Backup Calculations for Dresden Shroud Repair

Shroud Stress Report

for

Commonwealth Edison

Dresden Nuclear Power Station

Units 2 and 3

May 1995

Prepared by: _F. Shahrivar_   5.12-95
F. Shahrivar   Date

Verified by: _(signatures)_   5-12-95
M. Patel   Date
S. Hlavaty
Y. Wu
E. Mohtashemi

Approved by: _M D Potter for_   5/12/95
R.P. Svarney, GE Project Manager   Date
Quad Cities Shroud Repair Project

GE Nuclear Energy
San Jose, California

PROPRIETARY INFORMATION NOTICE

This document contains proprietary information of General Electric Nuclear Energy (GENE) and is furnished to Commonwealth Edison (ComEd) in confidence solely for the purpose or purposes stated in the transmittal letter. No other use, direct or indirect of the document or the information it contains is authorized. The recipient shall not publish or otherwise disclose it or the information to others without written consent of GENE, and shall return the document at the request of GENE.

IMPORTANT NOTICE REGARDING THE CONTENTS OF THIS REPORT

The only undertakings of GENE respecting information in this document are contained in the contract between ComEd and GENE, and nothing contained in this document shall be construed as changing the contract. The use of this information by anyone other than ComEd, or for any purpose other than that for which it is intended, is not authorized; and with respect to any unauthorized use, GENE makes no representation or warranty and assumes no liability as to the completeness, accuracy, or usefulness of the information contained in this document.

TABLE OF CONTENTS

SECTION 1: GENERAL ASSUMPTIONS AND APPROACH
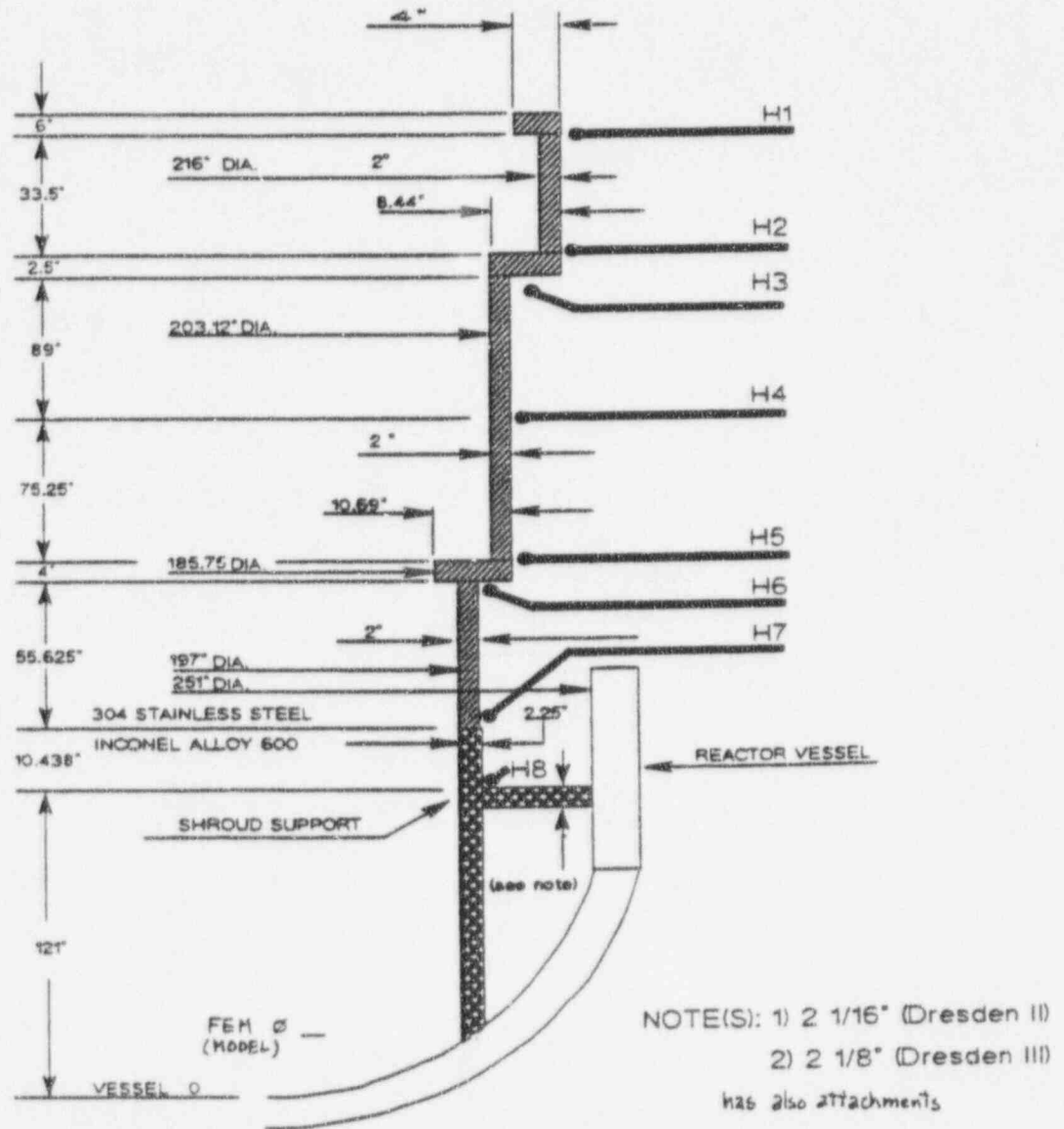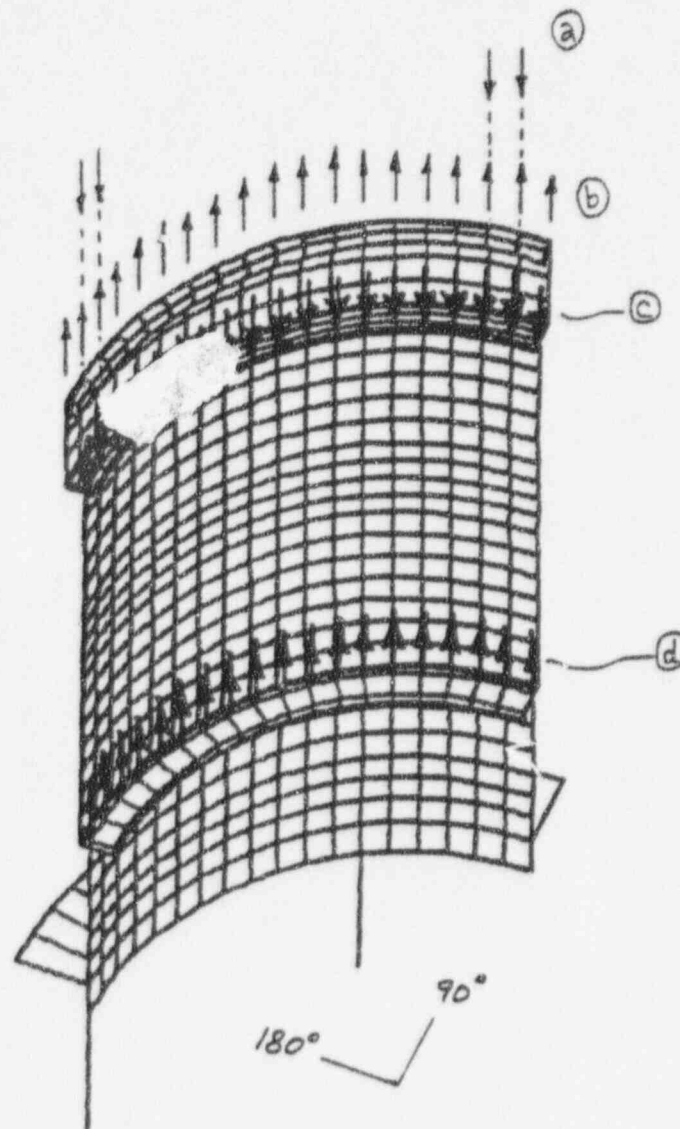
SECTION 2: THE FINITE ELEMENT MODEL

FIGURE 2.1 Basic shroud geometry and weld designations.

SECTION 3: LOADING CASES & THEIR APPLICABLE LOADS

Symmetric Half of the model

Figure 3.2. Application of Tie Rod Forces (at 4 nodes per tie rod), and Uniform Vertical Forces at the Shroud Head (distributed equally among the nodes shown), Top Guide (distributed equally among the nodes shown) and Core Plate (distributed equally among the nodes shown) Flanges.

Applied
nodal forces to
shroud head
due to Shroud Head
moment

Elevations
at which
Lateral Seismic
forces are
applied

Spring
forces

Z

X

Plan View of typ. lateral
seismic nodal forces at each
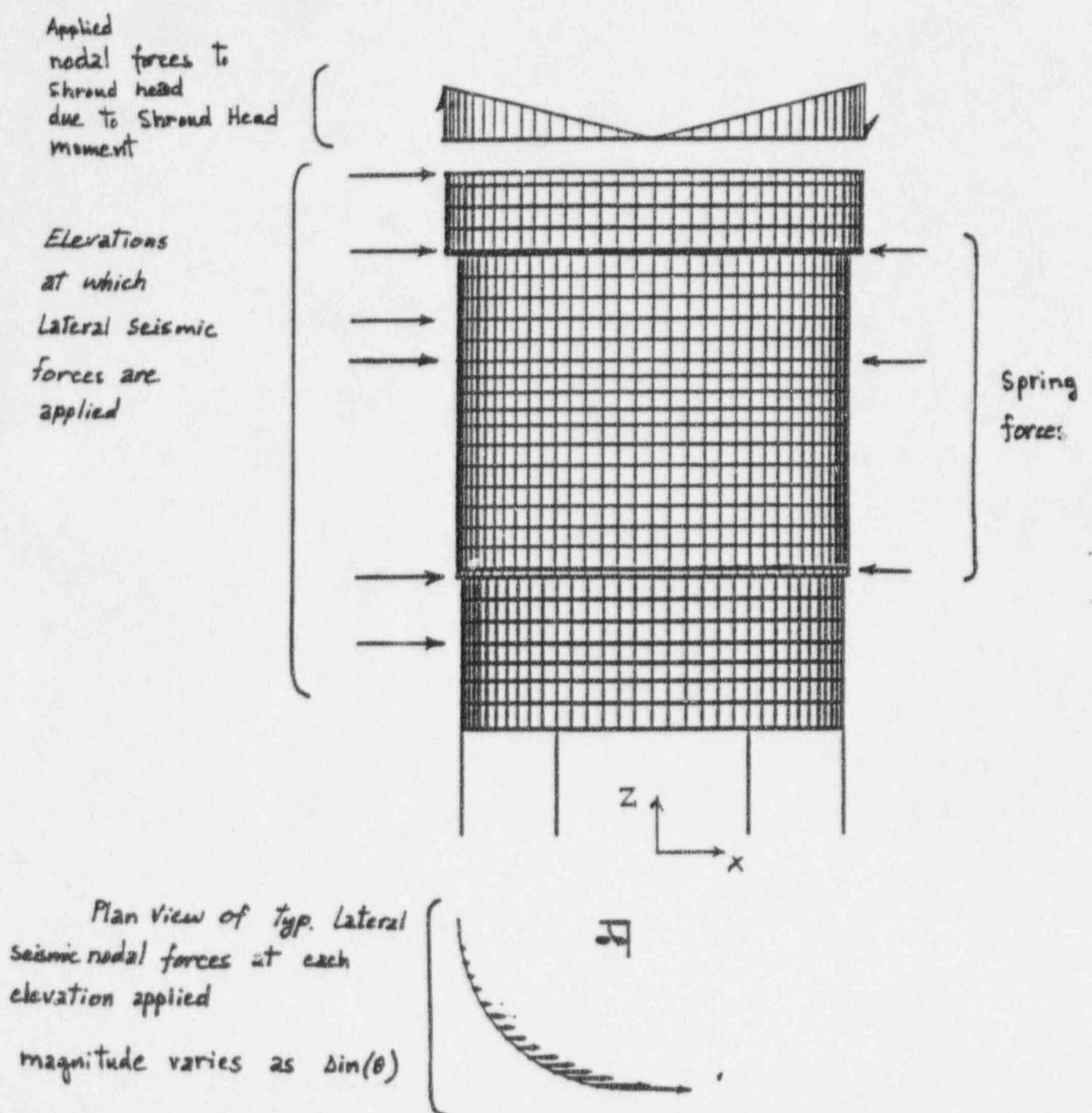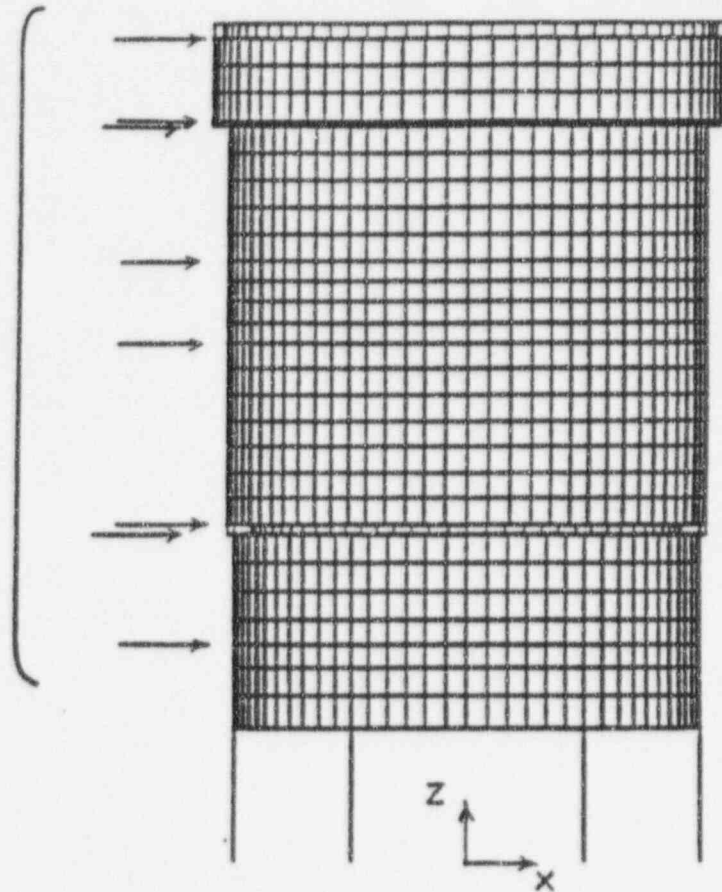elevation applied

magnitude varies as $\sin(\theta)$

Figure 3.3   Application of Seismic Lateral Forces and Moment of Shroud Head

Elevations
at which
Lateral RC LOCA
forces are
applied

Plan View of typ. Lateral
LOCA nodal forces at each
elevation applied

magnitude varies as COS(θ)

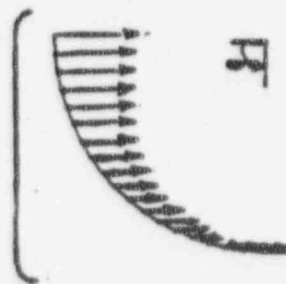Figure 3.4 Application of RC LOCA Lateral Forces.

SECTION 4: NORMAL & UPSET SEISMIC

GENE-771-82-1194
Rev. 1
DRF B13-01749

PROPRIETARY

GE Nuclear Energy

Backup Calculations for Dresden Shroud Repair - Shroud Stress Report   Page 19

SECTION 5: EMERGENCY 1

SECTION 6: EMERGENCY 2 & 3

(Emergency 2 is the limiting case due to its higher loads)

SECTION 7: FAULTED 1 & 2

(Faulted 1 is the limiting case due to its higher loads)

SECTION 8: UPSET THERMAL

APPENDIX I: EFFECTIVE STIFFNESS

FOR COMBINED

SHROUD (SHELL) & MIDDLE SPRING

APPENDIX II: CORE-PLATE WEDGE DESIGN

PAGES 60 THROUGH 62
INTENTIONALLY LEFT BLANK

APPENDIX III: ANALYSIS RUN IDENTIFICATIONS

PAGES 67 THROUGH 68
INTENTIONALLY LEFT BLANK

APPENDIX IV: H8 WELD ANALYSIS

APPENDIX V: SHROUD FLANGE SUPPORTING TIEROD

APPENDIX VI: GAP AT A CRACKED H6 WELD

REFERENCES

1. DRF B13-01749, Section E.1, 1995.

2. "Dresden Nuclear Power Station Units 2 & 3 Shroud and Shroud Repair Hardware Analysis for the repair of Welds H1 through H7", Vol. II: Shroud, Stress Report for Commonwealth Edison Co., GENE-771-81-1194, Rev. 1, May 1995.

Enclosure 8

GENE-771-83-1194, Revision 1

Commonwealth Edison Company
Dresden Nuclear Power Plant Units 2 & 3
Shroud and Shroud Repair Hardware Analysis
Shroud Repair Hardware Backup Calculation

General Electric Nuclear Company Proprietary Information