LICENSEE EVENT REPORT

CONTROL BLOCK: (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

LICENSEE CODE (2)	I L L S C 1
LICENSE NUMBER (3)	0 0 - 0 0 0 0 0 - 0 0
LICENSE TYPE (4)	4 1 1 0 0 0
CAT (5)	
REPORT SOURCE (6)	L
DOCKET NUMBER (7)	0 5 0 0 0 3 7 3
EVENT DATE (8)	0 7 2 2 8 2
REPORT DATE (9)	

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

On 7/23/82 Commonwealth Edison notified NRC Region III and NRR personnel of a potential 10CFR50(55E) assessment involving post LOCA chugging phenonena with suppression chamber to Drywell Vacuum Breakers. After reviewing tests of similar valves Commonwealth Edison has concluded that LaSalle County vacuum breaker valves are adequate and will perform their intended safety function.

SYSTEM CODE (11)	S D
CAUSE CODE (12)	B
CAUSE SUBCODE (13)	A
COMPONENT CODE (14)	V A L V E X
COMP. SUBCODE (15)	C
VALVE SUBCODE (16)	C
LER/RO REPORT NUMBER (17) — EVENT YEAR	8 2
SEQUENTIAL REPORT NO.	0 6 5
OCCURRENCE CODE	0 1
REPORT TYPE	T
REVISION NO.	0
ACTION TAKEN (18)	Z
FUTURE ACTION (19)	X
EFFECT ON PLANT (20)	Z
SHUTDOWN METHOD (21)	Z
HOURS (22)	0 0 0 0
ATTACHMENT SUBMITTED (23)	Y
NPRD-4 FORM SUB. (24)	N
PRIME COMP. SUPPLIER (25)	A
COMPONENT MANUFACTURER (26)	G 2 0 2

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

Written response of this potential 10CFR50(55E) will be issued.
Additional tests will be conducted on a full size LaSalle County valve as described in letter from L. DelGeorge to H. Denton, dated 7/26/82.

FACILITY STATUS (28)	B
% POWER (29)	0 0 3
OTHER STATUS (30)	NA
METHOD OF DISCOVERY (31)	D
DISCOVERY DESCRIPTION (32)	NLA Review
ACTIVITY RELEASED (33)	Z
CONTENT OF RELEASE (34)	Z
AMOUNT OF ACTIVITY (35)	NA
LOCATION OF RELEASE (36)	NA
PERSONNEL EXPOSURES NUMBER (37)	0 0 0
TYPE (38)	Z
DESCRIPTION (39)	NA
PERSONNEL INJURIES NUMBER (40)	0 0 0
DESCRIPTION (41)	NA
LOSS OF OR DAMAGE TO FACILITY TYPE (42)	Z
DESCRIPTION (43)	NA
PUBLICITY ISSUED (44)	N
DESCRIPTION (45)	NA

8209160518 820805
PDR ADOCK 05000373
S PDR

NRC USE ONLY

NAME OF PREPARER Dale B. Wint[illegible] PHONE:

I. LER NUMBER: 82-065/01T-0

II. LASALLE COUNTY STATION: UNIT 1

III. DOCKET NUMBER: 050-373

IV. EVENT DESCRIPTION

On July 23, 1982 at 1300 hours Commonwealth Edison Nuclear Licensing notified NRC Region III and NRR personnel of a potenial 10CFR50 (55E) assesment. Recent design reviews of the " Surpression Chamber to Drywell Vacuum Breakers" has led to the tentative conclusion that the installed GPE 30" Vacuum Breakers may exceed the LaSalle County specific load definition as defined by the Mark II Owners Group for the case of a double guillotine failure on a recirculation loop. The LaSalle County Drywell 1 Surpression Chamber Vacuum Breakers Valves are expected to undergo a single open-shut cycle as a result of the Surpression Chamber pressurization associated with pool swell in a Post-Loca condition.

V. PROBABLE CONSEQUENCES OF THE OCCURANCE:

Commonwealth Edison has reviewed and presented to the NRC Staff results of extensive analyses and confirmatory tests performed by Mark 1 containment owners having GPE 18" and 24" vacuum breaker valves of similar design. The applicability of these results to the LaSalle County valves was reviewed with the Mark 1 Owners' consultant who judged the results indicative of the capability for the LaSalle County Vacuum Breaker valves to operate adequately and perform their intended safety function.

VI. CAUSE

The potenial problem of Drywell/Surpression Chamber Vaccum Breaker valve failure was reviewed with the NRR Staff on July 23, 1982. Further discussion is provided in the attached letter from L.O. DelGeorge to H.R. Denton dated July 26, 1982.

VII. CORRECTIVE ACTION

Written response of this potenial 10CFR50 (55E) will be issused to document this Drywell/Surpression Chamber Vacuum Breaker Valve Post-Loca chugging phenomena. Additional tests will be conducted on a full size LaSalle County valve as described in the above letter.

Prepared by: D. Winterhoff

Dale B Winterhoff
8-4-82

CWS

file: ____________

LSCS July 26, 1982

Messrs:	
C. Reed/N. A. Kershaw	Q.A. Engineer - SNED
J. S. Abel	D. J. Scott (NC Only)
H. E. Bliss	V. I. Schlosser - RIII Only
J. D. Bowers	B. R. Shelton/T. E. Watts
L. J. Burke - RIII Only	W. J. Shewski
T. C. Cihlar/G. E. Peterson	B. B. Stephenson/D. L. Shamblin
E. E. Fitzpatrick	W. L. Stiede
D. P. Galle	H. K. Stolt/W. L. Eck (Bull., Circ., & I. Not. Only)
K. L. Graesser (NC Only)	R. J. Tamminga (ISI Only)
J. F. Gudac (NC Only)	G. P. Wagner
R. H. Holyoak	P. P. Steptoe-IL&B (Letters Only)
J. H. Hughes	H. R. Peffer - G.E.
R. E. Jortberg	M. A. Bowidowicz - S&L
N. J. Kalivianakis	G. Wright - State of Illinois (NRC/CECo Ltrs only)
A. W. Kleinrath/A. D. Rossin	G. F. Owsley - Exxon
R. Kyrouac	W. R. Bird - Consumers Power Co. - RIII Only
D. E. Lindvall	NL Distribution
J. J. Maley	
T. E. Quaka	
R. E. Querio - RIII Only	
R. Ralph	

In the judgement of the Nuclear Licensing Administrator, the attached document contains the following commitments to the NRC or requirements from the NRC.

Identification of Attached Document: LSCS1/2 - Drywell/Wetwell Vacuum Breaker Assessment; L. O. DelGeorge letter to H. R. Denton dated July 26, 1982.

NRC Commitment or Requirement:

Due Date	Commitment or Requirement	Responsible Edison Department
8/13/82	Provide NLA schedule for conduct of vacuum breaker test-including expected date of bounding test run.	PE/B. Shelton
11/1/82	Provide NLA evaluation report on results of vacuum breaker test for transmittal to NRC. Note: NLA should be on distribution for all preliminary drafts of this report.	PE/B. Shelton

NOTE: (1) Proj. Eng. is expected to coordinate with LSCS operations/construction to make a valve available for testing.

(2) Proj. Eng. is expected to initiate a final design basis evaluation of the subject valves including plant specific load definition, possible modifications and replacement of the U2 valve used for the test.

When it is determined by the responsible department that a due date will not be met, the Nuclear Licensing Administrator should be notified immediately.

L. O. DelGeorge 82-29

Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690

July 26, 1982

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: LaSalle County Station Units 1 and 2
Drywell/Wetwell Vacuum Breaker Assessment
NRC Docket Nos. 50-373/374

Dear Mr. Denton:

The purpose of this submittal is to document the Commonwealth Edison assessment of the drywell/wetwell vacuum breakers which was reviewed with your staff on July 22 and 23, 1982. The subject valves have been reviewed through the Mark II Containment Owners Group and a generic bounding load definition established. The methodology associated with this review was discussed with your staff in May, 1982. We are unaware, at this time, of any outstanding questions although a report documenting this methodology has not yet been submitted. Relative to the bounding load definition, it should be recognized that the LaSalle County valves, due to their location outside the wetwell, do not experience cycling (open and shut) as a result of the post-LOCA chugging phenomena. The LaSalle County valves are expected to undergo a single open-shut cycle as a result of the wetwell pressurization associated with pool swell. The pipe break size leading to the maximum swell induced differential pressure (ΔP) is discussed in Attachment I of this letter.

Having established that a pool swell induced ΔP across the vacuum breakers must be assessed to assure that the valve safety function will be fulfilled, Commonwealth Edison has performed what is judged a bounding assessment using bounding generic angular velocities associated with the maximum ΔP developed through the Mark II Owners Group. The conservatisms in this load definition, both with respect to the generic methodology and plant specific applicaton to LaSalle County are discussed in Attachment II. Of primary importance is the fact that the LaSalle County valves are outside the wetwell and are in a pipe loop which also contains two isolation valves. This configuration is likely to have a significant effect on the LaSalle County specific ΔP and thereby, the LaSalle County specific load definition. These numbers, and other plant specific adjustments to the generic load denfition are now being developed and will be incorporated into the final design basis evaluation.

DUPE ~~8207280154~~

Notwithstanding the expected reduction in the plant specific load definition, a bounding evaluation of the vacuum breakers has been performed. This evaluation, which was reviewed with the staff on July 22, 1982 indicated that the LaSalle County vacuum breakers would fulfill their safety function. As a result of uncertainties associated with this evaluation, i.e. the applicability of the closing impact results on the opening impact loads on the valve body and internals; Commonwealth Edison reviewed and prsented to the NRC staff the results of extensive analyses and confirmatory tests performed by Mark I containment owners having vacuum breakers of similar design (18" and 24" GPE valves). The applicability of these results to the LaSalle County valves was reviewed with the Mark I owners' consultant, and those results were judged indicative of the capability of the LaSalle County valve. The results of this detailed assessment, presented to the staff on July 23, 1982, are docuemented in Attachment III. Of particular interest is the fact that this assessment clearly indicates that the closing impact bounds the opening impact case, the major expressed staff concern.

It is on the basis of the simplified analysis of the LaSalle County vacuum breakers, supported by the applicable Mark I program detailed analyses and test of similar valves that Commonwealth Edison has concluded that the LaSalle County vacuum breakers are adequate and will fulfill their intended safety function. This conclusion is further supported by the fact that the bounding load definition is of exteremely low probability due to its dependence on a double guillotine failure of the largest diameter pipe(s) (Attachment I); and due to the expected reduction in the LaSalle specific load definition when appropriate refinements are made to reflect actual LaSalle County parameters (Attachment II).

Notwithstanding our belief in the present adequacy of these valves, Commonwealth Edison will conduct a confirmatory test on a full size LaSalle County valve using the bounding generic load definition. This test will be completed and an evaluation presented to the NRC by November 1, 1982. The NRC Staff will be given advance notice of the date of the bounding test run to allow for their observation of the test if desired. It is fully expected that this test of an actual LaSalle County valve to what is judged a very conservative load definition will resolve all present uncertainties.

If you have any questions concerning this submittal, please contact this office.

Very truly yours,

L. O. DelGeorge

L. O. DelGeorge

cc: NRC Resident Inspector - LSCS

4591N

ATTACHMENT I

LaSalle County Maximum Uplift Pressure

Reference: LSCS DAR

$V_{DW} = 221{,}500\ ft^3$
$V_{WW} = 166{,}400\ ft^3$
$Vent_{sub} = 12.83\ ft$
$A_{vent} = 295.2\ ft^2$ (98 vents)
$V_{pool} = 142{,}160\ ft^2$
Pool depth = 26.5 ft.
$A_{pool} = 5069\ ft^2$ (i.e. $\frac{V_{pool}}{D_{pool}} - A_{vents}$)

1. From Maise - Economos Report (NUREG-CR2191)

$F = A_B \times A_p \times V_{WW}/V_{DW} \times A_0^2$

ΔPUP = MAX. AT F = .06
and is positive from F = 0.35 to .12

2. For LaSalle County at F = .06

A_{Break} 1.37 ft^2 for max. uplift pressure

$.80 < A_B' < 2.74\ ft^2$

ATTACHMENT II

Expected Valve Disc Velocity

Pool Swell ΔPup

- 28 4TCO runs , 8 with measured ΔPup
- 2 max runs
- generic calculation predicts ΔPup for MK-II's

ΔPup Value

- Maize correction based on- one data point +1.2
- GE correction based on data +.5
- Further corrections for uncertainly + 1.5
- Expected uncertainty. +.5
- Conclusion - Expected peak ΔPup ~ 4 psi
  - Expected velocity is less

AS-BUILT VALVE CONFIGURATION

- VACUUM BREAKER IS BETWEEN ISOLATION VALVES
- ΔP_{UP} APPLIED ACROSS VACUUM BREAKER
- ΔP VACUUM BREAKER$\Big|_{AS\text{-}BUILT} < \Delta P_{UP}\Big|_{DESIGN}$
- VACUUM BREAKER RESISTANCE IS ~1/3 OF 'AS-BUILT CONFIGURATION

HYDRODYNAMIC TORQUE

- $\tau = L_D \, A \, \Delta P(t)$

- BOUNDING VALUE USED

- OVERPREDICTS MEASURED RESULTS

- REFINE MARGIN

- MKI EXPERIENCE PRODUCED REDUCED IMPACT VELOCITY

ATTACHMENT III

NUTECH ANALYSIS OF MARK I GPE VACUUM BREAKERS AND COMPARISON TO LASALLE VACUUM BREAKERS

- INTRODUCTION / COMPARISON OF VALVE TYPES
  - 18" MARK I
  - 24" MARK I
  - LASALLE
- ANALYSIS MODELS
  - RIGID BODY DYNAMICS
  - IMPACT MODELS
  - STRESS/STIFFNESS MODELS
- ANALYSIS RESULTS
  - DISPLACEMENT TIME HISTORIES
  - STRENGTH RATIOS
  - 18" MARK I
  - 24" MARK I
- TEST PROGRAM AND COMPARISON TO ANALYSIS
- CONCLUSIONS

GPE - WETWELL/DRYWELL VACUUM BREAKERS

	LASALLE	24-INCH MK I	18-INCH MK I
PALLET DIA. (INCHES)	25	22	21
PALLET WEIGHT (LB)	45	50	40
TOTAL SUSPENDED WEIGHT (LB)		61	50
PALLET THICKNESS (INCH)	3/8	7/16	3/8
PALLET MATERIAL	SA 516-GR70	SA240-TP31655	SA516-GR70
HINGE TYPE	HALF PINS	HALF PINS	FULL PIN
VALVE BODY THICKNESS (INCH)	3/8	3/8	3/8
VALVE BODY MATERIAL	SA516-GR70	SA516-GR70	SA516-GR70
VALVE BODY SEAT DETAIL	PINS	RING	PINS

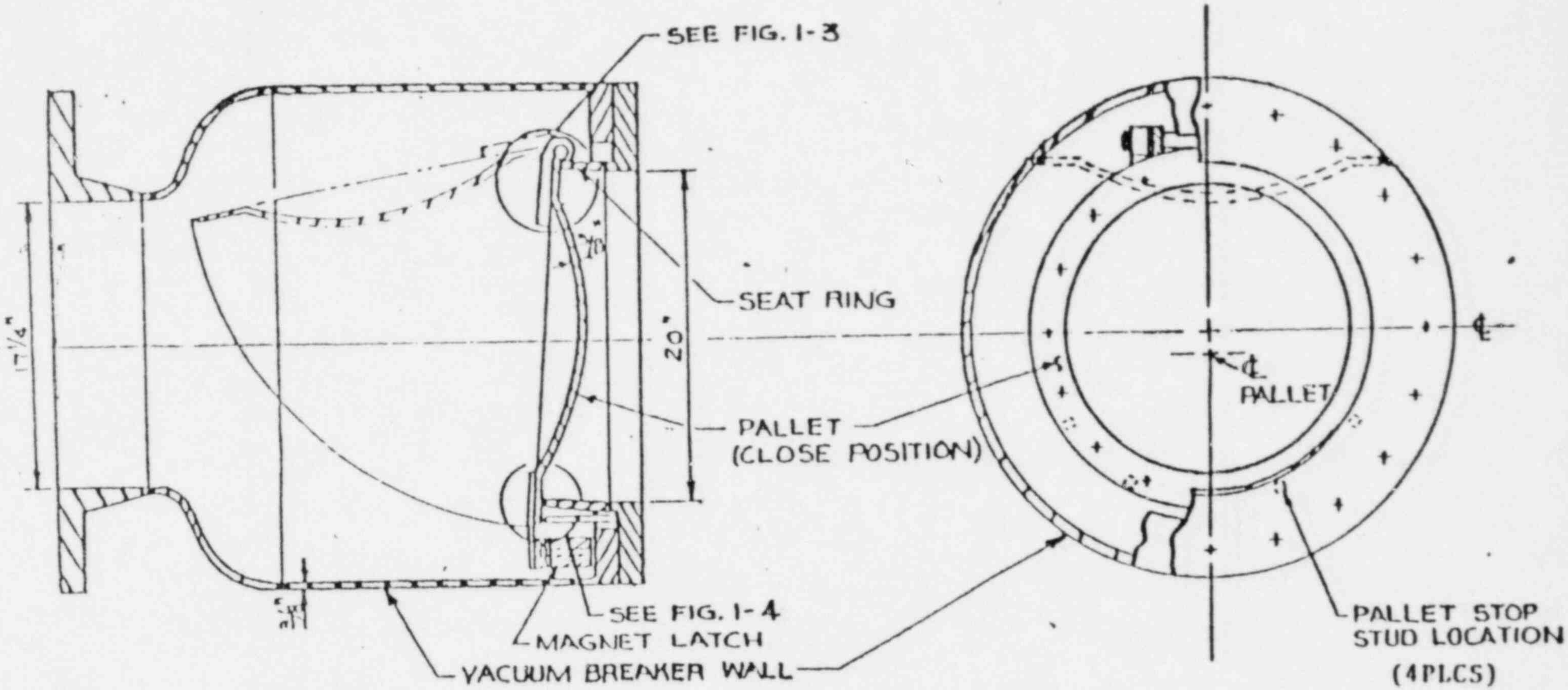


FIGURE 1-2

GPE 18" VALVE GEOMETRY

(GPE TYPE LD-240-208)

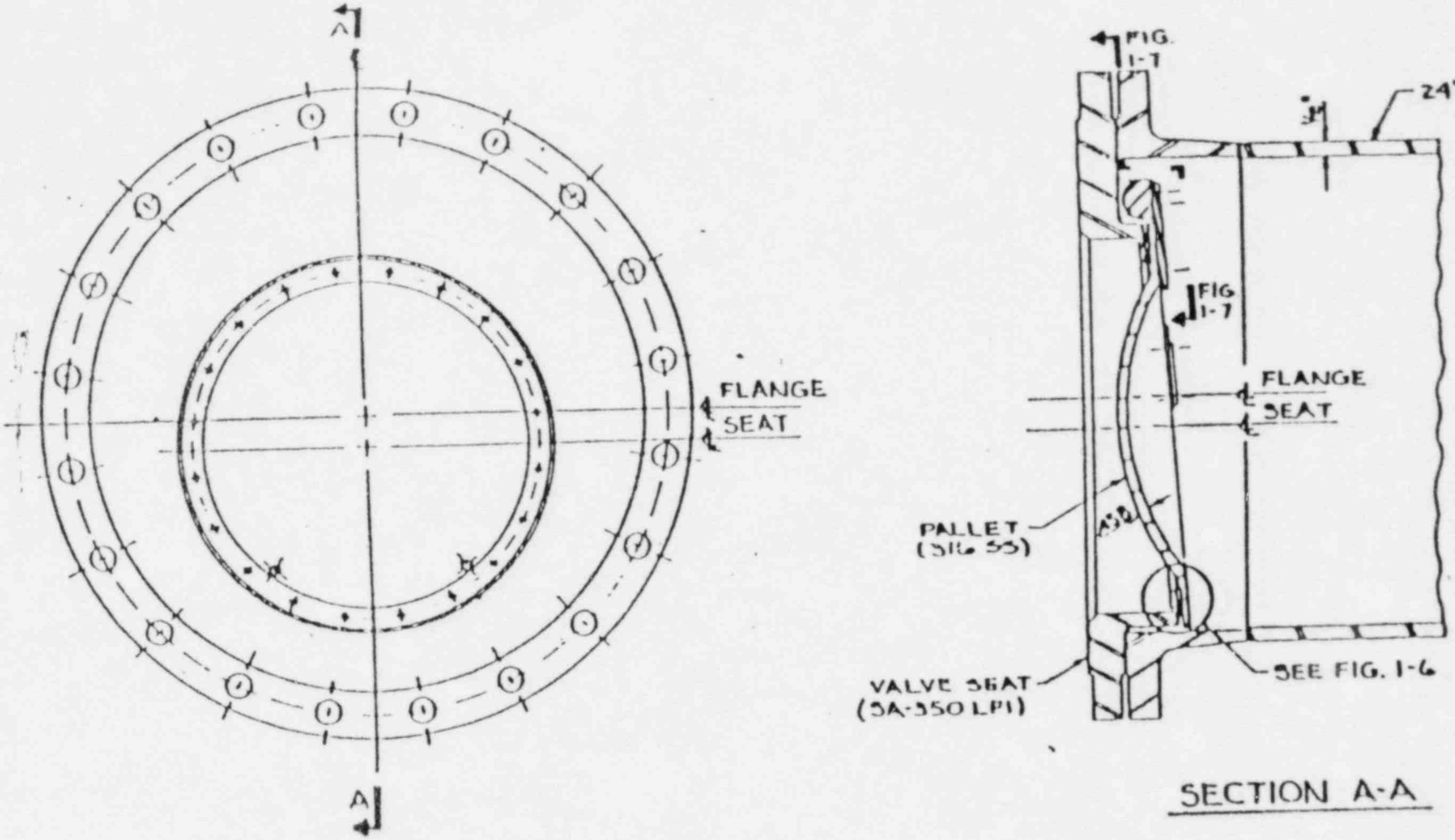


FIGURE 1-5

GPE 24" VALVE DETAILS

(GPE TYPE LD-240-383)

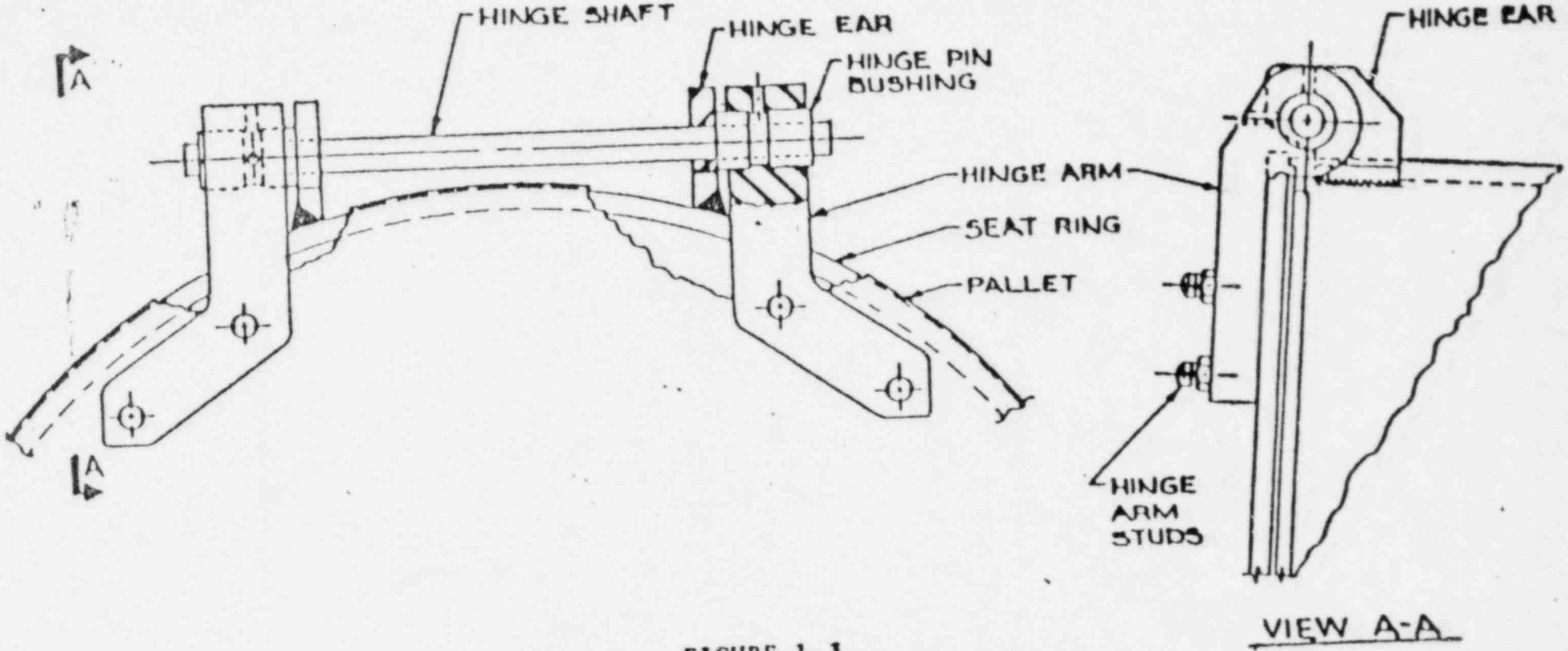


FIGURE 1-3

GPE 18" VALVE HINGE DETAILS

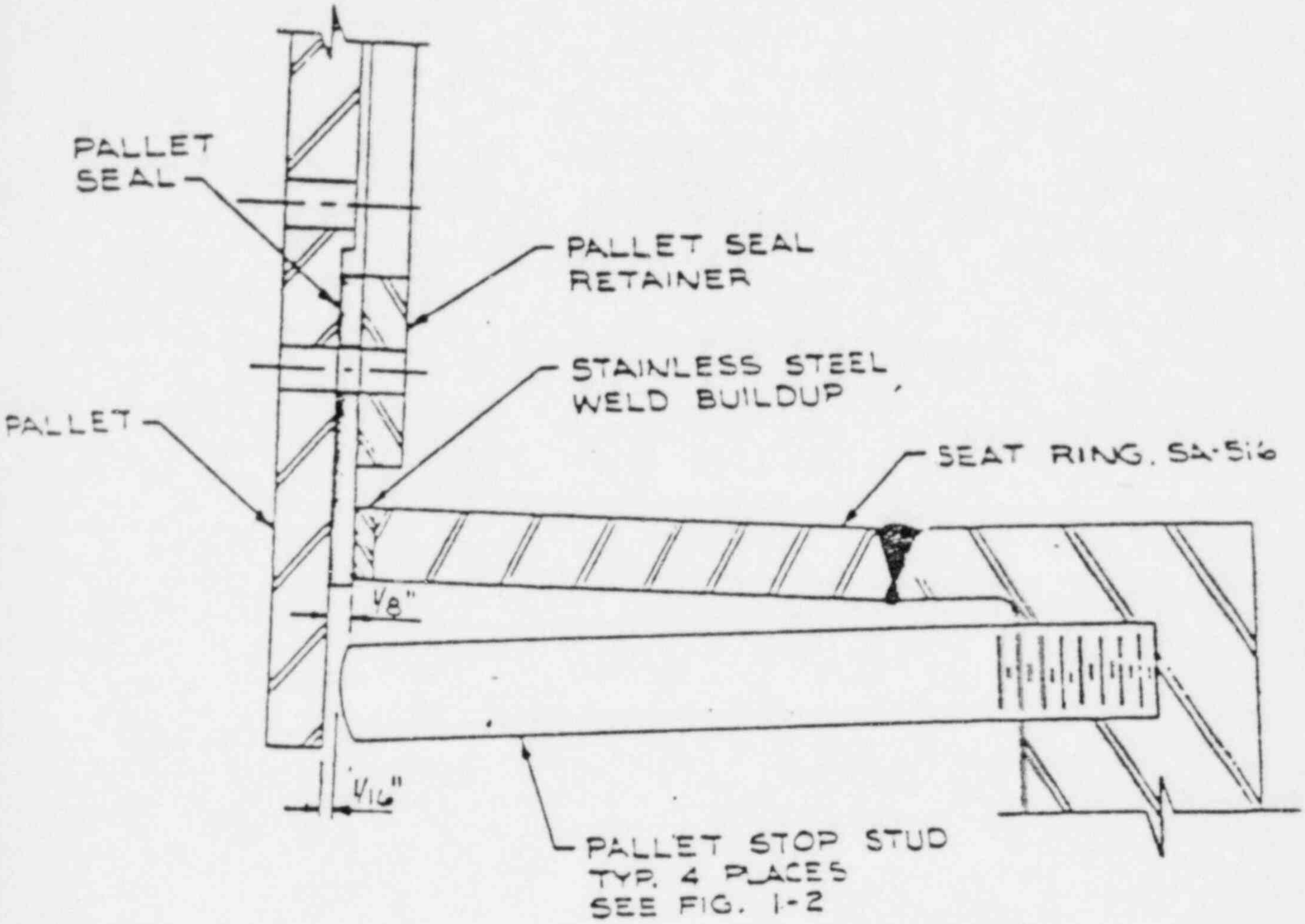


FIGURE 1-4

GPE 18" VALVE SEAT DETAILS

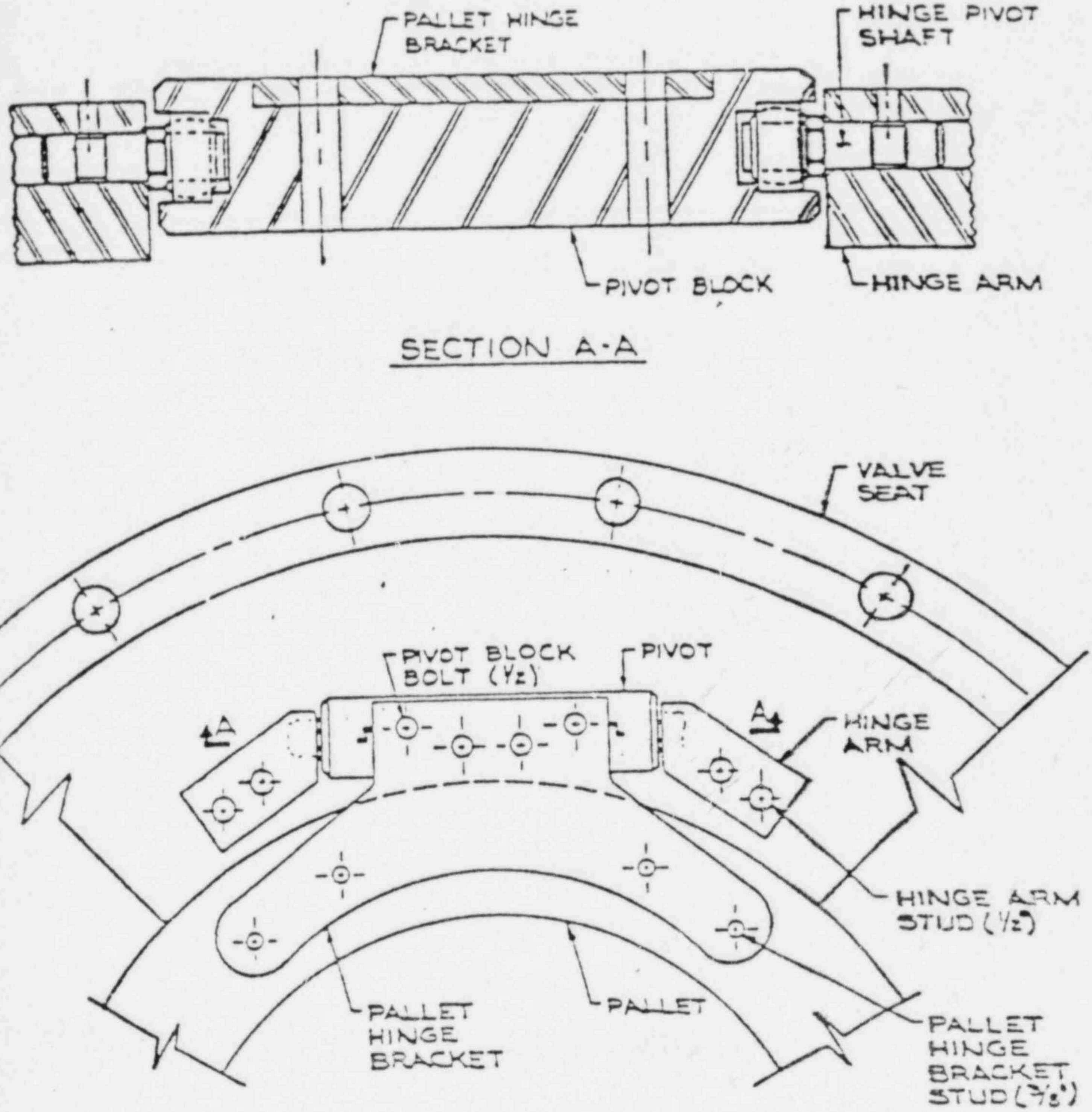


FIGURE 1-7

GPE 24" VALVE HINGE GEOMETRY

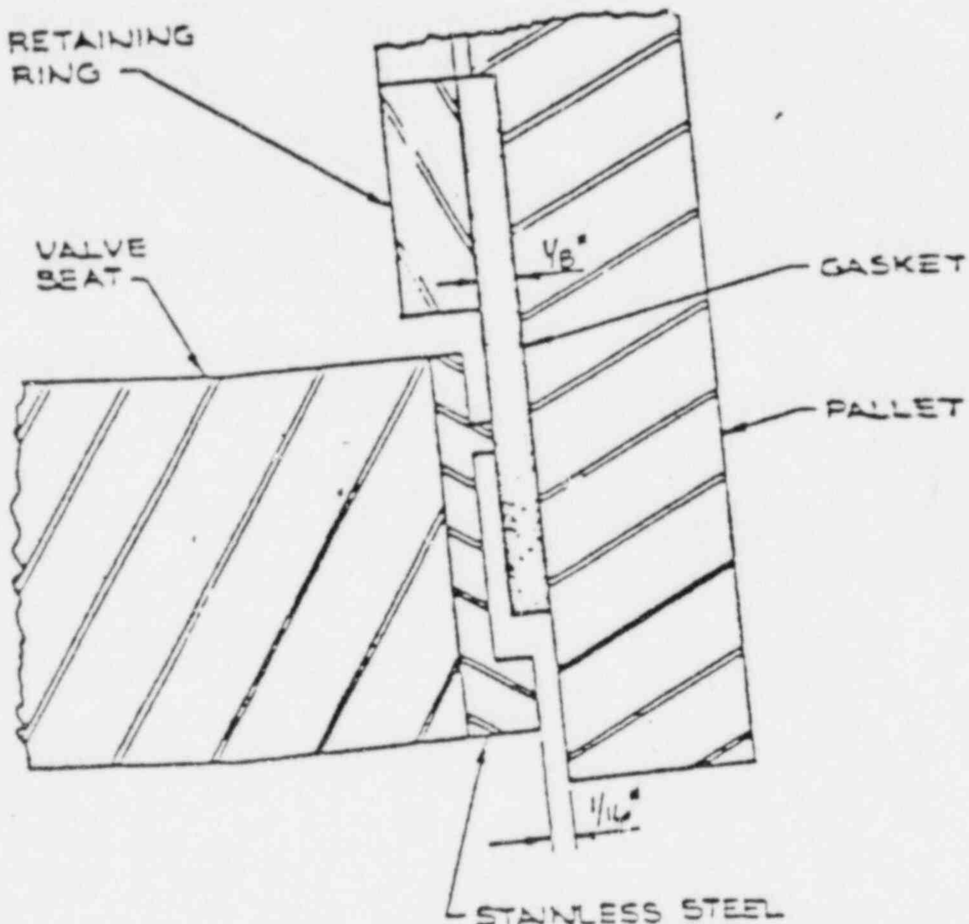


FIGURE 1-6

GPE 24" VALVE SEAT GEOMETRY

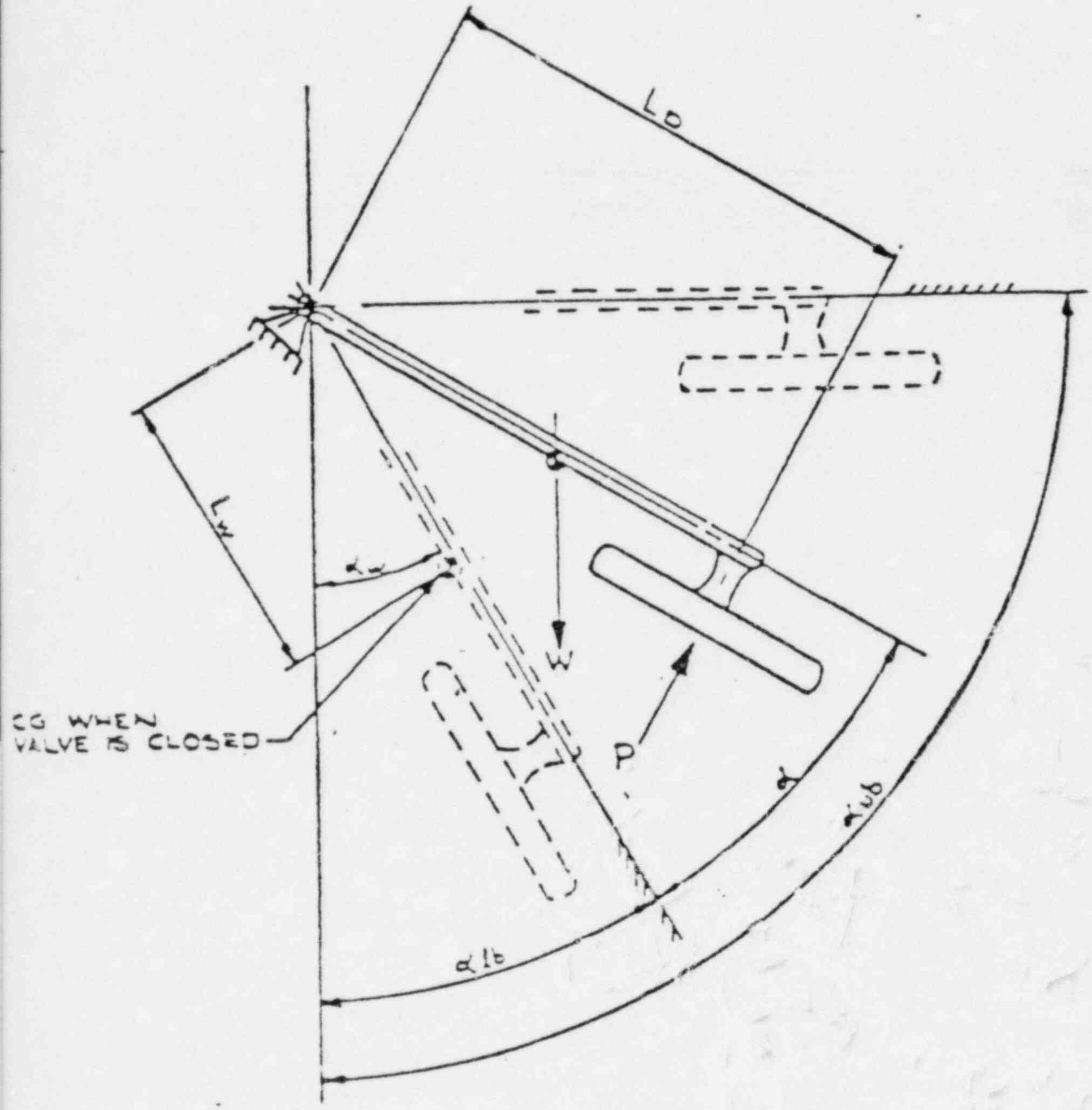


FIGURE 2-4

VALVE ASSEMBLY AND FORCE SYSTEM

UNSCALED FSTF FORCING FUNCTION AND DISC RESPONSE

(GPE 18" Φ INTERNAL VACUUM BREAKER)

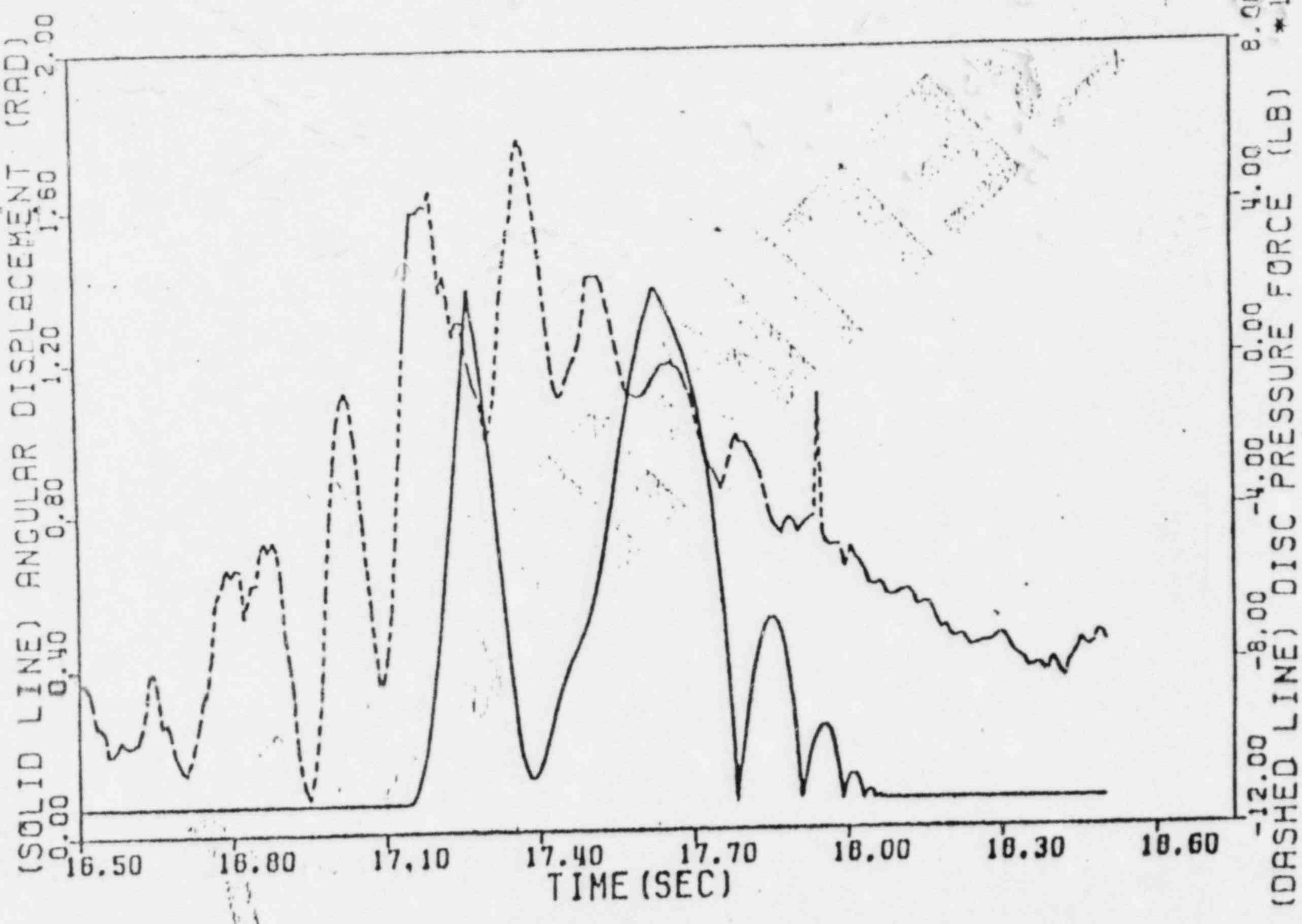


FIGURE 3-3

TYPICAL GPE RIGID BODY DYNAMICS RESULT

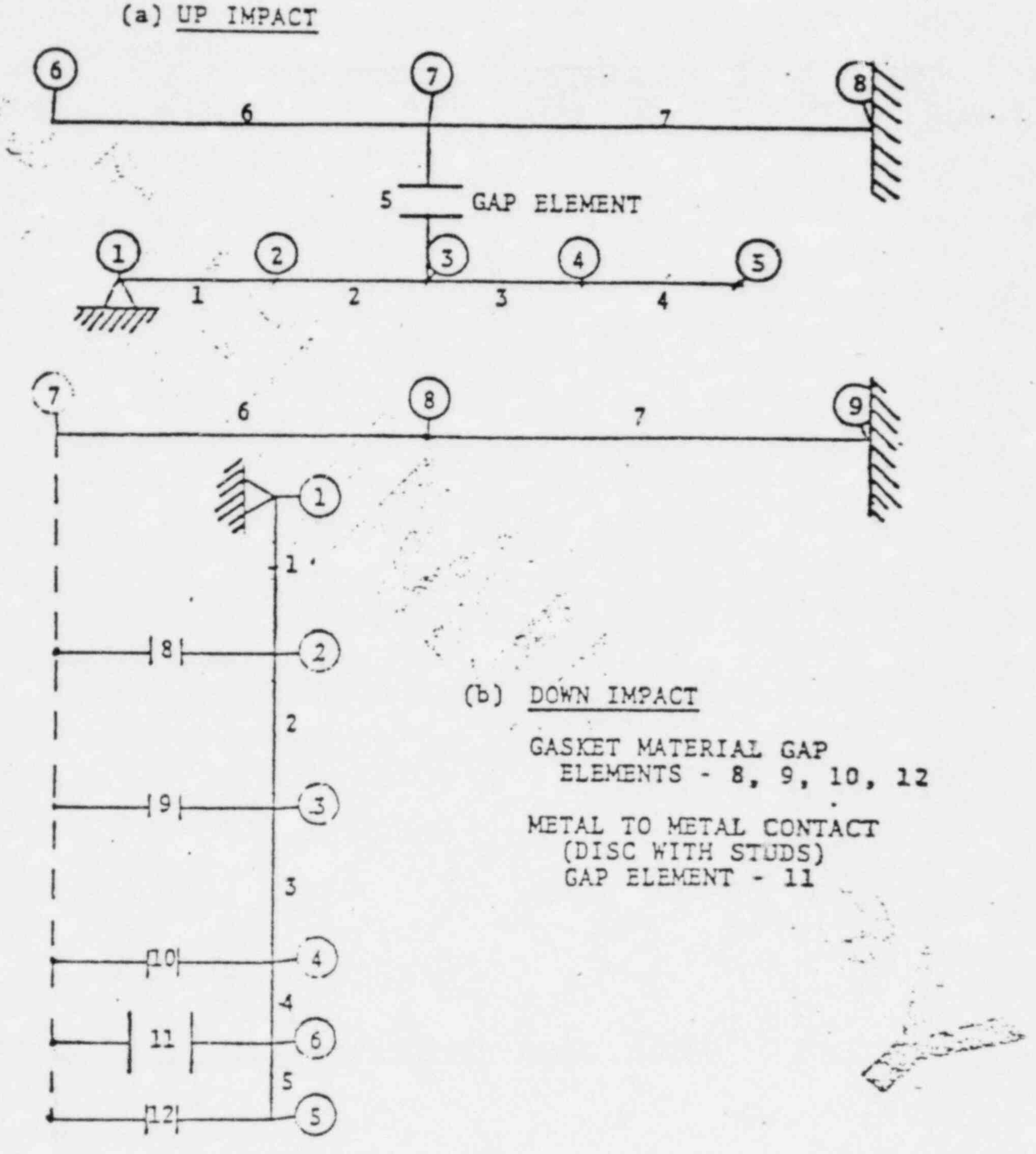


FIGURE 4-1

BEAM IMPACT MODELS USED
IN GPE ANALYSIS

UP = UP-IMPACT (OPENING) DOWN = DOWN-IMPACT (CLOSING)

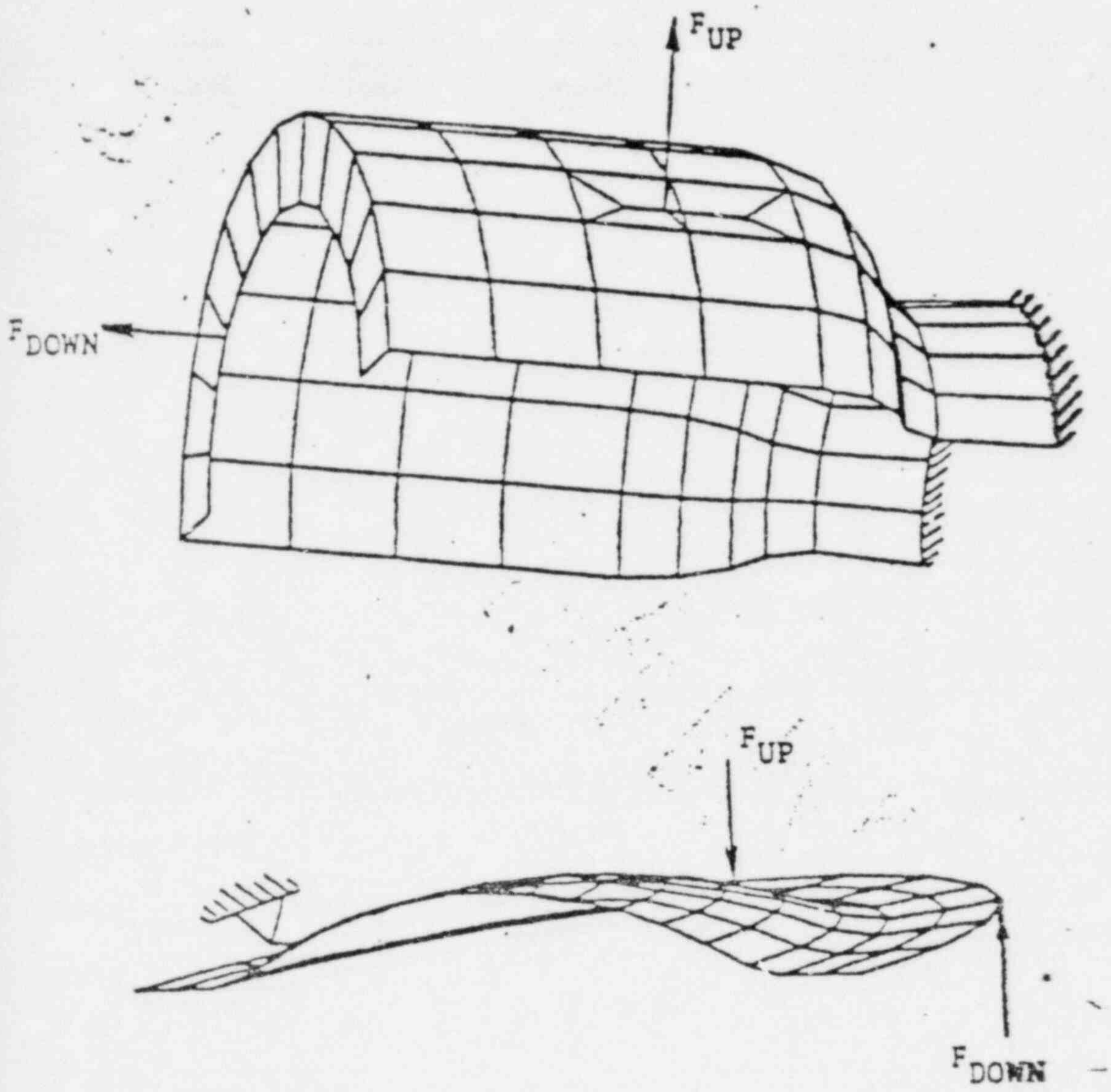


FIGURE 4-2

GPE DISC AND VALVE BODY STIFFNESS AND

DYNAMIC MASS DETERMINATION MODELS

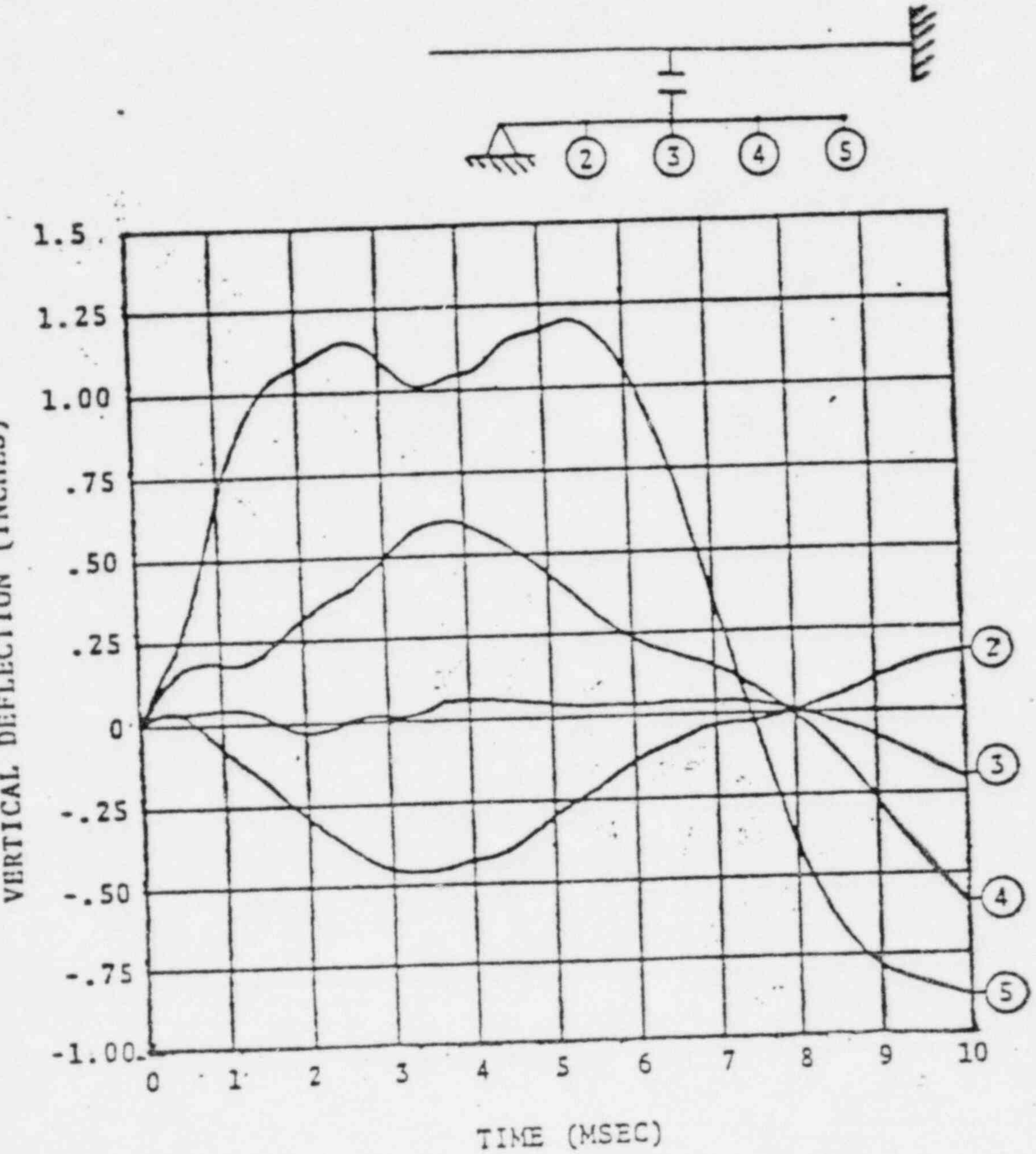


FIGURE 4-3

GPE UP-IMPACT ANALYSIS

DISC (BEAM) NODES DISPLACEMENT HISTORY

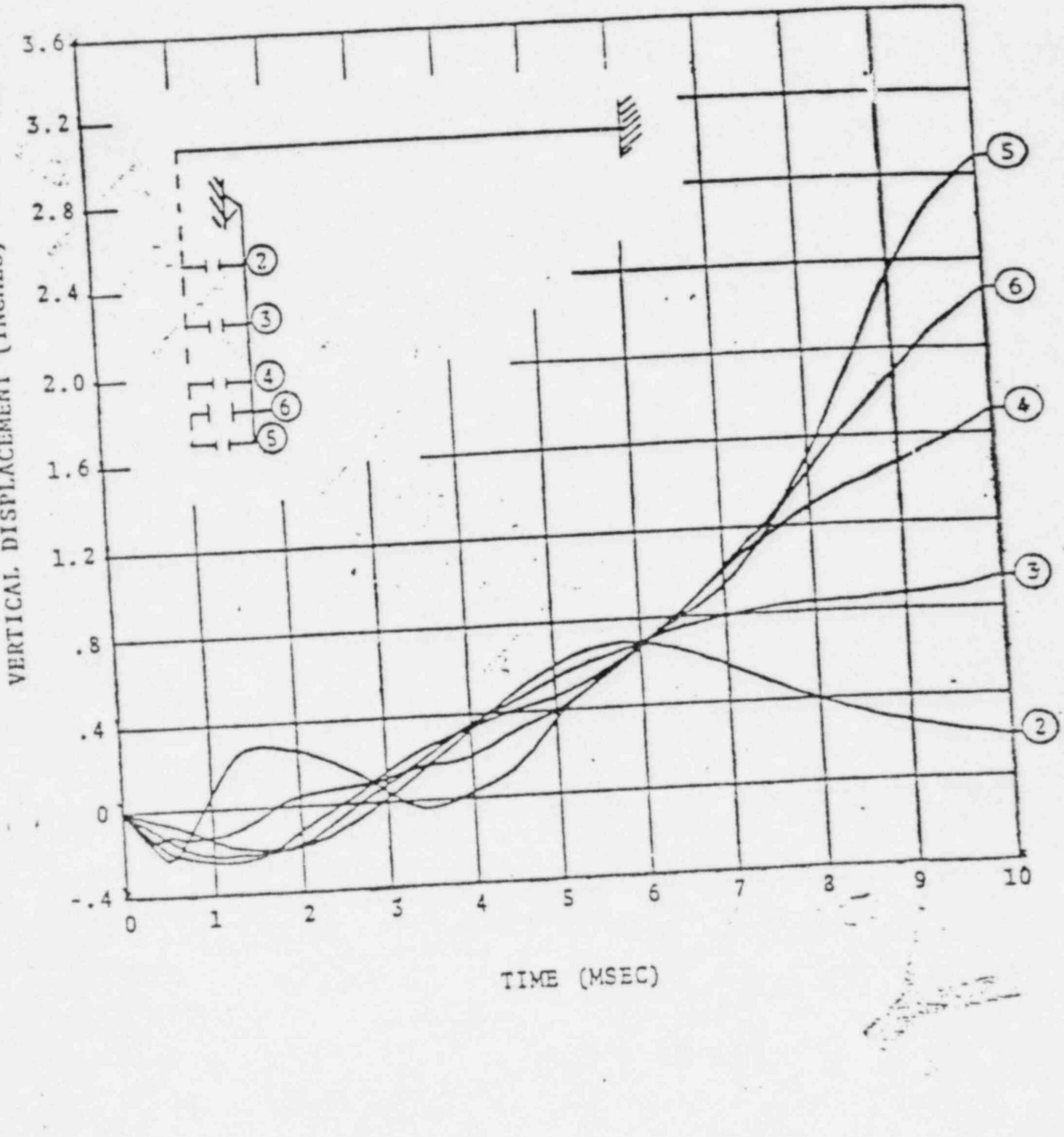


FIGURE 4-4

GPE DOWN-IMPACT ANALYSIS
DISC (BEAM) NODES DISPLACEMENT HISTORY

nutech

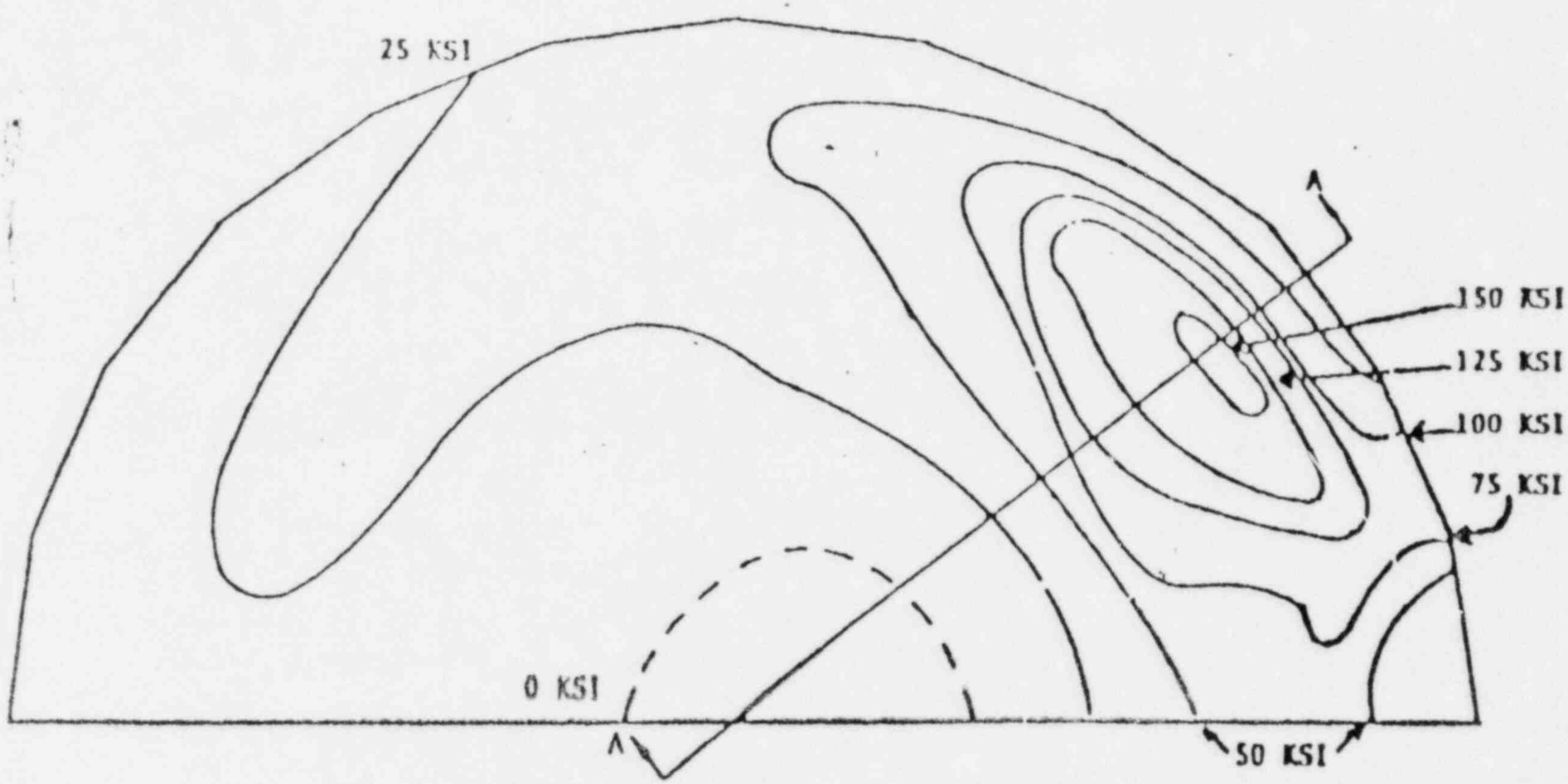


FIGURE B.3-5

GPE PALLET DOWN-IMPACT STRESS CONTOUR PLOT OF MAXIMUM STRESS AT TOP SURFACE

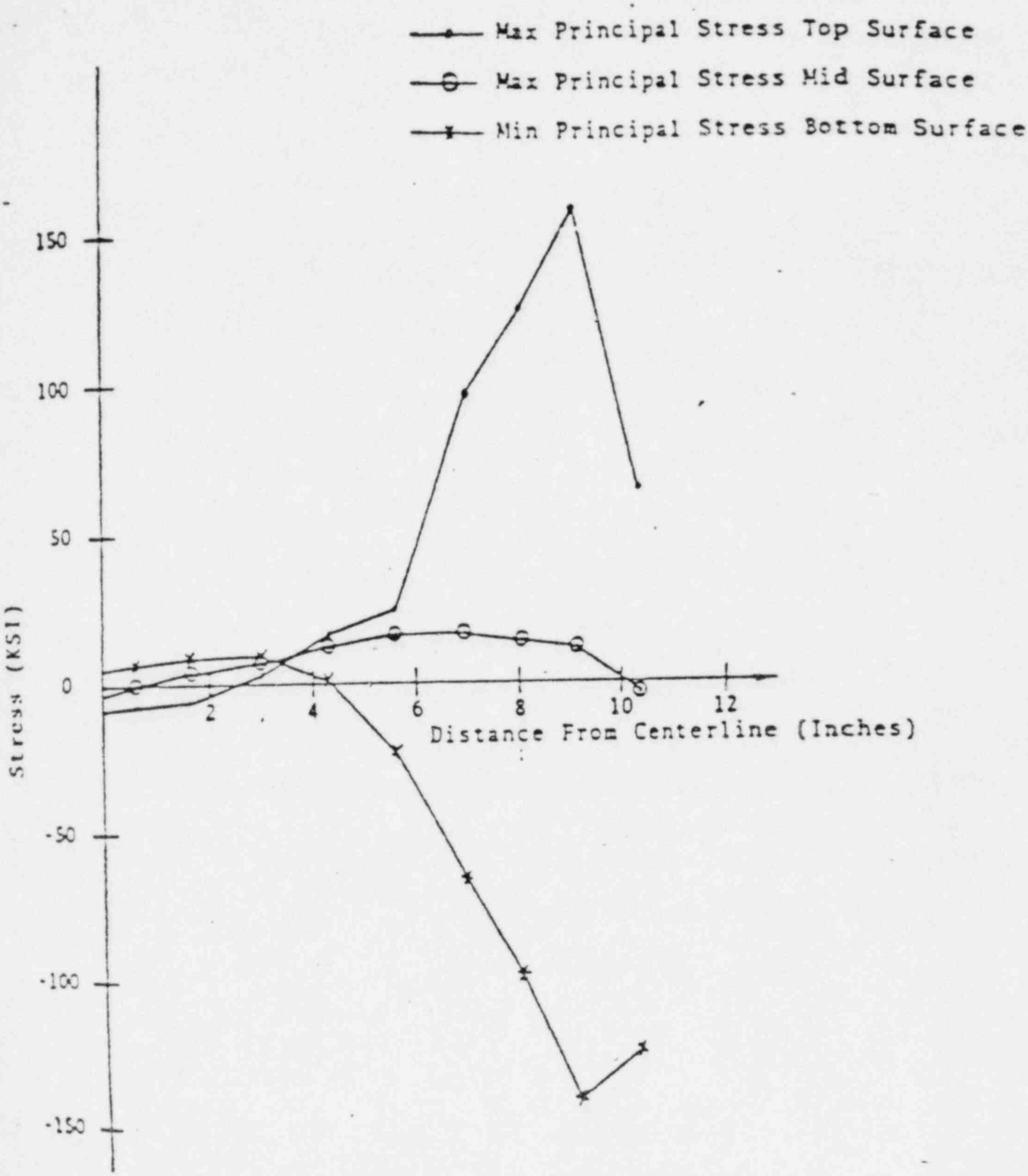


FIGURE B.3-6

GPE PALLET DOWN-IMPACT PRINCIPAL STRESS DISTRIBUTION ALONG SECTION FROM PALLET CENTER TO IMPACT POINT (SECTION A-A)

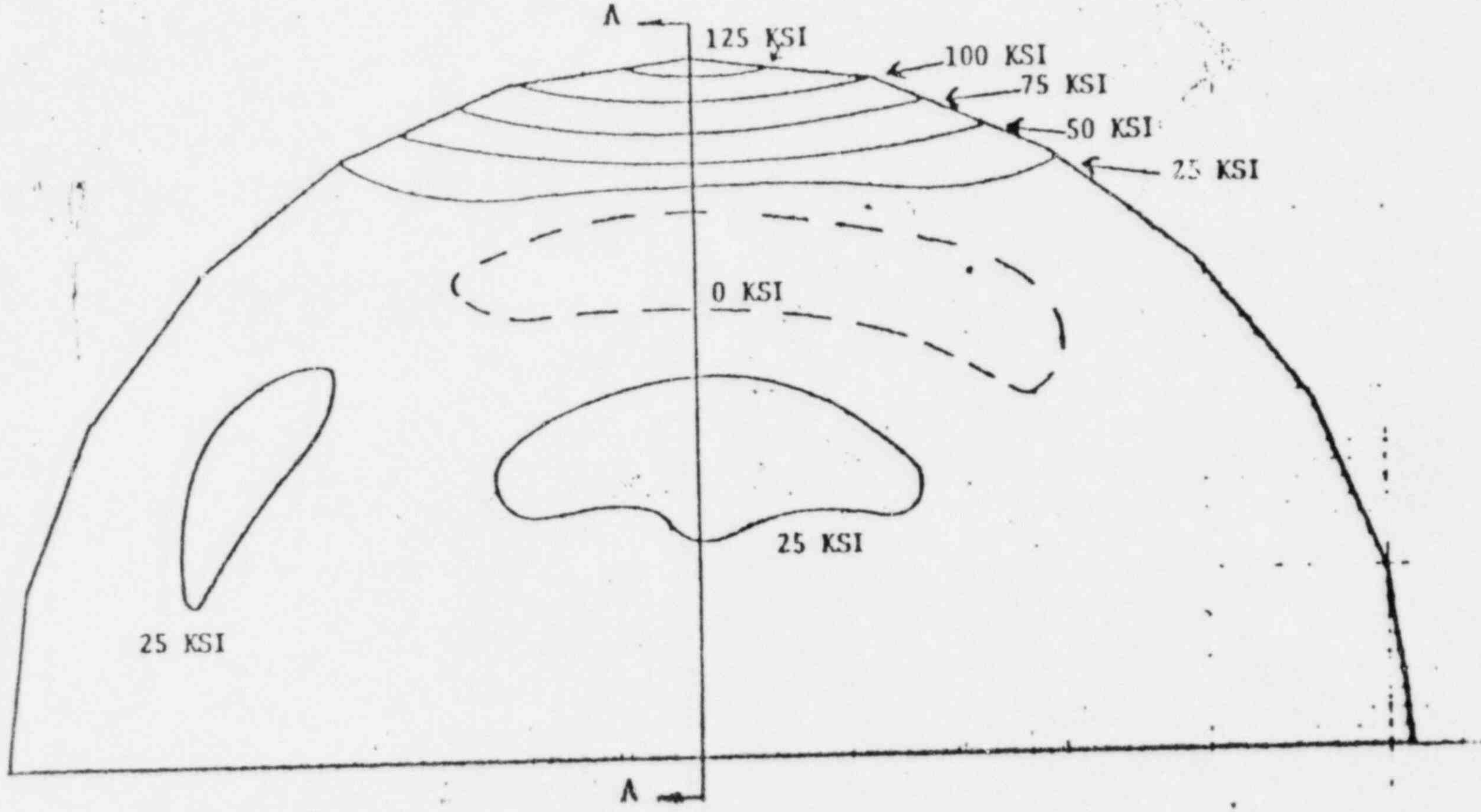


FIGURE 5-6

GPE DISC UP-IMPACT STRESS CONTOUR PLOT OF MAXIMUM STRESS AT TOP SURFACE

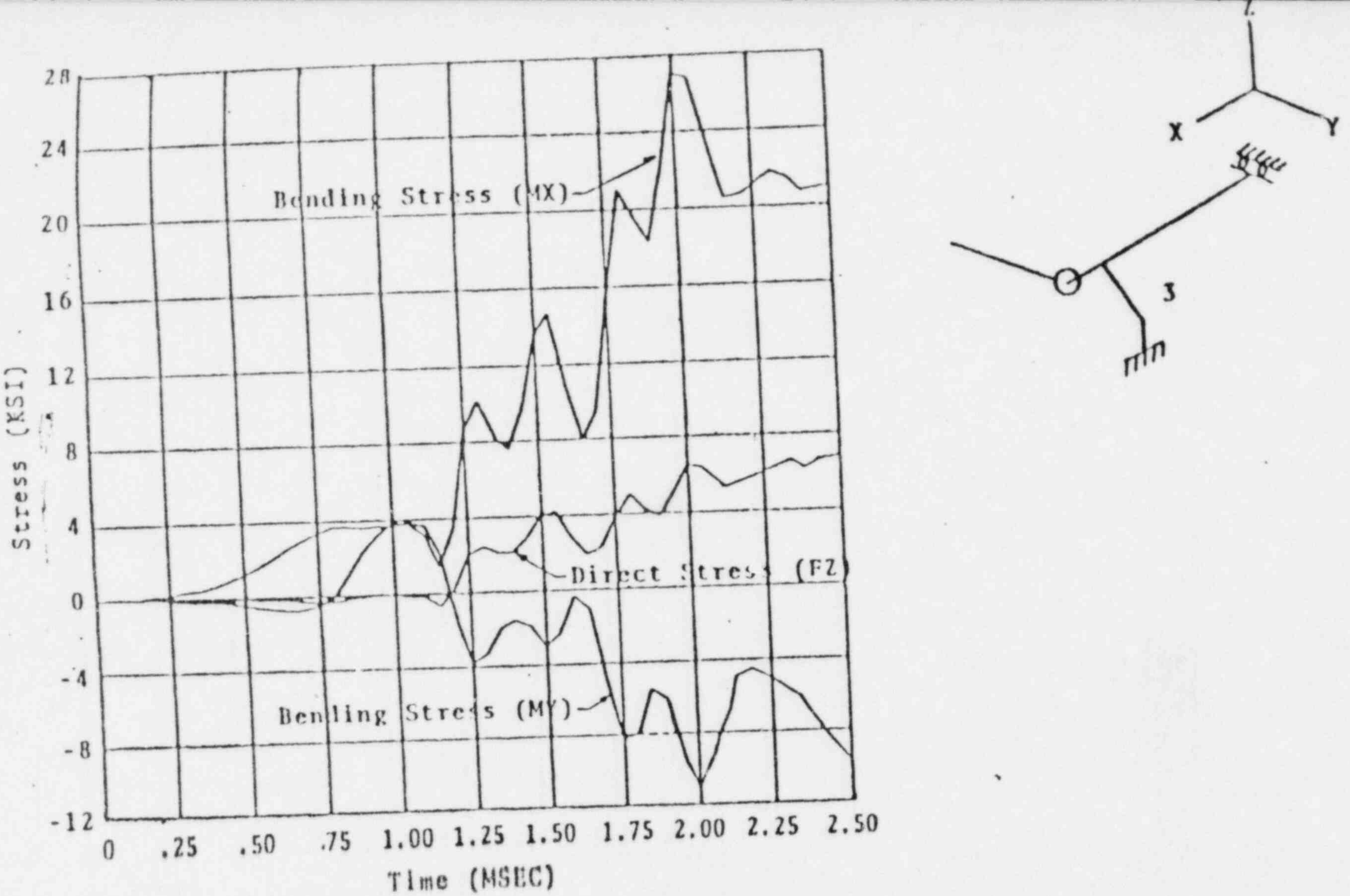


FIGURE B.3-11

DETAILED HINGE MODEL DOWN-IMPACT STRESS RESULTS
MAXIMUM STRESS IN HINGE EAR

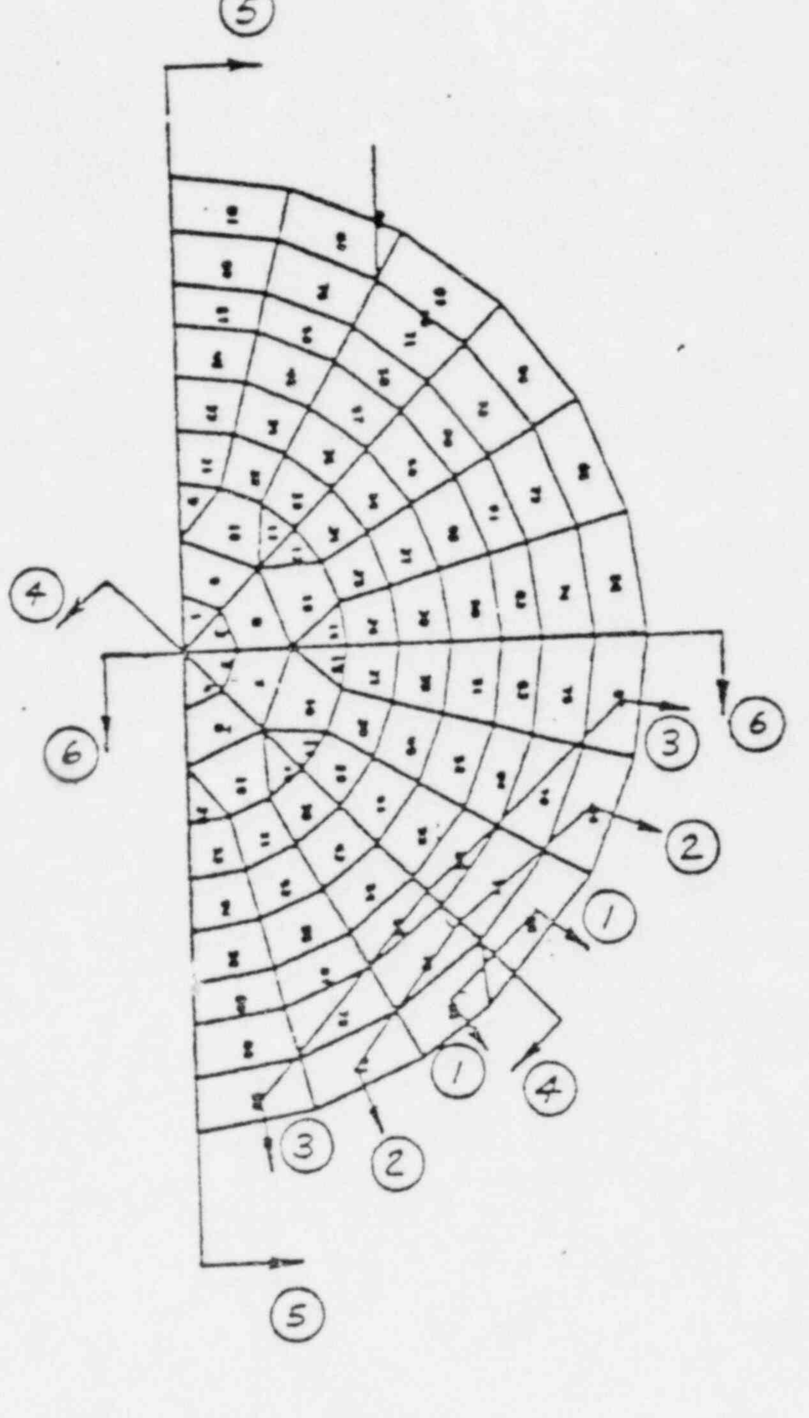


FIGURE B.3-7

CRITICAL STRESS PLANES FOR COMPUTING PALLET STRENGTH RATIOS FOR DOWN-IMPACT

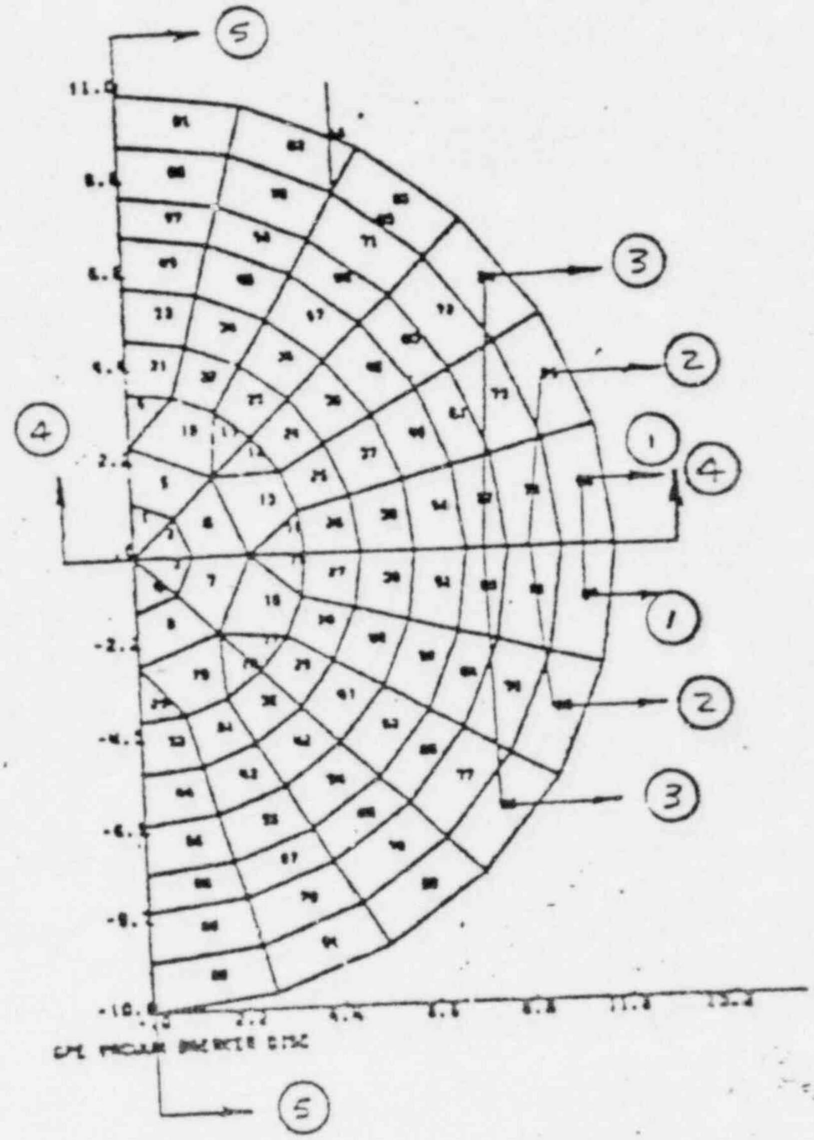


FIGURE 7-1

CRITICAL STRESS PLANES FOR COMPUTING DISC STRENGTH RATIOS FOR UP-IMPACT

nutech

TABLE 7-1

Disc/Pallet Strength Ratios

	FSTF FORCING FUNCTION		SHORT TERM FORCING FUNCTION
	UP-IMPACT (16.02 RAD/SEC)	DOWN-IMPACT (19.59 RAD/SEC)	DOWN-IMPACT (8.04 RAD/SEC)
Disc Section			
(1)	.20	.36	.15
(2)	.36	.62	.25
(3)	.24	.52	.21
(4)	.20	.32	.13
(5)	.19	.14	.06

NOTE:

1. No up-impact predicted with short term forcing function.

nutech

TABLE 7-2
Hinge Component Strength Ratios

COMPONENT	TYPE OF STRESS	FSTF FORCING FUNCTION						SHORT TERM FORCING FUNCTION		
		UP-IMPACT (16.02 RAD/SEC)			DOWN-IMPACT (19.59 RAD/SEC)			DOWN-IMPACT (8.04 RAD/SEC)		
		STRESS (KSI)	CAPACITY (KSI)	STRENGTH RATIO	STRESS (KSI)	CAPACITY (KSI)	STRENGTH RATIO	STRESS (KSI)	CAPACITY (KSI)	STRENGTH RATIO
HINGE ARM	BENDING DIRECT	78.02 0.4	110.4 89.7	0.71	69.7 0.2	110.4 89.7	0.63	28.6 0.1	110.4 89.7	0.26
HINGE SHAFT	BENDING SHEAR DIRECT	73.2 9.5 7.1	108.5 46.6 84.8	0.71	121.6 10.1 4.1	108.5 46.6 84.8	1.14	49.9 4.1 1.7	108.5 46.6 84.8	0.47
HINGE EARS	BENDING DIRECT	22.6 4.5	110.4 89.7	0.21	21.8 8.7	110.4 89.7	0.22	8.9 3.6	110.4 89.7	0.09
HINGE ARM STUDS	DIRECT SHEAR	75.5 36.2	84.8 46.5	1.18	68.6 15.5	84.8 46.6	0.87	28.2 6.3	84.8 46.6	0.36

NOTE:

* - No up-impact predicted with short term forcing function.

2.6 STRENGTHS RATIOS

Component strengths for the vacuum breakers were computed utilizing the Von-Mises maximum energy distortion criterion to evaluate the ultimate strength capacities. According to this criterion, failure occurs when the strain energy reaches the ultimate capacity of the component section. Accordingly, the interaction equation for general loading is:

$$\left\{ \left(\frac{M}{M_u}\right)^2 + \left(\frac{N}{N_u}\right)^2 + \left(\frac{T}{T_u}\right)^2 + \left(\frac{V}{V_u}\right)^2 \right\}^{1/2} = \text{Strength Ratio}$$

where:

- M, N, T, V = computed bending moment, normal force, torque, and shear force
- M_u = ultimate bending moment assuming S_y at the neutral surface and S_u at the outer fiber
- N_u = ultimate membrane capability assuming S_u through the section
- T_u = ultimate torque capability assuming a shear stress equal to $.55S_u$ through the section
- V_u = ultimate shear capability assuming a shear stress equal to $.55S_u$ through the section

For all components, ultimate capacities for each mode of loading were developed based on the material properties from Tables 2-3 and 2-4 multiplied by the Strain Rate Factor.

TABLE C.3-1

STRENGTH RATIOS FOR GPE 24" VALVE

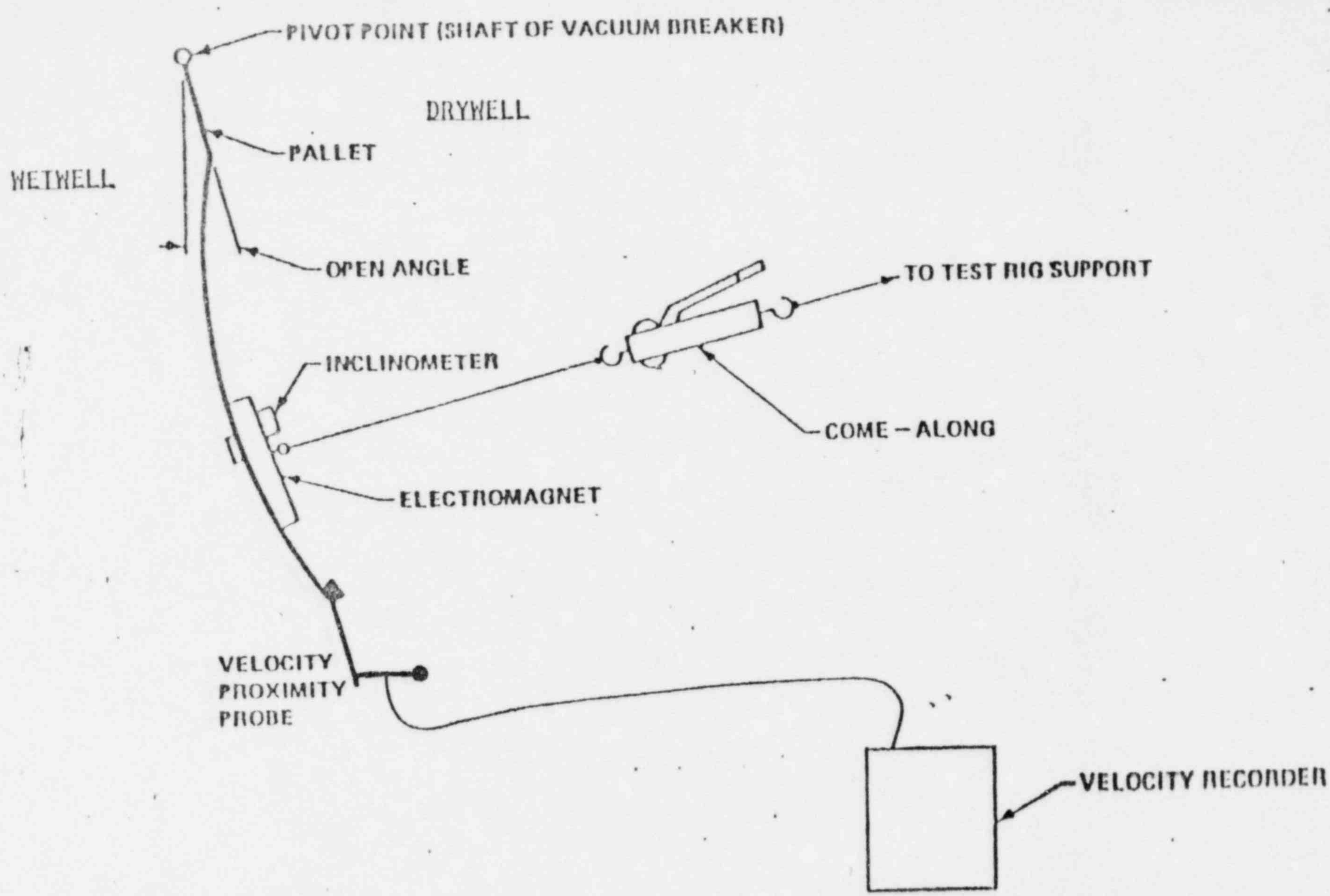
COMPONENT	MATERIAL	YIELD STRENGTH	ULTIMATE TENSILE STRENGTH	STRENGTH RATIO
PALLET (SECTION 3-3)	SA240 TYPE316	22.33 ksi	75 ksi	.27
HINGE BRACKET	SA240 TYPE316	22.35 ksi	75 ksi	.32
PALLET HINGE BRACKET STUD	SA320 B8	30 ksi	75 ksi	.76
PIVOT BLOCK BOLT	SA193 B8M	30 ksi	75 ksi	.35
PIVOT BLOCK	SA479 TYPE316	30 ksi	75 ksi	.13
HINGE PIVOT SHAFT	SA479 TYPE316	30 ksi	75 ksi	.28
HINGE ARM STUD	SA320 B8M	30 ksi	75 ksi	.503
HINGE ARM	SA479 TYPE316	30 ksi	75 ksi	.06

UNMODIFIED TEST PROGRAM

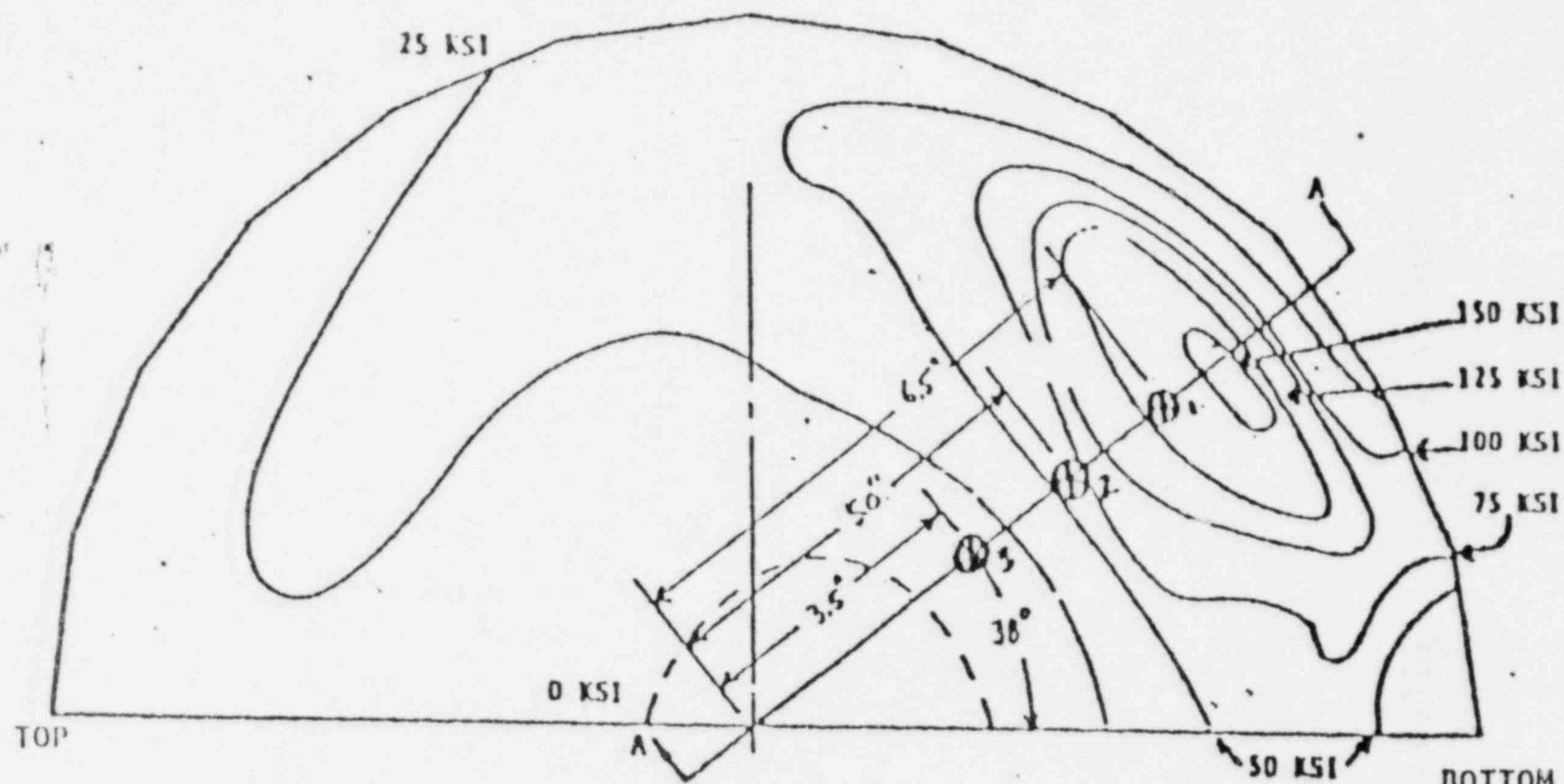
- PURPOSE OF TESTS
  - SHOW LINEARITY OF ANALYSIS
  - CONFIRM THE ACCURACY OF ANALYTICAL RESULTS WITH A SIMPLE DROP TEST
  - IDENTIFY ANALYTICAL CONSERVATISMS
- TEST SETUP
- TEST RESULTS

TEST SETUP

- SIMPLE DROP TEST
  - 10°, 20°, 30°, 40°, 50°, 54°
- TEST INSTRUMENTATION
  - STRAIN GAUGES
  - VELOCITY PROXIMITY PROBE (USED TO MEASURE IMPACT VELOCITIES)
  - INCLINOMETER

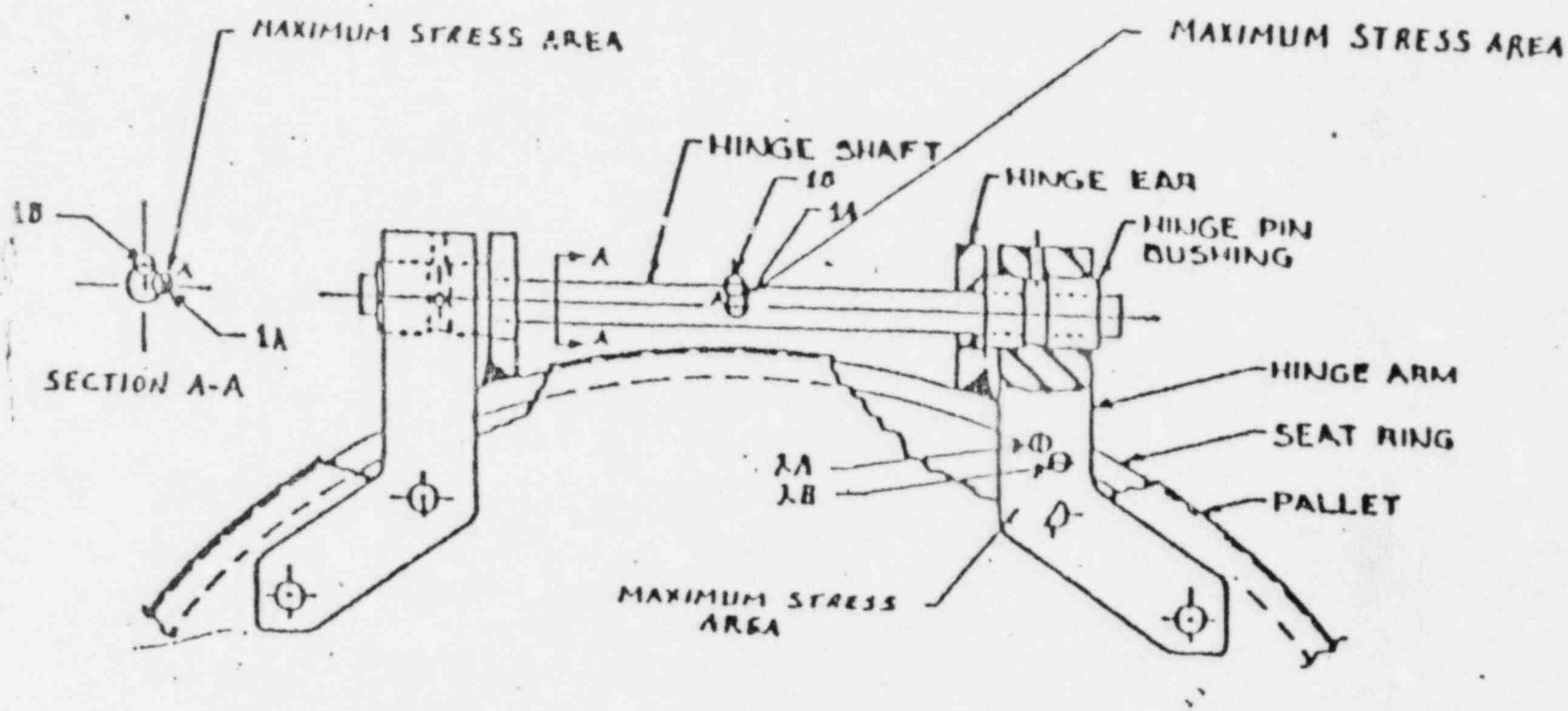


TEST INSTRUMENTATION

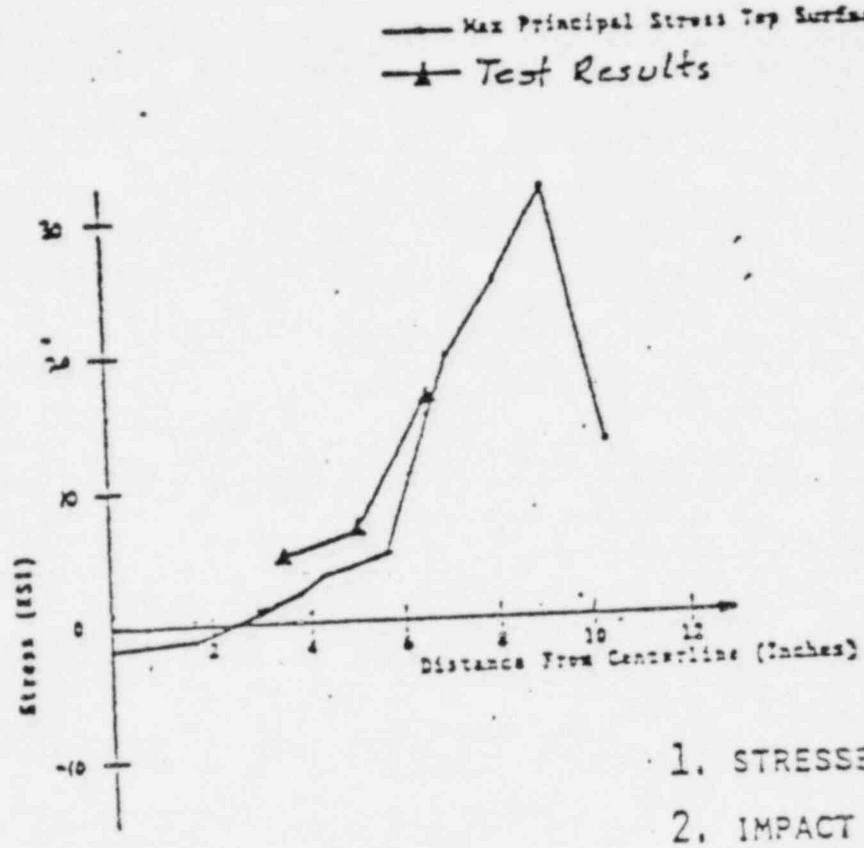


LOCATION OF PALLET STRAIN ROSETTES 1, 2, AND 3

(INSIDE SURFACE)



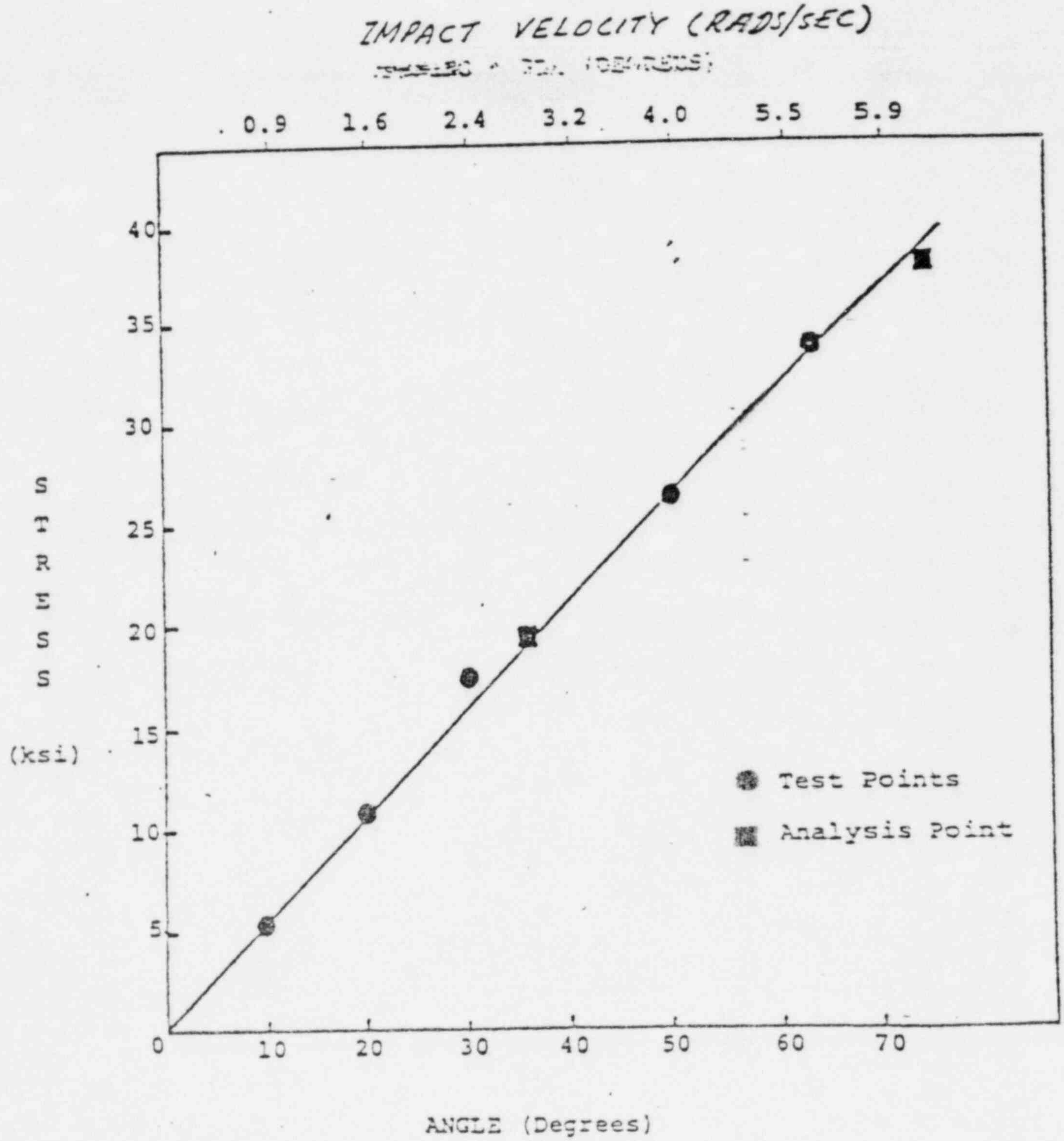
LOCATION OF SHAFT AND HINGE STRAIN GAUGES 1A, 2B, AND 2A, 2B



1. STRESSES ALONG SECTION A-A
2. IMPACT VELOCITY OF 5.0 RADS/SEC.

GPE PALLET DOWN-IMPACT
PRINCIPAL STRESS DISTRIBUTION ALONG
SECTION FROM DISC CENTER TO IMPACT POINT (SECTION A-A)

Plot of Bending
Stresses in Shaft



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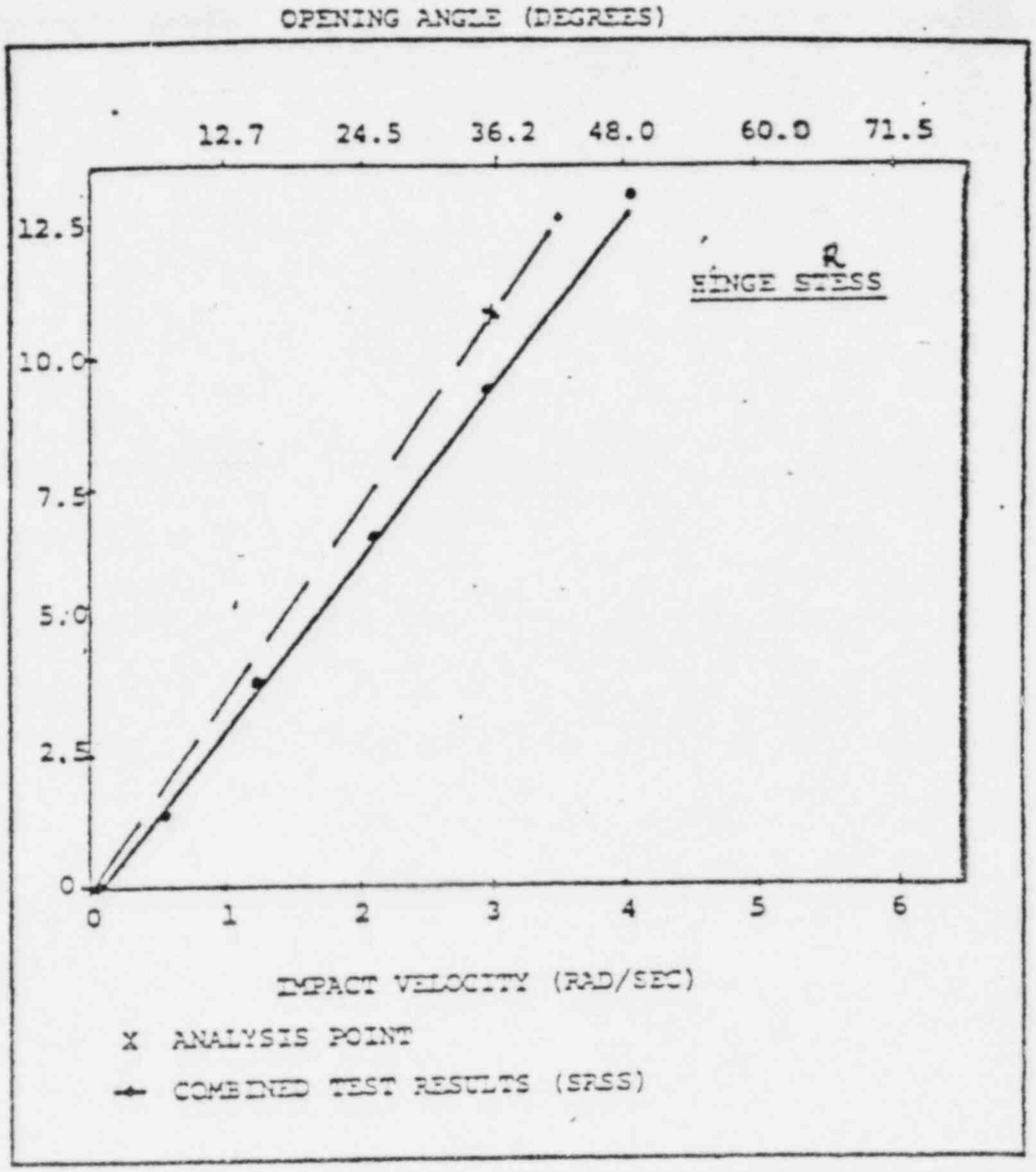


nutech ENGINEERS

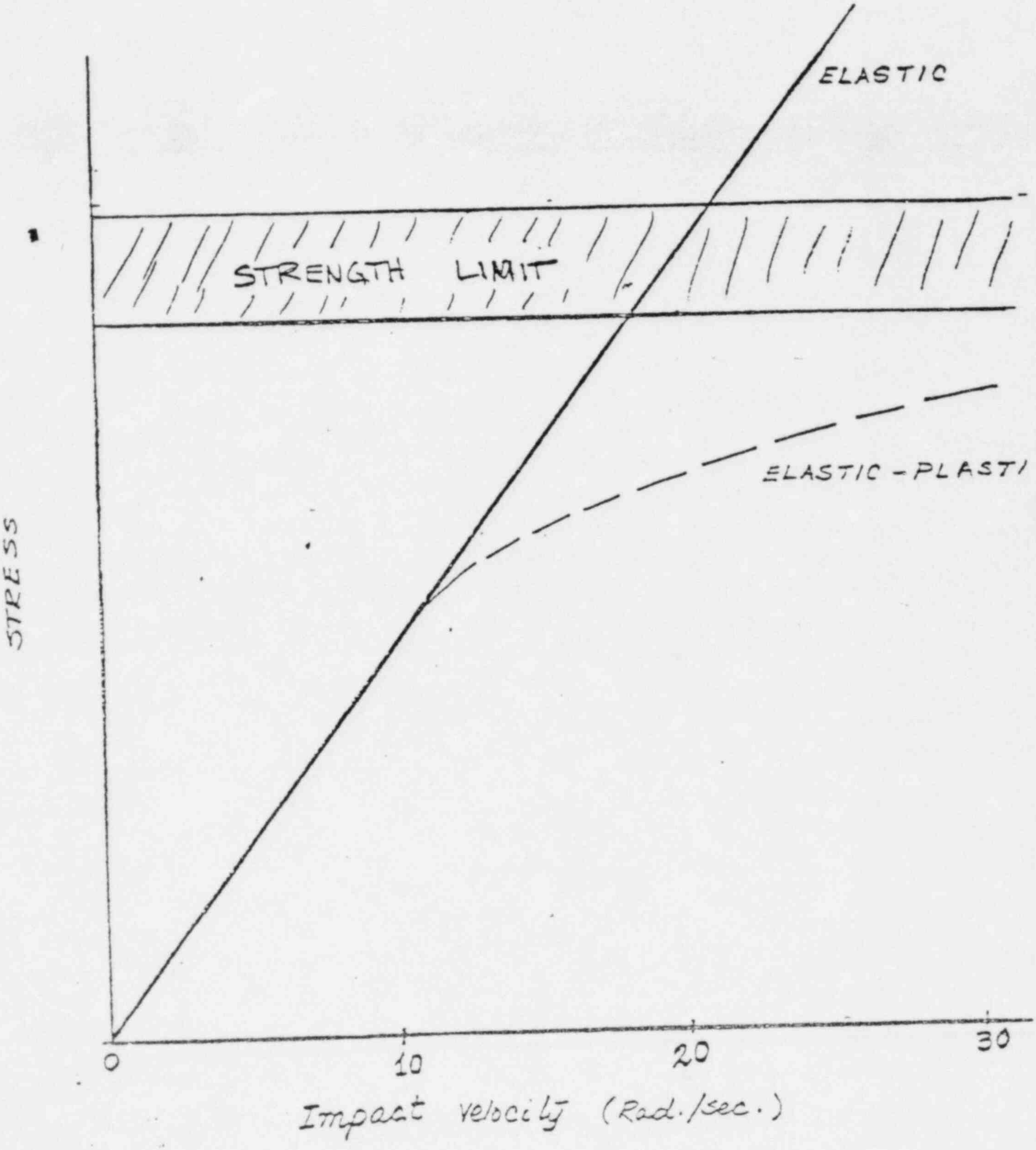
CONCLUSIONS

- 18" AND 24" MARK I VALVES GOOD FOR AT LEAST 20 RAD/SEC (LINEAR ELASTIC ANALYSIS CONFIRMED BY TEST

- OPENING AND CLOSING IMPACTS ARE OF ABOUT EQUAL SEVERITY

- ~~#~~ MARK I VALUES SIMILAR ~~ENOUGH~~ TO LASALLE VALUES TO GENERALIZE RESULTS

- ~~S~~ ADDITIONAL MARGIN, BEYOND 20 RADIANS/SECOND, EXPECTED BECAUSE OF PLASTICITY EFFECTS AND DYNAMIC NATURE OF LOAD


ELASTIC
STRENGTH LIMIT
ELASTIC - PLASTI
STRESS
0
10
20
30
Impact velocity (Rad./sec.)