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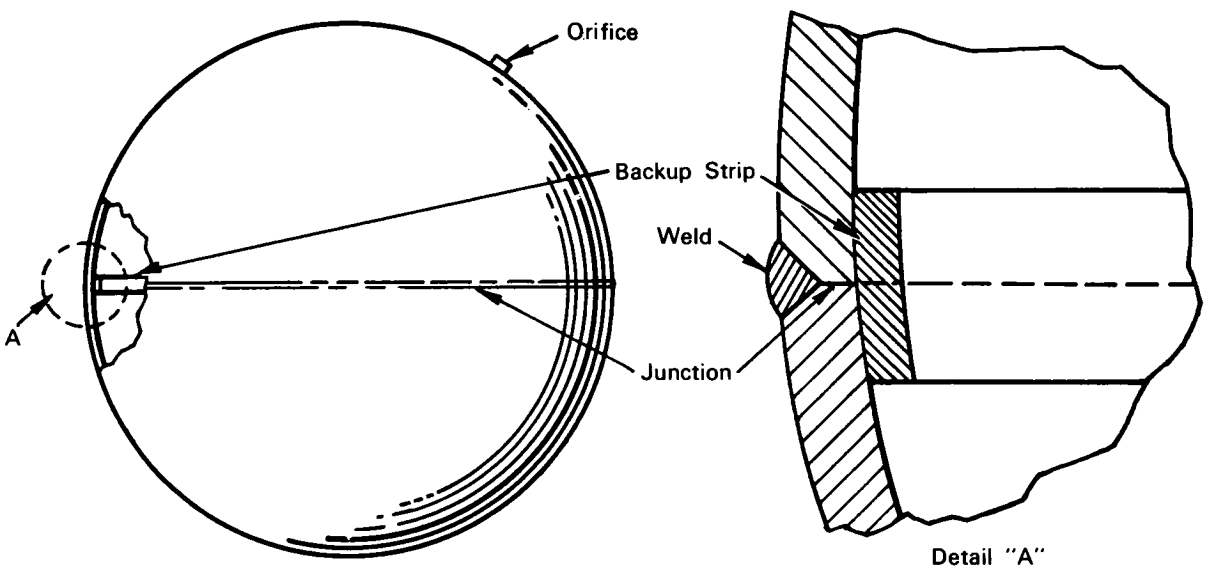
NASA TECH BRIEF

This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the NASA space program.

Method of Welding Joint in Closed Vessel Improves Quality of Seam



The problem: Closed vessels of various shapes, assembled by welding, may often be designed with only a few small access holes. They can therefore be welded only from the outside. But in single-side welding, without a backup bar to absorb heat, it is difficult to prevent burning of holes through the vessel or weakening of some wall areas.

The solution: Use a metal backup strip at the junction inside the vessel and, after welding from the outside, dissolve the metal backup strip by a chemically reactive solvent (one which does not attack the vessel) poured through an orifice or filler hole into the vessel.

How it's done: The two sections of the vessel to be welded together, for example two hemispheres, are shown in position for welding. A metal backup strip is first fitted into one of the sections in the form of a band on the inside periphery of the vessel. Approximately half the width of the backup strip, or band, is placed to fit snugly into the selected section of the vessel. The band not only serves as a backup strip, but also as a means for positioning the two sections. The exterior is then welded in a conventional manner around the junction between the two sections.

After the welded vessel has cooled, a chemically reactive solvent for the backup band is poured through the small opening into the vessel and allowed to react with the band. When the band has completely dissolved, the spent liquid is drained from the vessel.

(continued overleaf)

Notes:

1. For a 2014-T6 aluminum vessel the backup strip may be made of copper. In this case nitric acid may be used for dissolving the copper without attacking the aluminum. If the vessel is made of stainless steel, a backup band of aluminum may be used. A caustic soda solution will dissolve the aluminum band, while the stainless steel remains inert to this reagent.
2. The backup band may be split to permit insertion into the vessel during assembly.
3. A metal having good heat conductivity should be selected for the backup strip.
4. A vent through which the solvent may be added to or drained from the vessel may be fitted to one of the sections prior to or after welding of the two sections.
5. This technique is suitable for any application involving tankage having access holes too small to permit entry of a welding tool. Small vessels whose interior dimensions must be accurately controlled, as for some nuclear-related components, represent a specialized application.
6. For further information about this innovation inquiries may be directed to:
   Technology Utilization Officer
   Jet Propulsion Laboratory
   4800 Oak Grove Drive
   Pasadena, California 91103
   Reference: B63-10139

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: Clarence Levoe and Robert Freeman
(JPL-170)