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FACIL:50-244 Robert Emmet Ginna Nuclear Plant, Unit 1, Rochester G 05000244
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RECIP.NAME RECIPIENT AFFILIATION
CRUTCHFIELD,R. Operating Reactors Branch 5

SUBJECT: Discusses installation & NDE of steam generator tubesheet sleeves,Approval to install 10 addl sleeves,based on insp results,requested.

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TITLE: Ginna (50-244) Steam Generator Tube Failure

NOTES:NRR/DL/SEP 1cy. 05000244

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March 23, 1984

Director of Nuclear Reactor Regulation
Attention: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Steam Generator Tubesheet Sleeves
R. E. Ginna Nuclear Power Plant
Docket No. 50-244

Dear Mr. Crutchfield:

The installation of tubesheet sleeves was approved by the Nuclear Regulatory Commission (NRC) through their Safety Evaluation Report (SER) transmitted to Rochester Gas and Electric (RG&E) by letter dated June 13, 1983. This SER limited the number of tubesheet sleeves that could be installed in 1983 to not more than 30 and also prevented the installation of additional tubesheet sleeves after the Spring 1983 outage until the effectiveness of inspection techniques could be demonstrated by RG&E. During the 1983 outage, four tubesheet sleeves were installed in the A Steam Generator and twenty-four in the B Steam Generator.

The technical evaluation of nondestructive examination methods for the purpose of optimizing inspectability of tubesheet sleeve/tube integrity has been an ongoing effort for the past three years. Prior to the April 1983 sleeve installation and inspection at Ginna Station, RG&E contracted and worked with the B&W Utility Power Generation Division in Lynchburg, Virginia to define the best technology to perform the inspections. As a result of the work prior to the 1983 outage, the following technical achievements were made and documented:

- Optimize the fabrication methods for calibration standards.
- Optimize the rotating pancake coil design for reliability and ALARA.
- Optimize the annular differential coil design.
- Optimize the magnetic bias in probes.

During the inspection activities performed during the April 1983 outage, Dr. Caius Dodd of the Oakridge National Laboratory,

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acting as a consultant to the NRC on eddy current inspection, reviewed the inspection techniques, procedures and inspection results. After the outage, Dr. Dodd provided a comprehensive post-outage critic of the sleeve/tube inspections performed. Dr. Dodd's letter to R. W. McClung identified valid technical areas which should be pursued prior to the next outage so that further enhancements to the data acquisition and analysis of the sleeve/tube inspection could potentially be developed. RG&E was supportive of these recommendations and they all have been pursued to completion. In addition to those items defined in Dr. Dodd's letter, other inspection techniques have been included in the program to further define the state of the art.

Specifically, those areas which have been pursued are identified below:

- Mixing of frequencies on the rotating probes.
- Use of nonrotating multi-element coils.
- Digital signal processing.
- Evaluation of the 3-d probe.
- Construction and evaluation of cross wound probes.
- Additional magnetism studies.
- Fabrication of more standards.
- An industry review of the technology pursued.

Although improvements have been made in the eddy current inspection techniques, there are still some areas of the tubesheet sleeve/tube combination where detection and sizing of defects at the 20% level is not possible. These areas are at the weld transitions and at the upper end of the sleeve. The eddy current coil now in use is an annular differential type with magnetic bias and operates on multiple frequencies including 50 and 150 kilo hertz. Use of the above coils will allow 20% thru wall defects to be seen 1 inch above the top of the tubesheet sleeve and at the lower transition as shown on Attachments 1 and 2. Larger defects can be seen at some intermediate locations.

Due to limitations of the eddy current inspection techniques, the acceptability of installing additional tubesheet sleeves has been reviewed. The small number of defects found during eddy current inspection of the steam generator tubes this outage indicates that the crevice environment especially at the upper end of the tubesheet sleeves is enhanced by our programs of crevice flushing and water chemistry control. Therefore the probability

of experiencing additional degradation in the area of concern is minimal. Further, the indications that have been seen have been well within the crevice, below the explosive joint. Also, a corrosion test program is under way with Babcock & Wilcox to access the potential for primary side stress corrosion cracking. Preliminary results of samples removed from the test environment have not indicated any detrimental effects due to the tubesheet sleeve process.

To further minimize the consequences of potential defects, the tubesheet sleeves have been shortened approximately 1.25 inches. This will provide a minimum of 0.75 inches of tube within the tubesheet which can be inspected to the 20% thru wall criteria. A 0.75 inch length of tubing within the tubesheet will restrict the maximum achievable flow rate should a leak occur at this location. Even under postulated accident conditions, the tube will remain engaged in the tubesheet and the maximum flow rate would be well less than the capacity of one charging pump and, therefore, is acceptable.

Because installation of tubesheet sleeves permits repair of tubes without requiring the tube to be removed from service, as is the case in plugging, it is desirable to sleeve instead of plug. Based on the results of our inspections during the current outage, we request approval to install no more than ten (10) additional tubesheet sleeves. We believe this is acceptable based on the limited area at the upper end of the sleeve where the eddy current inspection cannot currently detect and size defects at the 20% level, the low likelihood defects will occur in this area near the top of the tubesheet, and the acceptable consequences even if a defect does develop in this area.

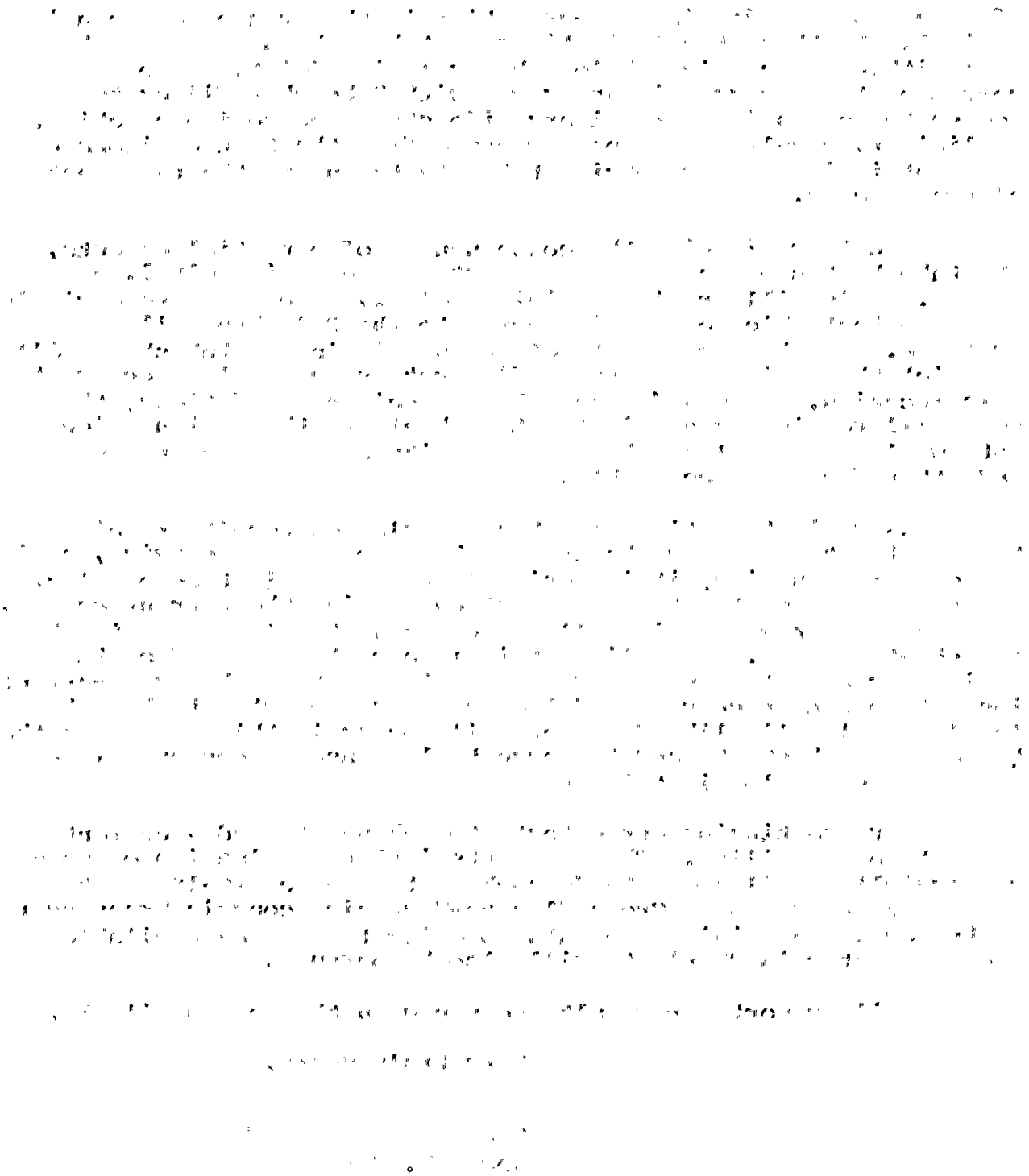
We are continuing our efforts to enhance the eddy current inspection capability. These efforts include evaluation of non-commercially available methods such as the Zetec MIZ-18 and the Steam Generator Owners Group Electro-Magnetic Acoustic Transducer technology. The finite elements modeling technology available at the NDE Center in Charlotte will also be pursued.

We will report our results to you when they are available.

Very truly yours,

Roger W. Kober

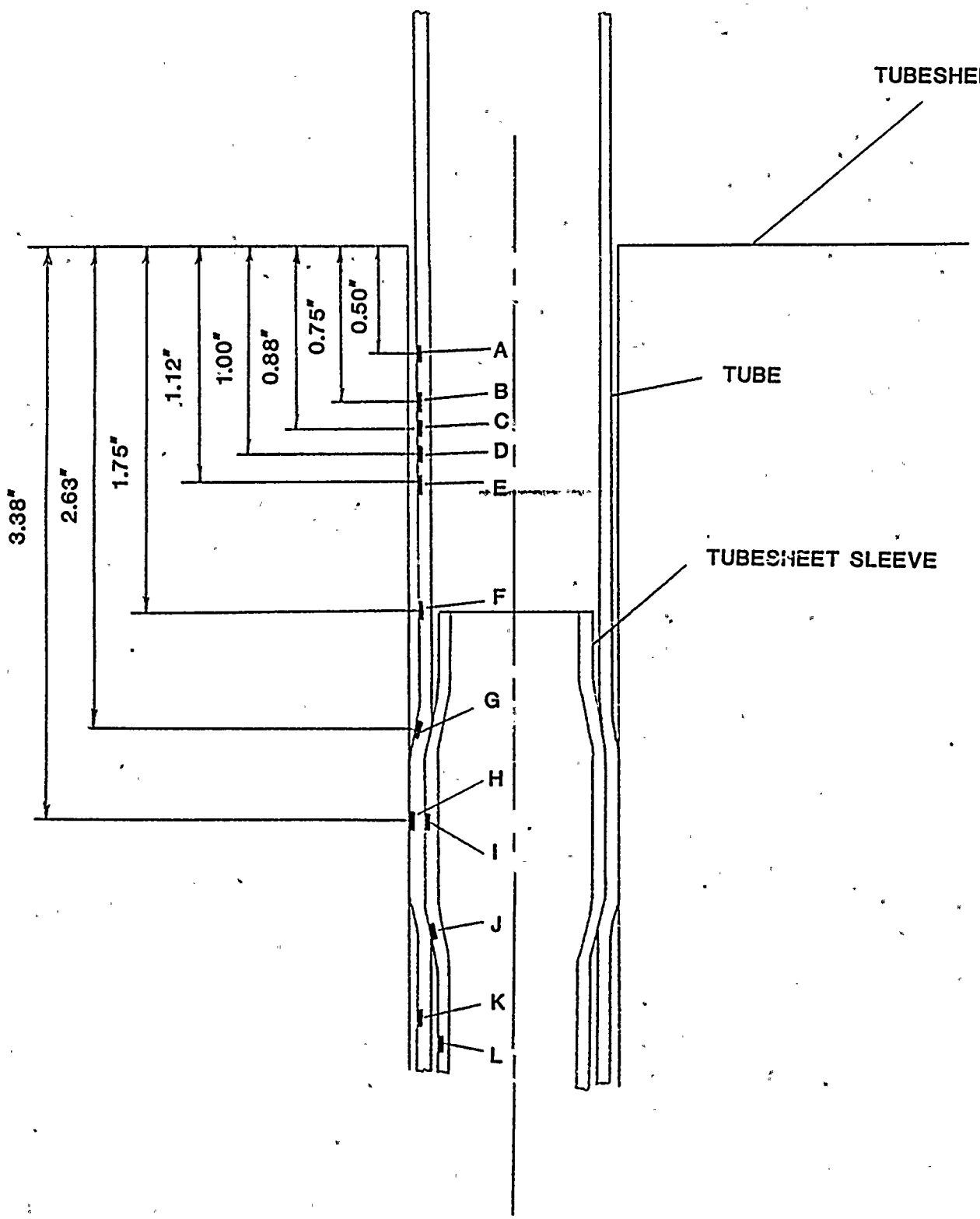
Roger W. Kober



ATTACHMENT 1

TUBE / SLEEVE EDDY CURRENT

INSPECTION CAPABILITY



ATTACHMENT 2

Tube/Sleeve Eddy Current Inspection Capability

Designation	Distance from Top of Tubesheet	Flow Detection Capability	Flow Signing Capability
A	0.50"	Yes	20%
B	0.75"	Yes	20%
C	0.88"	Yes	Marginal
D	1.00"	Yes	None
E	1.12"	Marginal	None
F	1.75"	None	None
G	2.63"	None	None
H	3.38"	Yes	40%
I	3.38"	Yes	40%
J	-	Yes	20%
K	-	Yes	20%
L	-	Yes	20%