CONSUMERS POWER COMPANY

MIDLAND NUCLEAR PLANT

REQUEST FOR EXEMPTION

FROM

BRANCH TECHNICAL POSITION

BTP-CMEB 9.5-1

FOR

CONTROL PANELS C43 AND C44

MAY 25, 1984

cpm2/C43-N/44/D8

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I. BACKGROUND AND SUMMARY

BACKGROUND

On October 26, 1983, a meeting was held between Consumers Power Company (CPCo), Bechtel, and the NRC staff to discuss fire protection for control panels containing redundant safe shutdown components and their potential susceptibility to fire damage. CPCo presented a discussion of all safe shutdown panels within the control room, control room peripheral rooms, and safety related equipment (SRE) rooms. The control panel arrangement and area layout are shown on Figure 1. CPCo stated that panels C43 and C44 contained redundant safe shutdown circuits that could be damaged by a single fire and, therefore, positive means would be required to safeguard these circuits from fire induced failures. CPCo indicated that a halon fire suppression system incorporating cross-zoned smoke detection system was being designed for the SRE room and panels C43 and C44 to provide this positive protection.

This submittal provides discussion on the low probability of actual fires in the SRE rooms and details of this state-of-the-art fire suppression system. This information will form the basis for an exemption request.

SUMMARY

There are only two panels within the SRE rooms, the C43 and C44 panels which contain redundant channels of safe shutdown circuits which require protection from fire induced failures. This document demonstrates that the proposed and existing fire protection features for the SRE rooms within fire area 65A combined with the low probability of fire in these rooms provide a level of fire protection consistent with the fire hazards both transient and in-situ identified for these rooms. The highly reliable smoke detection/halon suppression system described in Section III will function such that internal or external panel fires will be extinguished before they can cause the loss of redundant safe shutdown functions. Alternate methods of safeguarding the safe shutdown circuits in these rooms were considered but determined to be less effective in protecting both redundant trains than the total flooding halon system described in this submittal.

This document contains information pertaining to the low fire probability and the highly reliable smoke detection/halon suppression system. Based on a probabilistic risk assessment study, the probability of a fire in the SRE room (2.3×10^{-5}) coupled with the overall probability of a failure of the smoke detection/halon suppression system (1×10^{-4}) results in a failure rate of 2.3×10^{-9} per reactor year. Included are discussions of the following:

- Very low fire probability for the SRE rooms,
- High sensitivity and rapid response of the cross-zoned detection system,
- The high success of Halon as a complete suppression agent,
- Redundant detection and automatic suppression components, and
- Passive protection of both redundant channels of safe shutdown circuits.

This information forms the basis for an exemption request from Branch Technical Position BTP-CMEB 9.5-1 as described in Section II.

II. EXEMPTION REQUEST

Branch Technical Position BTP-CMEB 9.5-1, Section C5.b.(2), requires that redundant trains of safe shutdown systems be protected from fire damage by 1) separation of cables and equipment by a 3-hour fire barrier; or 2) separation of cables and equipment by a horizontal distance of more than 20 feet with no intervening combustibles combined with the installation of fire detection and automatic fire suppression; or 3) enclosure of cables and equipment of one train by a 1-hour rated fire barrier combined with the installation of fire detection and automatic fire suppression.

Based on the information contained in this document describing the highly reliable smoke detection/halon suppression system and other passive fire protection features, CPCo is requesting an exemption from BTP- CMEB 9.5-1, Section C5.b.(2), for the circuits of safe shutdown functions identified on Table 1 for C43 and C44 panels.

III. BASIS FOR EXEMPTION

A. <u>INTRODUCTION</u>

A safe shutdown analysis was conducted for all control room cabinets, including the safety related equipment (SRE) room cabinets which contain safe shutdown circuits. Refer to Figure 1 for the location of the SRE room and for the layout of the panels within the room. The analysis of the SRE rooms indicated that potential fires in or near panels C41, C42, or C45 will not affect the safe shutdown capability of the plant. For panels C43 and C44, however, safe shutdown capability is threatened by the potential for uncontrolled fires in or adjacent to these panels. Some of the safe shutdown circuits within these panels are protected against such fires by transfer switches and require no further consideration. The remaining safe shutdown circuits of concern are the subject of this submittal and the accompanying exemption request. A list of the functions controlled by these circuits of concern is presented in Table 1.

Panel C43, a single multi-bay panel, is the Engineering Safety Features Actuation System (ESFAS) analog panel. Panel C44 is comprised of two multi-bay cabinets located end-to-end, separated by a 3 inch air space, and contains the ESFAS digital logic module and Loss of Off-site Power (LOP) and Emergency Core Cooling Actuation System (ECCAS) sequencers. Arrangement of the C43 and C44 panels is shown on Figure 2.

Circuit failures in any one channel, resulting in either inoperable equipment or spurious operation of ESFAS, will not affect the safe shutdown capability of the plant. Passive protection of the redundant circuits of concern within panels C43 and C44 is provided by physical separation of these circuits. In panel C43, the redundant circuits are located in different bays of that panel, and in C44 the redundant circuits are located in the opposite cabinets. This separation, combined with an effective fire detection/suppression system described in this submittal, provides protection against loss of redundant safe shutdown functions as a result of a fire.

Each Unit of the Midland Nuclear Plant has its own separate SRE room. The basis for this exemption request applies equally to both Units.

The SRE rooms in which these panels are located are an area of low activity and the in-situ fire loading is low, consisting primarily of wires and cable. A physical description of the SRE room is provided in tabular form in Table 2. A review of the potential for transient combustibles in the SRE rooms was performed by a Consumers Corporate Fire Protection Engineer. The results of this review indicate that the expected transient combustibles loading for these rooms is very small and would consist primarily of materials in the posession of plant personnel during the time that these rooms are occupied. The type and quantity of transient combustibles are controlled by administrative procedures. The low transient combustible loading contributes to a low fire probability from this room.

In addition to the items mentioned above, the SRE rooms of both Units form a separate fire area designated 65A. The fire area boundary which separates the SRE room from the main control room (area 65) and the balance of plant consists of 3-hour fire rated construction. Door openings and HVAC duct penetrations in the boundary walls are equipped with automatic self-closing fire rated doors and duct dampers. The fire rating on the doors and duct dampers is equivalent to that of the fire area boundary. Circuits in the SRE room are low voltage signal or control circuits with over-current protection provided as necessary. The combination of these factors supports the low fire probability. Based on nuclear plant experience, the median estimate of a fire in the Midland control room is 3.2×10^{-4} per reactor year[1]. It is further conservatively assumed that the SRE room contains equipment and materials representative of the control room and, therefore, the probability that a control room fire would occur in the SRE room (considering relative floor area) is 7.3 percent. This is a conservative estimate because activity levels within the SRE room will be less than within the main control room and because not all fires postulated to occur in the SRE room have the same potential for affecting panels C43 and C44. This gives a median estimate of a fire in the SRE room of 2.3×10^{-5} per reactor year.

Although the SRE room has a low fire probability, it was decided that positive means should be provided to protect redundant safe shutdown channels from a potential fire.

Several options to achieve this protection were considered. Relocation to achieve a separation of greater than 20' within the SRE room is not a reasonable approach for the bays of panel C43 considering panel and plant construction and layout. Similarly, separation of redundant circuitry within the SRE room by fire barriers is not a practical approach considering panel arrangement and due to lack of space. Electrical isolation devices were evaluated unfavorably, because their addition would significantly increase control system complexity, increase maintenance, and increase the susceptibility to control system failures due to the increased number of components. Therefore, a highly reliable fire detection/suppression system was chosen to protect both channels. Through rapid and reliable detection and suppression, not only are the safe shutdown functions safeguarded, but also the progression of any potential fire is halted, minimizing the total extent of the damage. For fires internal to the C43 or C44 panels, fire damage will be limited to the local area of the ignition source or faulted circuit. Fires external to any cabinet in the SRE room would be detected and extinguished before circuit damage could occur, thus preserving full system function of both redundant safe shutdown channels.

B. DESIGN

It is the intent to provide maximum protection to the safe shutdown circuits and extinguish incipient fires, preventing damage to one redundant safe shutdown channel and minimizing fire damage to the affected channel. This will be accomplished by the installation of a highly reliable halon suppression system. The SRE room of each unit will be provided with a separate smoke detection/halon suppression system. In addition to the total flooding halon system being installed, the SRE rooms will be outfitted with 3-hour fire rated doors and HVAC supply duct dampers. The doors equipped with automatic self-closing devices will close upon activation of the detection system. These features provide containment of the halon gas within the SRE room to maintain the concentration at a suppression level. The highly reliable total flooding halon system being installed is composed of three subsystems: 1) a detection system, 2) an actuation system, and 3) a supply/distribution system. Components of these subsystems have been laboratory tested (U.L. or F.M.) and their reliability has been proven under actual fire conditions.

The detection system utilizes ionization detectors strategically located for maximum surveillance and to provide rapid detection of any SRE room fire in its earliest development, the incipient stage. Detector location is dependent on several factors including: 1) hazard location, 2) room construction and in particular the ceiling details, and 3) smoke and air movement. Placement of the detectors is in accordance with the guidance provided by NFPA72E.[2] Minimum standards for detector placement outlined in this standard have been developed based on extensive testing and data gathered from actual fire investigations.

The actuation system is the interface between the detection system and the supply/distribution system. The actuation system is composed of solid state electronic logic modules which accept input signals from either automatic fire detection devices or manually operated switches. These logic modules convert the input signals to output signals which alarm in the control room and initiate the discharge of halon from the storage cylinders into the distribution piping. Spurious automatic discharge of the halon system is minimized by the logic modules using the principle of cross-zoned detection.

The supply/distribution system consists of halon storage cylinders, each equipped with an electrically actuated valve, and a fixed piping manifold and distribution system with appropriately selected discharge nozzles to distribute the halon into the SRE room and into panels C43 and C44.

The high reliability and rapid extinguishing features of the halon system outlined above and detailed in NFPA 12A[3] will be improved by: 1) improving detector response time, 2) improving system reliability, and 3) discharging the extinguishing agent directly into each bay of both the C43 and C44 panels. These improvements are shown on Figure 3 and detailed below.

Improving Detection Response Time

The ionization detectors are divided into two redundant strings, called zones and are arranged in a cross-zoned pattern. Each zone is capable of detecting the presence of products of combustion (POC) originating in the SRE room and from within either the C43 panel or the C44 cabinets. Area detection is accomplished using detectors installed within each SRE room in accordance with the guidance provided in NFPA 72E. The detection response time associated with this arrangement is improved by the addition of local (spot) detection directly above the C43 and C44 panels. The top of each bay of these panels will be opened and a smoke collection hood installed on each panel to direct the natural convection currents carrying the potential POC to the ionization detectors. This arrangement minimizes the dilution of the POC by the SRE room air before it reaches these detectors. A total of four ionization detectors (2 per detection zone) will be mounted within each smoke collection hood.

In addition to improving detector response time, this arrangement eliminates the potential for single failures to compromise the system function associated with local detection. Since four detectors are monitoring POC from within all bays of each panel, the failure of a single detector will not prevent detection.

Improving System Reliability

The reliability of the detection system has been improved by eliminating the system dependency associated with a single detector failure. The elimination of single failure modes within the actuation system has been accomplished through the following system improvements.

To prevent loss of power to the smoke detection and halon suppression sys _ redundant power supply, consisting of a battery backup, is located in the fire protection panel. This redundant power supply is capable of powering the smoke detection system for 24 hours and still be capable of actuating the halon delivery system should a fire occur during loss of local power.

The halon is stored in two redundant cylinders, each sized to flood the room, including panels to a minimum concentration of 5 percent by volume which is sufficient for rapid extinguishment of a fire[3,4]. The initial concentration of halon will assure that a minimum 5 percent concentration is maintained throughout a 10 minute soak time taking into account leakage of halon from the SRE room. The logic circuitry, on positive fire indication, will actuate; 1) alarms and 2) discharge the main cylinder releasing the total contents to the room and panels achieving a uniform 5 percent concentration. Should the main cylinder fail to discharge, after a short time delay (approximately 10 seconds), the second or reserve cylinder will be automatically actuated. Pressure switches, mounted in the halon discharge piping, will signal a successful discharge and will inhibit actuation of the reserve cylinder. Failure to detect the main cylinder discharge (or switch failure) may result in both cylinders discharging and will result in halon concentration of 10 percent which does not pose a hazard to operating personnel[3].

To evaluate the smoke detection/halon suppression system reliability, a study was conducted utilizing the methods described in NUREG/CR 2300[5]. The failure rate of each of the components and functions shown on Figure 3 was developed based on established data[6,7]. The SRE room 3-hour rated fire damper has no function related to the smoke detection/halon suppression system reliability and was not included in the analysis. Based on the foregoing, the failure rate of the system was conservatively calculated to be 1×10^{-4} per year. Elements of conservatism include consideration of potential common mode failures, a conservative estimate of the reliability of the control module, and no operator intervention.

Surveillance and operability requirements, which minimize potential single failures of the fire detection/suppression system functions, will be performed in accordance with Technical Specifications. Technical Specifications will ensure the operability of the smoke detection/halon suppression system. Surveillance and maintenance of the automatic self-closing fire doors will be performed in accordance with the corporate Property Protection Department Fire Protection Manual.

Improved Distribution

The supply/distribution system consists of two 100 percent capacity halon storage cylinders manifolded into a seismically supported distribution system. The distribution piping terminates with approved (U.L. or F.M.) discharge nozzles located in the SRE room and in each bay of the C43 and C44 panels.

The standard total flooding halon system described in NFPA 12A relies on turbulence created by area discharge nozzles and migration of the halon molecules to assure the desired concentration of halon within electrical enclosures. Additional nozzles located within each bay of panels C43 and C44 are provided to improve the distribution of halon. This arrangement assures extinguishment of any transient or in-situ fire either internal or external before involvement of nearby circuits.

The halon system internal to the cabinets will be designed such that distribution nozzles will not permit the direct impingement of the halon onto the solid state logic modules.

C. CONCLUSION

Within the SRE rooms only panels C43 and C44 require fire protection. The probability of a fire in this room is very low and will further be limited through administrative procedures. The overall probability of a failure of the smoke detection/halon suppression system (1×10^{-4}) coupled with the probability of a fire in the SRE room (2.3×10^{-5}) is 2.3×10^{-9} per reactor year. This very low failure rate supports CPCo's proposed request for an exemption from BTP-CMEB 9.5-1 as described in Section II. If a fire should occur, the halon supression system described will extinguish any transient or in-situ fire, preventing loss of redundant safe shutdown functions.

cpm15/C43-N/44/D8

IV. REFERENCES:

1. Midland Energy Center Probabilistic Risk Assessment; May, 1984; prepared by Pickard, Lowe, and Garrick, Inc.

National Fire Protection Association (NFPA)

2. NFPA 72E; Standard on Automatic Fire Detectors; 1982.

3. NFPA 12A; Standard on Halon 1301 Fire Extinguishing Systems; 1980.

4. Fire Protection Handbook, Fifteenth Edition, Section 18, Chapter 2, pp 18-11 through 18-22, National Fire Protection Association, Quincy, MA, 1981.

5. PRA Procedures Guide NUREG/CR, 2300.

6. S. H. Levinson and M.C. Yeater, "Methodology to Evaluate the Effectiveness of Fire Protective Systems in Nuclear Power Plants," Nuclear Engineering and Design 76(1983), pp 161-182

7. Reactor Safety Study, WASH-1400, 1975

TABLE 1

SAFE SHUTDOWN FUNCTIONS OF CONCERN
WITHIN PANELS C43 and C44*

Panel Number	Circuit Description	Component	Function
C43	Steam Generator Secondary Pressure Sensor/Logics	1PI3134A1	SG A Pressure Indicator
		1PR3134A	SG A Pressure Recorder
		1PI3134A2	SG A Pressure Indicator
		1PI3118B1	SG B Pressure Indicator
		1PR3118B	SG B Pressure Recorder
		1PI3118B2	SG B Pressure Indicator
		2PI3234A1	SG A Pressure Indicator
		2PR3234A	SG A Pressure Recorder
		2PI3234A2	SG A Pressure Indicator
		2PI3218B1	SG B Pressure Indicator
		2PR3218B	SG B Pressure Recorder
		2PI3218B2	SG B Pressure Indicator
C44	Reactor Building Cooling Fans Control Switches and Logic	*VV-57A	RPCAS Start
		*VV-57B	RPCAS Start
		*VV-57C	RBCAS Start
		*VV-57D	RBCAS Start
		*VV-57A	RBCAS Alarm
		*VV-57B	RBCAS Alarm
		*VV-57C	RBCAS Alarm
		*VV-57D	RBCAS Alarm
		*1 for Unit 1 2 for Unit 2	
	Auxiliary Building Safeguard Chillers Control Switches and Logic	*VM-59A	Alarm Circuit
		*VM-59A	Start Permissives
		*VM-59A	Start
		*VM-59A	Start Circuit
		*VM-59B	Alarm Circuit
		*VM-59B	Start Circuit
		*VM-59B	Start
		*1 for Unit 1 2 for Unit 2	
	Chilled Water Pumps Control Switches and Logic	*VP-02A	RBSAS Start
		*VP-02B	RBSAS Start
		*VP-02C	RBSAS Start
		*VP-02D	RBSAS Start
		*VP-02A	ESFAS Start

TABLE 1

SAFE SHUTDOWN FUNCTIONS OF CONCERN
WITHIN PANELS C43 and C44
(Continued)

Panel Number	Circuit Description	Component	Function
		*VP-02B	ESFAS Start
		*VP-02C	ESFAS Start
		*VP-02D	ESFAS Start
		*1 for Unit 1 2 for Unit 2	
	CCW Pumps Control Switches and Logic	*P-73A	LOP/ECCAS Start Pump
		*P-73B	LOP/ECCAS Start and Prevent Manual Stop of Pump Prevent Automatic Block
		OP-73	LOP/ECCAS Start Pump
		OP-73	LOP/ECCAS Start Pump Prevent Automatic Block
		*1 for Unit 1 2 for Unit 2 0 Shared Both Units	
	Makeup Pumps Control Switches and Logic	*P-58A	LOP/ECCAS Start Pump
		*P-58B	LOP/ECCAS Start Pump
		*P-58C	LOP/ECCAS Start Pump
		*P-58C	LOP/ECCAS Prevent Trip Pump
		*P-58C	LOP/ECCAS Start Pump
		*1 for Unit 1 2 for Unit 2	
	AFW Isolation Valves - Control Switches and Logic	1LV-3875A1	AFW Control to SG A
		1LV-3875A2	AFW Control to SG B
		1LV-3875B1	AFW Control to SG B
		1LV-3875B2	AFW Control to SG A
		2LV-3975A1	AFW Control to SG A
		2LV-3975A2	AFW Control to SG B
		2LV-3975B1	AFW Control to SG B
		LV-3975B2	AFW Control to SG A
	Motor-Driven AFW Pumps - Control Switches and Logic	*P-05A	Start Pump, Override Manual Stop
		*1 for Unit 1 2 for Unit 2	

TABLE 1

SAFE SHUTDOWN FUNCTIONS OF CONCERN
WITHIN PANELS C43 and C44
(Continued)

Panel Number	Circuit Description	Component	Function
	AWF Level Control Valve - Control Switch and Logic	1MO-3865A	Open Valve AWF Supply to SG A
		1MO-3865B	Open Valve AWF Supply to SG B
		1MO-3870B	Open Valve AWF Supply to SG B
		1MO-3870A	Open Valve AWF Supply to SG A
		2MO-3965A	Open Valve AWF Supply to SG A
		2MO-3965B	Open Valve AWF Supply to SG B
		2MO-3970B	Open Valve AWF Supply to SG B
		2MO-3970A	Open Valve AWF Supply to SG A
	Service Water Pumps Control Switches and Logic	OP-75A	LOP/ECCAS Start Pump
		OP-75B	LOP/ECCAS Start Pump
		OP-75C	LOP/ECCAS Start Pump
		OP-75D	LOP/ECCAS Start Pump
		OP-75E	LOP/ECCAS Start Pump
		OP-75E	LOP/ECCAS Start Pump
		OP-75E	LOP/ECCAS Start Pump
		OP-75E	LOP/ECCAS Start Pump
	Diesel Generators Control Switches and Logic	*G-11	ESFAS, Start DG A
		*G-11	ESFAS, Start DG B
			Automatic Stop for DG *G11
			Automatic Close for DG *G11
		*G-12	ESFAS, Start DG A
		*G-12	ESFAS, Start DG B
			Prevent Trip from High Jacket Water Temperature
			Automatic Close for DG *G12
			Automatic Stop for DG *G12
			Prevent Trip from High Jacket Water Temperature

*1 for Unit 1
2 for Unit 2

*Panels C43 and C44 contain additional safe shutdown functions which are protected by alternative methods.

TABLE 2

GENERAL FIRE PROTECTION INFORMATION
SAFETY RELATED EQUIPMENT ROOMS
FIRE AREA 65A

1.	Auxiliary Building	el. 659'-0"
2.	Rooms and Construction	
	a. Room Numbers	624 - Unit 1 626 - Unit 2
	b. Wall Height	14'-0"
	c. Wall Length	25'-1 1/2" N&S 16'-8" E&W
	d. Wall Area	351.7 sq ft N&S 233.3 sq ft E&W
	e. Wall Thickness	1'-6" N 3'-0" S 2'-3" E&W
	f. Wall Construction	Concrete all Perimeter Walls 8" Concrete Block Center Divider Wall
	g. Floor and Ceiling Area	419 sq ft per room
	h. Floor Thickness	1'-6" Concrete
	i. Ceiling Thickness	1'-3" Concrete 0'-3" Decking
	j. Total Volume	5,863 cu ft
3.	Ventilation	
	a. Type	Mechanical
	b. Volume	2,000 cfm

TABLE 2

GENERAL FIRE PROTECTION INFORMATION
SAFETY RELATED EQUIPMENT ROOMS
FIRE AREA 65A
(Continued)

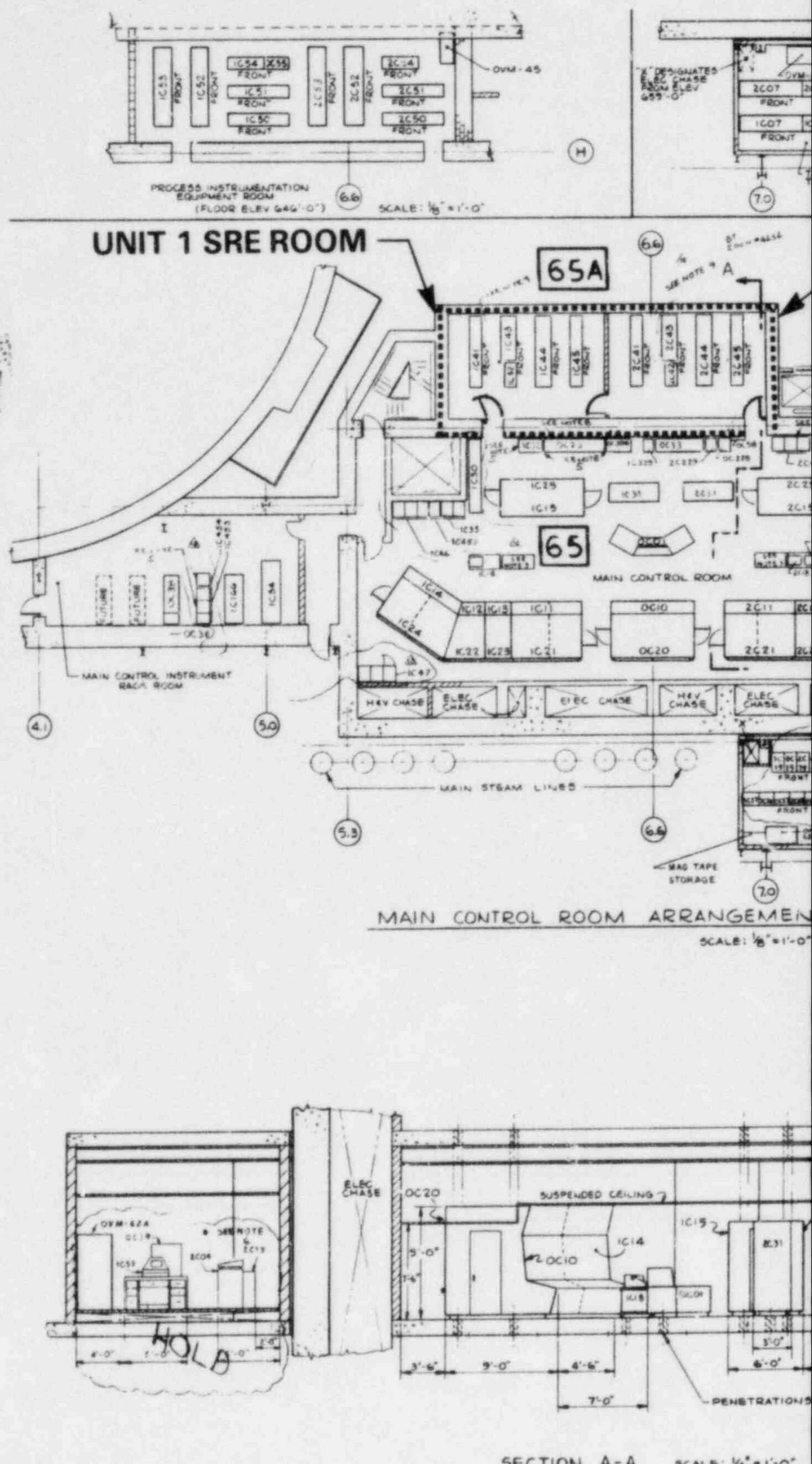
4. Fire Loading

a.	Room 624	6,170 Btu/sq ft
b.	Room 626	8,388 Btu/sq ft

5. Fire Protection Features

a.	Automatic	Total Flooding Halon 1301 Cross Zoned Ionization Detection
b.	Manual	One 15 lb Portable CO_2 per SRE Room Two 15 lb Portable CO_2 Main Control Room One 1 1/2" dia 75 ft Fire Hose F.H.C. #18

TI
APERTURE
CARD



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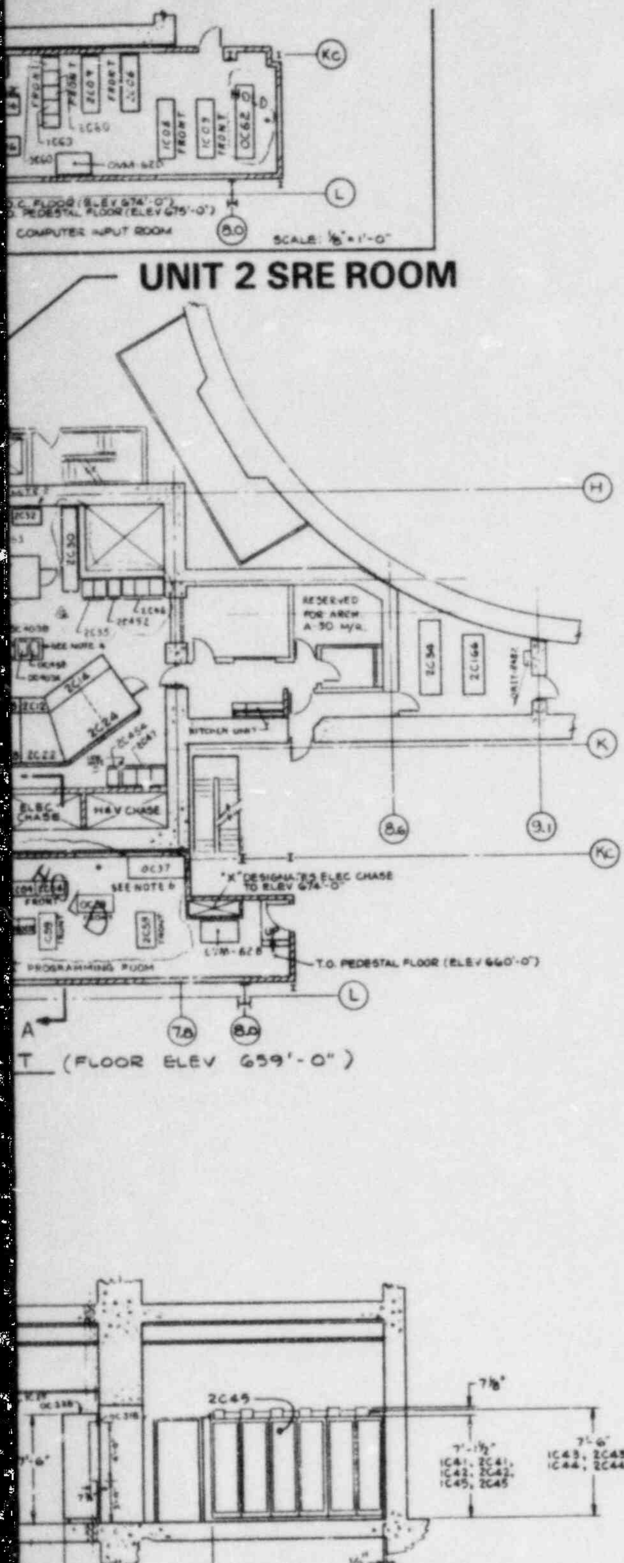
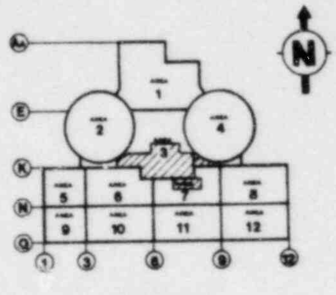




KEY PLAN

NOTES:

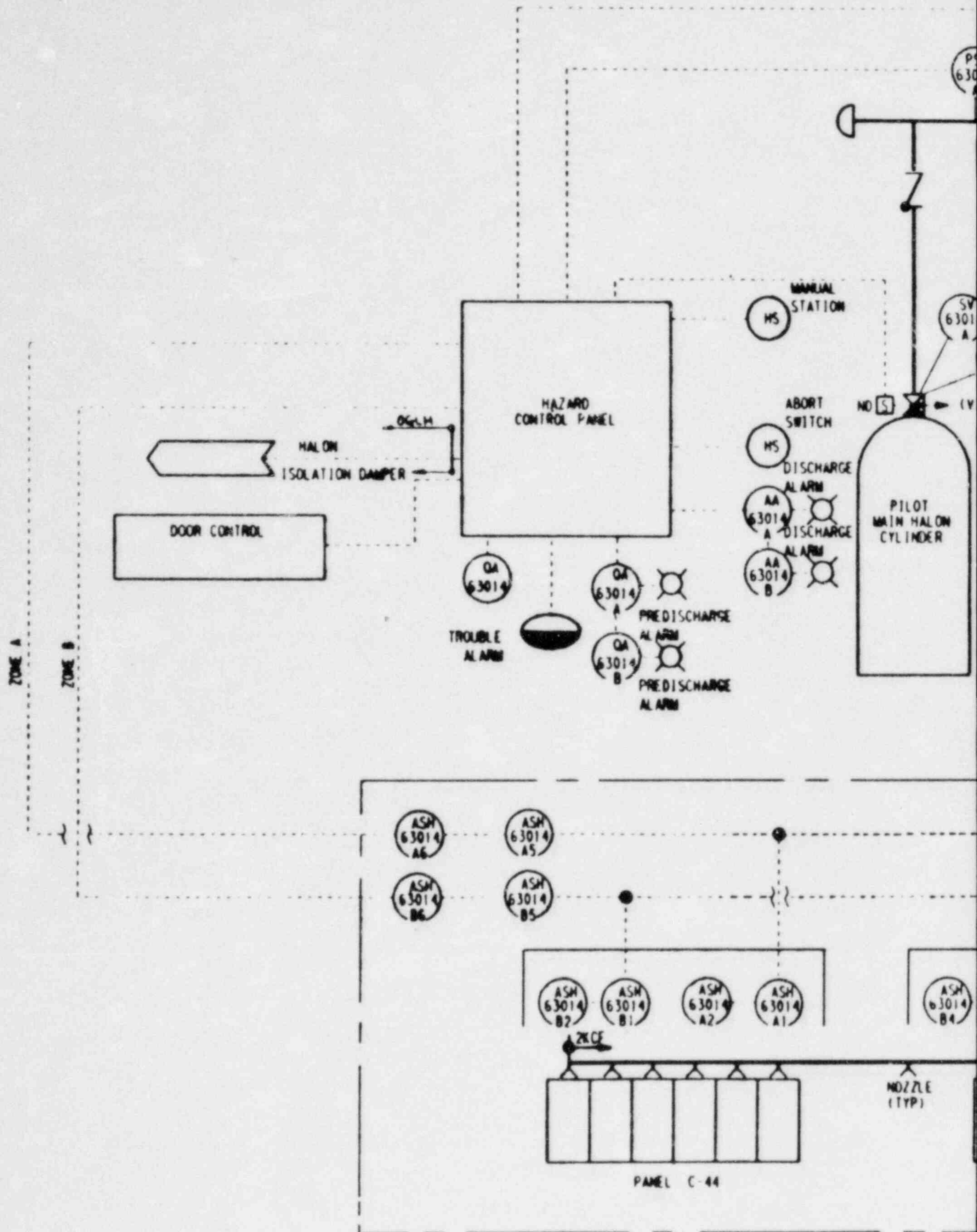
1. CONTROL PANEL DESCRIPTION:

Q-LISTED ITEMS	CONTROL PANEL (ARRANGEMENT DWG)			DESCRIPTION
	UNIT NO. 1	UNIT NO. 2	COMMON	
			0C01(J-748)	NUMBER ONE OPERATOR'S DESK
	1C59	2C59 *	2C59 *	PROGRAMMING FACILITY
			0C39	AYDIN DISPLAY GENERATORS SEE NOTE 6
	1C04	2C04		LINE PRINTER
	1C57	2C57 *	0C57 *	CENTRAL PROCESSING UNIT * SEE NOTE 6
	1C06	2C06		ANALOG INPUT PERIPHERAL TERMINATION CABINET (4 BAYS)
	1C07	2C07		COMPUTER INPUT MULTIPLEXER CABINET (5 BAYS)
	1C60	2C60	0C60	COMPUTER INPUT MULTIPLEXER CABINET (3 BAYS TOTAL)
		2C09		LOGIC INPUT/OUTPUT PERIPHERAL TERMINATION CABINET (4 BAYS)
Q			0C10(J-726)	EVAPORATOR & COMMON AUXILIARY CONTROL BENCHBOARD
Q	1C11(J-727)	2C11(J-731)		TURBINE-GENERATOR AND FEEDWATER CONTROL BENCHBOARD
Q	1C12(J-729)	2C12(J-733)		REACTOR COOLANT CONTROL BENCHBOARD
Q	1C13(J-728)	2C13(J-732)		CONTROL ROD DRIVE AND COMPUTER CONTROL BENCHBOARD
Q	1C14(J-730)	2C14(J-734)		ENGINEERED SAFETY FEATURES CONTROL BENCHBOARD
Q	1C15(J-744)	2C15(J-746)		ELECTRICAL VERTICAL PANEL
	1C16	2C16		COMPUTER INPUT MULTIPLEXER CABINET (2 BAYS)
	1C58	2C58	*	MAGNETIC TAPE UNIT AND PERIPHERAL CONTROLLERS
	1C18	2C18		CONTROL OPERATOR'S DESK AND ALARM TYPER
	1C19	2C19	0C19 *	MOVING HEAD DISC UNIT
Q			0C20(J-735)	COMMON AUXILIARY VERTICAL PANEL
Q	1C21(J-736)	2C21(J-740)		TURBINE SUPERVISORY INSTRUMENTATION & TURBINE-GEN AUXILIARIES VERT PNL
Q	1C22(J-738)	2C22(J-742)		BALANCE OF REACTOR COOLANT AND REACTOR AUXILIARIES VERTICAL PANEL
Q	1C23(J-728)	2C23(J-732)		BALANCE OF REACTOR MONITORING VERTICAL PANEL
Q	1C24(J-739)	2C24(J-743)		POST ACCIDENT MONITORING & BALANCE OF ENGINEERED SAFETY FEATURES VERT PNL
Q	1C25(J-745)	2C25(J-747)		ELECTRICAL PROTECTIVE RELAYS VERTICAL PANEL
Q			0C29	REACTOR BUILDING RADIATION SAMPLE AND HYDROGEN MONITORING CONTROL PANEL
Q	1C30	2C30		SAFETY RELATED AUXILIARY RELAY CABINET
Q	1C31	2C31		SAFETY PARAMETER DISPLAY CONSOLE
Q	1C32	2C32		RADIATION MONITORING SYSTEM VERTICAL PANEL
			0C33	ELECTRICAL SYSTEM STATUS DISPLAY PANEL
	1C34	2C34		ANNUNCIATOR TERMINATION CABINET
Q	1C35	2C35		ECCAS CONDITIONING CABINET (ACTUATION CHANNELS A&B) (2 BAYS)
			0C36	MEPLC DATA ACQUISITION REMOTE STATION (CONITEL)
			0C37	ENGINEERS CONSOLE * SEE NOTE 6
			0C38	SWITCHYARD TELEMETRY AND CONTROL CABINETS
Q	1C41	2C41		NUCLEAR INSTRUMENTATION AND REACTOR PROTECTION SYSTEM CABINET (SAFETY CHANNELS A, B AND C) (6 BAYS)
Q	1C42	2C42		NUCLEAR INSTRUMENTATION AND REACTOR PROTECTION SYSTEM CABINET (SAFETY CHANNEL D) (2 BAYS)
Q	1C43	2C43		B.O.P. ENGINEERED SAFETY FEATURES CABINET (ANALOG SENSOR CHANNELS 1, 2, 3 & 4) (4 BAYS)
Q	1C44	2C44		B.O.P. ENGINEERED SAFETY FEATURES CABINET (ACTUATION CHANNELS A & B) (6 BAYS)
Q	1C45	2C45		EMERGENCY CORE COOLING ACTUATION SYSTEM CABINET (6 BAYS)
Q	1C46	2C46		ESIS ANALOG CABINET (3 BAYS)
Q	1C47	2C47		ESIS DIGITAL CABINET (3 BAYS)
	1C50	2C50		INTEGRATED CONTROL SYSTEM CABINET (5 BAYS)
	1C51	2C51		NON-NUCLEAR INSTRUMENTATION X CABINET (5 BAYS)
	1C52	2C52		AUXILIARY RELAY CABINET (6 BAYS)
	1C53	2C53		PROCESS INSTRUMENTATION EQUIPMENT CABINET (6 BAYS)
	1C54	2C54		NON-NUCLEAR INSTRUMENTATION Y CABINET (3 BAYS)
			0C55	EVAPORATOR STEAM DEVELOPEMENT SYSTEM CABINET (2 BAYS)
			OVM-45	PROCESS INSTRUMENTATION EQUIPMENT ROOM UNIT COOLER
			OVM-62A&B	PROGRAMMING ROOM AIR HANDLING UNIT
			OVM-62C&D	COMPUTER INPUT ROOM AIR HANDLING UNIT
Q	1C166	2C166		B.O.P. SAFETY RELATED INSTRUMENTATION CABINET (4 BAYS)
			0C62	FRONT END PROCESSORS * SEE NOTE 6
			0C218	SEISMIC MONITORING PANEL
	1C219	2C219		LOOSE PARTS MONITORING PANEL
			0C318	MAIN CONTROL ROOM FIRE/SMOKE DETECTION PANEL
Q			0C388	HAZARDOUS GAS MONITORING PANEL
			0C403A	RADIATION MONITORING PANEL CRT
			0C403B	RADIATION MONITORING PANEL PRINTER
			ORTY 8482	AREA RADIATION MONITOR LOCAL CONTROL UNIT
Q	1C452	2C452		ESIS ANALOG CABINET (1 BAY)
Q	1C453	2C453		ESIS DIGITAL CABINET (3 BAYS)
Q	1C454	2C454		ESIS ANALOG CABINET (1 BAY)
			0C458	PROCESS STEAM RADIATION MONITORING CRT AND KEYBOARD

2. ALL BAYS WITHIN CABINETS ARE NUMBERED FROM LEFT TO RIGHT AS VIEWED FROM THE FRONT
3. THIS SPACE IS RESERVED FOR THE SHIFT SUPERVISOR'S DESK NO EQUIPMENT IS TO BE LOCATED IN THIS RESERVED AREA
4. DESK MAY BE OFFSET TO IMPROVE VISIBILITY OF THE MAIN CONTROL BOARD.
5. A MINIMUM SEPARATION OF 2" REQUIRED BETWEEN THE PANELS A MINIMUM SEPARATION OF 1" REQUIRED BETWEEN PANELS AND WALLS
6. * ON "HOLD" PENDING INCORPORATION OF IDCN
7. DELETED
8. PANEL 0C29 IS SET AT 1 1/2" OUT FROM SOUTH SIDE OF H WALLS FACE
9. PANEL 1C42 IS SEPARATED FROM PANEL 1C43 BY A DISTANCE OF 1" +1" -0".

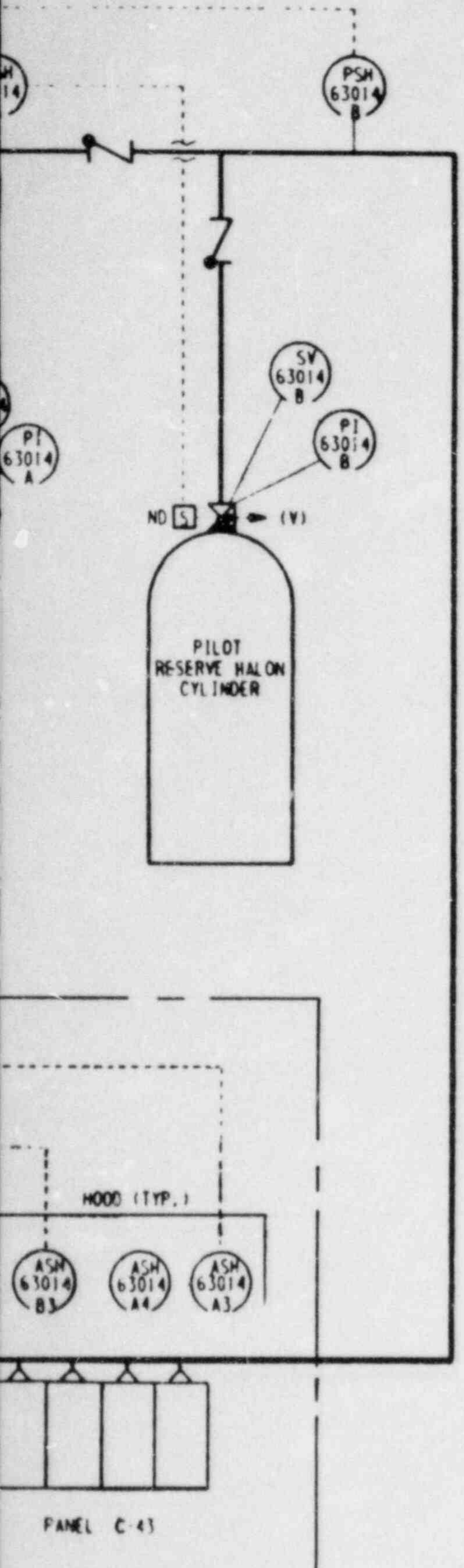
MCR GENERAL ARRANGEMENT
FIGURE 1

8406070265 -01



HALON 1301 FIRE PROTECTION SY

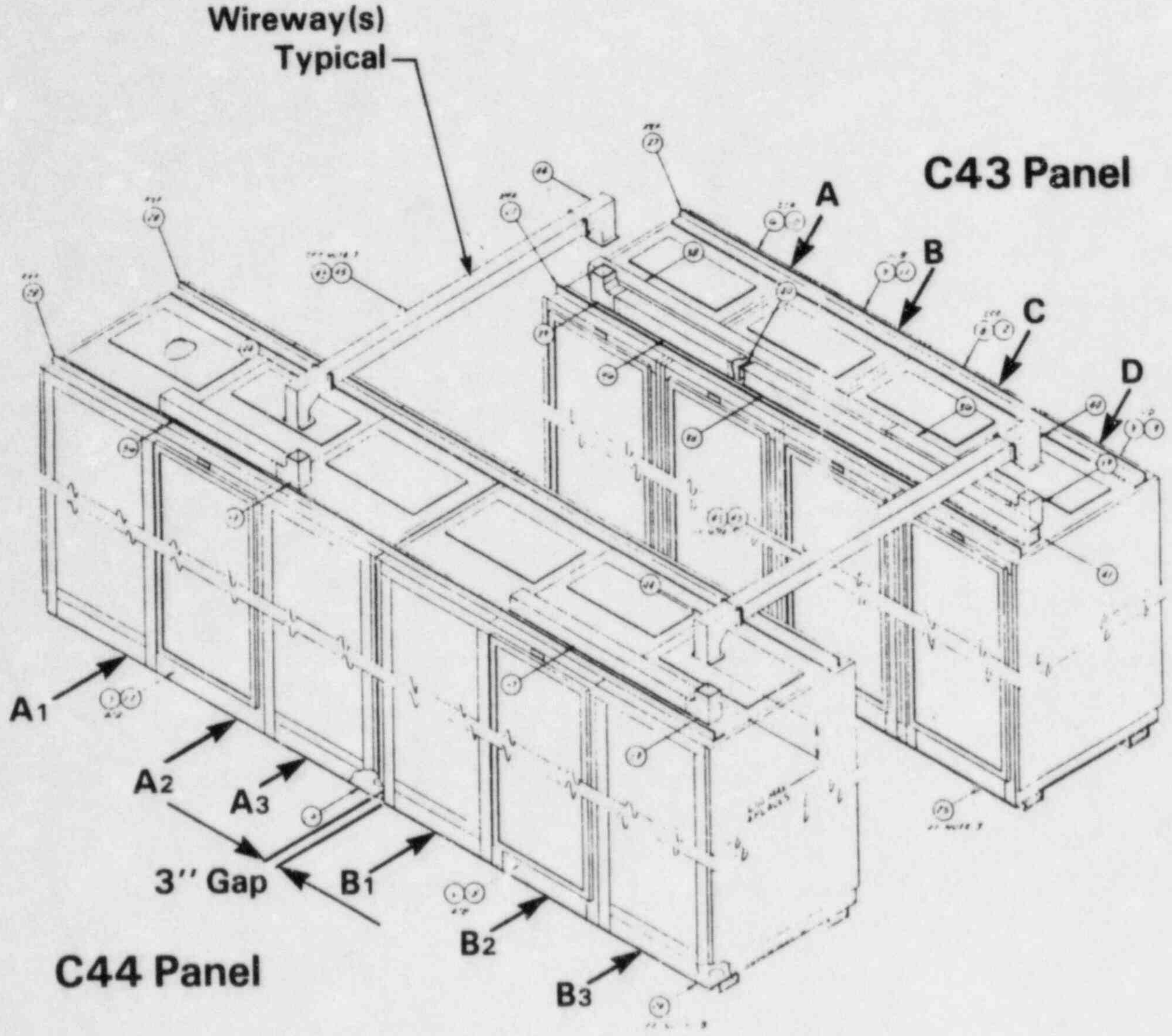
(TYPICAL BOTH UNITS)



STEM

SRE ROOM
FIRE DETECTION/SUPPRESSION SYSTEM

FIGURE 3



No Detection or Suppression is Shown on This Panel Arrangement

C43 AND C44 PANEL ARRANGEMENT

FIGURE 2