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LWRHU EB WELD DEVELOPMENT

L. A. Greene

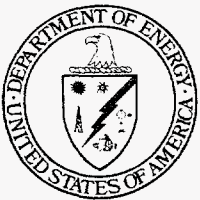
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Contract No. DE-AC04-76-DP00053

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I. INTRODUCTION

Electron beam weld development studies were performed for both the platinum frit vent-to-vent cap weld and also the vent cap-to-body weld for the LWRHU Project using a Hamilton Standard EBW-6 Electron Beam Welder.

A total of six (6) development welds each was performed to establish welding parameters and procedures which would produce satisfactory and acceptable welds.

The relatively small size of the platinum frit vent dictated that the frit-to-vent cap weld would have to be limited as to depth of penetration and also to minimize the reduction of the porous frit areas.

II. POST-WELD INSPECTION

A. Frit Vent-to-Vent Cap Weld

Visual and metallographic inspections showed all welds to be acceptable. Two welds showed a very slight tilting of the frit vent during welding due to a slightly loose fit-up, but this was not considered objectionable.

No serious problem with porosity was evident with any of the welds inspected. The flow rates on two of the welded frit vents were checked to determine if the welding operation in any way had altered the flow rates of the frit vents. The result of this flow rate check before and after welding showed no significant change.

Photomicrographs of a 180° transverse section and the as-welded condition of a typical frit vent-to-vent cap EB weld are shown in Figures 1 and 2.

B. Vent Cap-to-Body Weld

The EB weld development studies on the vent cap-to-body weld were performed on six (6) capsules. (Twenty other vent cap-to-body welds were initially made, but these welds were not subjected to metallographic inspection until after the GTA closure weld development had been performed. Upon reviewing the photomicrographs of several of these welds, preliminary data were obtained.) Final EB weld development studies were then performed on six (6) other capsules.

Due to some tilting of the vent cap to body during welding, it was decided that the vent cap should be held in place during the welding of the vent cap to the body. To accomplish this, a small tack welding fixture was constructed, whereby each vent cap would be tack welded to the body prior to performing the vent cap-to-body weld. The tacking fixture can accommodate up to eight (8) capsules. Each vent cap is tack welded to the body in two (2) places 180° apart using this tack welding fixture.

Because some weld undercutting (which is typical with this type of weld) was noted, a cosmetic weld pass was incorporated immediately after the initial vent cap-to-body weld.

Photomicrographs of a 180° transverse section and the as-welded condition of a typical capsule are included in Figures 3 and 4.

III. SUMMARY

Acceptable EB welds were made on both the frit-vent-to-vent cap welds and the vent cap-to-body welds.

Weld porosity was not a problem with either weld.

A list of the various EB welding parameters is also included with this report and are provided in Table 1.

TABLE 1

EB WELD PARAMETERS

Frit Vent to Vent Cap

30 KV
1.0 MA
0.010" Deflection
Speed Setting - Variable Start 180
Focus Setting - 280

Tack Weld Vent Cap to Body

60 KV
2.0 MA
0.010" Deflection
Tack Weld Two (2) Places 180° Apart
Beam On and Off Manually

Vent Cap to Body Weld

90-95 KV
2.0 MA
0.005" to 0.010" Deflection
Speed Setting 55-60 = 4 to 5 Sec/Rev.
Focus Setting - 450
Total Weld Time 8 to 10 Sec.

Cosmetic Weld

60 KV
2.0 MA
Speed Setting - 40
0.010" to 0.015" Deflection
Focus Setting - 350 to 360

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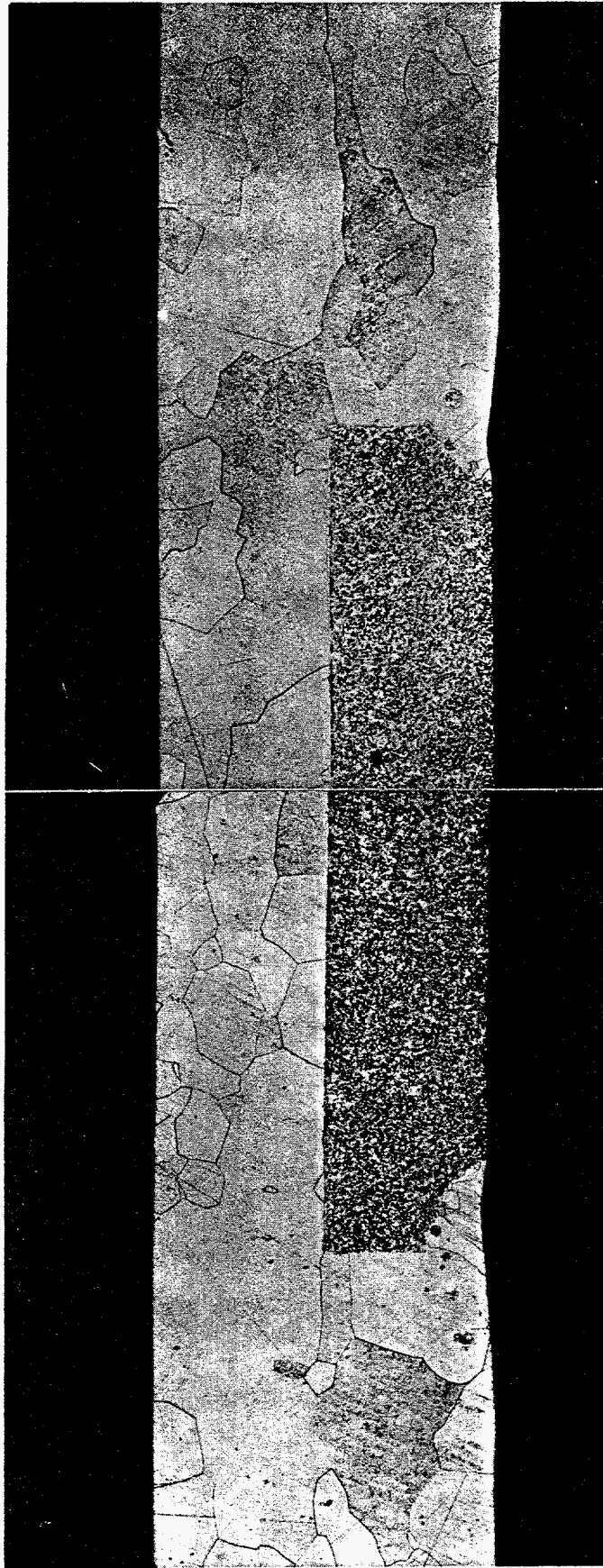


Figure 1: 180° Transverse Section of Frit Vent to Vent Cap EB Weld.

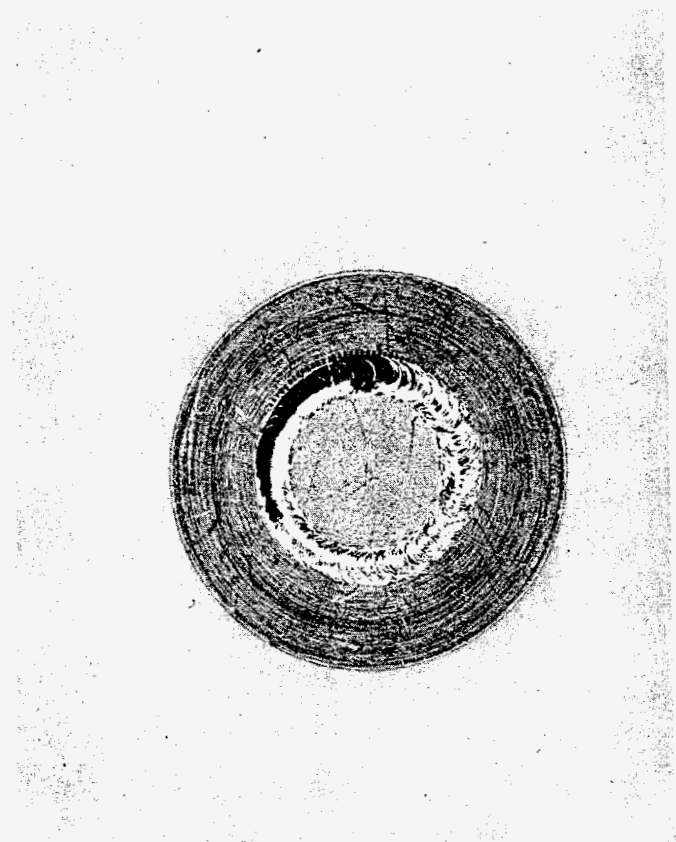


Figure 2: View of As-Welded Condition of a Typical Frit Vent-to-Vent Cap EB Weld.

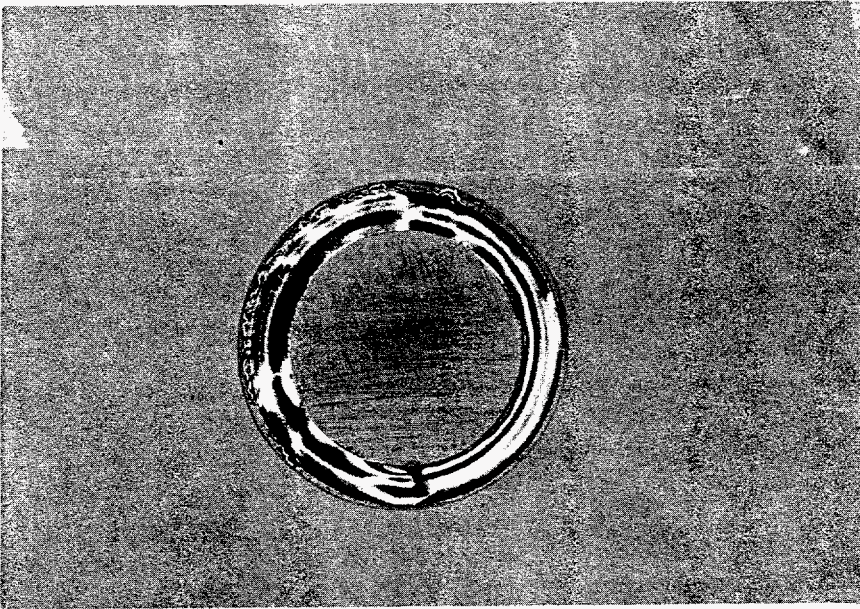
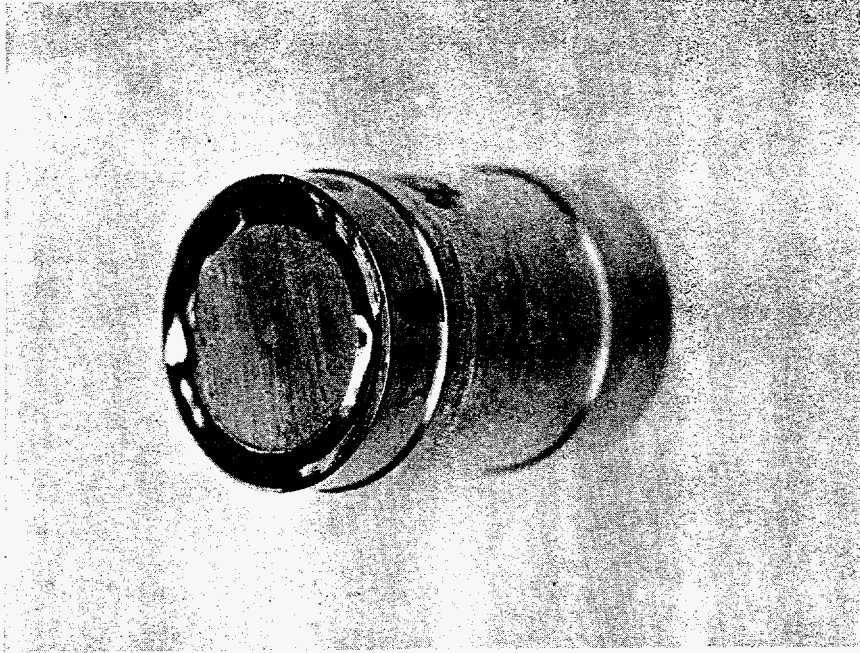


Figure 4: Two Views of Typical Vent Cap-to-Body EB Welds.