

STANLEY®
Engineered Fastening

HELI-COIL®
Salt Spray Testing
Primer Free® II Inserts
Installed in Aluminum

Technical Bulletin HC1049



HeliCoil®

1.0 BACKGROUND

Heli-Coil® Primer-Free® II inserts have been developed to provide an alternative protection method for eliminating galvanic corrosion of Heli-Coil® Stainless Steel insert assemblies installed into various aluminum parent materials. Primer-Free® II coated inserts eliminate the need for the application of liquid primers or epoxies to wire insert assemblies to achieve galvanic corrosion protection. The liquid application process is labor intensive and costly while Heli-Coil's Primer Free technology ensures that inserts are evenly coated and fully protected. Primer-Free® coating is a resin-bonded, Teflon® impregnated Fluoropolymer.

The original Primer Free® product had corrosion inhibiting properties, which were accomplished by using chromate based agents. These agents, in many industries, were restricted because of health concerns (possible carcinogen). The replacement formulation for the improved coating eliminates these chromate based agents and is now known as Primer Free® II.

Primer-Free® II coating is normally applied to both Heli-Coil® Stainless-Steel and Nitronic-60 (Gall-Resistant) insert materials.

2.0 SCOPE

This plan provides requirements and procedures for testing various Heli-Coil® inserts in a corrosive atmosphere. The inserts under test will be installed in a conversion coated aluminum panel. Fasteners will be assembled into some of the inserts to simulate typical exposure conditions.

3.0 TEST INSERTS

The insert sizes to be tested are 4-40, 6-32 & 10-32. The non-coated (CN) inserts are stainless steel locking inserts with no coating; these inserts will be used to establish a baseline or a worst case condition with and without strontium chromate primer.

3.0 TEST INSERTS			
#4-40			
3585-04CNW168	MS21209C04-15L	#4-40 Screw-Lock Dry Film Lubricated Insert	
3585-04CNPF168		#4-40 Screw-Lock Primer-Free® II Coated Insert	
#6-32			
3585-06CNW207	MS21209C06-15L	#6-32 Screw-Lock Dry Film Lubricated Insert	
3585-06CNPF207		#6-32 Screw-Lock Primer-Free® II Coated Insert	
3585-06CN207	MS21209C06-15	#6-32 Screw-Lock Insert	
#10-32			
3591-3CNW285	MS21209F1-15L	#10-32 Screw-Lock Dry Film Lubricated Insert	
3591-3CNPF285		#10-32 Screw-Lock Primer-Free® II Coated Insert	
3591-3ENPF285		#10-32 Screw-Lock Primer-Free® II Coated Nitronic	
3591-3CN285	MS21209F1-15	#10-32 Screw-Lock Insert	

4.0 DESCRIPTION OF TEST PANELS

Test panels will be made up of an aluminum top plate. This cover piece will just have a through hole while the housing pieces underneath will have the Heli-Coil® insert installations. The top panel will be approximately 2"x 6" in size and will have 10 through holes of the appropriate diameter. The housing panels will also be fabricated from Aluminum. All exterior surfaces of aluminum will be anodized. Tapped holes and the mating surfaces of housing and cover parts will be conversion coated. Refer to **Figure 1** for a depiction of the test samples.

A total of 14 housing panels (1"x 6") will be used in this test. Each panel will have 10 tapped holes for inserts; five of these will have fasteners installed.

Panel 1 will have 4-40 inserts installed, ten 3585-04CNW168 and ten 3585-04CNPF168 inserts.

Panel 2 will have 6-32 inserts installed, ten 3585-06CNW207 , ten 3585-06CNPF207 and ten 3585-06CN207 with strontium chromate primer.

Panel 3 will have 10-32 inserts installed, ten 3591-3CNW285, ten 3591-3CNPF285, ten 3591-3ENPF285 and ten 3591-3CN285 with no primer.

The panels will be marked for identification.

Five of each set of ten inserts will have a bolt installed and a plastic washer/spacer will be included under the head of the bolt. The washer will isolate any potential bolt head corrosion from the wire insert assembly, allowing for a more clear indication of any galvanic corrosion in a bolted joint.

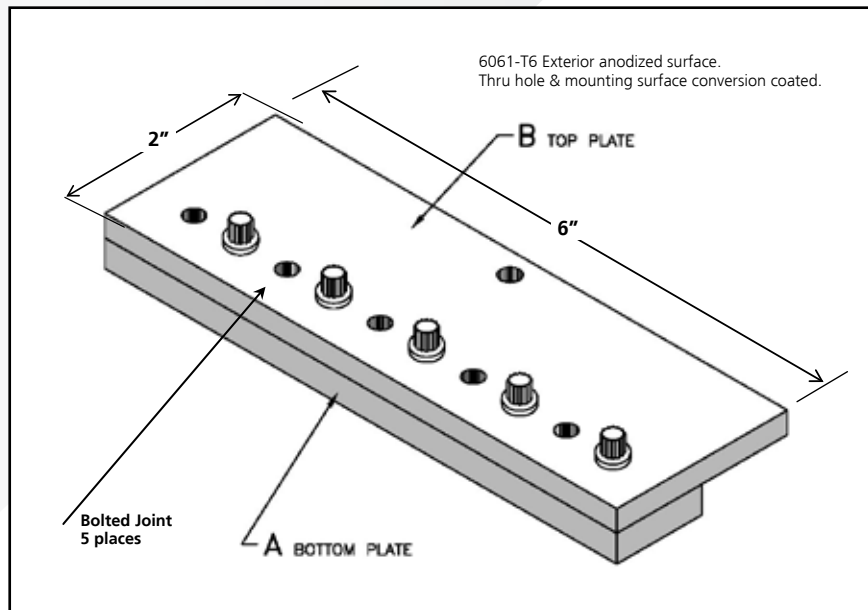


FIGURE 1 Sample Panel

4.1 TESTS AND TEST SET-UP

The corrosive atmosphere for this test will be per ASTM B 117-02. The test panels will be randomly placed in the chamber in an orientation that does not allow water droplets to collect on the inserts or for water droplets to cross over from one insert to another insert. This basically means that each panel must be orientated such that the 6" length is parallel to the horizon and the panel must allow each tapped hole to gravity drain.

The test will be run for 504 hours with inspection of the specimens taking place at 48 hours, 96 hours, 168 hours and 260 hours. A final inspection will also be performed after the 504 hours of exposure. Typically if the test is started on a Monday morning the inspections will take place on Wednesday, Friday, Monday, Friday and the following Monday.

Each panel must be initially photographed to establish visual means of documenting the panels. After each segment of salt spray, the samples will be removed from the salt fog chamber and gently rinsed with water no warmer than 28°C (100 °F) and then blown dry. Each insert/fastener location shall be visually inspected for corrosion. A sample from each test block shall be further inspected by cutting off a portion of the test plate to include one hole with insert & one bolted hole. Be sure to mark sample to identify which block it came from. The bolt is to be removed and the mating surfaces examined for corrosion. The tapped hole & insert should be sectioned to examine the surfaces where the stainless steel insert and the aluminum threaded hole are in direct contact, for any signs of galvanic corrosion. The remaining portion of the test block will be put back into the test chamber for additional hours.

This will be repeated after each duration of salt spray specified. If salt deposits make it difficult to inspect the interface between insert and aluminum, the samples may be gently rinsed with water no warmer than 28°C (100 °F). If changes in appearance are noticed during the inspection, process pictures of these areas shall be taken. The test panels will also be fully photographed (magnified enough to see any corrosion) upon completion of the 504 hour test.

4.2 CONNECTION AND ORIENTATION OF EQUIPMENT

Unless otherwise specified, the Corrosion tests shall be performed with the panel samples under the following normal conditions.

- | | |
|-------------------------|--|
| a. Mounting Position: | Ensure moisture will not collect within tapped holes, also ensure moisture in drop form will not travel from one insert to another or from one panel to another. |
| b. Ambient Temperature: | 95° +2, -3°F , (35° + 1.1, -1.7°C) |
| c. Ambient Pressure: | 29 ± 5 in. Hg |
| d. Relative Humidity: | 95-98% |
| e. pH range: | 6.5-7.2 |

5.0 TEST RESULTS

Upon completion of the specified time duration in the salt spray chamber, the samples were washed with warm water and air dried. Upon completion of the entire test, the samples were split to reveal the interactions of the corrosion between the insert and the aluminum block. Samples were "opened up" from the longest time in the corrosive environment and worked backwards until either there was no galvanic corrosion observed or no pitting was observed in the insert/aluminum interface. All samples were pit -free at the 168 hour interval.

5.0 TEST RESULTS

Part Number	168 Hours	260 Hours	504 Hours
3585-04CNW168	clean	slight pitting	pitted
3585-04CNPF168	clean	clean	slight pitting
3585-06CNW207	clean	slight pitting	pitted
3585-06CNPF207	clean	slight pitting	pitted **
3585-06CN207 (Strontium)	clean	pitted	pitted
3591-3CNW285	clean	slight pitting	slight pitting
3591-3CNPF285	clean	clean	slight pitting
3591-3ENPF285	clean	clean	slight pitting
3591-3CN285	clean	slight pitting	pitted

** Samples were "open" holes with no fastener installed.

