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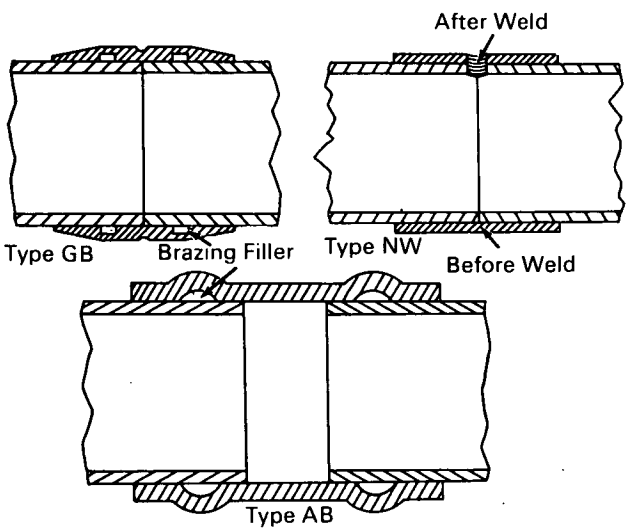
NASA TECH BRIEF

Testing of Brazed and Welded Connections of Stainless-Steel Tubing

Three types of semipermanent sleeve-type connections for stainless-steel tubing (see fig.) were tested comprehensively; outside diameters ranged from 0.25 to 1.5 in. (see documentation). Type-NW was TIG-welded by NASA; types AB and GB were brazed (80% Au–20% Ni) by two of its contractors. The 416 specimens underwent 2395 tests.

Specimens were subjected to: (1) 180 days of intermittent immersion in 3.5% solutions of NaCl; (2) proof pressure testing at a delivery pressure of ≤8000 lb/in^2 (350 specimens; no failures); (3) leak testing (348 specimens; no failures); (4) 2-yr storage on a rooftop (66 specimens; no failures); (5) long-term pressurization with gaseous nitrogen (194 specimens; no failures); (6) submersion in liquid nitrogen while pressurized with He at 3000 lb/in^2 (194 specimens; no failures); (7) baking at ≤600°F while pressurized with He (193 specimens; no failures); (8) 300,000-cycle vibration stressing at 500°, 70° (18,000 to 22,500 lb/in^2), and -320°F (26,500 to 33,200 lb/in^2); (9) impulse testing (194 specimens; no failures); (10) tensile tests (prior vibration had no effect); (11) metallographic examination; and (12) burst testing at from 125 to 30,000 lb/in^2 (141 specimens; no failures).

Only types AB and GB were corroded by salt water, at the interface between the brazing alloy and the sleeve or tubing; two of 19 AB specimens subsequently leaked. More-closely controlled manufacture may permit increase in the tabulated allowable limits for resistance to vibration. Vibration caused some hardening, and some cracks developed near changes in cross section. In all instances the tensile specimens failed under stresses lower than the averages for one-piece tubes; the scatter may be attributable to variables in manufacture.



Three Types of Connection

The metallographic examination disclosed various faults including improper depth of insertion of the tubing into the sleeve, improper clearance between tubing and sleeve, improper flow of brazing alloy, and nonuniform or off-center welding seams. The fact that some such faults are not readily detectable in the finished joints necessitates close control during manufacture.

Subject to the limited resistances to corrosion and vibration, all three types are suitable for extremes in reliability and environment, given close control during manufacture.

Notes:

1. The aircraft industry, mechanical, marine, and refrigeration engineers, and manufacturers of tubing may be interested.

(continued overleaf)

2. The following documentation may be obtained from:

Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Single document price $3.00
(or microfiche $0.65)

Reference:
NASA-CR-61310 (N70-11363), Investigation of Brazed and Welded Connections

Patent status:

No patent action is contemplated by NASA.
Source: J.B. Cahill of
Brown Engineering Company
under contract to
Marshall Space Flight Center
(MFS-20806)