Discovery of the Problem

It was brought to our attention in late 1978 by our Architect-Engineer (Stone & Webster) that on another of its projects a difficulty had been encountered with the cadsleeve welds fabricated by Graver Energy Systems (Graver). Gulf States initiated an investigation of the potential for a similar problem on the cadsleeve welds also fabricated by Graver for the River Bend Unit 1. This investigation was initiated based on the following considerations: 1) the same Graver welding procedures (i.e., 313N and 319N) that were used on the other S&W project were also used on River Bend Unit 1, 2) the welds were performed on both projects in the same time frame, and 3) the questionable welds were confined to those produced using the semi-automatic weld procedure (313N). In March, 1979, Gulf States determined that the potential for questionable cadsleeve welds appeared to be high and consequently notified the NRC I&E Region IV office by telephone and followed with a "Potential Reportable Deficiency - 10CFR 50.55(e)" letter dated March 20, 1979.

Over the next sixty days, Gulf States had further analysis performed on the cadsleeve welds, studied the potential for safety implications, and began to review possible corrective actions in case such action became necessary. At the end of this period, Gulf States concluded that a Reportable Deficiency under 10CFR 50.55(e) did exist and notified the NRC I&E Region IV office in a letter dated May 31, 1979. The following is a summary report of the cadsleeve weld problem and the corrective action to be taken.

Description of the Affected Components

The cadweld splices are located at junctions of the drywell, reactor pedestal, weirwall, and containment vessel at the top of the reactor building mat. They form load transfer interfaces for these structures. The cadweld sleeve types for

each structure and the number of each type is listed in Table 1.

Weld Design Requirements

The specification under which these components were prepared requires welding procedures and qualifications in accordance with ASME III subsection NE, with quality of workmanship to be "first class." Due to the partial penetration weld geometry of the component the nondestructive testing procedure specified is magnetic particle as specified in the ASME III code.

Investigation of the Welds

Upon being advised of the potential for internal welding inclusions, due to inadequate adherence to the vendor welding procedures using the semi-automatic welding process, S&W was directed to devise a means of nondestructive qualitative examination of the suspect welds. A special ultrasonic testing procedure was developed to examine the weld area for identification of possible lack of fusion and slag inclusion. The procedure developed has application only as a qualitative investigative procedure, and is not applicable for weld acceptance due to limited weld coverage. A sample group of welds was examined for gross qualitative discontinuities. Based on the results of this examination, which showed sufficient lack of fusion and slag inclusion to demonstrate noncompliance with the specified first class weld provision of ASME III subsection NE, it has been decided to reject all of the cadsleeve welds.

Safety Concerns Due to Potentially Defective Welds

The existence of gross amounts of discontinuities in the J-bevel area of the weld may lead to unacceptable stresses and deformations during the operation of the plant under abnormal conditions and endanger the structural integrity of the building.

Corrective Action

It has been decided to reject all of the cadsleeves and replace them using a program as follows:

Since all defective welds were produced using the semi-automatic welding procedure, the semi-automatic welding procedure will not be used in the rework.

A manual welding process will be used and will be augmented with increased inprocess controls and hold points under the fabricator's (Graver) QA program, as well as additional surveillance by the Architect-Engineer (S&W). In addition to the specified inspection of all final weld surface by MT, an additional MT inspection will be performed midway through the weld on a random sample.

These MT inspections will be performed using the DC Prod method which will provide some depth of inspection of the weld surface both at the $\frac{1}{2}t$ and final weld surface. UT examination of the partial penetration cadsleeve welds will not be utilized due to its lack of applicability and established procedures under the ASME III code. UT examination of this weld design has an extremely limited ability to adequately "see" or evaluate the entire weld volume. The faulted condition in this problem was the semi-automatic weld process misapplication. The use of manual welding and augmented Quality Assurance resolves this problem.

TABLE 1

CADWELD SLEEVE TYPES FOR RIVER BEND STATION - UNIT 1

	Structure	#18 RBB-18101-JA*	#14 RBB-14101-JA*	#18L RBB-537-JA*	#18 RBW-538-J*	Total
1.	Reactor Pedestal	642	214	214	-	1070
2.	Weirwall	645	430	215	-	1290
3.	Drywell	1892	-	-	172	2064
4.	Containment Vessel	1290	-	-	-	1290
5.	Sparger Rings	224	-	-	-	224
6.	Weirwall Notch Area	24	4			28
	Grand Total for Unit 1:					5964

NOTE:

1. The material of the cadweld sleeves is ASTM A519-1026.
2. All the above sleeves were welded to the embedment plates using a semiautomatic welding process.
3. The weld surfaces were inspected by magnetic particle examination.

*Erico Products, Inc. catalog number

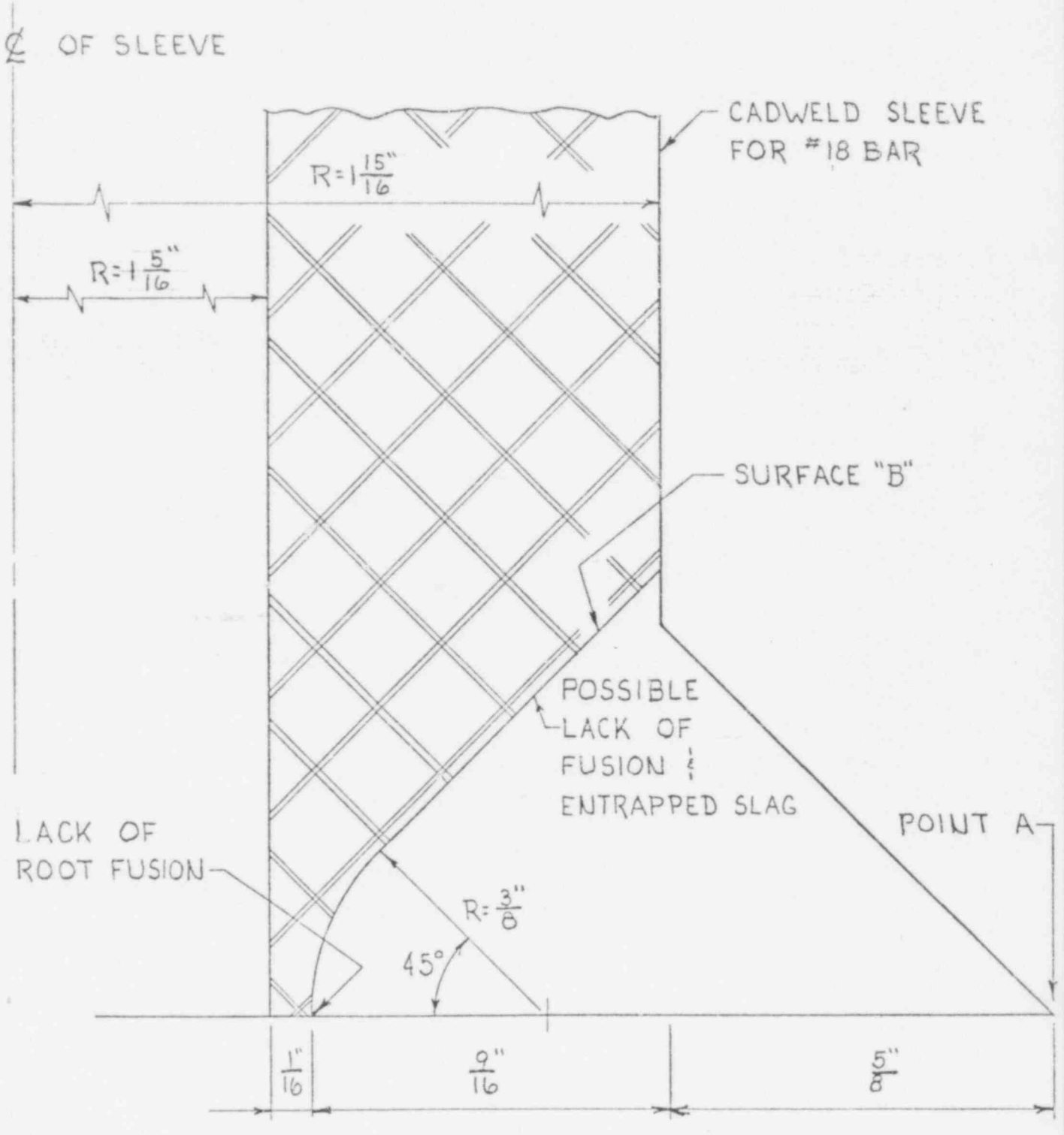

FIG. 1 TYP. WELD BETWEEN CADWELD SLEEVE & PLATE