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ENCLOSURES:
Response to AEC Questions on Monticello High Energy Line Breaks Outside of Containment

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PLANT NAME: Monticello

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FOR ACTION/INFORMATION 3-21-74 GC

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50-263

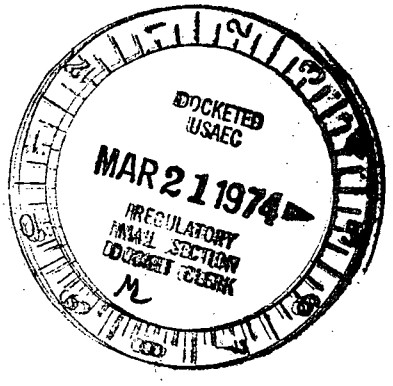
REGULATORY DOCKET FILE COPY

RESPONSES TO AEC

QUESTIONS ON MONTICELLO HIGH ENERGY

LINE BREAKS OUTSIDE OF CONTAINMENT

RETURN TO REGULATORY CENTRAL FILES
ROOM 016



2135

REGULATORY DOCKET FILE COPY

1. QUESTION: Provide the design pressure of the following;

a. Condenser Compartment (page 16)

b. HPCI Compartment (page 24)

c. RWCU Pump and Heat Exchanger Room (page 28)

d. Main Steam Chase

ANSWER: The maximum allowable pressures are as follows:

COMPARTMENT	MAX. ALLOWABLE PRESSURE (PSID)	PEAK PRESSURE (PSIG)
Condenser	8.4	1.4
HPCI	2.0*	0.9
RWCU Pump	16.0	0.2
RWCU Heat Exchanger	16.0	0.6
Main Steam Chase	13.4	12.2

* Original design pressure from tornado requirements.

In the study we utilized Theory of Plates and Shells, McGraw-Hill 2nd Edition, 1959 by Timoshenko and Weinowsky-Krieger to determine the maximum allowable pressures for each compartment.

The condenser compartment maximum allowable pressure is based on a solid wall. Actually, the condenser compartment has one section made from concrete blocks. The maximum pressure for the concrete block wall is difficult to determine but even if the concrete blocks fail, no safeguard equipment is located in their path. If the concrete block section fails

at a lower pressure than 1.4 psi, the compartment peak pressure would be reduced due to the added vent area. Therefore, this damage to the condenser compartment will not prevent the safe shutdown of the plant.

In all cases, the maximum allowable compartment pressures were either below the original design pressures or within the maximum allowable pressure calculated from Timoshenko and Weinowsky-Krieger, as noted in the above tabulation.

2. QUESTION: What is the basis of the time of ten minutes used for operator action? What is the maximum time allowed before the safety valves would open? (paragraph 6.2.1.(4) page 19)

ANSWER: It is generally assumed that ten minutes is more than sufficient time for an operator to determine plant status and initiate correct protective action following an incident. In cases where a specific operator action is required, such as the initiation of containment spray or manual initiation of relief valves for depressurization, it is generally demonstrated that the containment or core would not be in danger during the ten minute time frame (e.g. FSAR Section 6.2.4.3). In regard to the situation referenced, i.e. feedwater line break accompanied by MSIV isolation, there is never any danger to the reactor core. The level decrease, due to void collapse, would initiate HPCI and RCIC when reactor low water level trip is reached. Either of these systems can supply sufficient coolant to maintain the reactor water level above the active core. Operator action is only required in the event that neither of the systems is available. Thus, if it is assumed that water from the feedwater line spills from the main steam chase to the HPCI compartment, it can be shown that the critical time constraint relative to the ten minute assumption is determined from the rate of flooding in the HPCI compartment. The time required for the level to reach a critical HPCI component and possibly disable the HPCI has been shown to be in excess of ten minutes. Therefore, the maximum time available for safety/relief valve initiation is some time greater than ten minutes. The actual point has not been specifically determined since if the HPCI operated for ten minutes, the reactor should already be depressurized. Following depressurization of the reactor to 150 psig, the LPCI system will automatically operate to complete the plant shutdown.

3. QUESTION: Submit details of the additional protection mentioned in paragraph 6.2.2(1).

ANSWER: The additional protection envisioned at the time of the report was a plate protecting the turbine building mezzanine floor (elevation 931'0") from a jet of water impinging on the floor. This would also have provided pipe whip protection. Further analysis of the break and break locations resulted in the following:

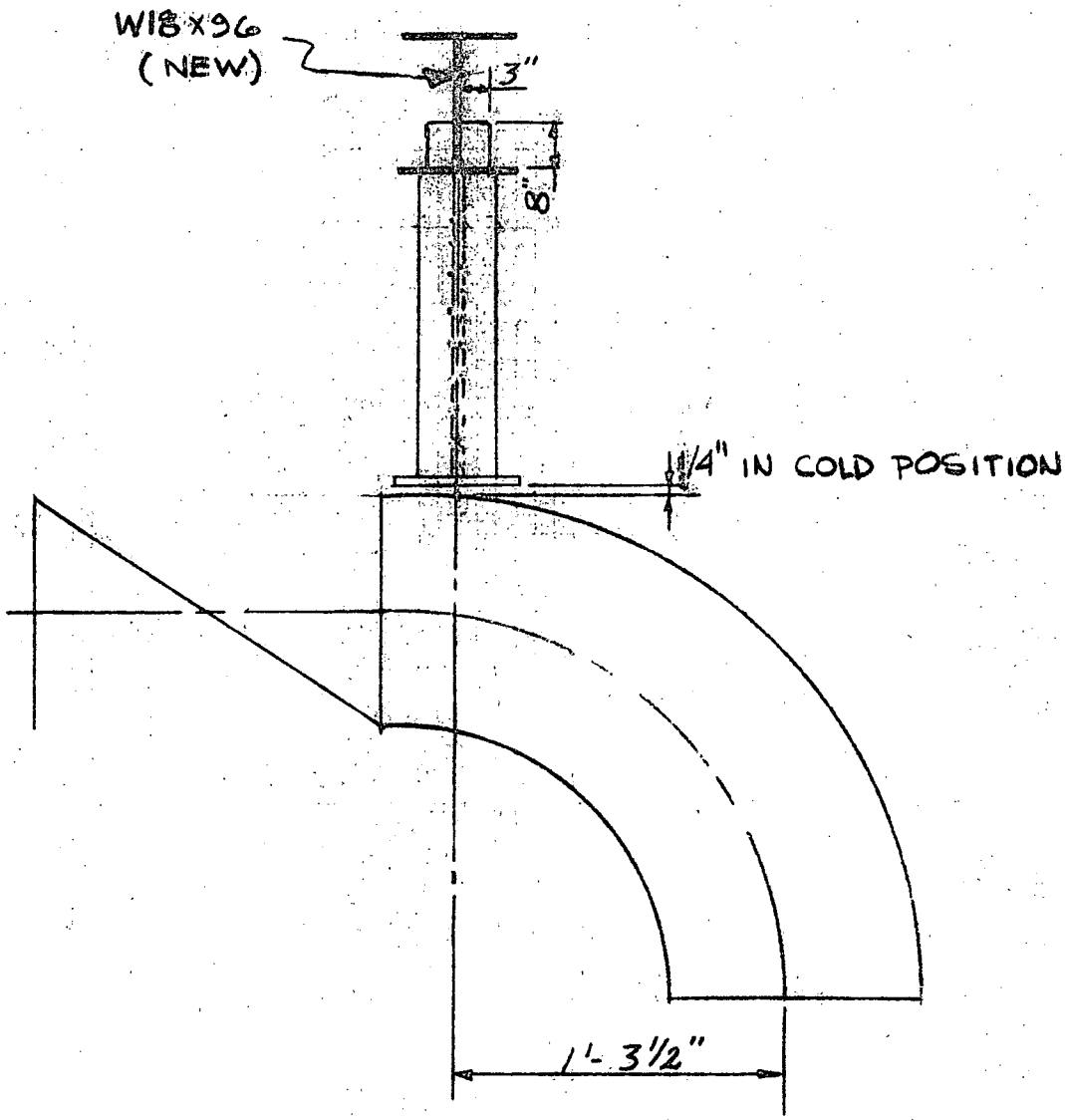
a. Jet Impingement

The original calculations assumed that the maximum operating pressure of the pump continued for a long period of time. This was a conservative approach that did not take into account the effects of pump discharge head versus the flow characteristics (system resistance). If we take into account these effects (pump run-out), the forces due to jet impingement will be reduced by approximately one order of magnitude. Using these new forces and the same method of calculation described in paragraph 5.1 of the report, the mezzanine floor will withstand the jet impingement, thereby supporting the redundant safeguard MCC without adding any steel plate.

b. Pipe Whip

In order to provide protection to the mezzanine floor against pipe whip, four restraints will be added. Detail drawings of the pipe restraints are attached. The design load for the pipe restraint was 161 kips.

With the addition of the four pipe restraints, the mezzanine floor will be protected; thereby insuring safe shutdown of the plant following a feedwater line break.



SECT. B-B

REV.	DATE	REVISIONS	BY	CH'K	DESIGN SUPVR	ENG'R	PROJ ENGR	APPR
0	2-14-74	ISSUED FOR CONSTRUCTION	R	B.P.	ECP	[illegible]	[illegible]	

MONTICELLO NUCLEAR
GENERATING PLANT — UNIT 1
MONTICELLO, MINNESOTA

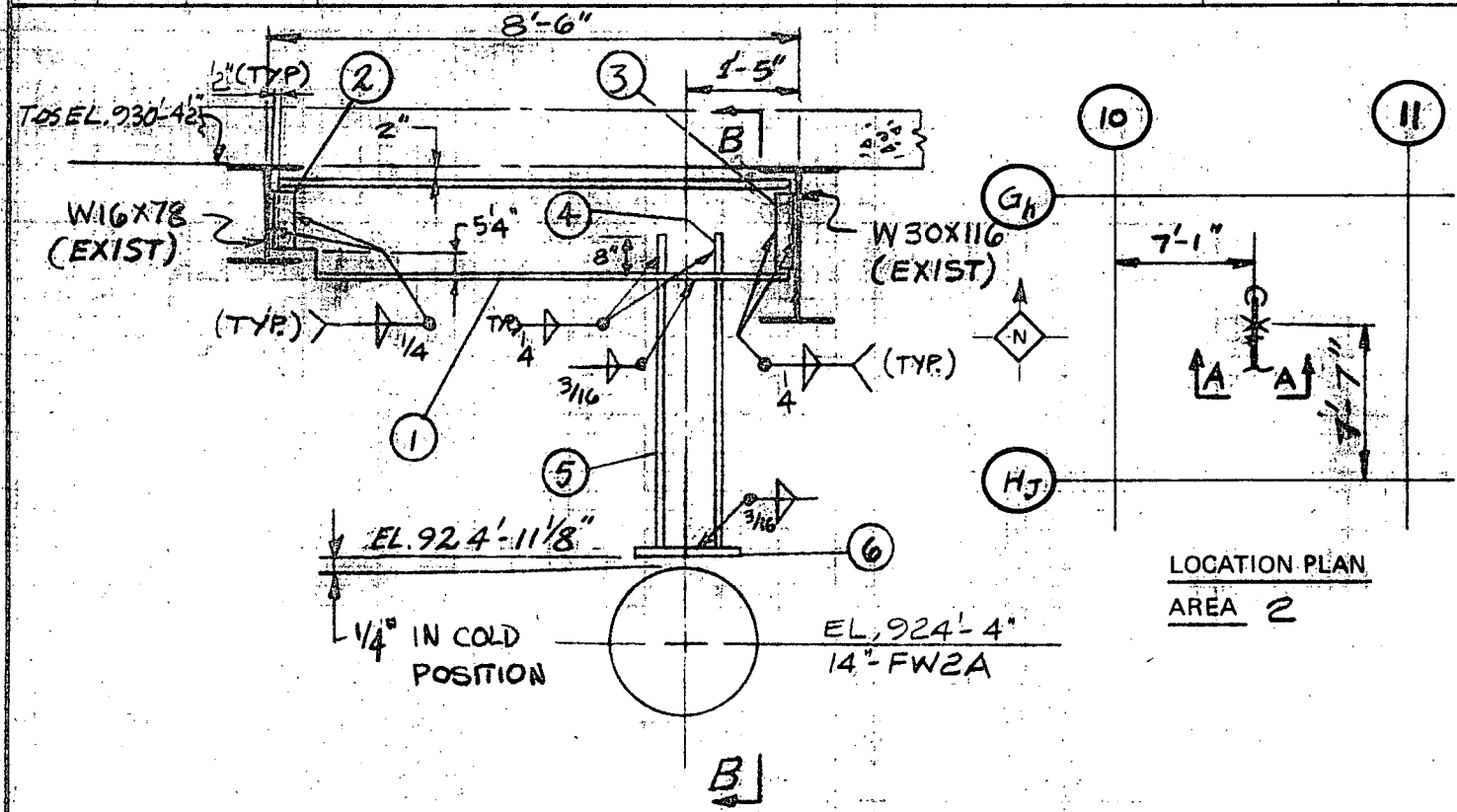
BECHTEL SAN FRANCISCO

REF. DWGS. ISO. SK-5828-L-206-C
PIPE M-218-12/M-223-14
STEEL C-241-4

PIPE SUPPORT - TURBINE BLDG.
REACTOR FEED WATER PUMP PIPING

JOB NO.	DRAWING NO.	REV.
10040	FWZA-H1A 2/2 NL60405 3/9	0

ITEM NO.	NO. REQ'D	PART NO.	SIZE	DESCRIPTION		
1	1	–	W18X96	BEAM X 8'-4 1/2" LG.		
2	2	–	L 4" X 4" X 3/8"	ANGLE X 0'-11 3/8" LG.		
3	2	–	L 4" X 4" X 3/8"	ANGLE X 1'-3" LG.		
4	4	–	1/2" X 3" X 8"	LG. C.S. PLATE		
5	1	–	W8X31	BEAM X 3'-8 1/2" LG.		
6	1	–	3/4" X 9" X 9"	C.S. PLATE		



ELEVATION A-A

LOCATION PLAN
AREA 2

LOAD

MARK NO. FW2A-H1A

REV.	DATE	REVISIONS	BY	CH'K	DESIGN SUPVR	ENG'R	PROJ ENGR	APPR
2	2-4-74	ISSUED FOR CONSTRUCTION			ECP			

MONTICELLO NUCLEAR
GENERATING PLANT — UNIT 1
MONTICELLO, MINNESOTA

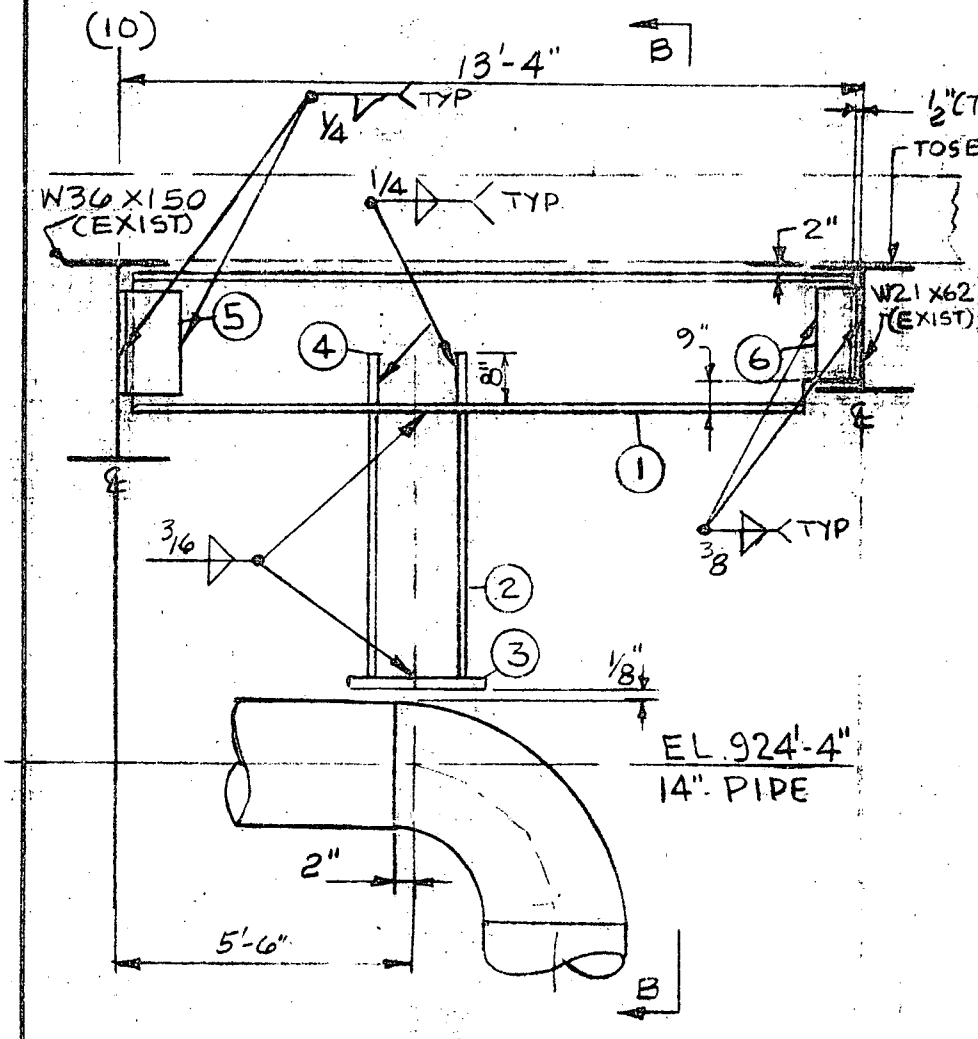
SAN FRANCISCO

REF. DWGS.
ISO SK-5828-L-206-C
PIPE M-218-12 / M-228-14
STEEL C-241-4

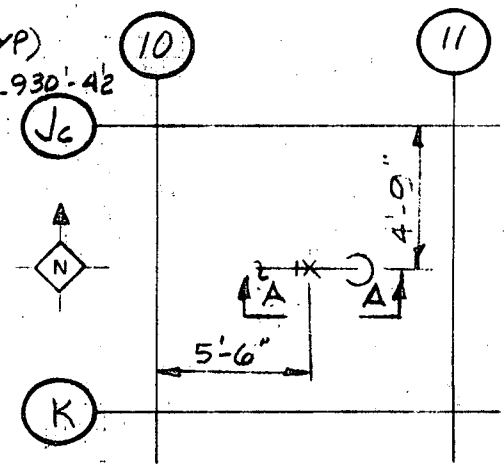
PIPE SUPPORT - TURBINE BLDG.
REACTOR FEED WATER PUMP PIPING.

JOB NO.	DRAWING NO.	REV.
10040	FW2A-H1A 1/1	0
	NL60405 2/2	

ITEM NO.	NO. REQ'D	PART NO.	SIZE	DESCRIPTION
1	1			W27 X 84 BEAM X 13'-2 1/2" LG
2	1			W 8 X 31 BEAM X 2'-11 7/8" LG.
3	1			3/4" X 9" X 0'-9" LG. C.S. PLATE
4	4			1/2" X 3" X 0'-8" LG. C.S. PLATE.
5	2			4" X 3" X 7/16" ANGLE X 1'-10" LG.
6	2			4" X 3" X 7/16" ANGLE X 1'-4" LG



ELEVATION A-A



LOCATION PLAN AREA

HANGER CRITICAL

MARK NO. FW2A-H2A

REV.	DATE	REVISIONS	BY	CH'K	DESIGN SUPVR	ENG'R	PROJ ENGR	APPR
A	2/11/74	ISSUED FOR CONSTRUCTION	NM		ECP			

MONTICELLO NUCLEAR GENERATING PLANT — UNIT 1
MONTICELLO, MINNESOTA

SAN FRANCISCO

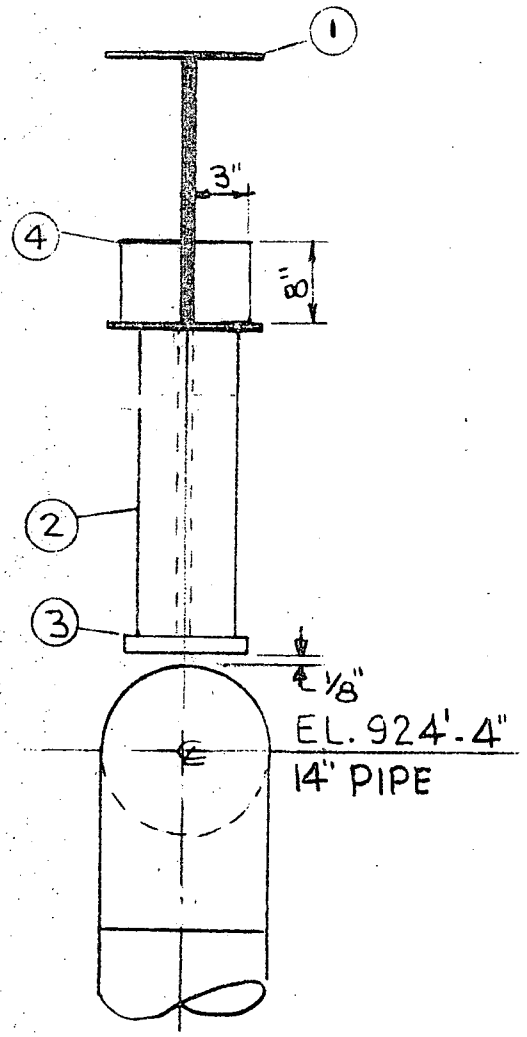
REF. DWGS. ISO SK-5828-L-206-C
PIPE M-218-12
STEEL C-241-4

PIPE SUPPORT - TURBINE BLDG.
REACTOR FEED WATER PUMP PIPING

JOB NO. 10040

DRAWING NO. FW2A-H2A 1/2
NL60404 4/9

REV. 9



SECTION - BB

HANGER CRITICAL

REV.	DATE	REVISIONS	BY	CH'K	ECP DESIGN SUPVR	ENG'R	PROJ ENGR	APPR
2	2-14-74	ISSUED FOR CONSTRUCTION	MM					

MONTICELLO NUCLEAR
GENERATING PLANT — UNIT 1
MONTICELLO, MINNESOTA

BECHTEL SAN FRANCISCO

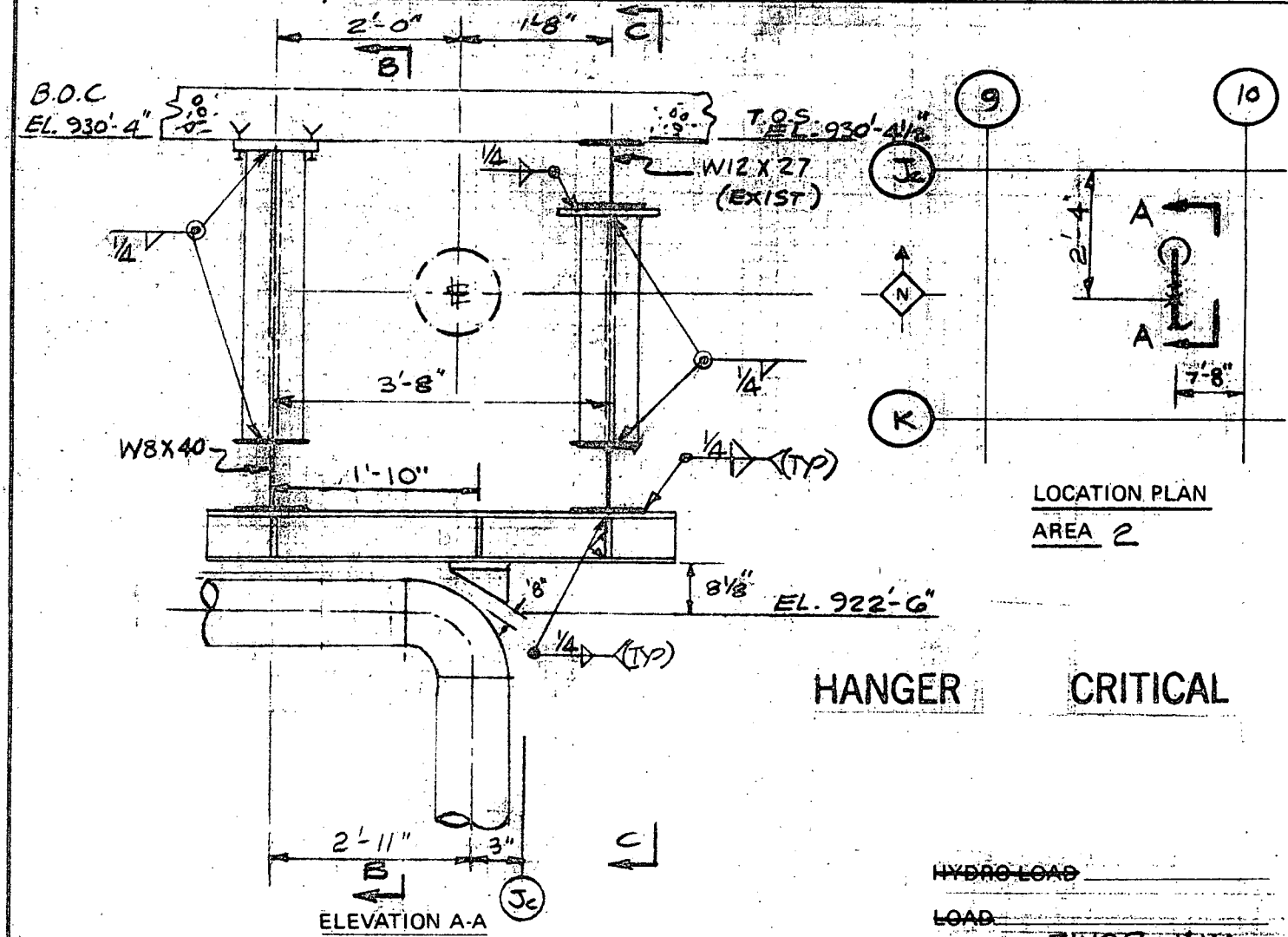
REF. DWGS.
ISO SK-5828-L-206-C
PIPE M-218-12
STEEL C-241-4

PIPE SUPPORT - TURBINE BLDG.

REACTOR FEED WATER PUMP PIPING

JOB NO.	DRAWING NO.	REV.
10040	FW2A-H2A 2/2 NL60404 5/9	0

ITEM NO.	NO. REQ'D	PART NO.	SIZE	DESCRIPTION
1	2		1½" X 14" X 1'-2"	C.S. PLATE (SEE DET. 1)
2	12	512	3/4"	PHILIPS SNAP-OFF CONC. FAST.
3	12		3/4" X 2 3/4"	TAP-BOLT
4	2		W8 X 40 BEAM X 5'-2"	LG.
5	1		W12 X 53 BEAM X 4'-4"	LG.
6	1		1" X 6" X 0'-9"	C.S. PLATE
7	1		W6 X 15.5 BEAM X 5'-4 13/16"	LG.
8	1		1" X 12" X 1'-0"	C.S. PLATE (SEE DET. 2)
9	2	512	5/8"	PHILLIPS SNAP-OFF CONC. FAST.
10	2		5/8" X 2½"	TAP BOLT
11	1		W6 X 15.5 BEAM X 4'-4 13/16"	LG.
12	1		1" X 7½" X 0'-7½"	C.S. PLATE



~~HYDRO LOAD~~ _____

~~LOAD~~ _____

MARK NO. FW2B-H11A

REV.	DATE	REVISIONS	BY	CH'K	DESIGN SUPVR	ENG'R	PROJ ENGR	APPR
1	2-22-74	RELOCATED ITEM 6	OBH		ECP		OH	

MONTICELLO NUCLEAR
GENERATING PLANT — UNIT 1
MONTICELLO, MINNESOTA

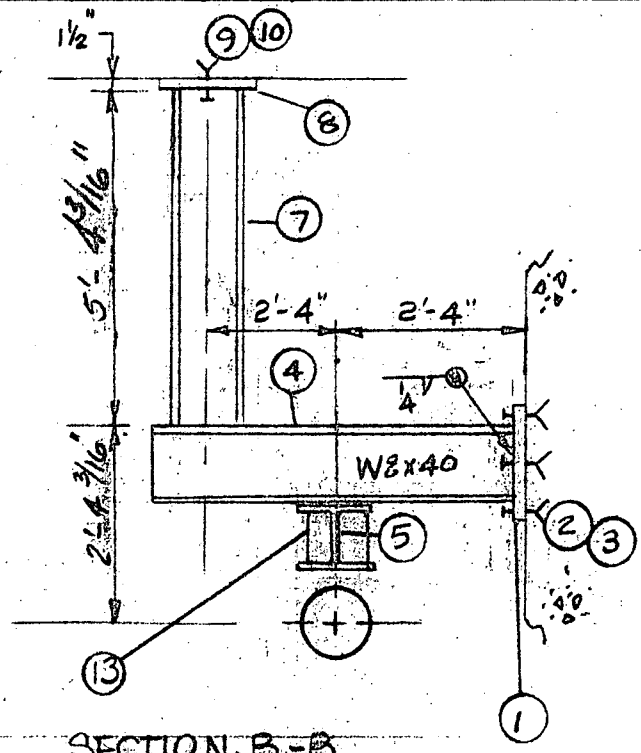
SAN FRANCISCO

REF. DWGS.
ISO SK-5828-L-206-6
PIPE M-218-12/M-223-14
STEEL C-241-4

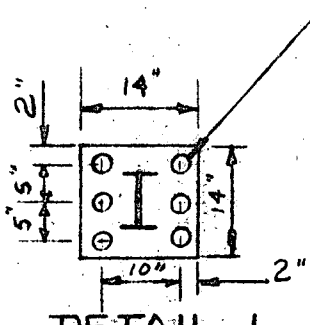
PIPE SUPPORT - TURBINE BLDG.
REACTOR FEED WATER PUMP PIPING

JOB NO.	DRAWING NO.	REV.
10040	FW 2B-H11A 1/2	1
	NL60404 6/9	

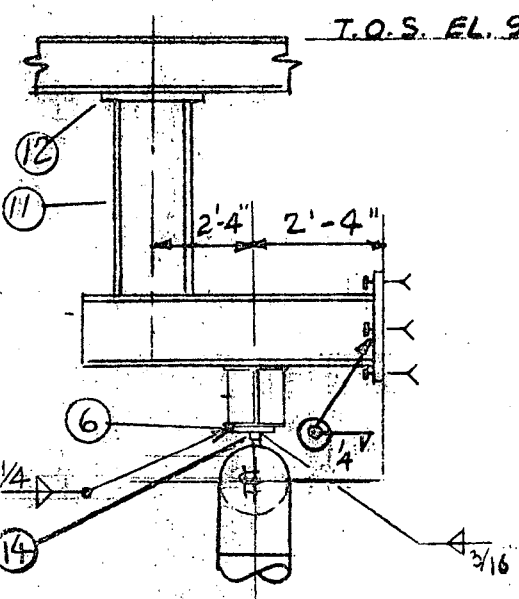
ITEM NO	NO REQ'D	PART NO	SIZE	DESCRIPTION
13	6		1/2" X 4 13/16" X 10 7/8"	C.S. STIFF. PLATE
14	1		3/4" X 6"	C.S. PLATE (SEE DET 3)



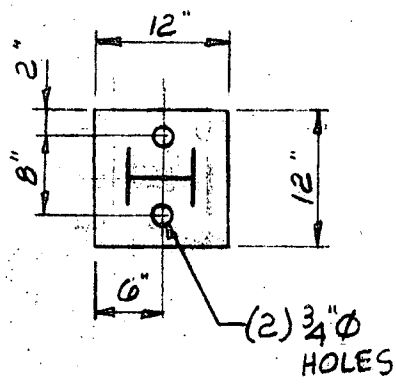
SECTION B-B



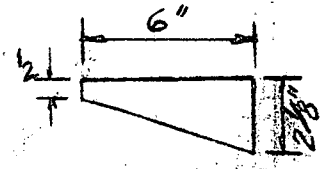
DETAIL 1



SECTION C-C



DETAIL 2



DETAIL 3

REV.	DATE	REVISIONS	BY	CH'K	DESIGN SUPVR	ENG'R	PROJ ENGR	APPR
1	2-29-72	RELOCATED ITEM 6	CEK		TECP			

MONTICELLO NUCLEAR
GENERATING PLANT — UNIT 1
MONTICELLO, MINNESOTA

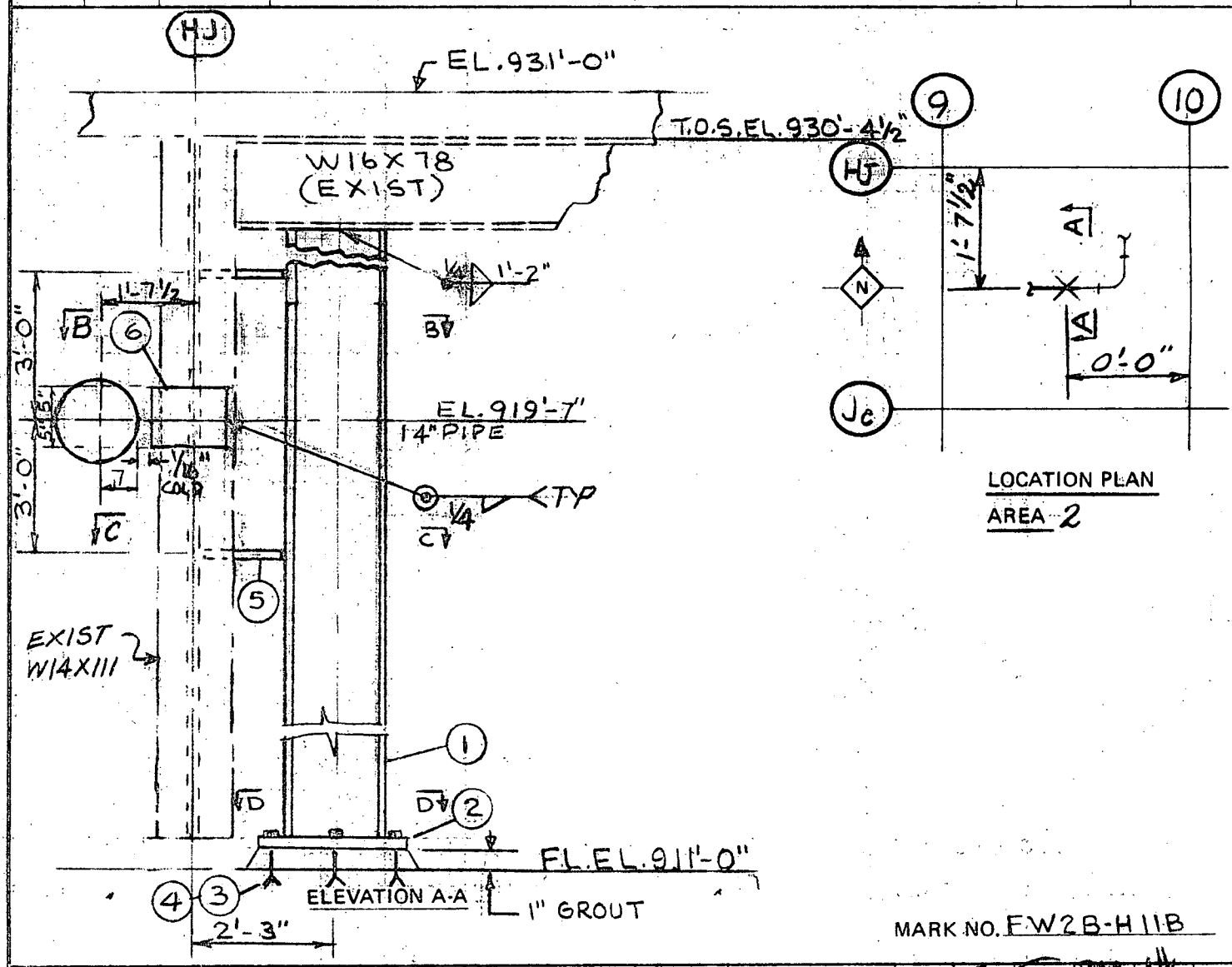
SAN FRANCISCO

REF. DWGS.
P&I.D.
PIPE M-218-12/M-223-14
STEEL C-241-4

PIPE SUPPORT - TURBINE BLDG.
REACTOR FEEDWATER
PUMP PIPING

JOB NO.	DRAWING NO.	REV.
10040	FW2B-H11A 2/2 NL60404 7/9	1

ITEM NO.	NO. REQ'D	PART NO.	SIZE	DESCRIPTION		
1	1			W16 X 78 BEAM X 17'-9 5/8" LG.		
2	1			1 1/2" X 1'-2" X 2'-0" LG C.S. PLATE		
3	6	512		7/8" Ø PHILLIPS SNAP-OFF CONC. FAST.		
4	6			7/8" X 2 3/4" TAP BOLT		
5	2			1" X 12 5/8" X 1'-6 9/16" C.S. PLATE		
6	2			1" X 10" X 1'-5" C.S PLATE		



MARK NO. FW2B-H11B

REV.	DATE	REVISIONS	BY	CHK	DESIGN SUPVR	ENG'R	PROJ ENGR	APPR'D
0	2-14-74	ISSUED FOR CONSTRUCTION	NM		ECP			

MONTICELLO NUCLEAR
GENERATING PLANT — UNIT 1
MONTICELLO, MINNESOTA

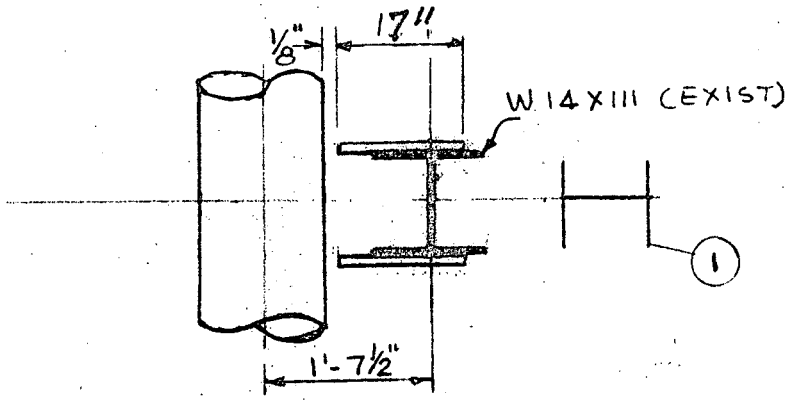
SAN FRANCISCO

REF. DWGS.
ISO SK-5828-L-206-C
PIPE M-218-12
STEEL C-241-4

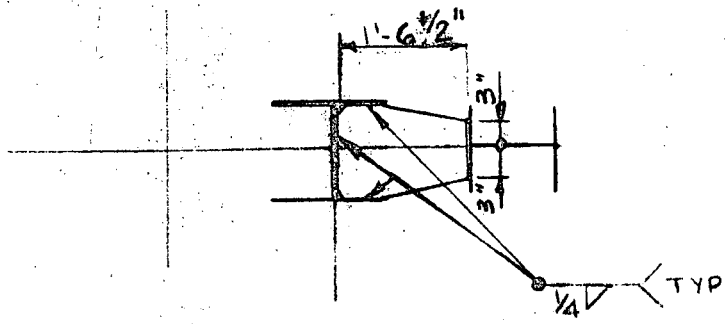
PIPE SUPPORT - TURBINE BLDG.

REACTOR FEEDWATER PUMP PIPING

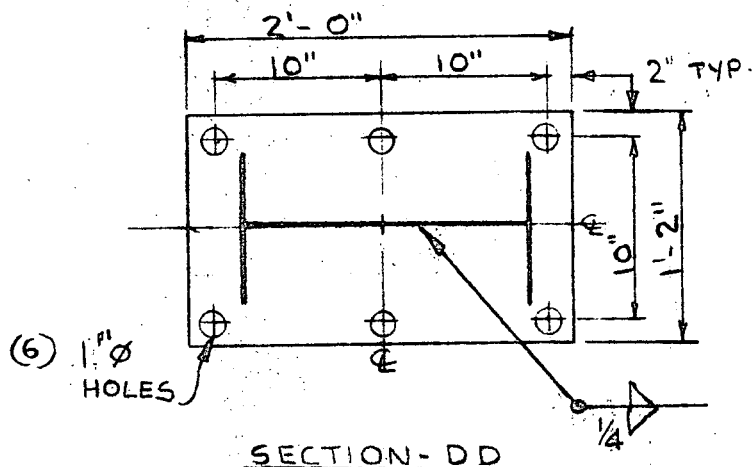
JOB NO.	DRAWING NO.	REV.
10040	FW2B-H11B 1/2	0
	NL 60 404	



SECTION - BB



SECTION - CC



SECTION - DD

REV.	DATE	REVISIONS	BY	CH'K	DESIGN SUPVR	ENG'R	PROJ ENGR	APPR
D	2-14-72	ISSUED FOR CONSTRUCTION	NM		ECR			

MONTICELLO NUCLEAR GENERATING PLANT — UNIT 1 MONTICELLO, MINNESOTA	SAN FRANCISCO	REF. DWGS.	ISO. SK-5828-L-206-C PIPE M-218-12 STEEL C-241-4
PIPE SUPPORT - TURBINE BLDG.	JOB NO.	DRAWING NO.	REV.
REACTOR FEEDWATER PUMP PIPING	10040	FW28-1-111LB 2/2 NL60404 9/9	0

4. QUESTION: Since the torus is not strictly a pipe, the statement that the torus will not be damaged because the torus wall thickness is greater than that of the HPCI steam line, may not be accurate. Similar circumstances on other BWR torus plants necessitated the installation of impact plates or restraints to prevent the HPCI and RWCU lines from impacting the torus. An analysis must be performed to show the impact energy the HPCI line will have on the torus. Please submit such an analysis for all high energy lines which could impact the torus (page 23).

ANSWER: The only high energy line that may impact the torus is the HPCI primary steam line. The statement contained in the report was based on the meeting held in Bethesda, Maryland on February 5, 1973 where the same point was discussed.

In performing additional analysis the suppression chamber integrity will be maintained but some permanent deformation of the shell may occur due to pipe whip from postulated break points (see criteria in Appendix A of the report). This shell deformation would not impair the ability of plant personnel to safely shutdown the plant.

We are continuing our analysis and design in order to protect the suppression chamber and prevent any shell deformation. Any restraints required will be installed when the analysis and design are completed.

5. QUESTION: What are the environmental consequences of a primary steam sample line break on any safety related equipment and cabling? (page 30)

ANSWER: The primary steam sample line is located on the west side of the turbine building. The line goes from the main steam line (PS1-18-ED) to the sample rack located at elevation 937'of the west side of the turbine building. The west side of the turbine building does not contain any safety related equipment or cabling that would be affected by this break. Our analysis indicated that a break in this 1" steam sample line would not interfere in the safe shutdown of the plant.

6. QUESTION: What are the environmental consequences of a main steam or feedwater sensing line break on safety related equipment or cabling? (page 32)

ANSWER: The main steam instrument sensing lines are routed from the primary steam lines to panel C210 located at elevation 951' of the east end of the turbine building. Until the lines penetrate the turbine operating deck, they are within the condeser compartment. There is no safety related equipment (except one of two emergency service water lines) or cabling located within the condenser compartment. The emergency service water line is a 3" schedule 160 pipe which will not be damaged by the instrument sensing line (1") break per the criteria contained in Appendix A of the report. An instrument sensing line break above the turbine operating deck at the rack itself will have negligible environmental consequences. The safeguard MCC's are located at elevation 911' and 931' of the east end of the turbine building. Reactor protection system instrumentation (Turbine/Generator Load Rejection instruments) located in the general area will not be affected since the cables from these instruments are within conduits and the cabling rated at 90°C. This rise in air temperature and humidity within the large volume (above the turbine operating deck) due to a sensing line break will be minimal. The break will be detected by an area radiation monitor which is located about ten feet from the instrument rack.

The feedwater instrument sensing lines are located on the east side of the turbine building at elevation 911'-0". A break in the feedwater instrument sensing line may possibly affect one of two safeguard MCC's (located at elevation 911'). This will not interfere with the safe shutdown of the plant following the logic described in the section on feedwater line breaks.