



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ROCHESTER GAS AND ELECTRIC CORPORATION

R. E. GINNA NUCLEAR POWER PLANT

DOCKET NO. 50-244

1.0 INTRODUCTION

By letter of April 20, 1983, Rochester Gas and Electric Corporation (RG&E) requested a review and approval of the installation of tubesheet sleeves in the steam generators at Ginna. Additional information was provided in the RG&E letters of April 26, 1983 and May 24, 1983 and at meetings held with the staff on May 12, 1983 and May 20, 1983. In addition, an NRC consultant visited the plant on May 13, 1983 to discuss the eddy-current inspection of sleeved tubing and provide an assessment of it to the NRC (1).

2.0 BACKGROUND

The sleeving of steam generator tubes has been recently introduced as a repair method for defective tubes to permit them to remain in service and forestall replacement and/or major repair of steam generators. Prior to April, 1983, tube sleeving at Ginna had been approved on a limited basis (maximum of 25 tubes per steam generator per inspection) as an alternative to plugging. Based on additional information submitted and staff analysis of it, the 25 tube limit was deleted from the Ginna Inservice Inspection (ISI) program by letter dated April 1, 1983.

Because of the geometric configuration of the steam generator, full length sleeves cannot be installed in peripheral tubes. As a result, RG&E and Babcock and Wilcox (B&W) developed shorter sleeves which fit entirely within the portion of the tubes enclosed within the tubesheet.

(1) ORNL Intra-Laboratory Correspondence, C. V. Dodd to R. W. McClung, "Travel to Rochester, NY, May 13, 1983," memorandum dated May 16, 1983.



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3.0 DISCUSSION

The basic tube sleeve design approved by the staff is a 26 to 36 inch long, bimetallic tube, explosively welded at the lower end, and brazed at the upper end. This is satisfactory for most applications. However, the length of a sleeve that can be installed in a given tube is restricted by the headroom available in the channel head. Since the channel head is hemispherical in shape, the headroom becomes much smaller towards the periphery of the tube bundle. Consequently, it is not possible to use the longer brazed sleeves in the peripheral tubes.

In order to provide the capability for sleeving these tubes, RG&E has developed a modification to the approved sleeve design (see Attachment 1). The modification, called a tubesheet sleeve, is explosively welded at both the bottom and top. The current tubesheet sleeve design is 22 inches long. However, RG&E anticipates the development of shorter lengths in the future. The tubesheet sleeve is designed to repair tube defects which occur within the tubesheet. The tubesheet sleeve is manufactured from the same 0.745 inch nominal O.D., bimetallic tubing as the sleeves. The lower tubesheet sleeve-to-tube joint uses the same configuration and explosive weld process as the brazed sleeves.

The upper tubesheet sleeve-to-tube joint also is made using an explosive welding process. The design of the weld is based on that used previously for the lower end joint which has been approved by the staff. The upper weld is made prior to making the lower end weld using a separate cartridge and detonation. The upper weld is the same length (0.75 inches) as the lower one, with its upper end a minimum of 1 inch below the top of the tubesheet. The sleeve O.D. is locally reduced over a length of 2 inches at the upper joint to provide the necessary weld standoff distance. The I.D. of the tube to be sleeved is cleaned by honing and dry swabbing prior to installation of the tubesheet sleeve. The weld configuration and installation procedure were developed using a series of tests. Test welded joints have been examined by metallographic examination to confirm their adequacy. The final configuration and welding procedure have been qualified to Section XI of the ASME Code in the same manner as the lower end joint of the brazed sleeve joint. All qualification specimens achieved the minimum weld length of 0.75 inch.

4.0 EVALUATION

During its review, the staff developed a number of concerns related to the adequacy of the inspectability of the part of the original steam generator tube located behind the upper expansion transition end of the tubesheet sleeve. In order to resolve this, the staff's consultant was

to make recommendations based on his site visit. He concluded that the inspection procedures used this time were adequate to ensure tube integrity for this outage and base-line sleeve inspection but that a more effective inspection technique will be needed at future outages which may require additional eddy current testing techniques such as multiple frequency and multiple pancake coil arrays. The staff agrees with the consultant's conclusions and recommends that RG&E investigate and develop as necessary an improved inspection technique to ensure the future inspectability of the tubesheet sleeve.

The licensee stated that the need for further development of the present system is recognized, but believes that adequate detection of the presence of flaws can be accomplished with the present system, and has made a commitment to investigate any indications by additional inspections in order to size the detected indications, using more sensitive techniques such as the rotating radial differential probe method. The staff agrees that this will provide added assurance of tube integrity but has determined that the need exists for the development of a better system.

The staff has previously approved the tubesheet sleeve design and installation process as described in the "Steam Generator Rapid Sleeving Program Design Verification Report," dated August 1982. The licensee has demonstrated that the tubesheet sleeve design and installation procedure are bounded by the analyses and tests described in that report. Review of the tubesheet sleeve installation procedure as required by Plant Technical Specification 6.5 was performed prior to installation.

5.0 CONCLUSION

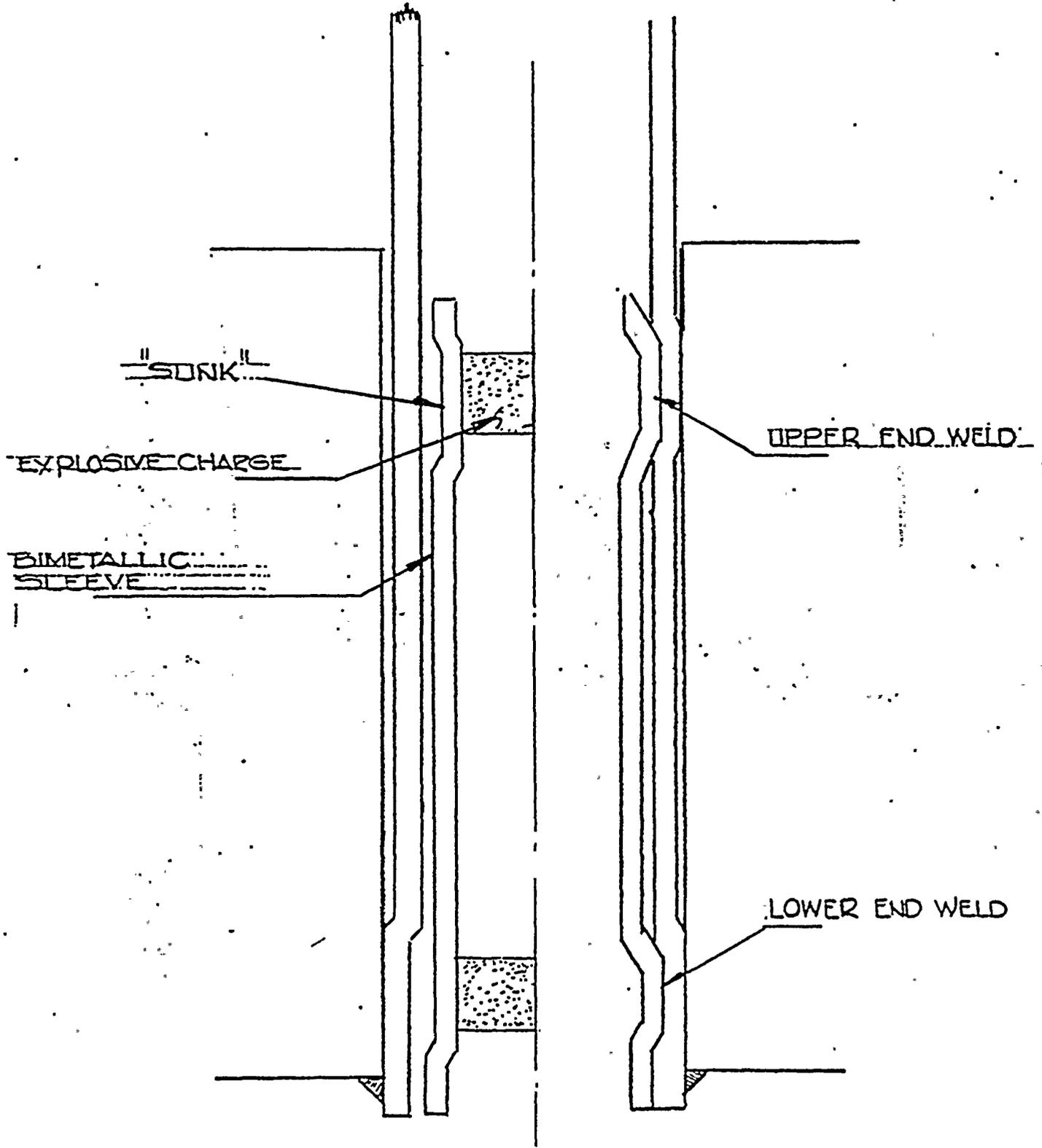
Because of the concerns previously indicated, the staff concludes that tubesheet sleeving of no more than 30 tubes is acceptable. Additional tubesheet sleeving shall not be performed until the licensee has demonstrated the effectiveness of its inspection techniques to the satisfaction of the staff. The staff also concludes that the inspection procedure for this inspection and the tubesheet explosively welded sleeve method are acceptable.

6.0 ACKNOWLEDGEMENT

H. Conrad contributed to this evaluation.

Date: June 13, 1983

BEFORE WELDING AFTER WELDING



TUBE SHEET SLEEVE



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