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LWRHU GTA WELD DEVELOPMENT

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MASTER

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I. INTRODUCTION

Nineteen LWRHU Development Welds have been made. Welds WD-1 through WD-4 were made early in the program to obtain preliminary joint design data. Welds WD-5 through WD-10 were made with the vertical leg of the shim located toward the closure end cap. A decision was made to locate the shim with the vertical leg on the fuel side of the capsule; therefore, the data obtained on the above capsule welds will not be included in this report. A tantalum pellet machined to the configuration of the fuel pellet was placed inside each development capsule. O.D. shrinkage measurements were taken across the stand-off ring nearest the weld. A small increase in capsule length resulted from the weld bead on the end of the capsule (see Table 1).

II. POST-WELD INSPECTION

All welds received a visual, dye-penetrant, and metallographic inspection. Welds WD-14 through WD-18 received a helium leak check and radiographic inspection. The capsules were acceptable with no defects found. The helium leak rate was less than 1.5×10^{-10} std. cm³/sec.

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III. SUMMARY

Acceptable GTA welds were made consistently using LWRHU hardware and the enclosed GTA welding parameters (Table 2). Porosity sometimes associated with GTA welds in platinum alloys was not a problem. It was found necessary to machine a small groove in the cap edge to relieve expanded gas created by heat from the weld. The start location of the weld should be 2.0 to 2.5 mm (0.08 inch to 0.10 inch) from the groove.

This report includes photomicrographs of a 180° section and the as-welded condition of a typical capsule.

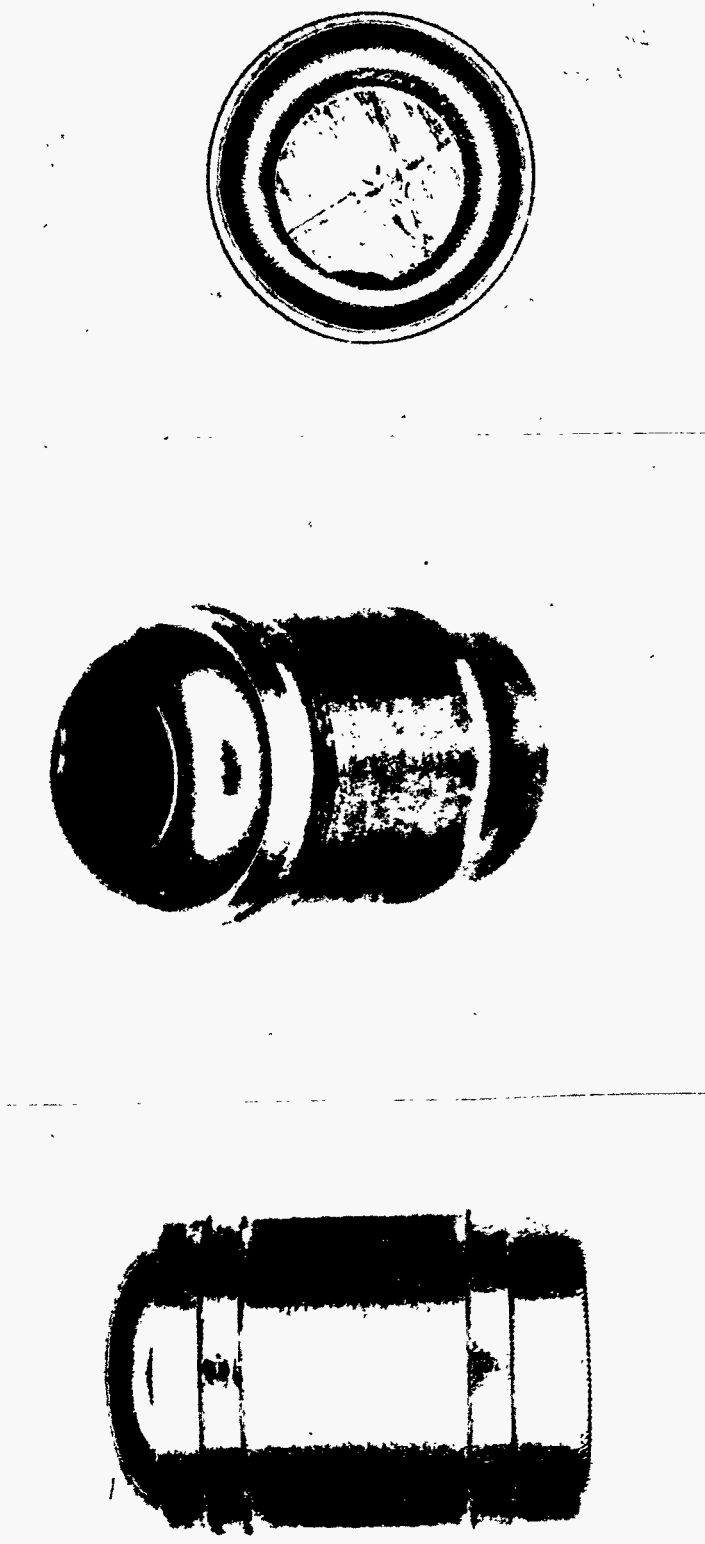
TABLE 1
GTA Weld Shrinkage Data

<u>Capsule No.</u>	<u>O.D. Shrinkage, mm (inches)</u>	<u>Length Increase, mm (inches)</u>
WD-11	0.05 (0.002)	0
WD-12	0	0.05 (0.002)
WD-13	0	0.05 (0.002)
WD-14	0.05 (0.002)	0.05 (0.002)
WD-15	0	0.05 (0.002)
WD-16	0.03 (0.001)	0.05 (0.002)
WD-17	0.03 (0.001)	0.05 (0.002)
WD-18	0.03 (0.001)	0.08 (0.003)
WD-19	0	0.03

TABLE 2

LWRHU GTA Weld Parameters

Welding Power Supply - Miller Analog 300, 3 Phase 300 Amp D.C.
Torch Rotation System - Servo-Tek Bi-Mode ST5100-1
Fixture Type - Mound Drawing No. AYC790538
Torch Type - Linde HW-20
Torch Gas Cup Size - No. 4
Box Gas - Helium
Torch Gas - Aircomatic No. 75 (75% Helium, 25% Argon) 20 C.F.H.
Torch Angle and Position - Figures 1 and 2
Torch Gas Preflow - 5 Sec
Rotation Speed - 6 Sec per Revolution
Weld Time - 6.5 Sec
Rotation Delay - 0.5 Sec
Starting Current - 32 Amperes D.C.S.P.
Upslope Time - 0
Welding Current - 43 Amperes D.C.S.P.
Downslope Time - 0.8 Sec
Final Current - 0
Electrode Type - 1.0 mm (0.040 inch) Dia. 2% Thoriated Tungsten
Electrode Shape - 3.81 mm (0.150 inch) Taper with 0.25 mm (0.010 inch) Rounded Point
Arc Gap - 0.64 mm (0.025 inch).



Side

45°

End

Figure 1: Three views of the GTA closure weld on MD-12.



Figure 2: 180° Transverse Section of GTA Closure on MD-12.

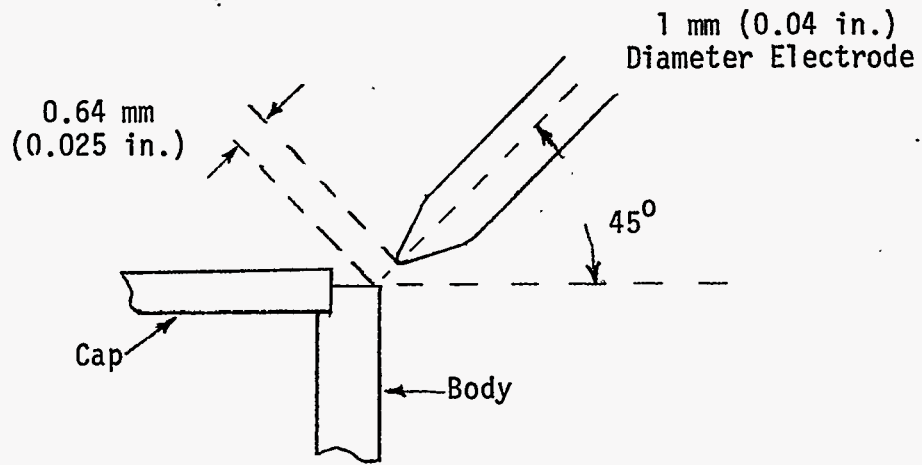


Figure 3: Electrode Position Sketch for GTA Weld (Side View).

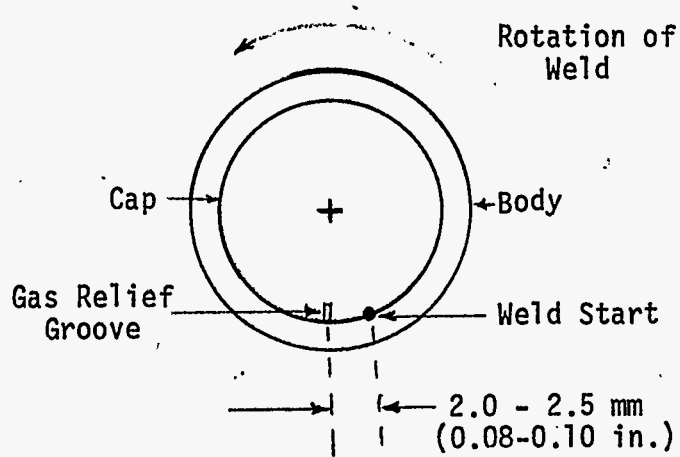


Figure 4: Weld Start Position for GTA Closure Weld.