

MILLSTONE FEEDWATER SPARGERS

UPGRADE PROGRAM

NRC
BETHESDA
APRIL 16, 1980

8005210 642

AGENDA

INTRODUCTION (NUSCO)

SPARGER DESIGN FEATURES (GE)

ISSUES IDENTIFIED BY NRC (GE)

IMPLICATIONS OF NRC FINDINGS (GE)

BROAD OBJECTIVES OF UPGRADING (GE)

ADDITIONAL DESIGN TASKS (GE)

CONTROL OF WORK (GE)

HARDWARE INSPECTION AND REWORK (GE)

REMEDIAL ACTION - IF REQUIRED (GE)

SUMMARY AND CONCLUSIONS (NUSCO)

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PLEASE PRINT

NEEL - Feedwater Sparger Meeting

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Express in IE Bulletin by 7/80

Get their approval as soon as possible
- comes into NRC

They have to sign for release

POOR ORIGINAL

WILL DISCUSS

- SPARGER DESIGN OBJECTIVES
- SPARGER DESIGN CRITERIA
- DESCRIPTION OF SPARGER
 - CONFIGURATION
 - NOMENCLATURE
 - MATERIALS
 - LOAD CARRYING WELDS
- STRESSES
 - DUE TO PRESSURE
 - DUE TO INSTALLATION
 - DUE TO THERMAL
- CONCLUSIONS

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DESIGN OBJECTIVES

- CAN BE INSTALLED AND REMOVED WITHOUT CUTTING FEEDWATER PIPING. IE; REMOVABLE SPARGER.
- PROTECT NOZZLE AGAINST HIGH FREQUENCY THERMAL CYCLES (NO LEAK - TRIPLE THERMAL SLEEVE)
- IMMUNE FROM VIBRATION
- ELIMINATE LOW FLOW STRATIFICATION (TOP MOUNTED ELBOWS)
- ELIMINATE NOZZLE FLOW SEPARATION (CONVERGING NOZZLES)
- USE MATERIALS AND PROCESSES IMMUNE TO IGSCC
 - SHT STAINLESS - 304
 - LOW CARBON 316
 - NiCrFe

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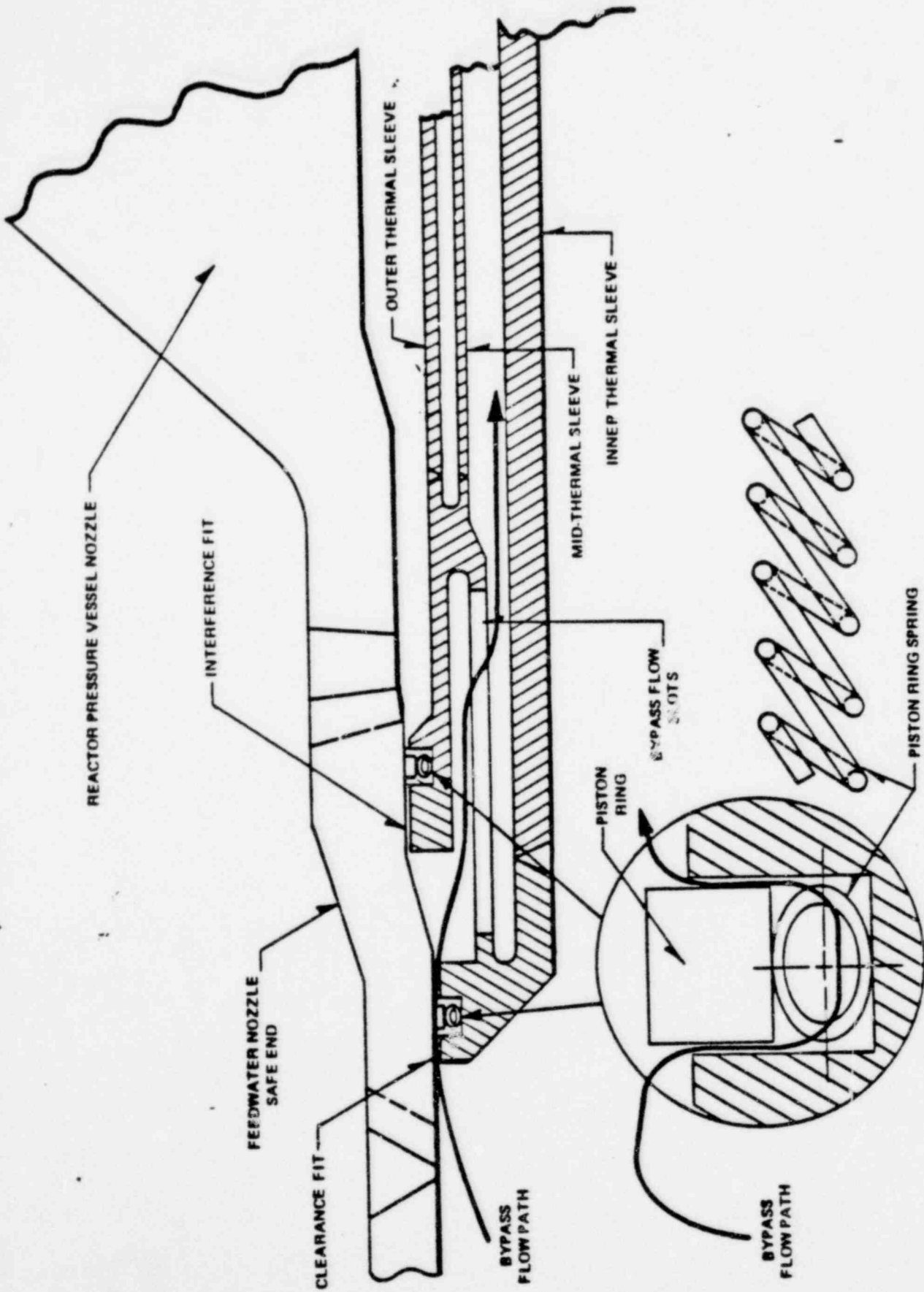
DESIGN CRITERIA

SINCE:

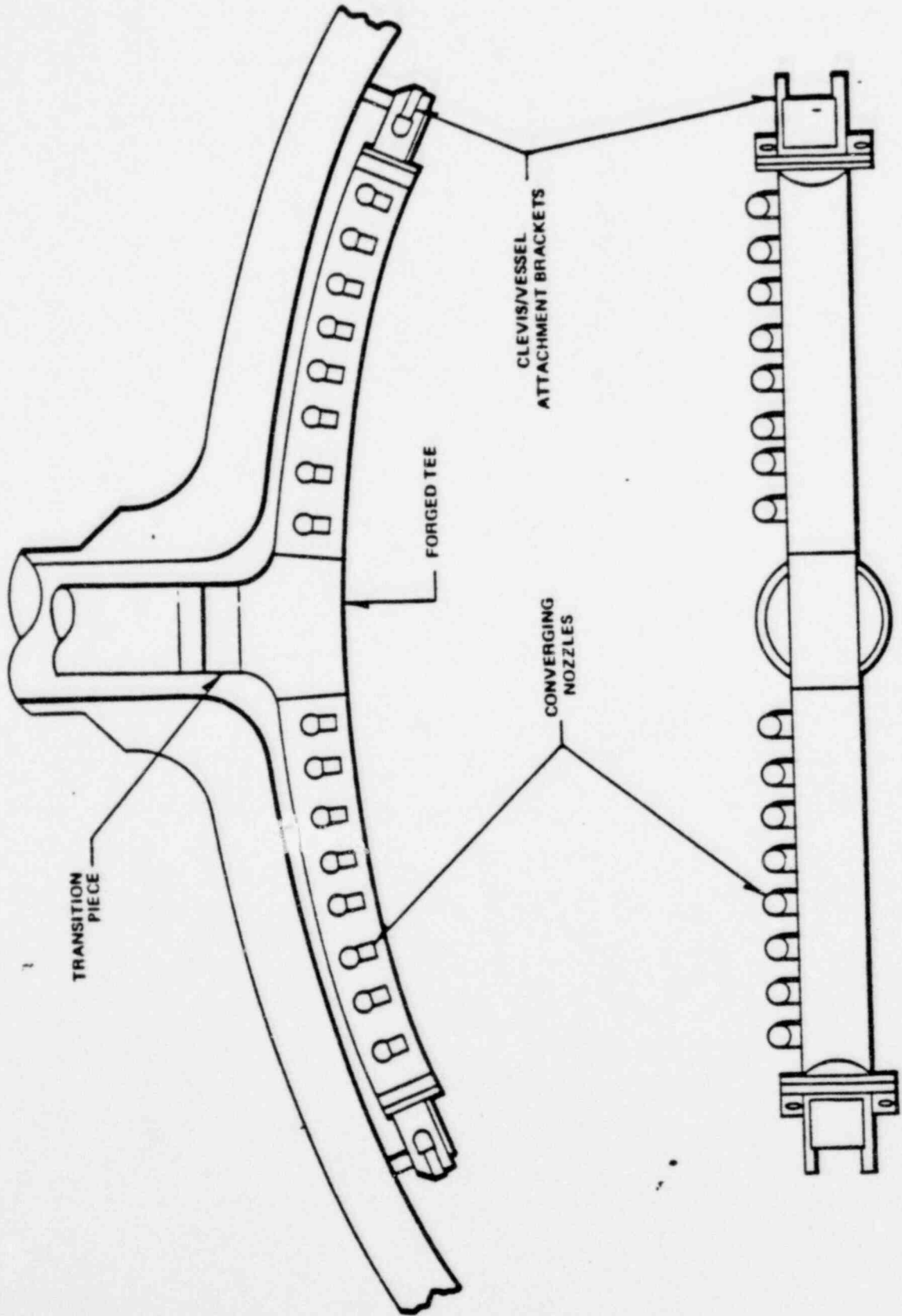
SPARGER IS NON-CODE
GE GENERIC DESIGN CLASSIFICATION IS NOT ESSENTIAL
TO SAFETY

DESIGN USING ASME SUBSECTION NG AS A GUIDE

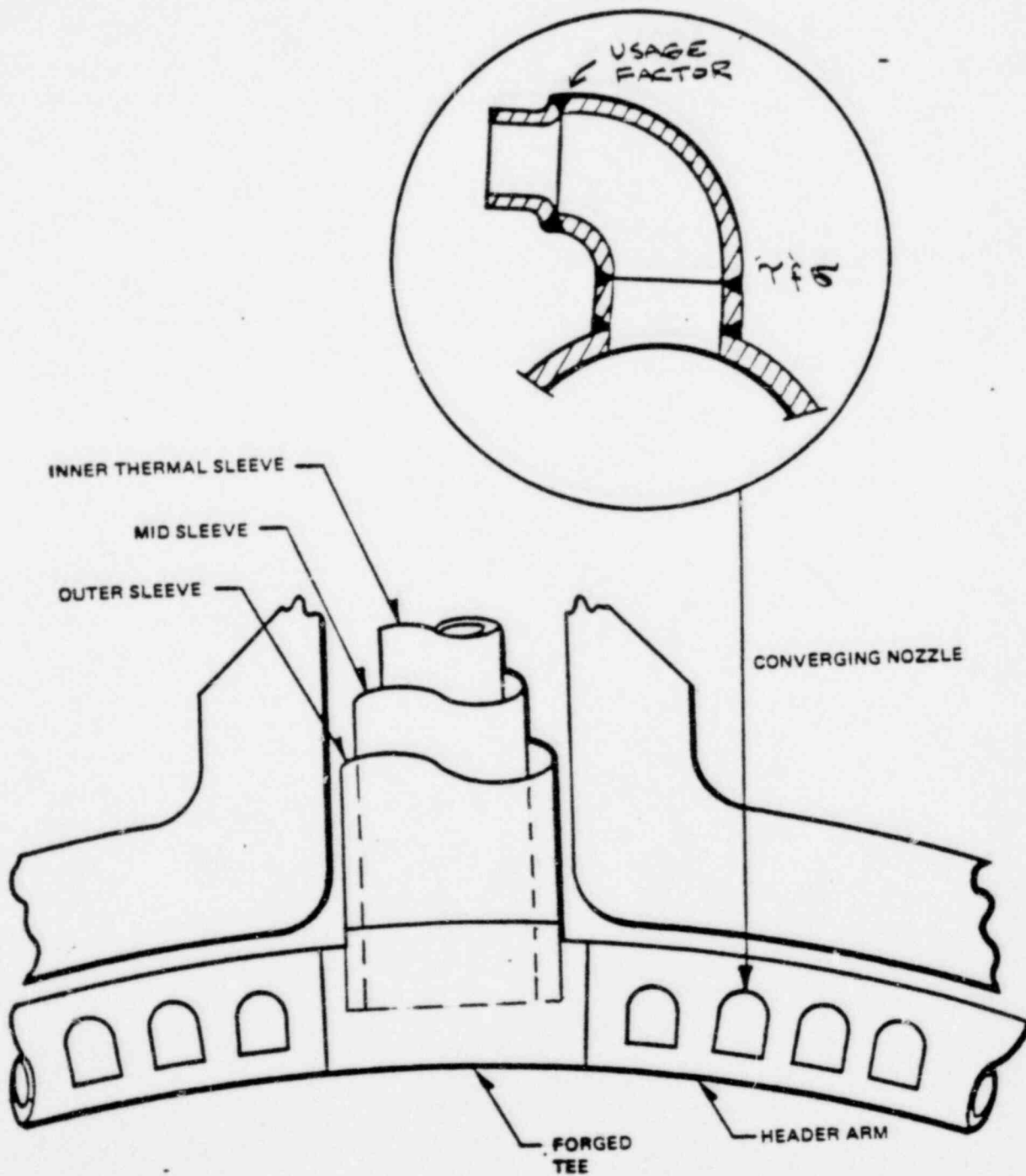
VERIFY THAT SPARGER MEETS NG 1122C REQUIREMENT
(I.E., FAILURE WILL NOT AFFECT ANY ESSENTIAL
COMPONENT)



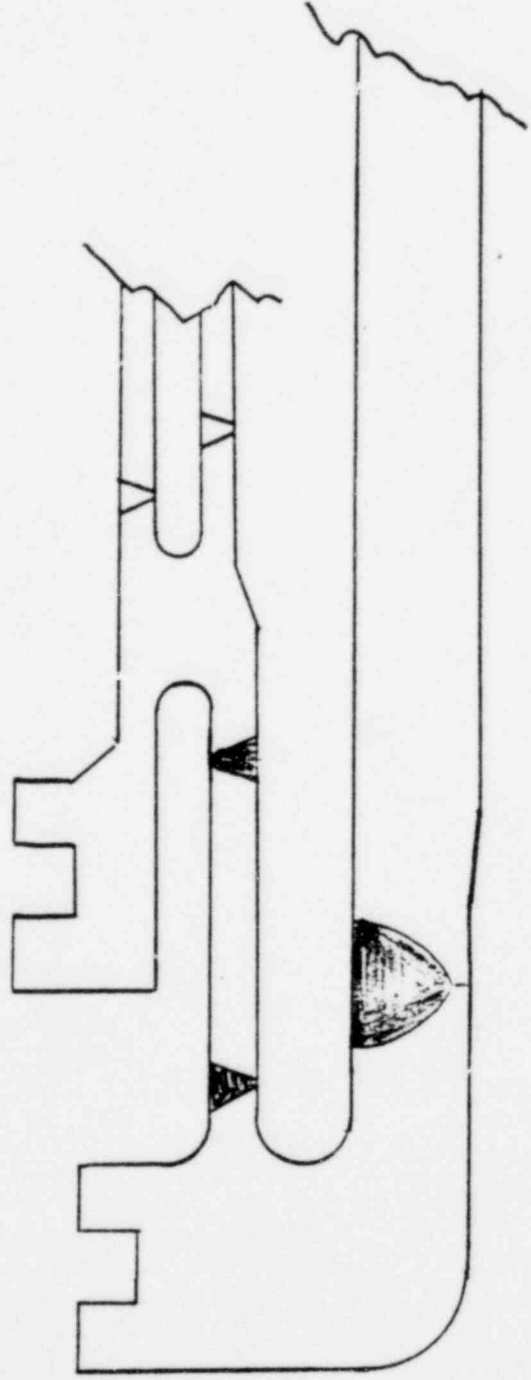
Improved Interference Fit Feedwater Sparger
 Thermal Sleeve Interference Fit Details



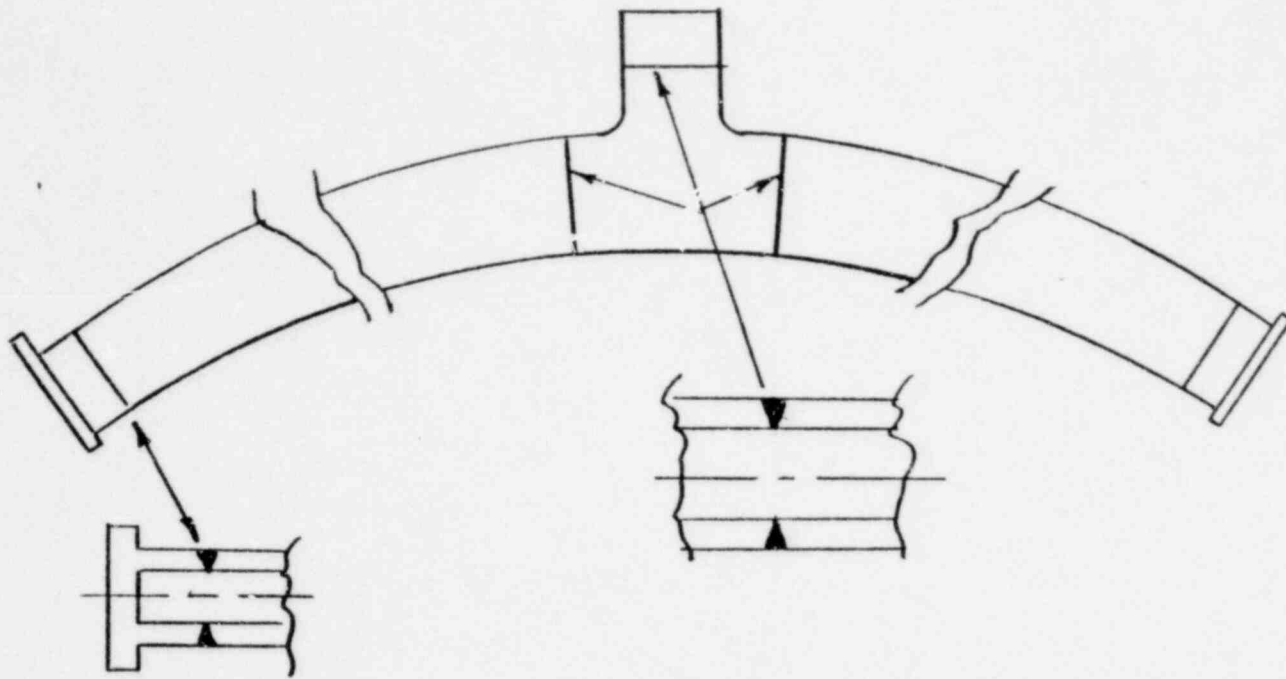
Improved Interference Fit Feedwater Sparger Assembly



* Improved Interference Fit Feedwater Sparger Assembly
 Nozzle and Thermal Sleeve Arrangement



STRUCTURAL WELD IDENTIFICATION THERMAL SLEEVE



HEADER STRUCTURAL WELDS IDENTIFICATION

STRESSES

PRESSURE

HOOP STRESS = 164 PSI

AXIAL TENSILE STRESS AT END PLATE WELD = 62 PSI

FLOW

NOZZLE

σ BENDING = 132 PSI

τ = 33 PSI

THUS:- PRESSURE AND FLOW STRESSES ARE NEGLIGIBLE

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STRESSES DUE TO INSTALLATION

- COMPRESSIVE STRESS IN SECONDARY HOUSING

- BENDING STRESS AT
 - HEADER TO TEE WELD

 - INNER THERMAL SLEEVE TO TEE WELD

NOTE:- THESE ARE DEFLECTION LIMITED
SECONDARY STRESSES. MAGNITUDE
LESS THAN ALLOWED BY ASME NG.

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THERMAL STRESSES

- IMPORTANT TO FATIGUE

- USAGE FACTORS
 - NOZZLES = .32
 - T.SLV TO HEADER = .28
 - HEADER TO END PLATE = .88

NOTE: ANALYSIS CONSERVATIVE

CONCERN - WOULD HAVE SOME CONCERN IF A WELD DEFECT WERE ON SURFACE. A LONG PLANAR SURFACE CRACK, 1/4 THROUGH WALL WOULD GROW SOMETHING LIKE .020" FOR SYSTEM OPERATION FOR 40 YEAR LIFE.

CONCLUSION

VISUAL AND LIQUID PENETRANT (LP) EXAMINATION ASSURE THAT SPARGER IS STRUCTURALLY ADEQUATE FOR SERVICE. PRECISE FABRICATION CONTROLS (IE; SECTION IX WELDERS AND FULL SCALE MOCKUPS) PLUS SURFACE LP EXAMINATION ASSURE STRUCTURAL ADEQUACY OF THE THERMAL SLEEVES.

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ISSUES IDENTIFIED BY THE NRC

- SOME FABRICATION OCCURRED PRIOR TO MARCH 7, 1979
- FABRICATION PER P.O. 205-AL709 NOT PROVEN
 - GE INSPECTIONS QUESTIONED
 - CHECKLIST NOT PROVIDED IN TIME
- NRC AUDIT OF MARVIN
 - DEFICIENCIES IN IMPLEMENTING QA PROGRAM

IMPLICATIONS OF NRC FINDINGS

CONTROL OF WELD PROCEDURES

IN-PROCESS INSPECTIONS

WELD MATERIAL

MATERIAL TRACEABILITY

QUALIFICATION OF WELDERS

BROAD OBJECTIVES OF UPGRADING

RECORDS REVIEW

TO IDENTIFY AREAS OF CONCERN
TO IDENTIFY DEVIATIONS
VENDOR BINDER
MATERIAL P.O.'S
VENDOR DETAIL RECORDS

ADDITIONAL TESTS OR INSPECTIONS

TO RESOLVE DISCREPANCIES IN RECORDS
TO VERIFY TECHNICAL ACCEPTABILITY
TO ESTABLISH NEW OR ADDITIONAL RECORDS

QUALIFY MARVIN TO IMPLEMENT A SAFETY ESSENTIAL PROGRAM

REWORK OR REPAIR

REPLACE WHAT IS QUESTIONABLE
RESTORE TO ACCEPTABLE CONDITION
ALL WORK UNDER ANSI N45.2 PROGRAM

WILL BE ABLE TO STATE

FW SPARGERS WERE SUPPLIED, OR REWORKED, UNDER A PROGRAM
THAT MEETS THE INTENT, IF NOT THE LETTER, OR 10 CFR 50,
APPENDIX B

ADDITIONAL DESIGN TASKS

- GE ENGINEERING USES ONE PROCEDURE SYSTEM
DESIGN REVIEW
DESIGN VERIFICATION
DESIGN RECORDS
- SEISMIC CATEGORY I ANALYSIS REQUIRED
- ANSI N45.2 WILL BE APPLIED TO VENDOR FOR
REWORK & INSPECTION
- NO DESIGN MODIFICATIONS REQUIRED
(UNLESS DICTATED BY SEISMIC ANALYSIS)

MILLSTONE FEEDWATER SPARGER PROGRAM
CONTROL OF WORK

- ANSI N45.2 WILL BE IMPOSED FOR ALL VENDOR REWORK ACTIVITIES
- GE WILL SPECIFY INSPECTION CRITERIA
- GE ENGINEERING WILL DISPOSITION REPORTED RESULTS
- VENDOR WILL SUBMIT OVERALL PLAN ON TRAVELERS FOR APPROVAL
- GE ENGINEERING WILL IDENTIFY APPROPRIATE SPECIFICATIONS FOR REWORK
- VENDOR WILL SUBMIT REPAIR PROCEDURE FOR APPROVAL BY GE
- INSPECTIONS, REPLACEMENT, REWORK AND REPAIRS WILL BE DOCUMENTED
- GE QA WILL PROVIDE INCREASED SURVEILLANCE OF THESE ACTIVITIES UNDER NUSCO APPROVED QA PLAN

HARDWARE INSPECTION AND REWORK

THERMAL SLEEVES

- X-RAY ALL FIVE WELDS
 - TECHNIQUE PER ASME NB OR NG
 - EVALUATE PER ENGINEERING REQUIREMENTS EXCEPT NO SURFACE CRACKS ALLOWED.

- PT ALL WELDS AND ADJACENT PARENT MATERIAL ACCESSIBLE SURFACES

HEADERS

- X-RAY
 - HEADER PIPE TO END CAPS
 - HEADER PIPE TO FORGED TEE
 - FORGED TEE TO EXTENSION SLEEVE
 - TECHNIQUE PER ASME NB OR NG
 - EVALUATE PER ENGINEERING REQUIREMENTS EXCEPT NO SURFACE CRACKS ALLOWED

- PT ALL HEADER WELDS INCLUDING NOZZLE WELDS

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REMEDIAL ACTION - IF REQUIRED

- SURFACE DEFECTS WILL BE GROUND OUT, IF POSSIBLE.
- LOCAL WELD REPAIR, IN ACCORDANCE WITH APPROVED PROCEDURES, IF POSSIBLE.
- CUT APART, RE-WELD PREP, AND REWELD IF ABOVE REPAIRS NOT POSSIBLE.

NOTE:- IF ANY WELD REPAIR IS NECESSARY ON THE HEADERS SOLUTION HEAT TREATMENT IS NECESSARY. SHT WILL BE FOLLOWED BY PICKLING AND A DIMENSIONAL CHECK.

NOTE:- IF CUT APART, HEADER WILL HAVE LESS ARC LENGTH. ANALYSIS SHOWS THAT UP TO 1/2 INCH LOSS DOES NOT ADVERSELY AFFECT FLOW DISTRIBUTION. END BRACKETS CAN ALSO ACCOMMODATE LENGTH CHANGE.

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REMEDIAL ACTION - CONTINUED

MATERIAL

MATERIAL THAT DOES NOT HAVE TRACEABILITY
WILL BE RETESTED OR SCRAPPED AND REPLACED.

CONCLUSION

X-RAY REJECTED THERMAL SLEEVES WILL REQUIRE
COMPLETE REPLACEMENT SINCE ANY WELDING WILL
RESULT IN LOSS OF CONCENTRICITY.

ANY SUBSTANTIAL HEADER DEFECT CAN BE REPAIRED -
SUBSTANTIAL DEFECTS NOT EXPECTED.

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