YANKEE ATOMIC ELECTRIC COMPANY

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2.C.2.1
FYR 81-73

May 5, 1981

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
Division of Licensing

References: (a) License No. DPR-3 (Docket No. 50-29)
(b) USNRC Letter to YAEC dated February 27, 1981

Subject: Additional Information for SEP Topic IV-7.B, ESF Switchover

Dear Sir:

Reference (b) requested additional information for your evaluation of SEP Topic VI-7.B, ESF Switchover from Injection to Recirculation Modes at Yankee Rowe. The attachment has been prepared in response to your six questions.

If you have any further questions or desire additional information, please contact us.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

J. A. Kay
Senior Engineer - Licensing

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Attachment

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ATTACHMENT

Question (1) Describe the procedures used to switchover from the injection to the recirculation mode of emergency core cooling (ECC).

Response:

The recirculation mode of emergency core cooling is initiated when the safety injection tank level reaches 11 feet. The operator performs the following actions:

a. Close the LPSI header isolation valves, CS-MOV-533 and CS-MOV-535 (two valves in series).

b. Close the HPSI pump recirculation valves, SI-MOV-48 and SI-MOV-49 (two valves in series).

c. Open the vapor container sump suction valves, SI-MOV-516 and SI-MOV-517 (two valves in parallel).

d. Close the suction valve from the safety injection tank, SI-MOV-518.

e. If the vapor container pressure is unknown, or $\leq$ 10 psig, secure all but one LPSI and one HPSI pump.

f. After recirculation flow is established, flow may be throttled with the HPSI header isolation valve, SI-MOV-46, as required for cooldown.

Copies of safety class drawings No. M-7 and M-16 are attached to assist in following this procedure.

Question (2) For each instrument, indicator, logic device, and alarm that is used by the operator to perform a manual function or that is used to initiate an automatic function in the switchover sequence; describe how that device is qualified and installed (e.g. independence and separation of circuits) as Class 1E equipment.

Response:

The operator utilizes redundant safety injection tank level indicators to perform the manual functions required. The information requested on these instruments is included in the response to question 3.

Question (3) Describe the level sensing system that is used to indicate or detect the level in the tank that supplies injection coolant. This description should include sensor and data column location, freeze protection, freeze protection power supply and those items specified in (2) above.

Response:

Two level sensing systems are utilized to indicate the water level in the safety injection tank. One level sensing system is original plant equipment. This pneumatic measuring loop consists of the following equipment:

(a) 1 pneumatic transmitter; Moore Model 174S, Type E884NS

(b) Level indicator located in the main control room; Bailey type TG200FAA, Model A-330 WAA-327W

(c) 1 level indicator; Ashcroft gauge, located in the Primary Aux. Building

The second level sensing system is electronic, and consists of the following equipment:

(a) Electronic transmitter, GE type 555

(b) Level indicator, GE type 180

(c) Power Supply, GE Type 570-06 FAAC1

Both transmitters, electronic and pneumatic, are individually housed in electrically heated enclosures located below the Safety Injection tank. Freeze protection is maintained by the use of an electrical heating element in each enclosure. The heaters are powered from a station service bus.

Freeze protection is further assured by the location of the equipment; directly under the insulated tank. The heated tank maintains the insulated area below the tank at a temperature greater than ambient air. For example, with the ambient air measuring 55°F, the area below the tank measured 82°F.

Either mode is sufficient in itself to maintain the transmitters and sensors at proper operating temperature. Both modes are operational at all times.

The power supply, and the primary indicators, are all located in a non-harsh, controlled environment, specifically, in the Main Control Room.

All equipment which is used in these systems were selected as the best available at the time of implementation.

Independence and separation of both measurement systems have been maintained by separate routings from sensors to control room equipment.

Question (4) If injection pumps are not automatically tripped on low level, quantify the level at which the operator must secure these pumps and the time remaining beyond this level (assuming all pumps are running) at which loss of NPSH occurs.

Response:

The injection pumps are not automatically tripped as all actions are manual. The manual actions required are initiated based on safety injection tank level. At a level of 19 feet in the tank, the operator is required to secure one train of safety injection, i.e. one LPSI and one HPSI pump. At approximately 2 minutes later, the calculated NPSH equals the required NPSH from the pump characteristic curves.

The switchover from the injection to the recirculation mode is initiated at a level of 11 feet in the tank. With two trains of safety injection operating, i.e. two LPSI and two HPSI pumps, there is approximately 16 minutes before the calculated NPSH equals the required NPSH from the pump characteristic curves.

Question (5) Describe the paths of the minimum flow lines from each ECCS pump discharge to the line end. This description should identify all valves in these lines, the signals that control each valve, the power sources for each valve, and the qualification of each valve.

Response:

The minimum flow path from each LPSI and HPSI pump is through an individual locked open manual valve and orifice into a common header, then through two motor operated valves in series, discharging into the safety injection tank through a locked open manual valve.

The two motor operated valves, SI-MOV-48 and SI-MOV-49, are manually controlled from the control room. Each motor operated valve is operated by a control switch and a key operated switch in series.

The power source for one of the motor operated valves is from the emergency MCC-2 located in the Safety Injection Building and the other is powered from MCC-4 Bus 2 located in the Primary Auxiliary Building. The Emergency MCC-2 is normally supplied power from the 5-2 bus and in an emergency is supplied power from the #3 diesel generator. MCC-4 Bus 2 is normally supplied from the 4-1 bus and in an emergency is supplied power from the #2 diesel generator.

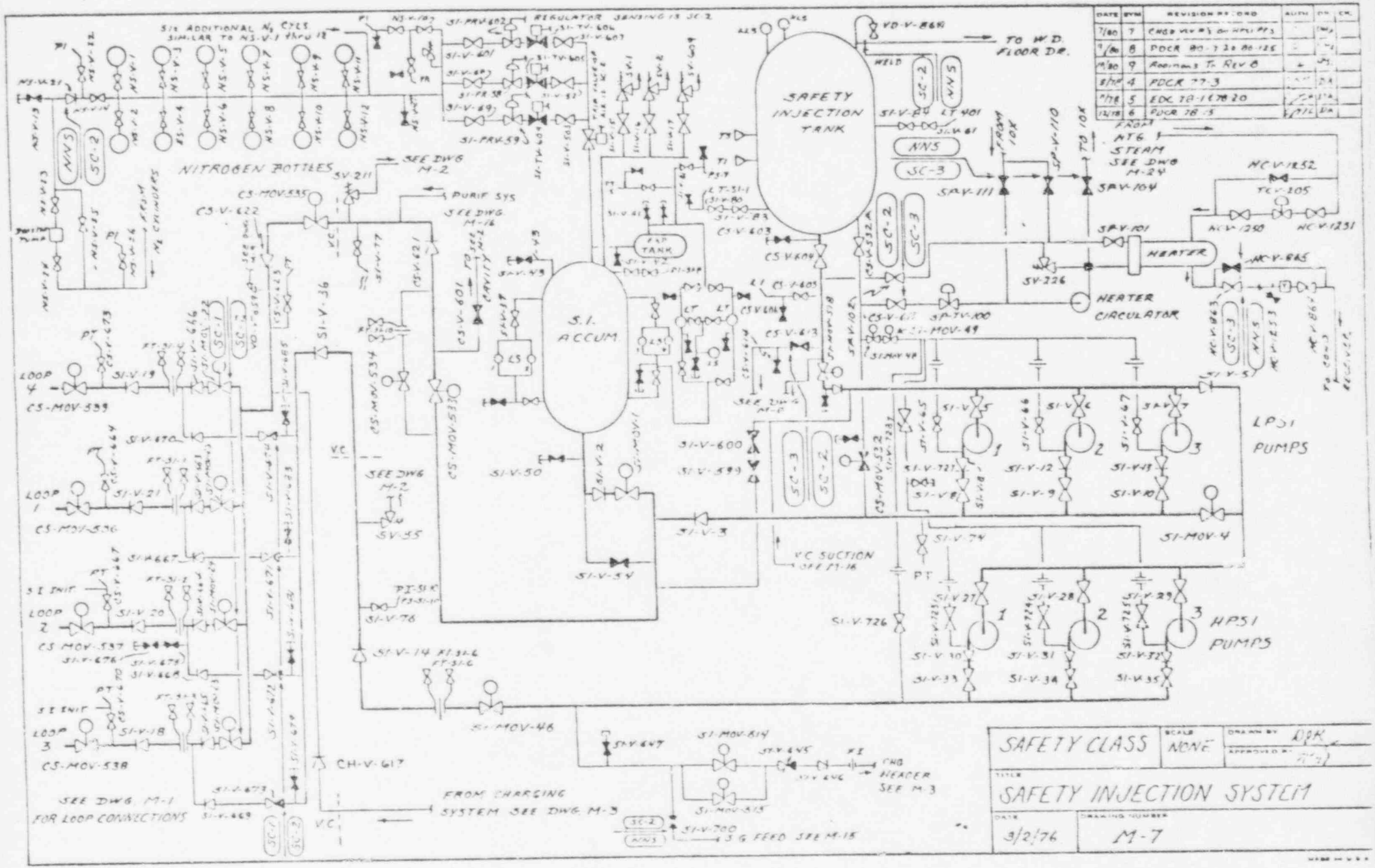
Safety class drawings No. E-1, E-4, and E-5 are attached to allow following these power supplies.

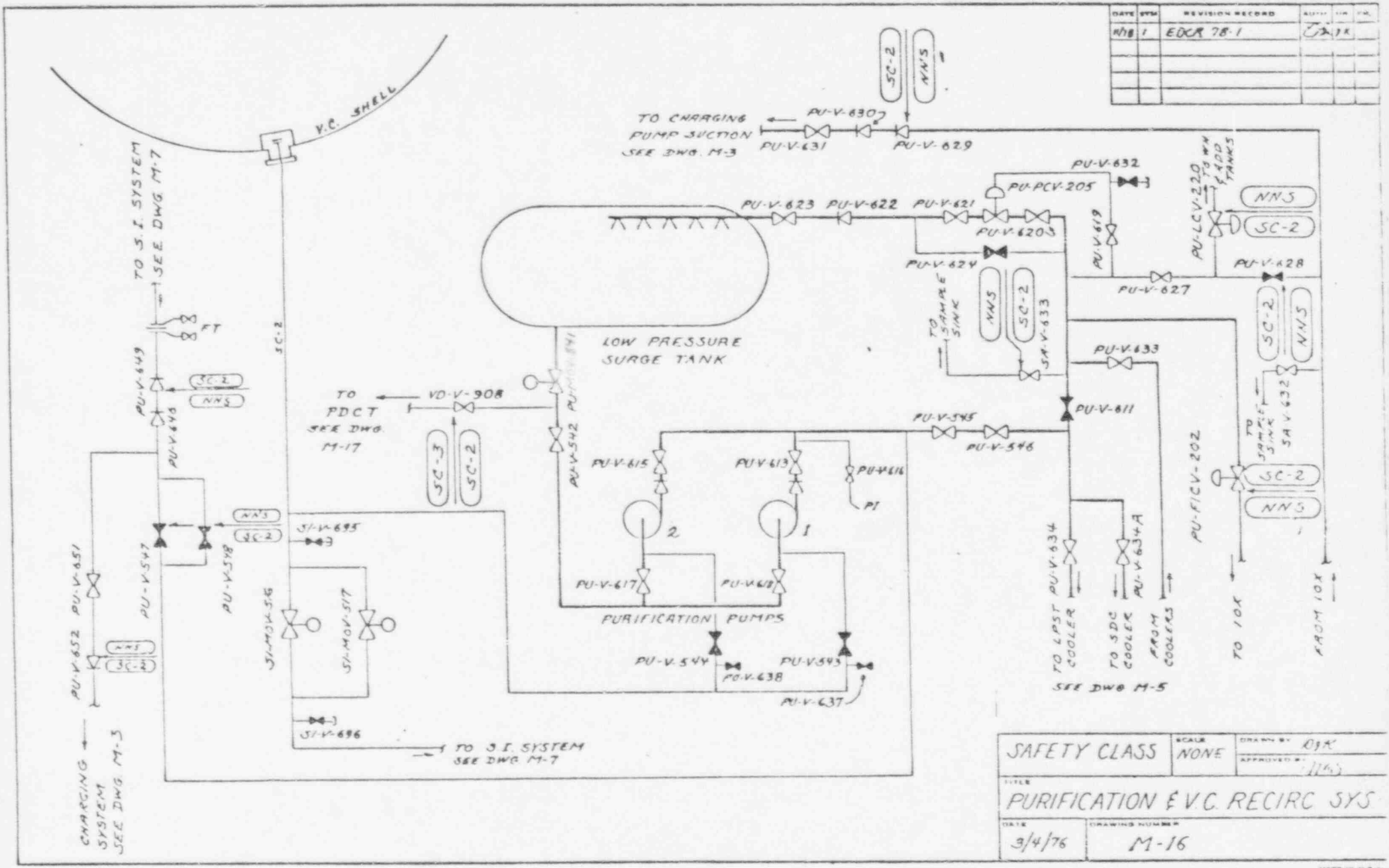
The qualification of these two valves is addressed in Acton Environmental Testing Corporation Test Report No. 15421-26. If required, a copy will be supplied.

Question (6) For each minimum flow line that returns to a point other than the pump intake point, provide a single failure analysis and quantify the offsite dose rate, dose, and dose assumptions obtaining from all single failures that do not isolate these lines during the recirculation phase of ECC.

Response:

The minimum flow lines are described in the answer to question No. 5. The common line back to the safety injection tank has two valves in series, powered from different busses. Therefore, there are no single active failures that will prevent the isolation of this flow path.





DATE	SYM	REVISION RECORD	AUTH		
4/78	1	EDCR 78-1	DJK		

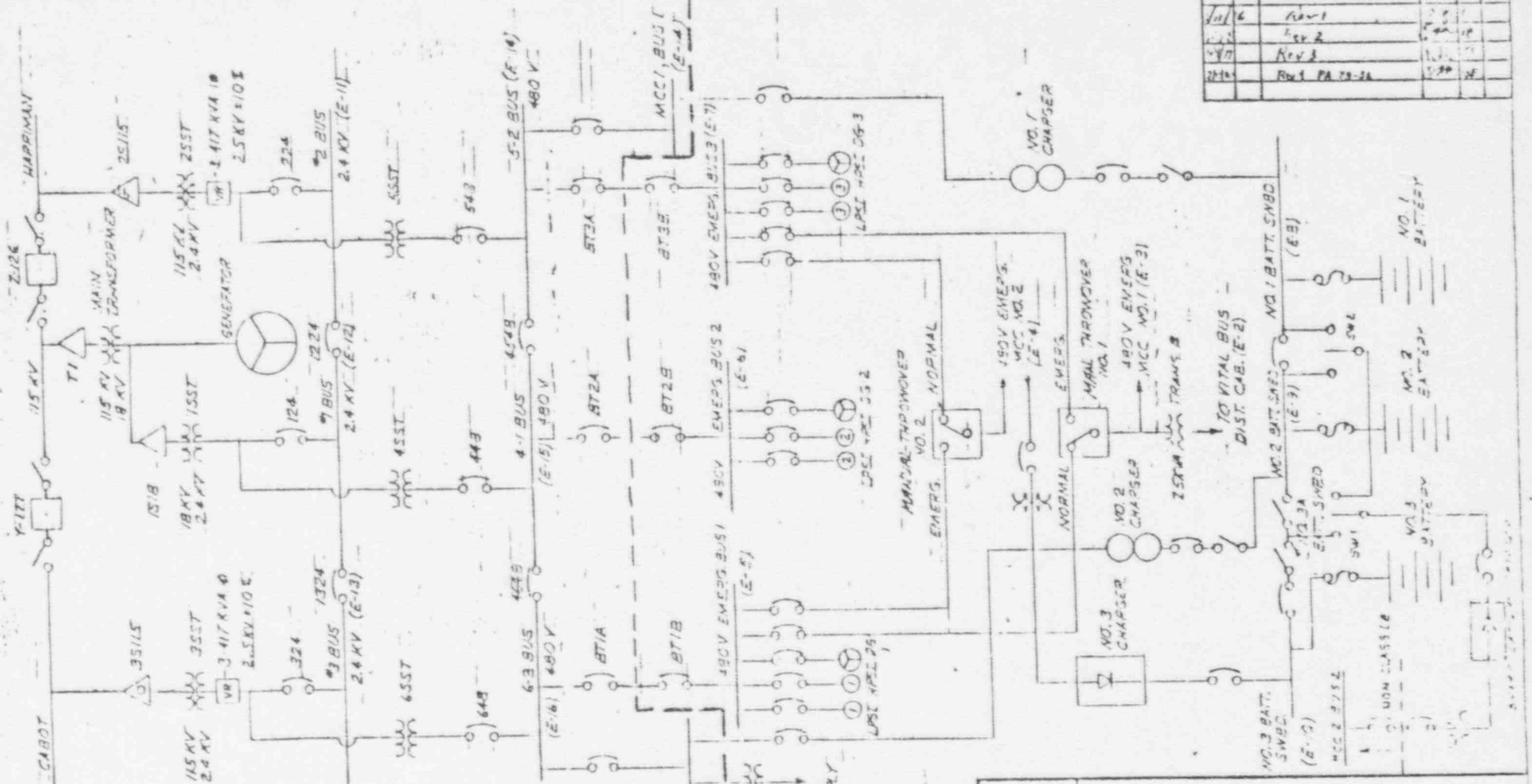
SAFETY CLASS	SCALE NONE	DRAWN BY DJK	
		APPROVED BY	

TITLE

PURIFICATION & V.C. RECIRC SYS

DATE	DRAWING NUMBER
3/4/76	M-16

H-E



DATE	SYM	REVISION RECORD			
[illegible]	6	Rev 1			
[illegible]		Rev 2			
[illegible]		Rev 3			
[illegible]		Rev 4 PA 79-26			

NOTES:

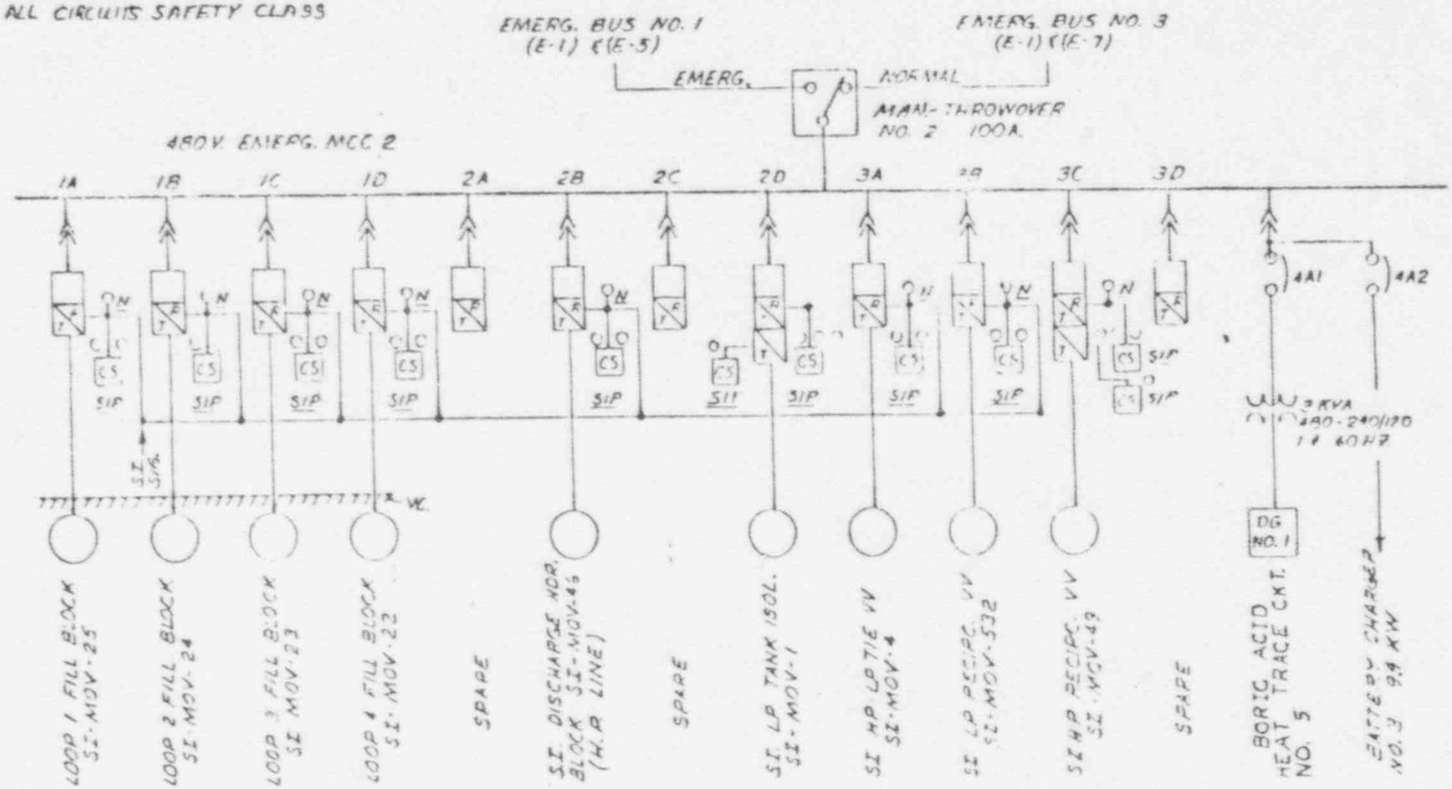
1. QA PROGRAM REQUIRED FOR ALL SAFETY CLASS CIRCUITS
2. REFER TO DWGS E-11 THRU E-16 FOR QA PROGRAM APPLICABILITY FOR NON-SAFETY CLASS CIRCUITS

NON SAFETY CLASS SYSTEMS | SAFETY CLASS SYSTEMS (Class 1E)

TOLERANCES (EXCEPT AS NOTED)	YANKEE ATOMIC ELECTRIC CO.		
DECIMAL ±		SCALE NONE	DRAWN BY [illegible] / APPROVED BY [illegible]
FRACTIONAL ±	TITLE STATION SERVICE AC, DC & VITAL INSTRUMENTATION SUPPLY		
ANGULAR ±	DATE 8/22/75	DRAWING NUMBER	E-1

DATE	SYM	REVISION RECORD	AUTH	DR.	CK.
[illegible]		[illegible]	[illegible]		
[illegible]		FCR 76-23 [illegible]	[illegible]		
[illegible]		REV 3 [illegible]	[illegible]		
[illegible]		REV 4	[illegible]		

NOTE:
1. ALL CIRCUITS COME UNDER QA PROGRAM REQUIREMENTS
2. ALL CIRCUITS SAFETY CLASS



REFERENCE DWG. NO. 9699-FE-1J

LEGEND

MAGNETIC CONTACTOR DESIGNATIONS:
- T - CONTROL
- R - REVERSING
- CS - CONTROL SWITCH

SIP - LOCATED ON SAFETY INJ. PANEL
N - LOCATED ON NUC. SECTION OF MCB
MC - LOCATED ON MCC

TOLERANCES (EXCEPT AS NOTED)	YANKEE ATOMIC ELECTRIC CO.		
DECIMAL ±		SCALE	DRAWN BY [illegible] / APPROVED BY [illegible]
FRACTIONAL ±	TITLE EMERGENCY MCC NO. 2 480 VAC		
ANGULAR ±	DATE 8/22/7[illegible]	DRAWING NUMBER E-4	

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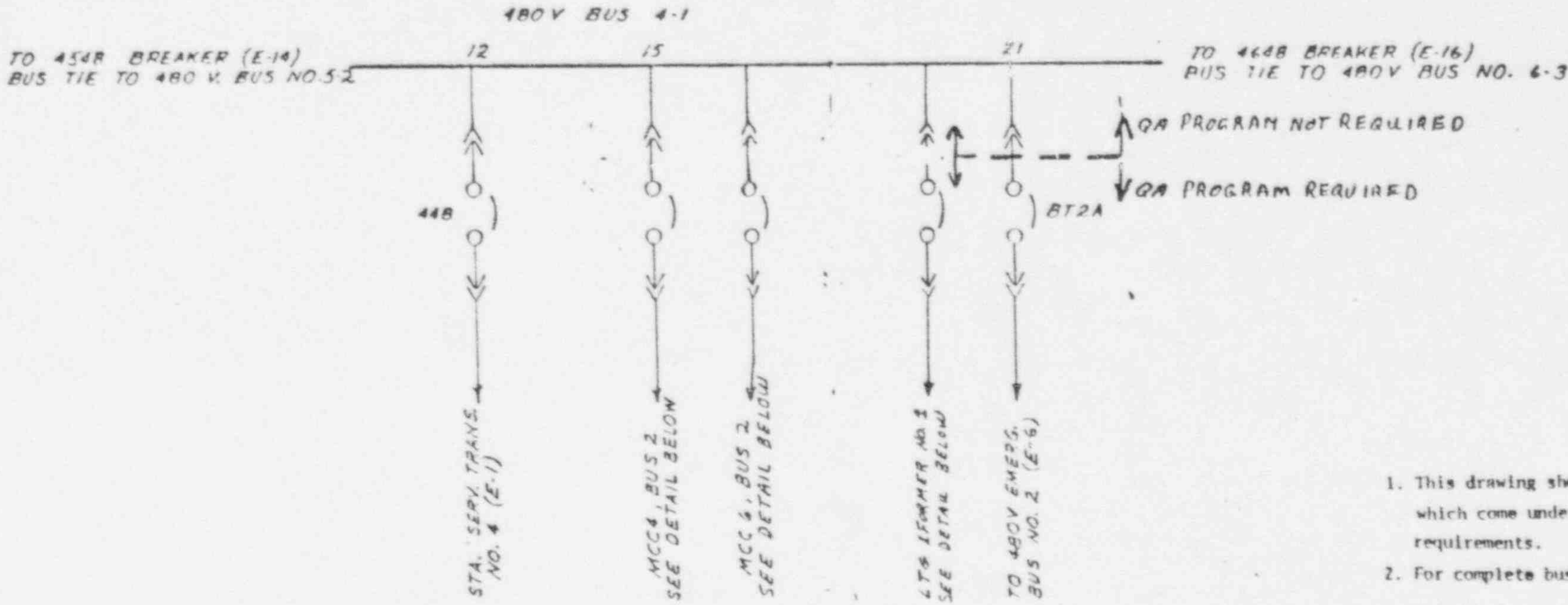

NOTES:

1. This drawing shows only those circuits which come under the Q A program requirements.
2. For complete bus see dwg. No. 9699-RE-1F.

Q A PROGRAM REQUIRED CIRCUITS

MCC4, BUS 2

MOV FEEDER:
CH-521, SI-98, 515, 516
CS-540, PU-541, DW-655
M.C. CHARGING PUMP P-15-3
FUEL PIT PUMP, P-20
PURIFICATION COOL'G & DRAIN PP, P-16-2

LTG CAB P-1:
CKT 20 BANT LINE HEAT TRACE
CKT 26+28: PBI SEAL PUMP P30-2

LTG XFORMER No. 1

LTG CAB C-1:
CKT 3: H₂ ANALYZER
LTG CAB C-3:
CKT 29&30: METEOROLOGICAL INST
CKT 6: FIRE DETECTION PANEL

MCC 6 BUS 2

MOV FEEDER:
SW-MOV-603

REVISION RECORD		
	Rev 1	
	Rev 2	
	Rev 3	
	Rev 4	
	Rev 5	

TOLERANCES (EXCEPT AS NOTED)	YANKEE ATOMIC ELECTRIC CO.		
DECIMAL ±		SCALE	DRAWN BY
			APPROVED BY
FRACTIONAL ±	TITLE BUS No 4-1 480 VAC		
ANGULAR ±	DATE 6-19-75	DRAWING NUMBER	E-15

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