UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

July 20, 1990

MEMORANDUM TO: John A. Zwolinski, Assistant Director for Region III
Division of Reactor Projects III, IV, V & Special Projects

THRU: Robert C. Pierson, Acting Director
Project Directorate III-I
Division of Reactor Projects III, IV, V & Special Projects

FROM: Brian E. Holian, Project Manager
Project Directorate III-I
Division of Reactor Projects III, IV, V & Special Projects

SUBJECT: SUMMARY OF MEETING WITH CONSUMERS POWER COMPANY PALISADES CONTAINMENT AIR ROOM APPENDIX R EXEMPTION REQUEST (TAC NO. 71852)

A meeting was held at NRC Headquarters on July 5, 1990 to discuss Palisade's exemption request to section III.G.2 of Appendix R to 10 CFR 50. In July of 1984 Palisades requested an exemption to the minimum instrument separation in the containment air room. A chronology of the containment air room instrument separation issue was provided by the licensee and is included as Attachment 1. Attachment 2 provides a list of meeting attendees.

Palisades fire protection personnel presented their analysis of a potential fire in the containment air room. Included in this analysis was:

1) a description of the room (large volume, well ventilated),

2) a discussion of the likelihood and types of fires possible (cable tray fire is most credible), and

3) a discussion of the consequences of the fire and its impact on transmitter accuracy (sufficient instruments are available for safe shutdown).

Palisades used the Hazard 1 fire assessment method. This computer software integrated fire model was developed by researchers at the National Institute of Standards and Technology's Center for Fire Research. Attachment 3 provides an overview of the containment air room fire analysis. Attachment 4 is the licensee's analysis of the effect of a fire on safety-related instruments in the containment air room.

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memo-4
uwb

The staff agreed with the licensee that their review of combustible loading and temperature excursions in the containment air room supports their exemption request from section III.G.2 of Appendix R. Palisades fire protection personnel will supplement their original exemption request with this additional information. Additionally, the licensee will more fully address the ability of the operators to safely shut down the plant assuming a worst case fire in the containment air room. It is anticipated that the staff review of this exemption request will be completed by September 1990.

original signed by

Brian E. Holian, Project Manager
Project Directorate III-1
Division of Reactor Projects - III,
IV, V & Special Projects
Office of Nuclear Reactor Regulation

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The staff agreed with the licensee that their review of combustible loading and temperature excursions in the containment air room supports their exemption request from section III.G.2 of Appendix R. Palisades fire protection personnel will supplement their original exemption request with this additional information. Additionally, the licensee will more fully address the ability of the operators to safely shut down the plant assuming a worst case fire in the containment air room. It is anticipated that the staff review of this exemption request will be completed by September 1990.

Brian E. Holian, Project Manager
Project Directorate III-1
Division of Reactor Projects - III,
IV, V & Special Projects
Office of Nuclear Reactor Regulation

Chonology of Containment Air Room Instrument Separation Issue

DATE	DESCRIPTION
7/16/84	CPCo requests an exemption request from section III.G.2 of Appendix R Instrument separation inside containment.
7/20/84	CPCo requests an exemption request from section III.G.2 of Appendix R Cable separation inside containment.
12/28/84	CPCo provides additional information to the NRC relating to the Instrument Separation issue. Requested by the NRC during the 10/5/84 conference call.
7/23/85	NRC grants exemption request for Cable separation inside the Containment Air Room.
10/4/85	CPCo provides additional information relating to Instrument Separation inside containment.
6/88-7/88	Special Safety Inspection conducted by the NRC on Fire Protection / Appendix R compliance. The report mentions that an analysis is to be done to show that it is not necessary to relocate redundant instruments for the containment air room.
1/11/89	CPCo agrees to withdraws the 10/4/85 Containment Air Room III.G.2 exemption request when exemptions for III.G.3 and III.L.2.d are granted.
Oct-89	General Office Licensing gets verbal indication from AWDeAgazio our Project Manager for Palisades that the requested exemption request will be denied. Notifies GWS and WLR at the plant.
11/17/89	RWSmedley sends a letter requesting Plant Projects to provide him with information on how we plan to bring the containment Air Room into compliance.
12/12/89	GWSleeper sends a letter to G.O. Licensing explaining the options and providing recommendation to install automatic suppression.
Jan-90	Conference call with the NRC indicates they would accept suppression as a method of compliance.
1/18/90	Project Record WBS 42109 initiated for suppression system.
1/20/90	ESSR written to get estimate for suppression system.
3/13/90	CPCo commits to install suppression system.
4/23/90	Estimate received from ESS to install suppression system.
5/3/90	New project manager for Palisades is given a tour of the Containment Air Room. During the tour he agrees to take another look at the exemption request provided CPCo develops more detailed information on the level of combustibles and possible temperatures the instruments will see during a fire.
6/7/90	With a conference call CPCo presents preliminary data from a review of combustible loading and temperature excursions using Hazard I fire modeling software. Another conference call is set up to discuss these results with an NRC fire protection person.
6/19/90	CPCo again discusses this issue with the NRC their fire protection person cannot support a timely review of any additional information. CPCo will submit additional information to support a possible extension of the commitment.
6/22/90	CPCo / NRC CONFERENCE CALL

ATTACHMENT 2

JULY 5, 1990

ATTENDEES LIST

NAME	AFFILIATION
Brian Holian	NRC
George Sleeper	CPCo
Dick Smedley	CPCo
Eric Dorbeck	CPCo
Bob Pierson	NRC
Tim Rowell	NRC
David Notley	NRC

Containment Air Room Fire Analysis

OUTLINE

- Description of Room
- Assumptions
- Likelihood of a fire.
- Type of a fire.
- Hazard I
- Consequences of a fire.
- Questions and Answers

Consumers Power Company

Description of Room

- The cable trays in the room are lightly loaded. The majority of the cable trays located near the instruments contain small gauge instrumentation cables.
- The flow of air in the room is from the louver at the 590' elevation and up the stairwell and through the door on the 607' elevation.
- Instruments are located below the cable trays.

Plant Projects

Consumers Power Company

ASSUMPTIONS

1. A cable tray fire is the only type of fire that needs to be considered for the following reasons:

   - Access to this area is severely limited during operations. Personnel entering containment dress and undress outside of containment. There are no "step-off" pads and no discarded Anti-Cs inside of containment during operation. Everything is stored or discarded outside of containment when the plant is operating.

   - Strict administrative controls dictate that all loose material be removed from containment prior to startup to prevent containment sump plugging and transient fires.

   Since controls are in place to remove the risk of transient fires during operation and the only major fixed combustible is cable, a cable tray fire is the only fire that needs to be considered.

2. Fires that occur during plant operations are considered worst case since that is the time the instruments would be needed to safely shut down.

3. A worst case fire involves the cables in one channel of cable trays only. By the use of cable tray fire stops and other protective features and controls, it can be assumed that one train of instrumentation circuits will be free of fire damage for anticipated fires inside containment.

Plant Projects

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LIKELIHOOD OF A FIRE

Two studies done looking at self-initiation of cable tray fires:

- One documented in NUREG/CR-5384 SAND89-1359, A summary of Nuclear Power Plant Fire Safety Research at Sandia National Laboratories, 1975-1987.

- Development and Results of a Test Program to Demonstrate Compliance with IEEE std. 384 and R.G. 1.75 Electrical Separation Requirements, IEEE Power Engineering Review, June 1987

CONCLUSIONS:

Fires resulting from self-initiation of cables in a cable tray are self-extinguishing and do not propagate to adjacent cable trays.

Plant Projects

Consumers Power Company

TYPE OF FIRE

- WORST CASE FIRE
  - RAPID FLAME SPREAD vs. SLOW FLAME SPREAD
  - ALL CABLES IN ONE CHANNEL BURNING AT ONCE

- STANDARD APPROACH
- WOULD MOST LIKELY NEED AN EXTERNAL IGNITION SOURCE

Plant Projects

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CONSEQUENCES OF A FIRE

- MODEL THE MAIN PART OF THE ROOM
- MODEL THE STAIRWAY AREA
- OUTPUT TEMPERATURES AND ELEVATIONS
- COMPARE LAYER ELEVATIONS WITH INSTRUMENT ELEVATIONS
- VERIFY ADEQUATE INSTRUMENTATION AVAILABLE TO SAFELY SHUT DOWN

Plant Projects

HAZARD I

WHAT IS HAZARD I

HAZARD I is a fire hazard assessment method with associated computer software and is the most comprehensive such integrated model growth for fire hazard assessment today.

HAZARD I was developed by researchers at the National Institute of Standards and Technology's Center for Fire Research. It was first offered for routine use in the summer of 1989..

HOW DOES HAZARD I WORK

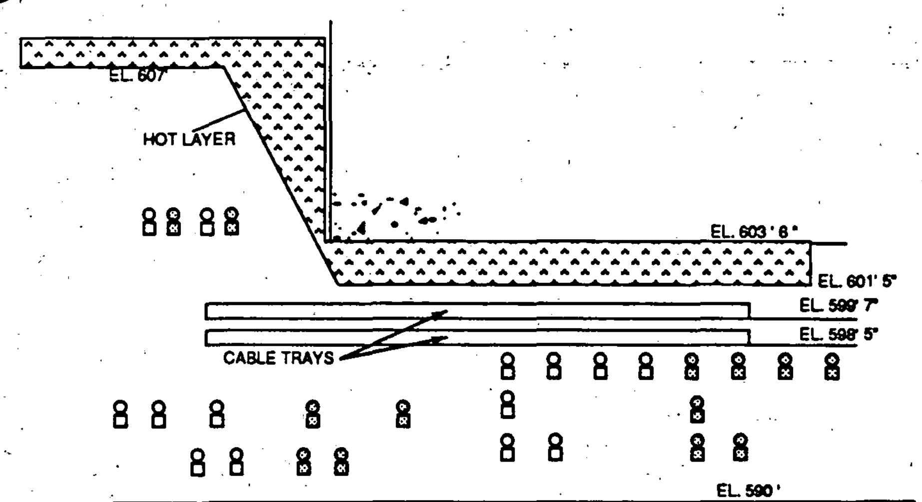
FAST - Fire And Smoke Transport

FAST is a zone-type fire model, which calculates temperature, smoke and gas levels in each of two layers (upper and lower) and the height of the interface between them, in each room.

DATA INPUT with FAST_in

CALCULATIONS with FAST

REVIEW DATA with FASTPLOT



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CONSUMERS POWER
MICHIGAN'S PROGRESS

Palisades Nuclear Plant
Engineering Analysis Work Sheet

EA- GWS-90-002

Sheet 1 of 17

Title Analysis of the affect of a fire on safety related instruments in the Containment Air Room.

INITIATION AND REVIEW

Rev #	Description	Initiated		Initiator Appd By	Review Method Check (✔)			Technically Reviewed		Reviewer Appd By
		By	Date		Alt Calc	Det Rvw	Qual Test	By	Date	
0	Original Issue	GWSleeper	6/26/90							

Reference/Comment

OBJECTIVE

The purpose of this analysis is to show the impact a fire in the Containment Air Room would have on safety related instruments located in that room. This analysis will show that the affect on the instruments will be small enough such that sufficient instruments will be available to safely shut down the plant.

ANALYSIS INPUT

1. Hazard I Fire Assessment Method, Version 1.0 National Institute of Standards and Technology, May 1989.
2. Various plant drawings showing room layout, equipment locations, conduit, cable and tubing routings.
3. SFPE Handbook of Fire Protection Engineering, Copyright 1988, Page 2-14.
4. NUREG/CR-5384, SAND89-1359, A Summary of Nuclear Power Plant Fire Safety Research at Sandia National Laboratories, 1975-1987.
5. EPRI NP-1881, Categorization of Cable Flammability Intermediate-Scale Fire Tests of Cable Tray Installations.
6. Generic Letter 86-10, Implementation of Fire Protection Requirements, April 24, 1986
7. Licensing correspondence pertaining to the Containment Air Room.
8. Development and Results of a Test Program to Demonstrate Compliance with IEEE Std. 384 and R.G. 1.75 Electrical Separation Requirements, IEEE Power Engineering Review, June 1987.

	Reference/Comment

ASSUMPTIONS

1. A cable tray fire is the only type of fire that needs to be considered for the following reasons:

   - Access to this area is severely limited during operations. Personnel entering containment dress and undress outside of containment. There are no "step-off" pads and no discarded Anti-Cs inside of containment during operation. Everything is stored or discarded outside of containment when the plant is operating.

   - Strict administrative controls dictate that all loose material be removed from containment prior to startup to prevent containment sump plugging and transient fires.

   Since controls are in place to remove the risk of transient fires during operation and the only major fixed combustible is cable, a cable tray fire is the only fire that needs to be considered.

2. Fires that occur during plant operations are considered worst case since that is the time the instruments would be needed to safely shut down.

3. A worst case fire involves the cables in one channel of cable trays only. By the use of cable tray fire stops and other protective features and controls, it can be assumed that one train of instrumentation circuits will be free of fire damage for anticipated fires inside containment. This has been agreed to by the NRC Staff and documented in our exemption request dated 7/23/85.

ANALYSIS

This analysis for a fire in the Containment Air Room is organized as follows:

1. Description of Room
2. Likelihood of a fire.
3. Type of a fire.
4. Consequences of a fire.

Description of Room

The room is oddly shaped with a 13 1/2 foot high ceiling. Total volume is approximately 14,420 cubic feet. The walls, floors and ceiling are constructed of poured, reinforced concrete. The northeast corner contains a metal staircase. The stairs go up only. The area is well ventilated. Air flow is out of the room. — Reference 7

The cable trays in the room are lightly loaded. The majority of the cable trays located near the instruments contain small gauge instrumentation cables.

Table 1 has a listing of the cable trays in this room along with their loading obtained from the circuit and raceway schedule.

Reference/Comment

Table 1

RACEWAY	CABLE GAUGE	SIZE (inches) HEIGHT	WIDTH	LENGTH (Feet)	% FILL	CABLE VOLUME (cuft) Right	Left
CP226 (R)	AWG 14	4.00	6.00	25.00	18.10%	0.75	
CV226 (R)	AWG16	4.00	6.00	25.00	6.10%	0.25	
CP216 (L)	AWG12-14	4.00	6.00	40.00	11.90%		0.79
CV216 (L)	AWG16	4.00	6.00	40.00	11.10%		0.74
CV224 (R)	AWG16	4.00	6.00	25.00	10.30%	0.43	
CP224 (R)	AWG12-14	4.00	6.00	25.00	17.10%	0.71	
4CP224 (R)	AWG14	4.00	6.00	22.00	2.30%	0.08	
4CV224 (R)	AWG16	4.00	6.00	22.00	3.70%	0.14	
CP214 (L)	AWG12-14	4.00	6.00	20.00	11.90%		0.40
CV214 (L)	AWG14-16	4.00	6.00	20.00	18.50%		0.62
CP212 (L)	AWG12-14	4.00	6.00	20.00	11.90%		0.40
CV212 (L)	AWG14-16	4.00	6.00	20.00	22.10%		0.74
CP222 (R)	AWG12-14	4.00	6.00	20.00	17.10%	0.57	
CV222 (R)	AWG16	4.00	6.00	20.00	16.00%	0.53	
4CP222 (R)	AWG14	4.00	6.00	16.00	2.30%	0.06	
4CV222 (R)	AWG16	4.00	6.00	16.00	9.20%	0.25	
3CP212 (L)	AWG12-14	4.00	6.00	14.00	1.20%		0.03
3CV212 (L)	AWG14	4.00	6.00	14.00	14.40%		0.34
CP202	AWG2-14	4.00	12.00	25.00	18.20%	1.52	1.52
CP204	AWG2-14	4.00	12.00	23.00	16.70%	1.28	1.28
4CV180 (R)	AWG16	4.00	6.00	10.00	0.50%	0.01	
CV180 (R)	AWG16	4.00	6.00	6.00	5.90%	0.06	
CV170 (R)	AWG16	4.00	12.00	12.00	3.00%	0.12	
4CP210 (R)	AWG14	4.00	6.00	6.00	1.70%	0.02	
4CV210 (R)	AWG16	4.00	6.00	6.00	9.30%	0.09	
CP210 (R)	AWG1/0-14	4.00	16.00	5.00	25.00%	0.56	
CV210 (R)	AWG16	4.00	16.00	5.00	8.60%	0.19	
3CP214 (L)	AWG14	4.00	6.00	17.00	1.20%		0.03
3CV214 (L)	AWG16	4.00	6.00	17.00	13.10%		0.37
Total volume in cubic feet =						7.62	7.25

Figure 1 shows a 3-D perspective of the room with approximate locations of the raceways.

The flow of air in the room is from the louvre at the 590' elevation and up the stairwell and through the door on the 607' elevation.

Figure 2 with views A through F is a plan view of the room with the approximate locations of the various instruments in this room.

Reference/Comment

PALISADES NUCLEAR PLANT CONTAINMENT AIR ROOM CABLE TRAYS

Reference 4

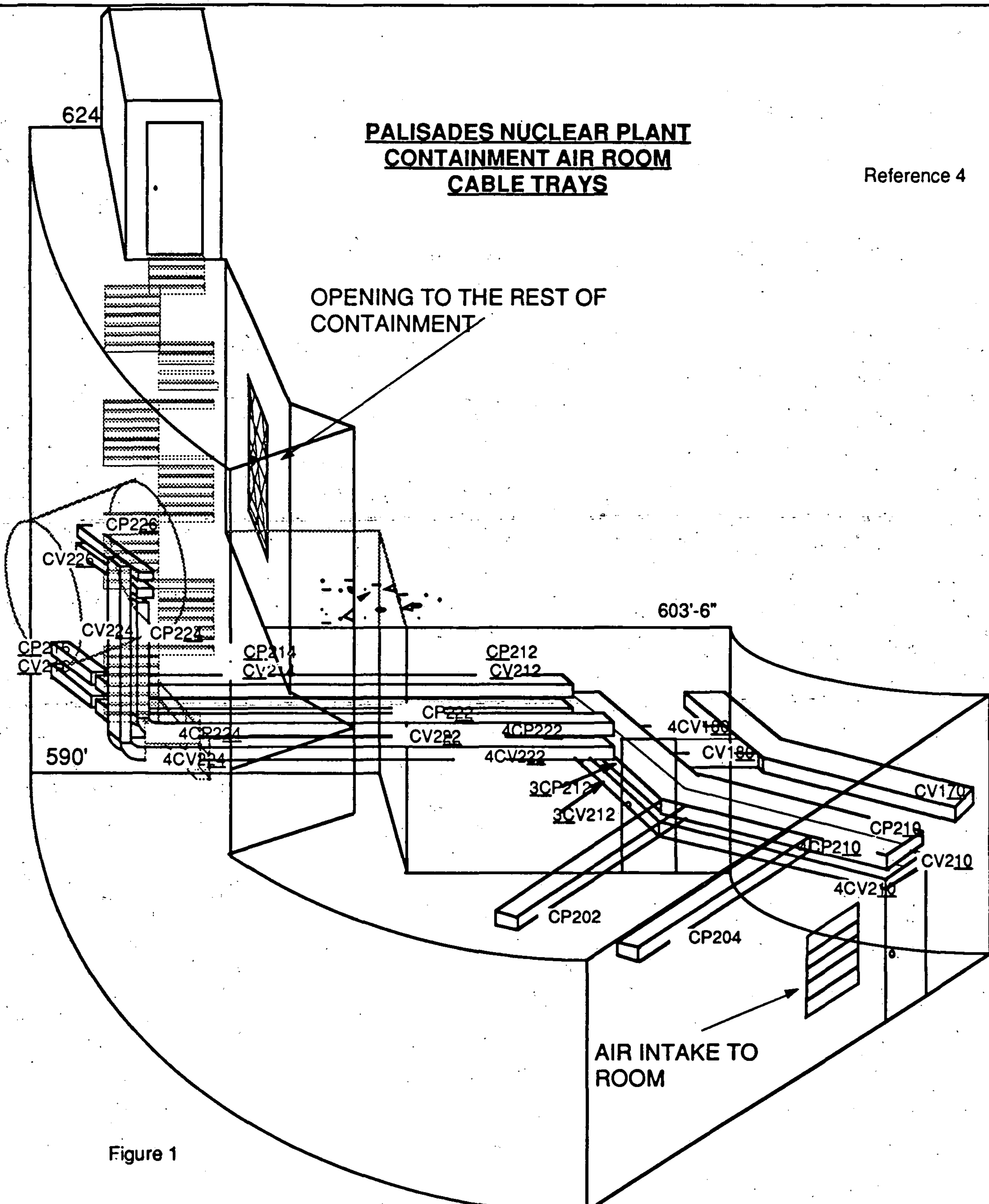


Figure 1

Reference/Comment

PALISADES NUCLEAR PLANT CONTAINMENT AIR ROOM

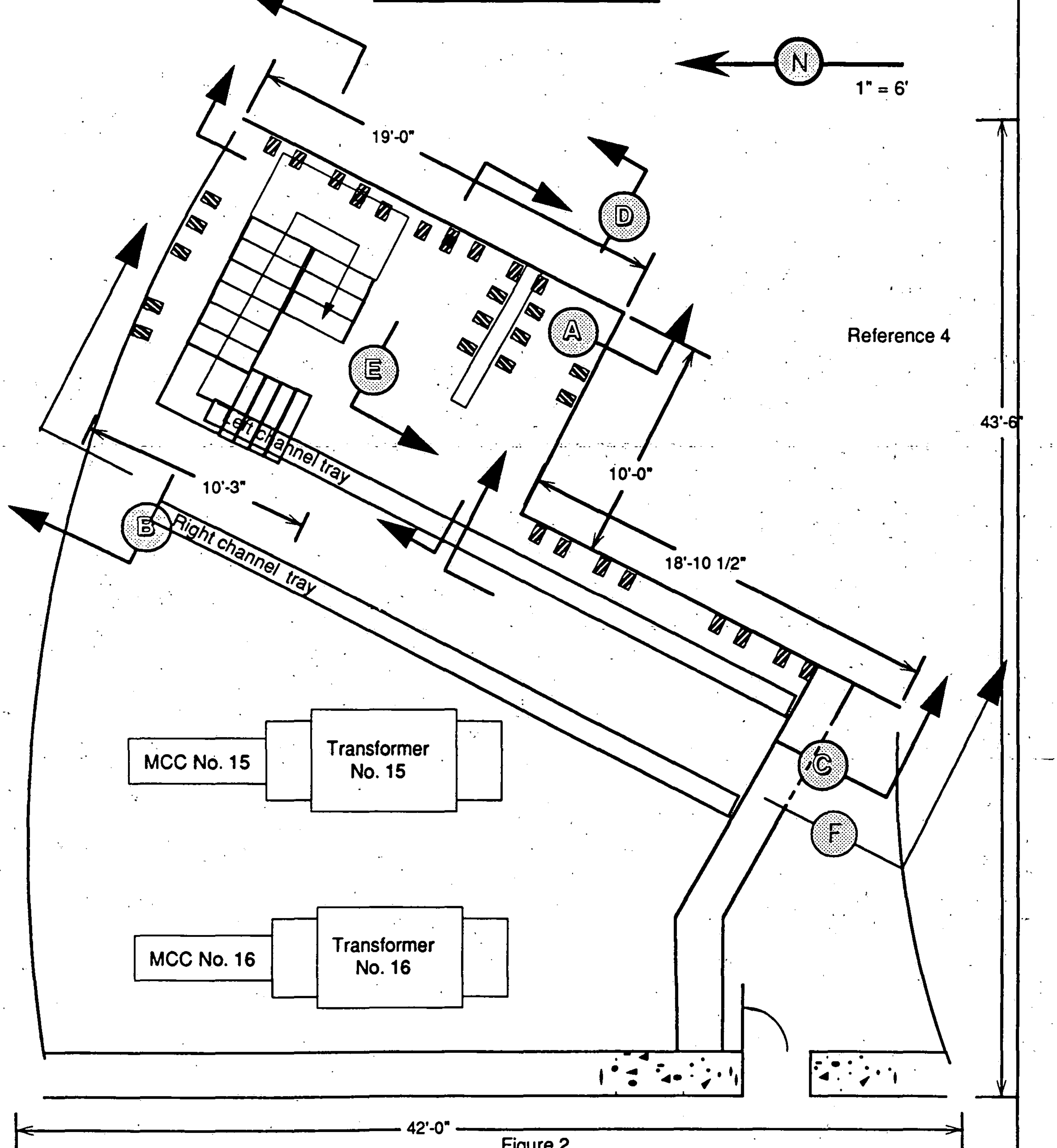
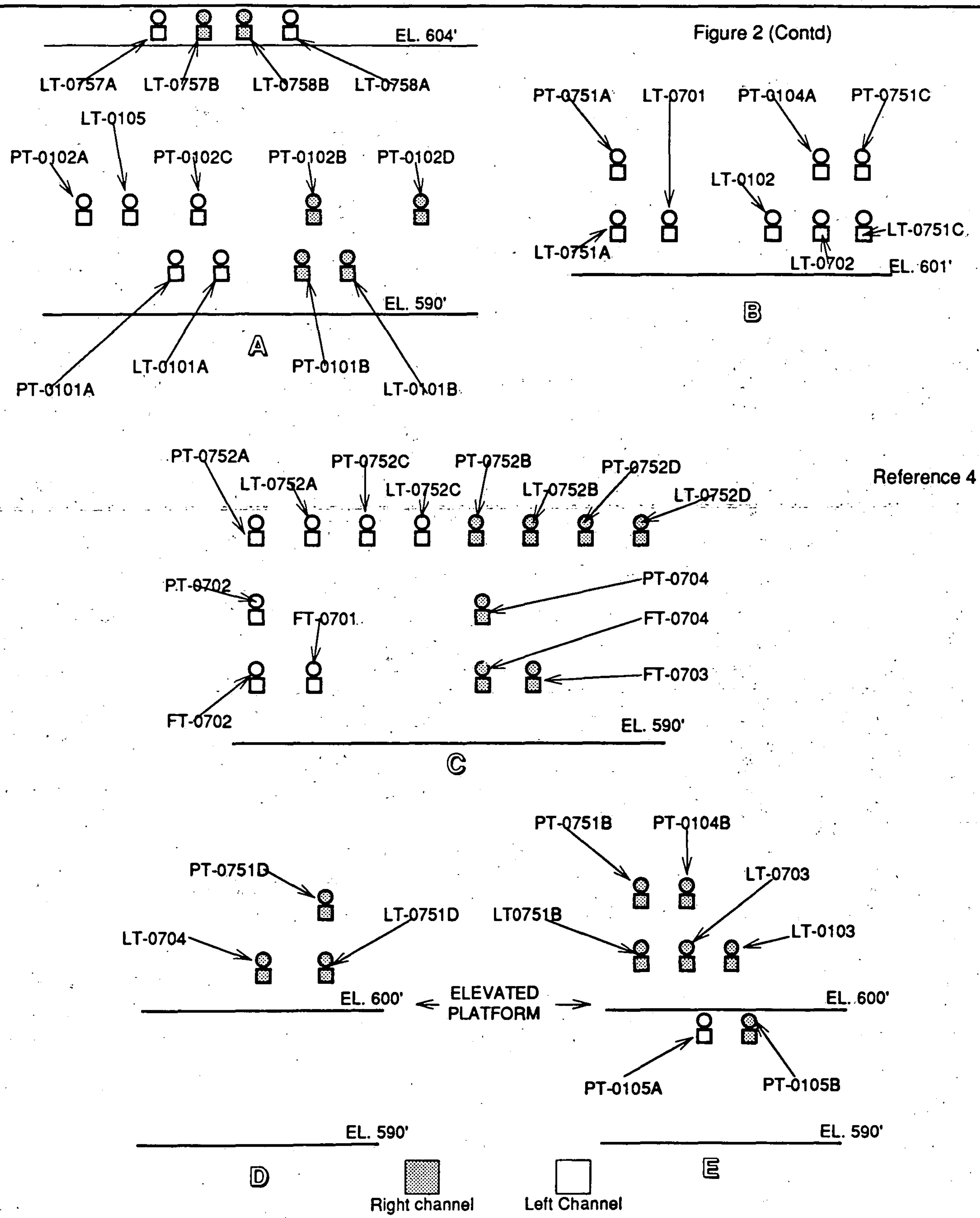


Figure 2

Reference/Comment

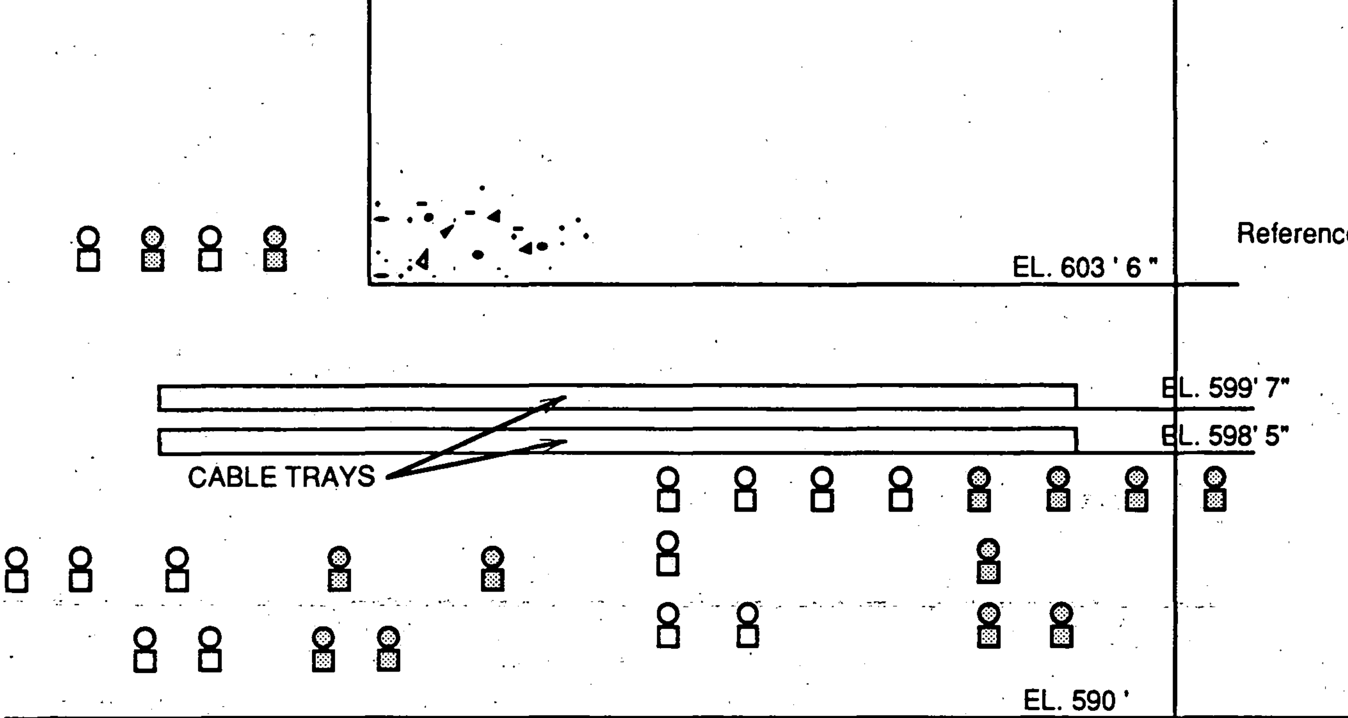
Figure 2 (Contd)



Reference 4

Reference/Comment

Figure 2 (Contd)



Reference 4

F

Likelihood Of A Fire

One aspect of this issue is the likelihood of a fire. During plant operation external sources of ignition are extremely unlikely. This leaves the possibility of a self initiated cable tray fire.

As a result of fire research it has been found that for #12 AWG cables currents of from 120 to 130 amperes were required to induce open flaming. In full-scale testing, the intense period of fire activity persisted for between 40 and 240 seconds after which rapid reduction to self-extinguishment of the fire was observed. In no case involving electrically initiated fires in rated low flame spread cables was propagation of the fire beyond the tray of fire origin observed. — Reference 4

In other tests conducted, locked rotor amperes (LRA) were applied to test cables to judge their impact on target cables. One of the design criteria for the test program was that the worst-case electrically induced fault would be on a motor feeder circuit, because the majority of large loads, and the more potentially damaging ones, are motor loads. The most credible worst-case fault would be the sustained application of locked rotor amperes (LRA) to the test cables. This type of fault was selected because it is a typical condition, it can be postulated as having an extended duration, and its magnitude is large enough to cause damage to the fault cable and adjacent cables. To select the test cable, typical plant cable feeder sizes were tabulated along with the corresponding maximum LRA for each feeder, and the corresponding motor pigtail conductor size. Based on preliminary screening test data, a relationship was developed between LRA durations and fusing (open circuit) of the motor pigtail conductors. Using this relationship in conjunction with data obtained from the screening tests, the worst-case fault cable was selected, and was used in the subsequent configuration tests. The selected worst-case cable was the cable with the highest temperature at the time its corresponding motor pigtails fused (open circuited). — Reference 8

	Reference/Comment

The tests demonstrated that when ignition occurred, the fire never propagated to an adjacent target cable even when both were touching. The fires that occurred were self-extinguishing when the electrical fault was interrupted. The amount of smoke created by the overload was extremely dense and would be readily detected by the plant fire detection systems.

The majority of the cable trays in the vicinity of the instruments contain only instrumentation cable which is fused to prevent the high currents necessary to ignite the cable. Should the fusing still allow high currents it is unlikely that surrounding cables or cable trays would be affected. Also the smoke generated would activate the detectors very early into a problem.

<u>Type Of A Fire</u>

From the previous section it can be seen that the most likely type of fire would be a small self-extinguishing fire that would generate a lot of smoke.

For the purposes of analysis, we will assume a much worse fire the type of which would be most likely initiated by an external source.

The type of fire was determined using an equation developed by B.T. Lee in a study conducted in 1985. This research indicates that the peak full scale heat release rate($\dot{q}_{fs}$) can be predicted according to bench scale heat release measurements — Reference 3

$$\dot{q}_{fs} = 0.45 \cdot \dot{q}_{bs}'' \cdot A$$

where the bench scale heat release value ($\dot{q}_{bs}''$) is the peak measured under irradiance conditions of 60 kW/sq m, and A is the exposed tray area actively pyrolyzing. The active pyrolysis area, in turn, is estimated based on the type of cable and its bench scale heat release rate which can be obtained from Figure 2-1.18 of the SFPE Handbook of Fire Protection Engineering, which gives dA/dt as a function of $\dot{q}_{bs}''$. Thus, at any given time t,

$$A(t) = A_o + \frac{dA}{dt} \cdot t$$

Using a conservative number 400kW/sq m for the bench scale heat release rate (322 is the mean for the ones listed) and 1.0sq m/min. rate of flame coverage (obtained from Ref. 3 Figure 2-1.18). The fire shown in Table 2 was generated:

Reference/Comment

Table 2

Time t (seconds)	Volume v (cu ft)	Length l (meters)	Area A (sq meters)	Heat Release q (KW)
0.00	0.00	0.0000	0.0000	0.00
30.00	0.28	0.8521	0.6001	106.66
60.00	0.55	1.6357	1.1001	195.54
90.00	0.80	2.4109	1.6001	284.41
120.00	1.06	3.1861	2.1001	373.29
150.00	1.32	3.9613	2.6001	462.16
180.00	1.58	4.7365	3.1001	551.04
210.00	1.84	5.5117	3.6001	639.91
240.00	2.10	6.2869	4.1001	728.79
270.00	2.35	7.0621	4.6001	817.66
300.00	2.61	7.8373	5.1001	906.54
330.00	2.87	8.6125	5.6001	995.41
360.00	3.13	9.3877	6.1001	1,084.29
390.00	3.39	10.1629	6.6001	1,173.16
420.00	3.65	10.9381	7.1001	1,262.04
450.00	3.90	11.7133	7.6001	1,350.91
480.00	4.16	12.4885	8.1001	1,439.79
510.00	4.42	13.2637	8.6001	1,528.66
540.00	4.68	14.0388	9.1001	1,617.54
600.00	5.20	15.5892	10.1001	1,795.29
630.00	5.45	16.3644	10.6001	1,884.16
660.00	5.71	17.1396	11.1001	1,973.04
780.00	6.75	20.2404	13.1001	2,328.54
900.00	7.78	23.3412	15.1001	2,684.04
1,080.00	0.00	0.0000	0.0000	0.00
1,500.00	0.00	0.0000	0.0000	0.00

This represents over 76 feet of 12" wide cable tray with 50% fill involved in a fire. The volume at the end of the fire exceeds the total volume of either right or left channel cable trays in the Containment Air Room. This is considered a worst case fire. A slower burning fire is more likely, however a slower fire would not produce as high a temperature as a faster fire.

Consequences of a Fire

Now that we have looked at the room configuration and at what we consider is a worst case fire, we can try to assess the impact this fire will have on instruments the operators need to safely shut down the plant.

What we expect will happen is that hot air from the fire will travel along the ceiling and go up the stairway without having a negative impact on necessary instruments. To verify this we will use a fire modeling program called Hazard I developed by the National Institute of Standards and Technology.

Reference/Comment

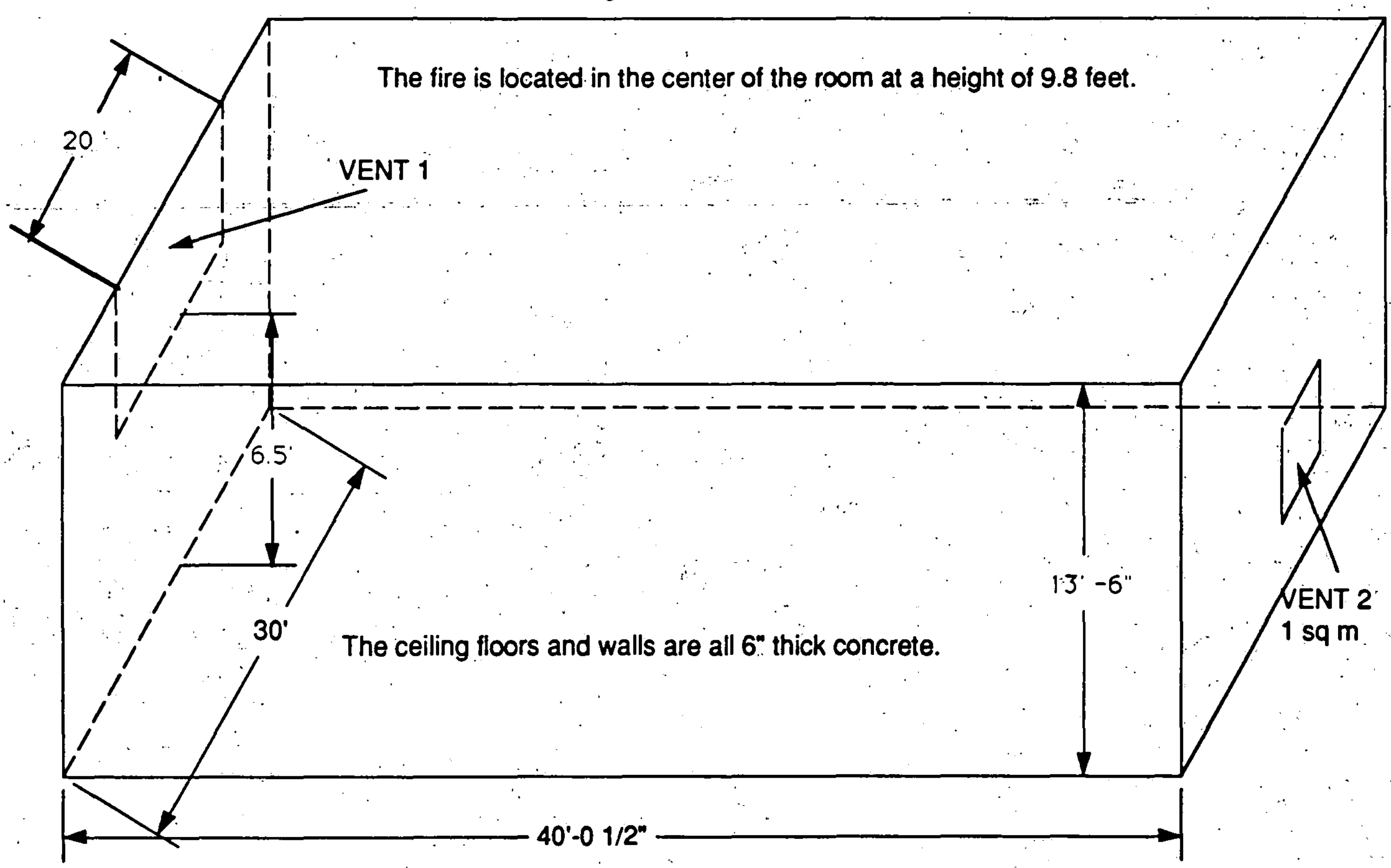
The first step in using Hazard I to validate our theory of what happens for a fire in the Containment Air Room is to input the necessary paramaters into the program.

We will do this in two parts. First we will look at the main part of the Containment Air Room, then we will look at the stairway. Each area will be modeled separately.

The first paramater we input is the physical dimensions of the main part of the room. Figure 3 below shows what this room looks like to the computer. Vent 1 represents the stairway going up.

Next we input the fire shown in table 2. Both the Heat Release Rate and the Area of the fire are input into Hazard I.

Figure 3



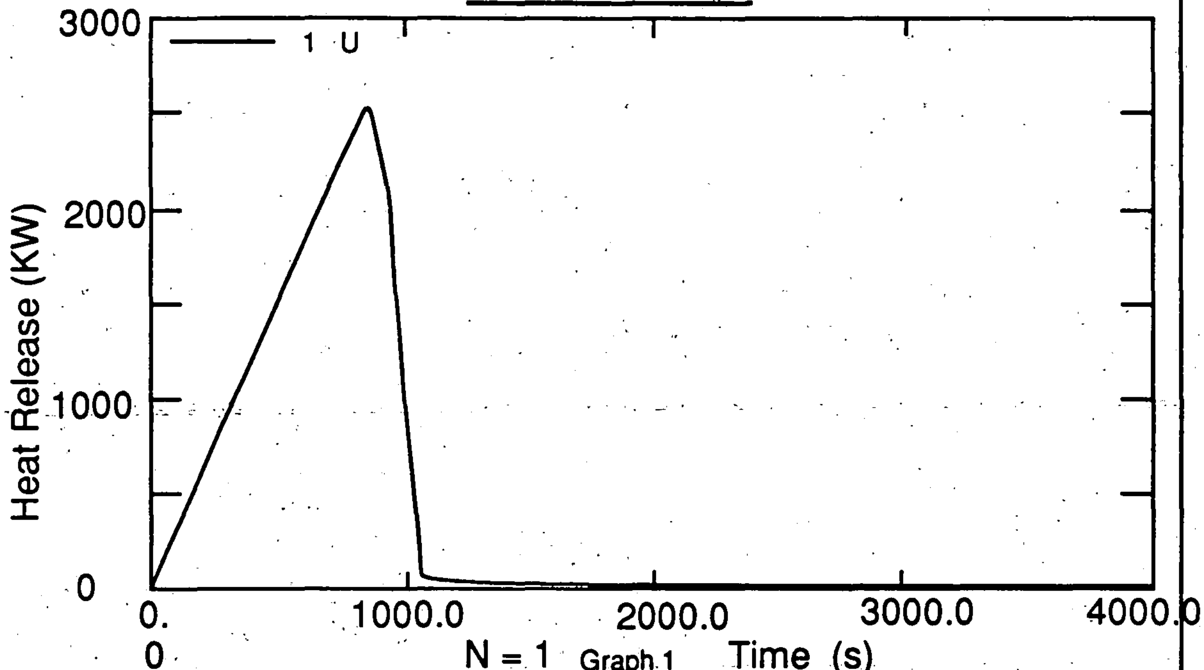
Ambient conditions:
Internal = 100 degrees F
External = 120 degrees F

Reference/Comment

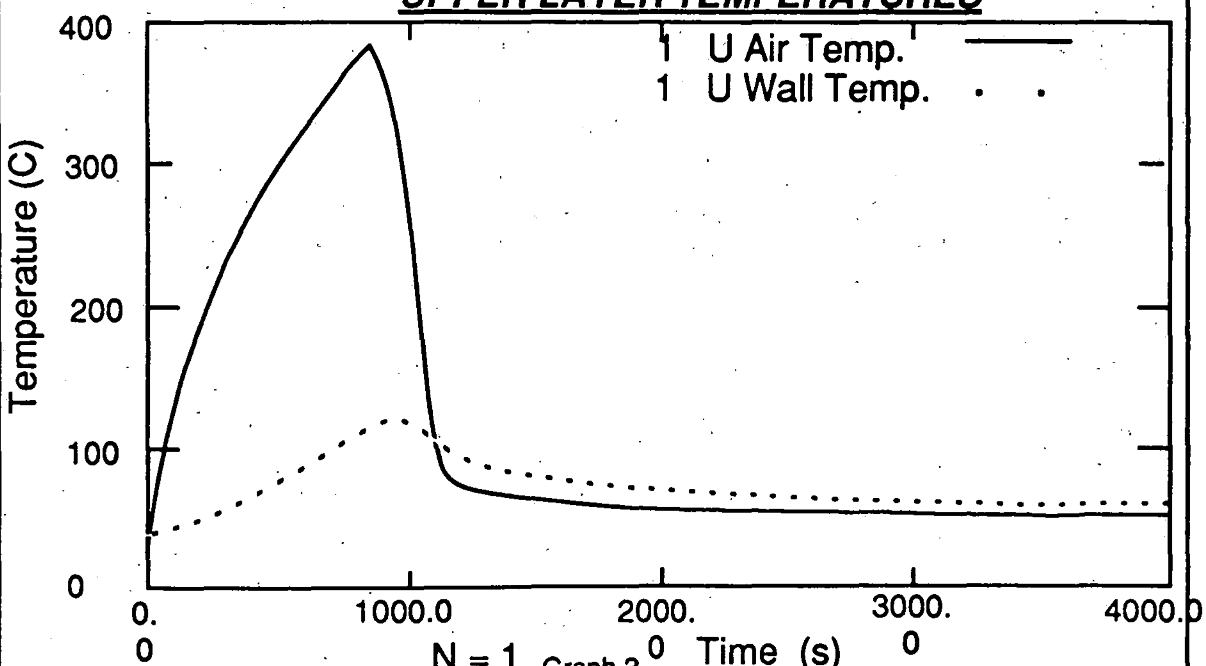
The results of running this fire model are shown in graphs 1 through 4. As can be seen from these graphs, there is a layer of extremely hot air near the ceiling, that extends down two feet during the worst part of the fire.

The lower layer of air in the room is significantly cooler than the upper layer. In addition, the wall temperature (which is where most of the instruments are mounted is also significantly cooler than the upper layer air temperature.

HEAT RELEASE

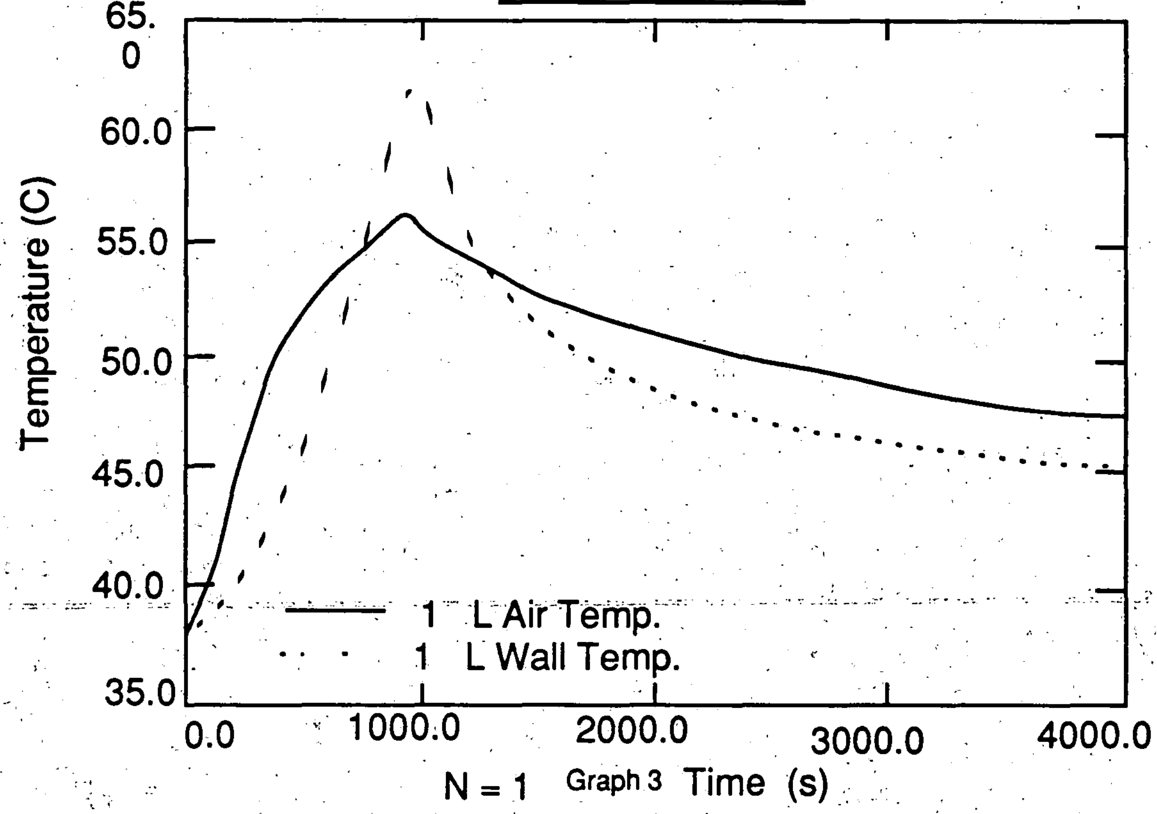


UPPER LAYER TEMPERATURES



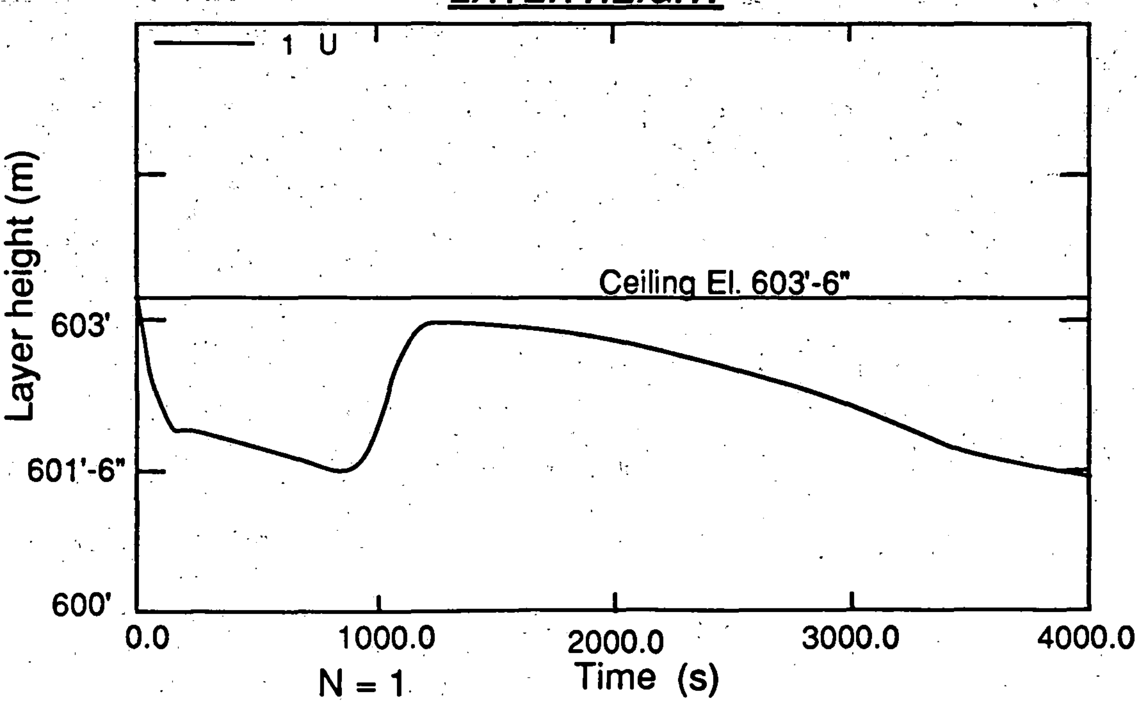
	Reference/Comment

LOWER LAYER TEMPERATURES



Graph 3

LAYER HEIGHT



Graph 4

	Reference/Comment

Now that we have modeled the main part of the room, we can model the stairwell area.

Again, we input the physical dimensions of the stairway. Figure 4 below shows what the stairway looks like to the computer. Vent 1 represents the opening to the main part of the room. Vent 2 represents the opening to the rest of containment.

Next we input the fire shown in table 2. Even though the fire will be in the main section of the room we will assume it is all contained in the stairway. Again, both the Heat Release Rate and the Area of the fire are input into Hazard I.

The other inputs to Hazard I were the same as the previous model.

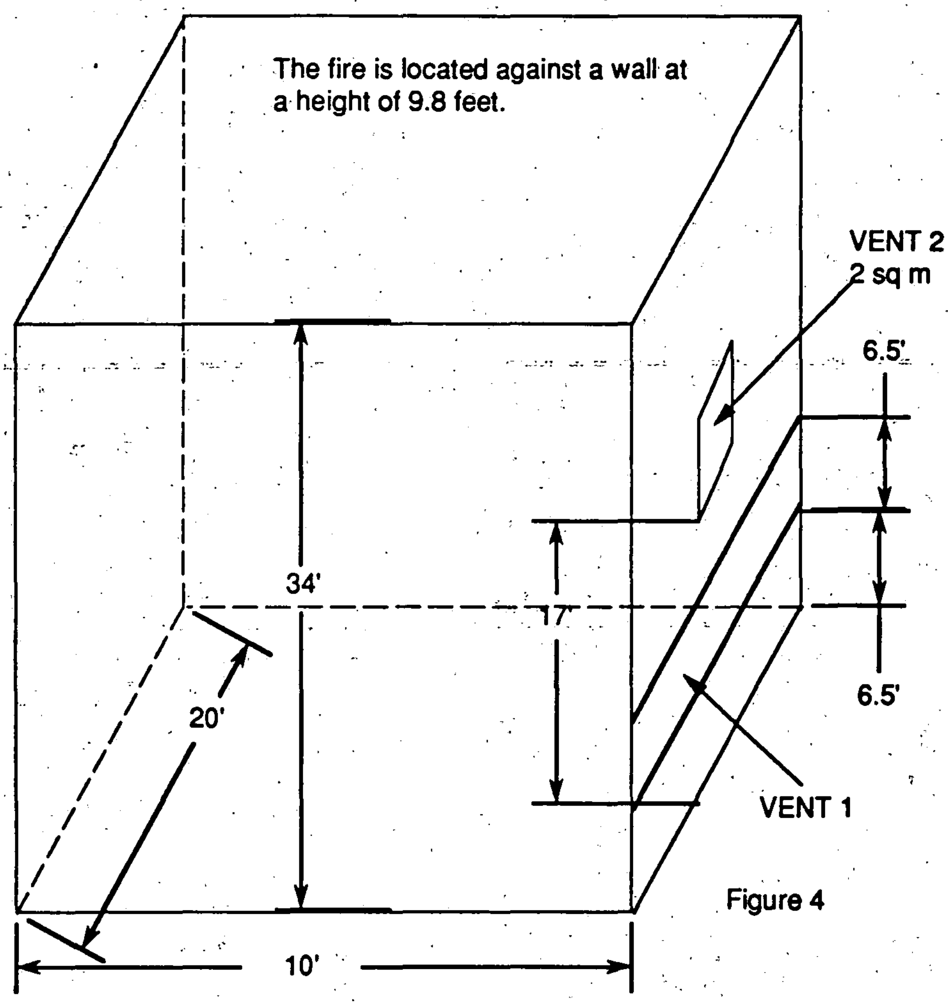
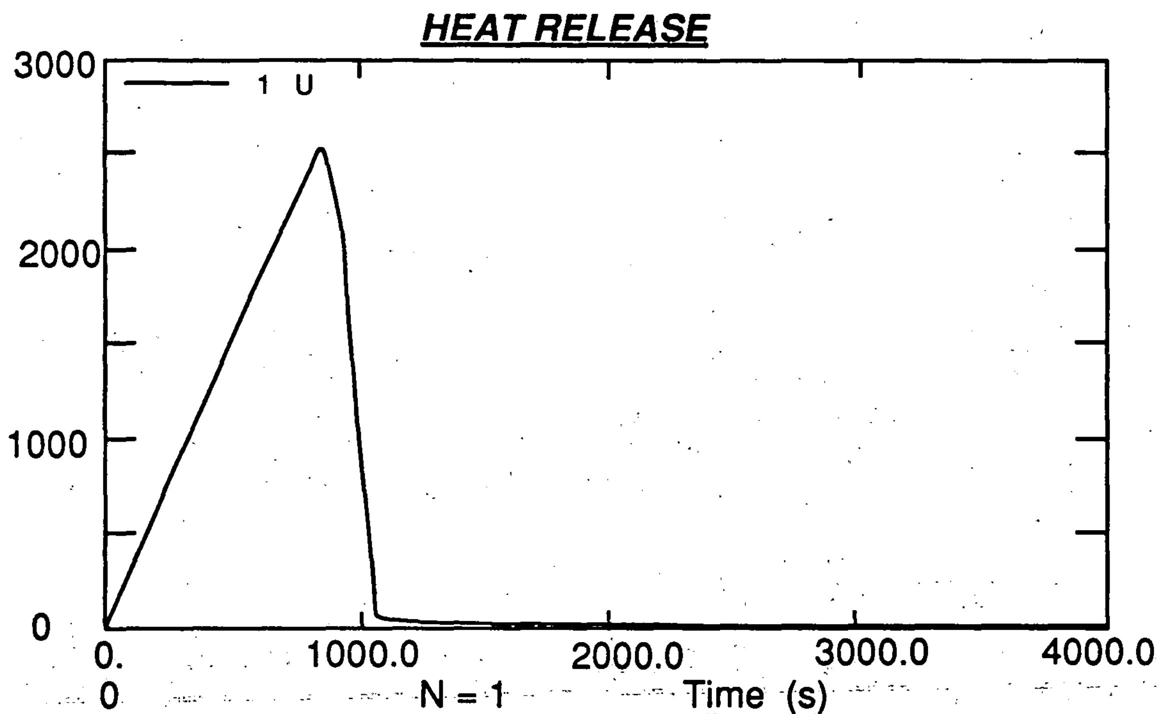


Figure 4

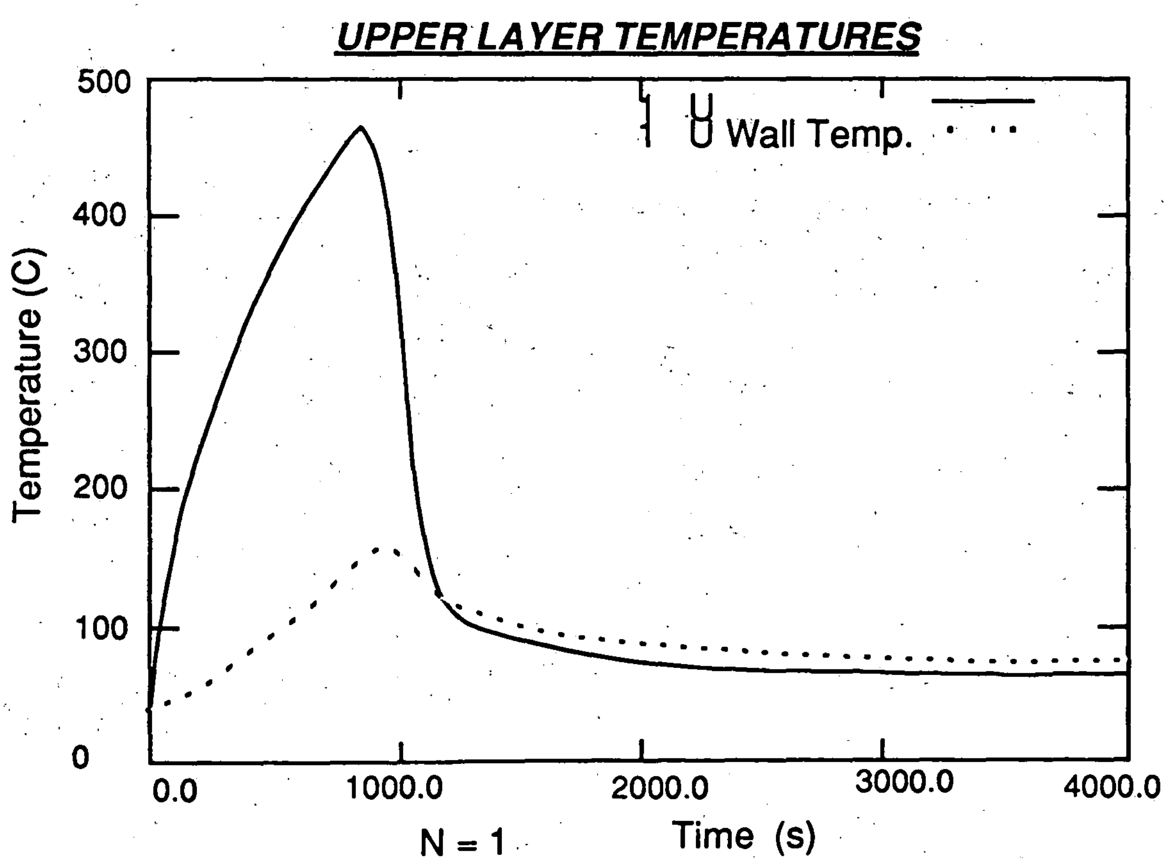
The results of running this fire model are shown in graphs 5 through 8. As can be seen from these graphs, the layer of hot air, extends down to above elevation 607'.

The lower layer of air in the stairwell is significantly cooler than the upper layer. In addition, the wall temperature (which is where the instruments are mounted is also significantly cooler than the upper layer air temperature).

	Reference/Comment

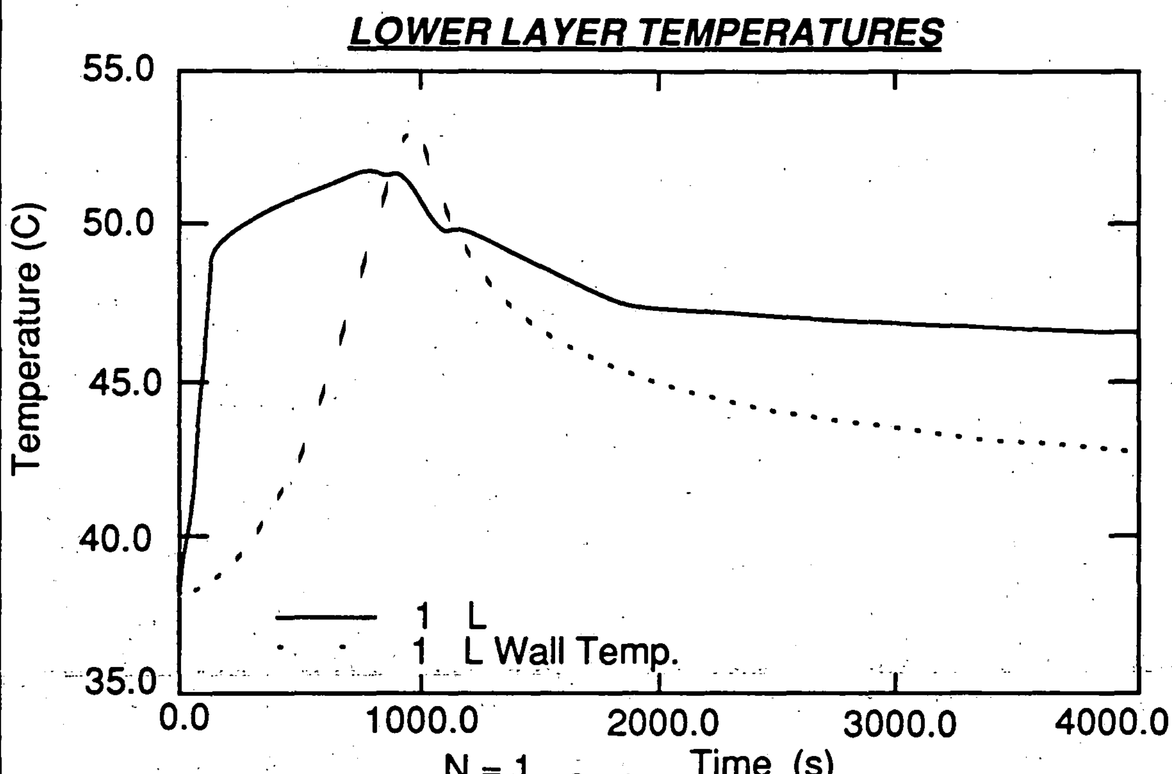


Graph 5

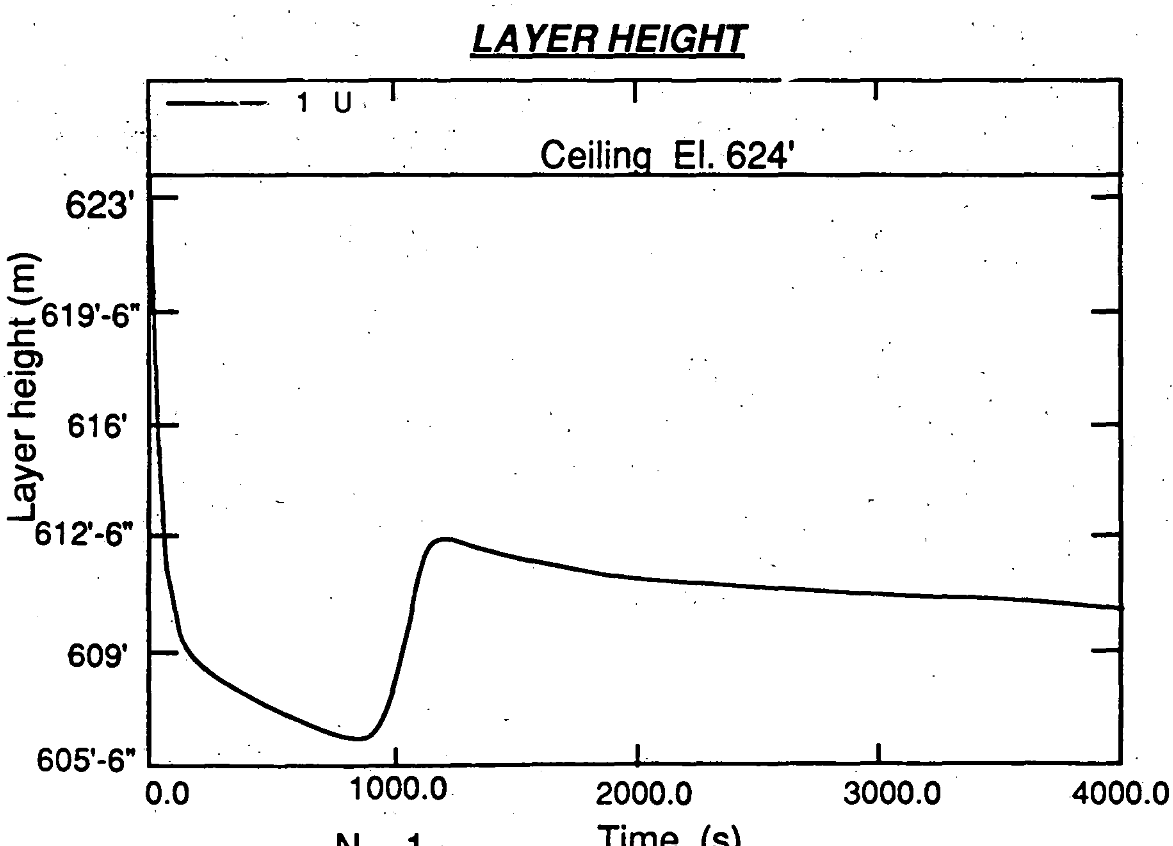


Graph 6

	Reference/Comment



Graph 7



Graph 8

Reference/Comment

Now that we have a good idea what the temperatures will be at what elevations in the Containment Air Room and stairwell, we can see how many instruments will be affected.

In the main part of the room, equipment below elevation 601' 4" will be in the cooler part of the room. In the stairway, equipment below elevation 607' will be in the cooler part of the room.

The safety related instruments in the Containment Air Rooom were looked at to see if enough instruments would be available to safely shut down the plant. In looking at the instruments, not only was the instrument elevation looked at but so was the elevation of the process tubing and cable. Table 3 was developed to show the results of this evaluation.

Table 3

Equipment ID	Description	Inst. / Tube Elevation	Conduit Elevation	Conduit Number	Route	In Hot Layer? Inst./Tube	In Hot Layer? Conduit
LEFT CHANNEL INSTRUMENTS							
PT-0751C	Steam Gen. A Pressure	600'-9"	599'-3"	C0737	3CV212,214	No	No
LT-0751C	Steam Gen. A Level	600'-9"	599'-3"	C0741	3CV212,214	No	No
PT-0752C	Steam Gen. B Pressure	600'-9"	599'-3"	C0727	3CV212	No	No
LT-0752C	Steam Gen. B Level	600'-9"	599'-3"	C0729	3CV212	No	No
LT-0757A	Steam Gen. A W.R. Level	600'-9"	604'-11"	C4083	CV212,214,216	No	No
LT-0758A	Steam Gen. B W.R. Level	600'-9"	604'-11"	C4085	CV212,214,216	No	No
LT-0102	Pressurizer Wide Range Level	601'-6"	599'-3"	FLEX	CV212,214	Yes	No
PT-0104A	N. R. Pressurizer Pressure	600'-9"	599'-3"	3C0181	3CV212	No	No
PT-0105A	W. R. Pressurizer Pressure	600'-9"	599'-3"	???	3CV212	No	No
RIGHT CHANNEL INSTRUMENTS							
PT-0751D	Steam Gen. A Pressure	601'-6"	602'-0"	C0740	4CV210,222	Yes	Yes
LT-0751D	Steam Gen. A Level	599'-3"	602'-0"	C0742	4CV210,222	No	Yes
PT-0752B	Steam Gen. B Pressure	599'-2"	599'-3"	C0724	CV210,222	No	No
LT-0752B	Steam Gen. B Level	599'-2"	599'-3"	C0276	CV210,222	No	No
LT-0757B	Steam Gen. A W.R. Level	599'-2"	613'-5"	C04082	CV210,222,224,226	No	Yes
LT-0758B	Steam Gen. B W.R. Level	599'-2"	612'-5"	C04084	CV210,222,224,226	No	Yes
LT-0103	Pressurizer Wide Range Level	599'-2"	599'-3"	C0746	CV210,222,224	No	No
PT-0104B	N. R. Pressurizer Pressure	599'-2"	599'-3"	3C0180	4CV210,222, 224	No	No
PT-0105B	W. R. Pressurizer Pressure	599'-2"	599'-3"	C1460	4CV210,222, 224	No	No

Located in Main Part of Room - (blank box)

Located in Stairway - (stippled box)

All these instruments are environmentally qualified which means they have been tested to survive a LOCA or MSLB. The temperatures seen in the lower layer of air are significantly lower than a LOCA or MSLB. Therefore, instruments located in the lower layer will operate satisfactorily.

As can be seen from the table there are some instruments that have either conduit, process tubing or instruments themselves in the hot layer of air. These instruments will be addressed individually as follows:

	Reference/Comment

LT-0102

LT-0102 has instrument tubing that extends into the hot layer. This is not a problem because this level transmitter is a differential pressure transmitter. Since both legs of the transmitter tubing see the elevated temperature, the net result on the transmitter accuracy will be negligible.

PT-0751D, LT-0751D

PT-0751D is located in the hot layer itself, LT-0751D has its cable extending into the hot layer. These are not a problem because the instruments for the other steam generator are available, and this is adequate to safely shut down.

LT-0757B, LT-0758B

These instruments have cables that extend up into the hot layer in the stairwell area. These are not a problem because the fire postulated in the stairwell area is significantly higher than what is possible. Therefore, it is more than likely that these instruments will still be available. In addition, the operators still have other Steam Generator Level instruments available and other indications as to the adequacy of the Steam Generator function should these actually fail.

CONCLUSION

This analysis has shown that the affect of a fire in the Containment Air Room on the instruments will be small enough such that sufficient instruments will be available to safely shut down the plant.