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

JUN 4 1981

Docket No. 50-341

APPLICANT: DETROIT EDISON COMPANY

FACILITY: Fermi 2

SUBJECT: SUMMARY OF MAY 20, 1981 OL REVIEW MEETING REGARDING MARK I CONTAINMENT STRUCTURAL ANALYSIS

The purpose of the meeting was to discuss applicant's interim evaluation of the modified design of the Fermi 2 containment and associated piping systems. Applicant's representatives were L. Schuerman, D. Lehnert, A. Higgnbotham (Nutech) and N. Edwards. NRC staff present were C. P. Tan, P. T. Kuo, D. Terao, and L. Kintner. A copy of the slides used in the meeting is enclosed.

The applicant had submitted an interim Plant Unique Analysis (PUA) that did not consider the condensation oscillation load prior to the issuance of staff's load definition report (NUREG-0661). The current calculations as presented in the meeting include the condensation oscillation load and its effects on the containment. A mitered joint saddle structure has been added to the torus to accommodate the condensation oscillation load. The saddle structure is welded to the torus and bolted to the basemat. (See page 10 of Enclosure)

The staff requested that the results of the current interim PUA analysis as presented in the meeting be submitted by the end of May 1981, including a comparison of loads and criteria with those in NUREG-0661. Staff also requested that a fatigue analysis of safety/relief valve discharge piping in the air space of the wet well be made.

The staff stated that the final Plant Unique Analysis would be reviewed by the same staff groups that will review operating BWRs. However the schedule must be compatible with the licensing schedule. Therefore staff requested

A

that the Plant unique Analysis be submitted prior to March 1, 1982 to allow time for review prior to issuing the operating license. Subsequent to this meeting and a meeting with the BWR Mark I Owners Group, staff recognized that the analysis of attached piping must be done after the torus analysis is completed and changed the requested submittal date to May 1, 1982.

L. L. Kintner, Project Manager
Licensing Branch No. 1
Division of Licensing

Enclosure:
As stated

cc: See next page

Mr. Harry Tauber
Vice President
Engineering & Construction
Detroit Edison Company
2000 Second Avenue
Detroit, Michigan 48226

cc: Eugene B. Thomas, Jr., Esq.
LeBoeuf, Lamb, Leiby & MacRae
1333 New Hampshire Avenue, N. W.
Washington, D. C. 20036

Peter A. Marquardt, Esq.
Co-Counsel
The Detroit Edison Company
2000 Second Avenue
Detroit, Michigan 48226

Mr. William J. Fahrner
Project Manager - Fermi 2
The Detroit Edison Company
2000 Second Avenue
Detroit, Michigan 48226

Mr. Larry E. Schuerman
Detroit Edison Company
3331 West Big Beaver Road
Troy, Michigan 48084

David E. Howell, Esq.
21916 John R
Hazel Park, Michigan 48030

Mr. Bruce Little
U. S. Nuclear Regulatory Commission
Resident Inspector's Office
6450 W. Dixie Highway
Newport, Michigan 48166

Dr. Wayne Jens
Detroit Edison Company
2000 Second Avenue
Detroit, Michigan 48226

Enclosure

EDISON/NRC MEETING - 5-19-81
EF-2 TORUS MODIFICATION PROGRAM
OVERVIEW

- EDISON APPROACH FOR RESOLUTION OF THE MARK I CONTAINMENT PROGRAM.

- INTERIM PUA VERSUS STP

- CURRENT STATUS

- DISCUSSION TOPICS
  - C/O LOAD EVALUATION
  - POOL SWELL VENT SYSTEM IMPACT
  - FATIGUE ASSESSMENT
  - PIPING

- NEED FOR SUBMITTAL PACKAGE

EDISON APPROACH FOR RESOLUTION OF THE MARK I CONTAINMENT PROGRAM

- INTERIM PUA - EXCEEDED THE STP CRITERIA - REQUIRED EXTENSIVE STRUCTURAL MODIFICATIONS.

- INTERIM PUA MODIFICATIONS CONTINUALLY RE-EVALUATED AS GENERIC PROGRAM INFORMATION (LDR, NRC ACCEPTANCE CRITERIA) MADE AVAILABLE.

- SOME MODIFICATIONS REDESIGNED TO MAINTAIN HIGH POTENTIAL FOR SATISFYING LTP ACCEPTANCE CRITERIA (EXAMPLES: SADDLES, VENT LEADER DEFLECTOR).

- ALL CURRENTLY IDENTIFIED MODIFICATIONS INSTALLED BY FUEL LOAD.

- LTP-PUA ACTIVITIES HAVE BEEN INITIATED - REPRESENTS A SUBSTANTIAL EFFORT (100,000 MANHOURS) - THEREFORE, EDISON HAS BEEN AWAITING FINALIZATION OF THE CRITERIA BEFORE PROCEEDING "FULL SPEED AHEAD."

- LTP-PUA ANALYTICAL ACTIVITIES (NOT REQUIRING TEST DATA) COMPLETE BY AUGUST, 1982.

- SUBMITTAL TO STAFF WILL BE MADE IN SEPTEMBER, 1982.

EDISON PROGRAM CONSISTENT WITH OTHER MARK I UTILITIES

- EDISON AN ACTIVE PARTICIPANT OF THE MARK I GENERIC PROGRAM - THEREBY PROVIDING AMPLE OPPORTUNITY TO CONTINUALLY EVALUATE CONTENT OF OUR APPROACH AND ITS PROGRESS.

- EDISON'S PROGRESS ON THE LTP-PUA IN TUNE WITH OTHER MARK I UTILITIES.

- MODIFICATIONS BEING INSTALLED AT OTHER MARK I PLANTS OF THE SAME NATURE AS THOSE ALREADY INSTALLED OR BEING INSTALLED AT FERMI-2.

INTERIM PUA VERSUS STP

	STP	INTERIM PUA
I. LOADS	D.L. (STEEL) L.L. (WATER) SEISMIC POOLSWELL	D.L., L.L. & SEISMIC P.S., CHUGGING & SRV P.S. IMPACT P.S. FROTH & FALLBACK V.S. THRUST, LATERAL & INTERNAL PRESSURE SUBMERGED STRUCTURE DRAG LOADS SRV PIPING TRANSIENT LOADS
II. LOAD COMBINATIONS	D.L. + SEISMIC + POOLSWELL (DBA)	SECTION 4.2 OF INTERIM PUA DOCUMENTS COMBINATIONS FOR DLS, P.S., SRV, CGG, & THERMAL
III. ACCEPTANCE CRITERIA	FACTOR OF SAFETY OF 2 AGAINST FAILURE	CODE ALLOWABLE - FACTOR SAFETY OF APPROXIMATELY 4 AGAINST FAILURE

ENRICO FERMI 2 TORUS MODIFICATION PROGRAM
MODIFICATION DESCRIPTION AND STATUS

MODIFICATION	STATUS
D.C. to V.H. Intersection Stiffening	I.C.
Downcomer Truss	I.C.
V.L. to V.H. Intersection Stiffening	I.C.
V.H. Supports	I.C.
D.C. Shortened to 3' Submergence	I.C.
V.H. Deflector	I.C.
Monorail Supports	I.C.
Spray Header Supports	I.C.
Catwalk Frame and Supports	I.C.
Column to Shell Connection	I.C.
Mitered Joint Saddle	F&I
V.B. Penetration Stiffening	I.C.
Additional Torus Internal Piping Supports	I.C.
V.B. Nitrogen Line Routing and Supports	I.C.
V.B. Electrical Conduit Routing and Supports	I.C.
Thermocouple Conduit Routing and Supports	I.C.
Reroute SRV Piping in the Wetwell	I.C.
Stiffening for SRV Penetration V.L.	I.C.
SRV V.H. and V.L. Pipe Supports	I.C.
SRV Quenchers and Supports	P.O.

* I.C. - Installation Complete

F&I - Fabrication and Installation currently proceeding

P.O. - Purchase Order for material, fabrication and delivery to be issued shortly

TODAY'S DISCUSSION TOPICS

- o C/O LOAD EVALUATION
- o POOLSWELL VENT SYSTEM IMPACT
- o FATIGUE ASSESSMENT
- o PIPING

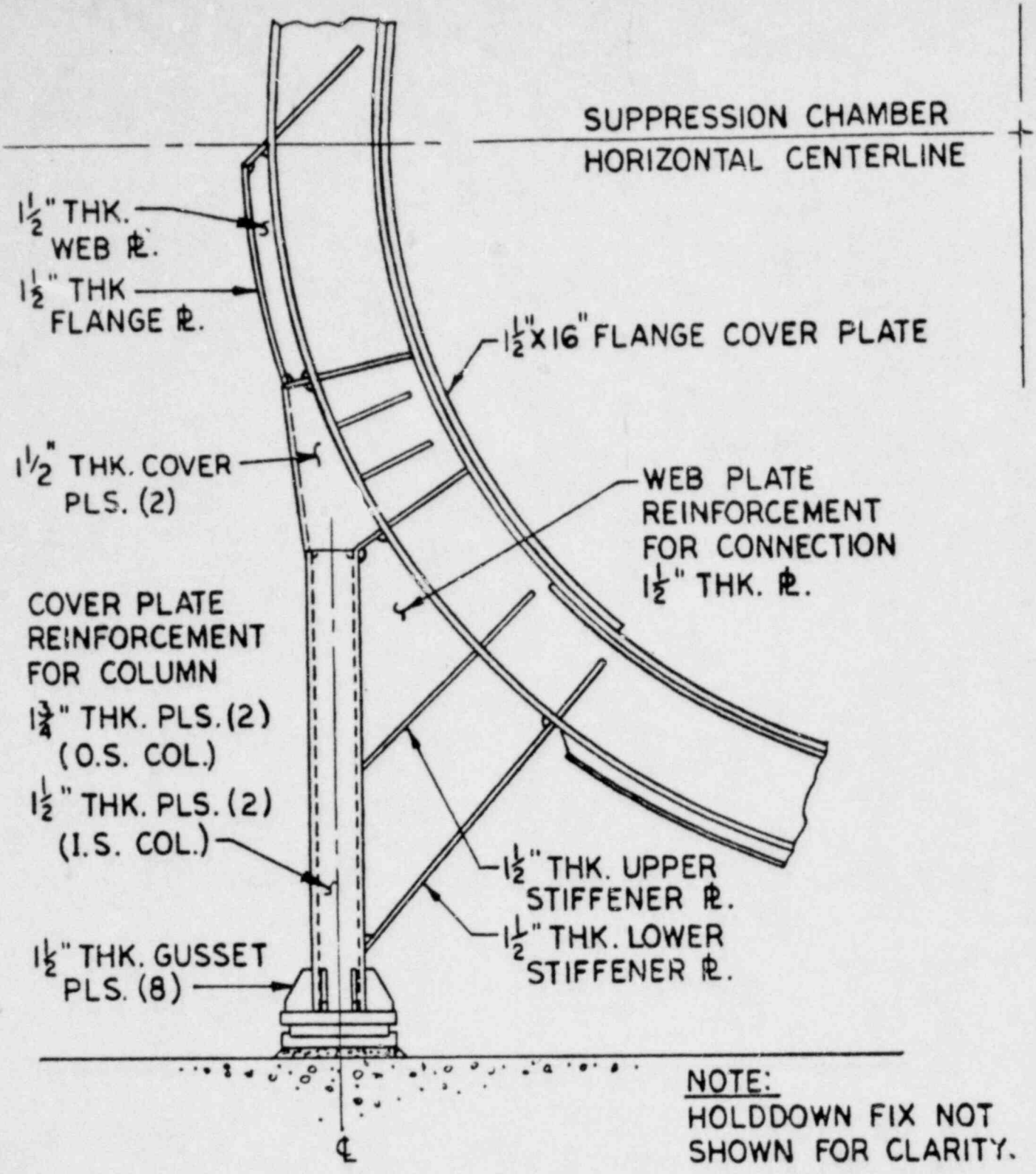
CONDENSATION OSCILLATION LOADS ASSESSMENT - OVERVIEW

- O INTERIM ANALYSIS LIMITED TO DOWNCOVER LATERAL LOADS.
  - LOAD DEFINITION ONLY RECENTLY FINALIZED

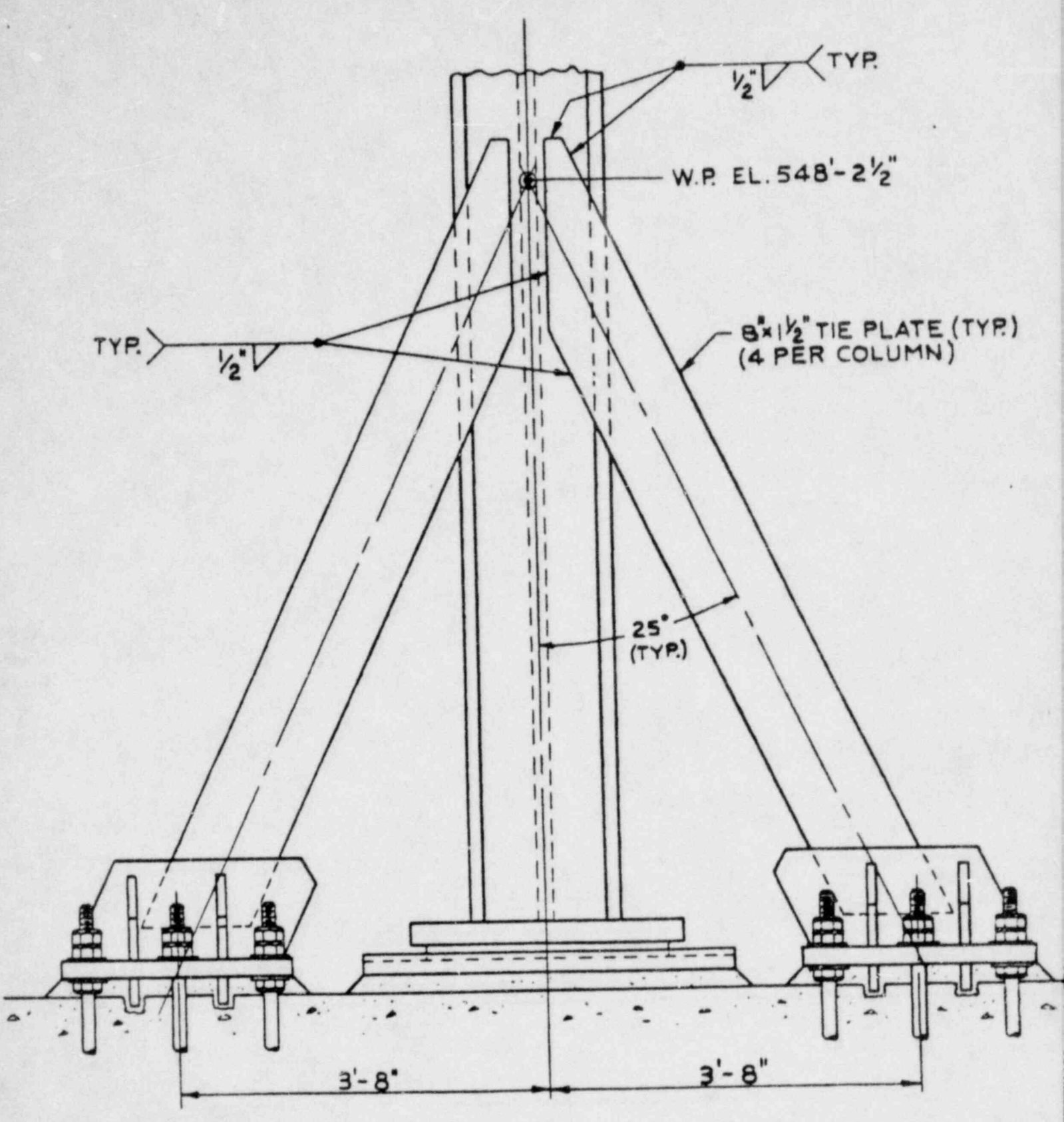
- O LTP DEFINITION OF THE SUPPRESSION CHAMBER C/O LOAD HAS BEEN ASSESSED.
  - USING ANALYSIS RESULTS FROM OTHER SIMILAR MARK I PLANTS.
  - USING ANALYSIS RESULTS FROM SIMPLIFIED FERMI ANALYTICAL MODELS.
  - ASSESSMENT RESULTED IN MODIFICATIONS TO SUPPORT SYSTEM, I.E., MITERED JOINT SADDLES.
  - SUBSEQUENT ASSESSMENT WITH SADDLES SHOWED SUFFICIENT SUPPORT SYSTEM CAPACITY EXISTS.

- O ASSESSMENT OF DOWNCOMER LATERAL LOADS SHOWED INTERIM LOADS ENVELOP LTP LOADS.

- O COMPLETE EVALUATION OF C/O INCLUDED IN PUA.
  - PUA NOW UNDERWAY.



COLUMN TO SHELL CONNECTION



SUPPRESSION CHAMBER COLUMN ANCHORAGE

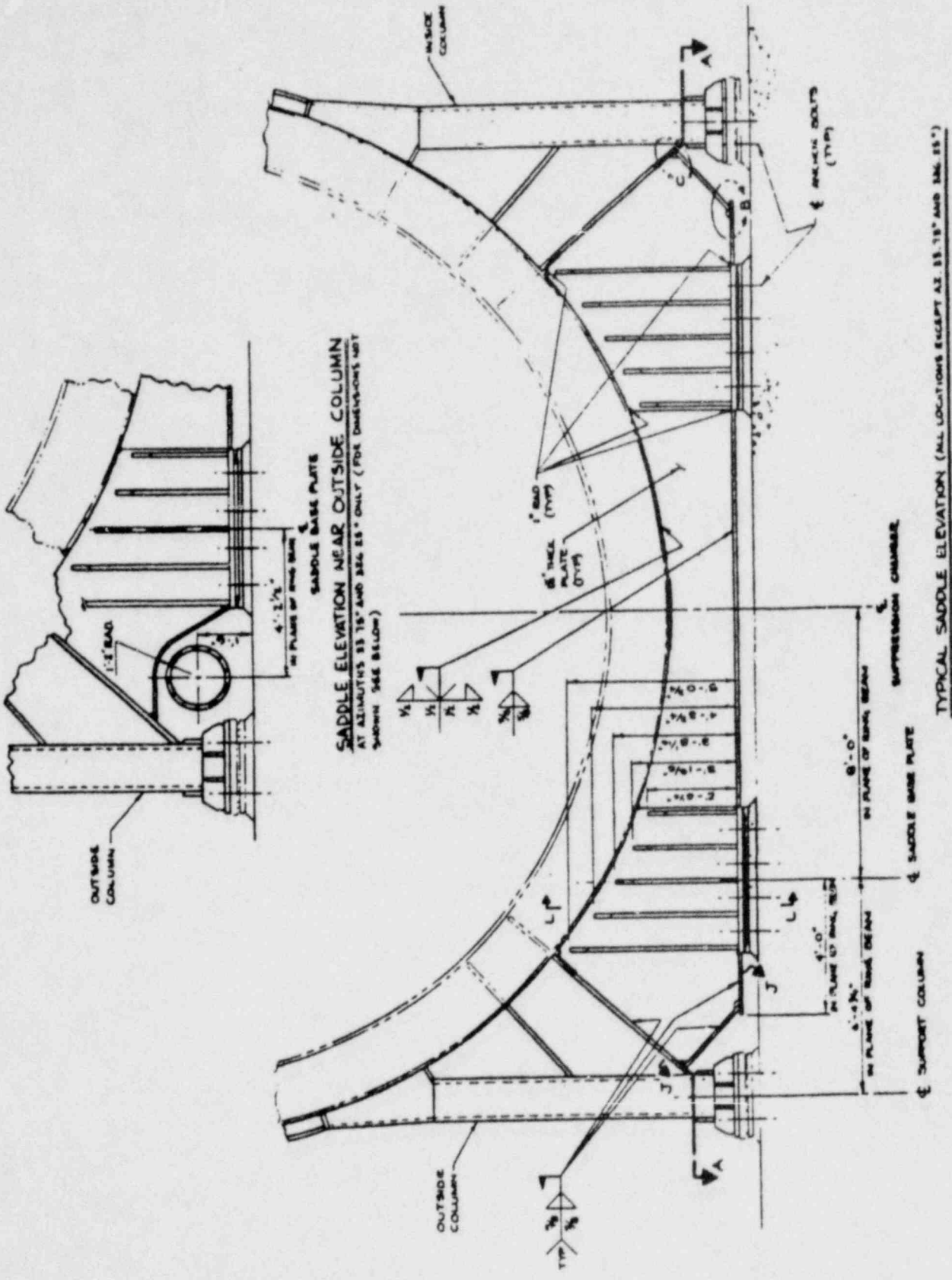


FIGURE 1
PRELIMINARY MITERED JOINT SADDLE DESIGN

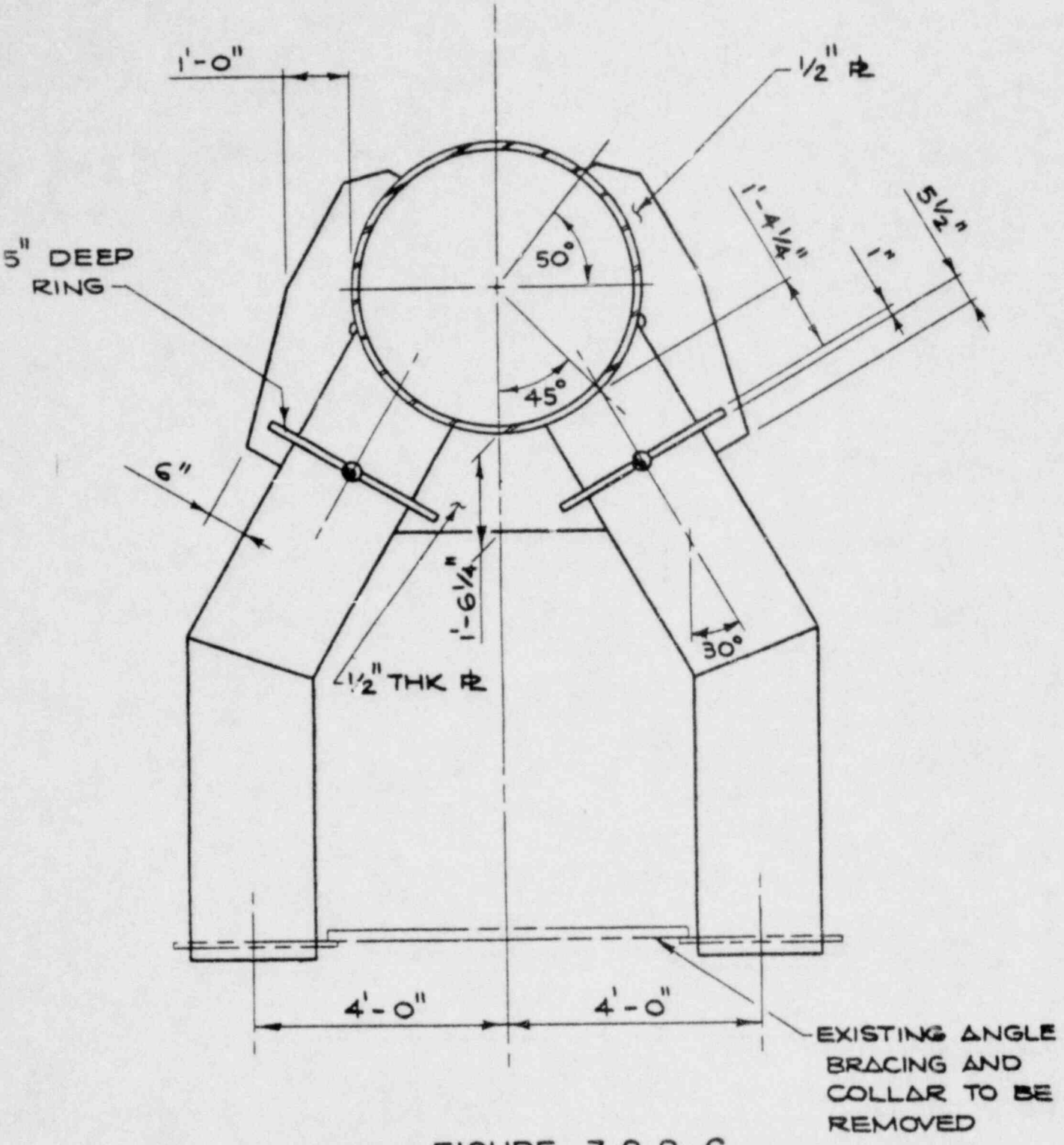
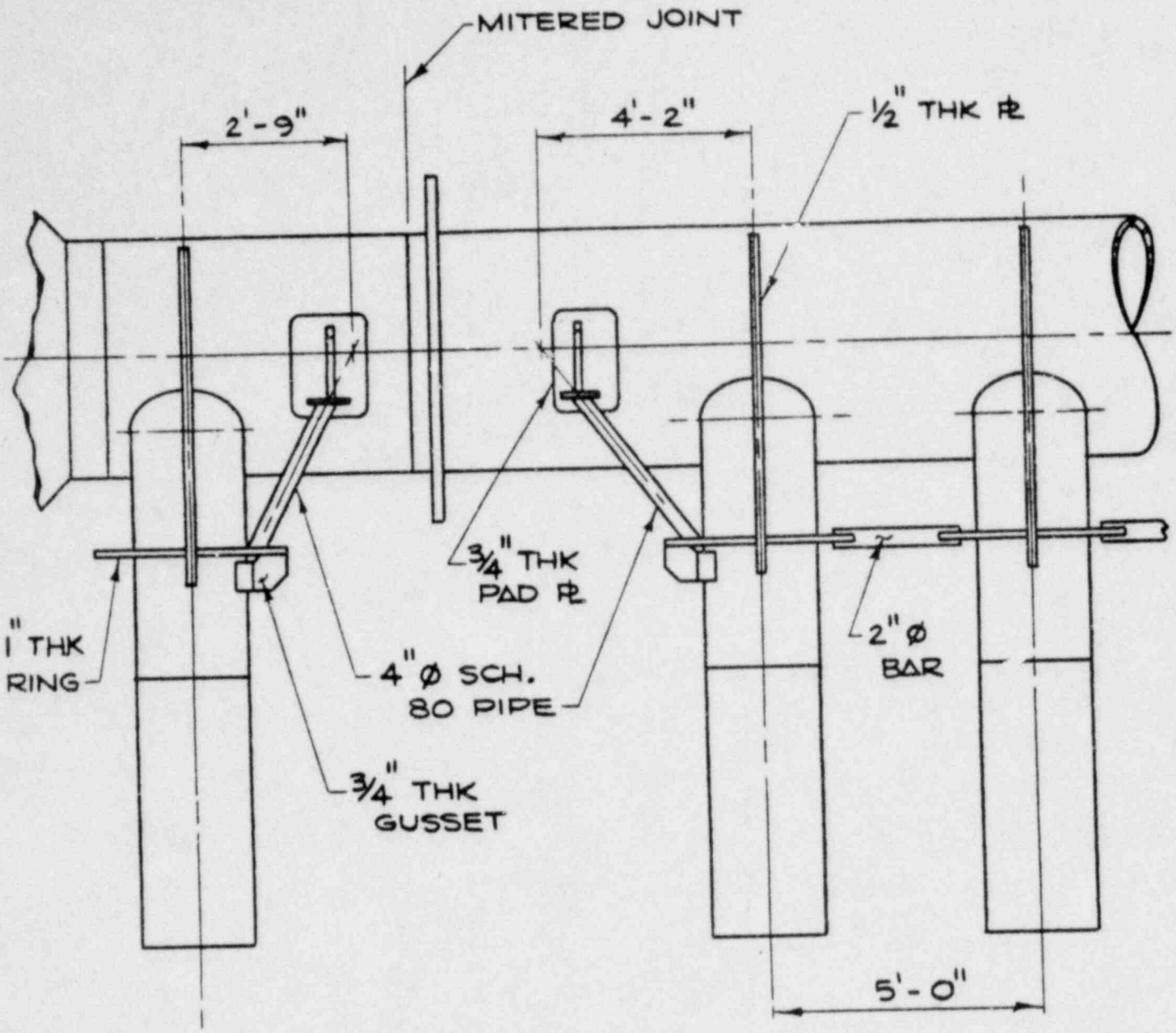


FIGURE 3.2.2-6

DOWNCOMER TO VENT HEADER

INTERSECTION STIFFENING

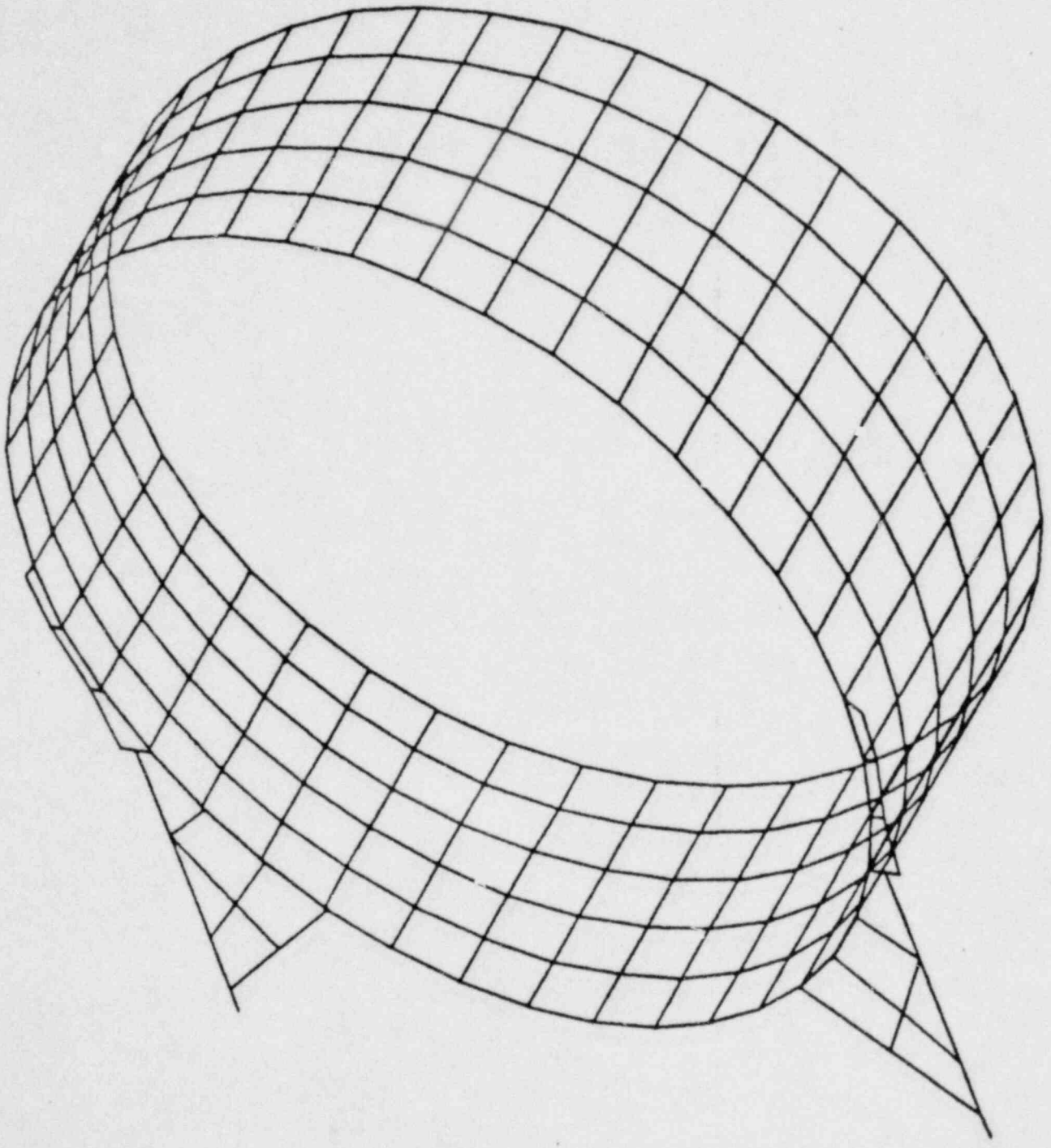


NOTES:

1. VIEW DEVELOPED NORMAL TO AXES OF V.H. AND DOWNCOMER.
2. V.H. SUPPORT COLUMN DETAILS NOT SHOWN FOR CLARITY.

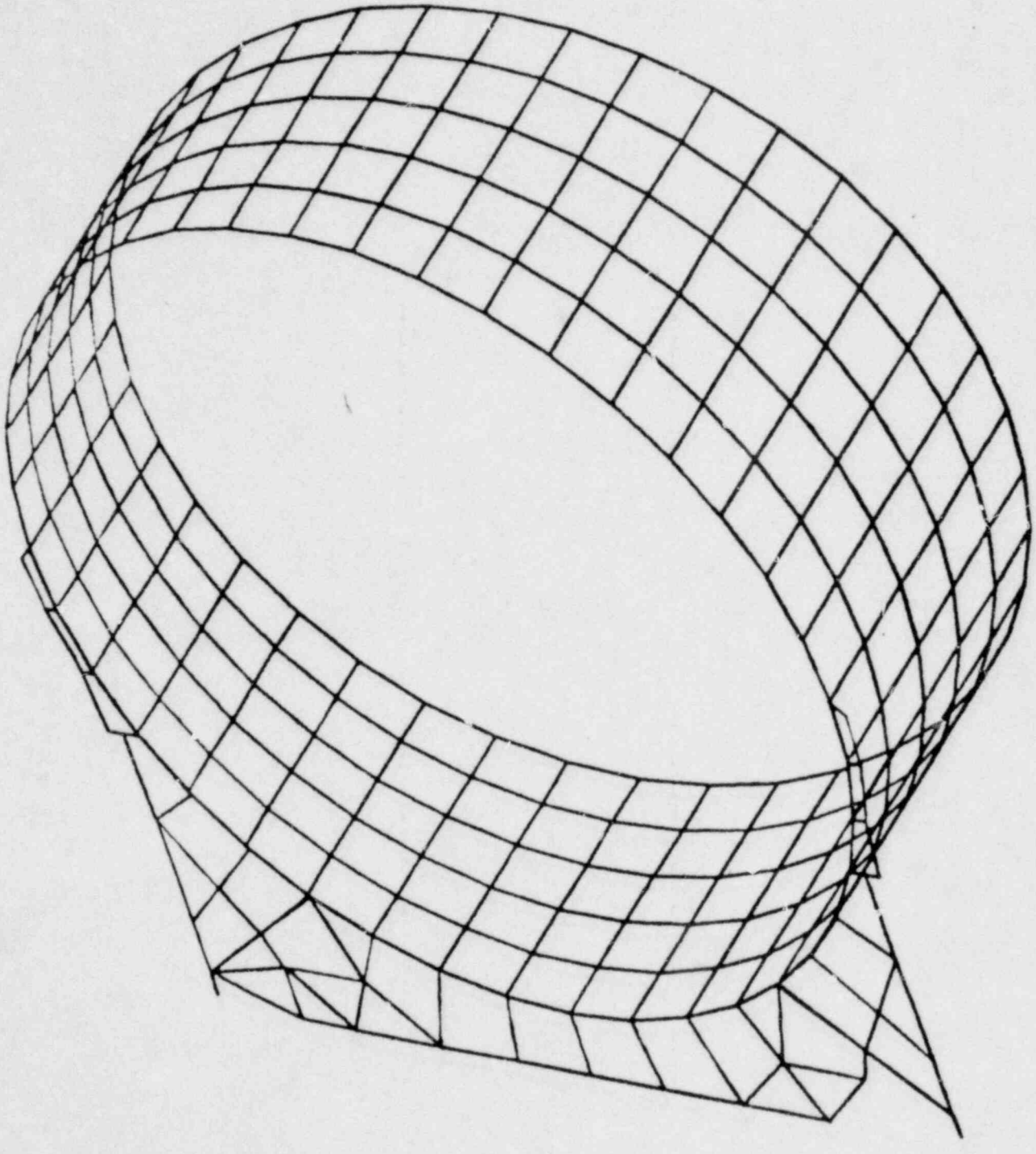
FIGURE 3.2.2-5

DOWNCOMER TRUSS



FERMI II - 1/32 SEGMENT MODEL

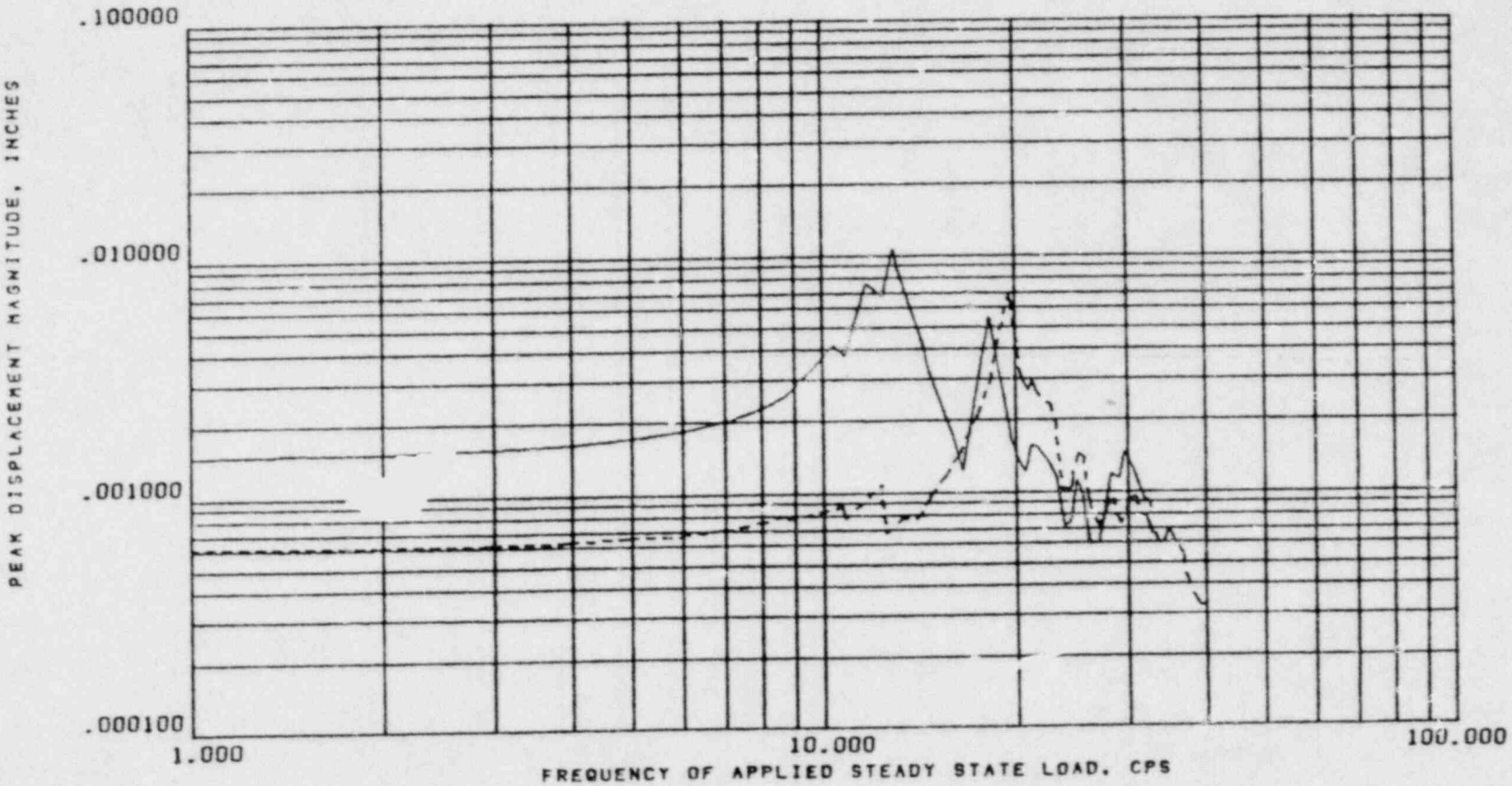
INTERIM DESIGN SUPPORT SYSTEM



FERMI II - 1/32 SEGMENT MODEL

MITERED JOINT SADDLE STRUCTURE

ENRICO FERMI NUCLEAR GENERATING PLANT
STEADY STATE STRUCTURAL RESPONSE
FOR 1 PSI CONDENSATION OSCILLATION LOADING
TOP OF OUTSIDE COLUMN (NODE 290) VERTICAL DISPLACEMENT



FIGURE

———PEAK DYNAMIC DISPLACEMENT, AS BUILT--SLIDER
- - - - - - -PEAK DYNAMIC DISPLACEMENT, SADDLE-SLIDER

SUPPRESSION CHAMBER C/O LOAD ASSESSMENT RESULTS

- O STEADY STATE RESPONSE OF FERMI SUPPRESSION CHAMBER IMPROVED WITH MITERED JOINT SADDLE.
  - DOMINANT STRUCTURE FREQUENCY INCREASED BY $\sim$ 60%
  - COLUMN LOAD AMPLITUDES DECREASED $\sim$ 45%

- O SUMMATION OF C/O LOAD HARMONICS RESULTS IN TOTAL VERTICAL REACTION OF $\sim \pm$ 1550 KIPS.

SUPPRESSION CHAMBER SUPPORT SYSTEM CAPACITIES FOR C/O LOADS

- INTERIM PUA SUPPORT SYSTEM CAPACITIES
  - UPWARD LOAD 800 KIPS
  - DOWNWARD LOAD 1400 KIPS

- SUPPORT SYSTEM CAPACITIES WITH SADDLE
  - UPWARD LOAD 2000 KIPS
  - DOWNWARD LOAD 3000 KIPS

- REACTIONS CAUSED BY C/O LOADS ARE LESS THAN SADDLE SUPPORT SYSTEM CAPACITIES.

DOWNCOMER C/O LOADS ASSESSMENT RESULTS

- MAGNITUDE OF DOWNCOMER LATERAL LOADS USED IN INTERIM PUA ENVELOP LTP LOADS.
  - LTP PRESSURE MAGNITUDE $\sim$ 12.1 PSI
  - EQUIVALENT INTERIM PUA PRESSURE MAGNITUDE $\sim$ 26.5 PSI

- LTP DOWNCOMER LATERAL LOAD DISTRIBUTIONS SIMILAR TO THOSE USED IN INTERIM PUA.

- PRELIMINARY ASSESSMENT SHOWS DOMINANT DOWNCOMER FREQUENCY GREATER THAN DOMINANT LOAD FREQUENCY.

- VENT SYSTEM STRESSES RESULTING FROM C/O DOWNCOMER LATERAL LOADS COMPUTED IN INTERIM PUA ARE EXPECTED TO ENVELOP THE STRESSES COMPUTED USING LTP LOADS.

CONDENSATION OSCILLATION LOAD ASSESSMENT CONCLUSIONS

- ADDITION OF MITERED JOINT SADDLE IS EXPECTED TO PROVIDE LONG TERM SOLUTION FOR LTP SUPPRESSION CHAMBER.
  - RAISES DOMINANT STRUCTURE FREQUENCIES BEYOND MAXIMUM LOAD FREQUENCIES THEREFORE LOWERS RESPONSE.
  - MORE EVENLY DISTRIBUTES LOADS THEREFORE REDUCTIONS IN LOCAL STRESSES ANTICIPATED.
  - MORE THAN DOUBLES SUPPORT SYSTEM CAPACITY.

- DOWNCOMER STIFFENING SYSTEM EXPECTED TO BE ADEQUATE FOR LTP DOWNCOMER C/O LOADS.

POOLSWELL IMPACT OF THE VENT SYSTEM - OVERVIEW

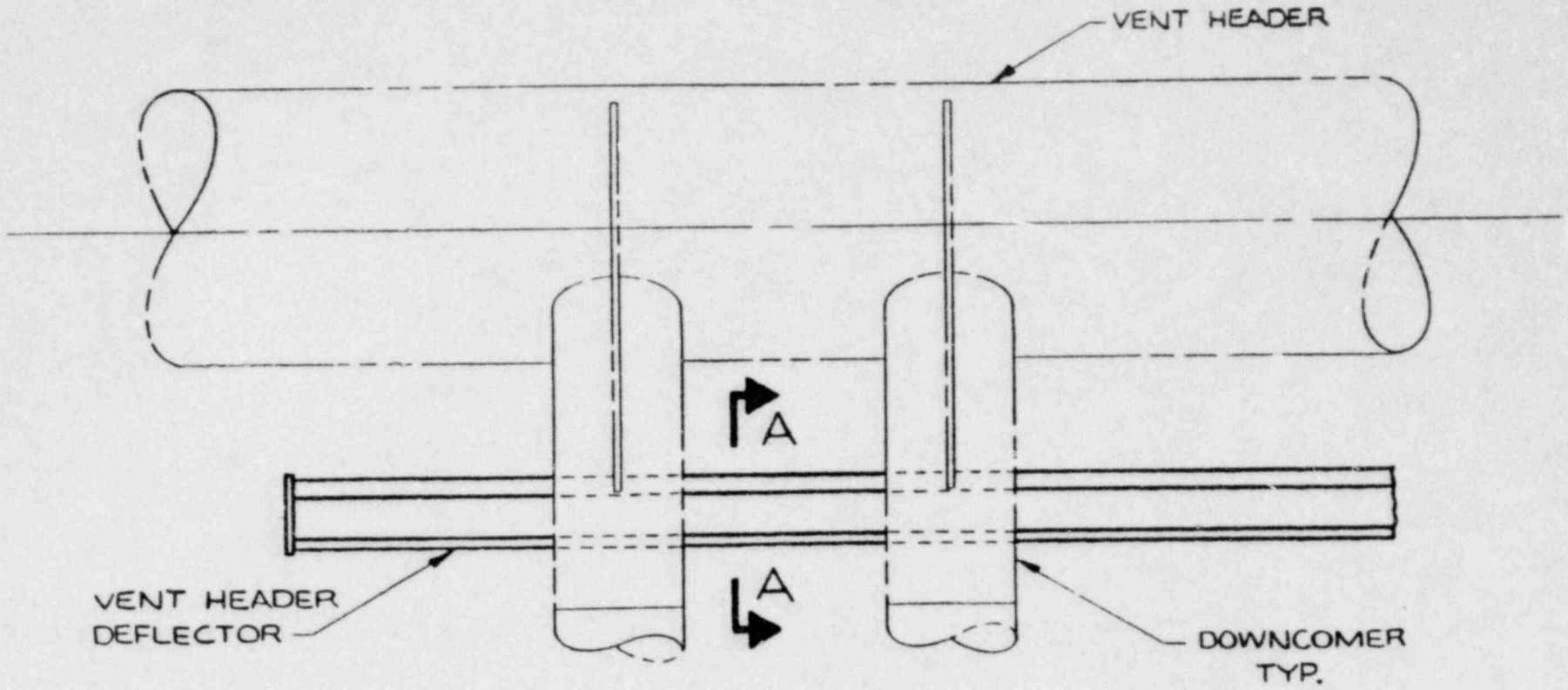
- O SOME AREAS OF VENT SYSTEM OVERSTRESSED FOR INTERIM ANALYSIS POOLSWELL LOADS.

- O GENERIC EFFORTS PREDICT HIGH LOCAL VENT HEADER STRESSES DUE TO POOLSWELL IMPACT.

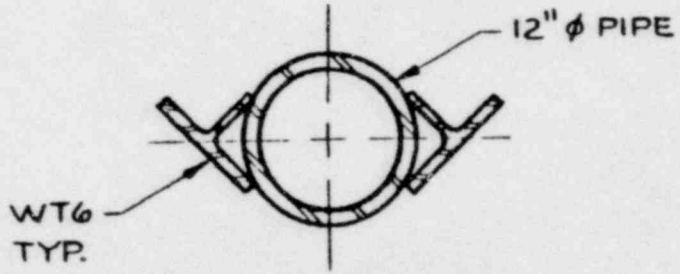
- O DECISION WAS MADE TO ADD VENT HEADER DEFLECTOR.
  - QUARTER SCALE TESTS SHOW DEFLECTOR EFFECTIVELY MITIGATES HIGH LOCAL STRESSES.

- O ASSESSMENT OF POOLSWELL LOADS SHOWED INTERIM LOADS ENVELOP LTP LOADS.

- O COMPLETE EVALUATION OF POOLSWELL INCLUDED IN PUA.
  - PUA NOW UNDERWAY.



ELEVATION VIEW



SECTION A-A

FIGURE 2

VENT HEADER DEFLECTOR MODIFICATION

DET-01-349
JLB-81-025

VENT SYSTEM ASSESSMENT WITH VENT HEADER DEFLECTOR

- O POOLSWELL IMPACT ACCOUNTS FOR MORE THAN HALF OF TOTAL COMPUTED STRESS IN THE INTERIM PUA.

- O INTERIM ANALYSIS POOLSWELL LOADS.
  - MAXIMUM PRESSURE OF 15.1 PSI.
  - TOTAL APPLIED LOAD OF 200 KIPS.
  - FLAT POOL ASSUMED.

- O LTP POOLSWELL LOADS (TAKEN FROM PULD).
  - MAXIMUM PRESSURE OF 12.0 PSI.
  - TOTAL APPLIED LOAD OF 75 KIPS.
  - POOL PROFILE LESS CRITICAL.

- O VENT SYSTEM STRESSES RESULTING FROM POOLSWELL IMPACT LOADS COMPUTED IN INTERIM PUA ARE EXPECTED TO ENVELOP THE STRESSES COMPUTED USING LTP LOADS.

LOADS CONTRIBUTION DETERMINED IN THE INTERIM - PUA

Stress/Area	Total Stress (KSI)	D.L.	Seismic (%)	Pool Swell (%)	SRV (%)	V.S. Disc. Thrust (%)	Int. Pressure (%)
Membrane/ Vent Header Near Vent Line	22.0	1	3	53	29	10	4
Membrane/ Vent Header Near Mitered Joint	22.0	3	2	63	17	13	2

FATIGUE ASSESSMENT

- O COMPREHENSIVE BASIS FOR EVALUATING FATIGUE NOT AVAILABLE AT TIME OF INTERIM PUA.

- O EMPHASIS OF INTERIM PUA PLACED ON SHORT TERM SAFETY NOT LONG TERM EFFECTS SUCH AS FATIGUE.
  - CONSISTENT WITH STP APPLIED TO OPERATING MARK I'S.

- O NO EVIDENCE OF FATIGUE PROBLEMS ENCOUNTERED AT FSTF.

- O NO EVIDENCE OF FATIGUE PROBLEMS ENCOUNTERED IN OPERATING MARK I'S.

- O FATIGUE EFFECTS FULLY ADDRESSED IN PUA.
  - NOW UNDER WAY.

INTERIM PUA FATIGUE ASSESSMENT

- FOR CHUGGING THE PREDICTED LOAD DURATION AND FREQUENCY IDENTIFIED 6000 STRESS CYCLES.

- COULD ACCOMMODATE 2000 SRV ACTIVATIONS BEFORE ATTAINING A USEAGE FACTOR OF 1.0.

- BASED ON OPERATING HISTORY OF OTHER PLANTS 2000 ALLOWABLE SRV ACTUATIONS EXPECTED TO EXCEED ANTICIPATED SRV ACTUATIONS OVER 40 YEAR PLANT LIFE.

EF2 TORUS ATTACHED PIPING

- SCHEDULE FOR PIPING REQUIRED ANALYSES TO BE PERFORMED BEFORE TORUS LOADS AND TORUS ANALYSES FINALIZED.

- STATIC DISPLACEMENT OF 0.25 INCHES INCLUDED IN EQUATION 9 FOR UPSET AND EMERGENCY ALLOWABLES.
  - CONSISTENT WITH STATIC ANALYSIS APPROACH FOR SEISMIC LOADS.
  - BASED ON AVAILABLE ANALYTICAL DATA FOR POOLSWELL LOADS.
  - COMBINED WITH SEISMIC INERTIA BY ABSOLUTE SUM.

- INTERNAL PIPING EVALUATED FOR SUBMERGED STRUCTURES LOADS.

MEETING SUMMARY DISTRIBUTION

JUN 4 1981

Docket File
NRC PDR
Local PDR
TIC/NSIC/Tera
N. Hughes
LB#1 Reading
H. Denton
E. Case
D. Eisenhut
R. Purple
B. J. Youngblood
A. Schwencer
F. Miraglia
J. Miller
G. Lainas
R. Vollmer
J. P. Knight
R. Bosnak
F. Schauer
R. E. Jackson LKintner
Project Manager
Attorney, OELD
M. Rushbrook
OIE (3)
ACRS (16)
R. Tedesco

NRC Participants:

CPTan, PTKuo, DTerao, and LKintner

G. Lear
WJohnston
S. Pawlicki
V. Benaroya
Z. Rosztoczy
W. Haass
D. Muller
R. Ballard
W. Regan
D. Ross
P. Check
Chief, Power Systems Branch
O. Parr
F. Rosa
W. Butler
W. Kreger
R. Houston
Chief, Radiological Assessment Branch
L. Rubenstein
T. Speis
MSrinivasan
J. Stolz
S. Hanauer
W. Gammill
T. Murley
F. Schroeder
D. Skovholt
M. Ernst
R. Baer
C. Berlinger
K. Kniel
G. Knighton
A. Thadani
D. Tondi
J. Kramer
D. Vassallo
P. Collins
D. Ziemann

bcc: Applicant & Service List