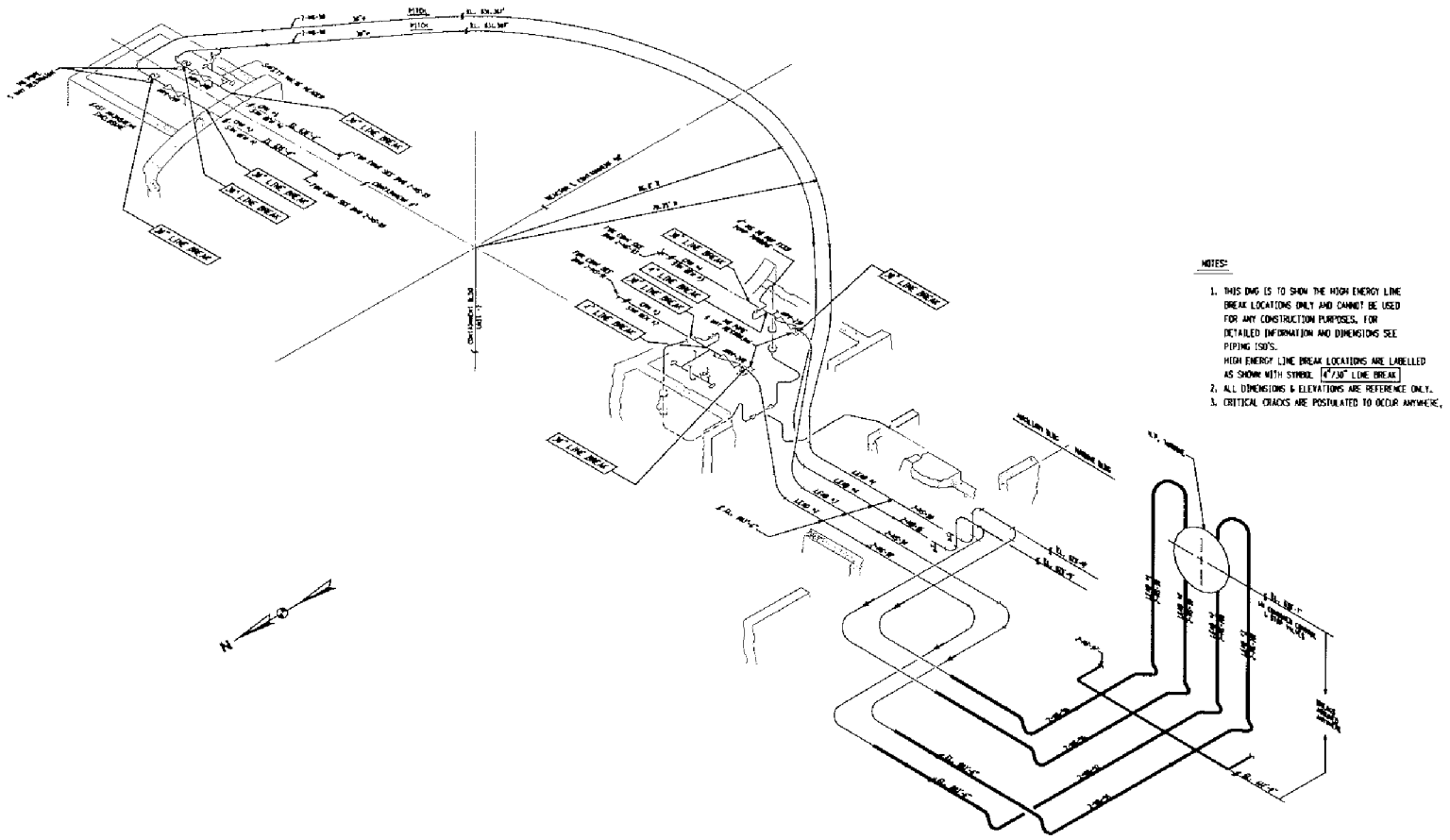
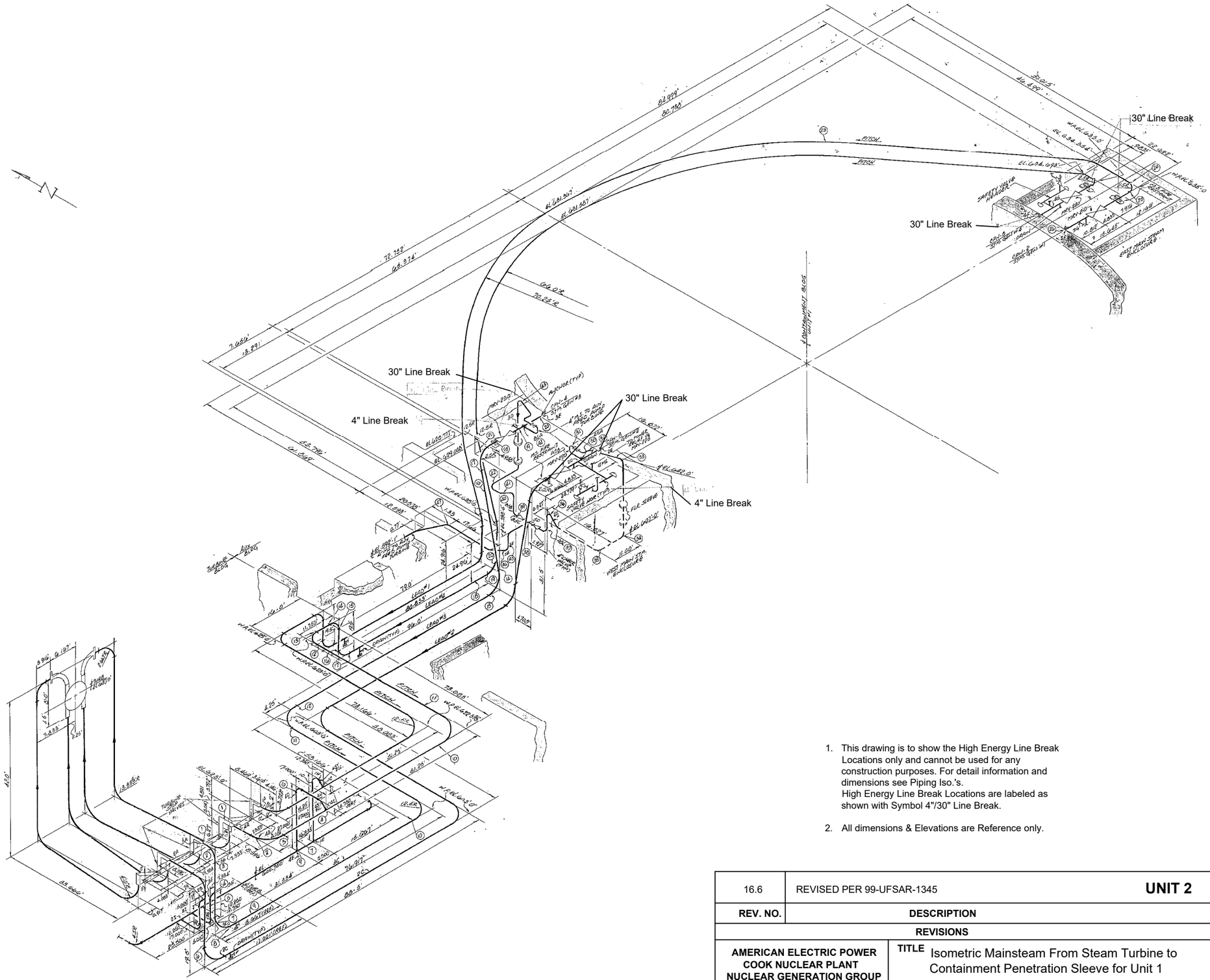


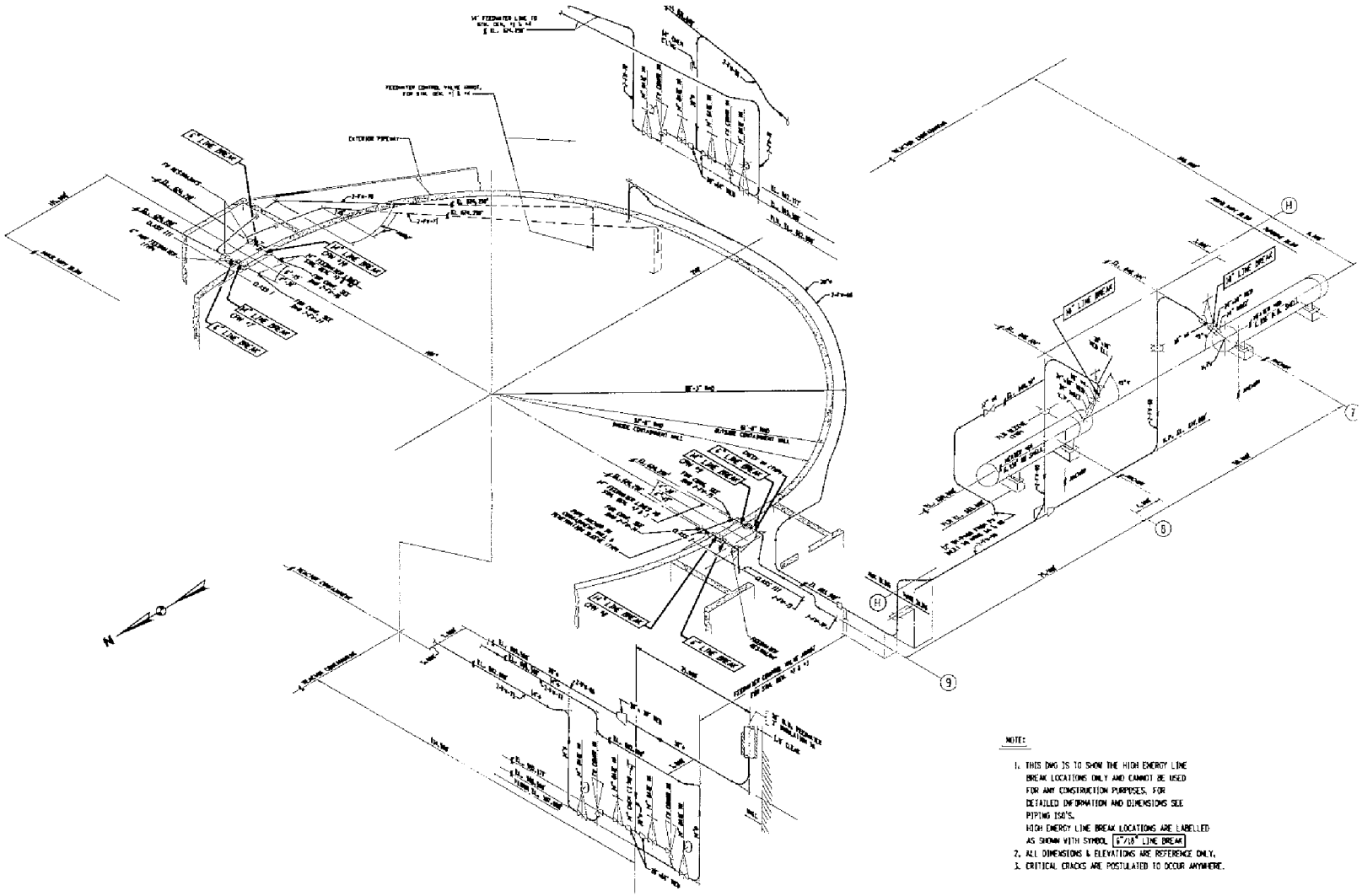
	16.4	REVISED PER 98-UFSAR-0779	**UNIT 2**
	REV. NO.	**DESCRIPTION**	
		REVISIONS	
	AMERICAN ELECTRIC POWER COOK NUCLEAR PLANT NUCLEAR GENERATION GROUP BRIDGMAN, MICHIGAN	**TITLE** **Isometric Mainsteam from Steam Turbine to Containment Penetration Sleeve Unit No.2**	
		DWG. NO. **FSAR FIG. 14.4.2-1**	SH 1 of 1



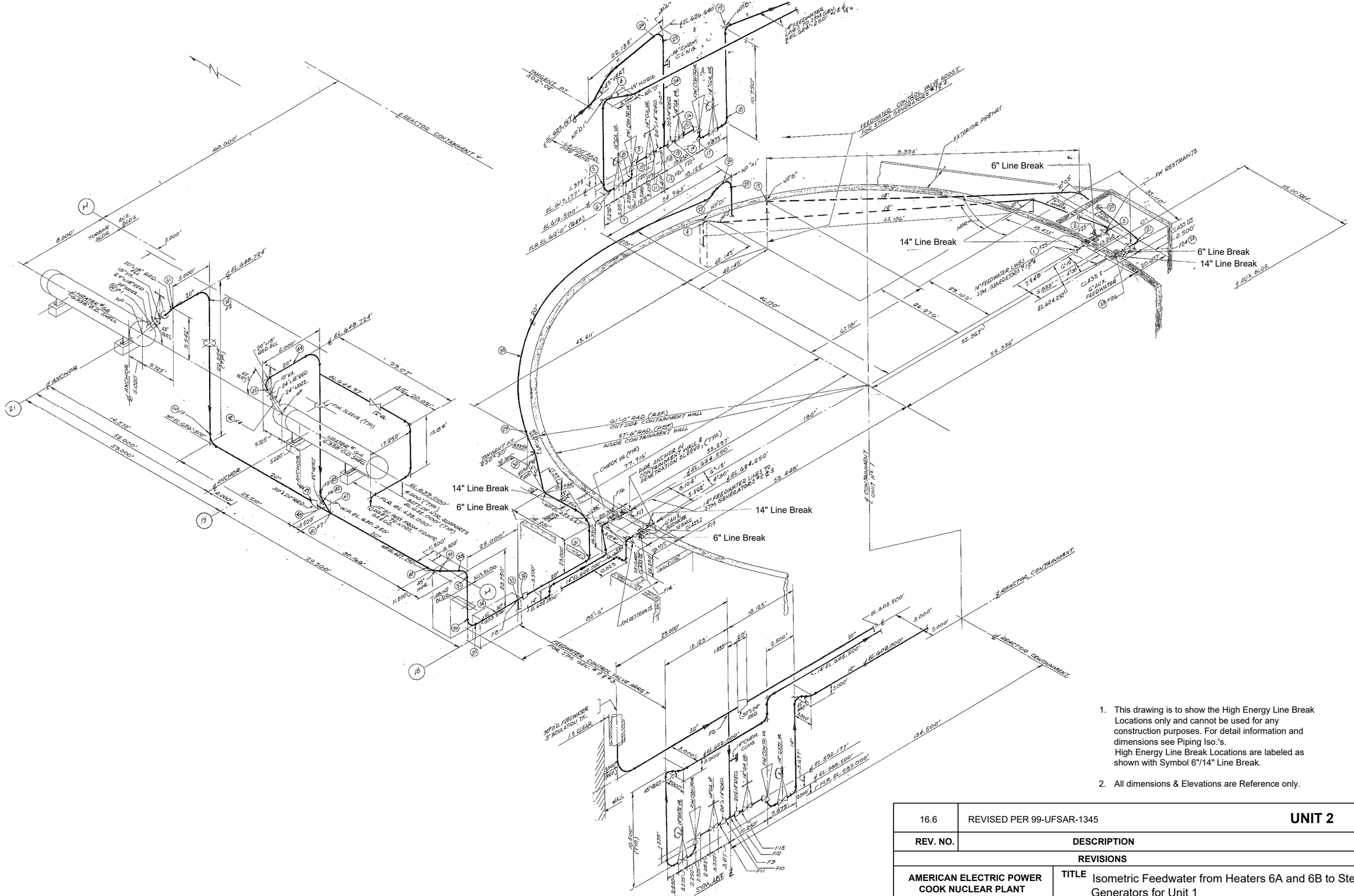
1. This drawing is to show the High Energy Line Break Locations only and cannot be used for any construction purposes. For detail information and dimensions see Piping Iso.'s.
   High Energy Line Break Locations are labeled as shown with Symbol 4"/30" Line Break.

2. All dimensions & Elevations are Reference only.

16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
	REVISIONS	
AMERICAN ELECTRIC POWER COOK NUCLEAR PLANT NUCLEAR GENERATION GROUP BRIDGMAN, MICHIGAN	**TITLE** Isometric Mainsteam From Steam Turbine to Containment Penetration Sleeve for Unit 1	
	DWG. NO. FSAR FIG. 14.4.2-1A	SH 1 of 1



	16.4	REVISED PER 98-UFSAR-0779	**UNIT 2**
	REV. NO.	**DESCRIPTION**	
	REVISIONS		
	AMERICAN ELECTRIC POWER COOK NUCLEAR PLANT NUCLEAR GENERATION GROUP BRIDGMAN, MICHIGAN	**TITLE** **Isometric of Feedwater from Heaters # 6A & 6B to Steam Generators Unit No. 2**	
		DWG. NO. **FSAR FIG. 14.4.2-2**	SH 1 of 1

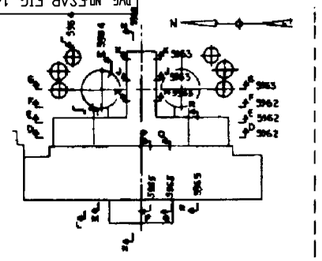


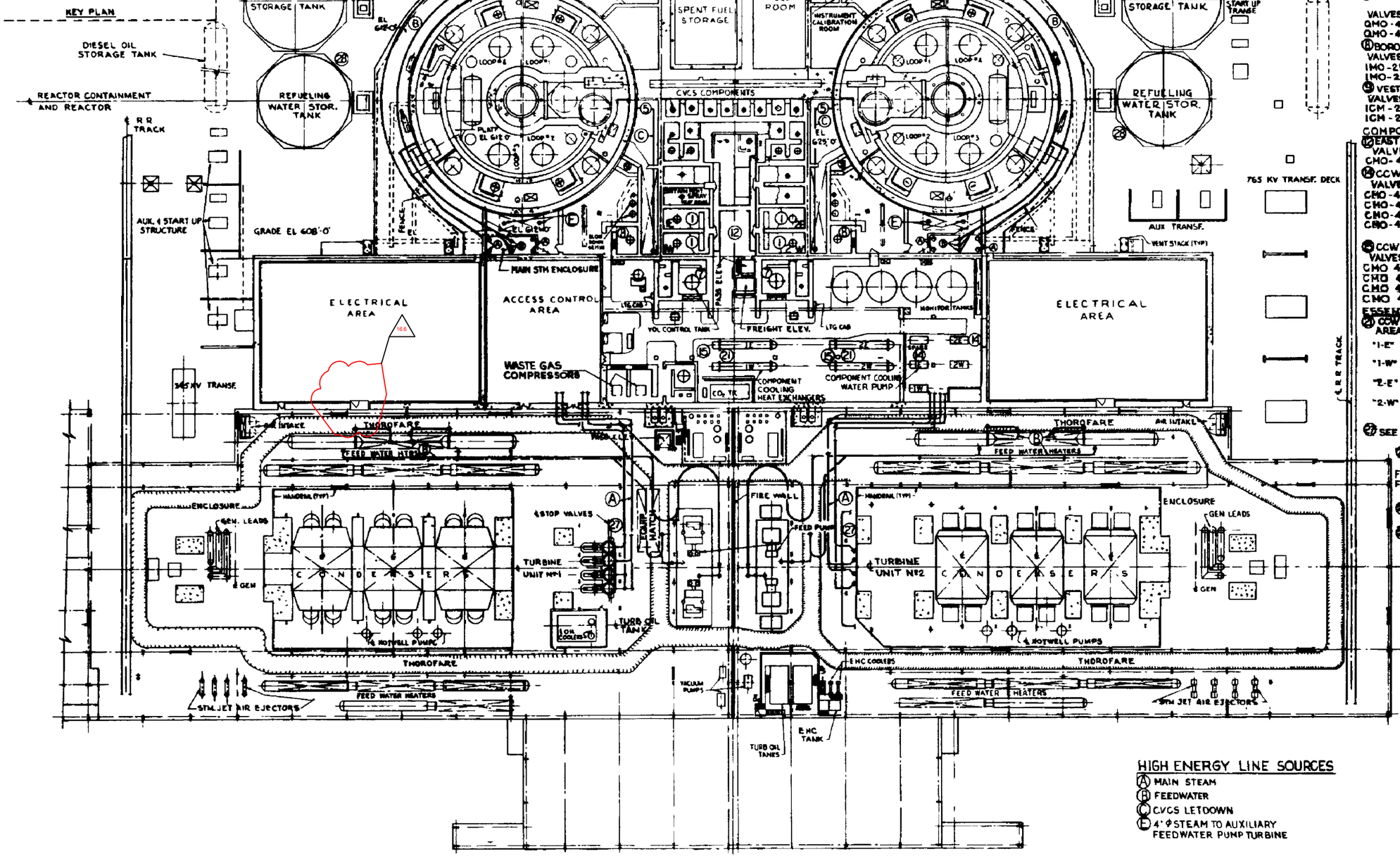
1. This drawing is to show the High Energy Line Break Locations only and cannot be used for any construction purposes. For detail information and dimensions see Piping Iso.'s.
   High Energy Line Break Locations are labeled as shown with Symbol 6"/14" Line Break.

2. All dimensions & Elevations are Reference only.

16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		
AMERICAN ELECTRIC POWER COOK NUCLEAR PLANT NUCLEAR GENERATION GROUP BRIDGMAN, MICHIGAN	**TITLE** Isometric Feedwater from Heaters 6A and 6B to Steam Generators for Unit 1	
	DWG. NO. **FSAR FIG. 14.4.2-2A**	SH 1 of 1

DWG. NO. FSAR FIG. 14.4.2-7





HIGH ENERGY LINE SOURCES

- (A) MAIN STEAM
- (B) FEEDWATER
- (C) CVCS LETDOWN
- (E) 4" ϕ STEAM TO AUXILIARY FEEDWATER PUMP TURBINE

UNIT 2

RESIDUAL HEAT REMOVAL SYSTEM
(1) HEAT EXCHANGER ROOM
"1-E" & "2-E"
VALVES
1MO - 312
1MO - 314
1RV - 310
1RV - 311
"1-W" & "2-W"
1MO - 322
1MO - 324
1RV - 320

CVCS
(5) VESTIBULE
VALVES
QCR-300
(7) VOLUME CONTROL TANK ROOM
VALVES
QMO-451
QMO-452
(8) BORON INJECTION TANK ROOM
VALVES: 1MO-255, 1MO-286
INSTRUMENTS: ITC-251, ITA-250
(9) VESTIBULE EL.612'-0"
VALVES
1CM-250
1CM-251

COMPONENT COOLING WATER SYST
(12) EAST MAIN HEAT EXCHANGER AREA
VALVE
CMO-419
(13) CCW PUMP AREA
VALVES: CMO-411, CMO-412, CMO-413, CMO-414
INSTRUMENTS: CPS-410, CPS-420, CPS-430, CRA-415, CRA-425
(15) CCW HEAT EXCHANGER AREA
VALVES
CMO 410
CMO 415
CMO 436
CMO 420

ESSENTIAL SERVICE WATER SYSTEM
(21) CCW HEAT EXCHANGER AREA

AREA	VALVES
"1-E"	1WMO-731, 1WMO-733
"1-W"	1WMO-735, 1WMO-737
"2-E"	2WMO-736, 2WMO-735
"2-W"	2WMO-732, 2WMO-734

MAIN STEAM
(27) SEE LIST FIG. 0-4

FEEDWATER SYSTEM
(2) TUNNEL AREA

VALVES	INSTRUMENTS
FRV-210	FFC-240
FRV-220	FFC-241

AUXILIARY FEEDWATER
(3) SEE LIST FIG. 0-1

REFUELING WATER
(4) SEE LIST FIG 0-3

NO.	DESCRIPTION
16.6	REVISED PER UCR 99-UFSAR-1307

REVISIONS

INDIANA MICHIGAN POWER COMPANY
DONALD C. COOK
NUCLEAR PLANT
BRIDGMAN MICHIGAN

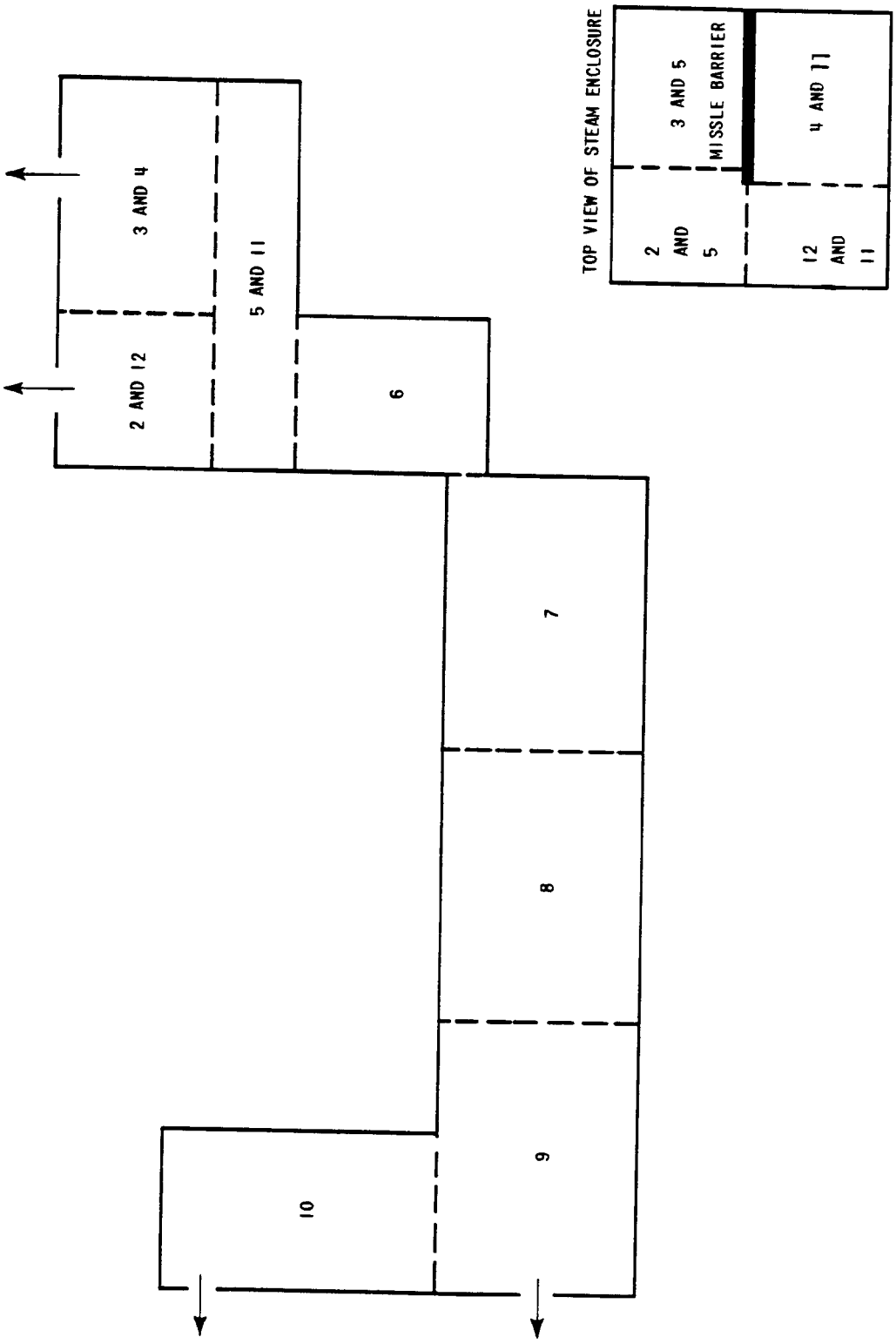
HI ENERGY LINE BREAK EQUIP/SOURCE ARRG'T MEZZANINE FL. EL. 609'-0" UNITS NO. 1 & 2

DWG. NO. FSAR FIG. 14.4.2 - 7

ARCH	ELEC	MECH	STR

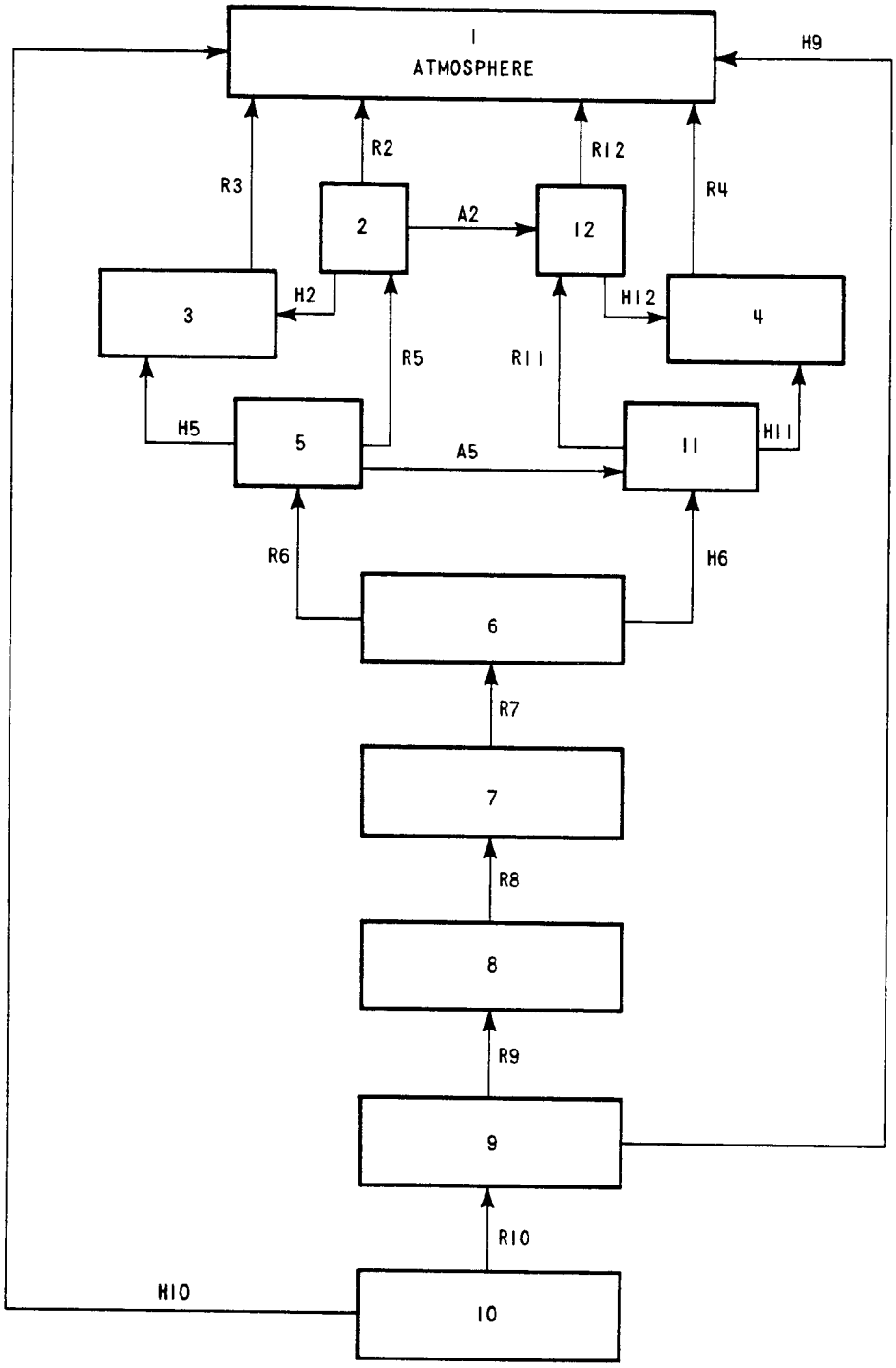
SCALE: - | JOB: -
DATE: - | CTR: -
DESIGN ENGINEERING DIVISION

AEP SERVICE CORP.
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215



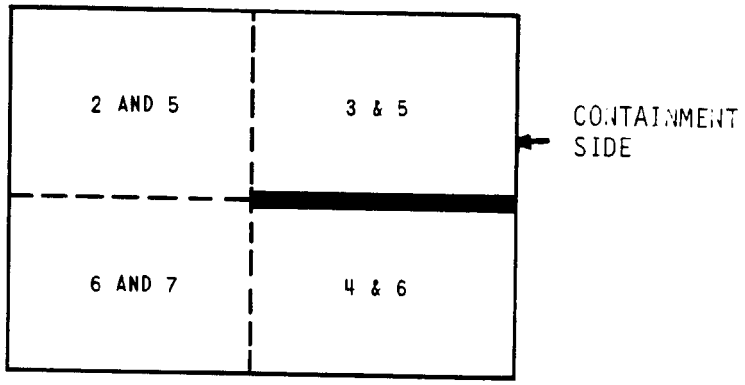
16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		

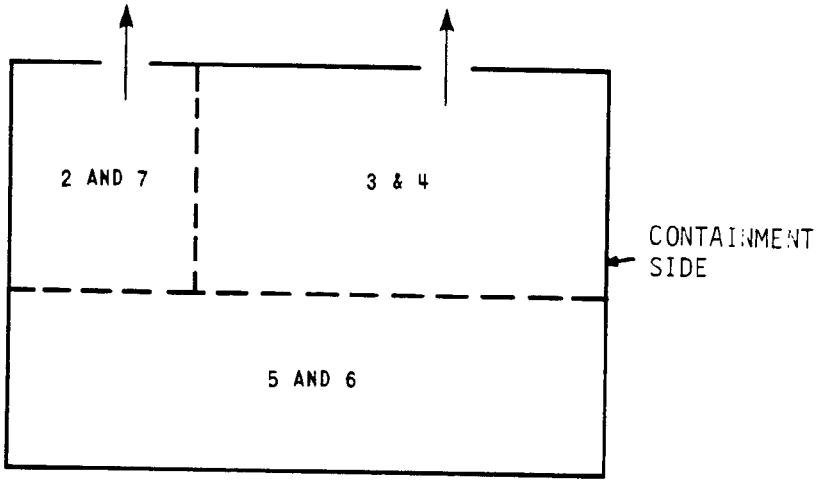
AMERICAN ELECTRIC POWER **COOK NUCLEAR PLANT** **NUCLEAR GENERATION GROUP** **BRIDGMAN, MICHIGAN**	**TITLE** Schematic of West Steam Enclosure/Main Steam Accessway	
	DWG. NO. **FSAR FIG. 14.4.6-1**	SH 1 of 1



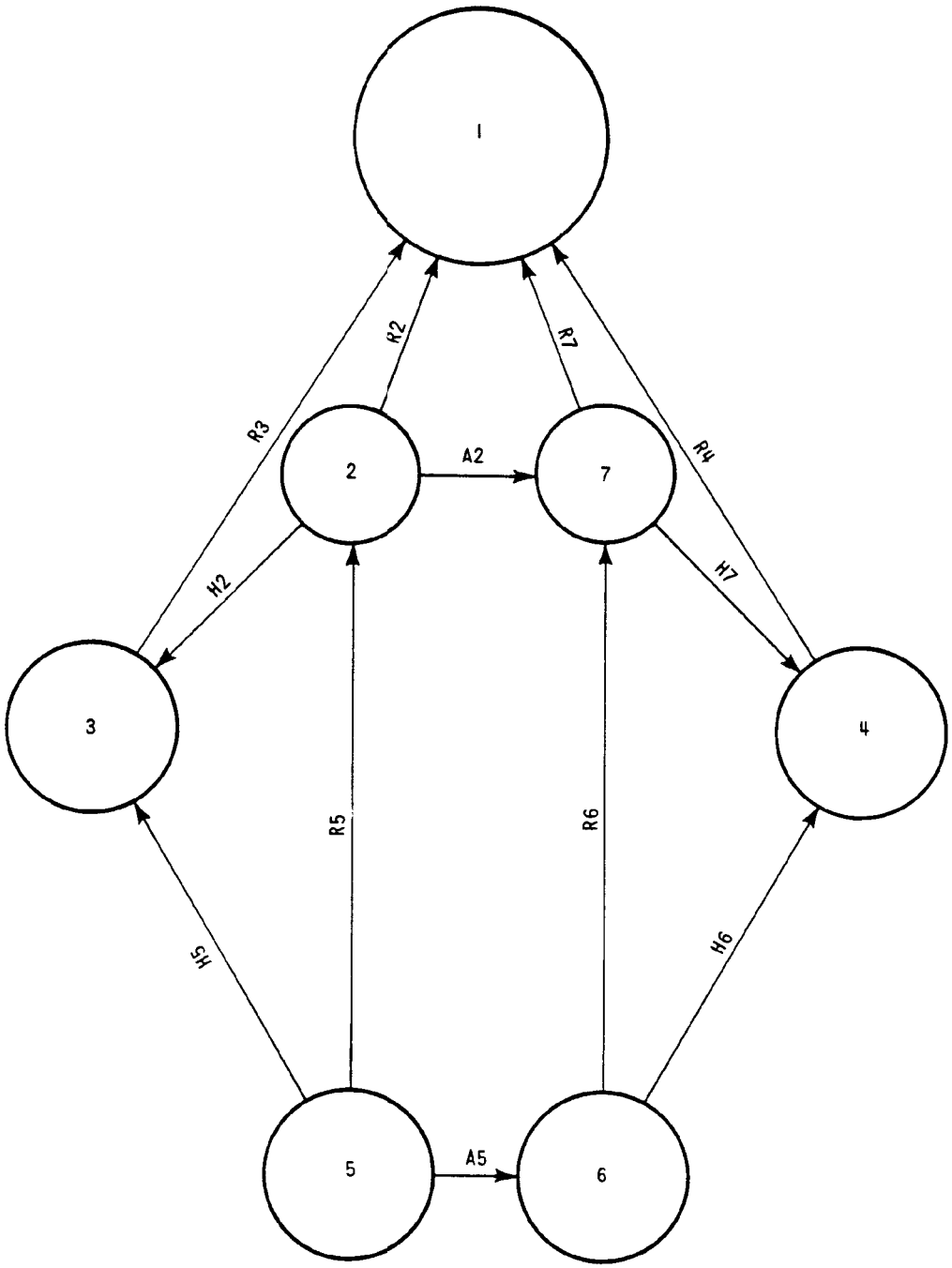
16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		

AMERICAN ELECTRIC POWER **COOK NUCLEAR PLANT** **NUCLEAR GENERATION GROUP** **BRIDGMAN, MICHIGAN**	**TITLE** TMD Network for West Steam Enclosure/Main Steam Accessway	
	DWG. NO. **FSAR FIG. 14.4.6-2**	SH 1 of 1



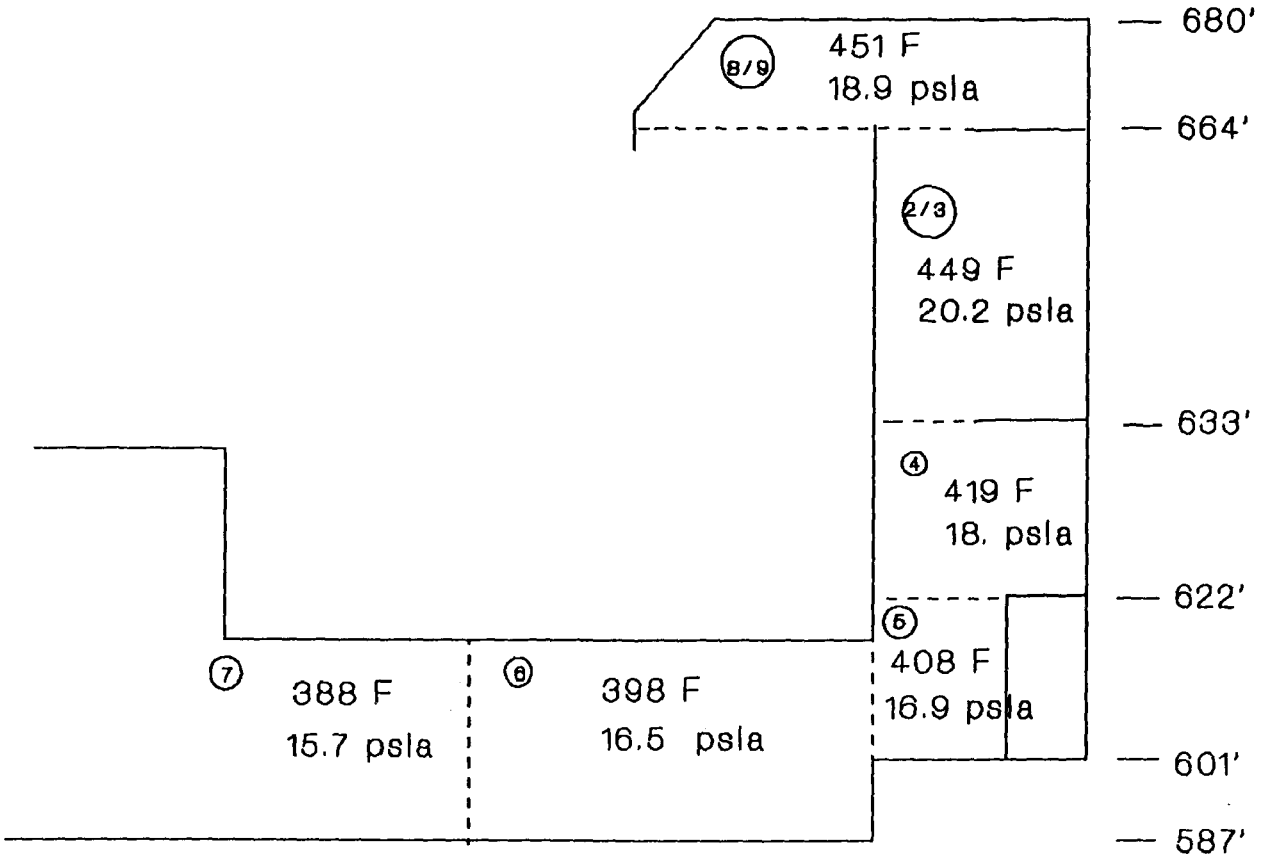


16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		
AMERICAN ELECTRIC POWER COOK NUCLEAR PLANT NUCLEAR GENERATION GROUP BRIDGMAN, MICHIGAN	**TITLE** Schematic of East Steam Enclosure	
	DWG. NO. **FSAR FIG. 14.4.6-3**	SH 1 of 1



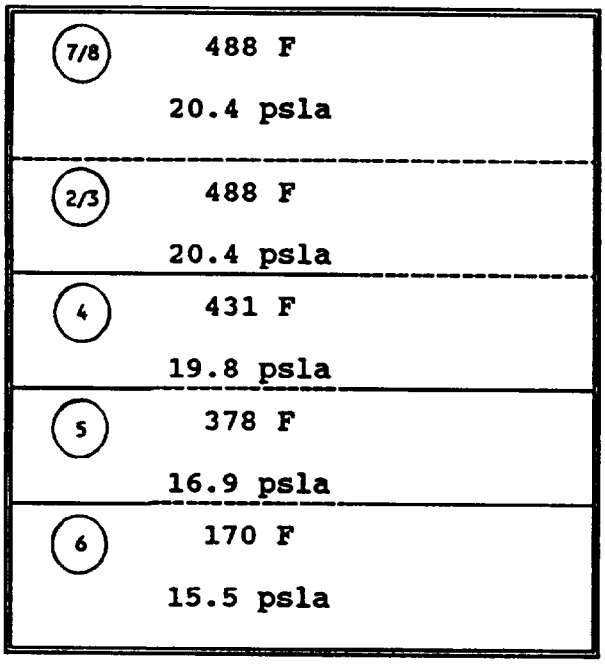
16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		

AMERICAN ELECTRIC POWER **COOK NUCLEAR PLANT** **NUCLEAR GENERATION GROUP** **BRIDGMAN, MICHIGAN**	**TITLE** TMD Network for East Steam Enclosure	
	DWG. NO. **FSAR FIG. 14.4.6-4**	SH 1 of 1



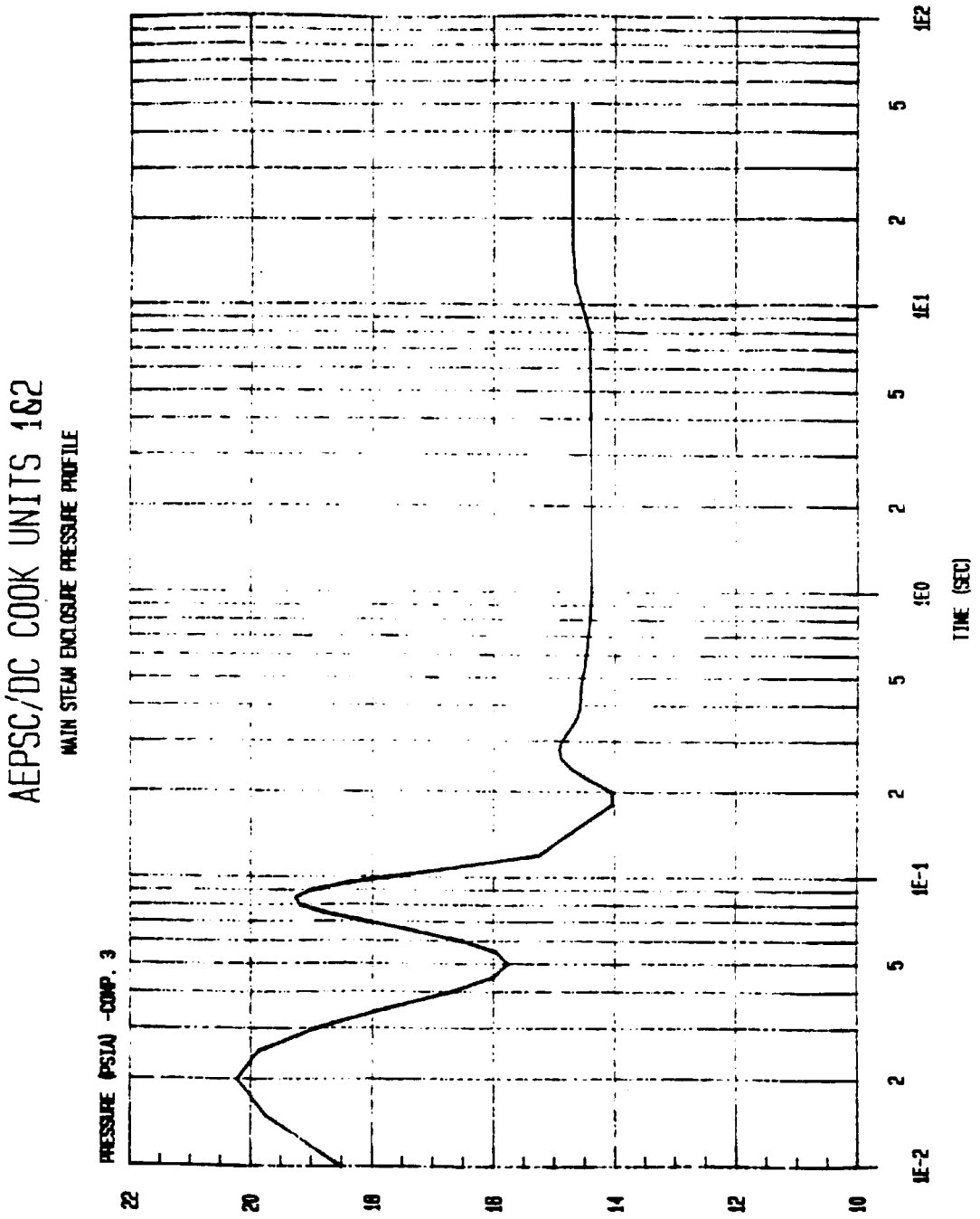
16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		

AMERICAN ELECTRIC POWER COOK NUCLEAR PLANT NUCLEAR GENERATION GROUP BRIDGMAN, MICHIGAN	**TITLE** Peak Environmental Parameters (West Main Steam Enclosure and Accessway) (Structural Qualification)	
	DWG. NO. **FSAR FIG. 14.4.6-5**	SH 1 of 1

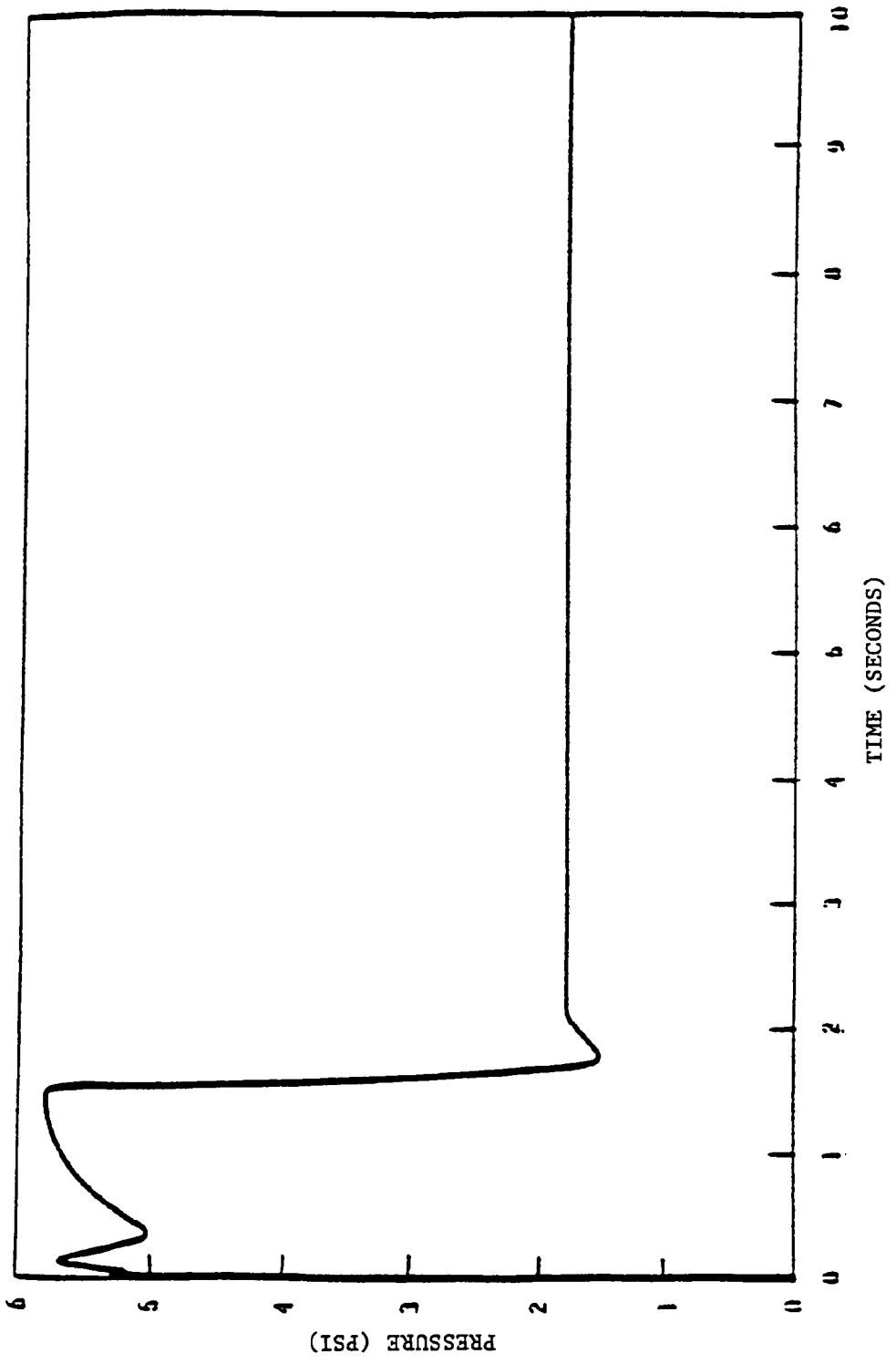


16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		

AMERICAN ELECTRIC POWER **COOK NUCLEAR PLANT** **NUCLEAR GENERATION GROUP** **BRIDGMAN, MICHIGAN**	**TITLE** Peak Environmental Parameter (East Main Steam Enclosure) (Structural Qualification)	
	DWG. NO. **FSAR FIG. 14.4.6-6**	SH 1 of 1

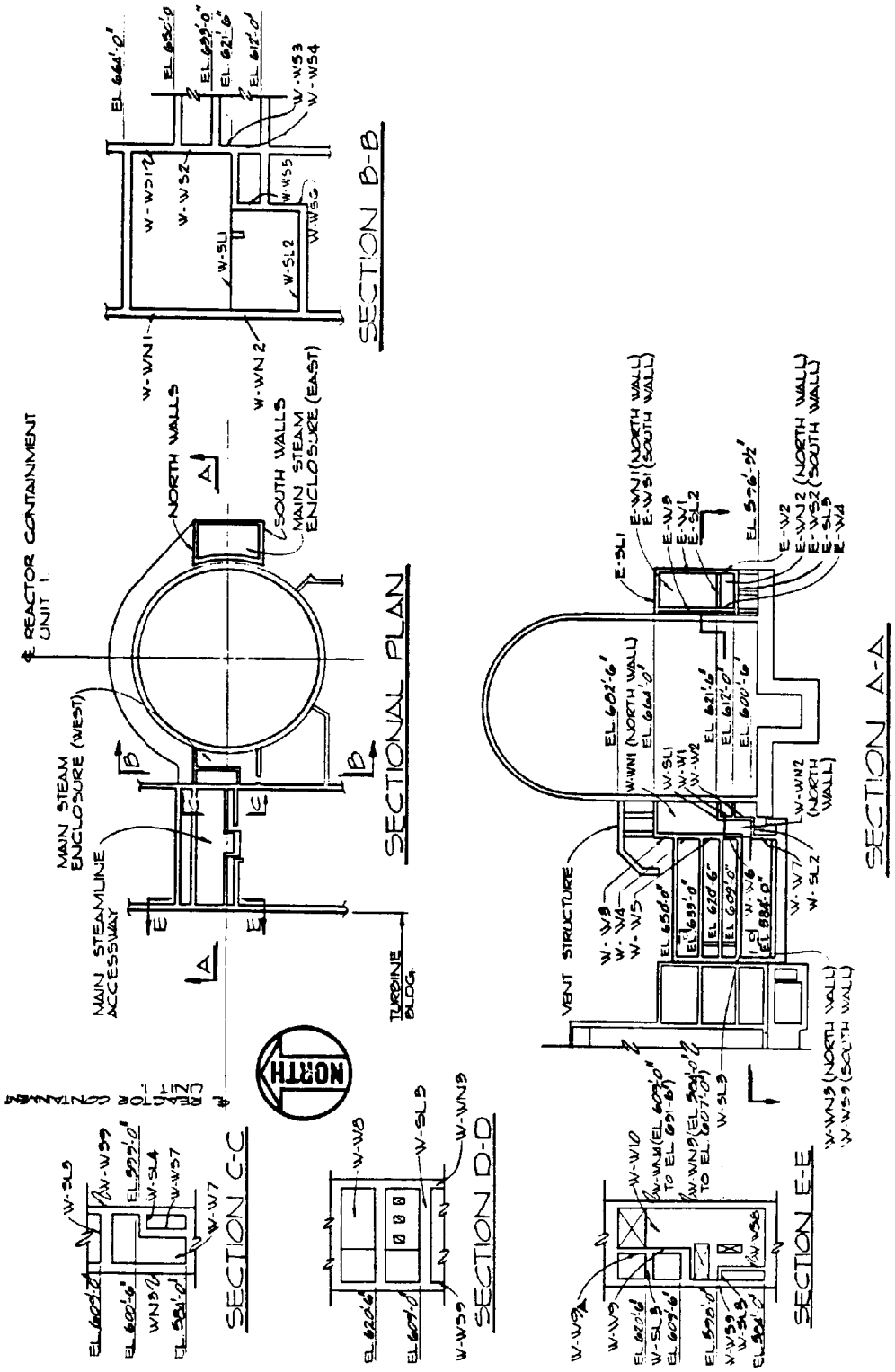


16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		
AMERICAN ELECTRIC POWER **COOK NUCLEAR PLANT** **NUCLEAR GENERATION GROUP** **BRIDGMAN, MICHIGAN**	**TITLE** East Main Steam Enclosure Pressure Profile in Elements 2 and 3	
	DWG. NO. **FSAR FIG. 14.4.6-8**	SH 1 of 1



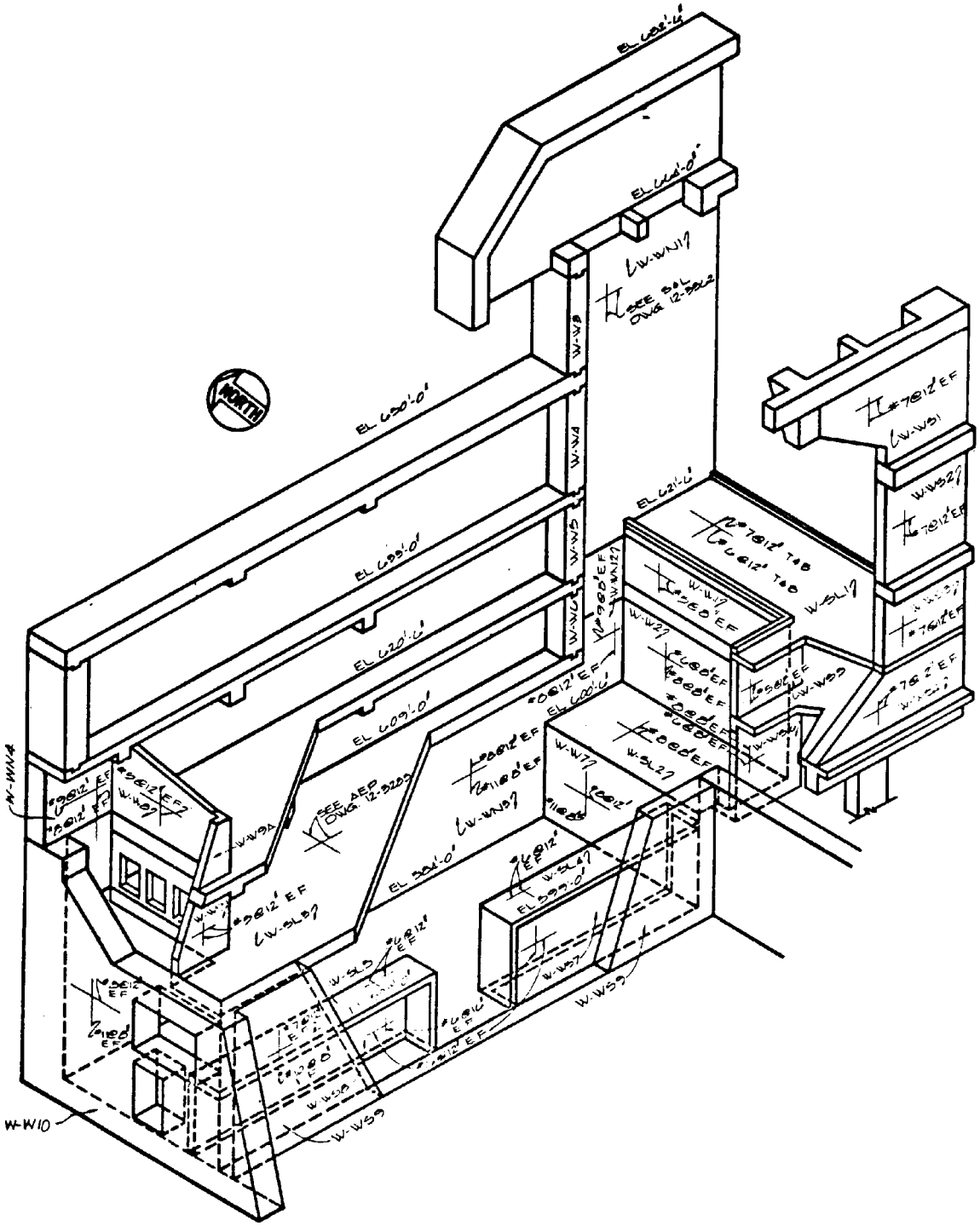
16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		

AMERICAN ELECTRIC POWER **COOK NUCLEAR PLANT** **NUCLEAR GENERATION GROUP** **BRIDGMAN, MICHIGAN**	**TITLE** Feedwater Line Break in Main Steam Accessway (Element 7) Pressure VS. Time	
	DWG. NO. **FSAR FIG. 14.4.6-11**	SH 1 of 1



16.6	Revised per 99-UFSAR-1345	**UNIT 2**
REV. NO.	DESCRIPTION	
REVISIONS		

AMERICAN ELECTRIC POWER COOK NUCLEAR PLANT NUCLEAR GENERATION GROUP BRIDGMAN, MICHIGAN	TITLE LAYOUT AND IDENTIFICATION OF WALLS AND SLABS FOR EAST MAIN STEAM ENCLOSURE, WEST MAIN STEAM ENCLOSURE, MAIN STEAM ACCESSWAY	
	DWG. NO. **FSAR FIG. 14.4.8-1**	SH 1 of 1



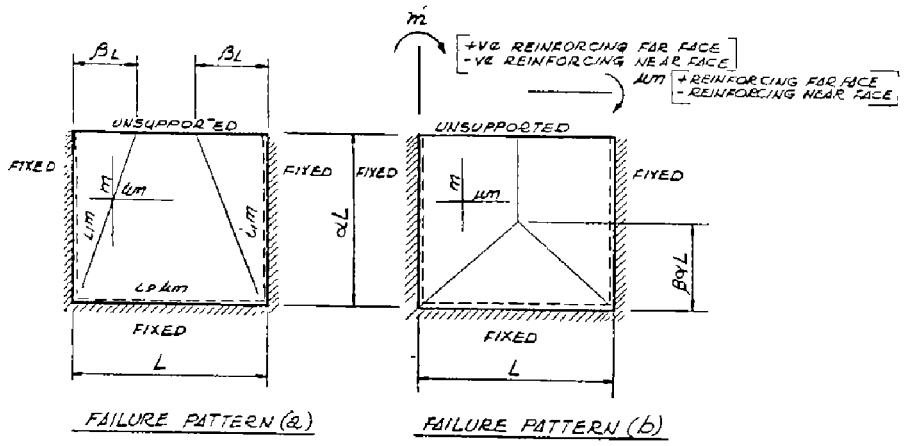
16.6	REVISED PER 99-UFSAR-1345	UNIT 2
REV. NO.	DESCRIPTION	

REVISIONS

AMERICAN ELECTRIC POWER
COOK NUCLEAR PLANT
NUCLEAR GENERATION GROUP
BRIDGMAN, MICHIGAN

TITLE **Isometric View of Main Steam Enclosure Accessway West of Containment**

DWG. NO. **FSAR FIG. 14.4.8-2** SH 1 of 1



FAILURE PATTERN (a)

FAILURE PATTERN (b)

FOR PATTERN (a):

$$\beta = \frac{\alpha^2}{\mu}\frac{(1+i_1)}{(3+i_2)}\left[\sqrt{4+3\frac{\mu}{\alpha^2}\frac{(3+i_2)}{(1+i_1)}}-2\right]$$

< 0.5 FOR PATTERN (a) TO BE VALID.

$$p_{max} = m\frac{6\mu}{\alpha^2 L^2}\frac{(4\beta+i_2)}{(3-4\beta)}$$

FOR PATTERN (b):

$$\beta = \frac{1}{4}\frac{\mu}{\alpha^2}\frac{(1+i_2)}{(1+i_1)}\left[\sqrt{1+12\frac{\alpha^2}{\mu}\frac{(1+i_1)}{(1+i_2)}}-1\right]$$

< 1.0 FOR PATTERN (b) TO BE VALID.

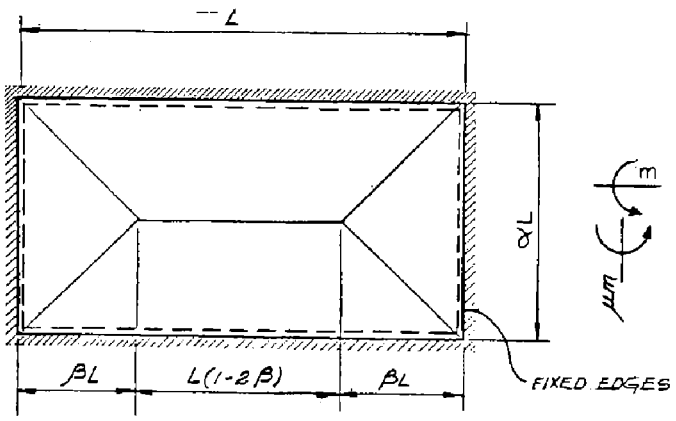
$$p_{max} = m\frac{2\phi(1+i_1)}{L^2(3-2\beta)}$$

EVALUATE BOTH CASES AND USE MINIMUM VALUE FOR p_{max}.

——— POSITIVE YIELD LINE

– – – – NEGATIVE YIELD LINE

16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
	REVISIONS	
AMERICAN ELECTRIC POWER COOK NUCLEAR PLANT NUCLEAR GENERATION GROUP BRIDGMAN, MICHIGAN	**TITLE** Yield Line Pattern for Panels with Three Edges Fixed & One Edge Unsupported Subjected to Uniformly Distributed Load	
	DWG. NO. FSAR FIG. 14.4.8-3	SH 1 of 1



——— POSITIVE YIELD LINE

– – – – NEGATIVE YIELD LINE

m = YIELD MOMENT (+) & (-) (SHORT DIRECTION)

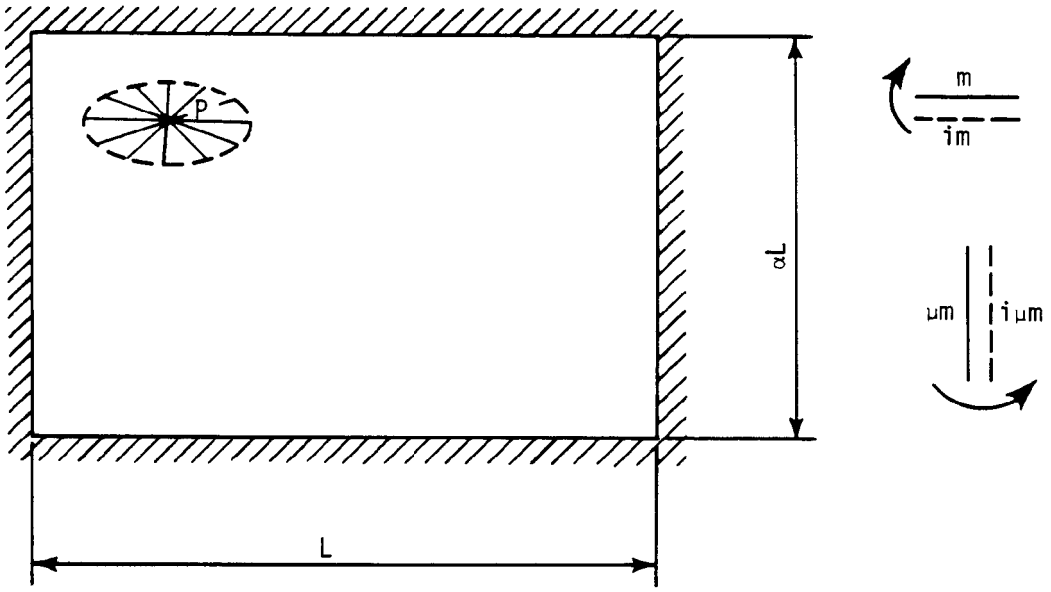
μm = YIELD MOMENT (+) & (-) (LONG DIRECTION)

$$\beta = \frac{\mu\alpha^2}{2}\left\{\sqrt{\left[1+\frac{3}{\mu\alpha^2}\right]}-1\right\}$$

IF $\beta > 0.5$ INTERCHANGE "L" & "αL"

$$P_{MAX} = \frac{24m\left[\frac{2}{\alpha}+\frac{\alpha\mu}{\beta}\right]}{\alpha L^2(3-2\beta)}$$

16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		
AMERICAN ELECTRIC POWER COOK NUCLEAR PLANT NUCLEAR GENERATION GROUP BRIDGMAN, MICHIGAN	**TITLE** Yield Line Pattern for Panels with Four Edges Fixed Subjected to Uniformly Distributed Load	
	DWG. NO. **FSAR FIG. 14.4.8-4**	SH 1 of 1



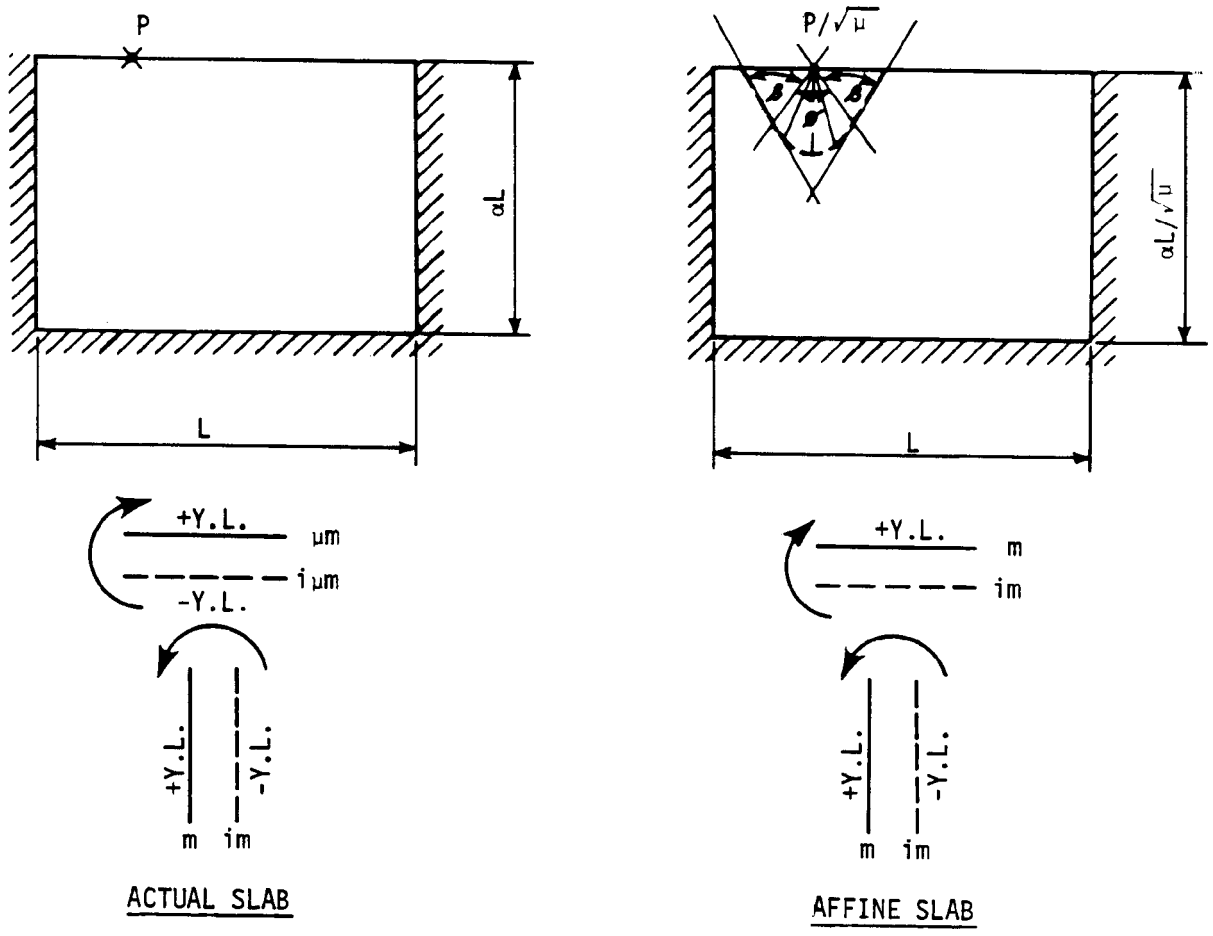
——— POSITIVE YIELD LINE
– – – – NEGATIVE YIELD LINE

m = +YIELD MOMENT
im = -YIELD MOMENT
μm = +YIELD MOMENT
iμm = -YIELD MOMENT

$$P_{max} = 2\pi\sqrt{\mu}\,(1+i)\,m$$

16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		

AMERICAN ELECTRIC POWER **COOK NUCLEAR PLANT** **NUCLEAR GENERATION GROUP** **BRIDGMAN, MICHIGAN**	**TITLE** **Yield Line Pattern for Panels with Four Edges Fixed Subjected to Concentrated Point Load**	
	DWG. NO. **FSAR FIG. 14.4.8-5**	SH 1 of 1



Y.L. = YIELD LINE

FOR (P/m) min., $\beta = 90°$, $\tan\left(\frac{\theta}{2}\right) = \sqrt{1}$

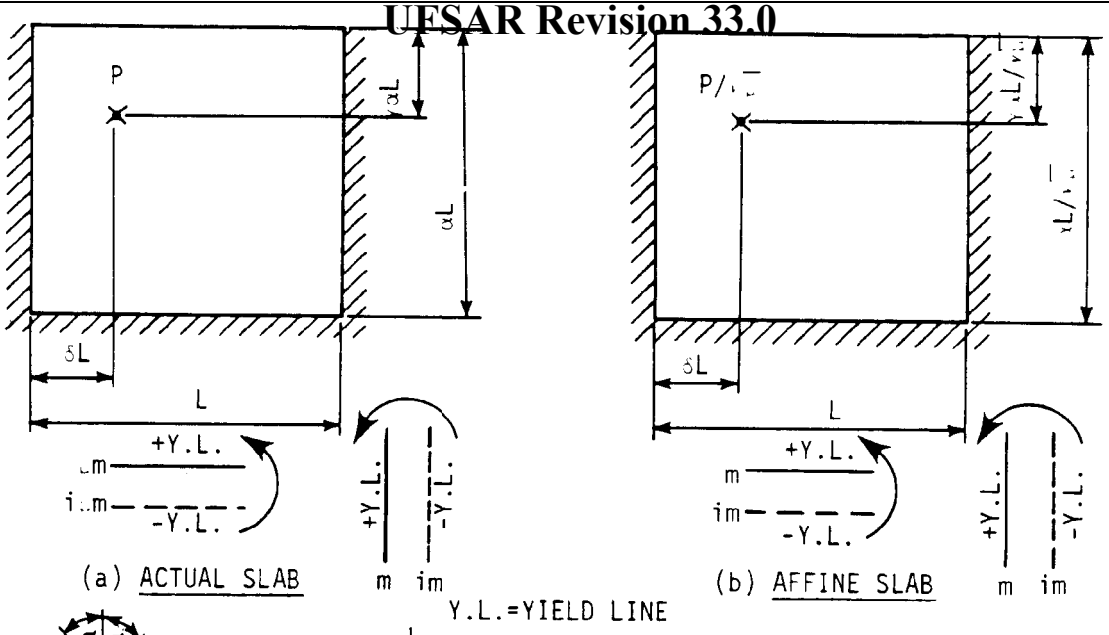
$P_{max} = \sqrt{\mu}\, m \{(1+i)\phi + 2\sqrt{1}\}$

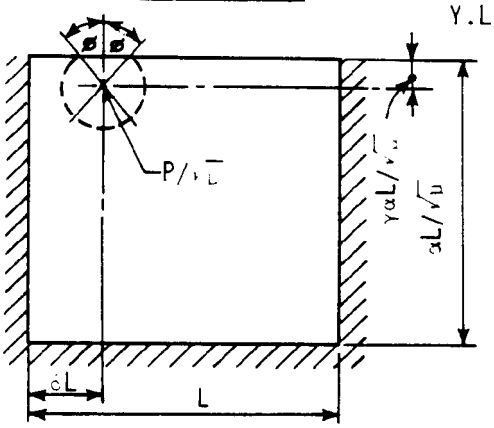
16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		

AMERICAN ELECTRIC POWER
COOK NUCLEAR PLANT
NUCLEAR GENERATION GROUP
BRIDGMAN, MICHIGAN

TITLE **Yield Line Pattern for Panels with Three Edges Fixed and Fourth Edge Free Subjected to a Concentrated Point Load at the Free Edge**

DWG. NO. **FSAR FIG. 14.4.8-6** SH 1 of 1

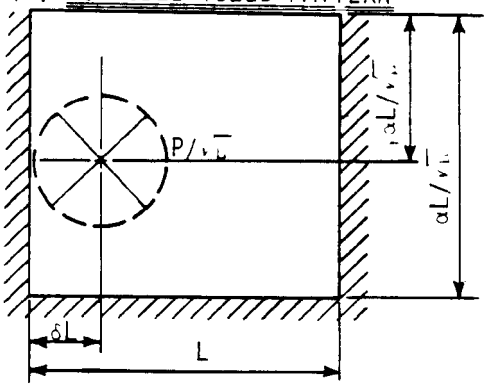




MIN=MINIMUM OF THE QUANTITIES
$\alpha L, (1-\delta)L, (1-\gamma)\alpha L/\sqrt{\mu}$

$$R = \frac{\gamma\alpha L}{\sqrt{\mu}\cos\psi}$$

(c) POSSIBLE YIELD PATTERN



(d) POSSIBLE YIELD PATTERN

POSSIBLE YIELD PATTERNS

FIND $R=\frac{\gamma\alpha L}{\sqrt{\mu}\cos\psi}$ WHERE $\psi=\tan^{-1}\sqrt{i}$

(i) R<MIN USE $\phi=\tan^{-1}\sqrt{i}$

$P=2\sqrt{\mu}\, m\{\tan\phi+(1+i)(\pi-\phi)\}$

FIG. (c) REPRESENTS THIS CASE

(ii) R>MIN, MIN $\frac{\gamma\alpha L}{\sqrt{\mu}}$

SET R'=MIN

$\cos\psi' = \frac{\gamma\alpha L}{\sqrt{\mu}\, R'}$

$P=2\sqrt{\mu}\, m\{\tan\psi'+(1+i)(\pi-\psi')\}$

FIG. (c) REPRESENTS THIS CASE

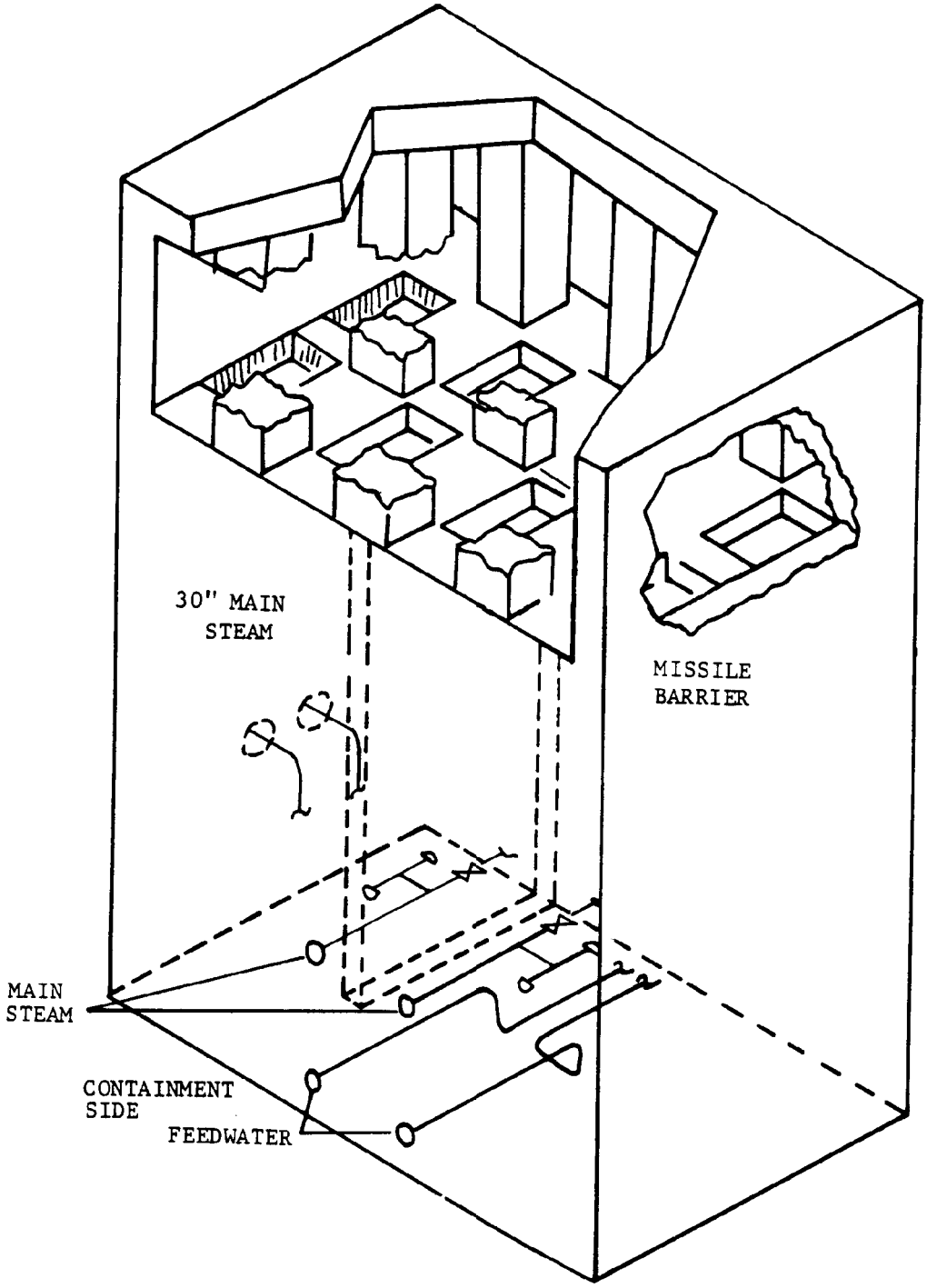
(iii) R>MIN, MIN $\leq \frac{\gamma\alpha L}{\sqrt{\mu}}$

$\phi=0$

$P=2\pi(1+i)m\sqrt{\mu}$

FIG. (d) REPRESENTS THIS CASE WHEN MIN = δL

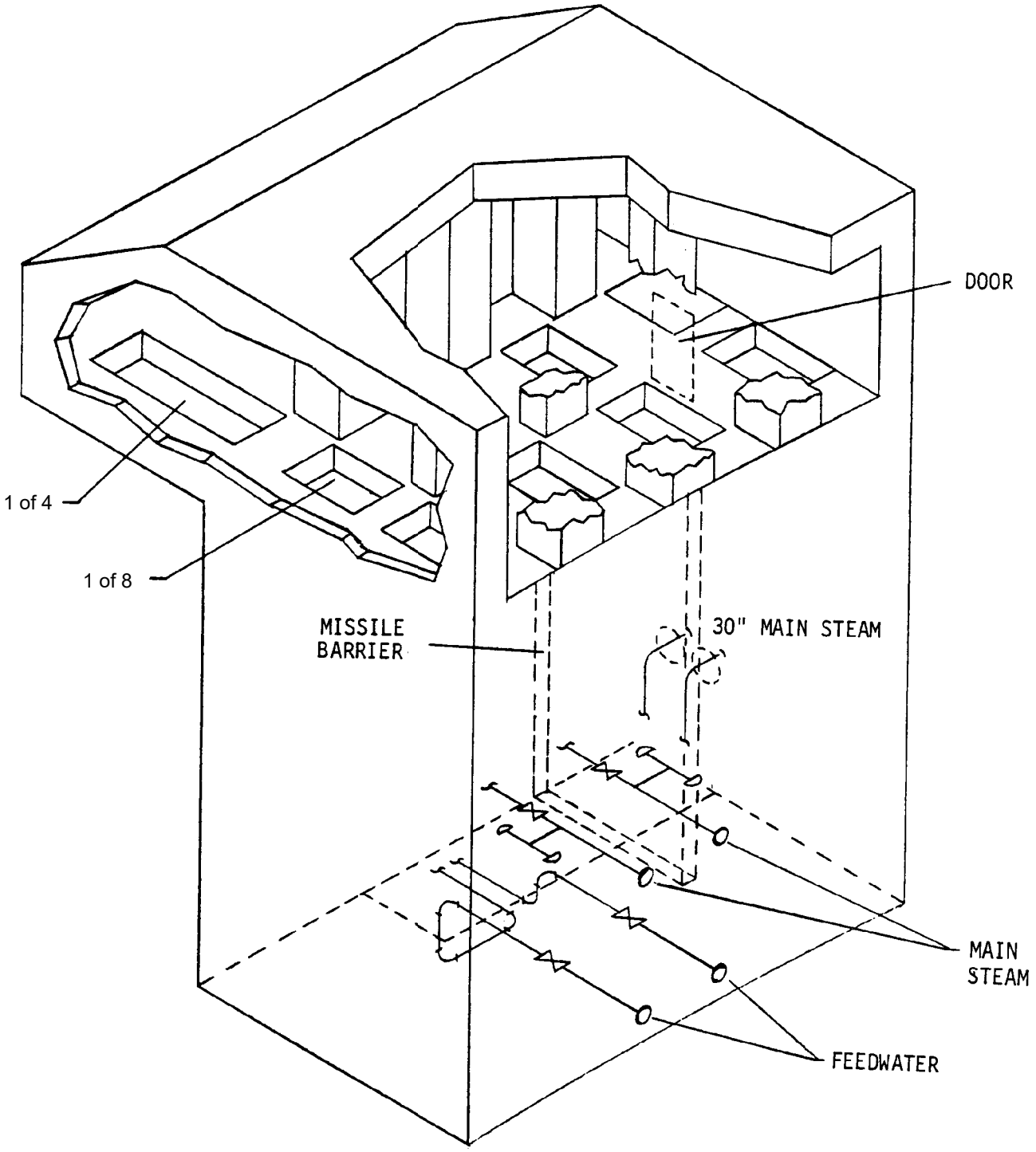
16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		
AMERICAN ELECTRIC POWER COOK NUCLEAR PLANT NUCLEAR GENERATION GROUP BRIDGMAN, MICHIGAN	**TITLE** Yield Line Patterns for Panels with Three Edges Fixed and Fourth Edge Free Subjected to a Concentrated Point Load at Interior	
	DWG. NO. FSAR FIG. 14.4.8-7	SH 1 of 1



16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	

REVISIONS

AMERICAN ELECTRIC POWER **COOK NUCLEAR PLANT** **NUCLEAR GENERATION GROUP** **BRIDGMAN, MICHIGAN**	**TITLE** East Steam Enclosure	
	DWG. NO. **FSAR FIG. 14.4.9-1**	SH 1 of 1



16.6	REVISED PER 99-UFSAR-1345	**UNIT 2**
REV. NO.	**DESCRIPTION**	
REVISIONS		
AMERICAN ELECTRIC POWER **COOK NUCLEAR PLANT** **NUCLEAR GENERATION GROUP** **BRIDGMAN, MICHIGAN**	**TITLE** West Steam Enclosure	
	DWG. NO. FSAR FIG. 14.4.9-2	SH 1 of 1