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REPORT NO: FTDM-2355
DATE: 17 January 1962

MATERIALS - SILVER-COPPER-LITHIUM ALLOY - 17-7PH SANDWICH PANELS BRAZED WITH - EFFECTS OF ELEVATED TEMPERATURE ON - STRUCTURAL EVALUATION OF

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TEST DATA MEMORANDUM

TEST: MATERIALS - SILVER-COPPER-LITHIUM BRAZING ALLOY - 17-7PH STAINLESS STEEL PANELS BRAZED WITH - EFFECT OF ELEVATED TEMPERATURE ON - STRUCTURAL EVALUATION OF

OBJECT:

To evaluate the effect of oxidation in air at 700 F on stainless steel sandwich panels brazed with sterling silver plus 0.2% lithium.

TEST SPECIMENS & PROCEDURE:

A 1/2" x 13" x 25" sandwich panel was brazed with sterling silver + 0.2% Li brazing alloy. After brazing, the panel was vacuum purged with air for ten times. It was cut into specimens as shown in Figure 1, and exposed as described in Table IIIa. The specimens were tested at room temperature on a 120,000 lb. Baldwin test machine. A second panel was brazed but not tested because of the results outlined from the first panel. Four 1/2" x 1" x 2" panel specimens were exposed as indicated in Table IIIa. These specimens were examined visually.

RESULTS & DISCUSSION:

The results of the mechanical tests are given in Tables I and II. Photomicrographs showing the extent of oxidation in the brazed fillet are shown in Figure 2. Contrary to expectation, the specimen strength was as good or better after exposure as it was before exposure. The high strength after exposure was probably due to additional precipitation hardening of the steel during exposure. A corrosion condition previously observed on PH15-7Mo brazed panels was found on the 17-7PH stainless steel panels of this test. Corrosion occurred on the steel adjacent to the brazing alloy-steel interfaces. It was most evident on the outer edges of the exposed honeycomb core. The condition was not evident immediately after cooling to room temperature. It apparently developed as the specimen steel in the moist air of the laboratory. The corrosion appeared as small brown growths or scale. The cause was not determined.

CONCLUSIONS:

1. After exposure in air at 700 F for periods up to 300 hours, 17-7PH steel sandwich panels with adequate fillets, brazed with sterling silver + 0.2% Li, have strengths equal to or better than similar panels in the as-brazed condition.

2. A new type of corrosion of brazed 17-7PH stainless steel panels was observed during this investigation. The mechanism of attack was not determined.

*See Supplemental Sheet S-1
**Cutting Diagram**

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Figure 1
Shear Beam Specimen Prandt Fillet. Exposed 30 min. at 700 F.

Approximate depth of oxidation in fillet = 0.5" Max. 250X

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SUPPLEMENTAL INFORMATION

The data presented in this report is supplemented with the following information:

A. The panels for these tests were brazed and processed in accordance with standard production procedures for B-58 panels. The brazing and heat treatment cycle was as follows:

1. Braze at 1665°F ± 2°F for 10 minutes.
2. Cool to 1400°F ± 25°F and hold for 90 minutes.
3. Cool to room temperature and refrigerate to -20°F (-10°F, -10°F) as rapidly as possible and hold for at least 60 minutes.
4. Allow panel to return to room temperature and then age at 1050°F ± 10°F for 90 minutes.
5. Cool to room temperature.

B. The preparation and testing procedures for the test specimens were as follows:

1. Edge Compression Test
   a. Specimen size is 2.00" x 3.00" x panel thickness.
   b. All edges are filed and sanded smooth to remove nicks and saw cuts which might induce premature failure and are filed with a soft machinable plastic material.
   c. The 2.00" edges are machined square and parallel to a tolerance of ± 0.001 inch per linear inch.
   d. The test machine loading head and platen are checked for parallelism and adjustments made to insure parallelism. Test specimens are placed in the machine with the 3.00" edges normal to the bearing surfaces.
   e. Testing is accomplished by applying a continuous load to the 2.00" edges at a rate of 8,000 pounds per minute until failure.

2. Shear Beam Test
   a. Specimen size is 2.00" x 5.00" x panel thickness.
   b. All edges are filed and sanded smooth to remove nicks and saw cuts which might induce premature failure. The 5.00" edges are filled with a soft plastic material.
   c. Specimens are tested and supported as a simple beam with a 3.00" span.
   d. A continuous load is applied at the center of the span at the rate of 500 pounds per minute until failure.