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ILLINOIS POWER COMPANY



CLINTON POWER STATION, P.O. BOX 678, CLINTON, ILLINOIS 61727

March 7, 1986

Docket No. 50-461

Director of Nuclear Reactor Regulation
Attention: Dr. W. R. Butler, Director
BWR Project Directorate No. 4
Division of BWR Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Clinton Power Station
Resolution of the Fire Protection Site Audit Concerns

Dear Dr. Butler:

The purpose of this letter is to respond to the Staff's concerns expressed in your October 18, 1985 letter regarding Fire Protection Site Audit Concerns. This letter incorporates the Staff's comments as discussed in joint meetings at Bethesda on November 6-7, 1985 and January 8-9, 1986. The responses are provided in Attachments (1) through (3).

If you need any further clarification, please advise.

Sincerely yours,

F. A. Spangenberg
F. A. Spangenberg
Manager - Licensing
and Safety

RPB/jkp

Attachments

cc: B. L. Siegel, NRC Clinton Licensing Project Manager
NRC Resident Office
Regional Administrator, Region III, USNRC
Illinois Department of Nuclear Safety

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ATTACHMENT (1)

1. Two-Hour Rating of Block WallsConcern

No justification was provided for the 2-hour fire resistance rating attributed to the eight-inch thick hollow concrete block walls serving as fire barriers.

Response

Illinois Power's investigation of this issue as a 10CFR50.55(e) is now complete, and we have determined that the condition is not safety significant. Justification for the 2-hour fire resistance rating is provided in the final report for the 10CFR50.55(e) (Letter U-600222 dated 9/19/85) and in Letter U-600360 dated 12/11/85.

2. Containment AirlocksConcern

The Reactor Building air lock doors are not fire rated. (Section D.1.(j) of Appendix A to BTP APCSB 9.5-1)

Response

Section 4.2.2.14.1 will be added to the Safe Shutdown Analysis to address this concern.

3. Bus Duct PenetrationsConcern

Electrical bus duct penetrations through fire barriers are not sealed. (Section D.1.(j) of Appendix A to BTP APCSB 9.5-1)

Response

Section 4.2.2.15 will be added to the Safe Shutdown Analysis to address this concern.

4. Unprotected Structural Steel in the Diesel Generator RoomsConcern

Structural steel forming a part of the fire barrier in the diesel generator day tank room is not protected. (Section D.1.(j) of Appendix A to BTP APCSB 9.5-1)

ATTACHMENT (1)

Response

A design clarification is provided as Attachment (2) for the unprotected steel in this area. The steel involved is not structural steel.

5. Ventilation Duct Fire DampersConcern

Some ventilation ducts penetrating fire barriers are not equipped with fire rated dampers. (Section D.1.(j) of Appendix A to BTP APCSB 9.5-1)

Response

Illinois Power has completed a review of all HVAC duct penetrations through fire rated barriers. Based on this review, design modifications are being implemented to install fire dampers in duct penetrations located in safe shutdown areas of the plant, except where specific deviations have been identified.

6. Fire Damper Dirty Assembly/"S"-Hook InstallationConcern

The tracks and blades of fire damper assemblies are loaded with dirt and debris and "S" hooks are installed backwards. (Section C.8 of Appendix A to BTP APCSB 9.5-1)

Response

To establish a standard method for testing and documenting the functional ability of fire dampers, Procedure GTP-38 has been developed to ensure that fire dampers are:

- a) tested and inspected in accordance with revised manufacturer's instructions.
- b) free of corrosion and dirt.
- c) verified to have the proper "S" hook installation.

7. Cable Trays Unprotected by Automatic Sprinkler SystemsConcern

Cable trays outside of the cable spreading room are not protected by automatic sprinkler systems. (Section D.3.(c) of Appendix A to BTP APCSB 9.5-1)

Response

A design clarification is provided in Attachment (3) for the fire hazard associated with cable tray loading.

ATTACHMENT (1)

8. Location of Fire Pump Flow Meter DischargeConcern

The location of the fire pump flow meter discharge outlet relative to the pump intake may adversely affect the fire flow test results. (Section E.2.(c) of Appendix A to BTP APCSB 9.5-1)

Response

The vertical fire pump has a 12" diameter intake that is located 34'-4" down the well from the top of the concrete. The water level is 25'-4" above the bottom of the pump screen inlet. The fire pump flow meter discharge outlet has a 10" diameter that is located 3'-6" down the well from the top of the concrete. The water level is 5'-6" below the bottom of the discharge outlet. This equates to a vertical distance difference of 30'-10" between the pump intake and discharge outlet. The horizontal distance is 5'-8½" between the intake and outlet. Considering the difference in elevation between the inlet and outlet, we feel that this will not adversely affect the flow test results. In addition, this recirculation line will be utilized as part of the preoperational test and the results obtained will be checked against the baseline to determine if there are any adverse effects.

9. Fire Hydrant SpacingConcern

Fire hydrant spacing exceeds 250 feet within the power block. (Section E.2.(g) of Appendix A to BTP APCSB 9.5-1)

Response

Illinois Power Company has reviewed the spacing of fire hydrants that does not meet the "approximately 250 feet" guideline of Appendix A to BTP APCSB 9.5-1. The appropriate hydrant hose houses will have supplemental lengths of 1½" and 2½" hose to provide an acceptable coverage in accordance with the intent of Appendix A and meet the requirements of NFPA-24. The total length will not exceed 500 feet of hose. The fire brigade will be trained to handle the size and lengths of hoses involved.

10. Fire Hose CoverageConcern

In many safety-related areas it may not be possible to reach all locations with 75 feet of fire hose due to congestion and changes in elevation. (Section E.3.(d) of Appendix A to BTP APCSB 9.5-1)

ATTACHMENT (1)

Response

A hose stretch test has been conducted of all fire hoses throughout the fire zones and confirmed that not all locations can be reached by 75 feet of fire hose. In order to ensure that the hose stations provide accessibility and coverage to all zones and that all areas in the plant can be reached by at least one effective hose stream, the following types of corrective actions will be taken:

- a) Hose replacement with proper length of hose
- b) Relocation of hose stations
- c) Addition of hose stations

The 100 feet maximum of 1½ inch hose per Section C.6.c(4) of CMEB 9.5-1 and its associated standpipe system will conform to NFPA-14.

Additionally, FPER, Section 4.0, E.3.d will be revised to address the following deviations:

- (1) Storage of an additional 50' hose to make 150' hose total, if needed, at the Control Room and the Steam Tunnel.
- (2) Hose station in Drywell (Fire Area C-1) not reaching entire area of Drywell.

11. Control Room ProtectionConcern

The Control Room is not adequately separated from its peripheral rooms by fire rated construction and automatic sprinkler protection is not provided in the peripheral rooms. (Section F.2 of Appendix A to BTP APCSB 9.5-1)

Response

Section 4.2.2.7 of the Safe Shutdown Analysis will be revised to address this concern.

12. Turbine Building Safety Related ConduitConcern

The Turbine Building contains conduits identified as being safety-related. (Various sections of Appendix A to BTP APCSB 9.5-1 and Appendix R to 10CFR50 that apply to areas containing safety-related equipment).

ATTACHMENT (1)

Response

Section 4.2.3.1.11 will be added to the Safe Shutdown Analysis to address this concern.

13. Suppression and Detection in Fire Areas C-1 and C-2

Concern

Fire protection means for the containment and drywell have not been provided in accordance with our guidelines. (Section III.G of Appendix R to 10CFR50 and Section F.1 of Appendix A to BTP APCS 9.5-1)

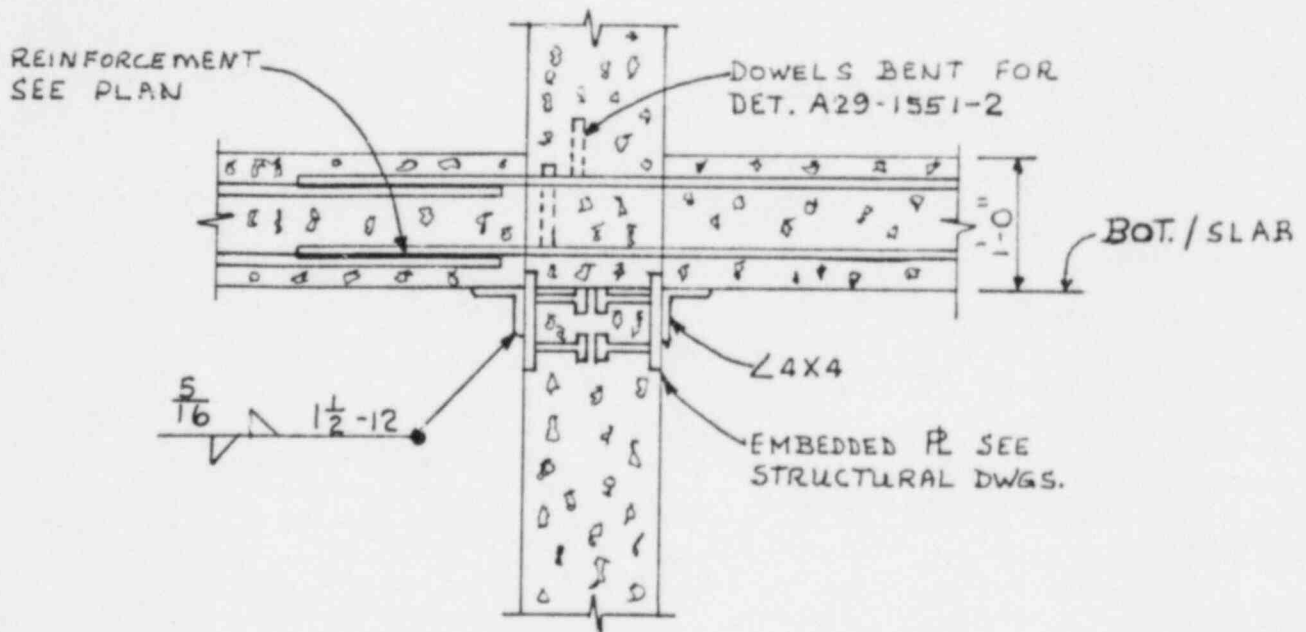
Response

Sections 4.2.3.1.4 and 4.2.3.1.10 will be added to the Safe Shutdown Analysis to address this concern. Also, Section 4.2.4.1 will be revised.

ATTACHMENT (2)

The L4x4 member in the Diesel Generator Day Tank Room, as shown on the following Detail A21-1070-18, provided temporary support for the wet concrete of the roof slab and adds shear resistance to the joint detail. The angle is welded to an embedment plate similar to other attachments to concrete firewalls. This angle is not required to maintain the integrity of the roof slab.

Additionally, the concrete wall which has the embedment plate for the angle is continuous and has no gaps and therefore provides a continuous fire barrier.



DETAIL A21-1070-18
A29-1551-1 & A29-1551-2

DESIGN CLARIFICATION ON THE AUTOMATIC
SUPPRESSION OF CABLE TRAYS IN SAFETY-RELATED AREAS

REFERENCE

APCSB, Appendix A, Section D.3(c)

"Automatic water sprinkler systems should be provided for cable trays outside the cable spreading room. . . ."

NRC CONCERN

The concern is that the level of fire protection in areas containing a high concentration of cables and cable trays (six or more cable trays in close proximity) may not be adequate without the added benefit of an automatic sprinkler in these areas. The high fuel load in the form of concentrated cable trays would lead to a severe fire exposure that may ultimately threaten safety-related cable trays in other areas.

FIRE AREAS/ZONES INVOLVED

		<u>Cable Tray Figure</u>
Elevation 712 feet 0 inch		
Fire Zone	F-1a	2
	CB-1b	7
Elevation 719 feet 0 inch		
Fire Zone	CB-1c	8
Elevation 737 feet 0 inch		
Fire Zone	F-1m	3
Elevation 751 feet 0 inch		
Fire Zone	CB-1e	9
Elevation 755 feet 0 inch		
Fire Zone	F-1p	4
Elevation 762 feet 0 inch		
Fire Zone	CB-1f	10
	D-10	10
	A-3d	4
	A-2k	4
Elevation 781 feet 0 inch		
Fire Zone	A-3f	5
	A-2n	5

Cable Tray Figure

Elevation 800 feet 0 inch		
Fire Zone	CB-6d	12
	CB-7	12
Elevation 803 feet 3 inches		
Fire Zone	C-2	6
Elevation 825 feet 0 inch		
Fire Zone	CB-1i	13

DESCRIPTION OF SAFE SHUTDOWN EQUIPMENT AND CABLE

All areas were reviewed for the effect of the cable concentration on safe shutdown. The effects of a fire on redundant safe shutdown equipment or cable are discussed in the Safe Shutdown Analysis.

ENGINEERING JUSTIFICATION

General

Only steel cable trays with solid bottoms are used to route cable at the Clinton site except for cable trays over motor control centers, which are of the ladder type for access to the equipment. All instrumentation cable trays, in addition to the solid bottom, have solid metal covers over the top. When power, control, and instrument cable trays are stacked and run horizontally, the instrument tray is closest to the floor with the power tray closest to the ceiling. Cable trays routed horizontally have a 6-inch depth whereas all cable tray risers have a 12-inch depth. The vertical separation of horizontal trays is usually 1 foot. Concentrated cable trays that are protected by an automatic sprinkler system were not analyzed in this design clarification.

All vertical cable tray risers, where they penetrate a floor and/or ceiling regardless of its rating are sealed with a 3-hour, fire rated silicone foam seal. The cable risers from the fuel floor (elevation 755 feet 0 inch) in the fuel building are sealed with a silicone foam fire stop approximately 15 feet up from the floor elevation due to the large vertical length of cable trays. Also, all vertical risers have solid metal covers up to 12 feet from the floor elevation.

The majority of the cables used in cable trays are constructed of ethylene-propylene rubber (EPR) covered with a hypalon jacket. A limited use of PVC cable for communication is installed throughout the plant. There are no concentrated areas where this type of cable is used in safety-related buildings. The flame-retardant, self-extinguishing characteristics of the IEEE-383 EPR/hypalon electrical cable have been demonstrated by a series of fire tests as summarized below.

Tests

The concern is concentrated, loaded cable trays and the resultant damage from installed or transient combustibles exposing these cable trays. Tests have proven that a fire will not propagate either horizontally or vertically along cable or between cable trays.

- Large-scale fire tests were conducted by FMRC for the Electric Power Research Institute, and they provided data on the ignition resistance and fire-retardant resistance to propagation between trays.
- The EPR/hypalon cable has also been tested in accordance with ASTM Test #E-84 and was given a flame spread rating of 15. This test was conducted by the Public Service Electric & Gas Company and submitted to the NRR in the Fire Protection Program Review for the Salem Nuclear Generating Station Unit 2, in response to Branch Technical Position 9.5-1. A product with no combustion has a 0 rating, with red oak flooring given a rating of 100. The higher the numerical rating, the greater the flammability hazard. Materials that exhibit high rates of flame spread contribute substantial quantities of fuel to a fire. This is not the case with EPR hypalon cable.
- The E-84 test consists of a 25-foot-long horizontal tunnel in which the ends of the cable are subject to a 300,000 Btu/hr gas burner. The test was designed to provide a moderately severe exposure of approximately 1400°F in the area of flame impingement. The flame spread rating of 15 demonstrates the difficulty of propagation of flame down the cables. (NFPA Handbook - Fifteenth Edition, 5-49) See also Table A-1, Evaluation Tests per EPR Cable.
- The presented fire testing done on EPR/hypalon cable confirms the difficulty of developing a fire with a solid bottom, either vertically or horizontally. The solid bottom tray provides a barrier to direct flame impingement, which in turn requires cables to be heated to a higher temperature to reach ignition (automatic ignition rather than pilot ignition). For EPR/hypalon cables, the automatic ignition temperature is greater than 1000°F.

Plant Survey

A plant walkdown was performed to locate areas of six or more cable trays within a 10-foot-diameter circular area. The walkdown was limited to safety-related buildings only.

All cable tray concentrations of six or more are listed in Tables A-2 and A-3. Cable tray concentrations of six or more are defined as those cable trays in close proximity to each other that would be exposed to a fire located on or near the floor.

Two types of cable fill per tray are presented in Tables A-2 and A-3: observed fill or design index. Whenever possible, the observed percent fill of each tray was used. If cables completely filled a 6-inch tray, an observed 100% fill for that tray was used. If cables only filled 3 inches of the 6-inch tray a 50% observed fill was used. Horizontal cable trays are accessible by hose stream for manual fire fighting.

The design index is calculated as follows:

- The formula is $\frac{\sum \text{of (cable diameter)}^2 \times 100}{\text{tray width} \times \text{usable depth}}$
- Usable depth for a 6-inch-deep tray is :
 - 2 inches for power cable
 - 3 inches for control and instrumentation

Example: A 24-inch-wide cable tray with twelve 2-inch-diameter power cables would have a design index of 100. It would also have an observed percent fill (if the cables were laid straight) of 33% (one-third of the tray would be filled with cables). A design index of 100 for control and instrumentation trays would have a 3-inch fill, resulting in an observed 50% fill of the actual cable tray.

For a specific location, Tables A-2 and A-3 list the number of either 2-foot- or 3-foot-wide cable trays. Immediately after this number is the number of instrumentation cable trays at this location. All instrumentation cable trays, in addition to having solid bottoms, are also enclosed at the top. Electrical cable in conduit, covered cable trays, or enclosed raceways are not considered as contributing to the fire load.

Taking credit for covered cable trays reduces the areas evaluated in Tables A-2 and A-3. Six or more concentrated cable trays are located in the following areas:

	<u>Location</u>	<u>Number of Horizontal Trays</u>
<u>#1 Control Building</u>		
Elevation 712 feet 0 inch		
Fire Zone CB-1b	T-129	6
Elevation 751 feet 0 inch		
Fire Zone CB-1e	T-129	7
<u>#2 Containment Building</u>		
Elevation 803 feet 3 inches		
Fire Zone C-2	270°	6
<u>#3 Diesel-Generator Building</u>		
Elevation 762 feet 0 inch		
Fire Zone D-10	AE-132	6
	AD-129	6

#4 Auxiliary Building

Elevation 762 feet 0 inch

Fire Zones A-2k
A-3d

AB-104	6
U-106	9
U-119	9
Z-119	6
AA-132	7
V-U/119	6

<u>Location</u>	<u>Number of Horizontal Trays</u>
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Elevation 781 feet 0 inch

Fire Zones A-2n
A-3f

U-V/121-123	6
AB-Z/103	6
X/105	6
U-V/123	8

The majority of the horizontal cable trays are located 10 or more feet above the floor elevation at which the exposure fire was developed, and which would not result in direct flame impingement. Also, totally enclosed instrumentation cable trays are located at the lowest elevation of a stacked horizontal tray arrangement and would prevent any fire propagation of that tray vertically up to the next tray.

The postulated fire event is considered to originate on or near the floor. All areas with safe shutdown high cable tray concentrations have automatic fire detection with alarm and annunciation in the control room. In general, combination nozzles on each hose station can be adjusted from straight stream to fog as the situation warrants. Utility fog nozzles are provided in areas of high-voltage equipment. These nozzles are able to provide manual suppression to high overhead cable trays. There are no in situ combustibles in the immediate area that would expose the concentrated cable locations. Hose stations can be used to control and extinguish the fire at the point of origin. The capability to cover all trays with an effective hose stream was also reviewed and the results are stated in Tables A-2 and A-3.

CONCLUSION

All fire zones in which concentrations are located contain a low fire loading, with all areas accessible for manual fire fighting. Due to the low cable tray loading, solid bottom cable trays, cable tray separation, totally enclosed instrument trays, difficulty in igniting the cable, general early warning by the fire detection system, and good accessibility of the trays for manual fire fighting, the existing conditions do not justify additional protection.

TABLE A-1
EVALUATION TESTS PER EPR CABLE

(conducted by Public Service Electric & Gas Company)

<u>Number of Tests</u>	<u>Test Type</u>	<u>Fire Source and Time</u>	<u>Remarks</u>
3	Horizontal control cable	100,000 Btu/hr burner, 20 minutes	<p>Three designs were compared:</p> <ol style="list-style-type: none"> 1. 18-inch vertical separation. 2. 12-inch vertical separation. 3. 12-inch vertical separation, with Thermalon blanket installed. <p>None of these designs propagated fire horizontally or vertically.</p>
2	Horizontal power cable	100,000 Btu/hr burner, 20 minutes	<p>Two designs were compared:</p> <ol style="list-style-type: none"> 1. 18-inch vertical separation. 2. 12-inch vertical separation. <p>Neither design propagated fire.</p>
5	Horizontal	100,000 Btu/hr 50 minutes	18-inch separation - EPR/jacketed cable; no fire propagation.

TABLE A-1, Cont.

<u>Number of Tests</u>	<u>Test Type</u>	<u>Fire Source and Time</u>	<u>Remarks</u>
2	Horizontal	200,000 Btu/hr 50 minutes	12-inch separation - with and without Thermalon blanket - no fire propagation.
1	Horizontal	100,000 Btu/hr 50 minutes	12-inch separation - Thermalon blanket with 4-inch x 3/8-inch sheets. No fire propagation.
1	"S" configuration, vertical with elbows on both ends	100,000 Btu/hr 50 minutes	EPR/neoprene; no fire propagation.
10	Vertical	Oil-soaked rag, ± 20 minutes	Test configuration similar to IEEE 0383. Tests confirmed EPR/neoprene cables to be nonpropagating.
5	Vertical	Oil rag, gas burner	Compare burners.
3	Horizontal	100,000 Btu/hr gas burner, 20 minutes	Tests compared polyethylene, FR-XLP, and EPR/jacketed cables in fully loaded horizontal cable trays. Tests confirmed EPR/jacketed cable to be nonpropagating.
2	ASTM E-84	300,000 Btu/hr gas burner, 10 minutes	Tests of EPR/jacketed cable. EPR/neoprene flame spread rating of 15.

TABLE A-2
HORIZONTAL CABLE TRAYS

Location	Number of Cable Trays (4) (Design Index or § 1111)	Number of Cable Trays (4) (Design Index or § 1111)	Minimum Gap Between Trays	Fire Zone	Fire Loading for Zone (8Fu/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessibility (aisle space)	Cable Tray Concentration Description
Control building: Elevation: 712 ft											
T-129	7 (1 inst.) P200, 56, P144, P126, 44, 2, and P144 (1)	--	1 ft	CB-1b	18,500	No	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	4 trays adjacent to each other with 3 additional trays perpendicular; see Cable Tray Figure 7.
T-132	6 (2 inst.) 11, P47, P7, P46, 44, and 5 (1)	--	1 ft	CB-1b	18,500	No	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	4 trays adjacent to each other with 2 additional trays perpendicular; see Cable Tray Figure 7.
T-4/129	4 (2 inst.) 6, P95, 46, and 4 (1)	2 P51 and 15 (1)	1 ft	CB-1c	36,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	T configuration stack of 3 trays on top and side.

(1) - Design index
(2) - Percentage of P-11
(3) - Cable tray figures are included in the Fire Protection Evaluation Report and the Safe Shutdown Analysis
(4) - p before a design index for a cable tray signifies that the cable tray contains power cables.

TABLE A-2 (Cont.)

Location	Number of 2-ft Cable Trays (4) (Design Index or § 1111)	Number of 3-ft Cable Trays (4) (Design Index or § 1111)	Minimum Gap Between Trays	Fire Zone	Fire Loading (Btu/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessi- bility (aisle space)	Concentration Description
T-129	2 50 and 50 (12)	7 (2 inst.) 50, 5, 100, 5, 30, 20, and 20 (12)	1 ft	CB-1e	25,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays and partial automatic sprinklers	None	Fair	Partial obstruction by HVAC ducts-air	Two stacks of 3 trays with 3 additional trays perpendicular, see Cable Tray Figure 9.
AC-AX/ 129	6 P131, 147, P128 59, 75, and 76 (11)	--	1 ft	CB-1f	42,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays and partial automatic sprinklers	None	Good	Good	2 parallel stacks of 2 trays each with 2 perpendicular single trays to these
Elevation: 762 ft											
AA-125	--	7 (2 inst.) 80, 80, 10, 10, 10, 10, and 30 (11)	1 ft	CB-1f	29,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Stack of 4 trays turned 90° with 3 additional trays perpendicular and above; see Cable Tray Figure 10.
AC-129	7 (2 inst.) 32, 116, P221, P151, 41, 13, and 23 (11)	--	1 ft	CB-1f	29,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	4 trays adjacent to each other with 3 additional trays below; see Cable Tray Figure 10.

TABLE A-2 (Cont.)

Location	Number of 2-ft Cable Trays (4) (design index or § 1111)	Number of 3-ft Cable Trays (4) (design index or § 1111)	Minimum Gap Between Trays	Fire Loading for Zone (Btu/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessibility (aisle space)	Cable Tray Concentration Description
Control building: Elevation: 800 ft										
AA-S/124	11 (6, Inst. 2, 37, 17, 15, 9, 14, 60, and 32 (East))	--	1 ft	CB-7 51,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Two stacks on opposite sides of the corridor - one stack 7 trays high, and the other 4 trays high; see Cable Tray figure 12.
20, 20, 15, and 20 (West) (2)										
Elevation: 825 ft										
AC-44/129	6 (P131, 147, P128, 59, 75, and 76 (1))	--	1 ft	CB-11 42,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	2 parallel stacks of 2 trays each with 2 perpendicular single trays to these.
Diesel generator building: Elevation: 762 ft										
AD-45/132	6 (P55, 10, 13, P65, 2 and P24 (1))	--	1 ft	D-10 29,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Two stacks of 2 trays each, with 2 additional trays perpendicular; see Cable Tray figure 10.
40-129	6 (P118, 42, 20, 60, P703, and 36 (1))	--	1 ft	D-10 29,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays and partial automatic sprinklers	None	Good	Good	Two stacks of 2 trays each, with 2 additional trays perpendicular; see Cable Tray figure 10.

TABLE A-2 (Cont.)

Location	Number of 2-ft Cable Trays (4) (Design Index or § f111)	Number of 3-ft Cable Trays (4) (Design Index or § f111)	Minimum Gap Between Trays	Fire Zone	Fire Loading for Zone (Btu/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessi- bility (aisle space)	Cable Tray Concentration Description
Auxiliary Building: Elevation: 762 ft											
2-106	---	6-11 inst. 3 P103, P57, 62, P97, 16, and 60 (11)	1 ft	A-3d	94,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	T configuration - stack of 3 trays on top and side; see Cable Tray Figure 4.
8B-104	4-12 inst. 3 P15, P31, 12, and 47 (11)	4 P33, P131, P113, and 38 (11)	1 ft	A-3d	94,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	One stack of 4 trays with a stack of 2 perpendicular stacks of 2 trays long stack on either side of the stack of 4; see Cable Tray Figure 4.
2-104	3-11 inst. 3 P31, 3, and 24 (11)	4-11 inst. 3 P215, P1, 44, and 30 (11)	1 ft	A-3d	94,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	L configuration - One stack of 4 trays with 3 single trays per- pendicular; see Cable Tray Figure 4
U-5/106	---	2-11 inst. 3 88, P80, P100, 64, 60, P156, and 49 (11)	1 ft	A-3d	94,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	W configuration - Top stack 4 trays high, with the left leg 2 trays high and the right leg 1 tray high; see Cable Tray Figure 4.

TABLE A-2 (Cont.)

Location	Number of 2-ft Cable Trays ⁽⁴⁾ (design index of § 1113)	Number of 3-ft Cable Trays ⁽⁴⁾ (design index of § 1113)	Minimum Gap Between Trays	Fire Zone	Fire Loading for Zone (BTU/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessibility (aisle space)	Concentration Description
U-119	--	10 (1-Inst.,) P53, P135, 46, 20, P109, 27, P111, P132, 65, and 3 (1)	1 ft	A-2N	103,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	W configuration - top stack 4 trays high, with the left leg 2 trays high and the right leg 4 trays high, see Cable Tray Figure 4.
S-124	--	6-(1-Inst.,) 69, 3, 17, 33, 12, and 10 (1)	1 ft	A-2N	103,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	One stack 3 trays high, with 3 single trays perpendicular to the stack, see Cable Tray Figure 4.
Z-119	1 39 (1)	6-(1-Inst.,) P84, 23, 24, P101, 118, and 6 (1)	1 ft	A-2N	103,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	V configuration - A stack 4 trays high connects with the lower right side of a stack 3 trays high, see Cable Tray Figure 4.
AA-123	2-(1-Inst.,) P45, 60, P32, 12, P118, 52, and 2 (1)	3 P152, P183, and C104 (1)	1 ft	A-2N	103,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Inverted L configuration - 6 single trays perpendicular to a stack of 4 trays, see Cable Tray Figure 4.
V-0/119	--	6 P58, 18, P119, P142, 71, and 6 (1)	1 ft	A-2N	103,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Two stack in parallel - one stack 4 trays high and the other 2 trays high, see Cable Tray Figure 4.

TABLE A-2 (Cont.)

Location	Number of 2-ft Cable Trays (4) (design index or § 111)	Number of 3-ft Cable Trays (4) (design index or § 111)	Minimum Gap Between Trays	Fire Zone	Fire Loading for Zone (BTU/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessi- bility (aisle space)	Cable Tray Concentration Description
Auxiliary Building: Elevation: 781 ft											
U-106	1-11nst, 1 14 (11)	5-11, 1nst, 1 35, 39, 40, 117, and 128 (11)	1 ft	A-3f	105, 730	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Y configuration, with 2 stacks of 3 trays on each side, see Cable Tray Figure 5.
80-124	3-11nst, 1 14, 14, and 15 (11)	5-11, 1nst, 1 97, 98, 97, 48, and 6 (11)	1 ft	A-2b	109, 000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Y configuration, with stacks of 4 trays on top and side; see Cable Tray Figure 5.
U-8/123	3-11, 1nst, 1 76, 161, and p140 (11)	6 99, P70, 98, 77, 97, and 50 (11)	1 ft	A-2b	109, 000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	One stack of 4 trays with a stack of 3 trays perpendicular to the 4, and a stack of 2 trays perpendicular to the stack of 3, see Cable Tray Figure 5.
U-5/107	--	6, 12, 1nst, 1, 1 bottom, and 3 down P77, 43, 56, P10, 13, and 28 (11)	1 ft	A-3f	105, 700	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Two stacks of 6 trays each; see Cable Tray Figure 5.
U-5/107	3 14 (11)	5, 12, 1nst, 1, on bottom) P42, 75, P101, 99, and 45 (11)	1 ft	A-3f	105, 700	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Two stacks of 6 trays each; see Cable Tray Figure 5.

TABLE A-2 (Cont.)

Location	Number of Cable Trays ⁽⁴⁾ (design index or § 8111)	Number of Cable Trays ⁽⁴⁾ (design index or § 8111)	Minimum Gap Between Trays	Fire Zone	Fire Loading for Zone (Btu/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessibility (aisle space)	Cable Tray Concentration Description
U-5/117-124	1 (1)	5 (2 inst. on bottom), P42, 25, P101, 90, and 45 (1)	1 ft	A-3f	105,700	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Two parallel stacks - top stack is 6 trays high and the bottom stack is also 6 trays high; see Cable Tray Figure 5.
U-5/117-124	--	6 (2 inst., 1 bottom and 3 down) P77, 48, 56, P10, 13, and 28 (1)	1 ft	A-3f	105,700	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Two parallel stacks - top stack is 6 trays high and the bottom stack is also 6 trays high; see Cable Tray Figure 5.
U-6/121-123	2-12 inst., 18 and 76 (1)	6 P11, C148, P91, P70, C98, and C77 (1)	1 ft	A-2n	109,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Two parallel stacks, with the left stack 3 trays high and the right stack 4 trays high. There is an additional single tray parallel to the right stack; see Cable Tray Figure 5.
Z-124	2-12 inst., 84 and 14 (1)	6-11 inst., P51, 10, 138, 114, 89, and 85 (1)	1 ft	A-2n	109,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	T configuration - stack of 4 trays on the top and a stack of 4 trays at the side; see Cable Tray Figure 5.

TABLE A-2 (Cont.)

Location	Number of 2-ft Cable Trays ⁽⁴³⁾ (design index or § 1111)	Number of 3-ft Cable Trays ⁽⁴³⁾ (design index or § 1111)	Minimum Gap Between Trays	Fire Zone	Fire Loading For Zone (Btu/ft ²)	Defection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessibility (aisle space)	Cable Tray Concentration Description
80-Z/103	4-12 Inst., 1 14, P57, 94, and 15 (1)	6-12 Inst., 1 P57, 52, 32 P44, 31, and 25 (1)	1 ft	A-3F	105, 700	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	T configuration, with a stack of 4 trays on top and a stack of 3 trays at the side. There is an additional stack of 3 trays perpendicular to the side; see Cable Tray Figure 5.
8-105	4-11 Inst., 1 14, P52, 60, and 25 (1)	3 P119, 27, and 31 (1)	1 ft	A-3F	105, 700	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	One stack 4 trays high with 3 single trays perpendicular; see Cable Tray Figure 5.
270*	8-12 Inst., 4 1 bottom, and 1 half up P52, P57, 36, 82, 22, 32, 17, and 3 (1)	---	1 ft	C-2	23, 500	Thermal partial-- all trays greater than 40% * 1111	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Single stack, 8 trays high; see Cable Tray Figure 6.
60*	10-14 Inst., 1 P4, 37, 6, 11, P9, P29, 38, 37, 6, and 5	---	1 ft	C-2	23, 500	Thermal partial-- all trays greater than 40% * 1111	Manual fire hose adequate because of accessibility and arrangement of trays	None	Good	Good	Two parallel stacks, the left side 4 trays high and the right side 2 trays high, and an additional stack 4 trays off of the left stack; see Cable Tray Figure 5.

Containment Building:
Elevation: 803 ft

Elevation: 803 ft 3 in.

TABLE A-2 (Cont.)

Location	Number of 2-ft Cable Trays (4) (design index or \$ fill)	Number of 3-ft Cable Trays (4) (design index or \$ fill)	Minimum Gap Between Trays	Fire Zone	Fire Loading for Zone (BTU/ft ²)	Defection	Manual Fire			Concentration Description
							Effect on Safe Shutdown	Fighting Capability for Trays	Accessi- bility (aisle space)	
907	6 (2 inst., P34, 34.0, P23, 18, and 3 (3))	---	1 ft	C-2	23,500	Thermal partial-- all trays greater than 40% * fill	None	Good	Good	Two parallel stacks - left side 3 trays high and the right side also 3 trays high; see Cable Tray Figure 6.

Containment Building:
Elevation: 789 ft

* All safe shutdown cable trays have linear thermal detection.

TABLE A-3

VERTICAL RISERS

Location	Number of 2-11 Cable Trays (4) (design index or § 1111)	Number of 3-11 Cable Trays (4) (design index or § 1111)	Minimum Gap Between Trays	Fire Zone	Fire Loading for Zone (BTU/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessibility (aisle space)	Cable Tray Figure (5)
Fuel Building: Elevation: 712 ft											
44-102	3 (1 inst. 1, 5, 20, and 20 (2))	-	6 in.	F-1a	29,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 2-11 separation between riser	None	Very good	Good	2
44-102	2 (1 inst. 1, 20 and 20 (2))	1/30 (2)	6 in.	F-1a	29,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 2-11 separation between riser	None	Very good	Good	2
Fuel Building: Elevation: 737 ft											
44-40/102	5 (2 inst. 1, 25, 30, 2, 30, and 40 (2))	1/30 (2)	8 in.	F-1a	17,300	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 2-11 separation between riser	None	Very good	Good	3

(1) - Design index

(2) - Percentage of full

(3) - Cable tray figures are included in the Fire Protection Evaluation Report and the Safe Shutdown Analysis.

(4) - P before a design index for a cable tray signifies that the cable tray contains power cables.

TABLE A-3 (Cont.)

Location	Number of 2-ft Cable Trays (4) (see 'gn Index or § 1111)	Number of 3-ft Cable Trays (4) (design Index or § 1111)	Minimum Gap Between Trays	Fire Zone	Fire Loading for Zone (Btu/ft ²)	Deflection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessibility (able space) (Figure 13)	Cable Tray (Figure 13)
AS-124	1 (1 inst., bottom) (3-18 in., horizontal trays, 30, 25, and 25) 15 (2)	3 (1 inst., 1 5, 10, and 25 7)	6 in.	F-1a	17,500	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 2-ft separation between riser	None	Very good	Good	3
AS-102	3 (1 inst., 15, 20, and 5 (2))	-	6 in.	F-1p	70,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 2-ft separation between riser	None	Very good	Good	4
AS-102	2 (1 inst., 25 and 25 (2))	1 40 (2)	6 in.	F-1p	70,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 2-ft separation between riser	None	Very good	Good	4

Fuel Building
Elevation:
755 ft

TABLE A-3 (Cont.)

Location	Number of 2-ft Cable Trays (4) (design index or § 1111)	Number of 3-ft Cable Trays (4) (design index or § 1111)	Minimum Gap Between Trays	Fire Zone	Fire Loading for Zone (Btu/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessibility (aisle space)	Cable Tray Figure (3)
Auxiliary Building: Elevation: 701 ft											
S-105	-	2 (3 inst.) 25, 25, 50, 50, 5, 5, and 10 (2)	6 in.	A-36	105,700	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Very good	Good	5
Control and diesel Building: Elevation: 719 ft											
S-152	6 (2 inst.) 10, 5, 0, 0, 0, and 1 (2)	-	6 in.	CB-1c	56,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Very good	Good	8
S-129	6 (2 inst.) 80, 70, 5, 50, 50, and 70 (2)	-	6 in.	CB-1c	56,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Very good	Good	8

TABLE A-3 (Cont.)

Location	Number of 2-ft Cable Trays (4) (design index or § 1111)	Number of 3-ft Cable Trays (4) (design index or § 1111)	Minimum Gap Between Trays	Fire Zone	Fire Loading for Zone (Btu/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessibility (aisle space)	Cable Tray Figure (3)
Control and drenal Building: Elevation: 751 ft											
S-132	3 (11 inst.) 1, 0, and 2 (2)	-	4 in.	CB-1e	25,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. Partial suppression in zone. 3-ft separation between riser	None	Good	Partial obstruction by HVAC ducts -- Fair	9
S-132	3 (11 inst.) 30, 40, and 5 (2)	-	4 in.	CB-1e	25,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. Partial suppression in zone	None	Good	Partial obstruction by HVAC ducts -- Fair	9
S-129	3 (12 inst.) 60, 40, 70, 60, and 30 (2)	2 50 and 50 (2)	4 in.	CB-1e	25,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. Partial suppression in zone. 4-ft separation between riser	None	Good	Partial obstruction by HVAC ducts -- Fair	9

TABLE A-5 (Cont.)

Location	Number of		Minimum Gap Between Trays	Fire Zone	Fire Loading for Zone (Bfu/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessibility (aisle space)	Cable Tray Figure (3)
	2-ft Cable Trays (4) Index or § 4111	3-ft Cable Trays (4) Index or § 4111									
S-129	$\frac{1}{5}$ (2)	$\frac{2 \text{ (1 inst.)}}{25 \text{ and } 40}$ (2)	4 in.	CB-1c	25,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. Partial suppression in zone	None	Good	Partial obstruction by HMC ducts -- Fair	9
S-132	$\frac{1 \text{ (1 inst.)}}{0}$ (2)	$\frac{2}{5 \text{ and } 5}$ (2)	6 in.	CB-1f	29,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 2-ft separation between riser	None	Very good	Good	10
S-132	$\frac{1 \text{ (1 inst.)}}{1}$ (2)	$\frac{2}{0 \text{ and } 1}$ (2)	6 in.	CB-1f	29,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 2-ft separation between riser	None	Very good	Good	10

Control and
diesel
building
Elevation:
762 ft

TABLE A-3 (Cont.)

Location	Number of 2-ft Cable Trays (4) (design index or § 8111)	Number of 3-ft Cable Trays (4) (design index or § 8111)	Minimum Gap Between Trays	Fire Zone	Fire loading for Zone (Btu/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual fire Fighting Compatibility for Trays	Accessibility (aisle space)	Cable Tray Figure (3)
4C-129	7 (2 Inst. 1, 52, 116, 222, 713, 81, 13, and 23 (1))	-	6 in.	CB-11	29,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays.	None	Very good	Good	10
5-129	1 (1 Inst. 1, 25 (2))	2 (70 and 30 (2))	6 in.	CB-11	29,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 2-ft separation between riser	None	Very good	Good	10
5-129	1 (1 Inst. 1, 5 (2))	2 (90 and 20 (2))	6 in.	CB-11	29,000	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 2-ft separation between riser	None	Very good	Good	10
Control Building Elevation 800 ft											
4C-128	3 (2 Inst. 1, 25, 80, and 30 (2))	1-11 tray (15 (2))	6 in.	CB-64	49,500	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 4-ft separation between riser	None	Very good. Double access doors to riser	Good	12

TABLE A-3 (Cont.)

Location	Number of 2-ft Cable Trays (4) (design index or § 1111)	Number of 3-in Cable Trays (4) (design index or § 1111)	Minimum Gap (Between Trays)	Fire Zone	Fire Loading for Zone (Btu/ft ²)	Detection	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessibility to aisle space	Cable Tray Figure (3)
4C-128	3 (1 inst. 1, 5, 7, and 8) (2)	-	6 in.	CB-6d	49,500	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 6-ft separation between riser	None	Very good; double access doors to riser	Good	12
4C-129	3 (1 inst. 1, 4, 4, and 5) (2)	-	6 in.	CB-6d	49,500	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 6-ft separation between riser	None	Very good; double access doors to riser	Good	12
4C-129	3 (1 inst. 1, 2, 6, and 3) (2)	-	6 in.	CB-6d	49,500	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 8 ft to next riser.	None	Very good; double access doors to riser	Good	12
4C-130	3 (1 inst. 1, 2, 7, and 3) (2)	-	6 in.	CB-6d	49,500	Yes	Manual fire hose adequate because of accessibility and arrangement of trays. 9 ft to next riser	None	Very good; double access doors to riser	Good	12

TABLE A-5 (Cont.)

Location	Number of 2-ft Cable Trays (4) (design index or § 1111)	Number of 3-ft Cable Trays (4) (design index or § 1111)	Minimum Gap Between Trays	Fire Zone	Fire Loading for Zone (Btu/ft ²)	Defraction	Comments	Effect on Safe Shutdown	Manual Fire Fighting Compatibility for Trays	Accessibility (false space)	Cable Tray Figure (3)
NC-130	1 10 (27)	-	6 in.	CB-68	89,500	Yes	Manual fire hose adequate because of accessibility and arrangement of trays	None	Very good; double access doors to riser	Good	12