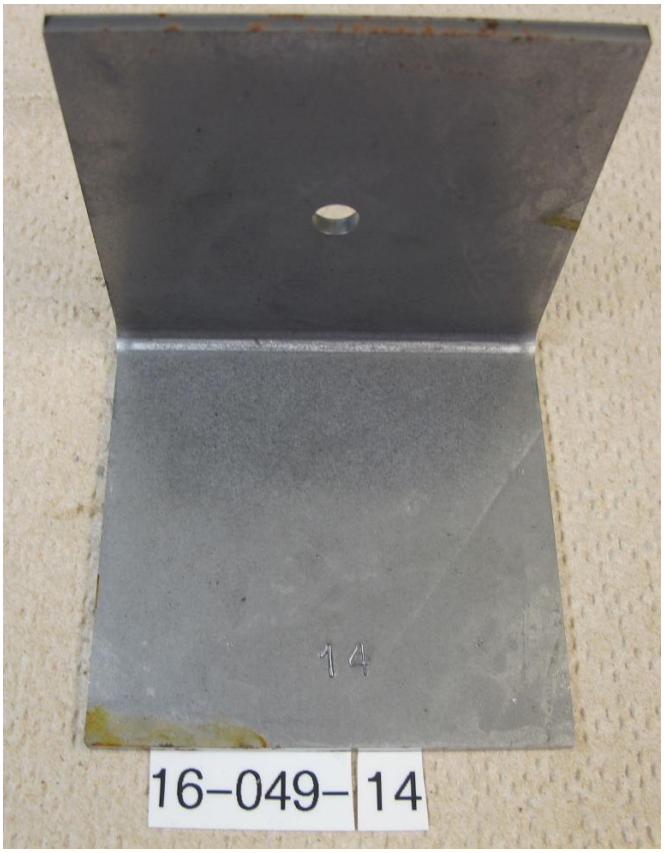

Figure 15: Part 14, after 522 hours in ASTM D-1735 testing.

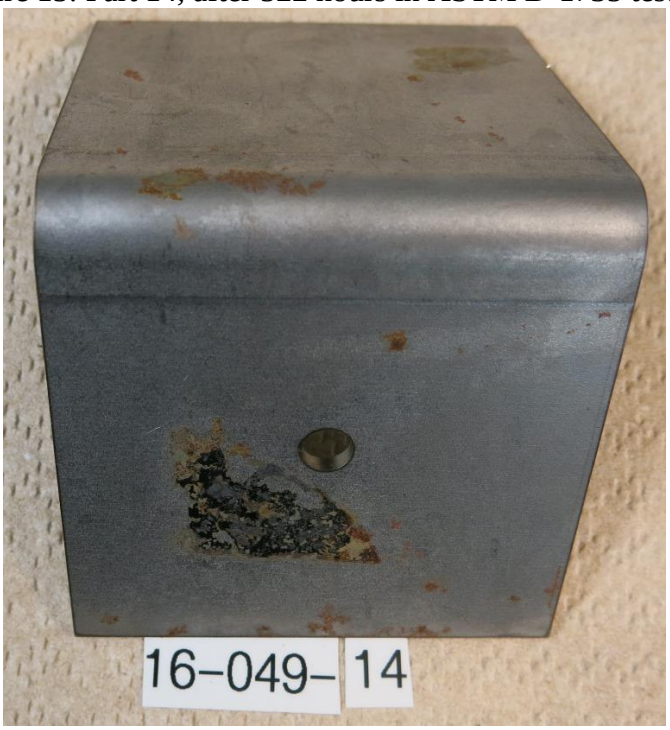

Figure 16: Part 14 (opposite side), after 522 hours of ASTM D-1735 testing.

Interpretations: After 522 hours of accelerated corrosion testing, the effectiveness of VpCI-126 was readily apparent. Whereas a cleaned part packed in non-VCI polyethylene corroded in less than 24 hours, a cleaned part packed with only VpCI-126 showed no corrosion at the end of testing. This shows an improvement of >2100%. All other systems utilizing VpCI-126 showed excellent results as well.

Comparing rust preventive liquids, BioCorr was the most effective single product solution, providing more than twice as much protection as any other product. BioCorr also provided more than twice as much protection as the combination of Rust Free 326 and Rustlick 631. The combination of Rust Free 326 and Transtore SCT 30 proved to be more effective, but this requires two products.