REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**49-7825**
SRP Section:	**06.02.01.05 – Minimum Containment Pressure Analysis for ECCS Performance Capability Studies**
Application Section:	**6.2.1.5**
Date of RAI Issue:	**06/23/2015**

Question No. 06.02.01.05-1

Section I.D.2 of Appendix K to 10 CFR Part 50 requires, in part, that the applicant calculate a containment pressure used for emergency core cooling system (ECCS) reflood conditions that shall not exceed a pressure conservatively calculated for that purpose. As specified in Standard Review Plan (SRP) Section 6.2.1.5, the conservatively calculated minimum pressure relies on a number of assumptions, including maximizing containment volume and heat transfer to heat sinks.

In Design Control Document (DCD) Tier 2, Section 6.2.1.5.4, the containment free volume used for the minimum pressure calculation is specified, and includes a “consideration of uncertainty.” In a response to the RAI, provide additional detail on the value of this uncertainty, including the magnitude and reasoning used to determine the value, and provide what degree of margin there is from the calculated value versus the expected asbuilt free volume. Update DCD Tier 2, Section 6.2.1.5.4 with the margin used in the minimum pressure calculation. The staff needs this information to assess the degree of conservatism in the analysis.

Response – Rev.1

Containment Maximum Free Volume Uncertainty

The maximum free volume is determined from the gross containment volume minus the volumes of internal structures such as walls and floors, structure steel, equipment, and piping. It is calculated from the following equation:

$V_{net} = V_C + V_D - V_B$

where,

Vc: Containment Cylinder Volume (Maximum value)

$V_{D:}$ Containment Dome Volume (Maximum value)

$V_{B:}$ Containment Blocked Volume (Minimum value)

The containment maximum net free volume used in NSSS accident analyses, such as the LOCA analysis for ECCS performance evaluation, is $[3.431 \times 10^6\ ft^3]^{TS}$. Table 1 presents the summary of the APR1400 containment volume, with uncertainties. Table 2 provides the maximum occupied volume by the components and structures in containment.

Table 1 Summary of Containment Volume

TS

Table 2 Blocked Volumes in Containment

TS

Table 2 Blocked Volumes in Containment (Continued)

TS

Table 2 Blocked Volumes in Containment (Continued)

TS

[redacted]

Containment Free Volume for Minimum Containment Pressure Analysis

CONTEMPT4/MOD5 is a containment analysis code used in the calculation of the minimum containment back pressures for the LBLOCA analysis. This code includes the fan and spray cooling system models and passive heat sink models which are essential to the calculation of containment back pressure for the LBLOCA analysis. To perform the LBLOCA analysis, CONTEMPT4/MOD5 and RELAP5/MOD3.3/K codes are merged to exchange the containment backpressure and the mass and energy release rate for every time step of RELAP5/MOD3.3/K.

The maximum containment net free volume of 97,155 m^3 (3,431,000 ft^3) is applied to the conservative minimum containment pressure analysis (See Table 1 above). Adjustments have been made in light of the inconsistencies in the minimum containment pressure analysis data of Section 6.2.1.5, including conservative containment net free volume (101,516 m^3 (3,585,000 ft^3)) and passive heat sink data (see details in the response to Question 06.02.01.05-2).

Other conservative assumptions are applied to the current minimum containment pressure analysis; for example:

1) No containment spray delay time. (The design value for the minimum spray delay time is 27 seconds)
2) No fan cooler trip. (The design value for the fan cooler trip time is approximately 75 seconds)
3) Higher fan cooler cooling capacity.

Figure 06.02.01.05-1-1 shows a comparison of the containment pressure using the current containment input against the revised input. The passive heat sink data of current containment input are constructed by merging 10 heat structures of conservative surface area and wall thickness. The 19 heat structures are modeled with the direct reflection of the revised containment input design data. (See markup in Attachment 1)

The re-analyses of the LBLOCA have been performed. Tables 6.2.1-23 and 6.2.1-24 are revised to incorporate the updated information. Table 6.2.1-39 and Figures 6.2.1-48, 49, 50, 51 and 52 are also revised.

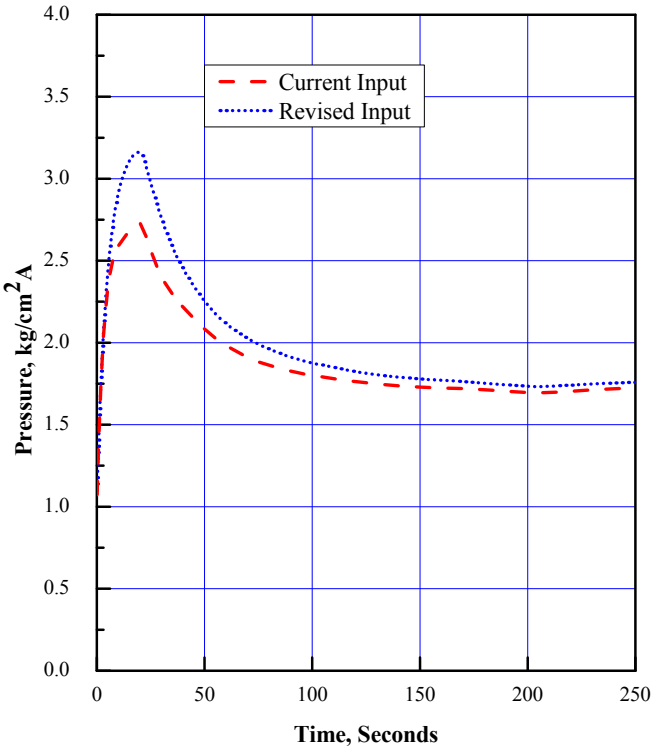

Figure 06.02.01.05-1-1. Pressure Comparison between Current and Revised Containment input

Impact on DCD

DCD Sections 6.2.1.5.4, Part C of Table 6.2.1-23 and Part B of Table 6.2.1-24 are revised as shown in the attached markup. Table 6.2.1-39, Figures 6.2.1-48, -49, -50, -51 and -52 are also revised. DCD Table 6.2.1-23 (Sheet 5 of 7, 6 of 7, 7 of 7) is revised to reflect changes submitted in the attached to RAI 296-8342.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Report

There is no impact on any Technical, Topical and Environmental Report.

heat transfer model of the reflood package of RELAP5/MOD3.3 has been modified based on independent assessment calculations against the FLECHT-SEASET data.

Containment back pressure depends on mass and energy release rates, and thermal-hydraulic phenomena depend on the containment back pressure. CONTEMPT4/MOD5 is a containment analysis code that is used especially for calculating containment back pressures in case of a LOCA. It includes fan and spray cooling system models and passive heat sink models that are essential for the calculation of the containment back pressures following a LOCA. It is equipped with the conservation equations of mass, momentum, and energy and can calculate the mass and energy transfer due to the pressure difference between compartments. It also includes state equation of non-condensable gas and can calculate humidity. Heat conduction can be modeled with diverse boundary heat transfer conditions.

RELAP5/MOD3.3 and CONTEMPT4/MOD5 are merged to exchange the containment back pressure calculated by the CONTEMPT4 and the mass and energy release rate calculated by the ~~RELAP5~~ in every time step.

RELAP5/MOD3.3/K

6.2.1.5.2 Mass and Energy Release Data

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The mass and energy released to the containment for a limiting LBLOCA, 100 percent double-ended guillotine break at the pump discharge leg (1.0 × DEG/PD), are listed as a function of time in Table 6.2.1-~~40~~. The quantity of safety injection fluid that spills from the break is described in Subsection 6.2.1.5.6. The analytical models applied in Subsection 15.6.5 best estimate analysis calculate the mass and energy released to the containment. This results are used to the calculation of minimum containment pressure.

6.2.1.5.3 Initial Containment Internal Conditions

The minimum containment temperature, minimum containment pressure, and maximum humidity encountered under limiting normal operating conditions are used for the analysis. The initial containment internal conditions that are used in the analysis are as follows:

Containment temperature	10 °C (50 °F) (minimum value)
~~Containment~~ IRWST water temperature	10 °C (50 °F) (minimum value)

delete

Containment pressure	1.024 kg/cm^{2}A (14.56 psia) (minimum value)
Relative humidity	90 percent (maximum value)

Each condition is a specified conservative value to minimize the containment pressure, consistent with Branch Technical Position 6-2 (Reference 20).

6.2.1.5.4 Containment Volume

97,155

3,431,000

The maximum net free containment volume that is used for the analysis is ~~101,516~~ m^3 (~~3,585,000~~ ft^3). The maximum net free volume is determined from the gross containment volume minus the volumes of internal structures such as walls and floors, structural steel, major equipment, and piping with a consideration of uncertainty.

6.2.1.5.5 Active Heat Sinks

In order to conservatively consider the heat removal capacity of the containment active heat sinks, the containment sprays and cooling fans are modeled to actuate immediately with the maximum capacity at the time of the postulated LOCA.

The containment atmosphere cooling systems designed as the non-safety-related system are also modeled to actuate immediately at the time of the postulated LOCA. In addition, the minimum temperature of the stored water for the spray cooling system and the cooling water supplied to the fan coolers, based on technical specification limits, are assumed.

The operating parameters for the containment sprays that are used in the analysis are as follows:

Flow rate (total, 4 pumps)	75,706 L/min (20,000 gpm)
Temperature	10.0 °C (50 °F)

The heat removal capacity of reactor containment fan cooler (RCFC) is shown in Figure 6.2.1-48.

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Table 6.2.1-23 (5 of 7)

Part C. Containment Physical Parameters – ECCS Performance Analysis

Net Free Volume	101,516 m^3 (3,585,000 ft^3)
Initiation Time for Spray Flow	0 sec
Containment Initial Conditions:	
Temperature	10 °C (50 °F)
Pressure	1.024 kg/cm^2A (14.56 psia)
Relative Humidity	90 %
Containment Spray Water:	
Temperature	10.0 °C (50 °F)
Flow Rate (4 pumps)	75706 L/min (20,000 gpm)

Heat Sink Physical Data

Heat Sinks	Layer	Material	Thickness		Surface Area	
			ft	m	ft^2	m^2
Containment cylinder	1	E Paint	0.00025	7.62E-05	84,005	7,804.4
	2	Z Paint	0.00025	7.62E-05		
	3	Carbon Steel	0.0288	0.008778		
	4	Concrete	4.4488	1.355994		
Dome	1	E Paint	0.00025	7.62E-05	35,696.4	3,316.3
	2	Z Paint	0.00025	7.62E-05		
	3	Carbon Steel	0.0259	0.007894		
	4	Concrete	3.5	1.0668		
Basemat	1	E Paint	0.002192	0.000668	15,186.3	1,410.9
	2	Concrete	3	0.9144		
	3	Carbon Steel	0.020833	0.00635		
	4	Concrete	12	3.6576		
Embedment Concrete	1	E Paint	0.00025	7.62E-05	7,815.6	726.1
	2	Z Paint	0.00025	7.62E-05		
	3	Carbon Steel	0.0864	0.026335		
	4	Concrete	2.5616	0.780776		

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Table 6.2.1-23 (5 of 7)

Part C. Heat Sink Physical Data for ECCS Performance Analysis

Heat Sinks	Layer	Material	Thickness		Surface Area	
			ft	m	ft^2	m^2
Containment cylinder	1	E Paint	0.00025	7.62E-05	84,005	7,804.3
	2	Z Paint	0.00025	7.62E-05		
	3	Carbon Steel	0.0288	0.008778		
	4	Concrete	4.4488	1.355994		
Dome	1	E Paint	0.00025	7.62E-05	35,696.4	3,316.3
	2	Z Paint	0.00025	7.62E-05		
	3	Carbon Steel	0.0259	0.007894		
	4	Concrete	3.5	1.0668		
Basemat	1	E Paint	0.002192	0.000668	15,186.3	1,410.9
	2	Concrete	3	0.9144		
	3	Carbon Steel	0.020833	0.00635		
	4	Concrete	12	3.6576		
Embedment Concrete	1	E Paint	0.00025	7.62E-05	7,815.6	726.1
	2	Z Paint	0.00025	7.62E-05		
	3	Carbon Steel	0.0864	0.026335		
	4	Concrete	2.5616	0.780776		

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Table 6.2.1-23 (5 of 7)

Part C. Heat Sink Physical Data for ECCS Performance Analysis

Heat Sinks	Layer	Material	Thickness		Surface Area	
			m	ft	m^2	ft^2
Containment cylinder	1	E Paint	0.0000762	0.00025	7,804.3	84,005
	2	Z Paint	0.0000762	0.00025		
	3	Carbon Steel	0.008778	0.0288		
	4	Concrete	1.355994	4.4488		
Dome	1	E Paint	0.0000762	0.00025	3,316.3	35,696.4
	2	Z Paint	0.0000762	0.00025		
	3	Carbon Steel	0.007894	0.0259		
	4	Concrete	1.0668	3.5		
Basemat	1	E Paint	0.000668	0.002192	1,410.9	15,186.3
	2	Concrete	0.9144	3		
	3	Carbon Steel	0.00635	0.020833		
	4	Concrete	3.6576	12		
Embedment Concrete	1	E Paint	0.0000762	0.00025	726.1	7,815.6
	2	Z Paint	0.0000762	0.00025		
	3	Carbon Steel	0.026335	0.0864		
	4	Concrete	0.780776	2.5616		

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Table 6.2.1-23 (6 of 7)

Heat Sink Physical Data (cont.):

Heat Sinks	Layer	Material	Thickness		Surface Area	
			ft	m	ft^2	m^2
Unembedment Concrete	1	E Paint	0.001275	0.000389	119,702.4	11,120.8
	2	Concrete	2.534579	0.77254		
	2	Concrete	1.5	0.4572		
Lined Fuel Pool	1	Stainless Steel	0.0172	0.005243	12,417.7	1,153.6
IRWST Outside	1	E Paint	0.002192	0.000668	21,714.6	2,017.4
	2	Concrete	1.5	0.4572		
IRWST Inside	1	Stainless Steel	0.0208	0.00634	29,518.8	2,742.4
	2	Concrete	1.5	0.4572		
Polar Crane and Bridge	1	E Paint	0.0005	0.000152	89,250	8,291.6
	2	Z Paint	0.0005	0.000152		
	2	Carbon Steel	0.04	0.012192		
SIT	1	E Paint	0.00833	0.002539	5,670	526.8
	2	Carbon Steel	0.1601	0.048798		
Misc. Steel G-A	1	E Paint	0.00025	7.62E-05	109,922	10,212.1
	2	Z Paint	0.00025	7.62E-05		
	3	Carbon Steel	0.054831	0.016712		
Misc. Steel G-B	1	Z Paint	0.00025	7.62E-05	760,15.5	7,062.1
	3	Carbon Steel	0.013698	0.004175		
Misc. Steel G-C	1	E Paint	0.00025	7.62E-05	54,835.5	5,094.4
	2	Z Paint	0.00025	7.62E-05		
	3	Carbon Steel	0.016127	0.004916		
Misc. Steel G-D	1	Z Paint	0.00025	7.62E-05	39,439.6	3,664.1
	2	Carbon Steel	0.013124	0.004		
Misc. Steel G-E	1	Z Paint	0.00025	7.62E-05	232,041.9	21,557.5
	2	Carbon Steel	0.005393	0.001644		

Table 6.2.1-23 (6 of 7)

Part C. Heat Sink Physical Data for ECCS Performance Analysis (Continued)

Heat Sinks	Layer	Material	Thickness		Surface Area	
			ft	m	ft^2	m^2
Unembedment Concrete	1	E Paint	0.001275	0.000389	119,702	11,120.7
	2	Concrete	2.534579	0.77254		
Refueling Pool	1	Stainless Steel	0.0172	0.005243	12,417.7	1,153.6
IRWST Outside	1	E Paint	0.002192	0.000668	21,714.6	2,017.4
	2	Concrete	1.5	0.4572		
IRWST Inside	1	Stainless Steel	0.0208	0.00633984	11,181.7	1,038.8
	2	Concrete	1.5	0.4572		
Polar Crane and Bridge	1	E Paint	~~0.0025~~	~~0.0000762~~	89,250	8,291.6
	2	Z Paint	~~0.0025~~	0.0000762		
	3	Carbon Steel	0.04	0.012192		
SIT	1	E Paint	0.0005	0.000152	5,670	526.8
	2	Carbon Steel	0.1601	0.048798		
Misc. steel G-A	1	E Paint	0.00025	7.62E-05	109,922	10,212.1
	2	Z Paint	0.00025	7.62E-05		
	3	Carbon Steel	0.054831	0.016712		
Misc. steel G-B	1	Z Paint	0.00025	7.62E-05	76,015.5	7,062.1
	3	Carbon Steel	0.013698	0.004175		
Misc. steel G-C	1	E Paint	0.00025	7.62E-05	36,182.7	3,361.5
	2	Z Paint	0.00025	7.62E-05		
	3	Carbon Steel	0.016998	0.00518099		
Misc. steel G-D	1	Z Paint	0.00025	7.62E-05	39,439.6	3,664.1
	2	Carbon Steel	0.013124	0.004		
Misc. steel G-E	1	Z Paint	0.00025	7.62E-05	232,042	21,557.5
	2	Carbon Steel	0.005393	0.001644		

0.00025

0.00025

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Table 6.2.1-23 (6 of 7)

Part C. Heat Sink Physical Data for ECCS Performance Analysis (Continued)

Heat Sinks	Layer	Material	Thickness		Surface Area	
			m	ft	m^2	ft^2
Unembedment Concrete	1	E Paint	0.000389	0.001275	11,120.7	119,702
	2	Concrete	0.77254	2.534579		
Refueling Pool	1	Stainless Steel	0.005243	0.0172	1,153.6	12,417.7
IRWST Outside	1	E Paint	0.000668	0.002192	2,017.4	21,714.6
	2	Concrete	0.4572	1.5		
IRWST Inside	1	Stainless Steel	0.00633984	0.0208	1,038.8	11,181.7
	2	Concrete	0.4572	1.5		
Polar Crane and Bridge	1	E Paint	0.0000762	0.00025	8,291.6	89,250
	2	Z Paint	0.0000762	0.00025		
	3	Carbon Steel	0.012192	0.04		
SIT	1	E Paint	0.000152	0.0005	526.8	5,670
	2	Carbon Steel	0.048798	0.1601		
Misc. steel G-A	1	E Paint	0.0000762	0.00025	10,212.1	109,922
	2	Z Paint	0.0000762	0.00025		
	3	Carbon Steel	0.016712	0.054831		
Misc. steel G-B	1	Z Paint	0.0000762	0.00025	7,062.1	76,015.5
	3	Carbon Steel	0.004175	0.013698		
Misc. steel G-C	1	E Paint	0.0000762	0.00025	3,361.5	36,182.7
	2	Z Paint	0.0000762	0.00025		
	3	Carbon Steel	0.00518099	0.016998		
Misc. steel G-D	1	Z Paint	0.0000762	0.00025	3,664.1	39,439.6
	2	Carbon Steel	0.004	0.013124		
Misc. steel G-E	1	Z Paint	0.0000762	0.00025	21,557.5	232,042
	2	Carbon Steel	0.001644	0.005393		

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Table 6.2.1-23 (7 of 7)

Heat Sink Physical Data (cont.):

Heat Sinks	Layer	Material	Thickness		Surface Area	
			ft	m	(ft^2)	m^2
Misc. Steel G-F	1	E Paint	0.00025	7.62E-05	17,091.1	1,587.8
	2	Z Paint	0.00025	7.62E-05		
	3	Carbon Steel	0.021554	0.00657		
Misc. Steel G-G	1	Stainless Steel	0.020998	0.0064	20,716.8	1,924.7
Misc. Steel G-H	1	Stainless Steel	0.002624	0.0008	58,096.1	5,397.3
Misc. Steel G-I	1	Z Paint	0.00025	7.62E-05	4,528.8	420.7
	2	Carbon Steel	0.22706	0.069208		
Misc. Steel G-J	1	Z Paint	0.00025	7.62E-05	18,713.6	1,738.6
	2	Carbon Steel	0.030235	0.009216		
Misc. Steel G-K	1	Stainless Steel	0.23805	0.072558	13,662.7	1,269.3

Thermal Conductivity of:	
Steel	40.6 kcal/m-hr-°C (27.3 Btu/ft-hr-°F)
Concrete	1.49 kcal/m-hr-°C (1.0 Btu/ft-hr-°F)
Paint (epoxy)	0.31 kcal/m-hr-°C (0.21 Btu/ft-hr-°F)
Paint (inorganic zinc)	1.49 kcal/m-hr-°C (1.0 Btu/ft-hr-°F)
Volumetric Heat Capacity of:	
Steel	942 kcal/m-hr-°C (58.80 Btu/ft^3-°F)
Concrete	517 kcal/m-hr-°C (32.3 Btu/ft^3-°F)
Paint (epoxy)	585 kcal/m-hr-°C (36.5 Btu/ft^3-°F)
Paint (inorganic zinc)	1250 kcal/m-hr-°C (78.0 Btu/ft^3-°F)

Table 6.2.1-23 (7 of 7)

Part C. Heat Sink Physical Data for ECCS Performance Analysis (Continued)

Heat Sinks	Layer	Material	Thickness		Surface Area	
			ft	m	ft^2	m^2
Misc. steel G-F	1	E Paint	0.00025	7.62E-05	17,106.9	1,589.3
	2	Z Paint	0.00025	7.62E-05		
	3	Carbon Steel	0.022075	0.00672846		
Misc. steel G-G	1	Stainless Steel	0.020600	0.00627888	20,149.6	1,872.0
Misc. steel G-J	1	Z Paint	0.00025	7.62E-05	18,713.6	1,738.6
	2	Carbon Steel	0.030235	0.009216		
Misc. steel G-K	1	Stainless Steel	0.23805	0.072558	13,662.7	1,269.3

Part D. Thermophysical Properties of Materials for ECCS Performance Analysis

Thermal Conductivity of:	
Steel	40.6 kcal/m-hr-°C (27.3 Btu/ft-hr-°F)
Concrete	1.94 kcal/m-hr-°C (1.3 Btu/ft-hr-°F)
Paint (epoxy)	0.31 kcal/m-hr-°C (0.21 Btu/ft-hr-°F)
Paint (inorganic zinc)	1.49 kcal/m-hr-°C (1.0 Btu/ft-hr-°F)
Volumetric Heat Capacity of:	
Steel	942 kcal/m^3-°C (58.8 Btu/ft^3-°F)
Concrete	517 kcal/m^3-°C (32.3 Btu/ft^3-°F)
Paint (epoxy)	585 kcal/m^3-°C (36.5 Btu/ft^3-°F)
Paint (inorganic zinc)	1250 kcal/m^3-°C (78.0 Btu/ft^3-°F)

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Table 6.2.1-23 (7 of 7)

Part C. Heat Sink Physical Data for ECCS Performance Analysis (Continued)

Heat Sinks	Layer	Material	Thickness		Surface Area	
			m	ft	m^2	ft^2
Misc. steel G-F	1	E Paint	0.0000762	0.00025	1,589.3	17,106.9
	2	Z Paint	0.0000762	0.00025		
	3	Carbon Steel	0.00672846	0.022075		
Misc. steel G-G	1	Stainless Steel	0.00627888	0.020600	1,872.0	20,149.6
Misc. steel G-J	1	Z Paint	0.0000762	0.00025	1,738.6	18,713.6
	2	Carbon Steel	0.009216	0.030235		
Misc. steel G-K	1	Stainless Steel	0.072558	0.23805	1,269.3	13,662.7

Thermal Conductivity of:	
Steel	40.6 kcal/m-hr-°C (27.3 Btu/ft-hr-°F)
Concrete	1.94 kcal/m-hr-°C (1.3 Btu/ft-hr-°F)
Paint (epoxy)	0.31 kcal/m-hr-°C (0.21 Btu/ft-hr-°F)
Paint (inorganic zinc)	1.49 kcal/m-hr-°C (1.0 Btu/ft-hr-°F)
Volumetric Heat Capacity of:	
Steel	942 kcal/m^3-°C (58.8 Btu/ft^3-°F)
Concrete	517 kcal/m^3-°C (32.3 Btu/ft^3-°F)
Paint (epoxy)	585 kcal/m^3-°C (36.5 Btu/ft^3-°F)
Paint (inorganic zinc)	1,250 kcal/m^3-°C (78.0 Btu/ft^3-°F)

Table 6.2.1-24

Initial Conditions for Containment Pressure Analysis

Part A. Initial Conditions for Containment External Pressure Analysis

Parameter	Initial Conditions
Containment Initial Conditions Initial Temperature Initial Pressure Relative Humidity	 48.9 °C (120 °F) 0.997 kg/cm²A (14.18 psia) 100 %
Containment Spray Temperature	10 °C (50 °F)

Part B. Initial Conditions for Containment Minimum Pressure Analysis

Parameter	97,155 Initial Conditions
Net free volume	~~101,516~~ m^3 (~~3.585~~ × 10^6 ft^3)
Initial Time for Spray Flow	0 sec 3.431
Containment Initial Conditions Initial Temperature Initial Pressure Relative Humidity	 10 °C (50 °F) 1.024 kg/cm²A (14.56 psia) 90 %
Containment Spray Water Temperature Flow Rate (2 pumps)	 10 °C (50 °F) 37,853 L/min (10,000 gpm)

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Table 6.2.1-39 (1 of 4)

Blowdown and Reflood Mass and Energy Release for the Minimum Containment Pressure Analysis

Time (sec)	Mass Flow		Energy Release		Integral of Mass Flow		Integral of Energy Release	
	(kg/sec)	(lbm/sec)	(kcal/sec)	(Btu/sec)	(kg)	(lbm)	(kcal)	(Btu)
0.0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.5	4.0478E+04	8.9239E+04	3.0496E+02	5.4892E+02	1.9390E+04	4.2747E+04	3.0489E+02	5.4881E+02
1.0	3.8352E+04	8.4551E+04	3.0536E+02	5.4966E+02	3.9243E+04	8.6517E+04	3.0502E+02	5.4904E+02
1.5	3.5484E+04	7.8229E+04	3.0614E+02	5.5104E+02	5.7629E+04	1.2705E+05	3.0525E+02	5.4943E+02
2.0	3.3342E+04	7.3507E+04	3.0736E+02	5.5324E+02	7.4844E+04	1.6500E+05	3.0557E+02	5.5004E+02
2.5	3.0077E+04	6.6308E+04	3.0904E+02	5.5628E+02	9.0762E+04	2.0010E+05	3.0603E+02	5.5082E+02
3.0	2.6917E+04	5.9342E+04	3.1092E+02	5.5965E+02	1.0495E+05	2.3138E+05	3.0657E+02	5.5182E+02
3.5	2.4673E+04	5.4394E+04	3.1330E+02	5.6394E+02	1.1780E+05	2.5970E+05	3.0716E+02	5.5291E+02
4.0	2.3000E+04	5.0706E+04	3.1553E+02	5.6796E+02	1.2972E+05	2.8599E+05	3.0785E+02	5.5411E+02
4.5	2.1681E+04	4.7798E+04	3.1769E+02	5.7186E+02	1.4088E+05	3.1059E+05	3.0853E+02	5.5536E+02
5.0	2.0762E+04	4.5773E+04	3.1906E+02	5.7429E+02	1.5148E+05	3.3395E+05	3.0921E+02	5.5658E+02
5.5	1.9331E+04	4.2616E+04	3.2273E+02	5.8093E+02	1.6150E+05	3.5605E+05	3.0993E+02	5.5787E+02
6.0	1.8100E+04	3.9903E+04	3.2677E+02	5.8820E+02	1.7084E+05	3.7665E+05	3.1075E+02	5.5933E+02
6.5	1.6981E+04	3.7436E+04	3.3031E+02	5.9456E+02	1.7961E+05	3.9598E+05	3.1162E+02	5.6091E+02
7.0	1.6005E+04	3.5284E+04	3.3358E+02	6.0047E+02	1.8785E+05	4.1414E+05	3.1251E+02	5.6252E+02
7.5	1.5184E+04	3.3475E+04	3.3654E+02	6.0577E+02	1.9564E+05	4.3132E+05	3.1341E+02	5.6413E+02
8.0	1.4343E+04	3.1621E+04	3.4015E+02	6.1228E+02	2.0302E+05	4.4759E+05	3.1431E+02	5.6576E+02
8.5	1.3768E+04	3.0354E+04	3.4188E+02	6.1537E+02	2.1003E+05	4.6303E+05	3.1519E+02	5.6735E+02

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Table 6.2.1-39 (1 of 4)

Blowdown and Reflood Mass and Energy Release for the Minimum Containment Pressure Analysis

Time	Mass Flow		Enthalpy		Integral of Mass Flow		Integral of Energy	
(sec)	(kg/sec)	(lbm/sec)	(kcal/kg)	(Btu/lbm)	(kg)	(lbm)	(kcal)	(Btu)
0.0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.5	3.9083E+04	8.6164E+04	3.0484E+02	5.4870E+02	1.9481E+04	4.2948E+04	5.9366E+06	2.3558E+07
1.0	3.7229E+04	8.2076E+04	3.0525E+02	5.4944E+02	3.8697E+04	8.5313E+04	1.1798E+07	4.6818E+07
1.5	3.4198E+04	7.5395E+04	3.0599E+02	5.5078E+02	5.6465E+04	1.2448E+05	1.7227E+07	6.8364E+07
2.0	3.2051E+04	7.0661E+04	3.0712E+02	5.5282E+02	7.3059E+04	1.6107E+05	2.2314E+07	8.8548E+07
2.5	2.9526E+04	6.5093E+04	3.0870E+02	5.5566E+02	8.8435E+04	1.9497E+05	2.7047E+07	1.0733E+08
3.0	2.6495E+04	5.8411E+04	3.1044E+02	5.5879E+02	1.0245E+05	2.2587E+05	3.1385E+07	1.2455E+08
3.5	2.4309E+04	5.3593E+04	3.1248E+02	5.6246E+02	1.1511E+05	2.5378E+05	3.5328E+07	1.4019E+08
4.0	2.2818E+04	5.0305E+04	3.1483E+02	5.6670E+02	1.2688E+05	2.7972E+05	3.9020E+07	1.5484E+08
4.5	2.1564E+04	4.7541E+04	3.1670E+02	5.7006E+02	1.3793E+05	3.0408E+05	4.2509E+07	1.6869E+08
5.0	2.0493E+04	4.5180E+04	3.1844E+02	5.7320E+02	1.4841E+05	3.2719E+05	4.5840E+07	1.8191E+08
5.5	1.9184E+04	4.2294E+04	3.2188E+02	5.7939E+02	1.5834E+05	3.4908E+05	4.9016E+07	1.9451E+08
6.0	1.8037E+04	3.9764E+04	3.2567E+02	5.8620E+02	1.6764E+05	3.6959E+05	5.2028E+07	2.0646E+08
6.5	1.7038E+04	3.7562E+04	3.2853E+02	5.9136E+02	1.7640E+05	3.8891E+05	5.4895E+07	2.1784E+08
7.0	1.6036E+04	3.5353E+04	3.3182E+02	5.9727E+02	1.8467E+05	4.0713E+05	5.7624E+07	2.2867E+08
7.5	1.5212E+04	3.3536E+04	3.3461E+02	6.0229E+02	1.9247E+05	4.2433E+05	6.0225E+07	2.3899E+08
8.0	1.4582E+04	3.2149E+04	3.3657E+02	6.0582E+02	1.9991E+05	4.4073E+05	6.2721E+07	2.4890E+08
8.5	1.4003E+04	3.0871E+04	3.3755E+02	6.0760E+02	2.0705E+05	4.5647E+05	6.5131E+07	2.5846E+08

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Table 6.2.1-39 (2 of 4)

Time (sec)	Mass Flow		Energy Release		Integral of Mass Flow		Integral of Energy Release	
	(kg/sec)	(lbm/sec)	(kcal/sec)	(Btu/sec)	(kg)	(lbm)	(kcal)	(Btu)
9.0	1.2562E+04	2.7694E+04	3.5097E+02	6.3176E+02	2.1666E+05	4.7765E+05	3.1609E+02	5.6897E+02
9.5	1.1544E+04	2.5449E+04	3.6493E+02	6.5688E+02	2.2272E+05	4.9102E+05	3.1721E+02	5.7097E+02
10.0	1.0776E+04	2.3757E+04	3.7671E+02	6.7807E+02	2.2830E+05	5.0331E+05	3.1852E+02	5.7334E+02
11.0	9.2543E+03	2.0402E+04	4.0238E+02	7.2429E+02	2.3830E+05	5.2535E+05	3.2147E+02	5.7866E+02
12.0	7.9242E+03	1.7470E+04	4.3098E+02	7.7579E+02	2.4689E+05	5.4430E+05	3.2476E+02	5.8457E+02
13.0	6.5127E+03	1.4358E+04	4.6772E+02	8.4190E+02	2.5411E+05	5.6022E+05	3.2824E+02	5.9084E+02
14.0	5.2411E+03	1.1555E+04	5.0596E+02	9.1069E+02	2.5998E+05	5.7316E+05	3.3179E+02	5.9723E+02
15.0	4.6682E+03	1.0292E+04	4.8775E+02	8.7792E+02	2.6481E+05	5.8380E+05	3.3504E+02	6.0308E+02
16.0	4.1764E+03	9.2074E+03	4.5039E+02	8.1068E+02	2.6921E+05	5.9352E+05	3.3728E+02	6.0709E+02
17.0	3.8009E+03	8.3795E+03	4.0661E+02	7.3191E+02	2.7319E+05	6.0228E+05	3.3863E+02	6.0955E+02
18.0	3.9936E+03	8.8044E+03	3.1929E+02	5.7472E+02	2.7715E+05	6.1102E+05	3.3886E+02	6.0993E+02
19.0	4.3933E+03	9.6855E+03	2.6231E+02	4.7215E+02	2.8125E+05	6.2004E+05	3.3818E+02	6.0873E+02
20.0	4.7481E+03	1.0468E+04	2.4456E+02	4.4020E+02	2.8625E+05	6.3107E+05	3.3656E+02	6.0580E+02
21.0	4.1141E+03	9.0701E+03	2.2618E+02	4.0713E+02	2.9071E+05	6.4091E+05	3.3499E+02	6.0297E+02
22.0	3.3562E+03	7.3991E+03	2.1431E+02	3.8576E+02	2.9440E+05	6.4904E+05	3.3358E+02	6.0044E+02
23.0	2.7299E+03	6.0185E+03	2.0023E+02	3.6041E+02	2.9739E+05	6.5564E+05	3.3234E+02	5.9821E+02
24.0	2.5565E+03	5.6361E+03	1.6748E+02	3.0147E+02	3.0008E+05	6.6157E+05	3.3098E+02	5.9576E+02
25.0	2.2504E+03	4.9613E+03	1.4686E+02	2.6435E+02	3.0253E+05	6.6697E+05	3.2956E+02	5.9321E+02
26.0	2.1186E+03	4.6708E+03	1.3026E+02	2.3446E+02	3.0478E+05	6.7191E+05	3.2814E+02	5.9066E+02
27.0	1.4850E+03	3.2739E+03	1.1722E+02	2.1099E+02	3.0648E+05	6.7568E+05	3.2704E+02	5.8864E+02

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Table 6.2.1-39 (2 of 4)

Time	Mass Flow		Enthalpy		Integral of Mass Flow		Integral of Energy	
(sec)	(kg/sec)	(lbm/sec)	(kcal/kg)	(Btu/lbm)	(kg)	(lbm)	(kcal)	(Btu)
9.0	1.3295E+04	2.9310E+04	3.4122E+02	6.1420E+02	2.1383E+05	4.7141E+05	6.7437E+07	2.6761E+08
9.5	1.2034E+04	2.6531E+04	3.5498E+02	6.3897E+02	2.2013E+05	4.8530E+05	6.9627E+07	2.7630E+08
10.0	1.1140E+04	2.4560E+04	3.6620E+02	6.5916E+02	2.2592E+05	4.9807E+05	7.1714E+07	2.8458E+08
11.0	9.7376E+03	2.1468E+04	3.8751E+02	6.9752E+02	2.3643E+05	5.2124E+05	7.5655E+07	3.0022E+08
12.0	8.3059E+03	1.8311E+04	4.1727E+02	7.5109E+02	2.4544E+05	5.4110E+05	7.9270E+07	3.1457E+08
13.0	7.0495E+03	1.5541E+04	4.4490E+02	8.0082E+02	2.5319E+05	5.5818E+05	8.2584E+07	3.2772E+08
14.0	5.6965E+03	1.2559E+04	4.8057E+02	8.6502E+02	2.5955E+05	5.7221E+05	8.5525E+07	3.3939E+08
15.0	4.6371E+03	1.0223E+04	5.0858E+02	9.1544E+02	2.6470E+05	5.8357E+05	8.8068E+07	3.4948E+08
16.0	4.2699E+03	9.4135E+03	4.6259E+02	8.3266E+02	2.6917E+05	5.9341E+05	9.0244E+07	3.5812E+08
17.0	4.2033E+03	9.2667E+03	3.8856E+02	6.9941E+02	2.7347E+05	6.0289E+05	9.2034E+07	3.6522E+08
18.0	3.9604E+03	8.7312E+03	3.4041E+02	6.1274E+02	2.7755E+05	6.1190E+05	9.3514E+07	3.7109E+08
19.0	3.6815E+03	8.1162E+03	3.1006E+02	5.5811E+02	2.8146E+05	6.2052E+05	9.4767E+07	3.7607E+08
20.0	3.3936E+03	7.4816E+03	2.8308E+02	5.0955E+02	2.8507E+05	6.2848E+05	9.5825E+07	3.8026E+08
21.0	3.1712E+03	6.9912E+03	2.5108E+02	4.5195E+02	2.8836E+05	6.3572E+05	9.6706E+07	3.8376E+08
22.0	3.5105E+03	7.7394E+03	2.1884E+02	3.9391E+02	2.9193E+05	6.4359E+05	9.7537E+07	3.8706E+08
23.0	3.1260E+03	6.8917E+03	1.9468E+02	3.5043E+02	2.9524E+05	6.5089E+05	9.8226E+07	3.8979E+08
24.0	2.3483E+03	5.1770E+03	1.9237E+02	3.4627E+02	2.9799E+05	6.5696E+05	9.8754E+07	3.9189E+08
25.0	1.9377E+03	4.2719E+03	1.7847E+02	3.2125E+02	3.0006E+05	6.6152E+05	9.9149E+07	3.9346E+08
26.0	1.9829E+03	4.3715E+03	1.3967E+02	2.5141E+02	3.0202E+05	6.6584E+05	9.9457E+07	3.9468E+08
27.0	1.7744E+03	3.9119E+03	1.1880E+02	2.1384E+02	3.0376E+05	6.6968E+05	9.9691E+07	3.9561E+08

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Table 6.2.1-39 (3 of 4)

Time (sec)	Mass Flow		Energy Release		Integral of Mass Flow		Integral of Energy Release	
	(kg/sec)	(lbm/sec)	(kcal/sec)	(Btu/sec)	(kg)	(lbm)	(kcal)	(Btu)
28.0	9.7126E+02	2.1413E+03	1.0656E+02	1.9181E+02	3.0783E+05	6.7866E+05	3.2606E+02	5.8691E+02
29.0	2.3777E+02	5.2418E+02	1.3044E+02	2.3480E+02	3.0845E+05	6.8001E+05	3.2563E+02	5.8614E+02
30.0	-2.7861E+01	-6.1424E+01	3.0927E+02	5.5667E+02	3.0849E+05	6.8011E+05	3.2562E+02	5.8608E+02
35.0	6.9793E+02	1.5387E+03	7.9865E+01	1.4375E+02	3.0897E+05	6.8117E+05	3.2540E+02	5.8571E+02
40.0	8.8990E+02	1.9619E+03	8.8169E+01	1.5870E+02	3.1048E+05	6.8450E+05	3.2437E+02	5.8387E+02
45.0	1.3250E+03	2.9211E+03	8.3381E+01	1.5009E+02	3.1447E+05	6.9328E+05	3.2137E+02	5.7848E+02
50.0	1.5416E+03	3.3986E+03	8.2278E+01	1.4811E+02	3.2109E+05	7.0788E+05	3.1645E+02	5.6962E+02
55.0	1.9205E+03	4.2340E+03	7.9000E+01	1.4220E+02	3.2996E+05	7.2744E+05	3.1010E+02	5.5818E+02
60.0	2.7710E+02	6.1091E+02	1.5380E+02	2.7683E+02	3.3467E+05	7.3783E+05	3.0708E+02	5.5276E+02
65.0	6.6563E+02	1.4675E+03	1.1439E+02	2.0590E+02	3.3853E+05	7.4633E+05	3.0482E+02	5.4867E+02
70.0	1.3201E+03	2.9104E+03	1.0186E+02	1.8334E+02	3.4253E+05	7.5514E+05	3.0251E+02	5.4456E+02
75.0	7.1960E+02	1.5864E+03	1.2308E+02	2.2155E+02	3.5108E+05	7.7399E+05	2.9760E+02	5.3568E+02
80.0	5.7749E+02	1.2732E+03	1.3700E+02	2.4659E+02	3.5385E+05	7.8010E+05	2.9631E+02	5.3335E+02
85.0	7.0170E+02	1.5470E+03	1.2683E+02	2.2829E+02	3.5678E+05	7.8656E+05	2.9500E+02	5.3098E+02
90.0	6.8902E+02	1.5190E+03	1.2712E+02	2.2883E+02	3.6023E+05	7.9418E+05	2.9340E+02	5.2808E+02
95.0	7.1538E+02	1.5771E+03	1.2854E+02	2.3137E+02	3.6377E+05	8.0198E+05	2.9178E+02	5.2520E+02
100.0	6.4224E+02	1.4159E+03	1.3226E+02	2.3807E+02	3.6713E+05	8.0938E+05	2.9033E+02	5.2259E+02
110.0	7.8987E+02	1.7414E+03	1.2860E+02	2.3147E+02	3.7479E+05	8.2626E+05	2.8699E+02	5.1658E+02
120.0	7.5700E+02	1.6689E+03	1.3782E+02	2.4809E+02	3.8276E+05	8.4384E+05	2.8378E+02	5.1082E+02
130.0	7.9850E+02	1.7604E+03	1.4100E+02	2.5380E+02	3.8957E+05	8.5885E+05	2.8144E+02	5.0661E+02

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Table 6.2.1-39 (3 of 4)

Time	Mass Flow		Enthalpy		Integral of Mass Flow		Integral of Energy	
(sec)	(kg/sec)	(lbm/sec)	(kcal/kg)	(Btu/lbm)	(kg)	(lbm)	(kcal)	(Btu)
28.0	5.6570E+02	1.2472E+03	1.0175E+02	1.8315E+02	3.0503E+05	6.7249E+05	9.9830E+07	3.9616E+08
29.0	-9.8747E+01	-2.1770E+02	3.4733E+02	6.2520E+02	3.0511E+05	6.7265E+05	9.9824E+07	3.9613E+08
30.0	-2.8582E+01	-6.3013E+01	1.3609E+02	2.4497E+02	3.0507E+05	6.7256E+05	9.9811E+07	3.9608E+08
35.0	2.2727E+02	5.0104E+02	9.4225E+01	1.6961E+02	3.0599E+05	6.7460E+05	9.9938E+07	3.9659E+08
40.0	4.0079E+02	8.8360E+02	1.4478E+02	2.6060E+02	3.0759E+05	6.7813E+05	1.0014E+08	3.9737E+08
45.0	4.1072E+02	9.0548E+02	1.4478E+02	2.6061E+02	3.0931E+05	6.8191E+05	1.0040E+08	3.9840E+08
50.0	2.3177E+03	5.1096E+03	8.2609E+01	1.4870E+02	3.1563E+05	6.9585E+05	1.0100E+08	4.0081E+08
55.0	1.6683E+03	3.6780E+03	8.2492E+01	1.4848E+02	3.2501E+05	7.1652E+05	1.0177E+08	4.0384E+08
60.0	2.0347E+03	4.4857E+03	8.2038E+01	1.4767E+02	3.3385E+05	7.3602E+05	1.0249E+08	4.0673E+08
65.0	1.5550E+03	3.4282E+03	9.3659E+01	1.6859E+02	3.4338E+05	7.5703E+05	1.0330E+08	4.0994E+08
70.0	1.1052E+03	2.4365E+03	9.7418E+01	1.7535E+02	3.4758E+05	7.6628E+05	1.0374E+08	4.1166E+08
75.0	1.0596E+03	2.3359E+03	9.9657E+01	1.7938E+02	3.5262E+05	7.7739E+05	1.0424E+08	4.1364E+08
80.0	7.8015E+02	1.7199E+03	1.0732E+02	1.9318E+02	3.5648E+05	7.8590E+05	1.0465E+08	4.1529E+08
85.0	2.3990E+02	5.2888E+02	1.9546E+02	3.5183E+02	3.6095E+05	7.9577E+05	1.0512E+08	4.1717E+08
90.0	8.0717E+02	1.7795E+03	1.0951E+02	1.9713E+02	3.6243E+05	7.9903E+05	1.0539E+08	4.1822E+08
95.0	6.5211E+02	1.4377E+03	1.1473E+02	2.0651E+02	3.6588E+05	8.0663E+05	1.0579E+08	4.1982E+08
100.0	1.7141E+03	3.7789E+03	9.6159E+01	1.7309E+02	3.7052E+05	8.1686E+05	1.0629E+08	4.2178E+08
110.0	1.3707E+03	3.0219E+03	9.3458E+01	1.6822E+02	3.8066E+05	8.3921E+05	1.0730E+08	4.2582E+08
120.0	1.1553E+03	2.5469E+03	1.0026E+02	1.8046E+02	3.9104E+05	8.6210E+05	1.0835E+08	4.2998E+08
130.0	8.9815E+02	1.9801E+03	1.0577E+02	1.9039E+02	4.0040E+05	8.8274E+05	1.0933E+08	4.3384E+08

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Table 6.2.1-39 (4 of 4)

Time (sec)	Mass Flow		Energy Release		Integral of Mass Flow		Integral of Energy Release	
	(kg/sec)	(lbm/sec)	(kcal/sec)	(Btu/sec)	kg	(kg/sec)	(lbm/sec)	(kcal/sec)
140.0	9.5967E+02	2.1157E+03	1.3145E+02	2.3660E+02	3.9830E+05	8.7811E+05	2.7828E+02	5.0088E+02+0
150.0	2.9828E+03	6.5760E+03	1.0014E+02	1.8025E+02	4.1133E+05	9.0683E+05	2.7316E+02	4.9170E+02
160.0	7.1382E+02	1.5737E+03	1.3534E+02	2.4361E+02	4.2243E+05	9.3130E+05	2.6916E+02	4.8449E+02
170.0	5.1086E+02	1.1262E+03	1.3636E+02	2.4546E+02	4.2852E+05	9.4473E+05	2.6727E+02	4.8108E+02
180.0	4.6529E+02	1.0258E+03	1.3828E+02	2.4889E+02	4.3343E+05	9.5556E+05	2.6576E+02	4.7837E+02
190.0	2.5487E+02	5.6189E+02	1.6409E+02	2.9536E+02	4.3804E+05	9.6570E+05	2.6429E+02	4.7573E+02
200.0	5.8582E+02	1.2915E+03	1.1404E+02	2.0528E+02	4.4215E+05	9.7477E+05	2.6308E+02	4.7355E+02
210.0	8.6572E+02	1.9086E+03	1.1693E+02	2.1047E+02	4.4943E+05	9.9082E+05	2.6075E+02	4.6937E+02
220.0	5.7720E+02	1.2725E+03	1.9409E+02	3.4936E+02	4.5694E+05	1.0074E+06	2.5885E+02	4.6592E+02
230.0	6.1350E+02	1.3525E+03	1.9972E+02	3.5952E+02	4.6446E+05	1.0239E+06	2.5740E+02	4.6334E+02
240.0	4.9210E+02	1.0849E+03	2.2733E+02	4.0920E+02	4.7021E+05	1.0366E+06	2.5678E+02	4.6221E+02
250.0	5.1957E+02	1.1455E+03	1.9743E+02	3.5537E+02	4.7567E+05	1.0487E+06	2.5610E+02	4.6097E+02
260.0	3.0596E+02	6.7452E+02	2.5417E+02	4.5750E+02	4.7992E+05	1.0580E+06	2.5575E+02	4.6036E+02
270.0	1.7236E+02	3.7999E+02	3.2615E+02	5.8707E+02	4.8231E+05	1.0633E+06	2.5587E+02	4.6057E+02
280.0	1.2492E+02	2.7540E+02	3.2722E+02	5.8900E+02	4.8358E+05	1.0661E+06	2.5619E+02	4.6115E+02
290.0	1.2775E+02	2.8164E+02	3.1618E+02	5.6913E+02	4.8490E+05	1.0690E+06	2.5634E+02	4.6143E+02
300.0	1.1250E+02	2.4803E+02	3.5827E+02	6.4484E+02	4.8607E+05	1.0716E+06	2.5655E+02	4.6178E+02

G

APR1400 DCD TIER 2

Table 6.2.1-39 (4 of 4)

Time	Mass Flow		Enthalpy		Integral of Mass Flow		Integral of Energy	
(sec)	(kg/sec)	(lbm/sec)	(kcal/kg)	(Btu/lbm)	(kg)	(lbm)	(kcal)	(Btu)
140.0	1.1298E+03	2.4908E+03	1.0262E+02	1.8471E+02	4.1093E+05	9.0594E+05	1.1043E+08	4.3821E+08
150.0	9.5167E+02	2.0981E+03	1.0889E+02	1.9600E+02	4.1912E+05	9.2399E+05	1.1132E+08	4.4175E+08
160.0	1.1363E+03	2.5051E+03	1.0489E+02	1.8881E+02	4.3166E+05	9.5164E+05	1.1261E+08	4.4686E+08
170.0	9.1526E+02	2.0178E+03	1.0773E+02	1.9391E+02	4.4223E+05	9.7495E+05	1.1373E+08	4.5131E+08
180.0	4.4847E+02	9.8870E+02	1.2333E+02	2.2199E+02	4.4953E+05	9.9104E+05	1.1454E+08	4.5453E+08
190.0	4.9428E+02	1.0897E+03	1.7914E+02	3.2245E+02	4.5528E+05	1.0037E+06	1.1524E+08	4.5732E+08
200.0	5.4523E+02	1.2020E+03	1.8537E+02	3.3366E+02	4.6069E+05	1.0157E+06	1.1622E+08	4.6121E+08
210.0	5.2823E+02	1.1645E+03	1.8529E+02	3.3352E+02	4.6557E+05	1.0264E+06	1.1717E+08	4.6496E+08
220.0	5.1639E+02	1.1384E+03	1.7528E+02	3.1550E+02	4.7111E+05	1.0386E+06	1.1813E+08	4.6879E+08
230.0	3.4466E+02	7.5985E+02	2.1803E+02	3.9246E+02	4.7535E+05	1.0480E+06	1.1894E+08	4.7201E+08
240.0	1.3835E+02	3.0501E+02	3.4640E+02	6.2352E+02	4.7706E+05	1.0517E+06	1.1950E+08	4.7422E+08
250.0	1.1657E+02	2.5700E+02	3.5294E+02	6.3529E+02	4.7832E+05	1.0545E+06	1.1994E+08	4.7596E+08
260.0	1.1309E+02	2.4933E+02	3.2035E+02	5.7663E+02	4.7943E+05	1.0570E+06	1.2031E+08	4.7745E+08
270.0	1.0166E+02	2.2411E+02	3.5015E+02	6.3027E+02	4.8051E+05	1.0593E+06	1.2068E+08	4.7889E+08
280.0	1.0073E+02	2.2206E+02	3.5595E+02	6.4071E+02	4.8152E+05	1.0616E+06	1.2104E+08	4.8031E+08
290.0	1.0174E+02	2.2430E+02	3.5329E+02	6.3591E+02	4.8252E+05	1.0638E+06	1.2139E+08	4.8172E+08
300.0	9.5467E+01	2.1047E+02	3.4684E+02	6.2431E+02	4.8351E+05	1.0660E+06	1.2174E+08	4.8310E+08

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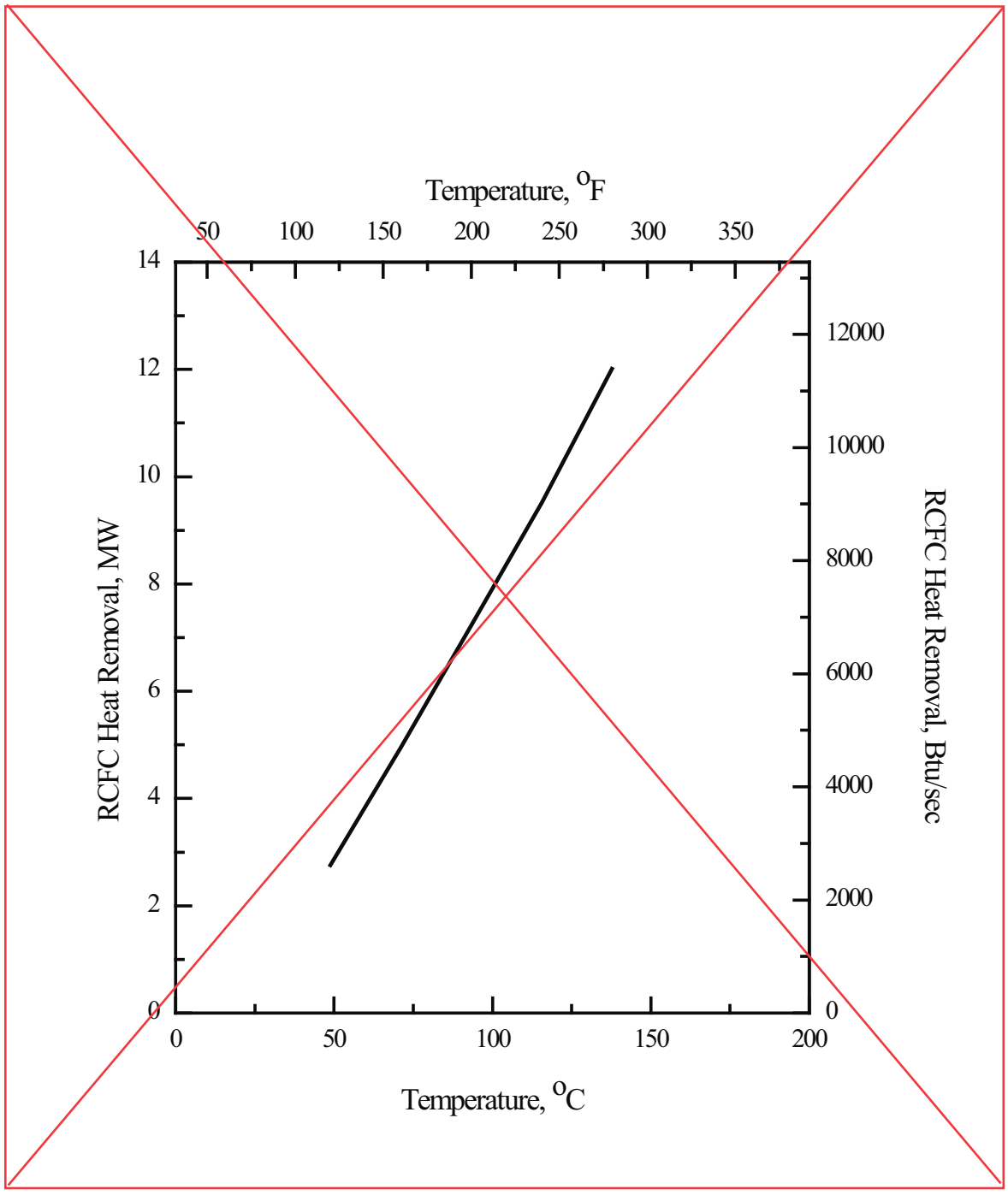
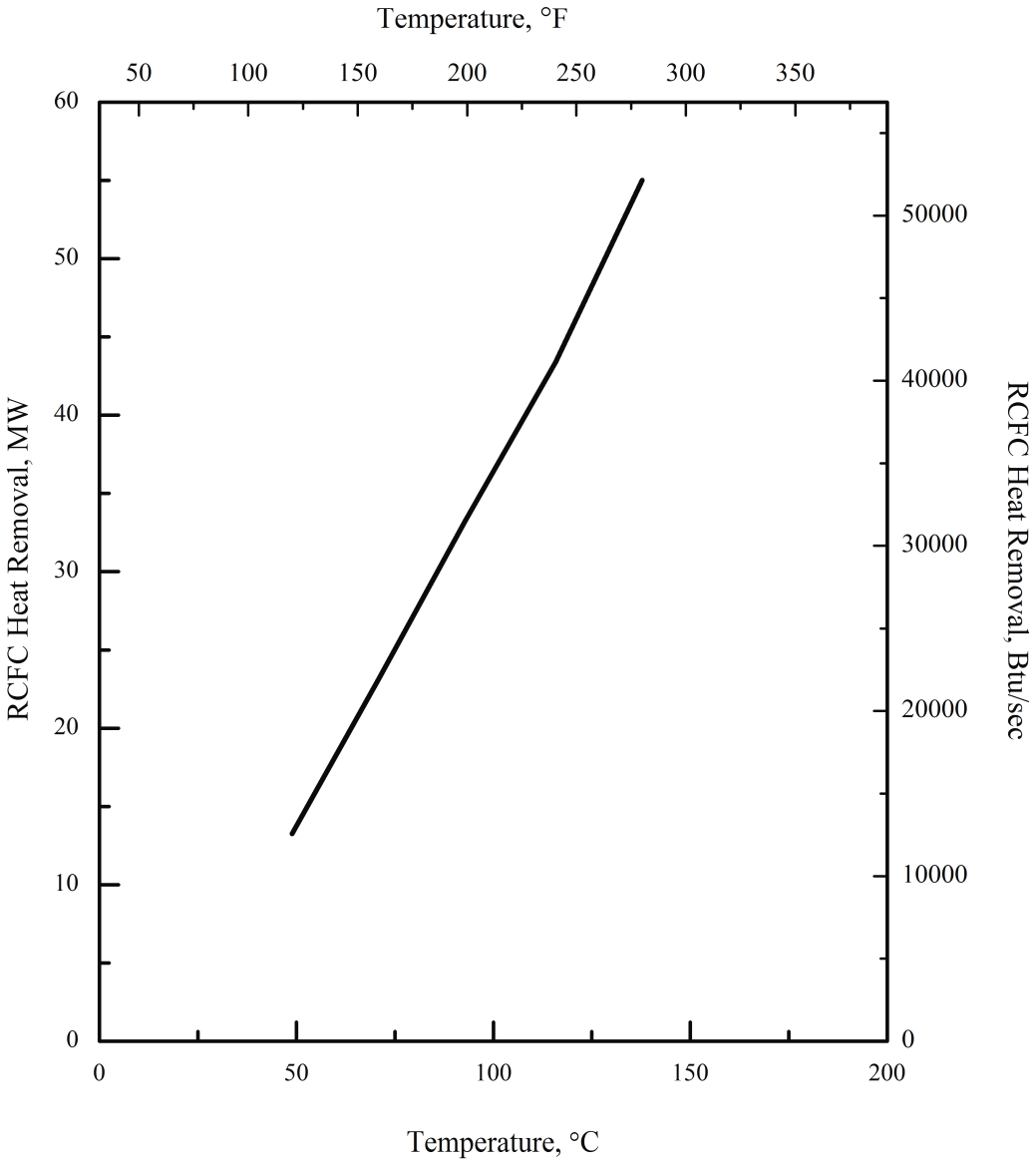


Figure 6.2.1-48 ECCS Performance Analysis (Cooling Fan Heat Removal Capacity)

H


Temperature, °F
50
100
150
200
250
300
350
60
50
40
30
20
10
0
RCFC Heat Removal, MW
50000
40000
30000
20000
10000
0
RCFC Heat Removal, Btu/sec
0
50
100
150
200
Temperature, °C

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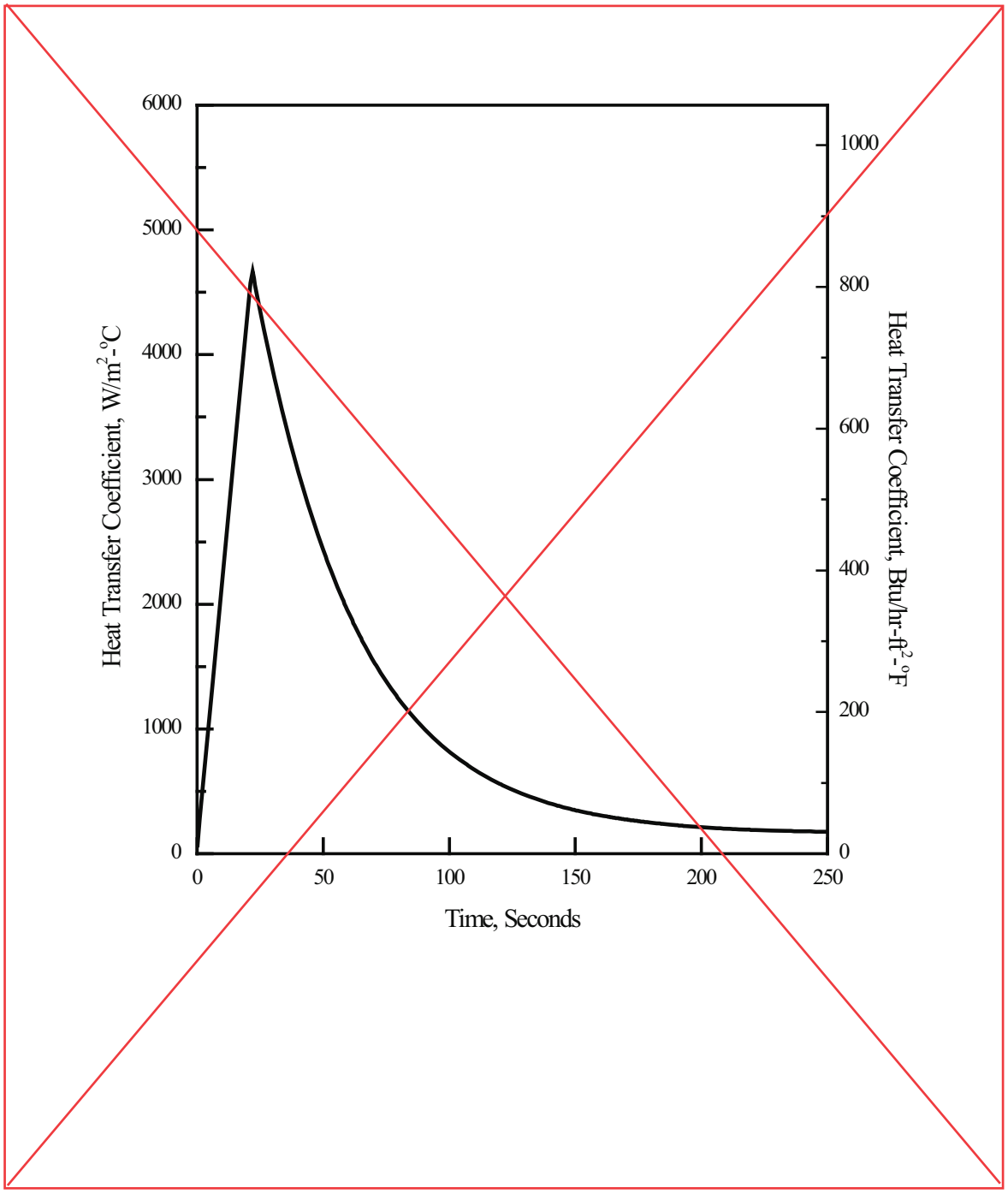
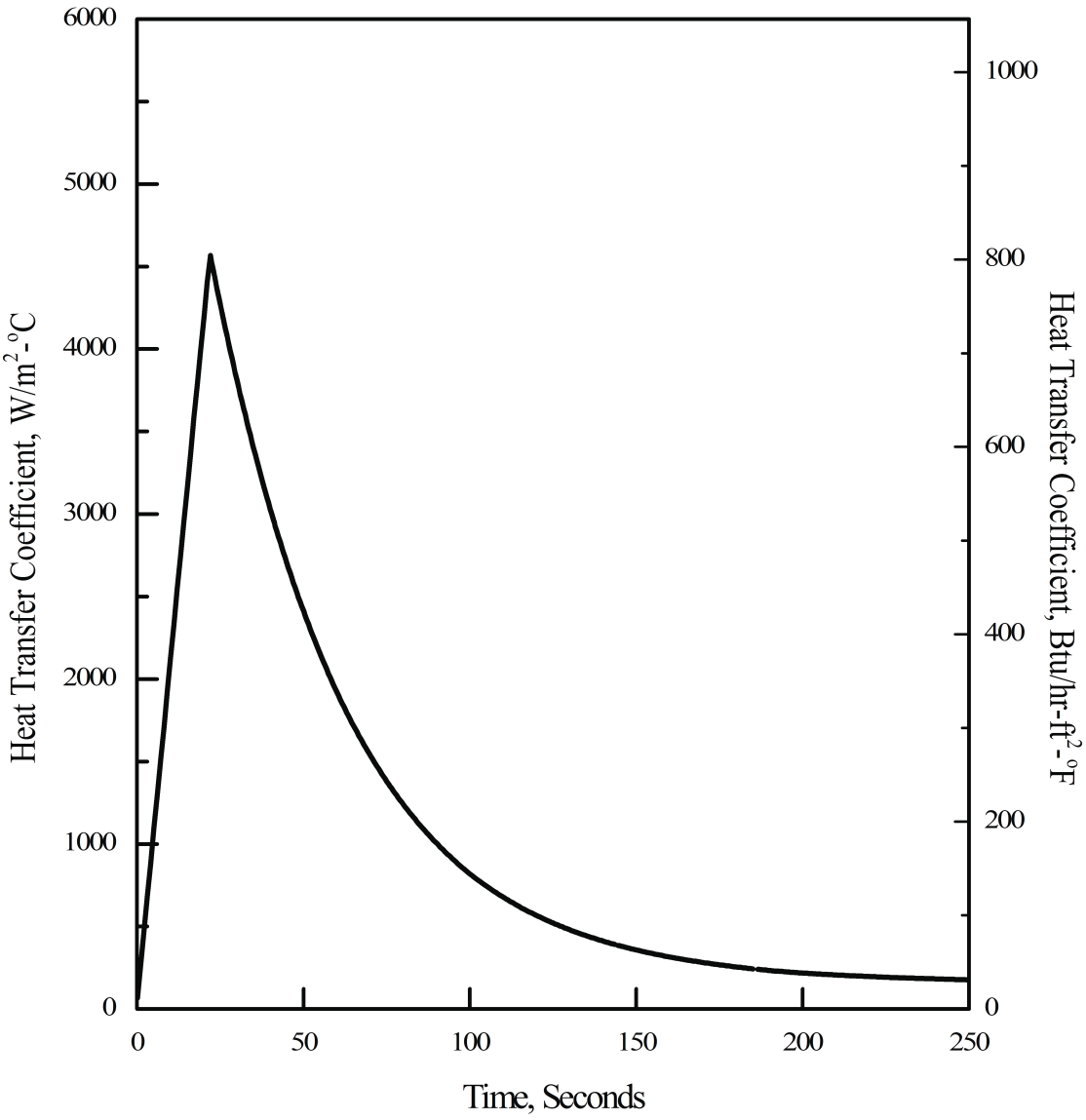


Figure 6.2.1-49 ECCS Performance Analysis
(Condensation Heat Transfer Coefficient for Passive Heat Removal Source)

I


Heat Transfer Coefficient, W/m^2-°C
Heat Transfer Coefficient, Btu/hr-ft^2-°F
Time, Seconds
6000
5000
4000
3000
2000
1000
0
1000
800
600
400
200
0
0
50
100
150
200
250

Replace with next page J

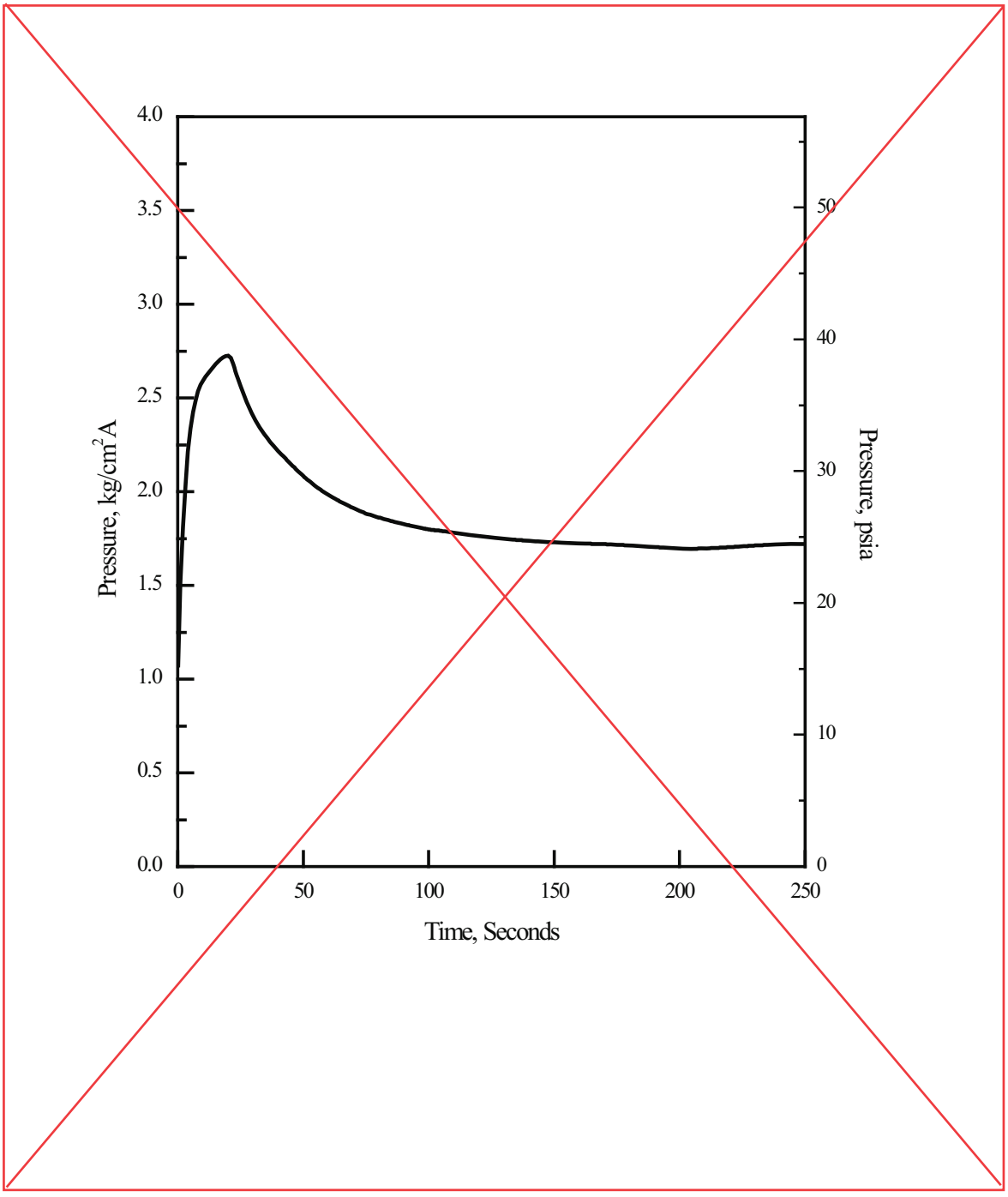
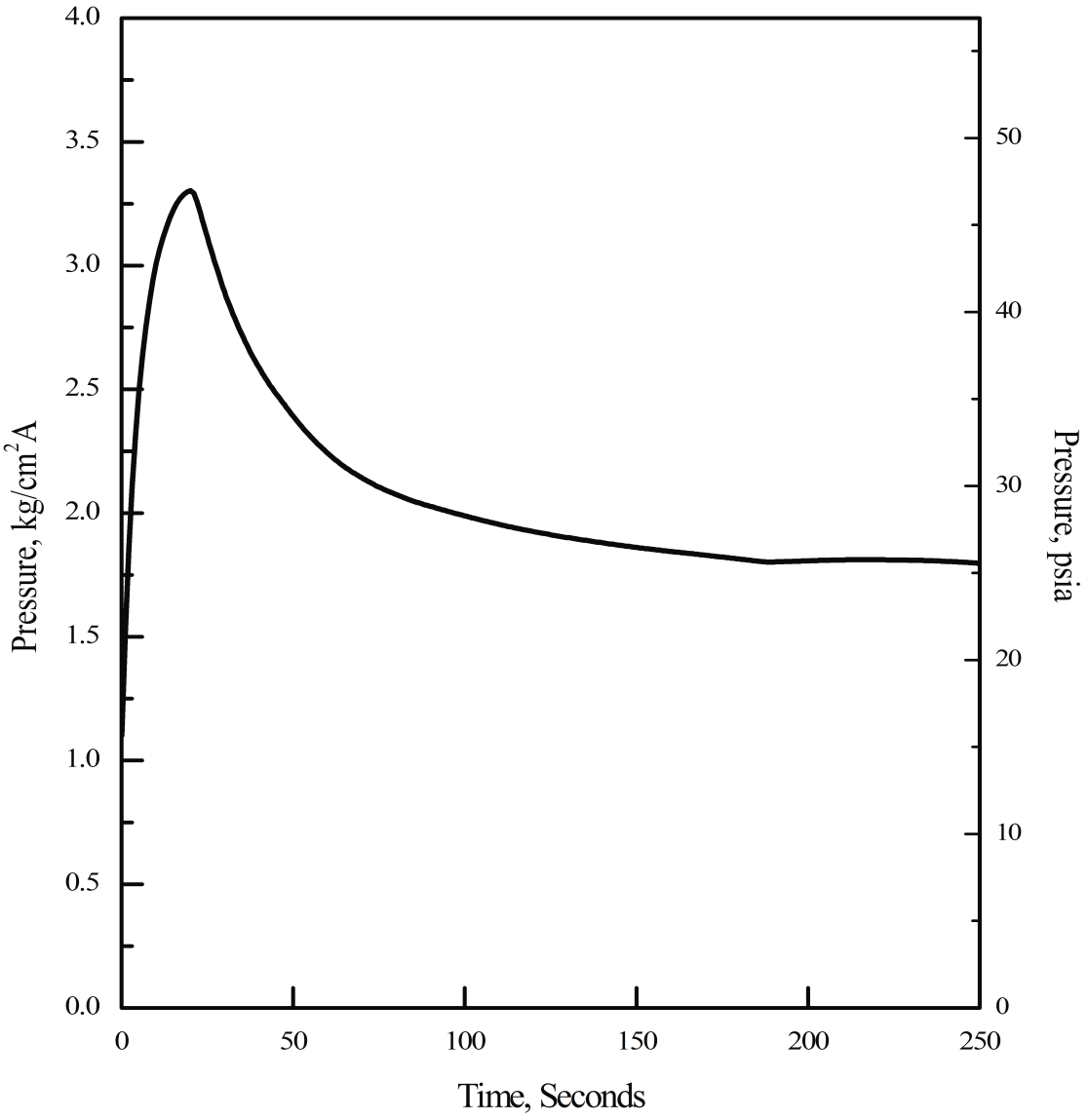


Figure 6.2.1-50 1.0 x Double-Ended Guillotine Break in Pump Discharge Leg (Min. Containment Pressure for ECCS Performance Analysis)

J


4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Pressure, kg/cm2A
50
40
30
20
10
0
Pressure, psia
0
50
100
150
200
250
Time, Seconds

Replace with next page K

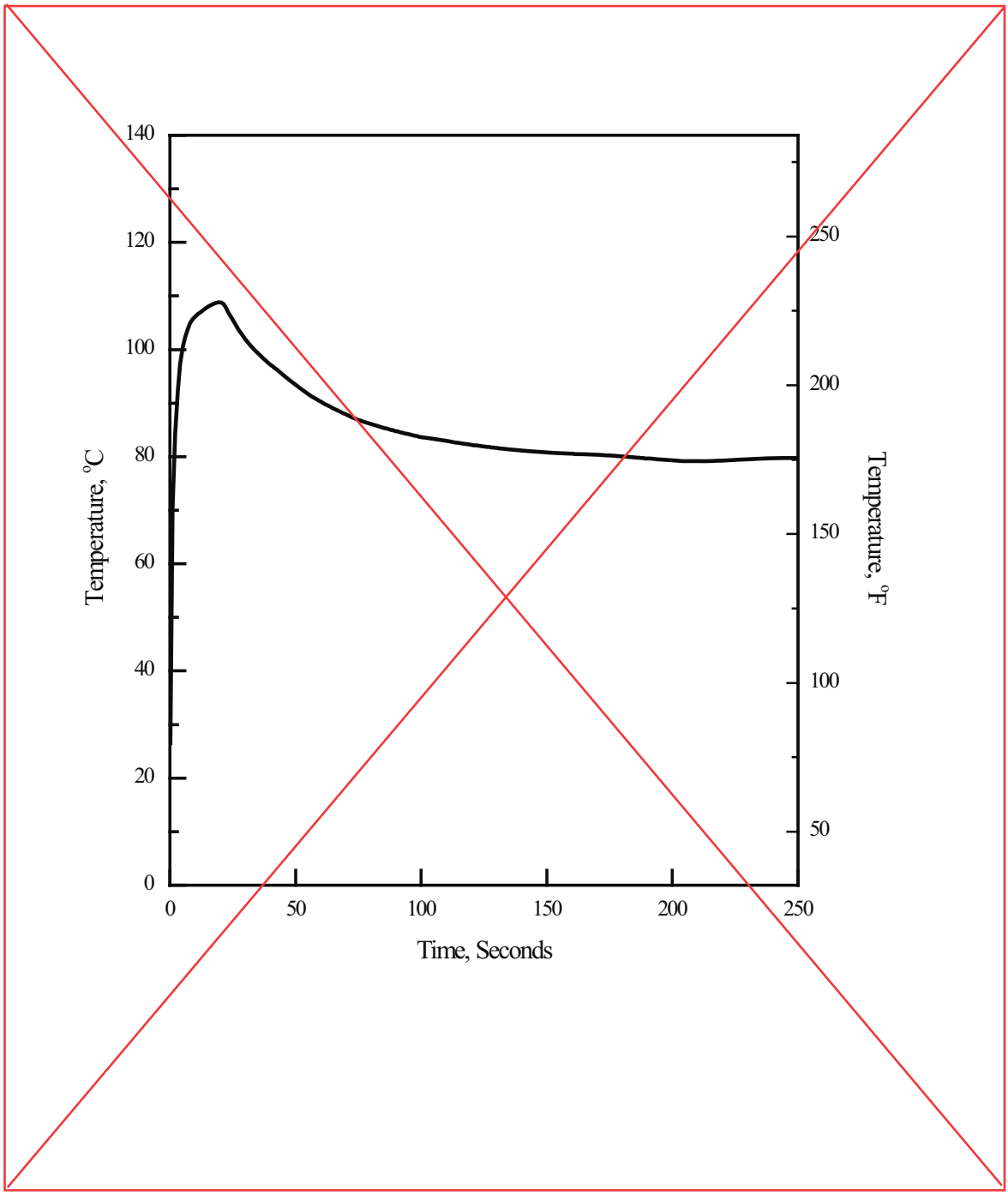
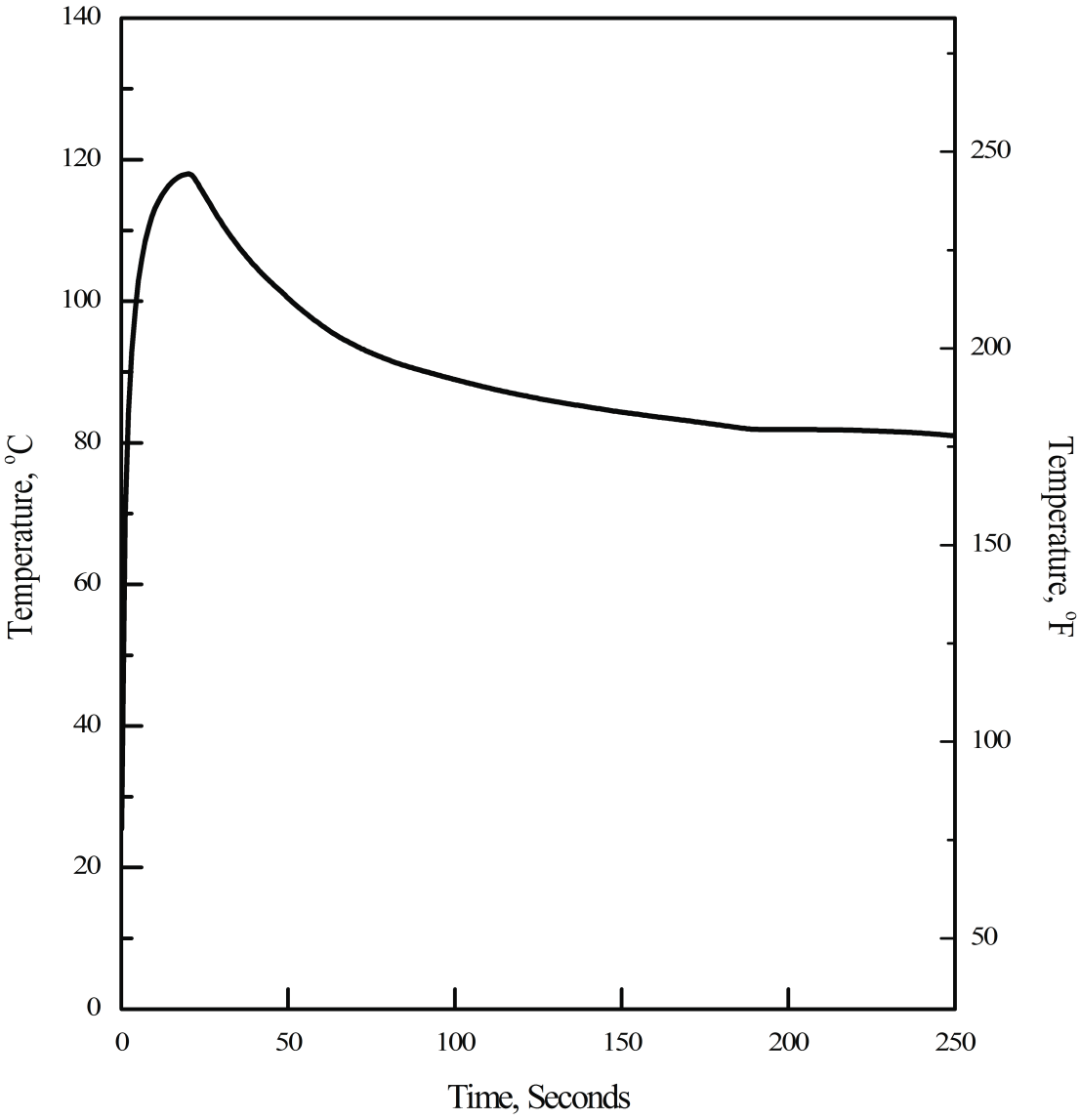


Figure 6.2.1-51 1.0 x Double-Ended Guillotine Break in Pump Discharge Leg (Containment Atmosphere Temperature)

K


140
120
100
80
60
40
20
0
Temperature, °C
250
200
150
100
50
Temperature, °F
0
50
100
150
200
250
Time, Seconds

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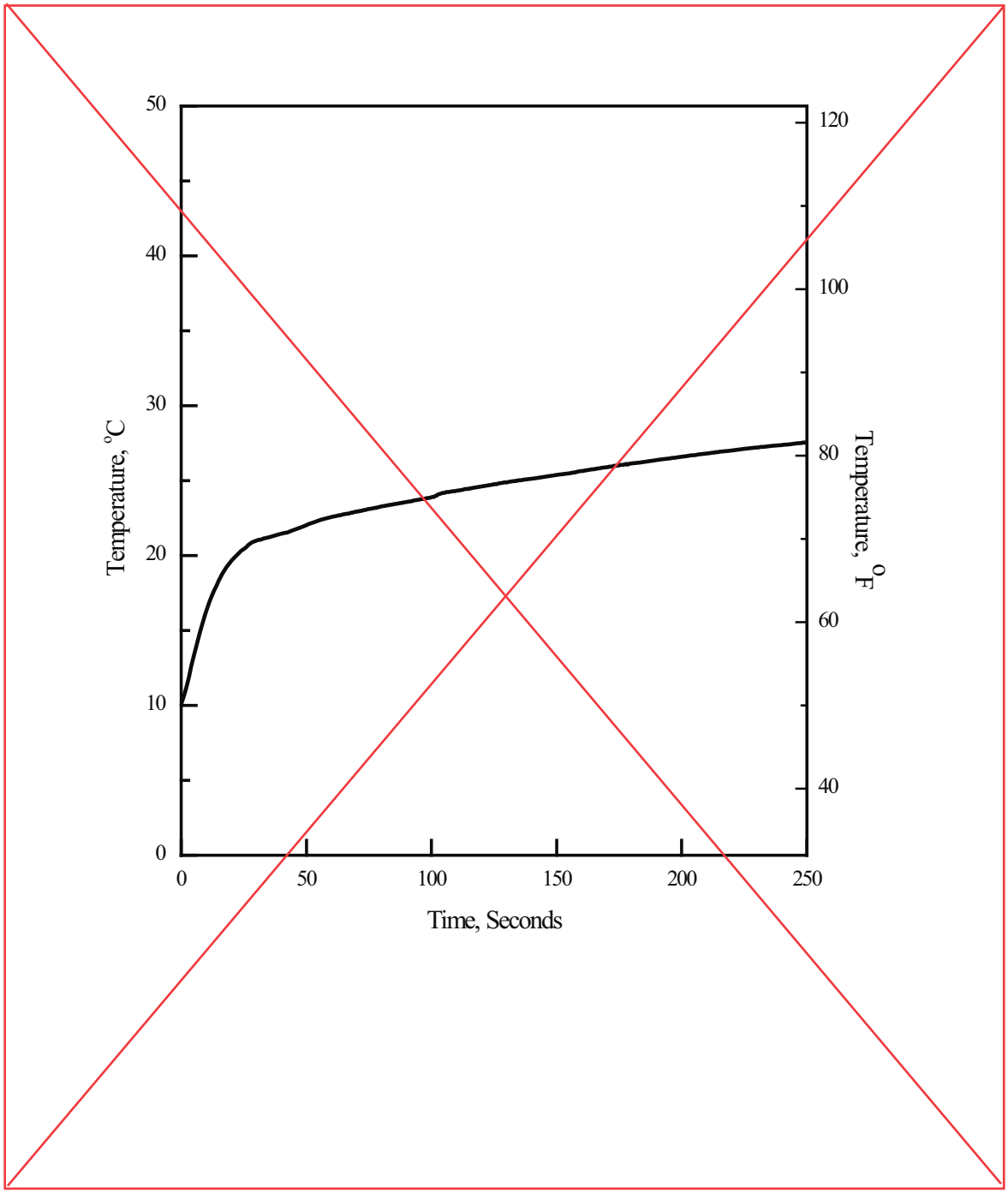
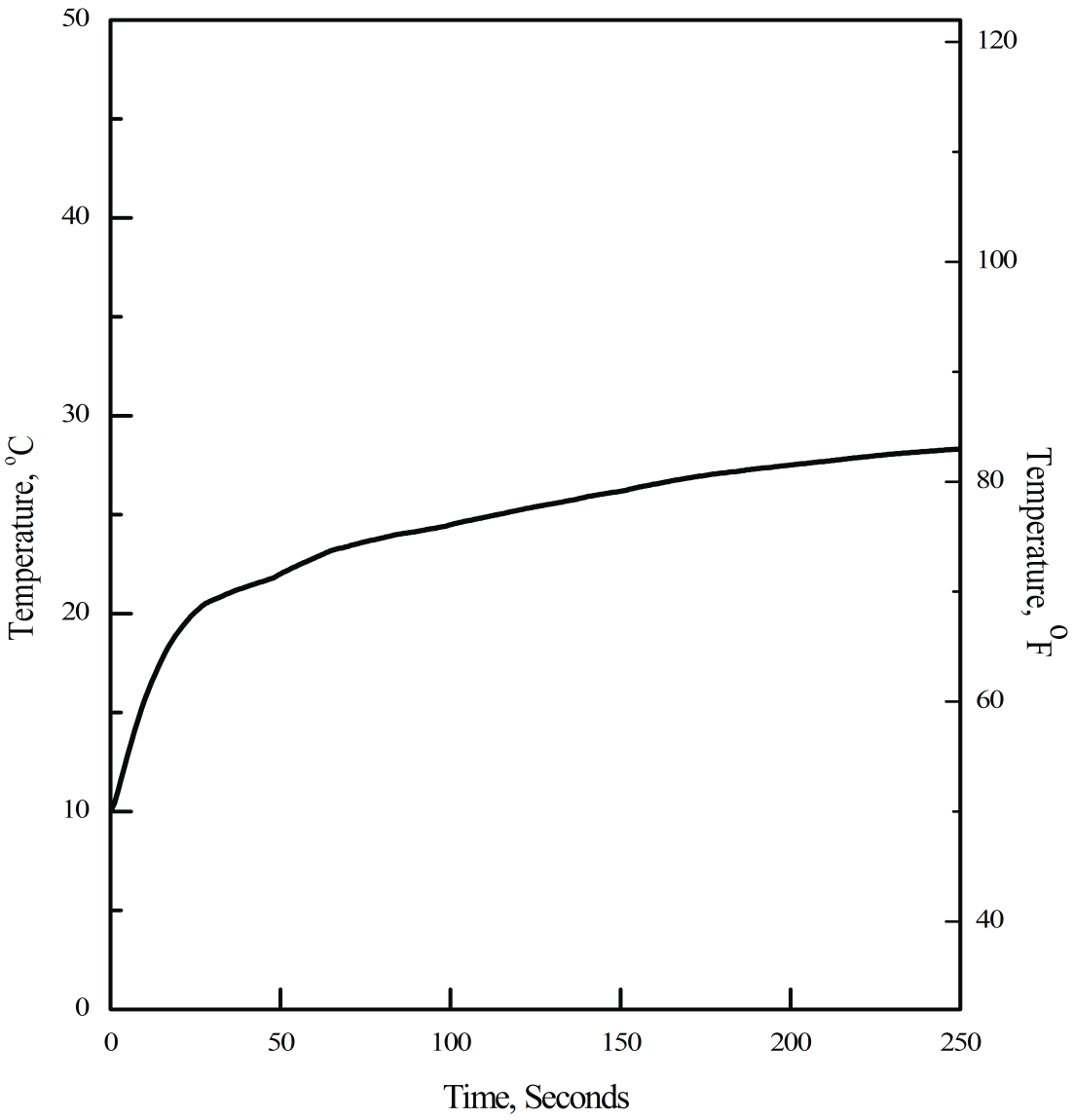


Figure 6.2.1-52 1.0 x Double-Ended Guillotine Break In Pump Discharge Leg (In-containment Refueling Water Storage Tank)

L


Temperature, °C
Temperature, °F
Time, Seconds
0
10
20
30
40
50
40
60
80
100
120
0
50
100
150
200
250