

Issued 1959-02
Revised 2001-10
Reaffirmed 2012-10
Superseding ARP573C

Silver, Copper and Nickel Alloy Brazed Joints for Aerospace Propulsion Systems

RATIONALE

ARP573D has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

This recommended practice covers design requirements for silver, copper and nickel brazed joints, primarily for tube connections, for aerospace propulsion systems. The environmental conditions stated herein, and those given in the applicable AMS specifications, provide the limitations of this ARP.

2. PURPOSE:

This ARP provides data for silver, copper, and nickel alloy brazed joints, based on sound engineering principles currently used throughout the aerospace propulsion systems industry, and provides a recommended practice for appropriate design configurations, engine and propeller standard utility parts, as applicable, and other propulsion systems components.

- 2.1 It further establishes a common standard practice for swaged tubing and a common standard for the inside diameter of the mating part of fittings for either silver, copper or nickel brazed joints. The purpose of establishing a common inside diameter for brazing applications is to facilitate manufacturing and to reduce the cost of related parts.

3. GENERAL REQUIREMENTS:

3.1 Applicable Specifications:

The AMS specifications mentioned herein should be complied with in all respects.

3.2 Material and Workmanship:

- 3.2.1 **Materials:** Materials should be of a quality which experience and tests have demonstrated to be suitable and dependable for aerospace propulsion systems.

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2012 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
http://www.sae.org

SAE WEB ADDRESS:

Full document details: SAE ARP573D

SAE values your input. To provide feedback on this Technical Report, please visit <http://www.sae.org/technical/standards/ARP573D>

Documents
Document Sharing Hub

3.2.2 Workmanship: Workmanship should be consistent with high-grade aerospace propulsion systems manufacturing practice.

3.3 Environmental Conditions:

The environmental conditions and temperatures stated herein and in the applicable AMS specifications cover these requirements.

3.4 Considerations:

The following sets forth some of the considerations which should be given to all brazed joints and the selection of brazing alloys. Certain fundamental design rules must be followed if good brazing joints are to be obtained. Some cases may occur which are not covered by this recommended practice. Such cases should be referred to a materials engineer.

3.4.1 Material combination comprising the joint.

3.4.1.1 Brazeability (wetting or flow characteristics).

3.4.2 Design of the joint and method or process of brazing for uniform heating during brazing so that all parts of the joint can be brought up to brazing temperature evenly.

3.4.3 Effect of the braze temperature on any work hardening gained during fabrication and hardness obtained by heat treatment.

3.4.4 Effect of hardness on the bonding surfaces of the parts before brazing. This can result in a poor bond and joint failure.

3.4.5 Effect of heat treatment of assembly after brazing.

3.4.6 Effect on plating before and after brazing.

3.4.7 Areas in the design in which brazing is not permitted.

3.4.8 Joint clearance, gaps and tolerances.

3.4.9 Venting of the joint bonding area or clearance space.

3.4.10 Lap or engaged length (or depth) of joint.

3.4.11 Positioning or centering of parts to be joined.

3.4.12 Ratio of tube diameter and wall thickness to engaged length of joint.

3.4.13 Strength of joint.

3.4.14 Temperature of the joint under operating conditions.

- 3.4.15 Natural frequency and vibration characteristics under operating conditions.
- 3.4.16 Type and degree of stress to be applied to the joint at the brazing heat and under operating conditions.
- 3.4.17 Effect of creep on the joint when it is subjected to a continuous load.
- 3.4.18 Coefficients of expansion of the materials to be joined together.
 - 3.4.18.1 Use of the member having the larger coefficient of expansion as the inside part of a sleeve joint where adequate joint clearance and tolerances permit.
- 3.4.19 Difficulty and methods of cleaning surface and type of finish.
- 3.4.20 Surface roughness of the joint surfaces.
- 3.5 General Design Features:
 - 3.5.1 Engaged Length of Joints: The joint should be calculated to be 1-1/4 times as strong as the tube or component when high strength joints are required, but not less than 6t in length (where "t" is thickness of thinner component part). Where no other appreciable force is acting on the joint but a straight tension load, this value may be reduced to 3t. Minimum length joints should be used wherever practicable to obtain maximum brazing penetration. Brazing material should not be expected to penetrate a joint length in excess of 0.450 inch from a single source of braze material. If the joint is overlapped greater than 0.450 inch for some design reason, then penetration beyond the 0.450 inch point will not be assured and should be waived by a drawing note.
 - 3.5.2 Joint Clearance: For flat, butt, and diametral joint design clearances, see detail requirements for applicable brazing.
 - 3.5.3 Joint Gap or Shoulder: Joints may have a gap or shoulder at one of the edges of the part to allow placement of braze materials (see Figure 1).

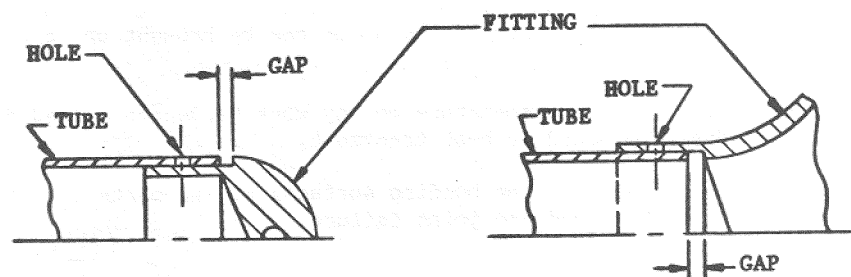


FIGURE 1