

YANKEE ATOMIC ELECTRIC COMPANY



20 Turnpike Road Westborough, Massachusetts 01581

June 18, 1980
B.4.1.1
WYR 80-70

United States Nuclear Regulatory Commission
Region I
631 Park Avenue
King of Prussia, Pennsylvania 19406

Attention: Office of Inspection and Enforcement
Mr. Boyce H. Grier, Director

References: (a) License No. DPR-3 (Docket No 50-29)
(b) USNRC Letter to YAEC dated November 30, 1979.
(c) YAEC Letter to USNRC dated February 29, 1980
(WYR 80-25)
(d) USNRC Letter to YAEC dated April 4, 1980.

Dear Sir:

Subject: Response to IE Bulletin 79-27; "Loss of Non-Class 1E
Instrumentation and Control Power System Bus During Operation"

As requested in Reference (b), we have performed a review and evaluation of Class 1E and Non-Class 1E power supplies to safety and non-safety related instrumentation and control systems which could affect the ability to achieve a cold shutdown condition using existing procedures.

The enclosure provides the results of our review and responds to the questions of Reference (b).

We trust you will find this information satisfactory; however, should you desire additional information, please to contact us.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

D. E. Moody
Manager of Operations

BLD/sec
Enclosure A

8007180/44* Q

ENCLOSURE A

Response to IE Bulletin 79-27 for Yankee Rowe

Discussion

The electrical system at Yankee Rowe was reviewed to determine the effects of loss of power to buses supplying safety related and non-safety related instrumentation and control systems which affect the ability to achieve a cold shutdown condition. As part of this study, applicable plant procedures were reviewed to determine those systems or subsystems that are required to place the plant in a cold shutdown condition. The review included instrumentation, control systems and their related power sources that would indicate system status to the operator.

Item 1: "Review the Class 1E and Non-Class 1E buses supplying power to safety and non-safety related instrumentation and control systems which could affect the ability to achieve a cold shutdown condition using existing procedures or procedures developed under Item 2 below. For each bus:"

Response:

I & C Buses

The following I & C Buses supply power to loads that are used during the shutdown and cooldown of the plant:

1. Vital Bus
2. Transformer "A" Bus
3. Transformer "B" Bus
4. 125 Volt DC Battery Bus No. 1
5. 125 Volt DC Battery Bus No. 2
6. 125 Volt DC Battery Bus No. 3

Note: Please refer to the attached drawings for the arrangement of applicable plant electrical systems.

Item 1(a): "Identify and review the alarm and/or indication provided in the control room to alert the operator to the loss of power to the bus."

Response: The buses listed above are provided with the following alarms or indications in the main control room:

Vital Bus - bus voltmeter, ground voltmeters and primary instrumentation Fail Safe panel alarms.

Transformer "A" Bus and "B" Bus - No specific alarm; however, the Emergency Buses which supply power to Emergency MCC 1 and Transformer "A" Bus and "B" Bus have a common low voltage alarm.

125 Volt DC Battery Bus No.'s 1, 2 & 3 - common low voltage (115 volts) and common critical voltage (105 volts) alarms. Other related alarms or indications:

Battery Charger - auto trip alarm (No. 1 & 2 batteries only)
Battery Charger 3 AC Failure Alarm
Spare Battery Charger Loss of AC Alarm
Battery Fuse Failure Alarm (No. 1 & 2 battery only)
Diesel Generators DC Control Loss Alarm
Ground Detection Voltmeters

Item 1(b): Identify the Instrument and Control System Loads connected to the bus and evaluate the effects of loss of power to these loads including the ability to achieve a cold shutdown condition."

Response:

1. Vital Bus

Because of the fail safe design of the Reactor Protection System, if power was lost to the vital bus, the reactor would automatically scram. The Vital Bus loads can be energized from two (2) different power sources. The normal power source is the vital bus motor generator set powered from the No. 1 Battery. The Vital Bus backup power supply is MCC 1 bus 2. The control room operator has the capability to energize the vital bus from the backup supply by operating a control switch in the control room.

Instrumentation and control functions that are powered from this source, and which are used during a shutdown and cooldown of the plant are listed below on the left. Alternate instrumentation and control functions powered from separate power sources are listed on the right.

Instrumentation or Control Function

Load

Nuclear Instrumentation;
Source, Intermediate
and Power Ranges

Primary Instrumentation;
M.C. Pressure and
Pressurizer Pressure

Alternate (and Power Source)

Refueling Source Range Channel
(Transformer "A" Bus)

M.C. Loop Pressure Channels
(Transformer "B" Bus),
Low Temperature
Overpressurization System
(Transformer "A" Bus) and Heise
Gage (Pneumatic)

M.C. Temperature and
Pressurizer Temperature

Incore Thermocouples and Data
Logger (Lighting Panel), Incore
Thermocouple Recorder
(Transformer "A" Bus)

Pressurizer Level WR
and NR

None

NR Steam Generator Levels

NR & WR Levels Available
(Transformer "B" Bus)

Charging Pump Control Circuits

Manual Operation from Main
Control Board (Pneumatic)

2. Transformer "A" Bus

Transformer "A" Bus is energized from Emergency MCC 1. Emergency MCC 1 is normally supplied by Emergency Bus No. 1 and can be alternately supplied by Emergency Bus No. 3 through a manual throwover switch.

Instrumentation and control functions that are powered from this source, and which may be used during a shutdown and cooldown of the plant are listed below on the left. Alternate instrumentation and control functions powered from separate power sources are listed on the right.

Instrumentation or Control Function

Load

Alternate and Power Source

Rod Position Indicating
Lights

Nuclear Instrumentation
(Vital Bus)

Low Temperature Over
Pressurization System

Main Coolant Pressure and
Temperature (Vital Bus)

Charging Pump Flow and
Pressure

Local pressure Indication
(direct)

Bleed Flow

Low Pressure Surge Tank
Level Channel (Pneumatic)

LP Surge Tank Pressure
& Level

Local Indication

Refueling source range
channel

Nuclear Instrumentation
Channels (Vital Bus)

Incore thermocouple
recorder

M.C. temperature (vital bus)
and Data Logger (lighting panel)

3. Transformer "B" Bus

Transformer "B" Bus is energized from Emergency MCC 1 in the same fashion as Transformer "A" Bus discussed above.

Instrumentation and control functions that are powered from this source, and which may be used during a shutdown and cooldown of the plant are listed below on the left. Alternate instrumentation and control functions powered from separate power sources are listed on the right.

Instrumentation or Control Function

<u>Load</u>	<u>Alternate and Power Source</u>
Secondary Instrumentation; S.G. Narrow and Wide Range Level	S.G. Narrow Range Level (Vital Bus)
M.C. Loop Pressures	M.C. Pressure (Vital Bus) and Low Temperature Overpressurization System (Transformer "A" Bus)

4. 125 V DC Battery Bus No. 1

The 125 V DC Battery Bus No. 1 is normally powered from the No. 1 Battery and its associated charger which is powered from MCC 1 Bus 1. The spare battery charger is available for backup purposes. A manually operated tie is available to tie the No. 1 and No. 2 battery buses during maintenance.

Instrumentation and control functions that are powered from this source, and which are used during a shutdown and cooldown of the plant are listed below on the left. Alternate instrumentation and control functions powered from separate power sources are listed on the right.

Instrumentation or Control Function

<u>Load</u>	<u>Alternate and Power Source</u>
Vital Bus Motor Generator Set	Backup Supply MCC 1 Bus 2
Control Power 480 volt Switchgear Bus 6-3	Manual Trip and Manual Closure of Individual Breakers (Mechanical)
Control Power 2400 volt Switchgear Bus 3	Manual Trip and Manual Closure of Individual Breakers (Mechanical)

5. 125 V DC Battery Bus No. 2

The 125 V DC Battery Bus No. 2 is normally powered from the No. 2 Battery and its associated charger which is powered from MCC 1 Bus 2. The spare charger and the tie capability delineated above for Battery Bus No. 1 are applicable to Battery Bus No. 2.

Instrumentation and control functions that are powered from this source, and which are used during a shutdown and cooldown of the plant are listed below on the left. Alternate instrumentation and control functions powered from separate power sources are listed on the right.

Instrumentation or Control Function

<u>Load</u>	<u>Alternate and Power Source</u>
Control Power 480 volt Switchgear Bus 4-1	Manual Trip and Manual Closure of Individual Breakers (Mechanical)
Control Power 2400 volt Switchgear Bus 1	Manual Trip and Manual Closure of Individual breakers (Mechanical)

6. 125 V DC Battery Bus No. 3

The 125 V DC Battery Bus No. 3 is normally powered from the No. 3 Battery and its associated charger which is powered from Emergency MCC 2. The spare battery charger is available for backup purposes. A manually operated tie is available to tie the No. 3 and No. 2 battery buses during maintenance.

Instrumentation and control functions that are powered from this source, and which are used during a shutdown and cooldown of the plant are listed below on the left. Alternate instrumentation and control functions powered from separate power sources are listed on the right.

Instrumentation or Control Function

<u>Load</u>	<u>Alternate and Power Source</u>
Control Power 480 volt Switchgear Bus 5-2	Manual Trip and Manual Closure of Individual Breakers (Mechanical)
Control Power 2400 volt Switchgear Bus 2	Manual Trip and Manual Closure of Individual Breakers (Mechanical)

Item 1(c): "Describe any proposed design modifications resulting from these reviews and evaluations and your proposed schedule for implementing those modifications."

Response: The following design modifications will be made:

The Vital Bus - No modifications are required.

Transformer "A" Bus - An undervoltage relay will be added to alarm in the main control room to indicate Transformer "A" Bus power failure. This alarm will be installed during the next refueling outage.

Transformer "B" Bus - An undervoltage relay will be added to alarm in the main control room to indicate Transformer "B" Bus power failure. This alarm will be installed during the next refueling outage.

A new pressurizer wide range level channel will be added on Transformer "B" Bus to provide a backup indication to the pressurizer wide range level on the Vital Bus. This new channel will be implemented during the next refueling outage.

125 Volt DC Battery Buses 1, 2 & 3 - No modifications are required.

Item 2: "Prepare emergency procedures or review existing ones that will be used by control room operators, including procedures required to achieve a cold shutdown condition, upon loss of power to each Class 1E and Non-Class 1E bus supplying power to safety and non-safety related instrument and control systems. The emergency procedures should include:

- a. The diagnostics/alarms/indicators/symptoms resulting from the review and evaluation conducted per Item 1 above.
- b. The use of alternate indication and/or control circuits which may be powered from other Non-Class 1E or Class 1E instrumentation and control buses.
- c. Methods for restoring power to the bus.

Describe any proposed design modification or administrative controls to be implemented resulting from these procedures, and your proposed schedule for implementing the changes."

Response: Vital Bus - Emergency Procedure(s) will be updated to include more information to the operator in the event of a loss of power to the vital bus. This information will include specific instructions on methods for restoring power to the vital bus as well as alternate instrumentation that could be used until the vital bus was reenergized.

Transformer "A" & "B" Buses - An emergency procedure will be developed to inform the operator of methods for restoring power to the bus loads as well as alternate instrumentation that could be used until the bus is reenergized.

125 Volt DC Battery Buses 1, 2, & 3 - Existing procedures and a new procedure will be developed to include more information and specific instructions on methods for restoring power to the Battery bus, as well as alternate instrumentation that could be used until the bus is reenergized.

The above proposed modifications to the procedures will be implemented prior to plant restart.

Item 3

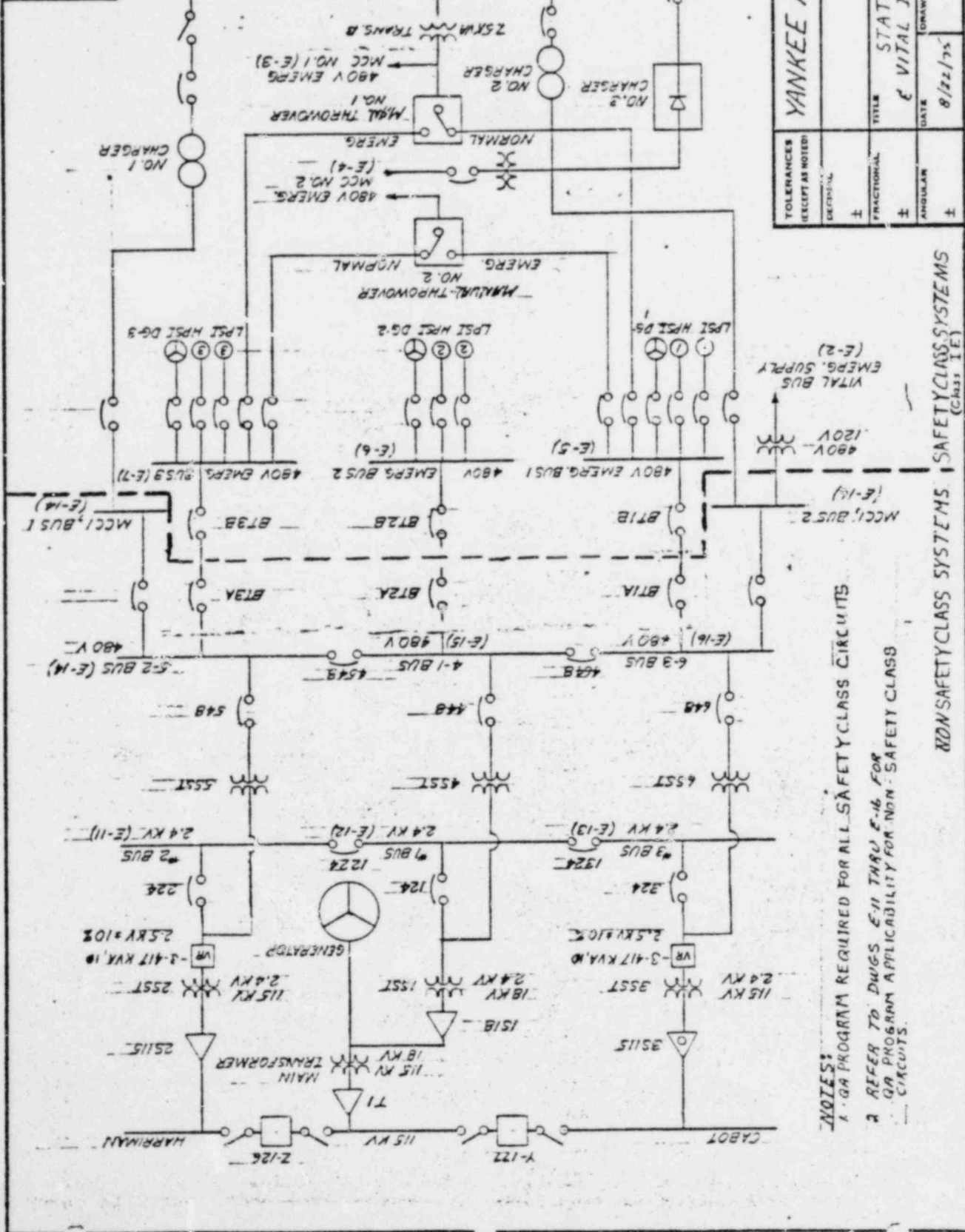
"Re-review IE Circular No. 79-02, Failure to 120 Volt Vital AC Power Supplies, dated January 11, 1979, to include both Class 1E and Non-Class 1E safety related power supply inverters. Based on a review of operating experience and your re-review of IE Circular No. 79-02, describe any proposed design modifications or administrative controls to be implemented as a result of the re-review.

Response:

We believe the IE Circular No. 79-02 is not applicable to the Yankee Rowe design for the following reasons:

Yankee Rowe does not use inverters to power the instrumentation and control buses or panels. A dc motor driven ac Generator set is used to power the 120 volt Vital Bus. The output of this motor generator set is monitored. The concerns expressed in the circular are not applicable to this motor generator set.

DATE	BY	REVISION	RECORD	AUTH	WR	CR
10/16	10-1					
	10-2					
	10-3					
	10-4					
	10-5					
	10-6					
	10-7					
	10-8					
	10-9					
	10-10					



YANKEE ATOMIC ELECTRIC CO.

SCALE: NONE
 DRAWN BY: JPT
 APPROVED BY: 12/10/5

TITLE: STATION SERVICE AC, DC & VITAL INSTRUMENTATION SUPPLY

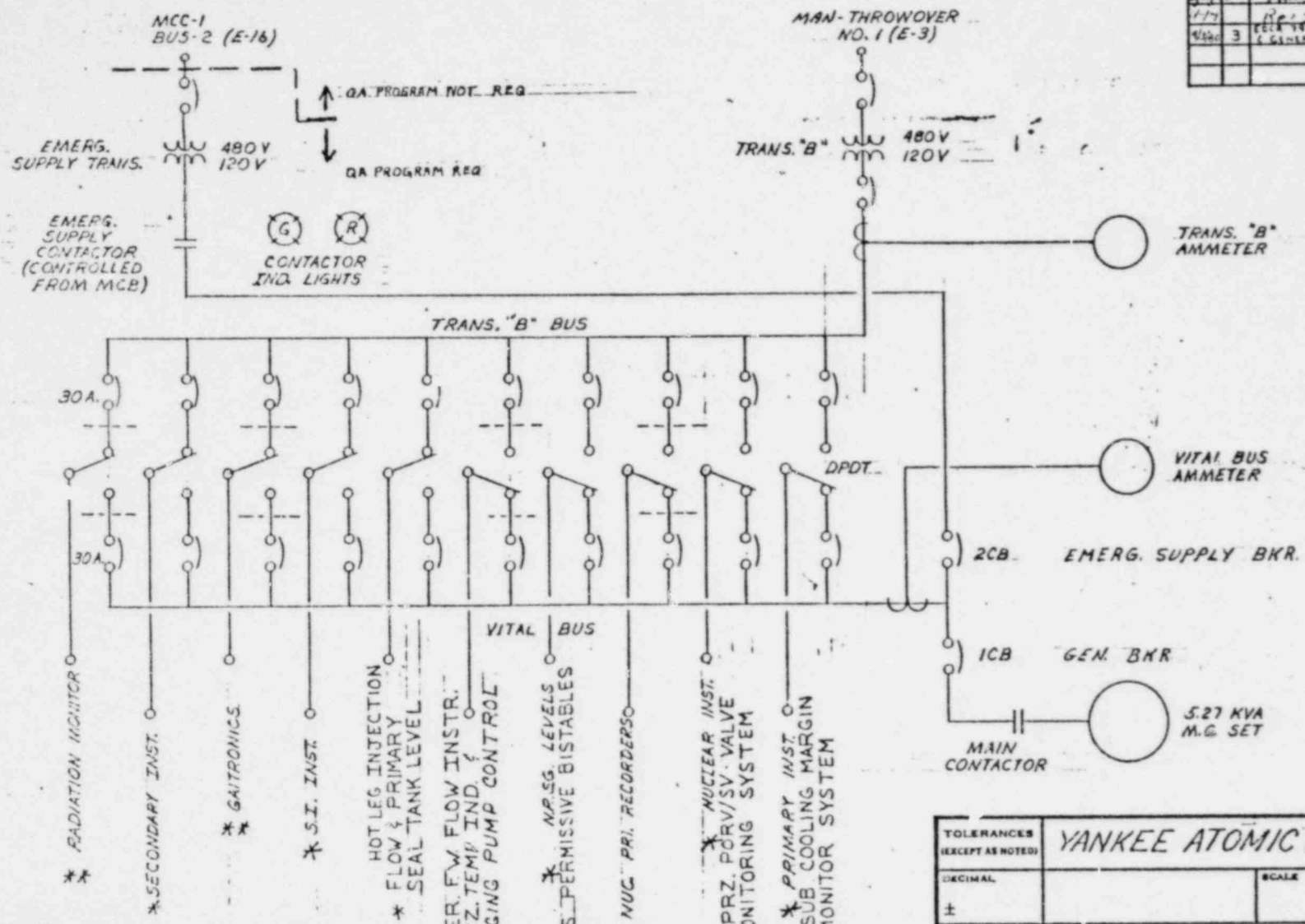
DATE: 8/22/75
 DRAWING NUMBER: E-1

TOLERANCES (EXCEPT AS NOTED):
 DECIMAL: ±
 FRACTIONAL: ±
 ANGULAR: ±

NON SAFETY CLASS SYSTEMS SAFETY CLASS SYSTEMS (CLASS I E)

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

DATE	BY	REVISION RECORD	AUTH.	DR.	CHK.
6/17	JKT	Rev. 1			
6/17	JKT	Rev. 2			
6/18	JKT	Rev. 3 (GENERAL UPDATE)			



- NOTES:**
1. REFER TO THE I-C SECTION OF THE SC MANUAL FOR QA APPLICABILITY FOR CRTS DENOTED BY *
 2. QA PROGRAM NOT REQUIRED - DENOTED BY **
 3. QA PROGRAM BOUNDARIES DENOTED BY----

** RADIATION MONITOR

* SECONDARY INST.

** GAITRONICS

* S.I. INST.

* HOT LEG INJECTION FLOW & PRIMARY SEAL TANK LEVEL

* EMER. FW FLOW INSTR. & PRZ. TEMP IND. & CHARGING PUMP CONTROL

VITAL BUS

* MR. SG. LEVELS PERMISSIVE BISTABLES

** NUC. PRI. RECORDERS

* NUCLEAR INST. (PRZ. PORV/SV. VALVE MONITORING SYSTEM)

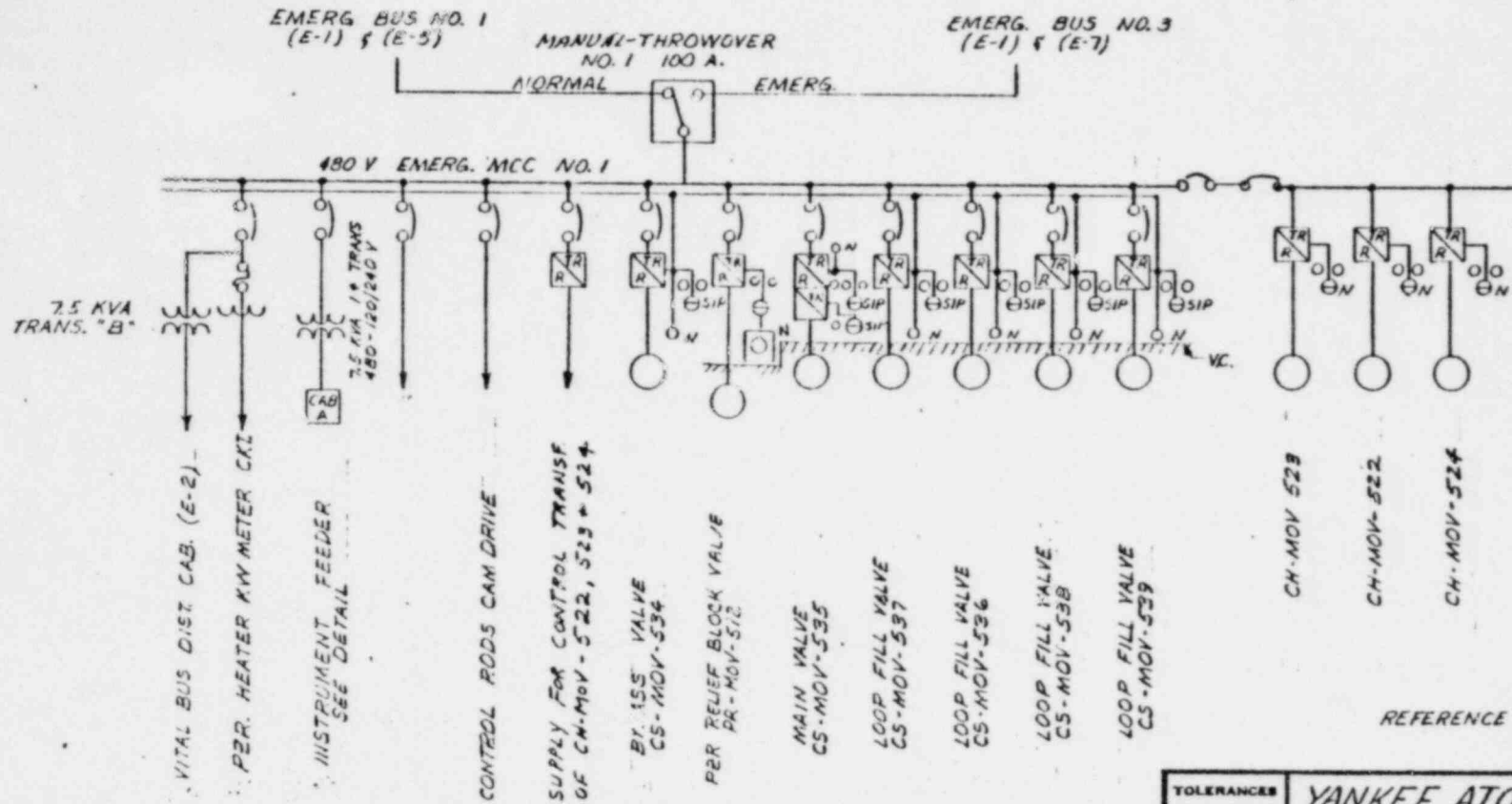
* PRIMARY INST. (SUB COOLING MARGIN MONITOR SYSTEM)

TOLERANCES (EXCEPT AS NOTED)	YANKEE ATOMIC ELECTRIC CO.		
DECIMAL	SCALE	DRAWN BY JKT	
±		APPROVED BY <i>JKT</i>	
FRACTIONAL	TITLE VITAL INSTRUMENT AND CONTROL POWER DISTRIBUTION		
±	DATE	DRAWING NUMBER	
ANGULAR	6-4-75	E-2	
±			

DATE	SYM	REVISION RECORD	AUTH	DR	CK
11/10/75		REV 1	JKT		
8/22/75		REV 2 CORR 1-1	JKT	SL	
7/1/75		REV 3 CORR 1-1	JKT	SL	
7/1/75		REV 4	MSW	J	
NOV 5		ENC 4 79-32	ST	SL	

NOTES:

1. QA PROGRAM REQUIRED FOR ALL CIRCUITS
2. ALL CIRCUITS SAFETY CLASS



LEGEND:

MAGNETIC CONTACTOR
 R - REVERSING
 TR - CONTROL

REFERENCE DWG. NO. 9699-FE-1J

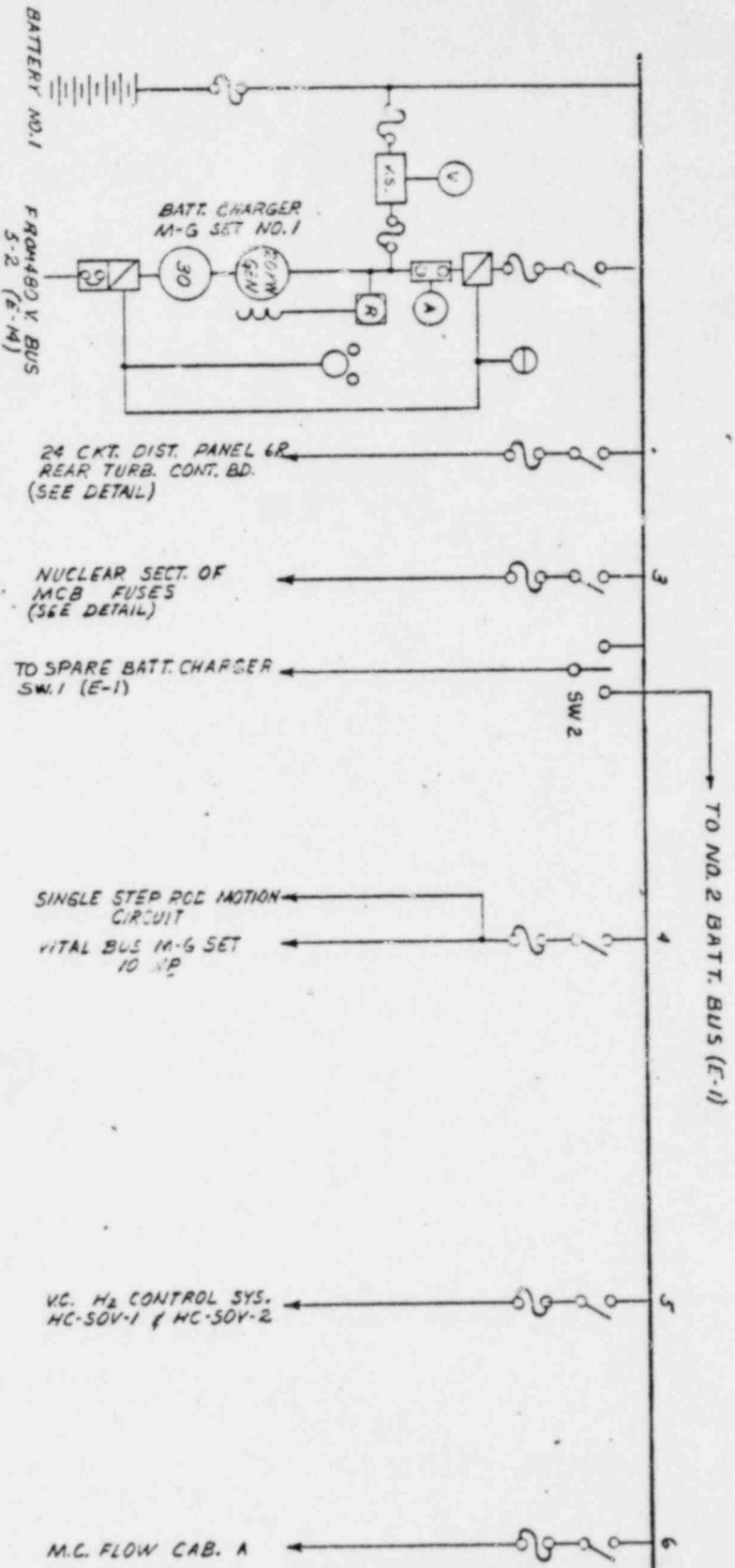
INSTRUMENT FEEDER DIST. CAB. A

- CKT 1: ADD POSITION IND. LIGHTS
- CKT 3: SEC. SECT M.C.B. FUSE BLOCK
- CKT 4: TURBINE S.U. PANEL FUSE BLOCK
- CKT 5: TURBINE SECT. M.C.B. FUSE BLOCK
- CKT 6: FN CAB REFUELING CHANNEL SOLAR TRANSFORMER

- CKT 7: NUCLEAR SECT. M.C.B. FUSE BLOCK
- CKT 9: VC AIR PARTICULATE MONITOR PUMP MOTOR
- CKT 8: NUCLEAR SECT. M.C.B. FUSE BLOCK
- CKT 12: MC. FLOW SYSTEM CAB. A/B TEST CKT.

TOLERANCES (EXCEPT AS NOTED)		YANKEE ATOMIC ELECTRIC CO.	
DECIMAL		SCALE	DRAWN BY JKT
±		NONE	APPROVED BY MSW
FRACTIONAL		TITLE EMERGENCY MCC No. 1 480 VAC	
±		DATE	DRAWING NUMBER
ANGULAR		8/22/75	E-3
±			

NOTES:
 1. ALL CIRCUITS ARE SAFETY CLASS AND OBEY UNDER THE Q A PROGRAM REQUIREMENTS.



- DISTRIBUTION PANEL 6R (CKT. D)**
- CKT. NO. 6 THROTTLE VALVE SOLENOID TRIP
 - CKT. NO. 7 B.F.P AUTO START & TRIP (3W-3) (ALARM)
 - CKT. NO. 8 SERVICE WATER AUTO START
 - CKT. NO. 10 COMPONENT COOLING AUTO START
 - CKT. NO. 13 PUMPS COOLING + DRAIN PUMP AUTO START
 - CKT. NO. 16 ANNUNCIATOR A
 - CKT. NO. 17 " B
 - CKT. NO. 18 " C
 - CKT. NO. 19 SAFETY INJECTION AUTO START (WL-1)
 - CKT. NO. 20 BFP TRIP ON REACTOR SCRAM (2C-X)
 - CKT. NO. 21 LTOP RELAY K-712
 - CKT. NO. 31

- MCB FUSES - NUCLEAR SECT. (CKT. 3)**
- FUSE NO. 1 ROD GROUP LIGHTS
 - FUSE NO. 6 SCRAM RANGE INDICATING LIGHTS
 - FUSE NO. 7 SCRAM AUX. RELAY (20 RS)
 - FUSE NO. 8 CHARIUM PUMP CONTROL ANTERLOCK
 - FUSE NO. 10 NUCLEAR SECTION ANNUNCIATOR
 - FUSE NO. 11 FUSE NO. 90 SOLENOID RELIEF VALVE
 - FUSE NO. 12 MEMORY LIGHT - TURBINE TRIP ON ALARM & SCRAM PANEL.

REFERENCE DNG. NO. 9699-FE-1H

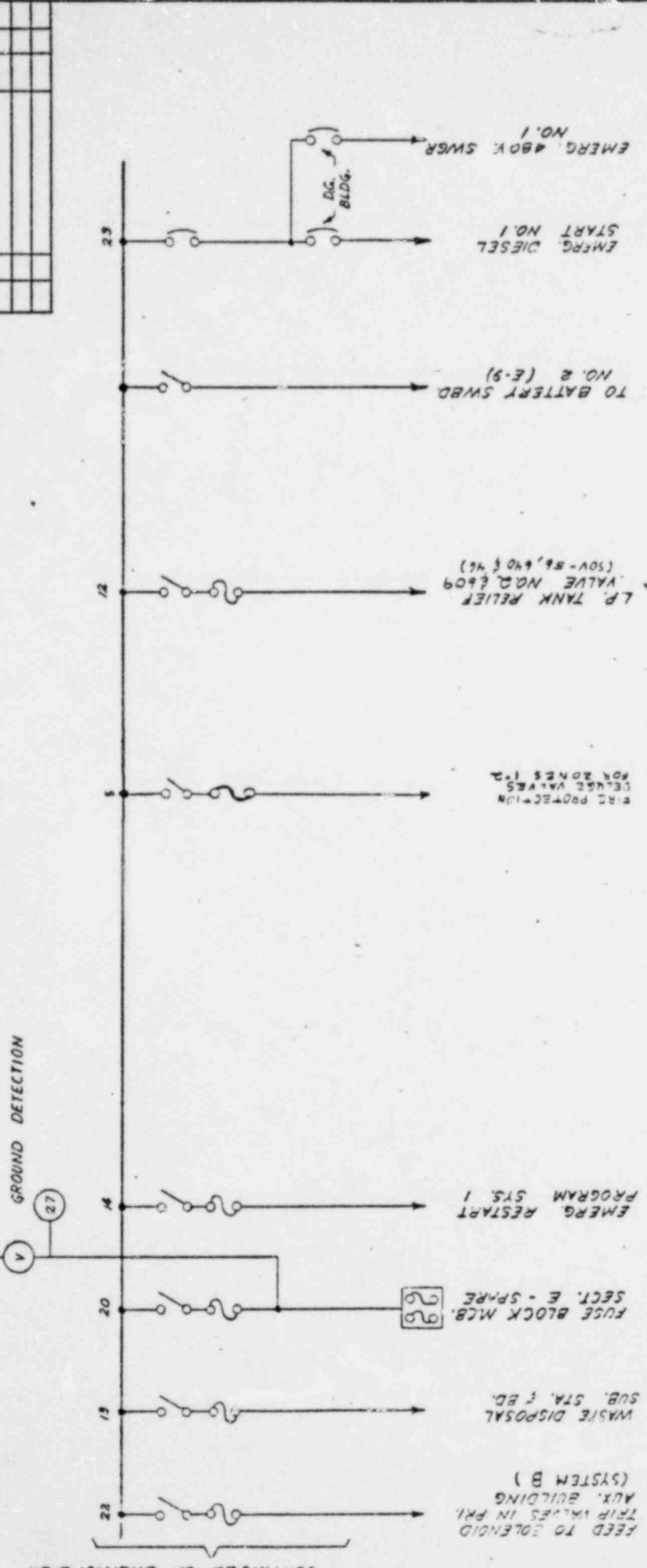
TOLERANCES (EXCEPT AS NOTED)	YANKEE ATOMIC ELECTRIC CO.		
DECIMAL	SCALE	DRAWN BY	JMT
FRACTIONAL	TITLE	APPROVED BY	[Signature]
F	BATTERY BUS NO. 1 135 VDC (SHEET 1 OF 2)	DATE	8/22/75
F	ANGULAR	DRAWING NUMBER	E-8A

DATE	SYN	REVISION RECORD	AUTH	CHK
7/24/75		REV 1	[Signature]	M
7/27/75		REV 2	[Signature]	[Signature]

CONTINUED ON DWG. NO. E8B



DATE	REVISION RECORD	AUTH. OR EN.
8/22/75	Rev. 1	



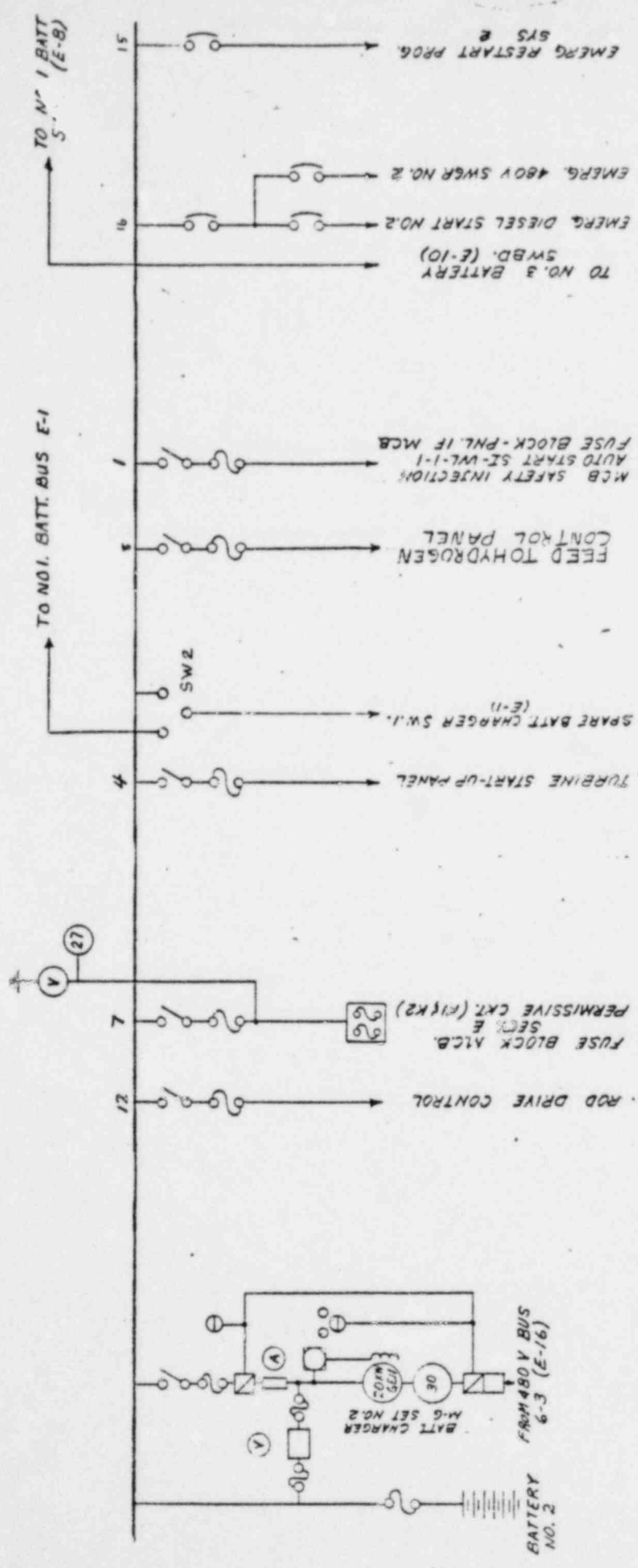
CONTINUED ON DWG. NO. E-8A

REFERENCE DWG. NO. 9199-EE-1H

TOLERANCES UNLESS NOTED	YANKEE ATOMIC ELECTRIC CO.	
DECIMAL	SCALE	DRAWN BY JFT
FRACTIONAL	APPROVED BY [Signature]	
ANGULAR	TITLE BATTERY BUS NO. 1	
	DATE 8/22/75	DRAWING NUMBER E-8B
		125 VDC (SHEET 2 OF 2)

- NOTES:
- ALL CIRCUITS ARE SAFETY CLASS AND CODE UNDER THE Q A PROGRAM REQUIREMENTS.

DATE	SYN	REVISION RECORD	AUTH	CR.	OK
11/15/55		Rev 1	JKT		
11/15/55		Rev 2	JKT		



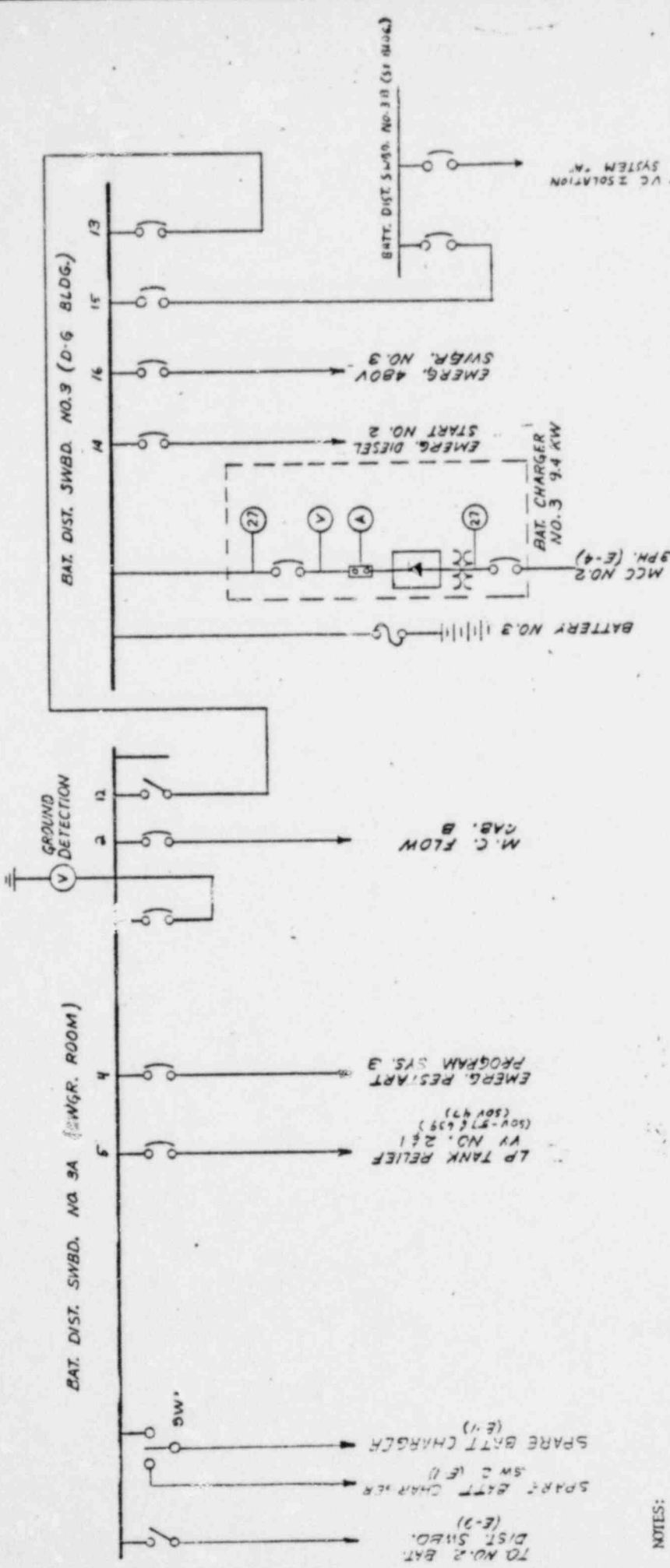
REFERENCE DWG. NO. 9699-FE-1H

TOLERANCES (UNLESS AS NOTED)	SCALE	DRAWN BY	APPROVED BY
DECIMAL ±		JKT	JKT
FRACTIONAL ±			
ANGULAR ±			
TITLE		BATTERY BUS NO. 2	
DATE		8/22/75	
DRAWING NUMBER		E-9	
TITLES		BATTERY BUS NO. 2	
VDC		125 VDC	

- NOTES:
- ALL CIRCUITS ARE SAFETY CLASS AND OIE UNDER Q A PROGRAM REQUIREMENTS



DATE	SYM	REVISION RECORD	AUTH	OR	DL
1/23/71		Rev 1			
5/7/71		Rev 2			



TOLERANCES (EXCEPT AS NOTED)	SCALE	DRAWN BY	APPROVED BY
DECIMAL		TJT	J. J. S.
FRACTIONAL		TITLE	
±		BATTERY BUS NO. 3	
±		125 VDC	
±		DATE	DRAWING NUMBER
±		5/22/75	E-10

NOTES:
 1. ALL CIRCUITS ARE SAFETY CLASS AND OBE UNDER THE Q A PROGRAM REQUIREMENTS.