REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8405030127   DOC.DATE: 84/04/25   NOTARIZED: NO   DOCKET #
FACIL:50-261 H. B. Robinson Plant, Unit 2, Carolina Power and Ligh   05000261
AUTH.NAME   AUTHOR AFFILIATION
CUTTER,A.B.   Carolina Power & Light Co.
RECIP.NAME   RECIPIENT AFFILIATION
VARGA,S.A.   Operating Reactors Branch 1

SUBJECT: Forwards Attachment 1 Rev 1 to pending exemption request from App R,Section III.G.2 re proposed mods to component cooling water pump room.Changes involve addition of partial area suppression.

DISTRIBUTION CODE: A006S   COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 12
TITLE: OR Submittal: Fire Protection

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	NRR ORB1 BC 01	3	3			
INTERNAL:	ELD/HDS1	1	0	IE FILE 06	1	1
	IE/WHITNEY,L	1	1	NRR FIORAVANT07	2	2
	NRR WAMBACH	1	0	NRR/DE/CEB 09	2	2
	NRR/DL DIR	1	1	REG FILE 04	1	1
	RGN2	1	1			
EXTERNAL:	ACRS 11	3	3	LPDR 03	1	1
	NRC PDR 02	1	1	NSIC 05	1	1
	NTIS	1	1			

TOTAL NUMBER OF COPIES REQUIRED: LTTR 21 ENCL 19

CP&L

Carolina Power & Light Company

APR 25 1984

SERIAL: NLS-84-171

Director of Nuclear Reactor Regulation
Attention: Mr. Steven A. Varga, Chief
Operating Reactors Branch No. 1
Division of Licensing
United States Nuclear Regulatory Commission
Washington, DC 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23
FIRE PROTECTION
CCW PUMP ROOM EXEMPTION REQUEST

Dear Mr. Varga:

In a letter dated June 7, 1983, Carolina Power & Light Company (CP&L) transmitted information to the NRC concerning the pending exemption request from Appendix R, Section III.G.2 and proposed modifications for the component cooling water (CCW) pump room at the H. B. Robinson Plant, Unit No. 2.

As a result of discussions with the NRC staff from December 1983 until early April 1984, CP&L proposes to install partial suppression coverage in the CCW pump room. We are herewith submitting Attachment 1, Revision 1 which supersedes Attachment 1 of the June 7, 1983 letter, with the exception of the photographs and engineering calculations which have no changes.

Changes to the attachment are indicated by vertical bars in the right-hand margins. Briefly, the changes involve the addition of the partial area suppression (refer to Figure 3) along with our proposal to delete the previously-proposed plume-impingement barrier beneath Balance of Plant cable trays in the area and our intention to remove the existing radiant heat shield wall adjacent to CCW Pump A.

Should you have any questions regarding this information, please contact our staff.

Yours very truly,

A. B. Cutter - Vice President
Nuclear Engineering & Licensing

JAM/ccc (9844JAM)
Attachment

cc: Mr. J. P. O'Reilly (NRC-RII)
Mr. G. Requa (NRC)
Mr. Steve Weise (NRC-HBR)

A006
1/1

411 Fayetteville Street • P. O. Box 1551 • Raleigh, N. C. 27602

ATTACHMENT 1

H. B. Robinson Unit No. 2
Additional Information On Pending Exemption Request

Component Cooling Water Pump Room

Introduction

In our submittal dated March 16, 1982, Carolina Power and Light Company (CP&L) requested an exemption from the requirements of 10 CFR 50, Appendix R, Section III.G.2 for the Component Cooling Water Pump Room (Fire Zone 5). On April 27, 1982, we submitted detailed technical justification to support our March 16, 1982 exemption request.

As a result of discussions with the Staff in April and May 1983 and February, March and April 1984, we are providing the following revised information which enhances and clarifies this exemption request. Figures 1-3 and the attached photographs are provided to assist the reviewer. Figure 1 provides an elevational view of the area. Figure 2 provides a plan view of the area and a director to the attached photographs. Figure 3 highlights the combustible loading in the area and illustrates the proposed suppression system coverage.

Discussion

The component cooling water pumps are located on a north-south orientation, with pump A redundant to pump C (Figure 2). Pumps A and C are 24 ft from centerline to centerline with approximately 20 ft (19' 11") between the closest points of each pump (See Figure 1). Only one of three (3) pumps and one (1) component cooling heat exchanger are required for safe shutdown.

The pump power supply cables for component cooling water pumps A and C are installed in conduit (Photographs 1, 2, 4-7). The pump A power cable currently is routed through conduit which empties into a tray. Power cables for both pumps are horizontally separated by 12 ft with the highest tray located 13 ft 10 in off the floor (Figure 1).

Proposed Modification

To enhance the protection of the component cooling water pump room and preclude ignition of the power cables to both pumps A and C, CP&L proposes to provide a one (1) hour barrier around the power supply cables for pumps A and C. In addition, a partial fire suppression system will be installed in the area of the component cooling water pumps and the aisle in front of the pumps. (See Figure 3.)1/

CCW Area Fire Hazards Analysis

The objective of this analysis is to demonstrate that with the the proposed modifications and existing configuration of the Component Cooling Water Pump Room, CP&L essentially meets the requirements of Appendix R, Sections III.G.2(b) and III.G.2(c), respectively.

The Component Cooling Water Pump Room is 2083 ft^2 in area and is separated from adjacent areas by three-hour-rated concrete walls, floors, and ceiling. The ceiling height is approximately 15 ft 6 in. The combustible loading in the area consists primarily of electrical cables. Those cables not inside conduits are coated with a flame-retardant material listed in the 1982 Factory Mutual Approval Guide and NRC Research Information Letter No. 46 (RIL 46) (Photographs 1-5). The remaining fixed combustible fuel load consists of approximately one quart of lubricating oil in each pump. Based on the calorific value of the predominant cable type (approximately 10500 Btu/lb), the combustible loading is 15600 Btu/ft^2. When adjusted to an equivalent value of materials used to generate the standard time-temperature curve (i.e., 8000 Btu/lb), the fuel loading is approximately 20500 Btu/ft^2 for an equivalent fire severity of 16 minutes. The remainder of the room has an insignificant fuel loading.

1/ Plume impingement barrier is obviated by the addition of a partial fire suppression system.

This estimate of fire severity should be considered as an upper limit for the area, since the presence of flame-retardant coatings reduces both the rate and amount of heat released from electrical cables in a fire. This phenomenon has been confirmed in controlled experiments conducted at Factory Mutual Research Corporation involving treated and untreated cable specimens.1/ In the few cases in these experiments where the coated cables could be ignited at all, the normalized mass of insulation and jacket materials ultimately consumed in the fire prior to self extinguishment was approximately 18 percent less than that suffered by untreated cables. In all cases where the coated cables were ignited, flame sizes and heights were smaller than observed for the uncoated cables.

In addition to lower heat release rates, fire propagation potential is also reduced by adding coatings to electrical cables. This feature is confirmed by regulatory research as documented in RIL 46 which concludes that the coatings used by Carolina Power and Light Company "can be utilized to prevent tray-to-tray fire propagation with cable not qualified to the IEEE-383 flame test standard with cable tray configurations and fires similar to those on which the fire retardant coating tests were conducted.2/ These facts in conjunction with the proposed partial suppression system in the area of the cable trays and pumps should preclude the need for any additional protection under the cable trays.

A cross-zoned smoke and heat detection system is presently installed in the area. Portable fire extinguishers and manual fire hose stations are available in adjacent areas and may be rapidly deployed if needed. Carolina Power and Light Company proposes to enhance the area's protection by providing a one (1) hour barrier around the power cables to pumps A and C. This includes rerouting pump A power cables

---

1/ M. Khan, J. Steciak, and A. Tewarson, "Small Scale Testing of Flame Retardant Coated Cables:, J.I. OG3R9.RC, Factory Mutual Research Corporation, Norwood, MA, 1982.

2/ Memorandum for Messrs. R. B. Minogue and H. R. Denton from Mr. S. Levine, Subject: "Research Information Letter #46, 'Effectiveness of Cable Tray Coating Materials and Barriers in Retarding the Combustion of Cable Trays (Horizontal Open Space Configuration)'", November 1978.

from the present conduit-tray routing to a conduit. In addition, a partial fire suppression system will be added above the cable trays and pumps to prevent the migration of fire between the redundant pumps A and C. The proposed fire protection system will be a preaction sprinkler system and integrated with the existing detection system described above.

Power cables to all pumps are or will be in conduit, and all cables in cable trays are coated with a fire retardant material. Therefore, the only remaining significant in-situ combustible in the fire area is the pump motor lubricating oil. The probability of ignition of the oil is low because the quantity of lubricating oil is low, the lubricating oil has a high flashpoint (approximately $350^{\circ}F$), and sufficiently hot surfaces do not exist in this fire area to cause the ignition of the lube oil.

The potential for transient combustibles accumulating to form a hazard has also been reviewed. Based upon estimates of maximal materials flow through the area, the magnitude of this potential is on the order of 40 lbs of anti-containment clothing. This amount represents the contents of two loosely packed bags taken from contaminated areas requiring full anti-contamination dress and arbitrarily assumed to be present for this purpose of analysis. This quantity, in fact, represents an abnormal condition, since such materials are normally placed in containers with approved fire-stopped tops reserved for this purpose after removal from the entrance to a contaminated area. Thus, ignition of transient materials would have to occur precisely during transition from the contaminated area to the metal containers.

In order to maximize the impact of a postulated exposure fire on the redundant pumps A and C, the transient combustible materials are assumed to be located directly in front of pump B, equidistant between the pumps (Figure 2). This location allows for radiation from the flames to directly impact both pumps simultaneously. An analysis of the effects of a fire is performed (Appendix A) which assumes that all radiant energy from the exposure fire will be viewed by the pump motor casings with no re-radiation to other energy-absorbing materials in the area and no natural convection to remove energy from the pump casings. The fire brigade would respond immediately for a fire in this area, nevertheless, the proposed suppression system would automatically actuate and suppress the fire.

An alternate site for the transient fire would involve its positioning in front of pump A. While this location would result in a higher temperature on the casing of pump A than determined in the analysis, it would also result in a greatly reduced excess temperature for pump C due to the inverse-square relationship associated with distance and energy. This situation would assure that at least one division of safe shutdown equipment remains free of fire damage.

Using the previously described assumptions and considerations, a conservative analysis of the effects of a transient exposure fire on the pumps is provided in the Appendix. The results of this analysis indicate that pump surface temperatures do not rise more than $100^{o}F$ above ambient temperatures while under operating conditions, thereby assuring the continued availability of the pumps. Peak values for the heat flux incident on the pumps are calculated to be less than 1.66 kW/M^2 (526.22 $Btu/HR\text{-}ft^2$). Such values indicate that transient combustible fires would not threaten redundant safe shutdown components. It is further concluded that the calculated pump casing temperature is also an upper bound for the temperature of the insulation on the cable inside the motor casings. Based on the thickness of the casings (approxiamtely 1/4 in.) and the mass of the steel, the thermal inertia of the pump casing is such that a fire involving significantly larger quantities of fuel burning for a longer duration would be required before cable insulation degradation would begin (Photographs 1 and 2).

The low probability of ignition of the lube oil combined with the lack of significant potential for transient combustible accumulations in conjunction with the existing separation distance and early warning detection system as well as the proposed partial suppression system provides reasonable assurance that the proposed systems and modifications will assure protection of at least one train of safe shutdown equipment.

No credit is given to the part-height radiant heat shield wall located adjacent to pump A. This wall is currently an impediment to maintenance of pump A. Since an automatic suppression system will be installed in the area, the radiant heat shield wall is no longer necessary and, as part of this exemption request, CP&L intends to remove this wall as soon as the proposed modifications to this area are completed.

In summary, the Component Cooling Water Area can be classified as having a low fuel loading (equivalent to 20500 Btu/ft^2 when analyzed against the heat potential of material used to generate the standard time-temperature curve) and close to 20 ft separation exists between redundant components of safety related equipment. The proposed installation of one-hour barriers around pumps A and C circuits and a partial suppression system further enhances the effectiveness of the approximately 20 ft of separation. Combined with the low fuel loading, room geometry, the existence of a fire retardant coating on all exposed cables, and the limited potential for transient combustible buildup in the area, resonable assurance is provided that a fire in the Component Cooling Water Pump Area would be quickly detected, responded to by the fire brigade or the automatic suppression system and promptly extinguished prior to damaging the redundant cooling water pumps in this area. For these reasons, we conclude that with the proposed modifications and the existing configuration the Component Cooling Water Pump Room would essentially meet the requirements of Appendix R, III.G.2.(b) and III.G.2.(c), respectively.

Table 1

COMPONENT COOLING PUMP ROOM
Summary Parameter Evaluation Table

A. Area Description

1. Construction
   a. Walls - reinforced concrete
   b. Floor - reinforced concrete
   c. Ceiling - reinforced concrete
2. Ceiling height - 15 ft 6 in.
3. Floor area - 2083 ft^2
4. Room volume - approximately 32300 ft^3
5. Ventilation - 7500 CFM; automatic dampers provided
6. Congestion - low; cables generally on room's west side at component cooling pumps

B. Safe Shutdown Equipment

1. Redundant systems in area - two safety-related component cooling pumps; one non-safety-related alternate shutdown component cooling pump and heat exchangers
2. Equipment in area required for hot shutdown - component cooling water pumps and heat exchangers required for hot and cold shutdown
3. Type of equipment involved - 480V power control cables for component cooling pump motors

C. Fire Hazards Analysis

1. Type of combustibles in area
   a. Cable insulation coated with fire retardant coating
   b. Pump lube oil
2. Quantity of fixed combustibles
   a. Cable insulation (estimated at 66 ft^3)
   b. One quart lube oil for each of three pumps
3. Transient combustibles - anti-contamination clothing
4. Total combustible loading is 15600 Btu/ft which, when adjusted to an equivalent value of materials used to generate the standard time-temperature curve is 20500 Btu/ft^2. This equates to an equivalent fire severity of approximately 16 minutes.

D. Fire Protection Existing

1. Fire detection sytems - redundant cross-zoned fire detectors
2. Fire extinguishing systems
   a. Local extinguishers
   b. Hose stations
3. Hose station/extinguisher - available
4. Propagation retardants - all exposed cables coated with fire retardant mastic

E. Proposed Modifications

1. Reroute pump A power cable to conduit and provide one (1) hour rated barriers around the power cables for pumps A and C
2. Partial fire suppression system as defined below:

   A preaction sprinkler system will be hydraulically designed to meet the requirements of NFPA 13-1983 with respect to density and area of coverage. The occupancy is considered to be "Ordinary Hazard, Group 1."

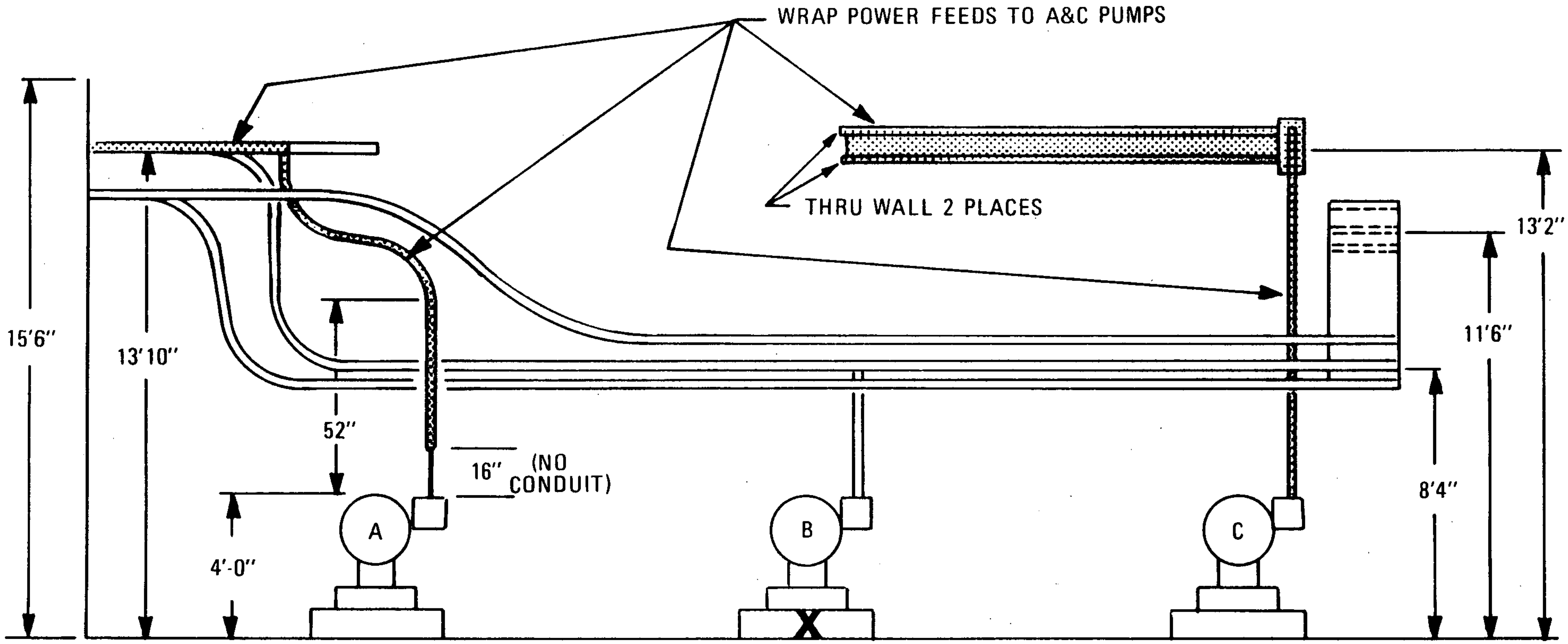
   The NFPA code will be applicable only to the extent referenced. The design conditions shall be as follows:

	Item	Value	Source
a.	Area Classification	Ordinary Hazard (Group 1)	NFPA 13, 1-7.3.1
b.	Area of Application	860 sq. ft.	NFPA 13, 2-2.1.2
c.	Density of Water Application	0.16 GPM/ft^2	NFPA 13, 2-2.1.2.8 and Figure 2-2.1B
d.	Max. Area Coverage Per Sprinkler	130 ft^2	NFPA 13, 4-2.2.2
e.	Number of Sprinkler Heads	8 minimum	NFPA 13, 4-2.2.2

	Item	Value	Source
f.	Maximum Distance Between Sprinkler Head Branch Lines	15 feet	NFPA 13, 4-2.1.2
g.	Maximum Distance of Branch Line from Wall	7½ feet	NFPA 13, 4-2.1.2
h.	Height of Sprinkler Head Below Ceiling	1" to 18"	NFPA 13, 4-3.4.1
i.	Seismic Requirements	DBE (acceleration = 1.51 g at elevation 246)	UFSAR Sections 3.2 and 3.7.3
j.	Sprinkler Heads	U.L. Listed, ½" orifice, 165°F (Grinnell Pt. No. SSU-3 or equal)	---

Electrical Requirements: Electrical equipment such as switchgear and motors shall be protected from sprinkler discharge water by means of sheetmetal covers, mounted above the equipment and seismically supported to DBE requirements, to prevent the direct impingement of sprinkler water onto the equipment.

NOTE: POWER FEEDS TO PUMP "A" CURRENTLY IN TRAY
TO BE REROUTED IN CONDUIT AND WRAPPED.



LEGEND:

INDICATES ONE-HOUR RATED BARRIER

X LOCATION OF POSTULATED FIRE

Figure 1 ELEVATION OF COMPONENT COOLING WATER AREA

NOTE: POWER FEEDS TO PUMP "A" CURRENTLY IN TRAY
TO BE REROUTED IN CONDUIT AND WRAPPED.

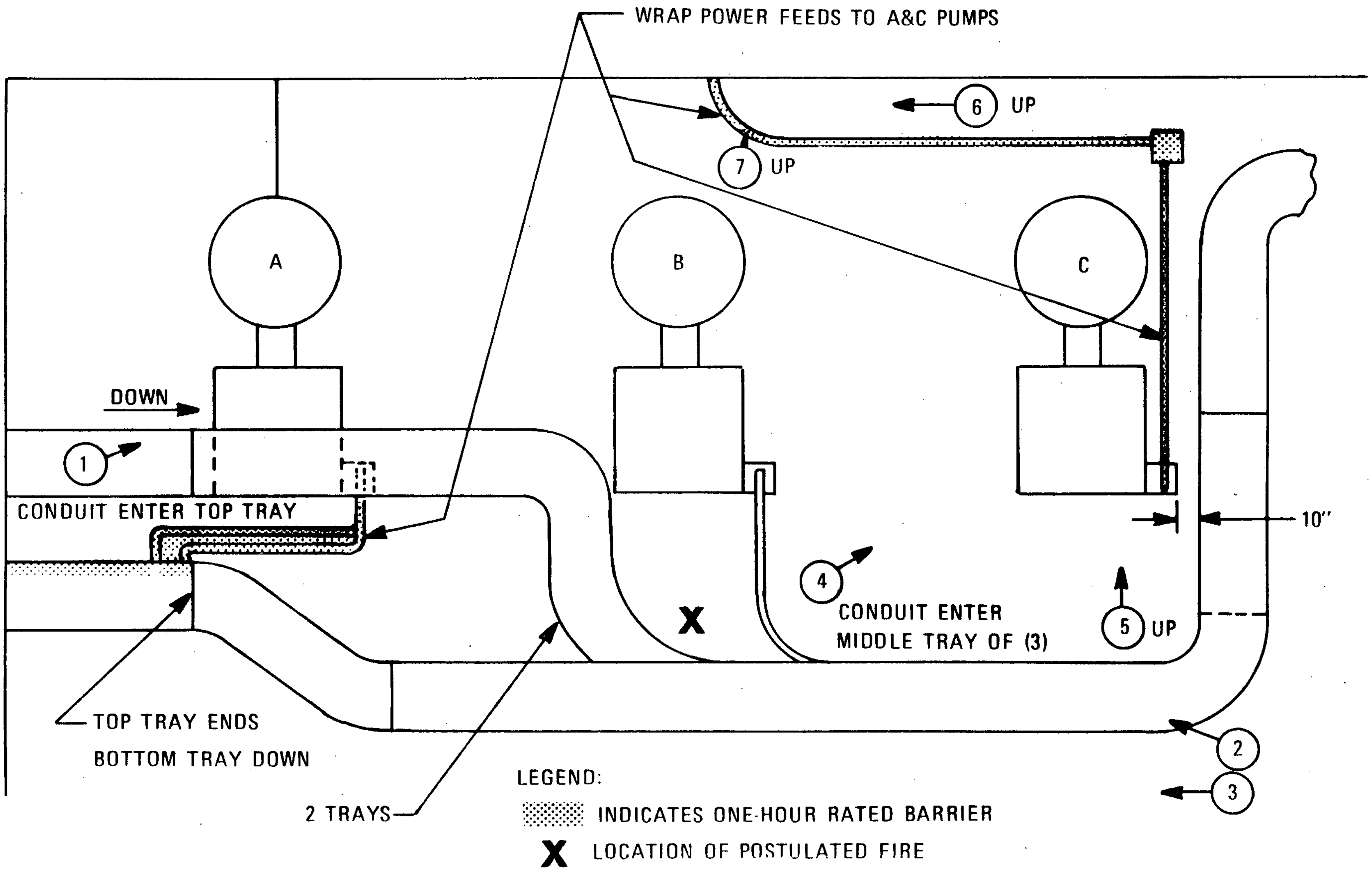
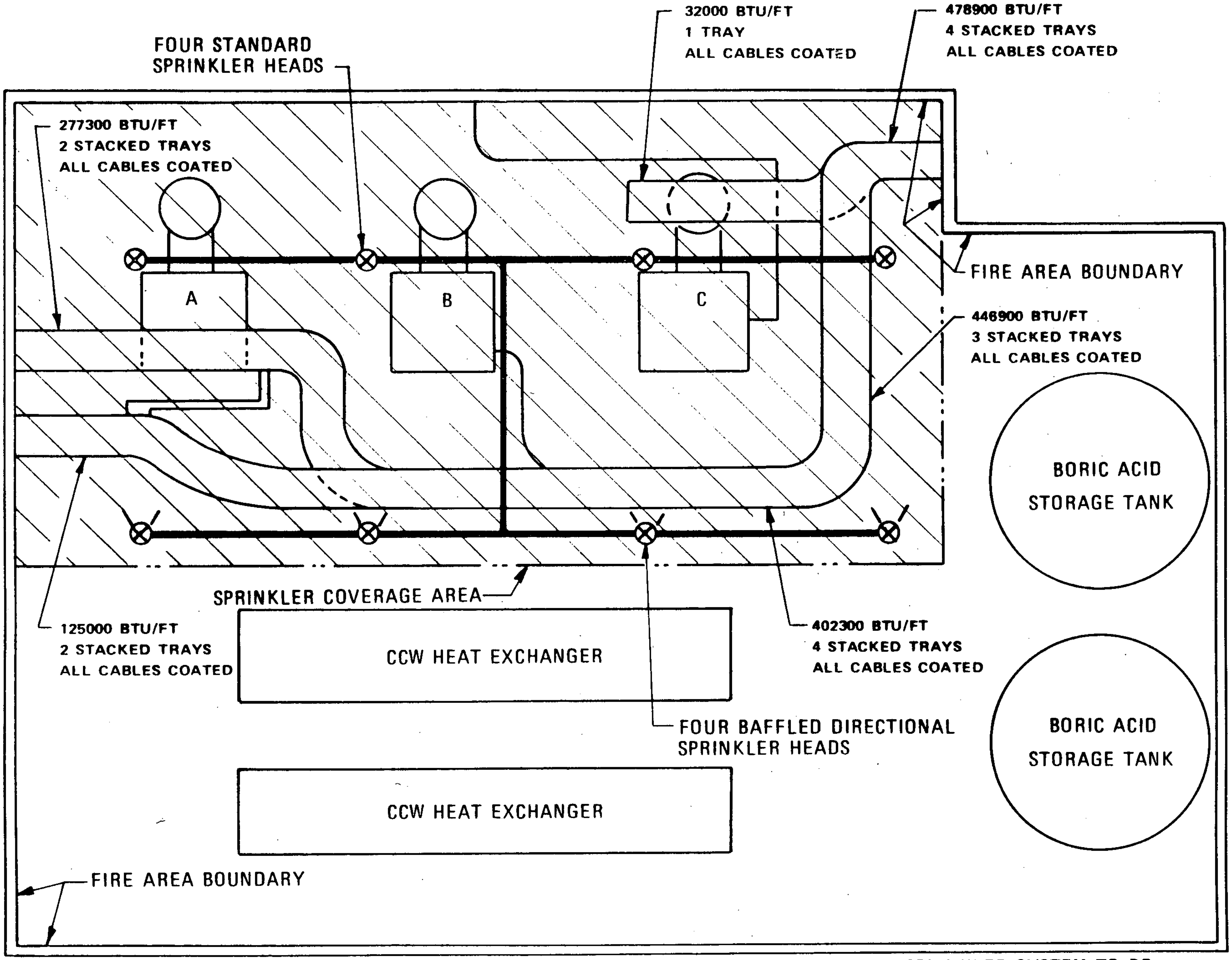


Figure 2 PLAN OF COMPONENT COOLING WATER AREA



NOTE: SPRINKLER SYSTEM TO BE INSTALLED AT CEILING HEIGHT

Figure 3 COMBUSTIBLE LOADING CONFIGURATION IN COMPONENT COOLING WATER AREA