July 18,2002

MEMORANDUM TO: Mark Reinhart, Section Chief
Licensing Section
Probabilistic Safety Assessment Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

FROM: Eric W. Weiss, Section Chief /**RA/**
Fire Protection Engineering and Special Projects Section
Plant Systems Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

SUBJECT: SUPPLEMENTAL FIRE MODELING FOR FIRE ZONE 98-J, EMERGENCY DIESEL GENERATOR CORRIDOR AND FIRE ZONE 99-M, NORTH ELECTRICAL SWITCHGEAR ROOM, ARKANSAS NUCLEAR ONE, UNIT 1 (TAC NO. MB2872)

The purpose of this memorandum is to provide you the additional computer fire modeling analysis for the Fire Zones 98-J and 99-M, Arkansas Nuclear One (ANO), Unit 1. This can be used to supplement our pervious fire hazard analysis dated May 28, 2002 (ADAMS Accession # ML021490005). This fire modeling has been performed as requested by your staff in our July 3, 2002, meeting, where we agreed to have my staff complete the supplemental analysis in 2 weeks. This supplement will support your effort with the Phase 3 Significance Determination Process (SDP) concerning an Unresolved Item (URI) 50-313;368/0106-02 in the ANO Triennial Fire Protection Inspection Report (ADAMS Accession # ML012330501).

If you require any additional information, please free to contact us.

Docket No. 50-313

License No. DPR-51

Attachment: As stated

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Fire Modeling of Fire Zone 98-J, Emergency Diesel Generator Corridor and 99-M, North Electrical Switchgear Room Arkansas Nuclear One - Unit 1

SUMMARY

Fire modeling of the Fire Zones 98J, Emergency Diesel Generator Corridor and 99-M, North Electrical Switchgear Room have been performed to evaluate the potentially hazardous conditions (increased temperature and smoke layer level) that could be caused by a fire and assess the associated damage potential to cables or equipment of redundant trains of systems for safe shutdown. The multi-zone fire model CFAST (Consolidated Model of Fire Growth and Smoke Transport) was used to evaluate the different fire scenarios in the Emergency Diesel Generator Corridor and North Electrical Switchgear Room.

IGNITION SOURCES

The primary combustibles of concern in the Fire Zone 98-J and 99-M are the in-situ electrical cabinets, cables, and electrical equipment.

A potential electrical cabinet and subsequent cable tray fire will pose a significant hazard to these Fire Zones. The most likely scenario is dominated by the cable trays that are closest to the ignition sources i.e., the electrical cabinet and electrical equipment.

The main ignition sources in the Fire Zone 98-J include, but are not limited to, the electrical wall-mounted cabinets, 125V DC distribution panels, and instrumentation cabinets (see Table 1). Ignition sources in the Fire Zone 99-M include, but are not limited to, the 4160V switchgear (vital and non-vital) 480V MCC, 480V load center, 120V instrument panel/transformer Y4/X62, inverter panels Y28, Y22, Y24, and Y25 (see Table 1).

Table 1
List of Ignition Sources in Fire Zone 98-J and 99-M

Ignition Sources	
Fire Zone 98-J, Emergency Diesel Generator Corridor	Fire Zone 99-M, North Electrical Switchgear Room
Electrical wall-mounted cabinets 125V DC distribution panels Instrumentation cabinets Emergency chiller water pump Switchgear room emergency chiller Battery charger room A/C unit North batter room/Charger room unit cooler South battery room/Charger room unit cooler	4160V switchgear (vital and non-vital) 480 V motor control center 480V load center 120V instrument panel/transformer Y4/X62 Inverter panels Y28, Y22, Y24, and Y25 Switchgear room cooler, VUC 2C and 2D Transformer X6

Other ignition sources such as a power cable failure in a tray, or other failures of electrical origin (distribution panel, circuit boards, electrical wiring, internal cable fault, electrical circuit fault in switchgear cabinets, etc.) will produce similar results. The electrical failure is postulated in this analysis to ignite the in-situ combustibles (cables). Outside ignition sources such as hot work or transient sources are also possible, but not included in the scope of this analysis.

FIRE GROWTH RATE

Testing has shown that the overall heat release rate (HRR) during the fire growth phase of many fires can often be characterized by the simple time dependent polynomial or exponential function (Heskestad and Delichatsios 1978). The total heat release of fuel packages can be reasonably approximated by the power law fire growth model for both a single item burning and for multiple items involved in a fire. The proposed model of the environment generated by fire in an enclosure is dependent on the assumption that the fire grows according to:

$$\dot{Q} = \alpha t^2 \qquad (1)$$

where

$\dot{Q}$ = the rate of heat release of fire (kW),
t = the time (sec), and
α = a constant governing the speed of fire growth (kW/sec^2)

The growth rate approximately follows a relationship proportional to time squared for flaming and radially spreading fires and is referred to as t-squared (t^2) fires. The t^2 fires are classed by speed of growth, labeled ultra-fast, fast, medium, and slow. Where these classes are used, they are defined on the basis of the time required for the fire to grow to a rate of heat release of 1000 kW (1 MW). The intensity α, and growth time t, related to each of these classes shown in Table 2.

Table 2
Summary of t^2 Fire Parameter

Type of Fire Growth	Intensity Constant α (kW/sec^2)	Growth Time t (sec)
Slow	0.00293	600
Medium	0.01172	300
Fast	0.0469	150
Ultra-fast	0.1876	75

The t^2 relationship has proven to be useful and has been adopted into the National Fire Protection Association NFPA 72 to categorize fires for detector spacing requirements and into NFPA 92B for design of smoke control system.

The modeled fire can be represented as one where the HRR per unit area is constant over the entire ignited surface and the flame is spreading with a steadily increasing area. In such cases, the burning area increases as the square of the steadily increasing fire radius. Fires that do not have a regular fuel array and consistent burning rate might or might not actually produce a t^2 curve; however, the t^2 approximation appears to be reasonable for use in this case to produce a realistic approximation of the expected fire growth.

HEAT RELEASE RATE ESTIMATE

This analysis is used to determined the extend of potential fire damage associated with a realistic, potential fire scenario in Fire Zones 98-J and 99-M. The analysis evaluates whether the postulated fire can lead to failure of safety-related cables or equipment of redundant trains of systems for safe shutdown. The impact of the fire scenario is analyzed using fire dynamics principles or fire model (e.g., CFAST). Different fire scenarios were considered in the analysis. Table 3 provides a summary of fire scenarios considered in this analysis.

Table 3
Summary of the Fire Scenarios

Fire Zone	Fire Scenario		Ventilation Condition
	Electrical Cabinet Fire Input HRR, Test # 23 & 24, NUREG/CR-4527, Volume 2, Figure 1 & 2	Electrical Equipment Fire t^2 Fast Fire Growth Figure 3	
98-J, Emergency Diesel Generator Corridor	1300 kW Peak HRR 1235 kW Peak HRR	500 kW 400 kW 300 kW 200 kW	Vent open and closed
99-M, North Electrical Switchgear Room	1300 kW Peak HRR 1235 kW Peak HRR	500 kW 400 kW 300 kW 200 kW	Door open and closed

Figure 1 and 2 show the input HRR used in CFAST fire simulation predicts the effects of a electrical cabinet fire in Fire Zone 98-J and Fire Zone 99-M. This HRR is based on the full-scale test results reported in NUREG/CR-4527, Volume 2, Test # 23 and 24. As shown in Table 1 several small electrical ignition sources are present in Fire Zones 98-J and 99-M. There is no direct data available on the burning of these ignition sources at full or intermediate scale, so a range of HRR were used. For the purpose of this analysis a t^2 fast fire growth rate for these fires was assumed for fire modeling (see Figure 3).

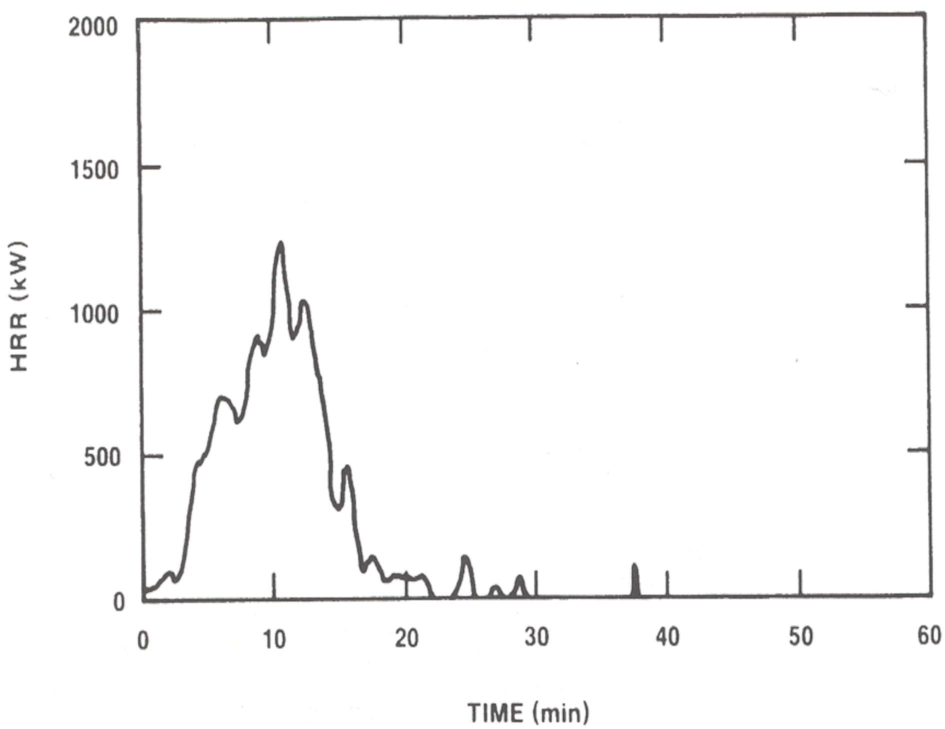

Figure 1 Measured Heat Release Rate for Electrical Cabinet Fire
NUREG/CR-4527, Volume 2, Test # 23

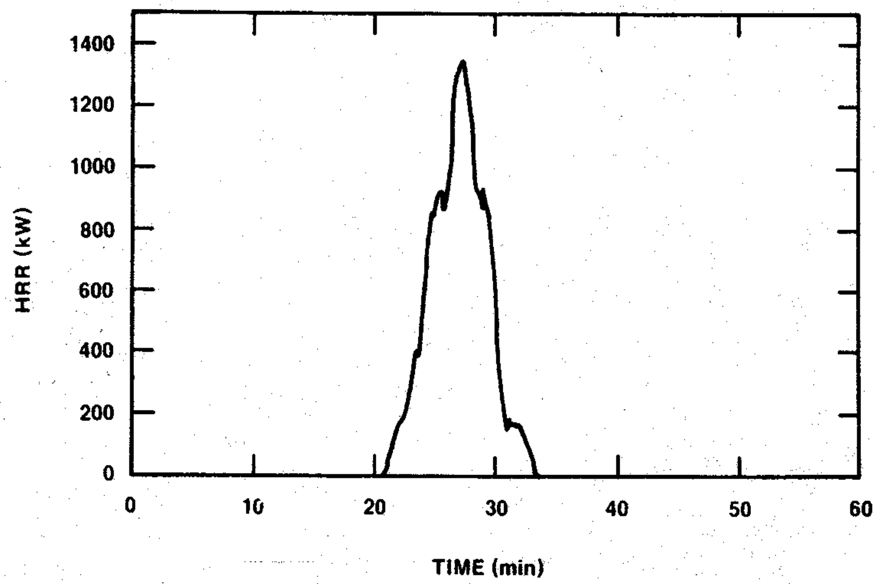

Figure 2 Measured Heat Release Rate for Electrical Cabinet Fire
NUREG/CR-4527, Volume 2, Test # 24

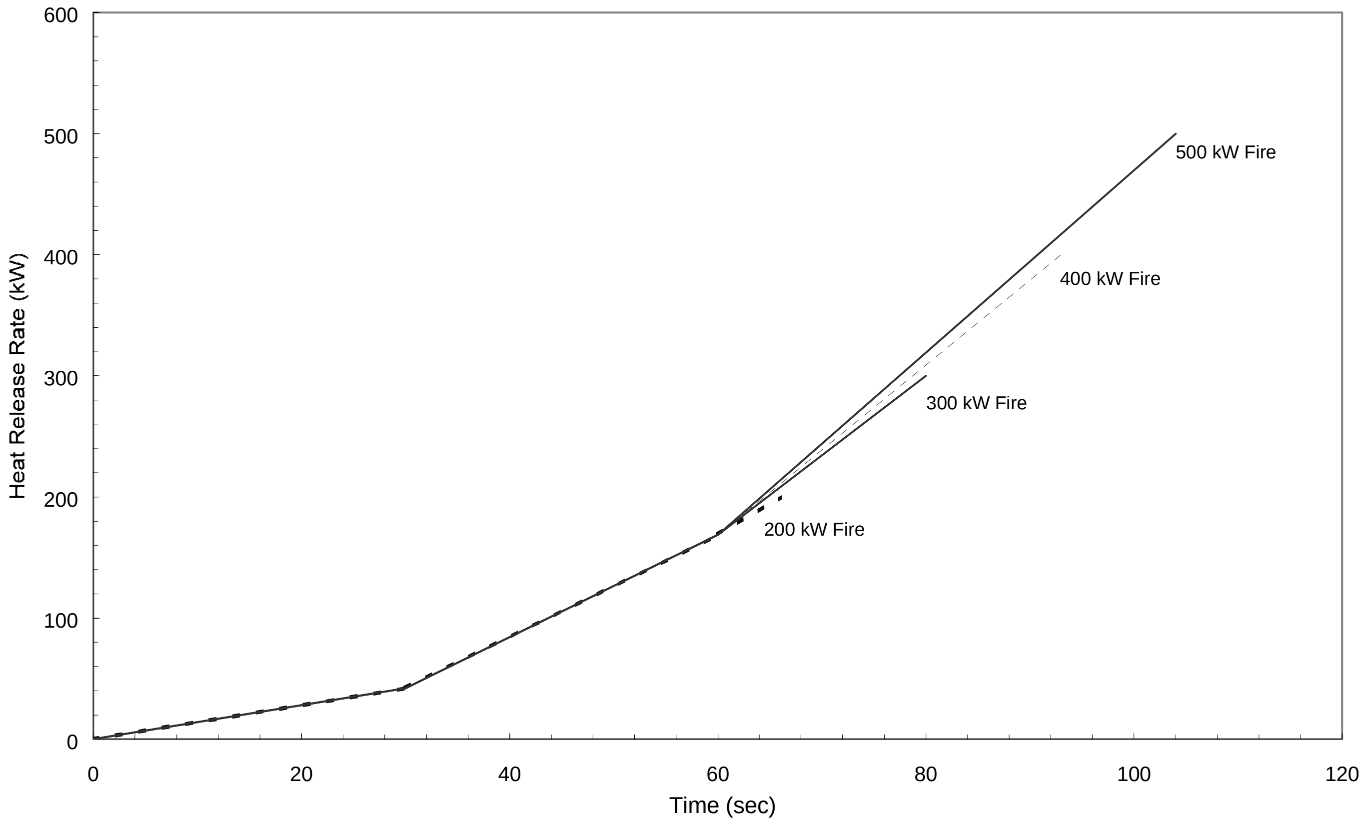

Figure 3 Input Heat Release Rate, Electrical Equipment Fire, t^2 Fast Fire Growth Rate

CFAST - CONSOLIDATED MODEL OF FIRE GROWTH AND SMOKE TRANSPORT

The multi-zone computer fire model CFAST was used to calculate the temperature in the Fire Zones 98-J and 99-M [Peacock *et al.,* 1997; Peacock *et al.,* 1993]. CFAST was developed by the Building and Fire Research Laboratory (BFRL) at the National Institute of Standards and Technology (NIST) for fire modeling steady and unsteady state burning rates in multiple compartment configurations (multiple room capability, up to 15 rooms can be modeled). The initiating fire is user specified, but adjusted by CFAST based on the available supply of oxygen. CFAST allows fires to be constrained or unconstrained. A fire specified as unconstrained in CFAST will not be limited by the availability of oxygen. When a constrained fire is specified, the chemically required oxygen is calculated and the available oxygen and unburned gases are tracked. A mass balance calculation of individual species is performed for each zone to track the available oxygen and unburned gases. Multiple compartments and vents can be modeled as well as the mechanical ventilation. Mechanical ventilation is addressed by CFAST in terms of fan/ductwork that includes consideration of fan pressure/flow characteristic curves and duct friction losses. The model divides each compartment into two zones, an upper zone containing the hot gases produced by the fire and a lower zone containing all space beneath the upper zone. The lower zone is a source of air for combustion and usually the location of the fire source, the upper zone can expand to occupy virtually all of the space in the compartment. The upper zone is considered a control volume that receives both mass and energy for the fire and loses energy to the surfaces in contact with the upper zone by conduction and radiation, by radiation to the floor, and by convection or mass movement of gases through openings. The two layer zone approach used by the CFAST has evolved from observations of such layering in full-scale fire experiments (Jones *et al.,* 2000). While these experiments show some variation in conditions within the layers, they are small compared to the differences in conditions between the layers themselves. Thus, the zone model can produce a fairly realistic simulation of the fire environment within a compartment under most conditions. CFAST has the capability to calculate the upper and lower layer temperature, the smoke density, the vent flow rate, the gas concentrations, and compartment boundary temperatures, the heat flux from the smoke layer to objects, the internal compartment pressure, and the interface elevation, all as a function of time.

A number of efforts of CFAST model comparison, verification and validation have been undertaken. Many of these efforts involved comparisons between measured and calculated parameters, primarily temperatures, mass flow rates and smoke layer interface positions. Duong, 1990, Peacock, et al., 1988, Mowrer and Gautier, 1997, Nelson and Deal, 1991, and EPRI TR-108875, 1998, compared CFAST model predictions with experimental data.

LIMITATIONS AND UNCERTAINTIES ASSOCIATED WITH FIRE MODELING

Fire models permit development of a better understanding of the dynamics of building fires and can aid in the fire safety decision-making process. There are certain limitations and uncertainties associated with the current fire modeling predictions. Extreme care must be exercised in the interpretation of the fire modeling results. For scenarios where the level of predicted hazard is well below the damage threshold, the results can be used with high level of confidence provided there is a high level of confidence that all risk-significant scenarios have been considered. For scenarios where the level of predicted hazard is near the damage threshold, the results should be used with caution in view of the uncertainties that exist.

A primary method of handling modeling uncertainties is the use of engineering judgment. Among other things, this judgment is reflected in the selection of appropriate fire scenario, hazard criteria, and fire modeling techniques. A slightly more formal application of engineering judgment is the use of safety factors. The safety factors can be applied in the form of fire size, increased or decreased fire growth rate, or conservative hazard criteria (Custer and Meacham, 1997). Experimental data obtained from fire test, statistical data, from actual fire experience, and other expert judgment can be used improve the judgment and potentially decrease the level of uncertainty.

CFAST MODELING OF FIRE ZONES 98-J AND 99-M

Fire modeling of the Fire Zones 98-J and 99-M was performed using CFAST. All CFAST input files used in this analysis are contained in Appendix A. With the parameters selected, CFAST provided information on the temperature in the room and the smoke interface height.

CFAST input data includes the physical dimensions of the compartment, the compartment construction materials, the opening dimensions and their elevations, the fire HRR, and the position of the fire in the specified room, gas species production rate, and exterior wind conditions (see input file).

To perform this analysis, several HRR curves were developed for the CFAST fire model. The input HRR assumes complete combustion and an ample supply of oxygen. Experimental HRR curves (NUREG/CR-4527, Vol. 2) and electrical equipment fire with a t^2 fast fire growth rate (i.e., energized failure) was used in the fire modeling.

The fire environment created in the Fire Zones 98-J and 99-M involving electrical cabinet and electrical equipment was determined using the data provided in Table 3. HRR data in Figures 1, 2, and 3, and Table 3 were used as input into CFAST, which will reduce this nominal HRR based on the availability of oxygen. In Fire Zone 99-J, fires were evaluated first with the vent open (3' x 2') then closed. In Fire Zone 99-M fires were evaluated first with the door open then closed. In the cases of the vent or door closed, a small vent was assumed near the floor to prevent an excessive pressure buildup and possible numerical instability in the model. This small vent assumption is reasonable and realistic since no compartment is air tight. For the model a summation of small leakage paths such as door gaps are assumed. The walls, floor, and ceiling of Fire Zones 98-J and Fire Zone 99-M are thermally thick concrete.

CFAST FIRE MODELING RESULTS

Results from the CFAST simulation of the fire scenarios in the Fire Zone 98-J and 99-M are provided in Figures 4 through 19 and summarized in Table 4. Figure 4 show the smoke layer temperature in Fire Zone 98-J using the input HRR from Test # 23 with vent open and closed. In this figure cable failure temperature 425 °F was reached in approximately 30 minutes when vent is open. In the case of vent closed the fire become ventilation limited with the smoke layer temperature reaching 400 °F in about 30 minutes. Figure 6 show the smoke layer temperature in Fire Zone 99-M using input HRR from Test # 23 with door open and closed. In both case the smoke layer temperature reach 425 °F approximately 11.5 minutes. The limiting temperature of 425 °F was used since this temperature can, cause failure of non IEEE-383 rated cables.

Figure 8 show the smoke layer temperature in Fire Zone 98-J using input HRR from Test # 24 with vent open and closed. In both fire scenarios, the smoke layer temperature reach in 425 °F approximately 6 minutes. In Figure 10 the smoke hot layer temperature in Fire Zone 99-M to reach 425 °F within 7 minute of the fire.

Figure 12 and 14 show the smoke layer temperature in Fire Zone 98-J with door open and then closed with HRR ranging from 200 to 500 kW. The temperatures reached during these fire scenarios exceeds 425 °F only for 300 and 400 kW fire when vent is open. In case when vent is closed, smoke layer temperature exceeds 425 °F only for 500 kW fire, other fires become ventilation limited and decayed.

Figure 16 and 18 show the smoke layer temperature in Fire Zone 99-M with door open and closed with HRR ranging from 200 to 500 kW. With the door open, in all cases the smoke layer temperature was below the non IEEE-383 rated failure temperature, therefore failure of the cables would not be expected. However, with the door closed, fires with HRR of 400 and greater could damage the cables in Fire Zone 99-M. Fires with HRR of 200 and 300 kW tend to become ventilation limited and decayed.

Table 4
Summary of Fire Modeling Results for Electrical Cabinet and Electrical Equipment Fire in Fire Zone 98-J and 99-M

Fire Scenario HRR (kW)	Fire Zone 98-J, Emergency Diesel Generator Corridor		Fire Zone 99-M, North Electric Switchgear Room	
	Smoke Layer Temperature (°F)		Smoke Layer Temperature (°F)	
	Vent Open	Vent Closed	Door Open	Door Closed
1300	**425** @ 6 min	**425** @ 6 min	**425** @ 7 min	**425** @ 7 min
1235	400 @ 9 min **425** @ 30 min	400 @ min	**425** @ 11.5 min	**425** @ 11.5 min
500	**425** @ 4 min	**425** @ 3.5 min	363 @ 60 min	**425** @ 5 min
400	**425** @ 19 min	408 @ 6 min	325 @ 60 min	**425** @ 10 min
300	390 @ 60 min	336 @ 14 min	284 @ 60 min	369 @ 27 min
200	305 @ 60 min	291 @ 19 min	230 @ 60 min	294 @ 27 min

Boldface indicate the non IEEE-383 rated cable failure temperature.

CONCLUSION

As expected and illustrated by Table 4, the damaging fire scenarios will be governed by the energetic faults in the electrical cabinets (HRR) and influenced by the compartment's ventilation conditions. Energetic electrical faults producing a HRR 400 kW or greater, can lead to fire growth and subsequent fire damage of concern in the compartment. Based on operating experience (e.g., the recent event at San Onofre Nuclear Generating Station (SONGS)(ADAMS Accession # ML011130255)) and laboratory testing (e.g., "An Experimental Investigation of Internally Ignited Fires in Nuclear Power Plant Control Cabinets, Part II: Room Effects Tests" NUREG/CR-4527, Volume 2) fires in excess of 1 MW (1000 kW) are creditable from electrical cabinets. This HRR is further validated by the February 2002, NRC Office of Nuclear Regulatory Research Report "Operating Experience Assessment Energetic Faults in 4.16 kV to 13.8 kV Switchgear and Bus Ducts That Caused Fires in Nuclear Power Plants 1986–2001" (ADAMS Package # ML021290364, Report Accession # ML021290358), which states,

> *"These events demonstrate that fires from energetic electrical faults contain more energy than assumed in fire risk models as evidenced by explosions, arcing, smoke, ionized gases, and melting and vaporizing of equipment. The energy release exceeds HRRs assumed in fire risk models, possibly by a factor of 1000. Lower HHR values currently used may explain why current fire risk models have not identified the potential larger effects of fires from energetic electrical faults which may include the following: bypass of the fire initiation and growth stages, propagation of the fire to other equipment and across vertical fire barriers, ac power system designs that may be vulnerable to an SBO, failed fire suppression attempts with dry chemicals and the need to use water, longer restoration time to recover, and unexpected challenges and distractions to the operator from fire-induced failures.*
>
> *Fire risk models may underestimate the risks from fires due to energetic faults in 4.16 kV to 13.8 kV switchgear and bus ducts by not considering: (1) development of HRR values corresponding to energetic electrical energy levels; (2) the effects of propagation from the fault location to other switchgear compartments, bus ducts, or overhead cables; (3) plant ac safety bus and circuit breaker configuration; (4) failed fire suppression attempts; (5) additional recovery actions; and (6) multiple accident sequences from fire induced equipment failures or operator error".*

Therefore, based on the realistic fire scenarios developed in this analysis, unacceptable fire damage due to an energized electrical cabinet ignited fire is credible.

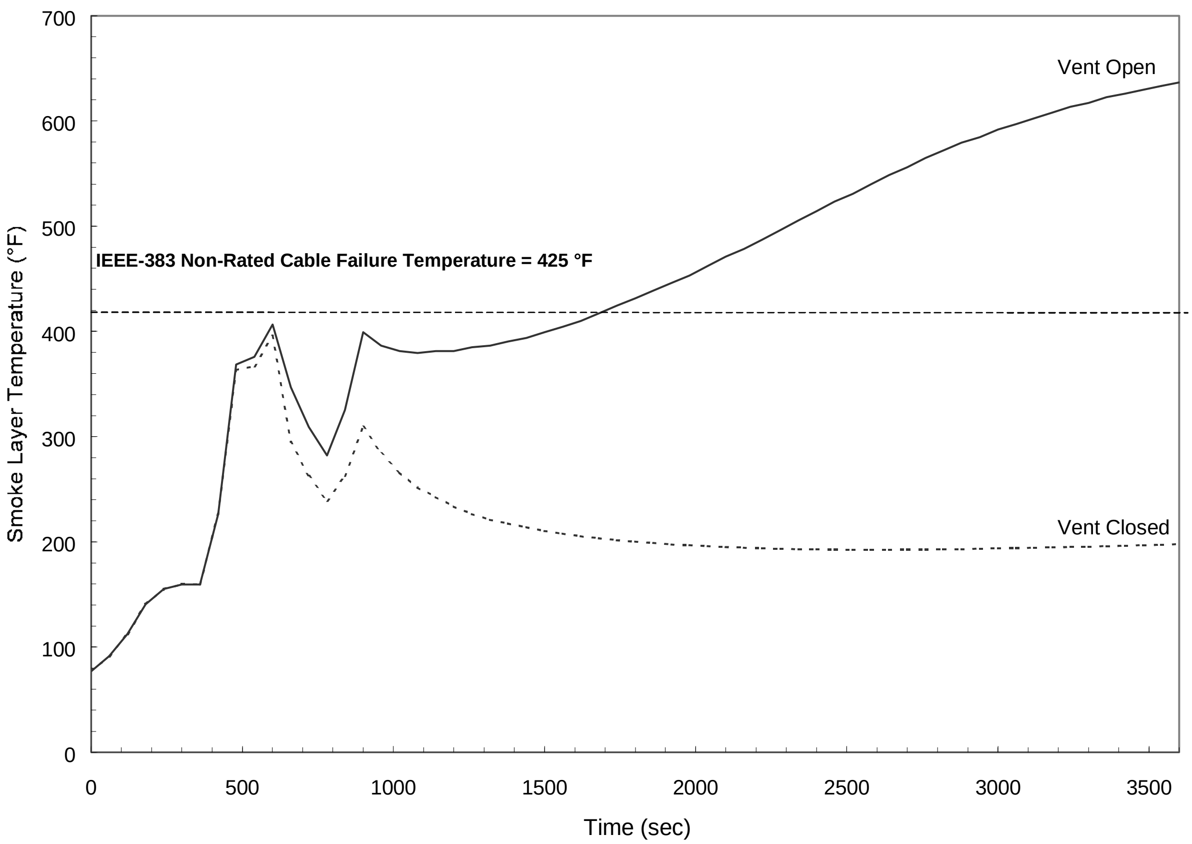

Figure 4 Smoke Layer Temperature in Fire Zone 98-J. Input Heat Release Rate Test # 23, NUREG/CR-4527, Volume 2

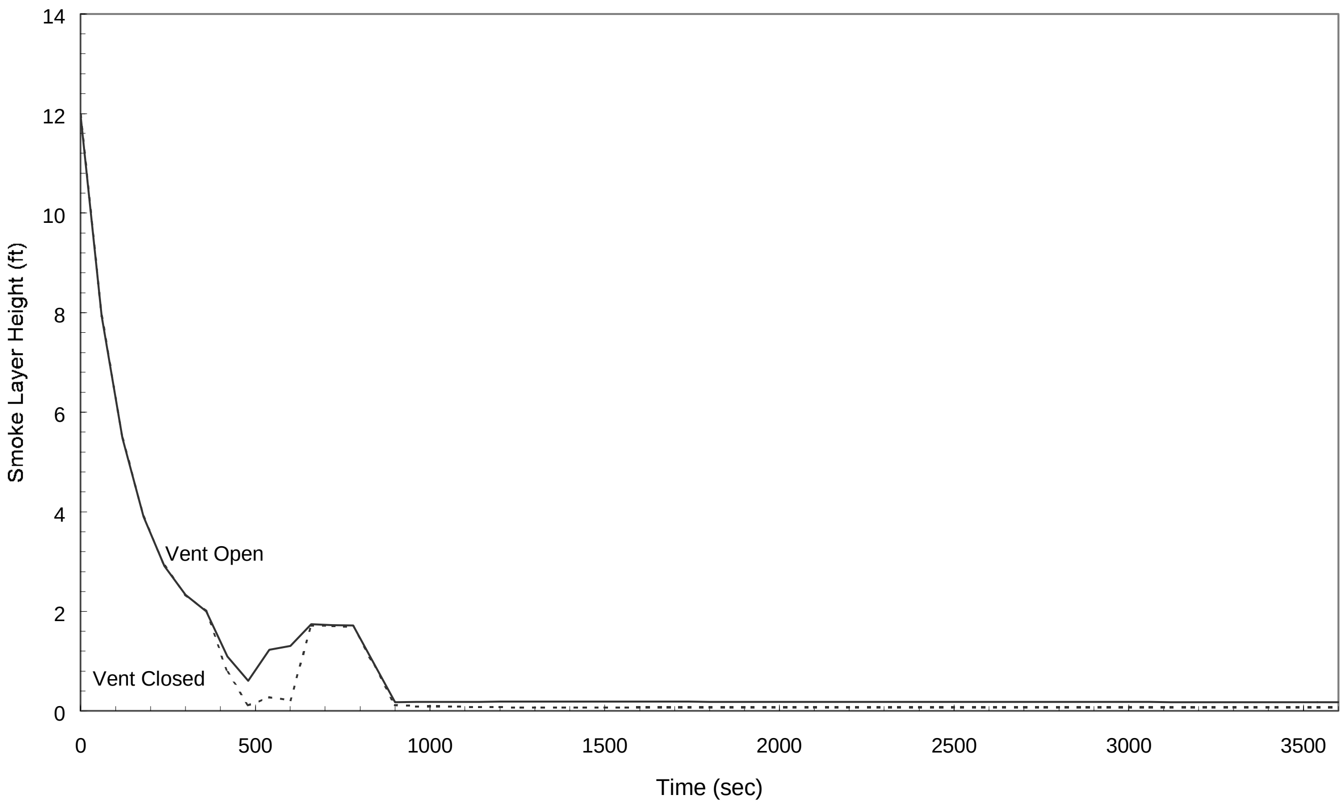

Figure 5 Smoke Layer Height in Fire Zone 98-J. Input Heat Release Rate Test # 23, NUREG/CR-4527, Volume 2

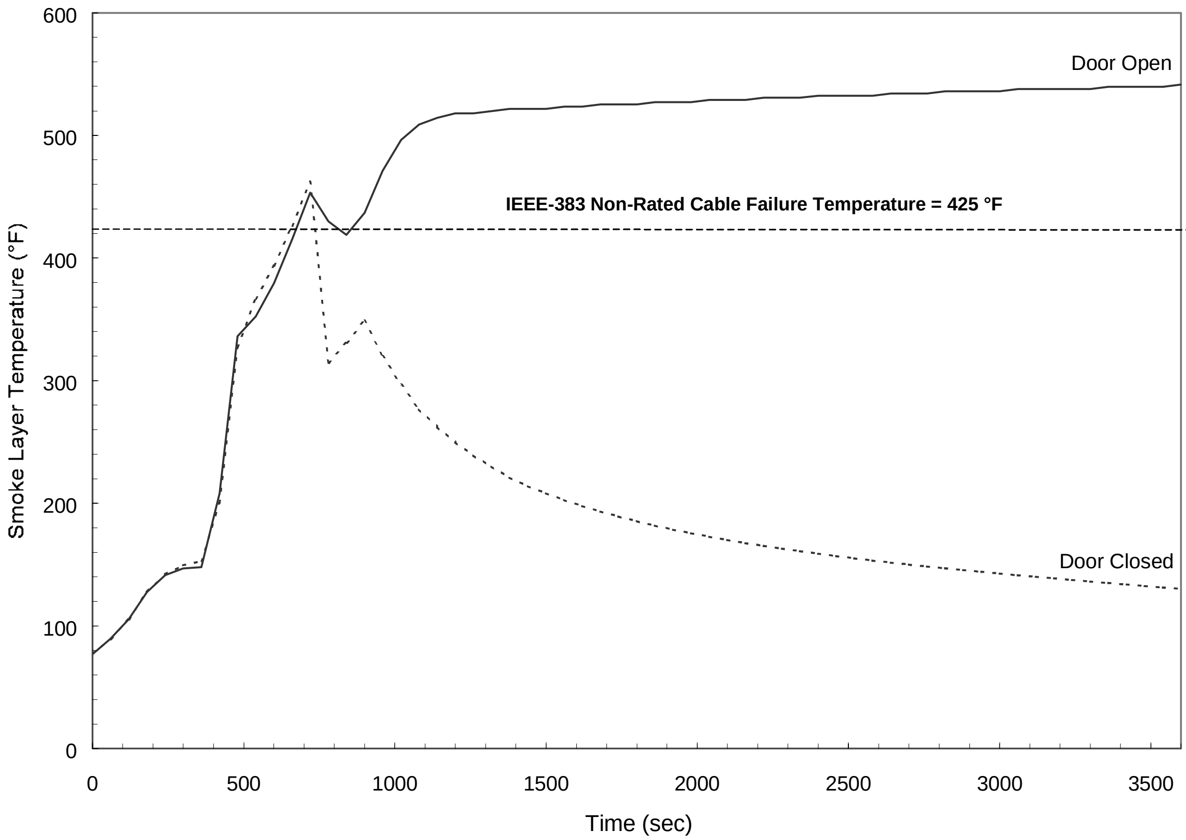

Figure 6 Smoke Layer Temperature in Fire Zone 99-M. Input Heat Release Rate Test # 23, NUREG/CR-4527, Volume 2

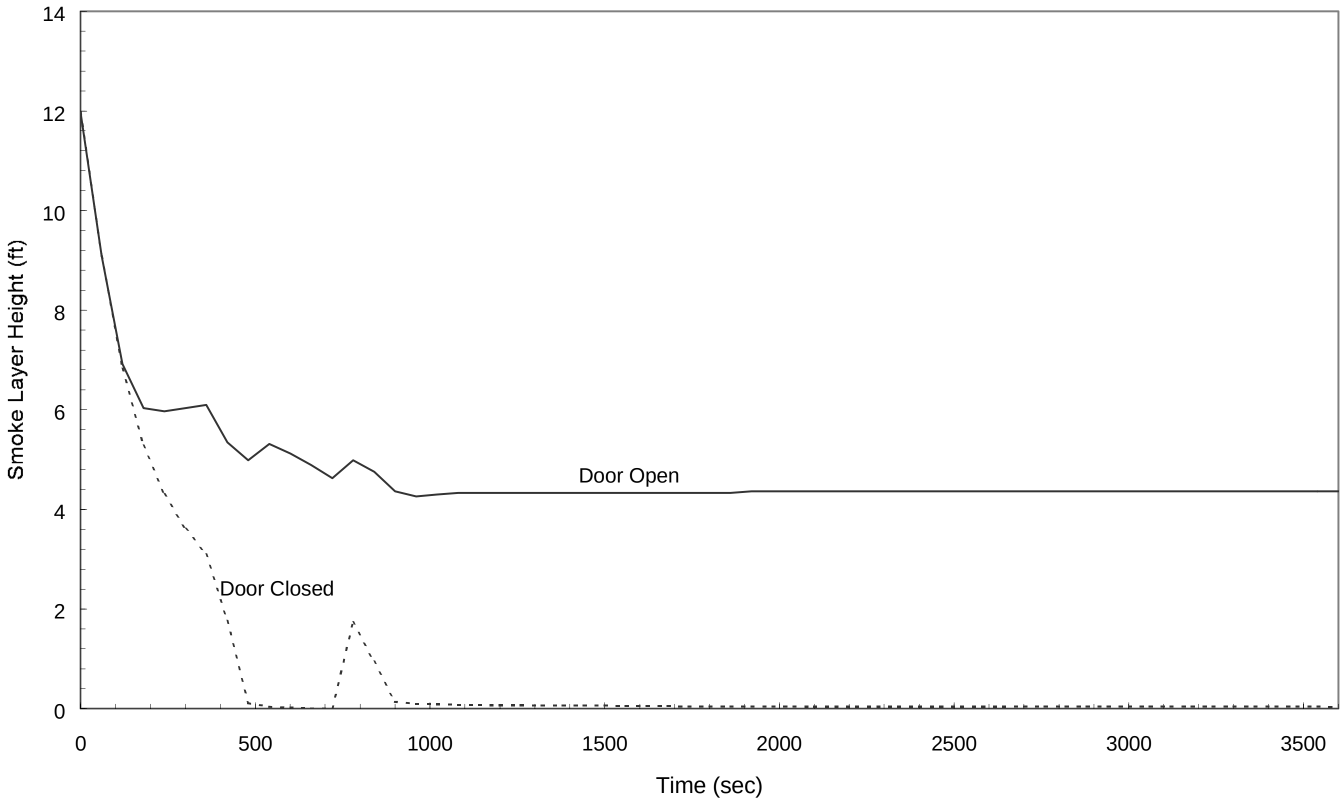

Figure 7 Smoke Layer Height in Fire Zone 99-M. Input Heat Release Rate Test # 23, NUREG/CR-4527, Volume 2

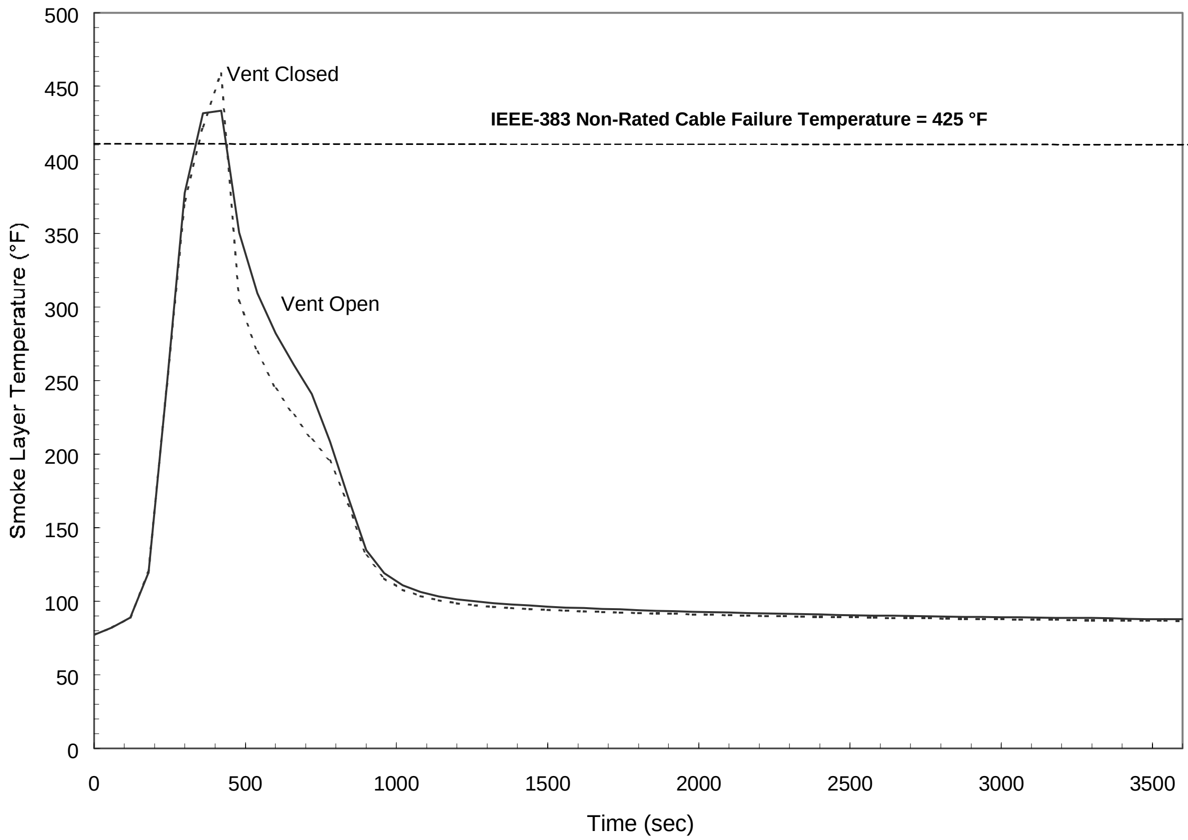

Figure 8 Smoke Layer Temperature in Fire Zone 98-J. Input Heat Release Rate Test # 24, NUREG/CR-4527, Volume 2

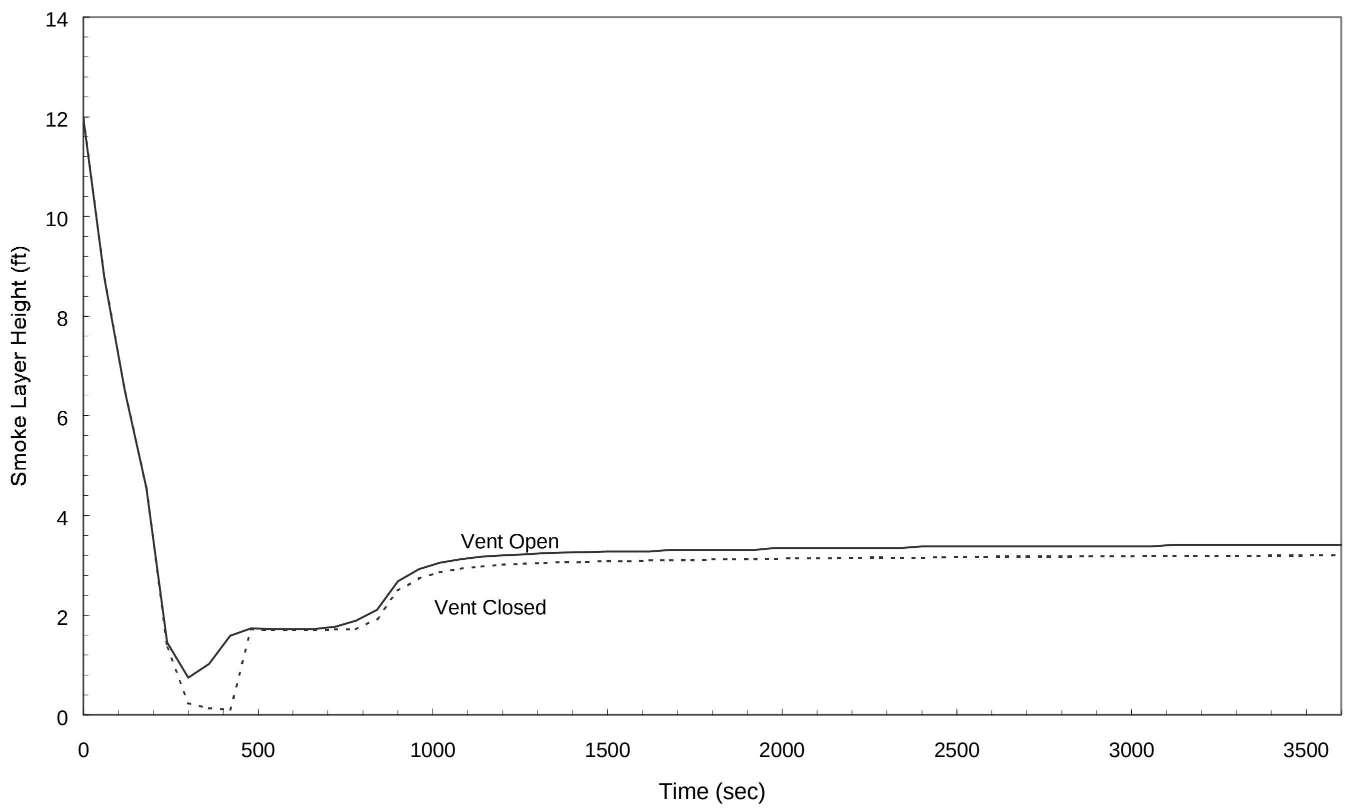

Figure 9 Smoke Layer Height in Fire Zone 98-J. Input Heat Release Rate Test # 24, NUREG/CR-4527, Volume 2

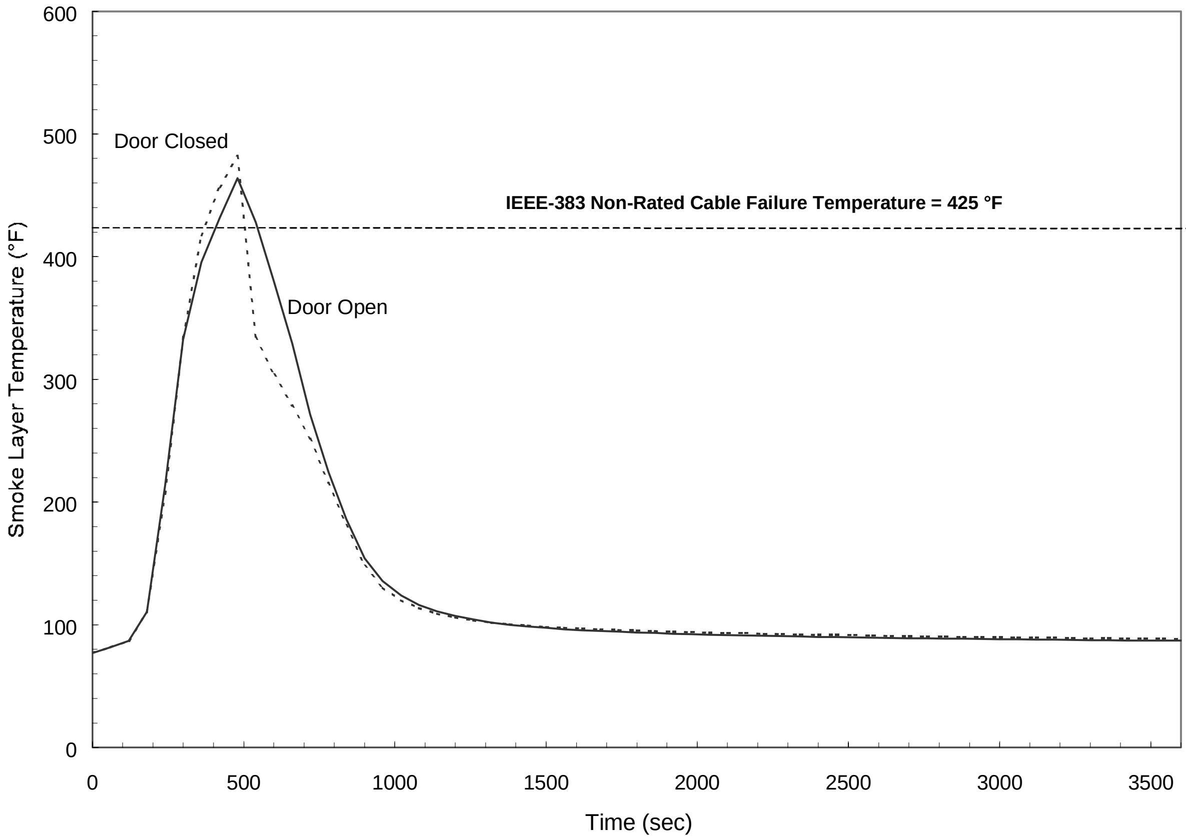

Figure 10 Smoke Layer Temperature in Fire Zone 99-M. Input Heat Release Rate Test # 24, NUREG/CR-4527, Volume 2

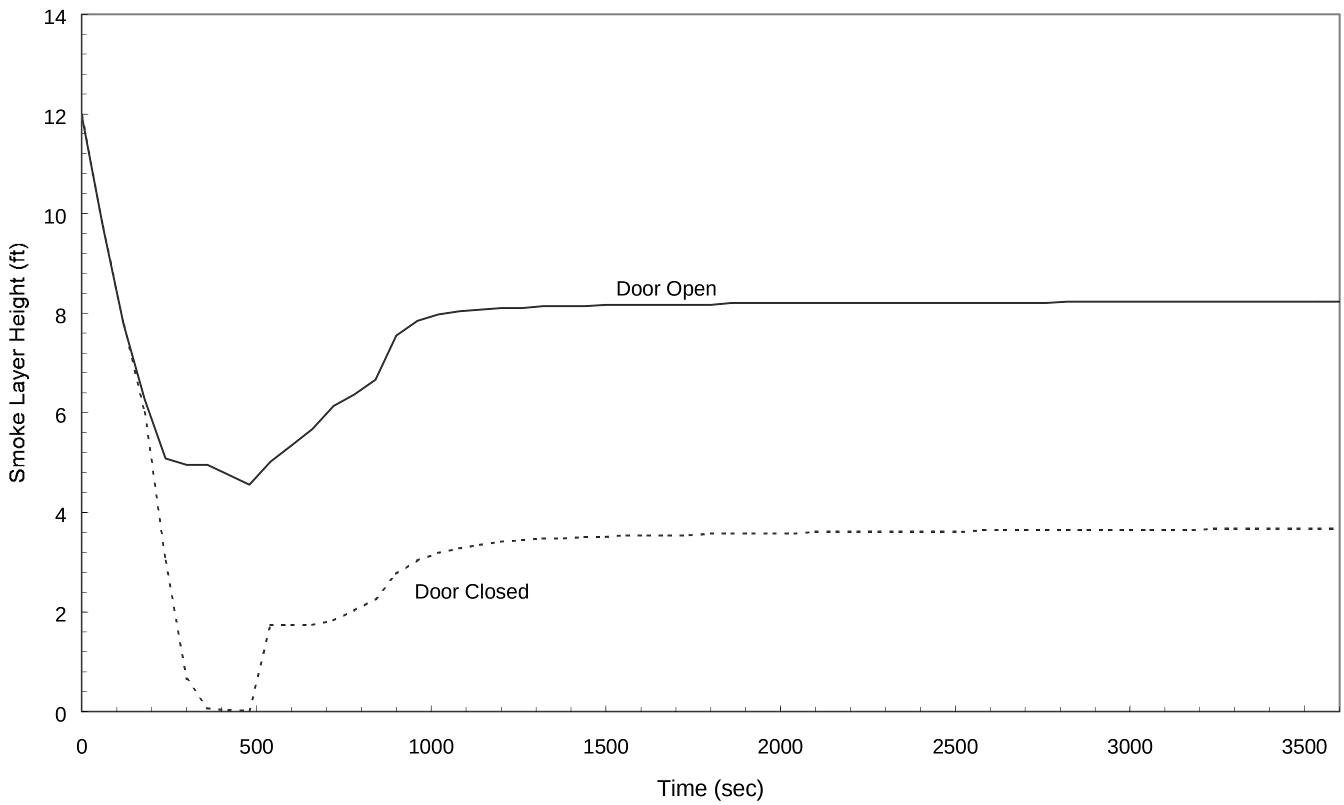

Figure 11 Smoke Layer Height in Fire Zone 99-M. Input Heat Release Rate Test # 24, NUREG/CR-4527, Volume 2

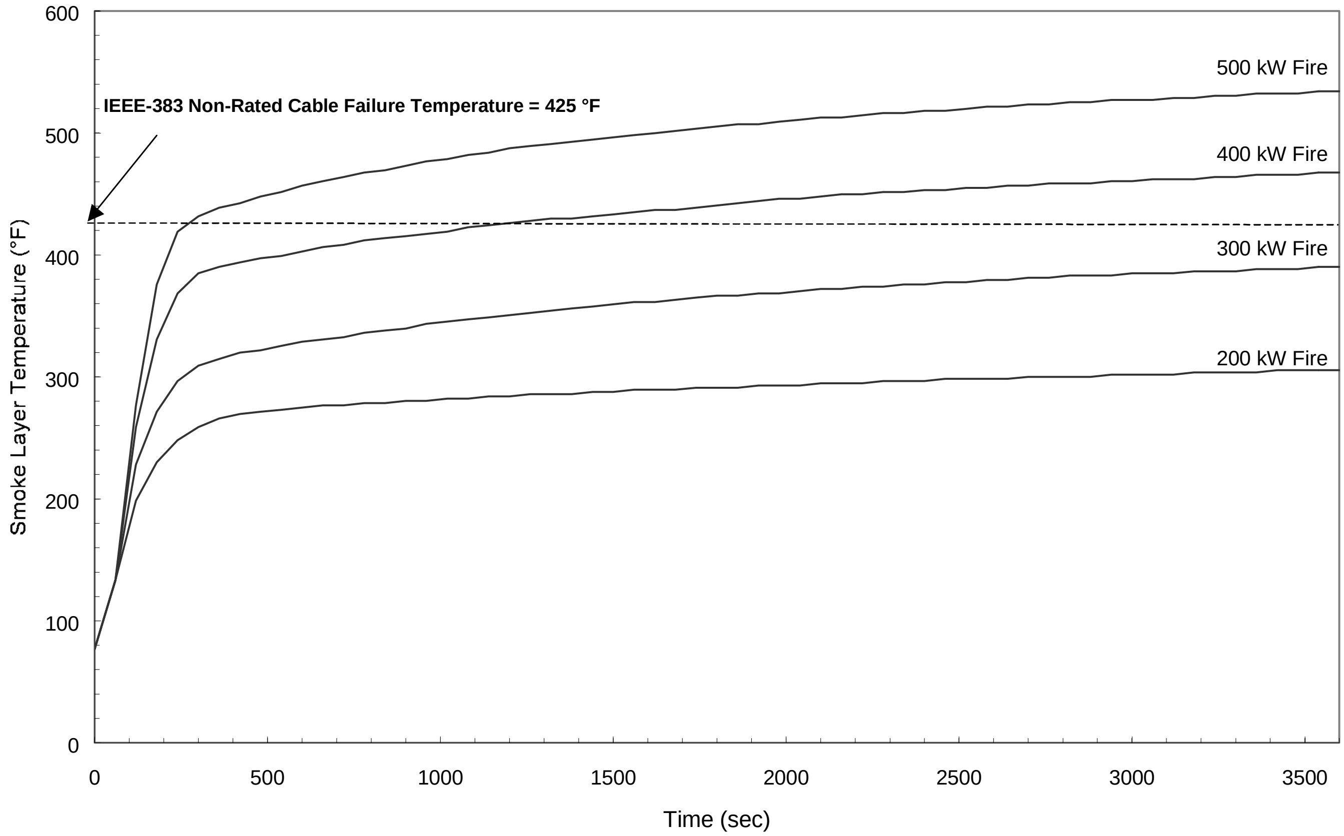

Figure 12 Smoke Layer Temperature in Fire Zone 98-J, Emergency Diesel Generator Corridor, Vent Open

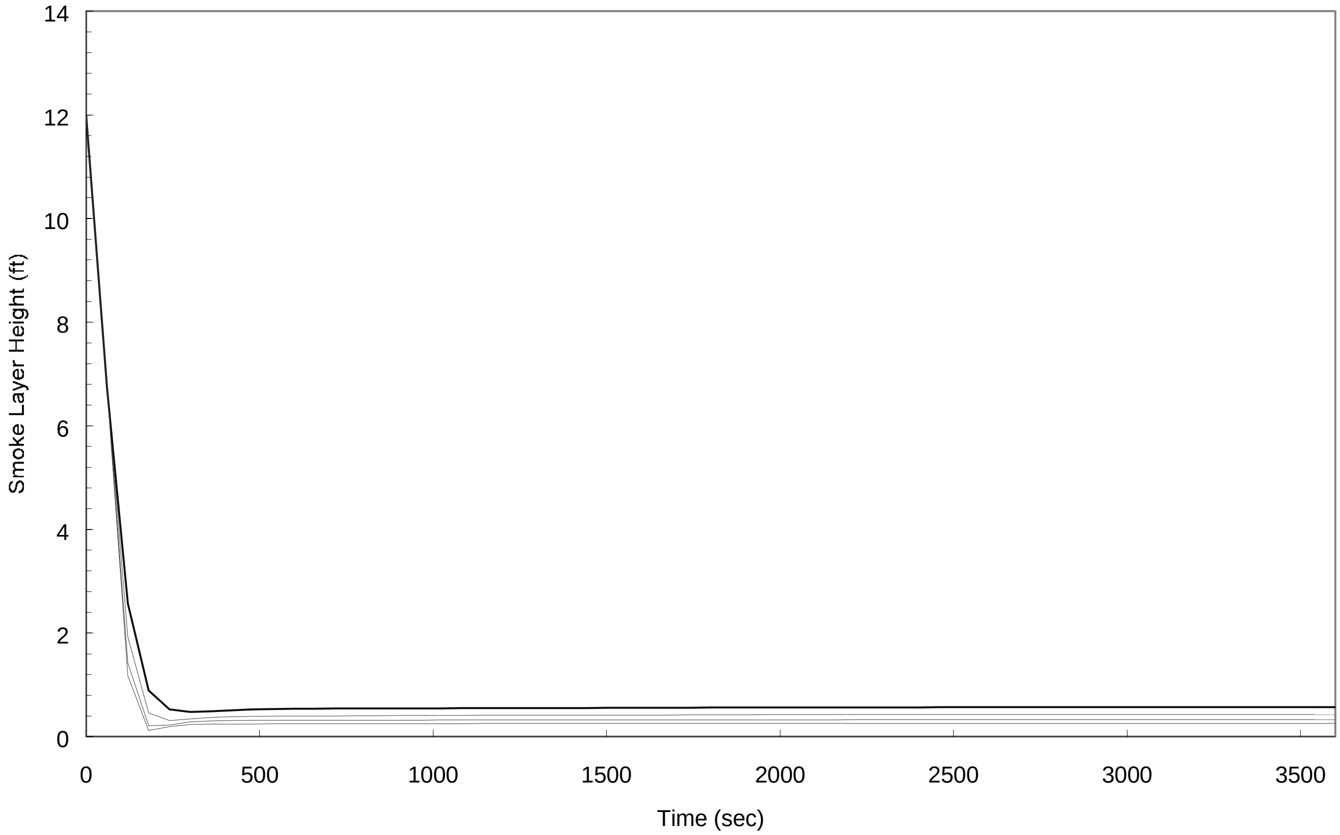

Figure 13 Smoke Layer Height in Fire Zone 98-J, Emergency Diesel Generator Corridor, Vent Open

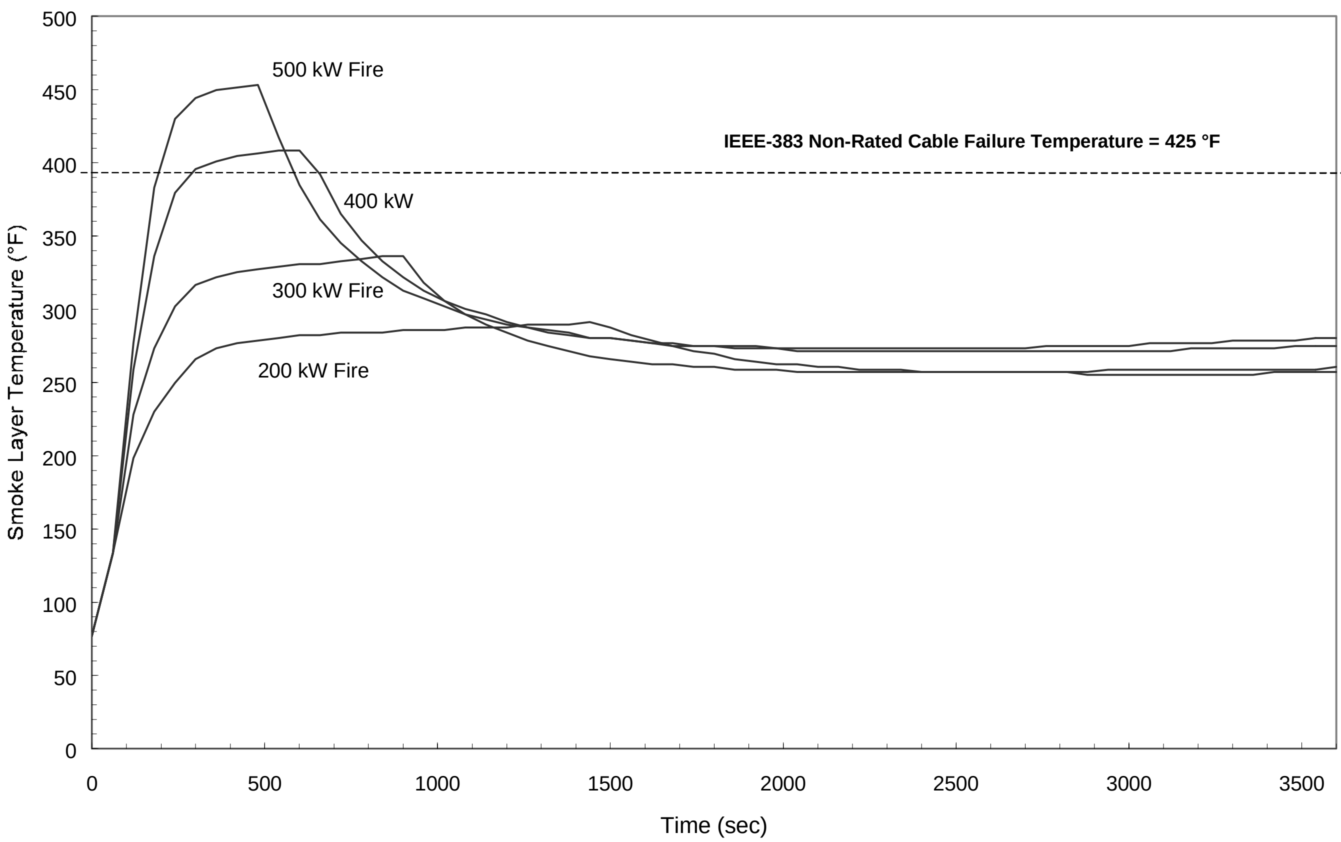

Figure 14 Smoke Layer Temperature in Fire Zone 98-J, Emergency Diesel Generator Corridor, Vent Closed

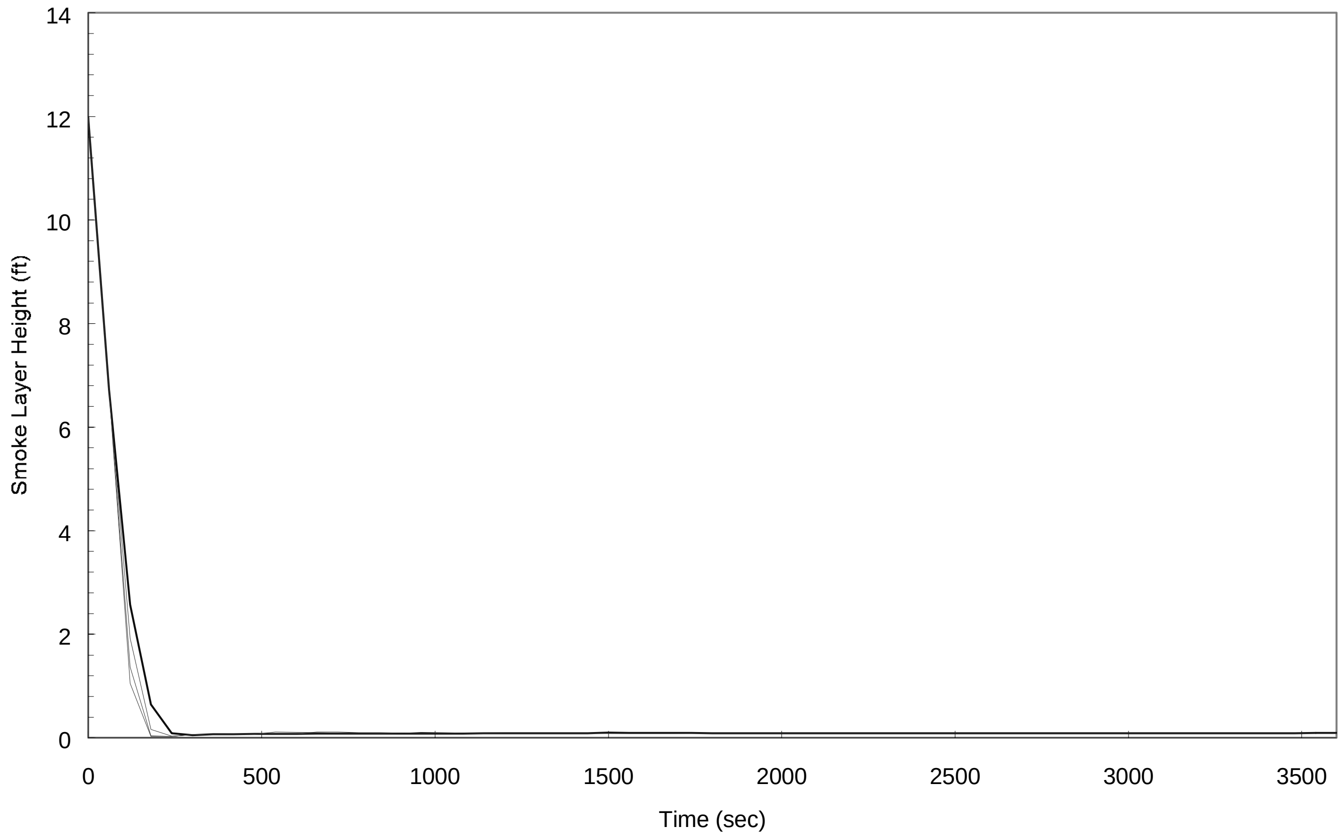

Figure 15 Smoke Layer Height in Fire Zone 98-J, Emergency Diesel Generator Corridor, Vent Closed

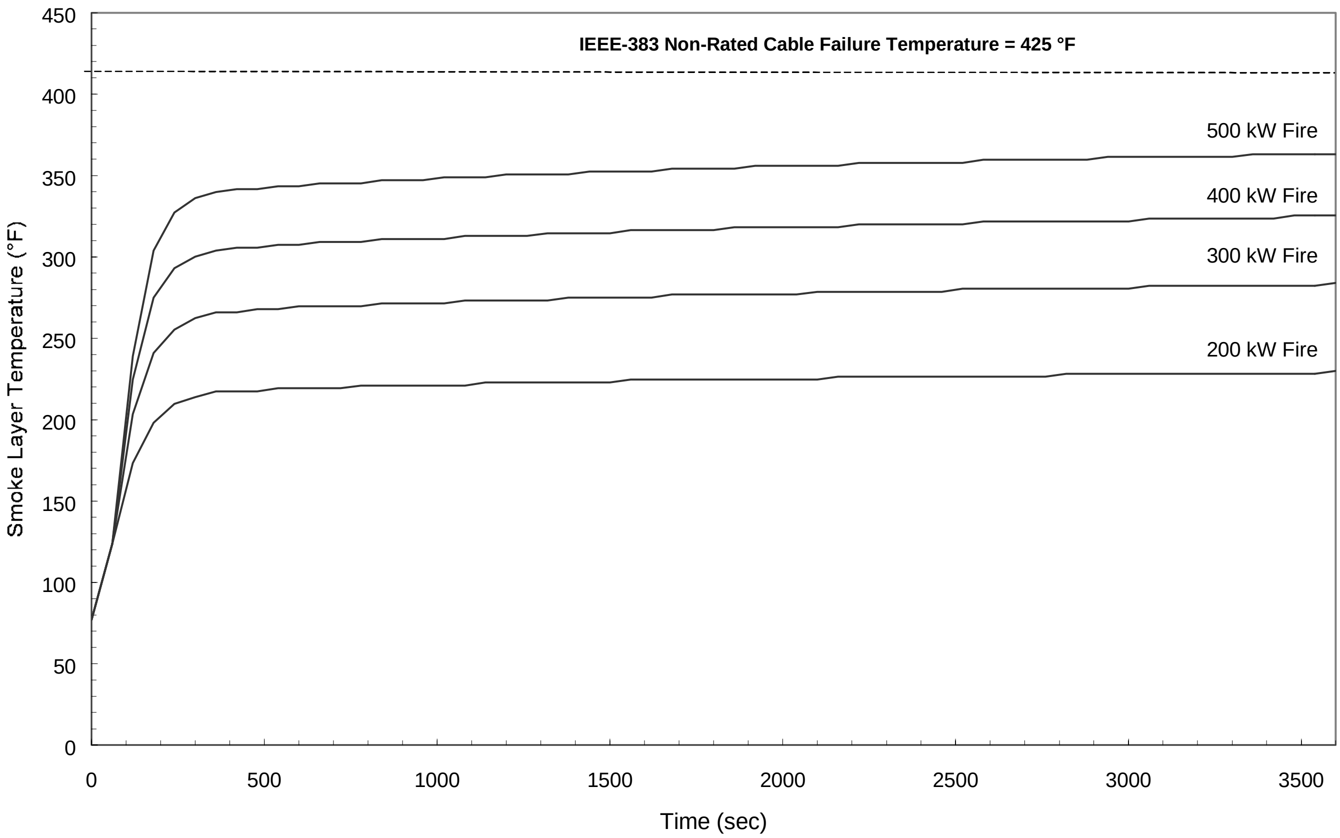

Figure 16 Smoke Layer Temperature in Fire Zone 99-M, North Electrical Switchgear Room, Door Open

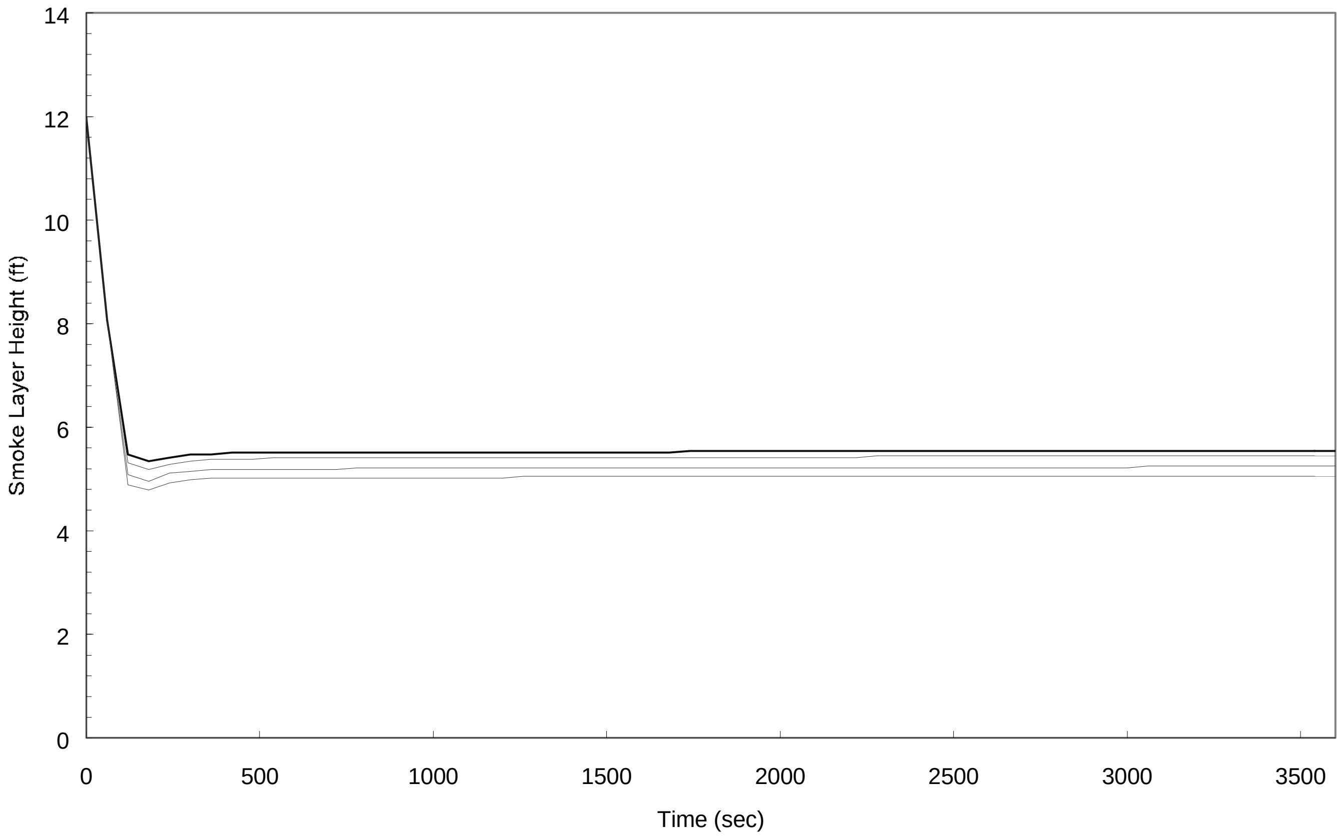

Figure 17 Smoke Layer Height in Fire Zone 99-M, North Electrical Switchgear Room, Door Open

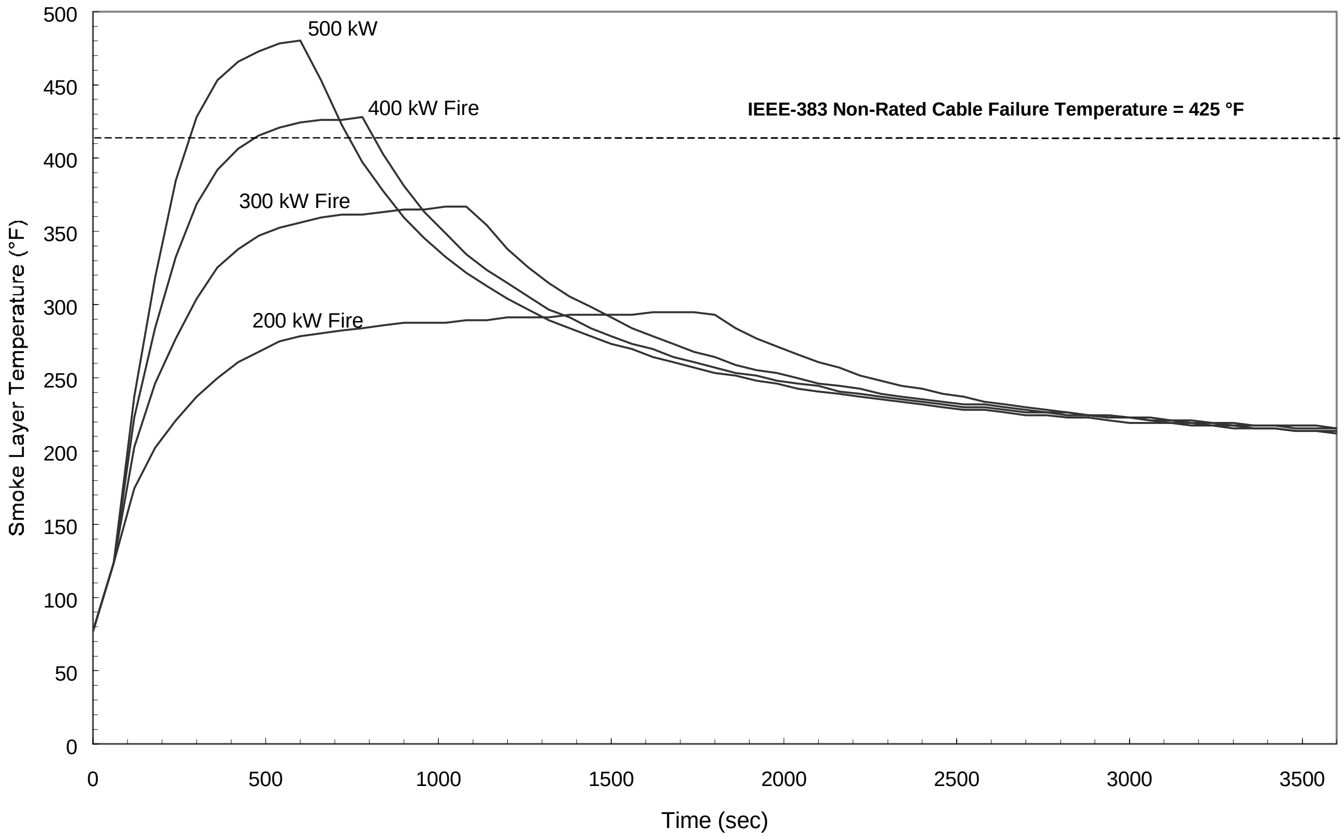

Figure 18 Smoke Layer Temperature in Fire Zone 99-M, North Electrical Switchgear Room, Door Closed

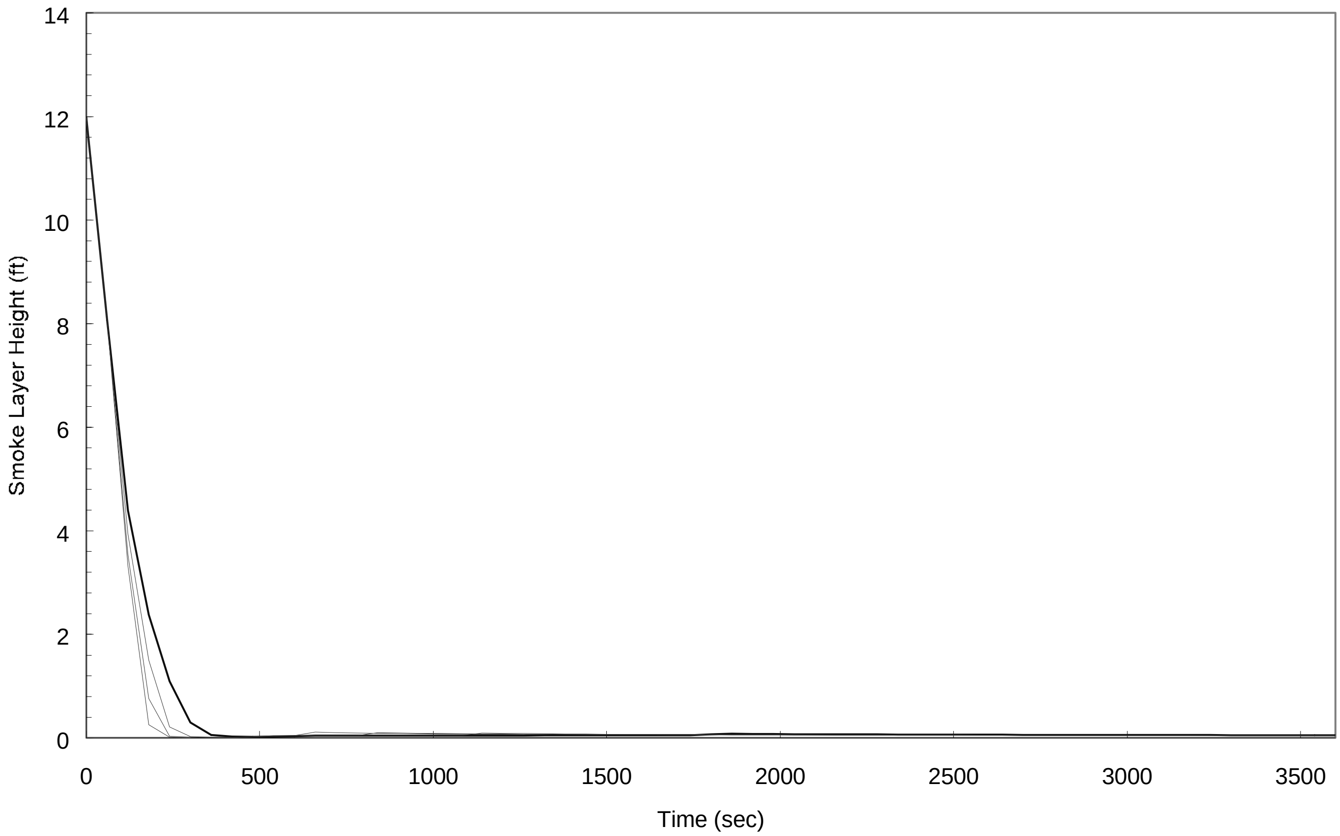

Figure 19 Smoke Layer Height in Fire Zone 99-M, North Electrical Switchgear Room, Door Closed

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APPENDIX - A

Computational Fire Modeling CFAST Input Data
Fire Zone 98-J, Emergency Diesel Generator Corridor and
99-M, North Electrical Switchgear Room
Arkansas Nuclear One - Unit 1

```
VERSN  3   Fire Zone 98-J, 200 kW fire, Vent Open
TIMES 3600  60  60  60   0
```

```
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  2.76
DEPTH  18.28
HEIGH  3.65
HVENT  1  2  1  0.9144  0.6096  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 10  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  66.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  200000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-1.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 98-J, 300 kW fire, Vent Open
```

```
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  2.76
DEPTH  18.28
HEIGH  3.65
HVENT  1  2  1  0.9144  0.6096  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 10  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  80.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  300000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.03
STPMAX  1.00
DUMPR ANO-2.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 98-J, 400 kW fire, Vent Open
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  2.76
DEPTH  18.28
HEIGH  3.65
HVENT  1  2  1  0.9144  0.6096  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 10  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.  60.0  93.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  400000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-3.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 98-J, 500 kW fire, Vent Open
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  2.76
DEPTH  18.28
HEIGH  3.65
HVENT  1  2  1  0.9144  0.6096  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 10  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  104.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  500000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-4.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 98-J, 200 kW fire, Vent Closed
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  2.76
DEPTH  18.28
HEIGH  3.65
HVENT  1  2  1  0.6096   0.3048   0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 10  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  66.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  200000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-5.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 98-J, 300 kW fire, Vent Closed
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  2.76
DEPTH  18.28
HEIGH  3.65
HVENT  1  2  1  0.6096  0.3048  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 10  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  80.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  300000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.03
STPMAX  1.00
DUMPR ANO-6.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 98-J, 400 kW fire, Vent Closed
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  2.76
DEPTH  18.28
HEIGH  3.65
HVENT  1  2  1  0.6096  0.3048  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 10  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.  60.0  93.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  400000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-7.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 98-J, 500 kW fire, Vent Closed
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  2.76
DEPTH  18.28
HEIGH  3.65
HVENT  1  2  1  0.6096  0.3048  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 10  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  104.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  500000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-8.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 99-M, 200 kW fire, Door Open
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  10.56
DEPTH  7.72
HEIGH  3.65
HVENT  1  2  1  1.82  2.44  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  66.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  200000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-9.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 99-M, 300 kW fire, Door Open
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  10.56
DEPTH  7.72
HEIGH  3.65
HVENT  1  2  1  1.82  2.44  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  80.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  300000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-10.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 99-M, 400 kW fire, Door Open
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  10.56
DEPTH  7.72
HEIGH  3.65
HVENT  1  2  1  1.82  2.44  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  93.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  400000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-11.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 99-M, 500 kW fire, Door Open
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  10.56
DEPTH  7.72
HEIGH  3.65
HVENT  1  2  1  1.82  2.44  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  104.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  500000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-12.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 99-M, 200 kW fire, Door Closed
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  10.56
DEPTH  7.72
HEIGH  3.65
HVENT  1  2  1  1.0  0.15  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  66.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  200000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-13.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 99-M, 300 kW fire, Door Closed
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  10.56
DEPTH  7.72
HEIGH  3.65
HVENT  1  2  1  1.0  0.15  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  80.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  300000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-14.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 99-M, 400 kW fire, Door Closed
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  10.56
DEPTH  7.72
HEIGH  3.65
HVENT  1  2  1  1.0  0.15  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  93.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  400000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-15.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 99-M, 500 kW fire, Door Closed
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  10.56
DEPTH  7.72
HEIGH  3.65
HVENT  1  2  1  1.0  0.15  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 30.0  60.0  104.0
FHIGH 0.5  0.5  0.5
FAREA 0.5  0.5  0.5
FQDOT 0.0  42210  168840  500000
CJET OFF
CO    0.14  0.14  0.14
OD    0.05  0.05  0.05
HCR   0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-16.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 98-J, Electrical Cabinet Fire, Test # 23, Vent Open
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  2.76
DEPTH  18.28
HEIGH  3.65
HVENT  1  2  1  0.9144  0.6096  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 90.0  156.0  372.0  450.0  525.0  630.0  720.0  780.0  900.0
FHIGH 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FAREA 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FQDOT 0.0  40000  85000  70000  690000  600000  900000  1235000  925000  1050000
300000
CJET OFF
CO    0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14
OD    0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05
HCR   0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-17.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 98-J, Electrical Cabinet Fire, Test # 23, Vent Closed
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  2.76
DEPTH  18.28
HEIGH  3.65
HVENT  1  2  1  0.6096  0.3048 0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 90.0  156.0  372.0  450.0  525.0  630.0  720.0  780.0  900.0
FHIGH 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FAREA 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FQDOT 0.0  40000  85000  70000  690000  600000  900000  1235000  925000  1050000
300000
CJET OFF
CO    0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14
OD    0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05
HCR   0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-18.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 99-M, Electrical Cabinet Fire, Test # 23, Door Open
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  10.56
DEPTH  7.72
HEIGH  3.65
HVENT  1  2  1  1.82  2.44  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 90.0  156.0  372.0  450.0  525.0  630.0  720.0  780.0  900.0
FHIGH 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FAREA 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FQDOT 0.0  40000  85000  70000  690000  600000  900000  1235000  925000  1050000
300000
CJET OFF
CO    0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14
OD    0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05
HCR   0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-19.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 99-M, Electrical Cabinet Fire, Test # 23, Door Closed
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  10.56
DEPTH  7.72
HEIGH  3.65
HVENT  1  2  1  1.0  0.15  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 90.0  156.0  372.0  450.0  525.0  630.0  720.0  780.0  900.0
FHIGH 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FAREA 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FQDOT 0.0  40000  85000  70000  690000  600000  900000  1235000  925000  1050000
300000
CJET OFF
CO    0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14
OD    0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05
HCR   0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-20.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 98-J, Electrical Cabinet Fire, Test # 24, Vent Open
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  2.76
DEPTH  18.28
HEIGH  3.65
HVENT  1  2  1  0.9144  0.6096  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 150.0  270.0  450.0  480.0  519.0  612.0  720.0  810.0  840.0
FHIGH 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FAREA 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FQDOT 0.0 20000  600000  1200000  1300000  1000000  600000  190000  100000  0.0
CJET OFF
CO    0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14
OD    0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05
HCR   0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-21.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 98-J, Electrical Cabinet Fire, Test # 24, Vent Closed
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  2.76
DEPTH  18.28
HEIGH  3.65
HVENT  1  2  1  0.6096  0.3048 0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 150.0  270.0  450.0  480.0  519.0  612.0  720.0  810.0  840.0
FHIGH 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FAREA 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FQDOT 0.0 20000  600000  1200000  1300000  1000000  600000  190000  100000  0.0
CJET OFF
CO    0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14
OD    0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05
HCR   0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-22.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRAPH 1  170.  300.   0. 625.   820.  10.  5  TIME CELSIUS
GRAPH 2  765.  300.   0. 1220.  820.  10.  5  TIME FIRE_SIZE (kW)
LABEL 1  970.  960.   0. 1231.  1005. 10.  15 00:00:00    0.   0.
LABEL 2  690.  960.   0. 987.   1005. 10.  13 TIME_ [SEC] 0.   0.
TEMPERA  0  0  0  0  1   1 U
HEAT     0  0  0  0  2   1 U
```

```
VERSN  3   Fire Zone 99-M, Electrical Cabinet Fire, Test # 24, Door Open
TIMES 3600  60  60  60   0
TAMB  298. 101300. 0.0
EAMB  298. 101300. 0.0
HI/F   0.0
WIDTH  10.56
DEPTH  7.72
HEIGH  3.65
HVENT  1  2  1  1.82  2.44  0.0  0.0
CEILI  CONCRETE
WALLS  CONCRETE
FLOOR  CONCRETE
CHEMI 16. 10. 12.  24000000.  298.  388. 0.2
LFBO  1
LFBT  2
FPOS  -1.0  -1.0  0.0
FTIME 150.0  270.0  450.0  480.0  519.0  612.0  720.0  810.0  840.0
FHIGH 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FAREA 0.5  0.5   0.5   0.5   0.5   0.5   0.5   0.5  0.5
FQDOT 0.0 20000  600000  1200000  1300000  1000000  600000  190000  100000  0.0
CJET OFF
CO    0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14  0.14
OD    0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05  0.05
HCR   0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30  0.30
STPMAX  1.00
DUMPR ANO-23.Hi
DEVICE 1
WINDOW   0  0. -100. 1280. 1024. 1100.
GRA
```