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BROWNS FERRY NUCLEAR PLANT UNITS 1-3

TENNESSEE VALLEY AUTHORITY

RESPONSE TO NRC IE BULLETIN 79-01B

ENVIRONMENTAL QUALIFICATION OF CLASS 1E EQUIPMENT

8012010552

ELECTRICAL EQUIPMENT ENVIRONMENTAL QUALIFICATION REPORT FOR BROWNS FERRY NUCLEAR PLANT

TENNESSEE VALLEY AUTHORITY

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1.0 Introduction

This report has been generated in response to the January 14, 1980, NRC IE Bulletin 79-01B and the NRC Memorandum and Order CLI-80-21 dated May 23, 1980. All information previously submitted in our April 30, 1980, and July 18, 1980, responses to Bulletin 79-01B is superseded by this report.

As directed, TVA has evaluated the environmental qualification of the safety-related electrical components which experience the harsh environment due to Loss of Coolant Accidents (LOCA's) and High Energy Line Break (HELB) accidents. Only that equipment either required to function for accident mitigation (Category a, as defined in NUREG-0588, Appendix E) or required not to fail (Category b, as defined in NUREG-0588, Appendix E) during accident mitigation, including those required for cold shutdown, are contained in this report.

The electrical equipment qualification evaluation was done in accordance with the requirements of Items 1 through 6 of IE Bulletin 79-01B as follows:

1. Item 1 of the bulletin required a "Master List" be provided to include all safety-related electrical components. In this report, the methods used to define this list are described in Section 2.0 and the complete list appears in Appendix A.

2. Item 2 of the bulletin required written evidence of environmental qualification of the components in the Master List to the requirements of Browns Ferry (1, 2, and 3) as licensed. Previous TVA submittals on Bulletin 79-01B have addressed this item.

3. Item 3 of the bulletin required profiles or tabulations of service conditions. Section 3.0 of this report defines the service conditions and how they were calculated. Appendix B also provides the profiles and tables used in the qualification evaluation.

4. Item 4 required evaluation of equipment qualification versus the "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors." The Evaluation Work Sheets (EWS) in Appendix C and their supporting appendixes provide documentation of qualification versus the "DOR Guidelines."

5. Item 5 of the bulletin required the evaluation of the maximum flood level as a result of LOCA/HELB inside containment and its effects on equipment which would be submerged. The EWS's in Appendix C provide the required information concerning submergence and qualification of equipment in this condition.

6. Item 6 of the bulletin required "Licenses Event Reports" (LER) be issued when a component is found not capable of performing its intended safety function. Section 5.2 of the report provides a Summary of Equipment Qualification Status which included the LER number issued when the above determination has been made.

In Section 5.0 of the report the results of the qualification investigation have been summarized.

Section 6.0 describes a qualification plan to be undertaken for those items not found to be fully qualified.

Section 7.0 of the report covers the quality assurance procedures used in the report preparation to comply with the 10 CFR 50 quality assurance requirements.

SECTION 2.0

DEFINITION OF EQUIPMENT LIST

2.0 Definition of Equipment List

The equipment list for TVA's response to IE Bulletin 79-01B was compiled to meet the guidelines of IEB 79-01B and NUREG-0588 as described below. All work was performed in accordance with applicable TVA QA engineering procedures.

2.1 Identification of Safety Systems and Components

The equipment necessary to mitigate an accident (LOCA, HELB inside or outside containment) that causes a harsh environment and to bring a unit to a cold shutdown condition has been identified. The identification process began by determining the safety functions listed as required in IE Bulletin 79-01B and its supplements that were pertinent to BFN. Plant-related documentation was reviewed to determine if additional safety functions were applicable to BFN. No additional safety functions were identified. Next, plant documentation was used to determine which systems had components involved with the defined safety functions. The specific components involved then were identified for each system.

Table 2.1 lists the systems and safety functions that were identified. Several safety functions (main feedwater shutdown and isolation plus auxiliary feedwater) identified in IE Bulletin 79-01B and its supplements are not listed as these functions are applicable only to PWR's. Also, several BFN systems (automatic depressurization and reactor protection) are not listed as separate systems since these systems are purely logic networks that use components that belong to identified systems in the table. The notes to Table 2.1 offer additional clarification.

The following plant-related documentation was used to identify the safety functions, systems, and components:

a. BFN Final Safety Analysis Report (through Amendment 70);

b. "Concluding Report on the Effects of Postulated Pipe Failure Outside of Containment for Unit 1 of the Browns Ferry Nuclear Plant," TVA Report DED-TM-PF1 dated October 15, 1973;

c. "Concluding Report on the Effects of Postulated Pipe Failure Outside of Containment for the Browns Ferry Nuclear Plant Units 2 and 3," TVA Report DED-TM-PF2 dated March 1, 1974;

d. BFN Technical Specifications (safety bases);

e. BFN Emergency Operating Instructions; and

f. TVA Drawings Series 47W800's (flow diagrams), 47W610's (control diagrams), and 47W611's (logic diagrams).

In listing the equipment required, specific categories of components were excluded. Items that gave input to main control room annunciators were excluded if redundant indicators existed that monitored the same parameters as the annunciators. The components that supplied input to redundant indicators were identified and listed so that the operator can rely upon them. This was done to assure that a false annunciation could be identified. Components that supplied input to required annunciators that had no redundant indicators were identified and listed.

2.2 Identification of Equipment in Harsh Environments

The items identified by the process described in Section 2.1 were reviewed to determine their location in the plant as the initial identification was based on function only with no regard given for location. Design documentation such as equipment layout drawings, cable routing schedules, and instrument panel locations were used to determine the location of each item identified. In some cases, particularly with hand switches, field surveys were conducted to verify location. The locations identified were compared to the areas defined in Section 3.1 as having potentially harsh environments following an accident. If an item's location was found to be outside these defined areas, the item was deleted from the list (although it still is required to be qualified for its nonaccident service environments). Before an item could be deleted, all associated items, especially cabling, was identified and their locations reviewed against the areas defined in Section 3.1. This assured that input or output associated with the original item was reviewed for qualification. For example, a cable carrying a signal to a main control room indicator may originate from an item that is not in any of the areas defined in section 3.1. However, the cable may be routed through such an area. To account for this the cable type was determined and the worst case environment possibly experienced by any cable of that type was then used for determining qualification. This assumed that the cable would be qualified for any area it may pass through.

2.3 Categorization of Equipment

During the process described in Section 2.1, each component identified was categorized as to its operability requirements and the type(s) of accident(s) for which it was required. As all of the items initially identified were based on review of their function without regard for environmental conditions, only two operating categories were used for classification. These were:

a. Equipment that must function to mitigate the defined accident(s) including going to cold shutdown;

b. Equipment that need not function to mitigate the defined accident(s) but that must not fail in a manner detrimental to plant safety or accident mitigation including going to cold shutdown.

These operating categories are equivalent to categories A and B defined in item 2 of Appendix E to NRC NUREG-0588. Categories C and D defined in item 2 of Appendix E were not used for this report as items in those categories either are not required to mitigate the defined accidents or are located where they will not experience the harsh environment resulting from the defined accidents.

The accidents considered for this report were identified as follows:

LOCA - The specific LOCA defined in BFN FSAR Chapter 14.

HI - High energy line break inside primary containment.

HO - High energy line break outside primary containment. If only one system was involved, then the acronym for that system was used (e.g., HPCI was used for an HO when only a HPCI system HELB was involved).

All - Includes all of the above accidents.

In some cases, a combination of accidents were identified. For these cases, the worst case environment was used to determine qualification.

2.4 Definition of Equipment Operating Time Requirements

Once equipment was categorized per Section 2.3, the operating time for each item was determined. Operating time was defined as the time period during which a component must be available to perform its function. It was not considered to be the time actually required to perform an action (i.e., actual time required for a valve to close).

An operating time category was defined as a <u>specified</u> time period starting at the accident initiation during which a component must be available to perform its function. This specified time period was given sufficient scope to incorporate all reasonable operating times required for the components in the category. Margin and accuracy for component operability is addressed in Section 4.1.

The following operating time categories were used:

W - One hour following accident initiation

X - One day following accident initiation

Y - Thirty days following accident initiation

Z - One year following accident initiation

W-Z - Items marked as "W-Z" are components that fit into operating category A for the first hour following accident initiation and then fit into operating category B for the duration of the event and recovery (taken to be one year for this report). Isolation valves fall into this situation. They are required to close and then to remain closed.

X-Z - Items marked as "X-Z" are components that fit into operating category A for the first 24 hours and then fit into operating category B for the year following the accident.

Y-Z - Items marked as "Y-Z" are components that fit into operating category A for the first 30 days and then fit into operating category B for the remainder of the year following the accident.

Operating time categories were assigned based upon the review of components' functions. For components that perform multiple functions, each function was considered and the worst case time requirement used for the components. General functions were defined as having the following operating times categories:

W & W-Z - Primary and secondary containment isolation (including SGTS initiation) following a LOCA or HELB inside primary containment; isolation for a HELB outside primary containment (i.e., the specific line that breaks); scram initiation (RPS), and scram following a LOCA or HELB inside primary containment or a HELB in the main steam line valve vault.

Rationale : The functions listed are automatic actions that should occur shortly after the events listed. The severity of the events and the resultant harsh environmental profiles provided cover the "worse case." In these cases, the automatic actions will occur within a few minutes of the event initiation. If the events result in less severe environments, the actuation setpoints may be reached later. A one-hour band incorporates reasonably significant events and their environments while considering reasonable errors in the operating times for components involved with the automatic functions listed.

X & X-Z - Primary and secondary containment isolation for HELB's outside primary containment (except for the line broken); scram initiation (RPS) and scram for HELB's outside primary containment (except for a main steam line break in the valve vault).

Rationale : These automatic actions can be reasonbly expected to have occurred within 24 hours of the event initiation.

Y & Y-Z - High pressure ECCS

Rationale : It is highly unlikely that the reactor will remain at high pressures for 30 days. The reduction in the core decay heat combined with the necessity to depressurize for long term shutdown cooling assures that high pressures will not be maintained.

Z - All other functions

Rationale : It is impossible to predict the time required to fully recover from an event. One year is chosen to reflect a conservative average for the spectrum of events that could be experienced.

Components whose function did not fit into the general functions were reviewed individually to determine the appropriate operating time category. Typically, these were assigned to Category Z.

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SYSTEM \ FUNCTION	Engineered Safeguards Actuation (a)	Reactor Protection (b)	Containment Isolation (c)	Steamline Isolation	Emergency Power (d)	Containment Heat Removal (e)	Containment Fission Product Removal (f)	Containment Combustible Gas Control (g)	Containment Ventilation (h)	Containment Radiation Monitoring (i)	Control Room Habitability	Ventilation Safety Equip.	Component Cooling	Service Water	Emergency Shutdown	Post-Accident Sampling & Monitoring	Radiation Monitoring	Safety Related Display Instrumentation (j)	Emergency Core Cooling
Main Steam	X	X	X	X											X			X	
Feedwater	X	X	X															X	
Fuel Oil					X													X	
RHRSW (1)						X								X	X			X	X
Raw Cooling Water	X																		
Ventilating											X	X						X	
Air Conditioning											X	X						X	
Control Air			X															X	
Sampling			X													X		X	
Standby Liquid Control															X			X	
Primary Containment	X	X	X						X			X						X	
Standby Gas Treatment							X	X	X									X	
RBCCW (2)													X		X			X	
Reactor Recirculation (3)			X															X	X
Reactor Water Cleanup			X															X	
EECW (4)			X															X	
RCIC (5)			X												X			X	X
HPCI (6)			X												X			X	X
Residual Heat Removal	X		X			X									X			X	X
Core Spray	X		X												X			X	X
Containment Inerting			X															X	
Radwaste			X															X	
Fuel Pool Cooling													X					X	
CAD (7)			X					X										X	
Control Rod Drive		X													X			X	
Neutron Monitoring		X													X			X	
Radiation Monitoring	X	X		X						X							X	X	
Auxiliary Power					X										X				

TABLE 2.1

Notes for Table 2.1

Systems:

(1) RHRSW-Residual Heat Removal Service Water

(2) EECW-Emergency Equipment Cooling Water

(3) The Reactor Recirculation System contains valves that must close for the RHR Low Pressure Coolant Injection mode to function effectively. Thus it is marked as being associated with the Emergency Core Cooling function. The system also contains pressure switches that interlock with RHR valves to maintain containment isolation until LPCI is required.

(4) RBCCW-Reactor Building Closed Cooling Water

(5) RCIC-Reactor Core Isolation Cooling

(6) HPCI-High Pressure Coolant Injection

(7) CAD-Containment Atmosphere Dilution

Functions:

(a) There is not a separate Engineered Safeguards Actuation System for BFN. The systems marked contain components that send signals to actuate other systems so that a safety function may be performed.

(b) The Reactor Protection System was not separated for this study. All items associated with initiating and achieving reactor scram were identified and are contained in the systems marked.

(c) "Containment" here refers to both the Primary and Secondary Containment for BFN. The systems marked have components associated with initiating and achieving containment isolation.

(d) Emergency Power was not separated as a separate system. When an item was identified as being required, the components associated with providing power to the item were identified and then treated as required components.

(e) "Containment" here refers to the Primary Containment only. The Containment Spray and Torus Recirculation modes for the RHR System are used to remove heat from the Primary Containment. The RHRSW System then removes the heat from the RHR System.

(f) "Containment" here refers to both the Primary and Secondary Containments at BFN.

(g) "Containment" here refers to the Primary Containment only.

(h) "Containment" here refers to the Secondary Containment only. There is not a safety-related ventilation system for the Primary Containment as one is not required in the FSAR.

(i) "Containment" here refers to both the Primary and Secondary Containments at BFN.

(j) Safety Related Display Instrumentation is defined as those items associated with displaying information in the Main Control Room that an operator could use to detect and monitor an event, to verify the status of required components and systems, and to verify that safety functions have been achieved. If a system is not marked, there are no components involved with Main Control Room indications.

2.5 Comparison of Field Generated Component Identification and EN DES Procurement Documentation

A list, by identification number, of the electrical equipment required to function under postulated accident conditions was sent to the field for visual identification of each device. A walk-through of areas outside the primary containment was conducted for all three units and inside the primary containment of unit 2.

The field list, generated by the walk through, provided the nameplate data consisting of the manufacturer, model number, and serial number of each device. Field data was not obtainable for some temperature elements, junction boxes, and terminal blocks because of inaccessibility or nonexistent identification numbers. These components had only plant identification numbers which correspond to procurement documents. It has been confirmed that these components are the same as originally installed and therefore accurately represented in design documentation data.

The field verification information was used to verify the equipment list developed from design documentation. When a discrepancy was found between the field generated list and design documentation, the information obtained from the field was or will be used as a basis of the qualification report. A subsequent update of this report will cover those discrepancies not presently resolved.

Since the identification of components for which qualification must be shown is a continuing process, some equipment has been added to the list too late to be field verified. The design documentation data was used for the basis of evaluation for these items. Any discrepancies uncovered in this field verification or the verification inside units 1 and 3 containments will be embodied in subsequent revisions of the report.

SECTION 3.0

SERVICE CONDITIONS

3.0. Service Conditions

The environmental conditions present in plant areas that can impact safety-related equipment have been established. The following categories were used to bound anticipated plant conditions.

1. Normal - The temperature, pressure, humidity, and radiation ranges that are expected to be present when the plant is in any of the technical specification modes of operation.

2. Abnormal - Conditions that could exist for all areas for a short period of time that may occur once or more a year.

3. Accident - Environmental conditions that would be experienced as a result of high energy pipe breaks outside containment, or a large, intermediate or small LOCA or main steam line break inside containment.

All analyses performed to determine the service conditions were performed consistent with the guidelines of IE Bulletin 79-01B and NUREG-0588 and in accordance with either TVA quality assurance procedure EP 3.03 or General Electric's internal quality assurance program.

3.1 Areas Constituting a Harsh Accident Environment

3.1.1 Temperature and Pressure Inside Containment

3.1.1.1 High Energy Line Breaks

The controlling breaks for the pressure response of the drywell and wetwell and the temperature response of the wetwell are the large LOCA Design Basis Accident (DBA) and the Intermediate Break Accident (IDA). The DBA and a 0.5 ft^2 steam leak produce the most severe temperature transient in the drywell. The pressure and temperature response of the drywell and wetwell are provided in figures C.1-1 through C.1-5. The containment pressure and temperature response for all breaks was evaluated by the methods discussed in General Electric Report No. NEDO-20533, June 1974. Mass and energy releases were calculated using the methods also discussd in the above General Electric report. Details of the analyses are provided in FSAR, section 14 and General Electric Report NEDO-24580.

3.1.2 Outside Containment

High Energy Line Breaks

Plant areas outside containment were reviewed to determine areas where high energy piping was located and could potentially produce effects that would impact safety-related equipment. The areas affected by high energy line breaks are the reactor building and the main steam valve vaults.

3.1.2.1 Reactor Building

The high energy lines located in the reactor building are:

(1) High Pressure Coolant Injection (HPCI) steam supply to the pump turbine - 547^{o}F, 1020 psia, quality - 1.
(2) Reactor Core Isolation Cooling (RCIC) supply to the RCIC pump turbine - 547^{o}F, 1020 psia, quality - 1.
(3) Reactor Water Cleanup (RWCU) system - 547^{o}F, 1020 psia, quality - 0.

Single-ended circumferential ruptures at the fluid conditions listed above were postulated. Mass and energy releases for all steam supply lines expect one break of the RWCU were generated using the Moody critical flow correlation assuming an fL/D equal to zero. Upstream pressure and temperture, and therefore mass flow rates, were assumed to remain constant until the line was isolated. These steam supply lines isolate automatically on high temperature in the reactor building. Temperature sensors are located in the vicinity of the line to assure rapid detection and isolation. Isolation times include signal process time, valve stroke time, and break detection time. The sensors used are redundant, class 1E, and electrically trained.

Mass and energy release of the remaining RWCU break was generated using the RETRAN computer code. Only this break requires operator action for isolation. Isolation was assumed to occur 10 minutes after the break. Detection of this break is based on high fluid temperature at the discharge of the nonregenerative heat exchangers.

The steam valve vault was modeled using three nodes and were input into the COMPARE-MOD1 computer code. No heat sinks were considered.

The valve vaults at Browns Ferry were constructed with large blowout panels to provide pressure relief to the turbine building in the event of a pipe break. These paths were included in the model.

Figure C.2-35 presents the temperature and pressure results of the analysis for the main steam valve vaults in all three units.

3.1.3 Radiation Environment

The radiation environments inside the drywell and in the reactor building after a design basis LOCA were calculated consistent with the requirements of IE Bulletin 79-01B and NUREG-0588.

Initial airborne sources in the drywell were calculated assuming an instantaneous release of 100 percent of the core inventory of noble gases and 50 percent of the core inventory of iodine. Transfer of iodine from the drywell free volume to the water in the torus was conservatively calculated as a function of time until the airborne concentration was reduced by a factor of 200 (considered to be at equilibrium). Sources in the water in the torus were calculated assuming an instantaneous release of 1 percent of the core inventory of the solid fission products and the iodine transferred from the drywell. Airborne activity in the reactor building was calculated based on a design basis leak rate from the primary containment and design flow of the SGTS.

Source terms were calculated at various times after an accident allowing for decay and dose rates were calculated with a point-kernel-with-buildup computer code. Radiation exposures in the reactor building due to recirculation of the torus water through the RHR and containment spray systems were also calculated. These dose rates were then integrated over the duration of the accident.

3.2 Operational Environmental Conditions

An environmental listing of service conditions are tabulated in Table 1. The service conditions considered were pressure, temperature, huimidity, and radiation. Normal and abnormal space ambient temperatures for nonaccident conditions were obtained from information used in the initial design phase of the plant in conjunction with data accumulated at the plantsite in various spaces, for all units, under extreme outside temperature conditions (100°F outside atmosphere). Pressures

In order to calculate the environmental conditions following a pipe break, a 20 node model was developed to represent the reactor building and used as input to the SPA Rev 2 computer code. SPA is a subcompartment code using a homogeneous equilibrium model and models two-component, two-phase flow. Evaluation of superheated steam conditions is also included in the code. No heat sinks were modeled. Figures C.2-1 through C.2-6 show the reactor building with the nodes outlined. Figures C.2-7 and C.2-8 are schematics of the model portraying the various flow paths for units 1 and 2, respectively. The modeling of unit 3 is the same as that of unit 2. Table C.2-1 provides the pipe breaks considered and the nodes where breaks were assumed to occur.

The results provided are a composite profile for each node representing the worst condition in the node at any point in time. Temperature profiles are provided in Figures C.2-9 through C.2-21 for unit 1 and Figures C.2-22 through C.2-34 for units 2 and 3. Table C.2-2 provides the pressure response versus time for the reactor building. The pressure and temperature response of the reactor building beyond the analysis times of Figures C.2-9 through C.2-34 and Table C.2-2 is conservatively assumed to linearly return to ambient in 24 hours. The humidity in all areas of the building as a result of any break is 100 percent during the blowdown phase of the transient and is then conservatively assumed to return to ambient 24 hours after the event.

3.1.2.2 Main Steam Valve Vaults

The high energy lines in the valve vaults are the main steam lines and the main feedwater lines. Breaks in the main steam line are controlling from an environmental standpoint due to the large line size and the high energy associated with the steam. Conditions of the main steam are 550°F, 1050 psia, quality - 1.

A double-ended rupture of the main steam coincident with a break of the 4-inch RCIC steam line was evaluated. Mass and energy releases were provided by General Electric. Break flow was terminated by isolation of the main steam lines based on signals from safety-related sensors.

and temperatures for accident conditions were obtained from transient curves and analysis which studies the effects of a LOCA on reactor zone spaces (see Section 3.1.2). Radiation doses are discussed under "Radiation Environment" (see Section 3.1.3). Environmental service conditions were only considered in the reactor zone and primary containment. The control bay and electrical board room were not considered since their atmospheres did not interface with the reactor zone environment. The environmental table of service conditions was developed for various plant conditions including the following: normal average day, abnormal conditions (outside temperature 96-100°F and maximum river water temperature exists), LOCA/HELB inside primary containment, HELB outside primary containment, and tornado (sudden pressure drop by 3 pounds per square inch).

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TABLE 1
BROWNS FERRY NUCLEAR PLANT
SUMMARY OF OPERATIONAL ENVIRONMENTAL CONDITIONS

Plant Location	Elevation	Building Location	Operational Condition	Pressure Extreme (PSIA)	Peak Temperature (^oF)	Peak Humidity (%)	Total 40-Yr Integrated Dose (Rads)	Integrated Accident Dose (Rads)
Outside	--	--	2	ATM	96-100	100	5×10^2	NA
			5	11.4	NA	NA	NA	NA
Reactor Building	541.5	Drywell	1	15.6	140	100	1×10^8	NA
			2	15.6	150	100	1×10^8	NA
			3	69.4	325	100	NA	Center 1×10^8 2×10^9 Edge 4×10^7 4×10^9
			4	NA	NA	NA	NA	NA
			5	15.6	NA	NA	NA	NA
	519.0	Wetwell	1	ATM	95	100	NA	NA
			2	ATM	105	100	NA	NA
			3	43.2	158	100	NA	2×10^8
			4	NA	NA	NA	NA	NS
			5	ATM	NA	NA	NA	NA
	519.0	HPCI Room	1	ATM*	95	98	2×10^4	NA
			2	ATM*	105	98	2×10^4	NA
			3	ATM*	150	100	NA	3×10^4
			4	15.7	300	100	NA	NS
			5	11.4	NA	NA	NA	NA
	519.0	SW Pump Room	1	ATM*	95***	98	2×10^4	NA
			2	ATM*	105***	98	2×10^4	NA
			3	ATM*	160	100	NA	3×10^7
			4	15.0	292(U1) 158(U2&3)	100	NA	NS
			5	11.4	NA	NA	NA	NA

TABLE 1
BROWNS FERRY NUCLEAR PLANT
SUMMARY OF OPERATIONAL ENVIRONMENTAL CONDITIONS

Plant Location	Elevation	Building Location	Operational Condition	Pressure Extreme (PSIA)	Peak Temperature (°F)	Peak Humidity (%)	Total 40-Yr Integrated Dose (Rads)	Integrated Accident Dose (Rads)
Reactor Building	519.0	NW Pump Room	1	ATM*	95	98	2×10^4	NA
			2	ATM*	105	98	2×10^4	NA
			3	ATM*	160	100	NA	3×10^7
			4	15.0	297	100	NA	NS
			5	11.4	NA	NA	NA	NA
	519.0	NE Pump Room	1	ATM*	95	98	2×10^4	NA
			2	ATM*	105	98	2×10^4	NA
			3	ATM*	160	100	NA	3×10^7
			4	15.0	171(U1) 160(U2&3)	100	NA	NS
			5	11.4	NA	NA	NA	NA
	519.0	SE Pump Room	1	ATM*	95	98	2×10^4	NA
			2	ATM*	105	98	2×10^4	NA
			3	ATM	160	100	NA	3×10^7
			4	15.0	139(U1) 294(U2&3)	100	NA	NS
			5	11.4	NA	NA	NA	NA
	519.0	Pressure Suppression Chamber	1	ATM*	95***	98	1.5×10^5	NA
			2	ATM*	105***	98	1.5×10^5	NA
			3	ATM	170	100	NA	3×10^7
			4	15.0	217(U1) 220(U2&3)	100	NA	NS
			5	11.4	NA	NA	NA	NA
	565	Main Steam Valve Vault	1	ATM*	140	98	2×10^6	NA
			2	ATM*	160	98	2×10^6	NA
			3	ATM	140	100	NA	3×10^4
			4	21.5	308	100	NA	NS
			5	11.4	NA	NA	NA	NA

TABLE 1
BROWNS FERRY NUCLEAR PLANT
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Plant Location	Elevation	Building Location	Operational Condition	Pressure Extreme (PSIA)	Peak Temperature (°F)	Peak Humidity (%)	Total 40-Yr Integrated Dose (Rads)	Integrated Accident Dose (Rads)
Reactor Building	565	General Floor Area	1	ATM*	90	98	1×10^5	NA
			2	ATM*	100	98	1×10^5	NA
			3	ATM	140	100	NA	2.1×10^7**
			4	15.0	147(U1) 157(U2&3)	100	NA	NS
			5	11.4	NA	NA	NA	NA
	593	General Floor Area	1	ATM*	90	98	2×10^4	NA
			2	ATM*	100	98	2×10^4	NA
			3	ATM	135	100	NA	2.1×10^7**
			4	15.0	214(U1) 211(U2&3)	100	NA	NS
			5	11.4	NA	NA	NA	NA
	593	Reactor Water Cleanup Pump Rooms	1	ATM*	120	98	1.4×10^7	NA
			2	ATM*	130	98	1.4×10^7	NA
			3	ATM	135	100	NA	3×10^4
			4	15.9	220	100	NA	NS
			5	11.4	NA	NA	NA	NA
	593	Heat Exchanger Room	1	ATM*	125	98	1.4×10^7	NA
			2	ATM*	135	98	1.4×10^7	NA
			3	ATM	135	100	NA	3×10^7
			4	18.2	227(U1) 221(U2&3)	100	NA	NS
			5	11.4	NA	NA	NA	NA
	621	General Floor Area	1	ATM*	90	98	1×10^3	NA
			2	ATM*	100	98	1×10^3	NA
			3	ATM	185	100	NA	3×10^4
			4	15.0	174(U1) 199(U2&3)	100	NA	NS
			5	11.4	NA	NA	NA	NA

TABLE 1
BROWNS FERRY NUCLEAR PLANT
SUMMARY OF OPERATIONAL ENVIRONMENTAL CONDITIONS

Plant Location	Elevation	Building Location	Operational Condition	Pressure Extreme (PSIA)	Peak Temperature (°F)	Peak Humidity (%)	Total 40-Yr Integrated Dose (Rads)	Integrated Accident Dose (Rads)
Reactor Building	639	General Floor Area (South)	1	ATM*	90	98	1×10^3	NA
			2	ATM*	100	98	1×10^3	NA
			3	ATM	130	100	NA	3×10^4
			4	15.0	135(U1) 178(U2&3)	100	NA	NS
			5	11.4	NA	NA	NA	NA
	639	General Floor Area (North)	1	ATM*	90	98	1×10^3	NA
			2	ATM*	100	98	1×10^3	NA
			3	ATM	130	100	NA	3×10^4
			4	15.0	153(U1) 174(U2&3)	100	NA	NS
			5	11.4	NA	NA	NA	NA
	664	Refueling Floor	1	ATM*	90	98	1×10^3	NA
			2	ATM*	100	98	1×10^3	NA
			3	15.0	120	100	NA	3×10^4
			4	NA	NA	NA	NA	NS
			5	11.4	NA	NA	NA	NA
	593.0	RWCU BW Receiving Tank Room	1	ATM*	95	98	5.3×10^7	NA
			2	ATM*	105	98	5.3×10^7	NA
			3	ATM	135	100	NA	3×10^4
			4	15.0	214(U1) 211(U1&2)	100	NA	NS
			5	11.4	NA	NA	NA	NA
	639.0	RWCU Demineralizer A	1	ATM*	90	90	2.1×10^8	NA
			2	ATM*	100	90	2.1×10^8	NA
			3	ATM	100	90	NA	3×10^4
			4	ATM	105	90	NA	NS
			5	11.4	NA	NA	NA	NA

TABLE 1
BROWNS FERRY NUCLEAR PLANT
SUMMARY OF OPERATIONAL ENVIRONMENTAL CONDITIONS

Plant Location	Elevation	Building Location	Operational Condition	Pressure Extreme (PSIA)	Peak Temperature (^oF)	Peak Humidity (%)	Total 40-Yr Integrated Dose (Rads)	Integrated Accident Dose (Rads)
Reactor Building	639.0	RWCU Demineralizer B	1	ATM*	90	90	2.1×10^8	NA
			2	ATM*	100	90	2.1×10^8	NA
			3	ATM	100	90	NA	3×10^4
			4	ATM	105	90	NA	NS
			5	11.4	NA	NA	NA	NA
	621.5	Cleanup Demineralizer Valve Room	1	ATM*	95	90	1.7×10^5	NA
			2	ATM*	105	90	1.7×10^5	NA
			3	ATM	105	90	NA	3×10^4
			4	ATM	110	90	NA	NS
			5	11.4	NA	NA	NA	NA

NOTES:

A. Operational condition definitions:

1. Normal average day.
2. Abnormal conditions, outside temperature 96-100^{o}F and maximum river water temperature exists. The maximum duration for this condition is 8 hours during a 24-hour period but may occur on a daily basis for a 2- or 3-week period. (Outside design temperature is 95^{o}F.)
3. LOCA/HELB inside primary containment.
4. HELB outside primary containment.
5. Tornado (sudden pressure drop of 3.0 pounds per square inch).

B. ATM indicates a pressure equal to atmospheric pressure will be present. Normal atmospheric pressure at the Browns Ferry site is 14.4 pounds per square inch.

C. ATM* indicates a pressure slightly below atmospheric.

D. All dose rates and integrated dose rates shown are upper limits for the summation of the gamma and beta contributions unless otherwise indicated. All dose rates are for LOCA; HELB is not significant (denoted NS). Maximum dose rates for these elevations are indicated by **. Actual valves may vary significantly depending on location. Total radiation dose rates can be obtained by adding the 40-year integrated and accident dose rates.

E. Normal humidity is 30 to 80 percent.

F. For operational condition 3, the drywell and wetwell pressure and temperature values are peak values. For transient conditions, see attachment 1.

G. For operational condition 4, temperatures shown are peak values for transient conditions (see attachment 2).

H. Pressure, humidity, and radiation parameters apply to units 1-3. Temperatures are applicable to all units unless otherwise indicated. *** indicates space temperatures may reach 150^{o}F during normal shutdown mode.

I. Primary containment areas are not subject to a chemical spray.

J. Reactor building equipment is not subject to submergence.

K. NA indicates not applciable for this operating condition.

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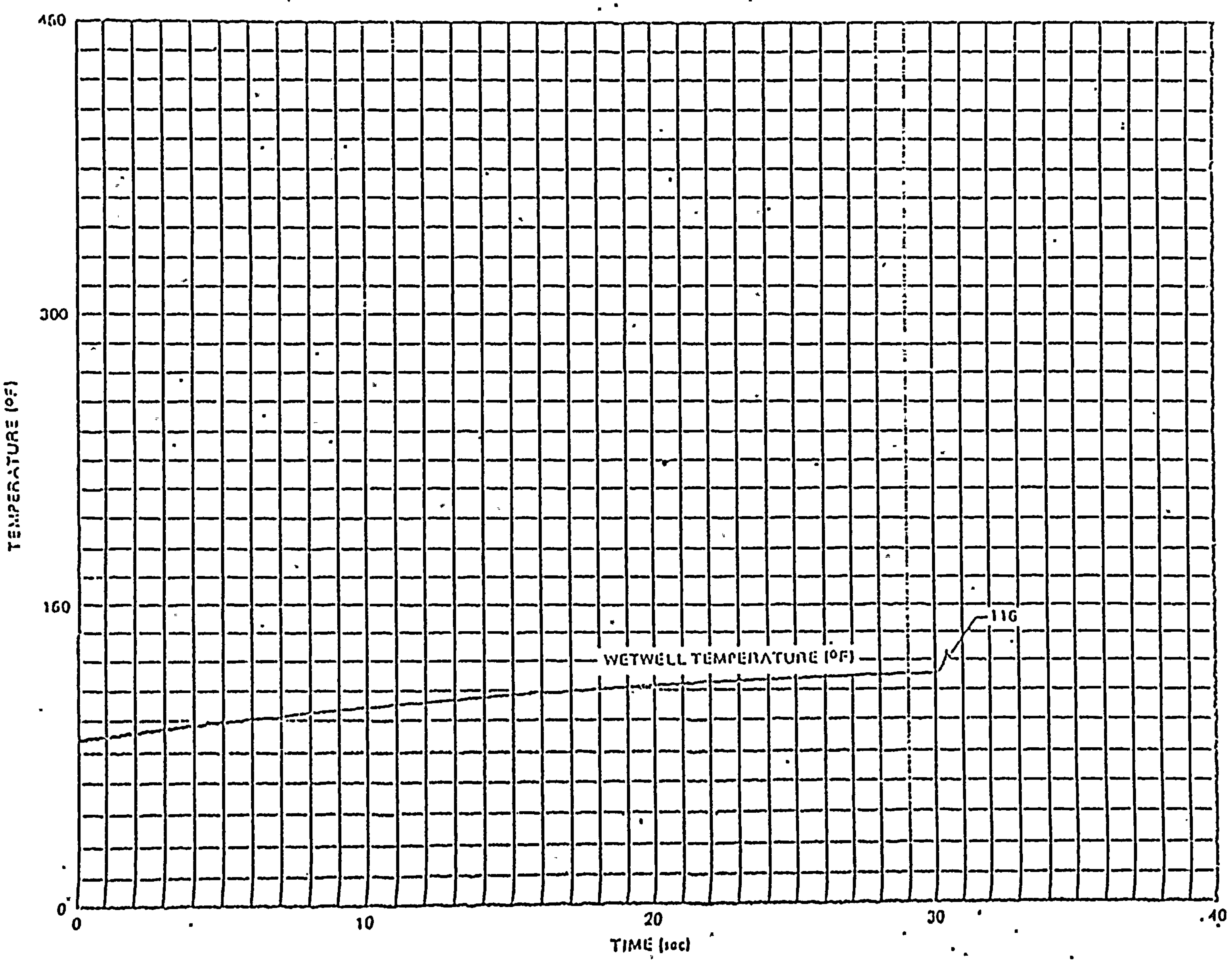
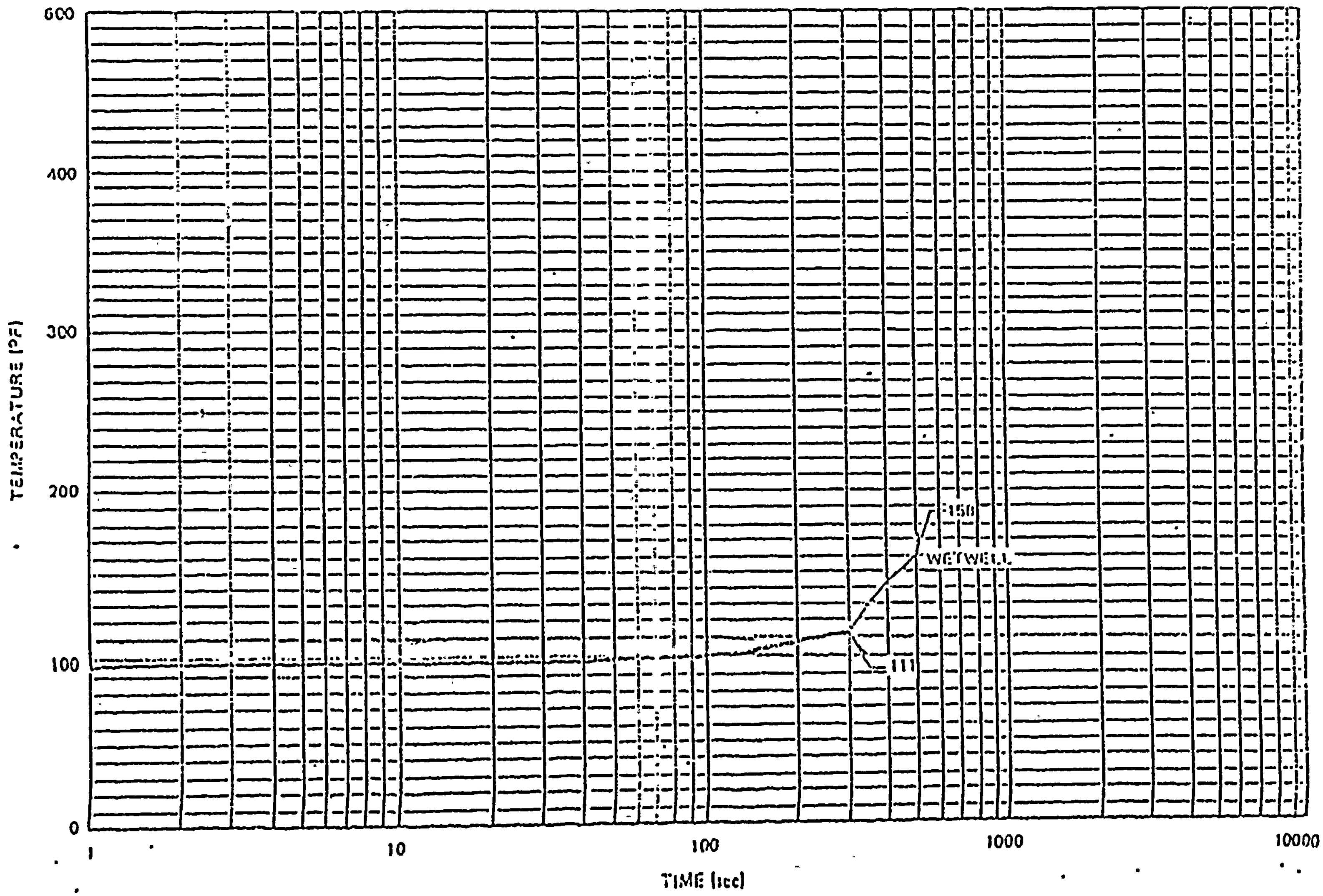


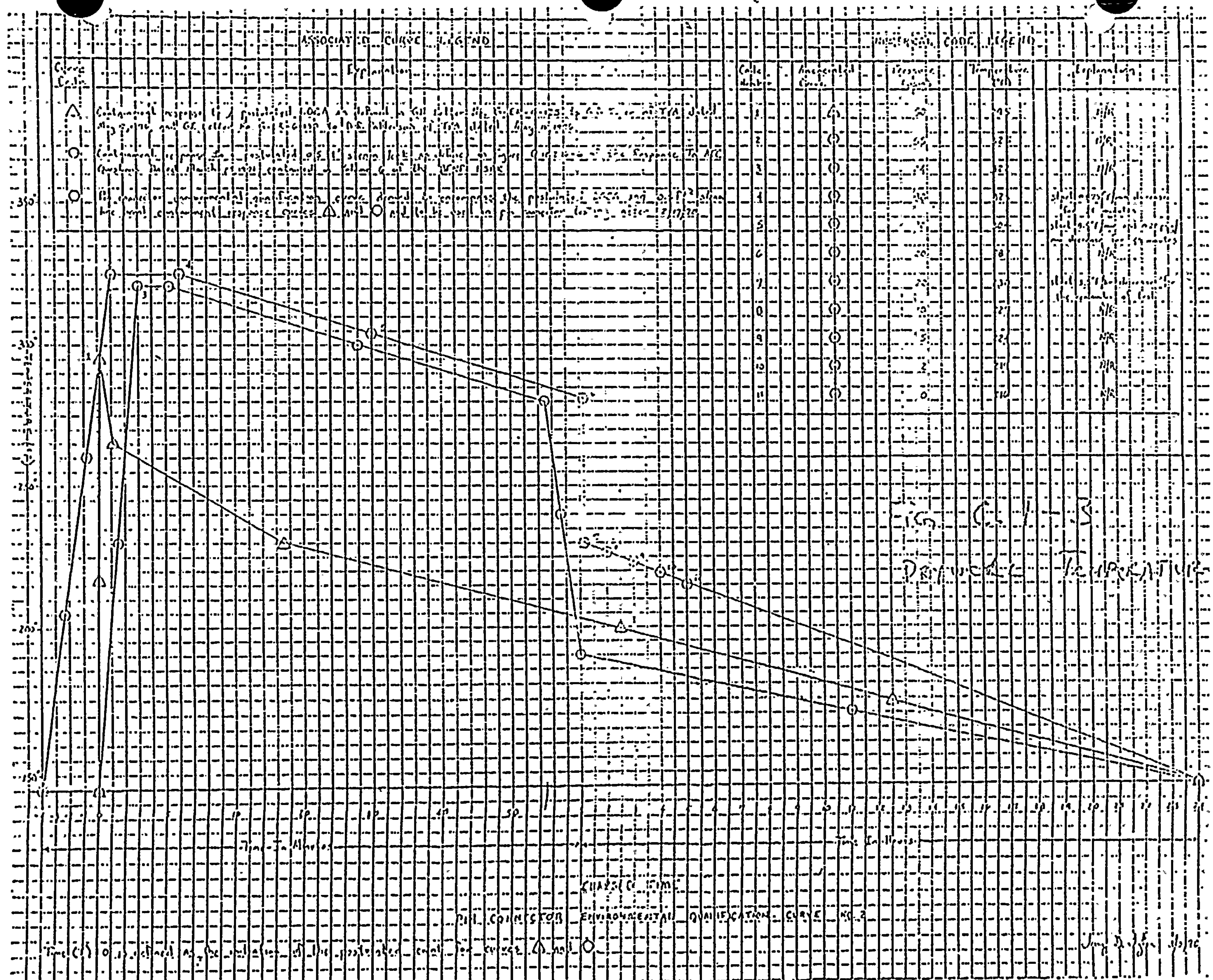
C.1-1 WETWELL

Figure ...... DBA [illegible] Temperature Response



C-1-2 WETWELL

Figure ~~[illegible]-2~~. IDA [illegible] Temperature Response


ASSOCIATED CURVE LEGEND
Curve Code
Explanation
Code
Time In Minutes
Time In Hours
Fig. C-1-5
Drywell Temperature
CONNECTOR ENVIRONMENTAL QUALIFICATION CURVE NO. 2

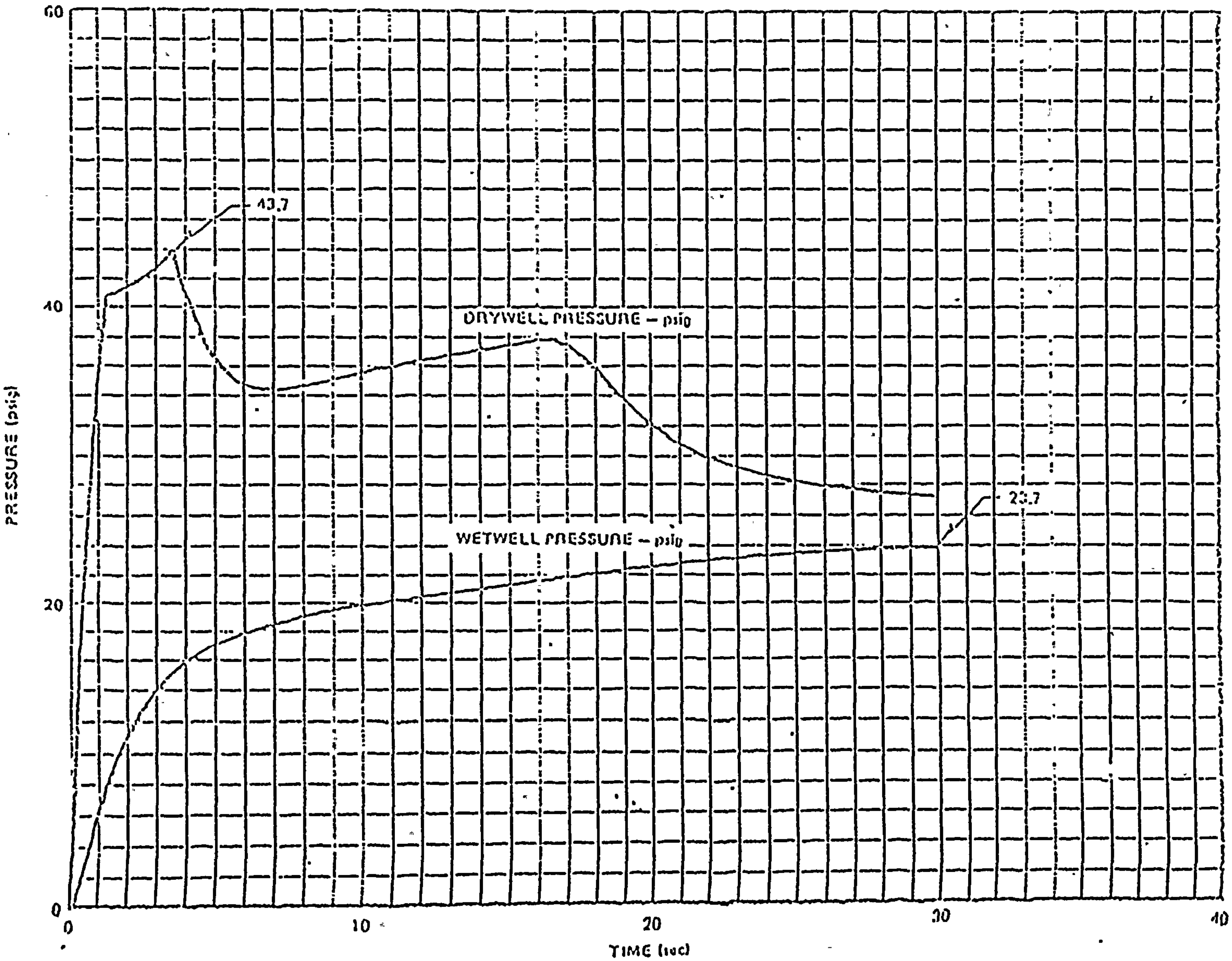


Figure 6.1-7 . DBA Containment Pressure Response

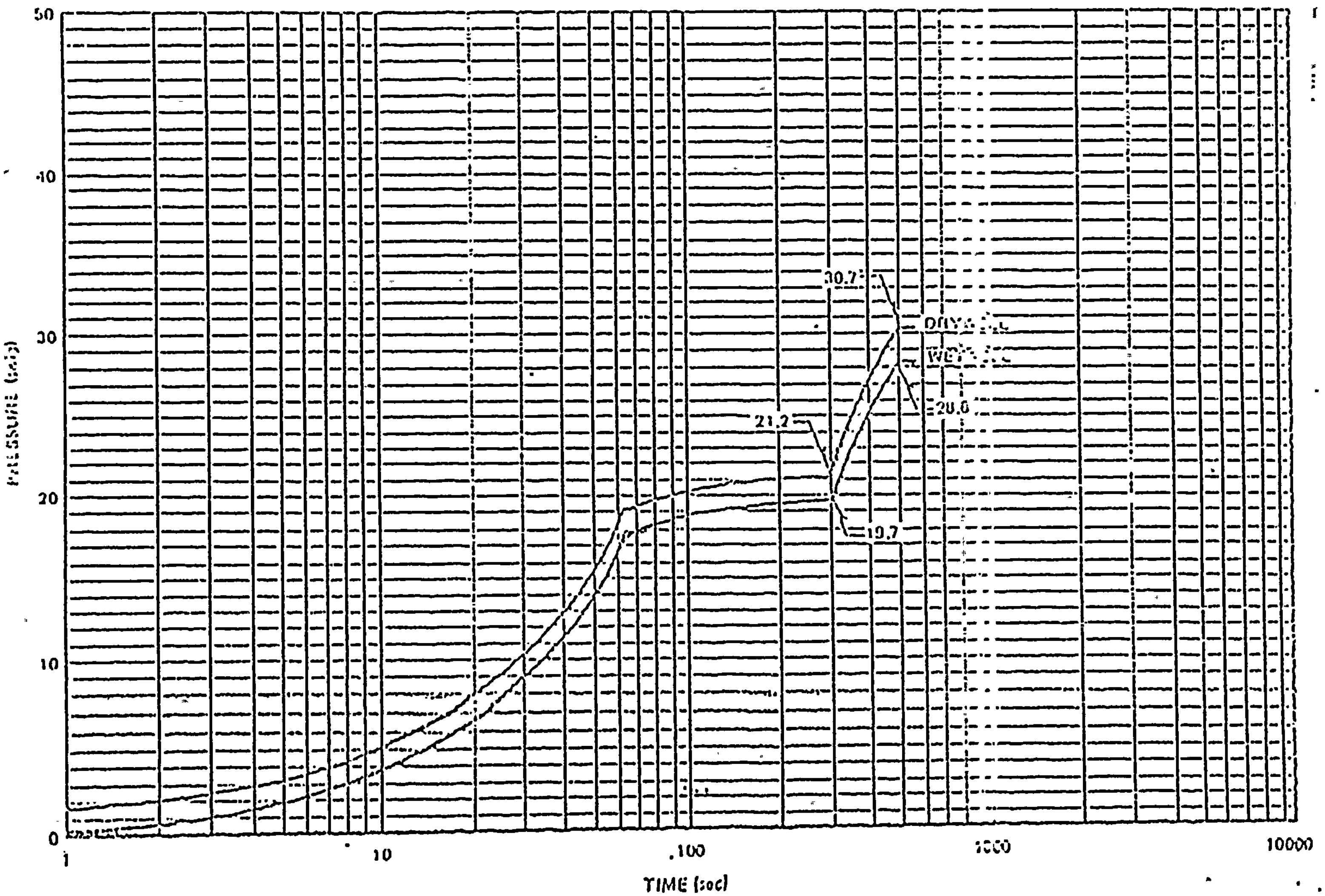
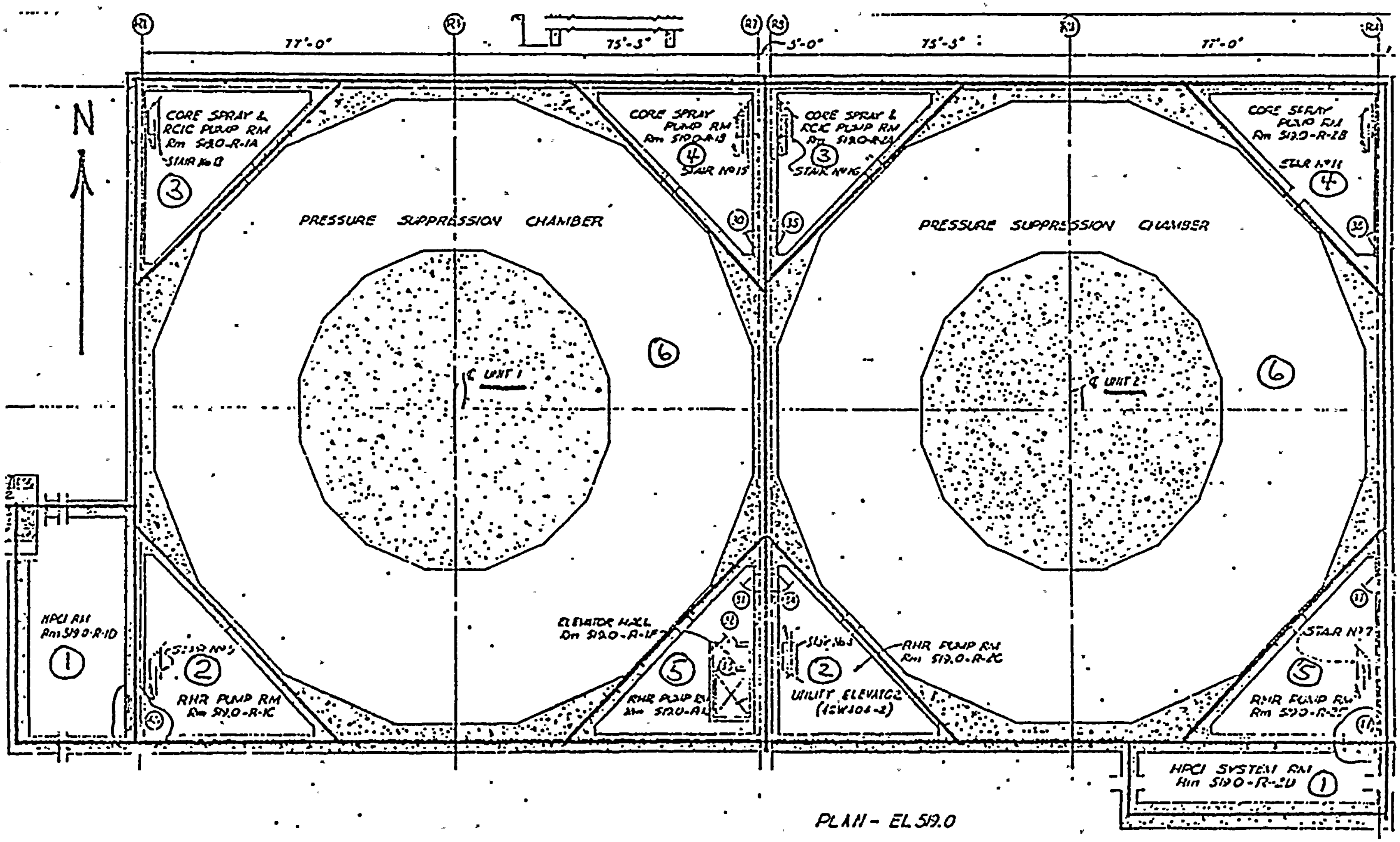


Figure C.1-5 IDA Containment Pressure Response



N
77'-0"
75'-3"
5'-0"
75'-3"
77'-0"
CORE SPRAY & RCIC PUMP RM Rm 519.0-R-1A
STAIR No 13
3
CORE SPRAY PUMP RM Rm 519.0-R-1B
4
STAIR No 15
CORE SPRAY & RCIC PUMP RM Rm 519.0-R-2A
STAIR No 16
3
CORE SPRAY PUMP RM Rm 519.0-R-2B
STAIR No 11
4
PRESSURE SUPPRESSION CHAMBER
PRESSURE SUPPRESSION CHAMBER
UNIT 1
UNIT 2
6
6
HPCI RM Rm 519.0-R-1D
1
STAIR No 5
2
RHR PUMP RM Rm 519.0-R-1C
ELEVATOR HALL Rm 519.0-R-1F
5
STAIR No 3
RHR PUMP RM Rm 519.0-R-2C
2
UTILITY ELEVATOR (1EW104-2)
STAIR No 7
5
RHR PUMP RM
HPCI SYSTEM RM Rm 519.0-R-2D
1
PLAN - EL 519.0

FIG C.2-1

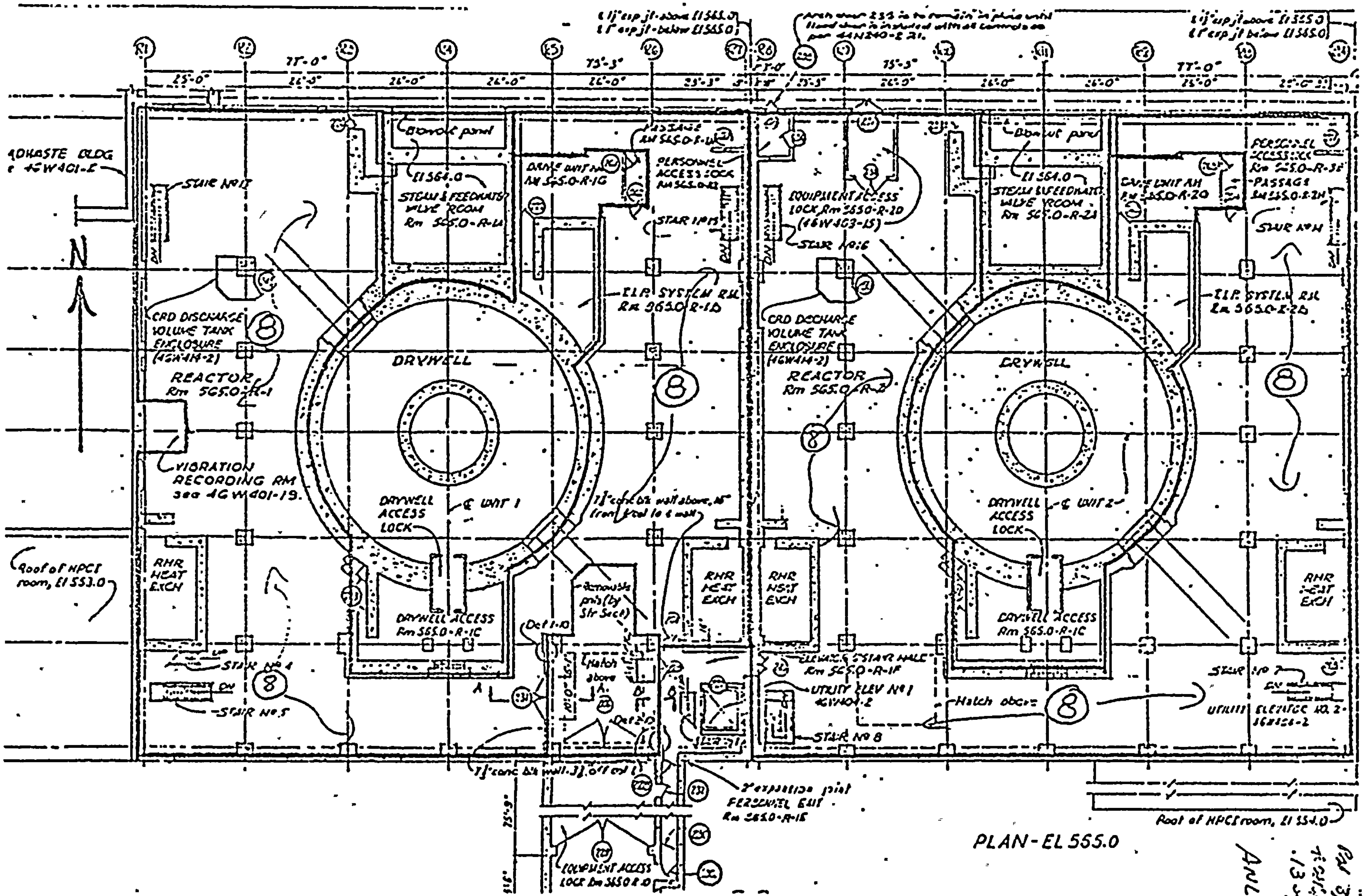


FIG C.2-2

ANL-16 R0

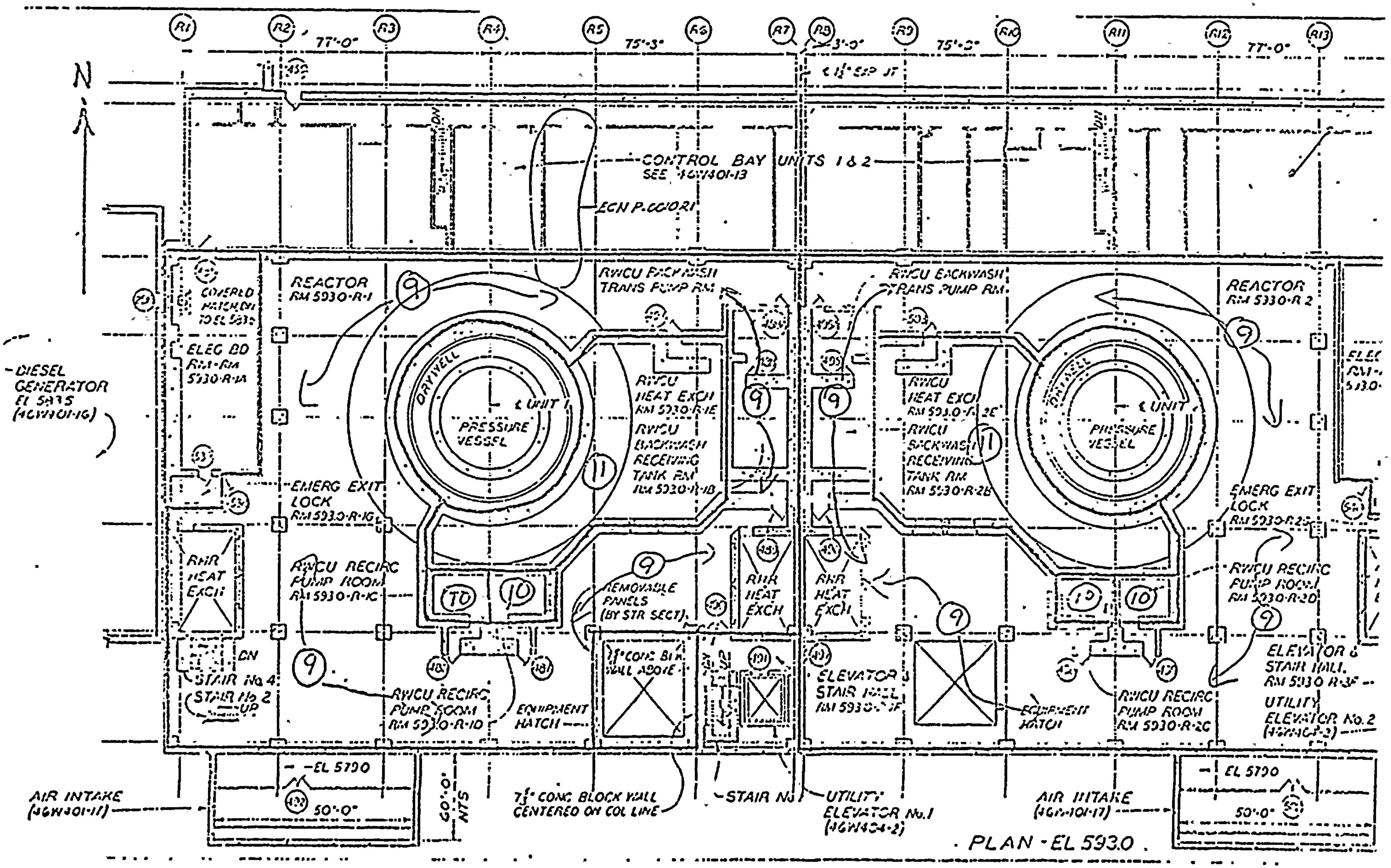


FiG. 8C.2-3

14 of 137
ANL-16

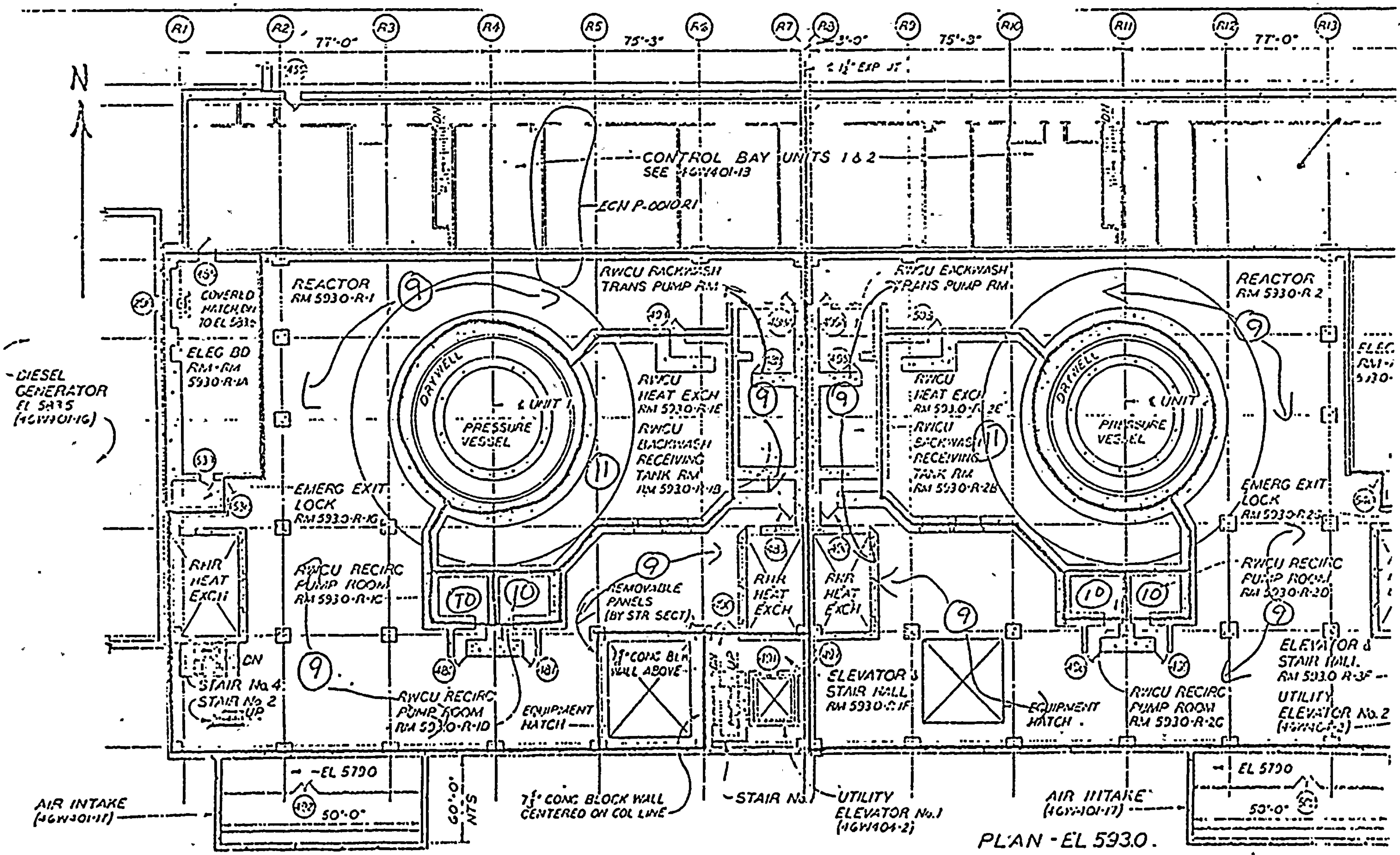
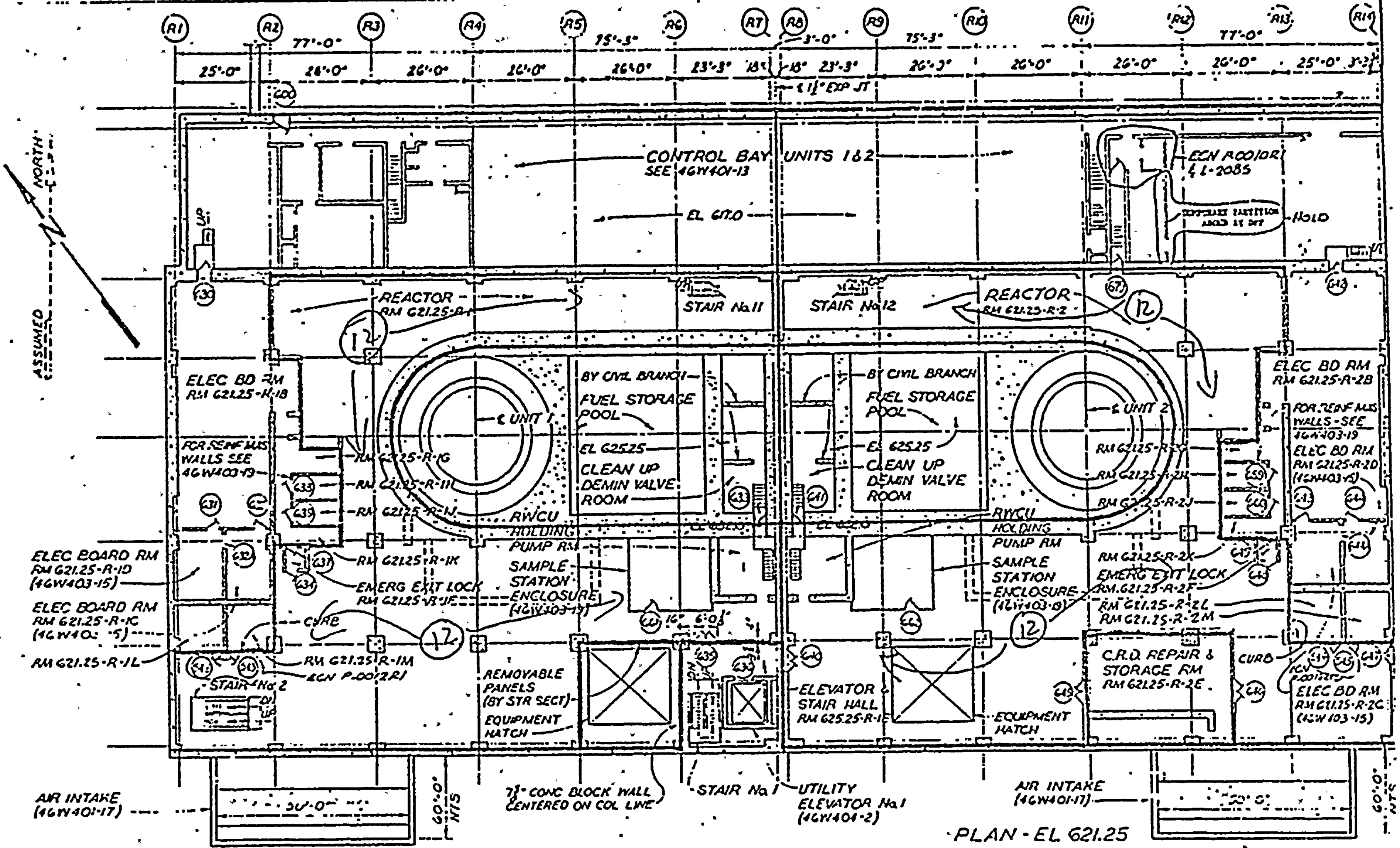


FiG. 3 C.2-3

14 of 137



PLAN - EL 621.25

Fig. C.2-4

Rd 3/21/80
ANL-16 RO

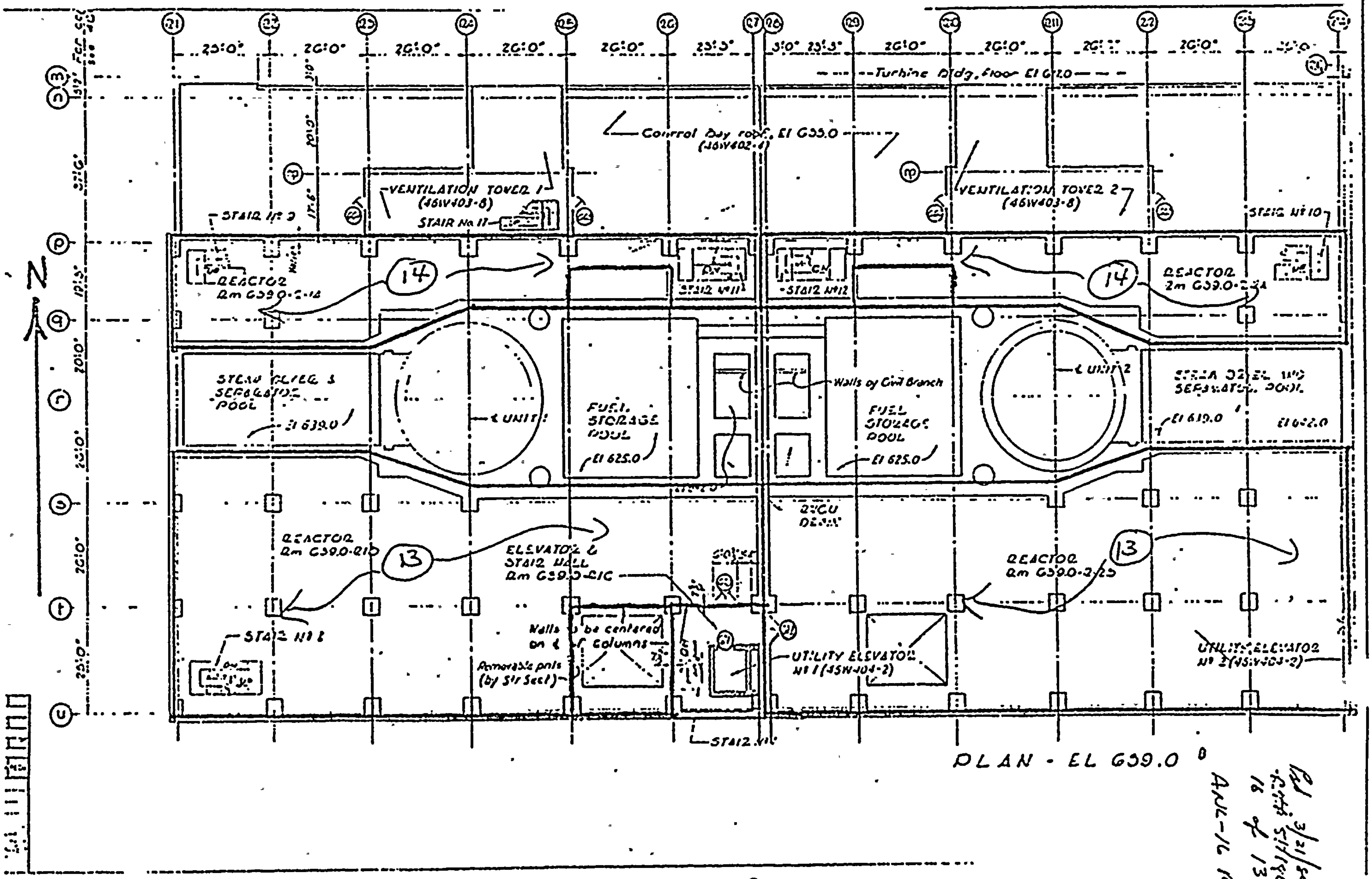


Fig C.2-5

Ref 3/21/80
16 of 137
ANL-16 R0

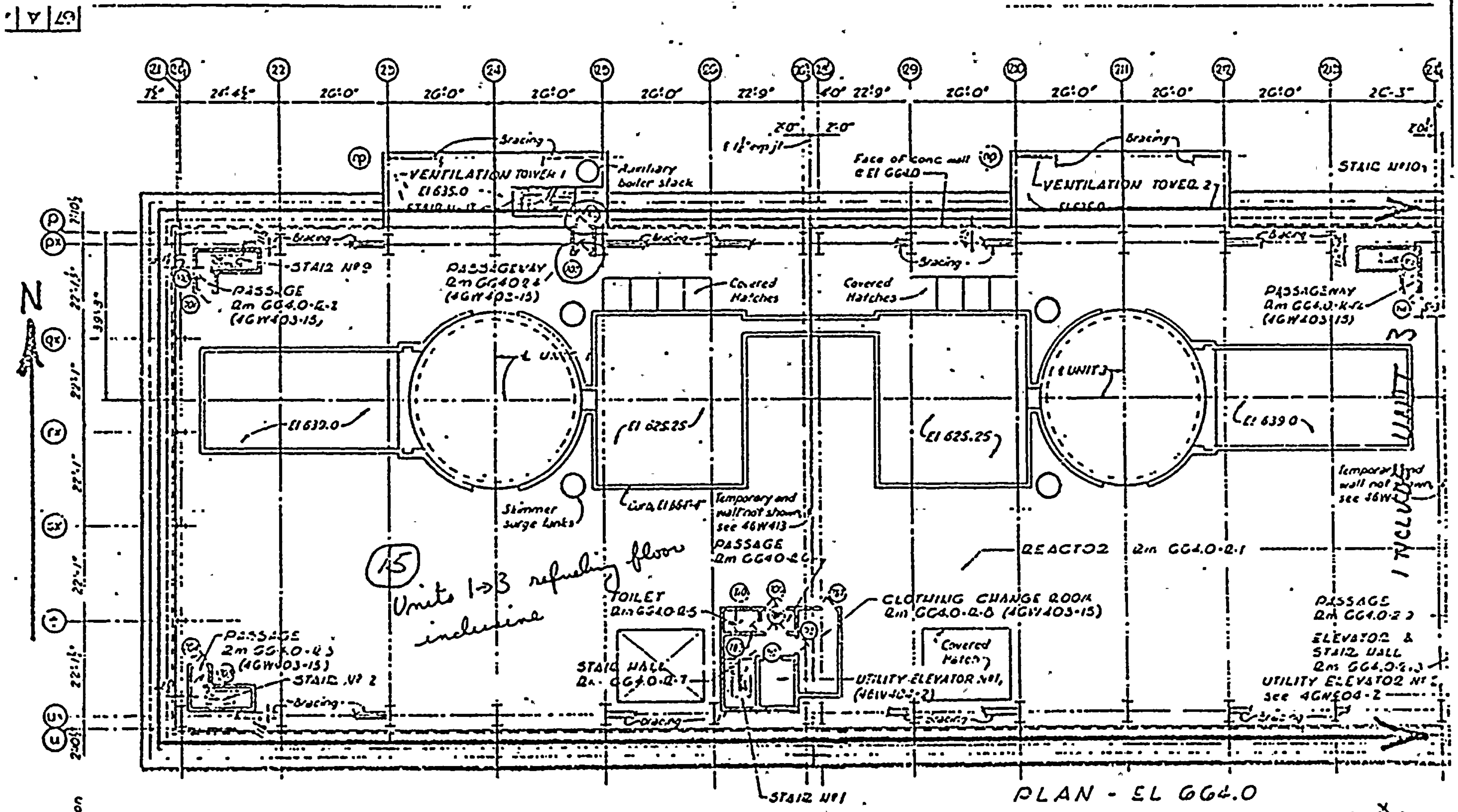


FiG C.2-6

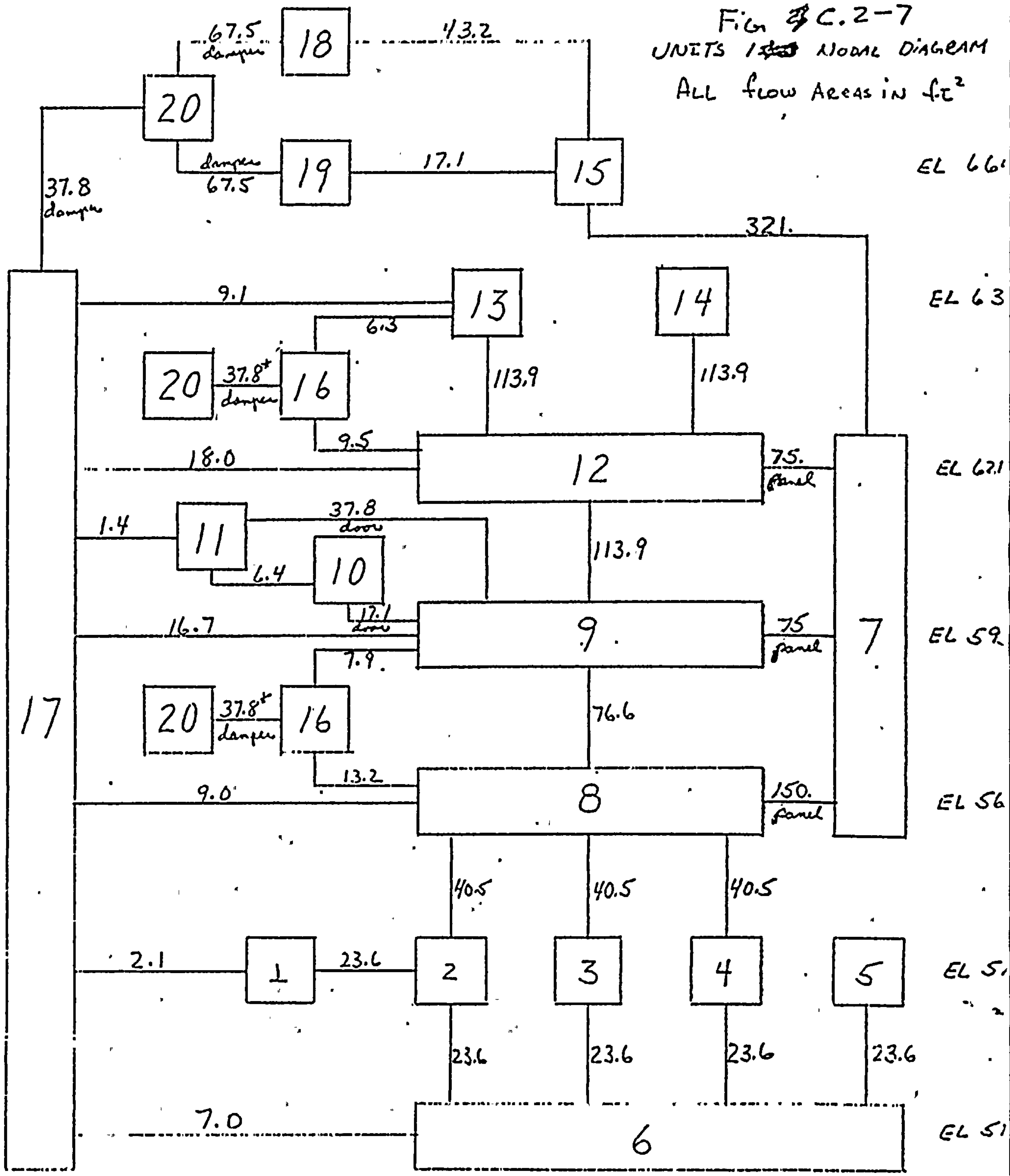
RNL-16 00
12 of 137
7/3/80

TVA 488A (EN DES-3-77) TENNESSEE VALLEY AUTHORITY SHEET 70 OF

SUBJECT ______ PROJECT ANL-16 R0

COMPUTED BY ______ DATE 3/24/80 CHECKED BY RHS DATE 5-15-80

Fig C.2-7
UNITS 1 NODAL DIAGRAM
ALL flow Areas in ft²



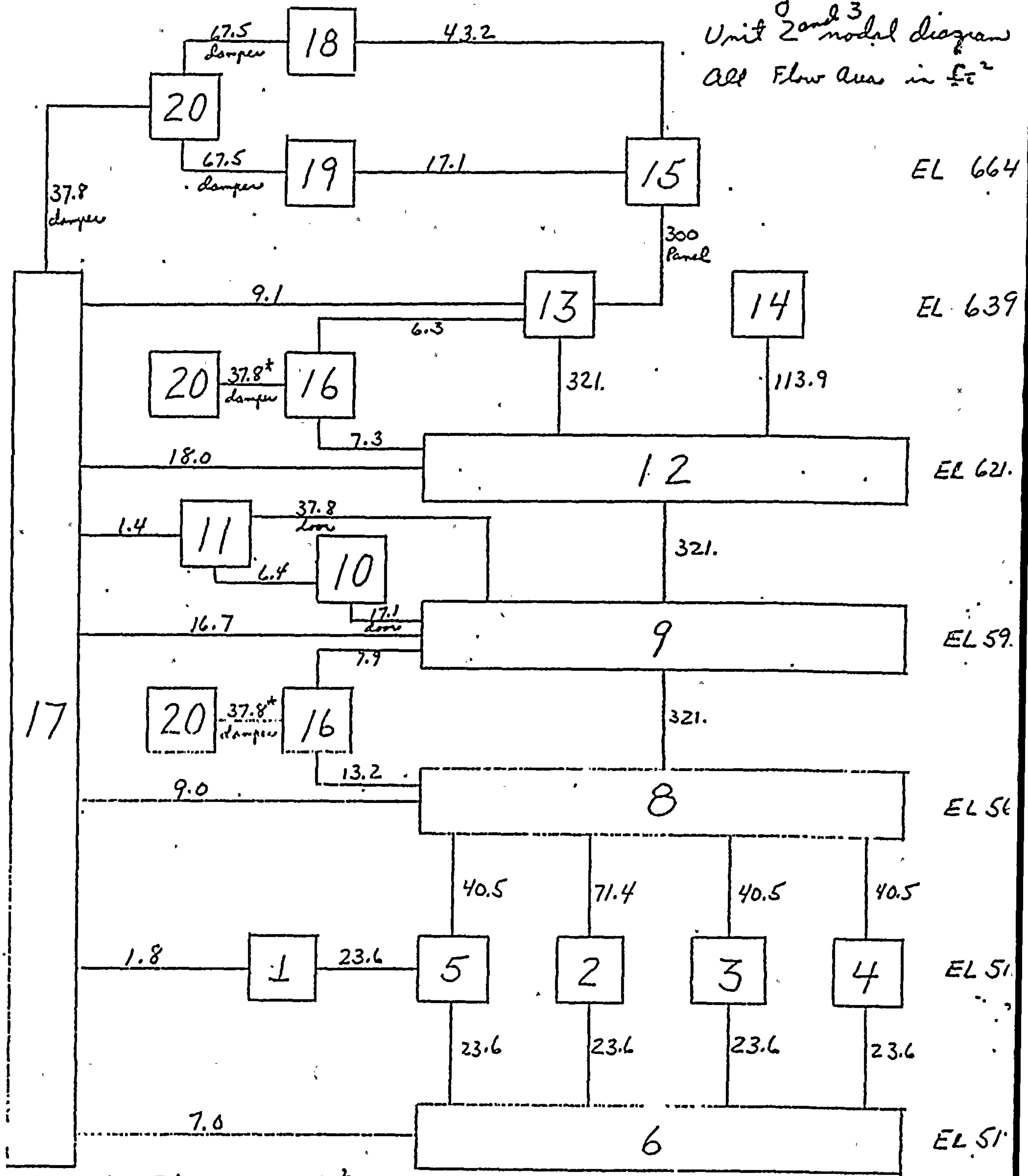
+ Total 16-20 = 37.8 ft²

TVA 488A (EN DES-3-77) TENNESSEE VALLEY AUTHORITY SHEET 17 OF 151

SUBJECT ______ PROJECT ANL-16 R0

COMPUTED BY [illegible] DATE 3/24/80 CHECKED BY [illegible] DATE 5-15-80

Fig C.2-8
Unit 2 and 3 nodal diagram
All Flow Area in ft²



* total 16-20 = 37.8 ft²

Table C.2-1

Breaks Considered	Break Nodes
S.E. *HPCI	1, 6
S.E. RCIC	3, 6
S.E. RWCU	10, 11, 8
Main Steam	Steam Valve Vault

*Single-ended

E10298.21

Table C.2-2

Time Vs Pressure

Unit 1

Time	Compartment (1)
2 sec	1.3 psig
5 "	1.1 "
11 "	.8 "
30 "	.1 "
50 "	0. "

Unit 2 & 3

Time	Compartment (1),(10),&(11)
Same as for unit 1	

Time	Compartment (10)
.02 sec	2.4 psig
.6 "	.8 "
5 "	1.3 "
45 "	1.3 "
47 "	.2 "

Time	All Remaining Area
1 sec	.1 psig
30 "	.5 "
45 "	.5 "
50 "	.1 "
120 "	0. "

Time	Compartment (11)
1 sec	2.4 psig
10 "	3.4 "
45 "	3.8 "
47 "	.4 "
55 "	.1 "
120 "	0. "

Time	All Remaining Areas
1 "	.1 psig
30 "	.5 "
45 "	.6 "
50 "	.2 "
120 "	0. "

All Units

Time	Steam Valve Vault
.1 sec	1.7 psig
3	7.1 "
4 "	4.5 "
5 "	2.7 "
6 "	2.0 "
10 "	1.8 "
150 "	1.8 "

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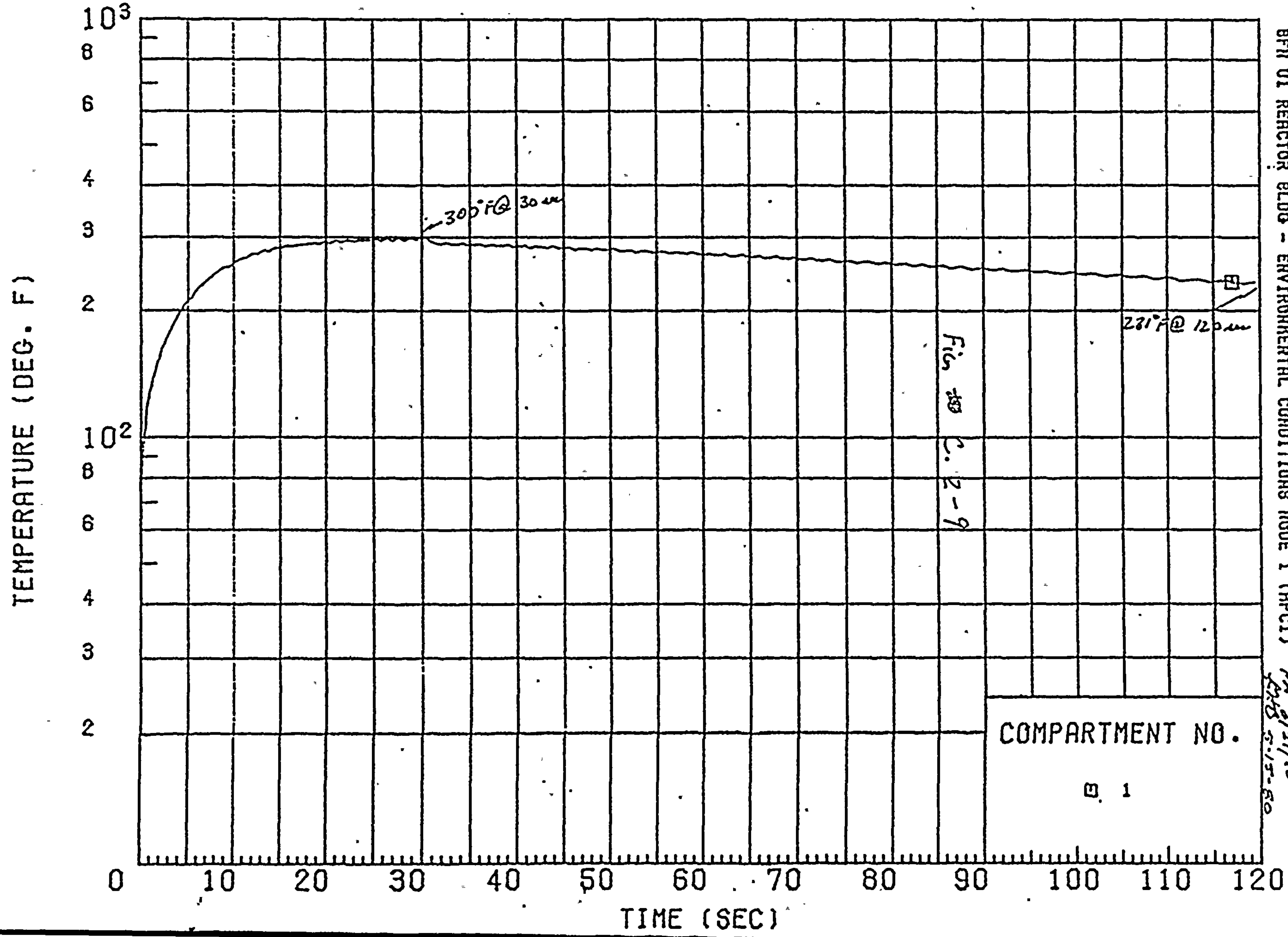
SUBCOMPARTMENT TEMPERATURE HISTORY



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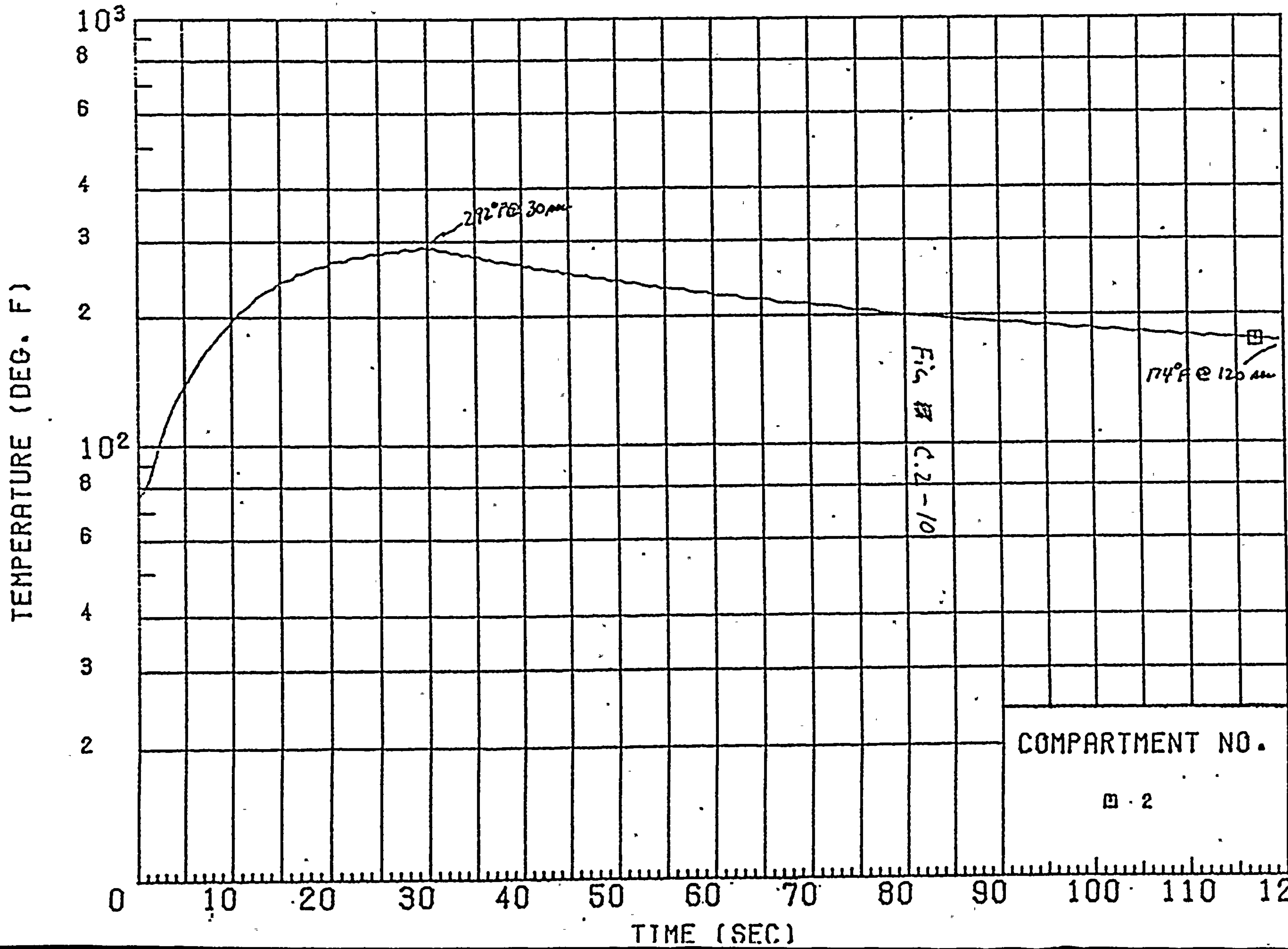
BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 1 (HPCI)

SUBCOMPARTMENT TEMPERATURE HISTORY



SPA (REV. 2) NEQ. TI NO.

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 1 (HPCI)

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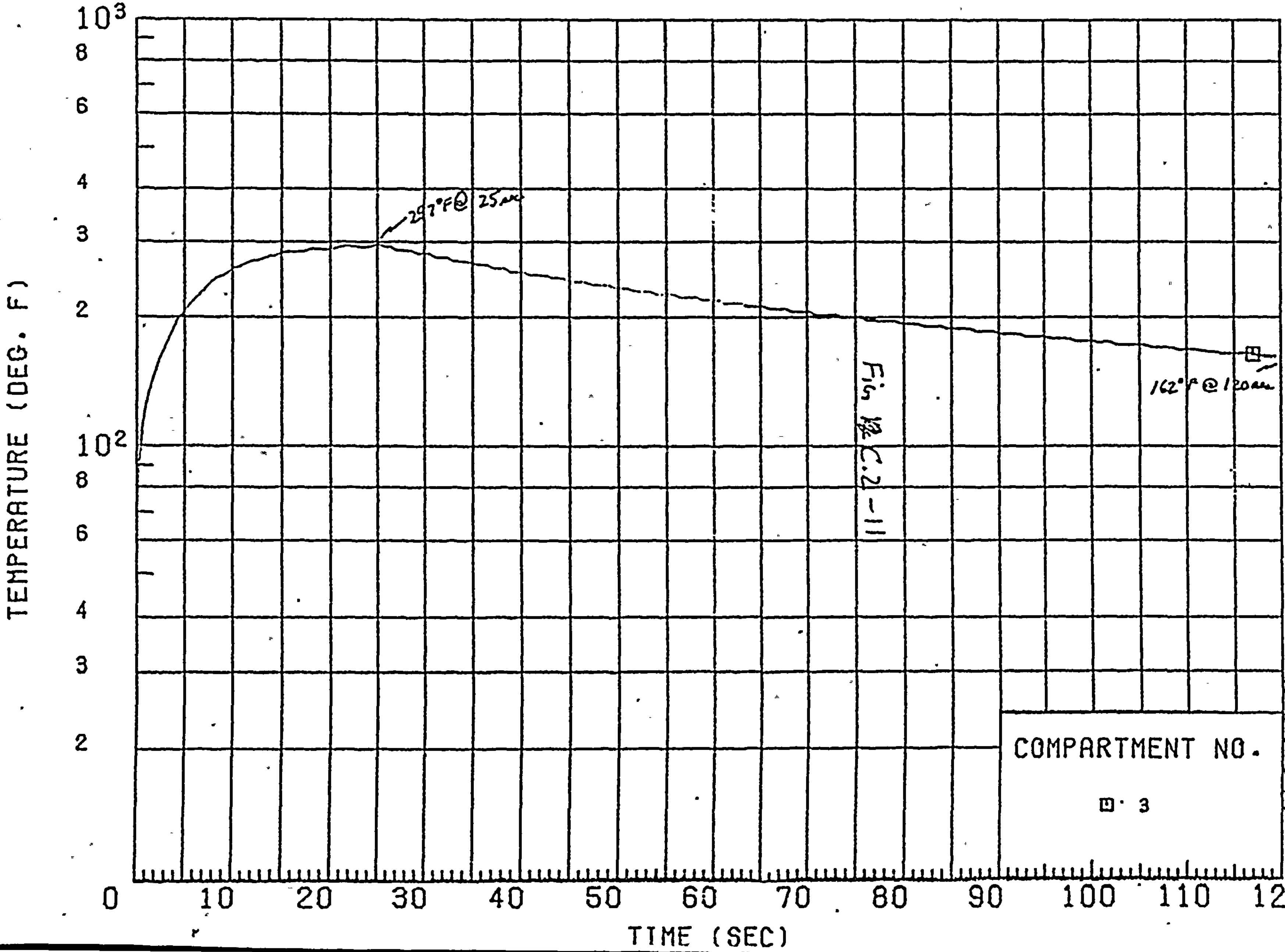
5/21/80 5-15-80 AUL-16 R0

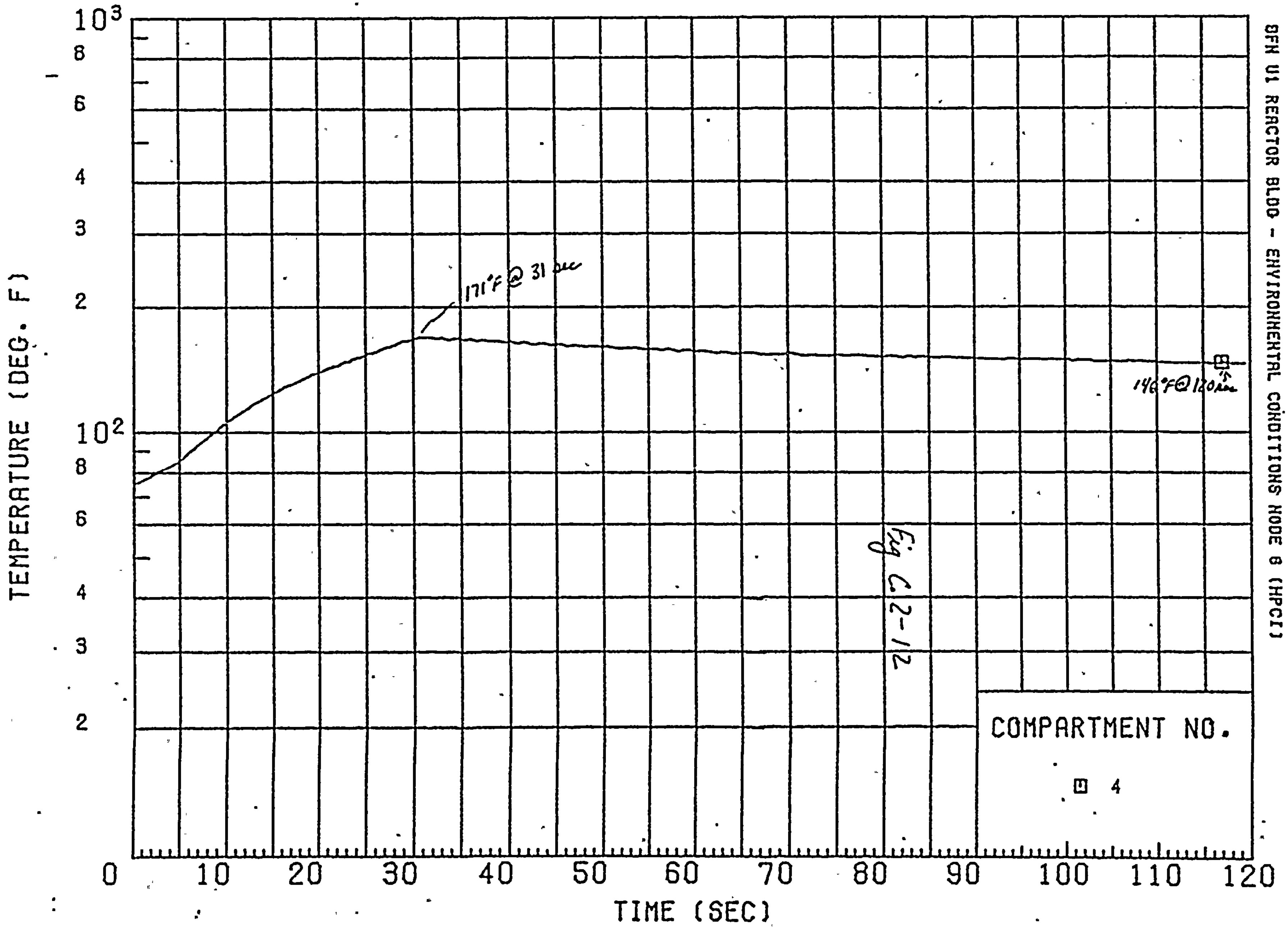
SUBCOMPARTMENT TEMPERATURE HISTORY



SPA (REV. 2)
NEG. TI NO.
BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 3 (RICI)

ANC-16120

SUBCOMPARTMENT TEMPERATURE HISTORY



BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 8 (HPCI)

SPA (REV. 2) NEG. TI NO.

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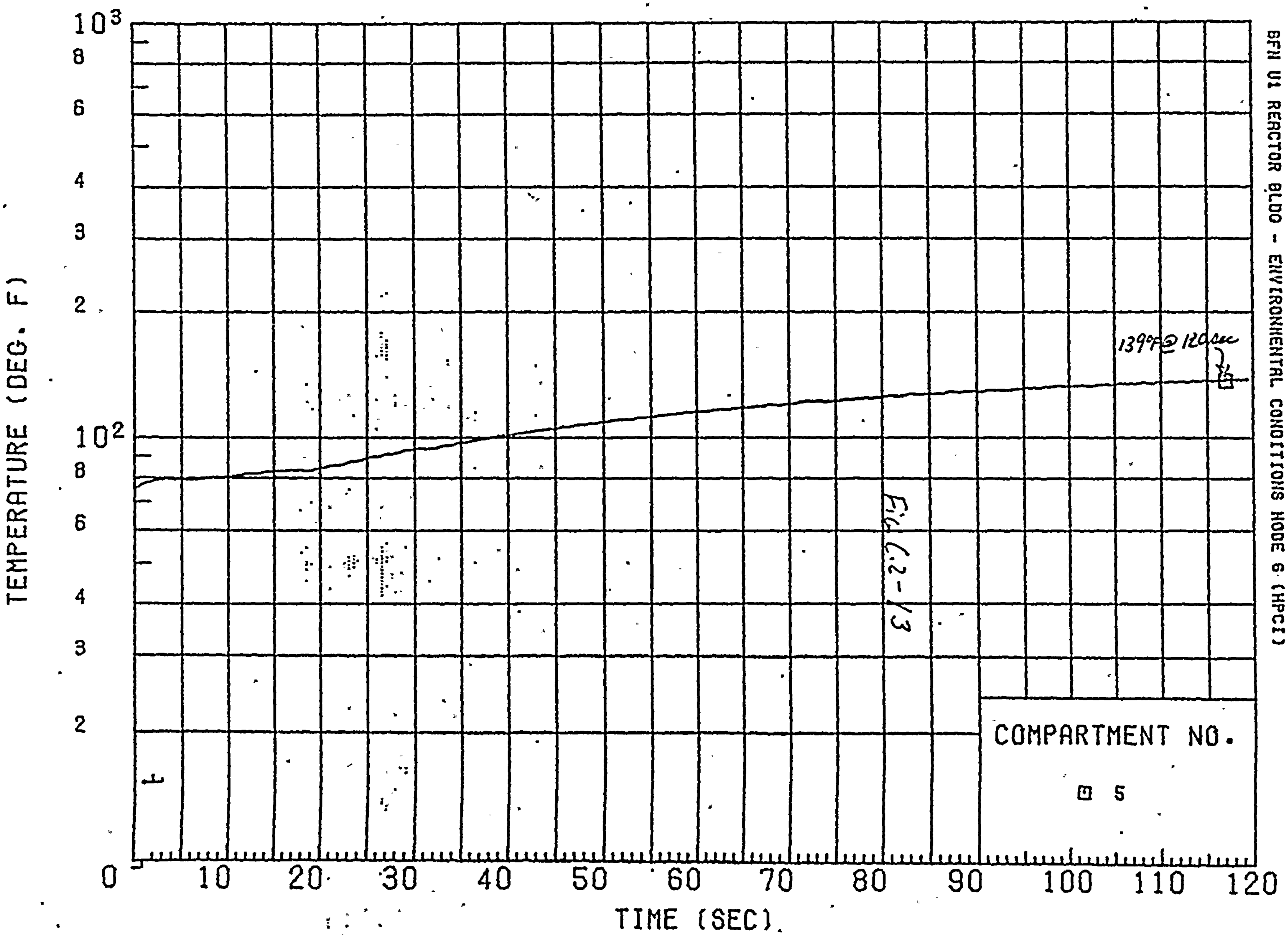

SPA (REV. 2)
NEG. TI NO.
PAGE OF

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 6 (HPCI)

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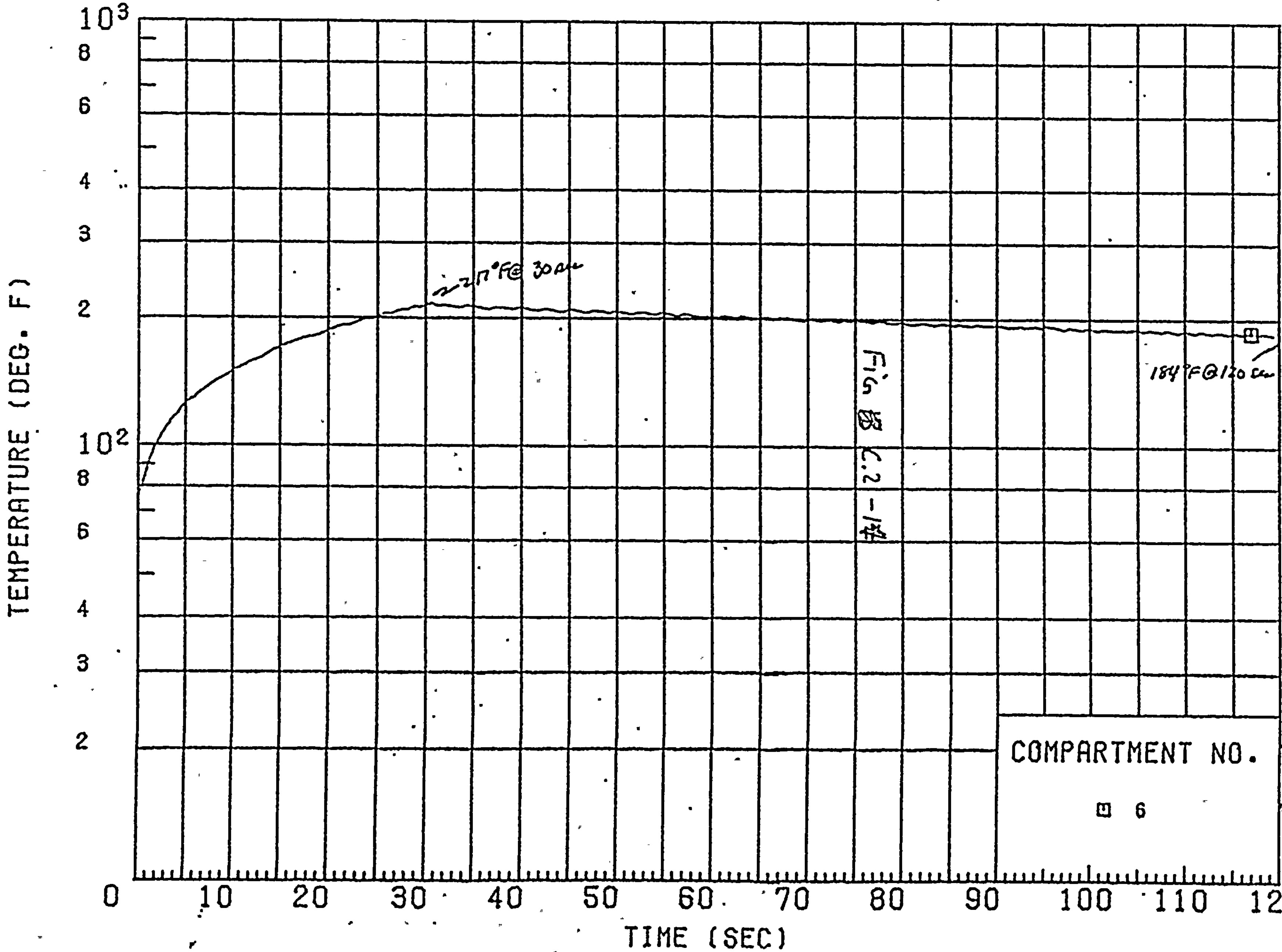

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BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 6 (HPCI)

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SUBCOMPARTMENT TEMPERATURE HISTORY

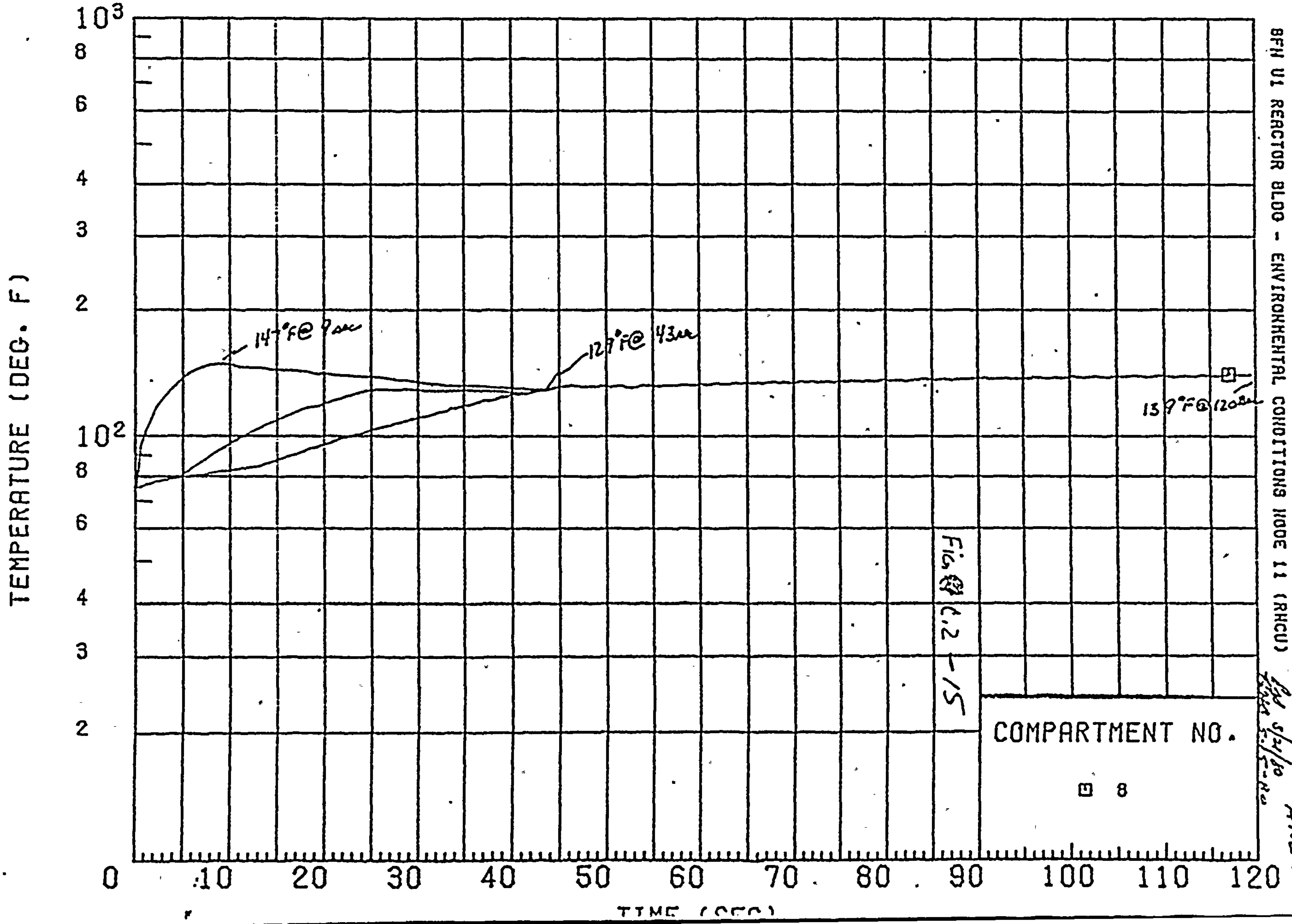

Fig. C.2-15

SPA (REV. 2) NEG. II NO.

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 11 (RHCU)

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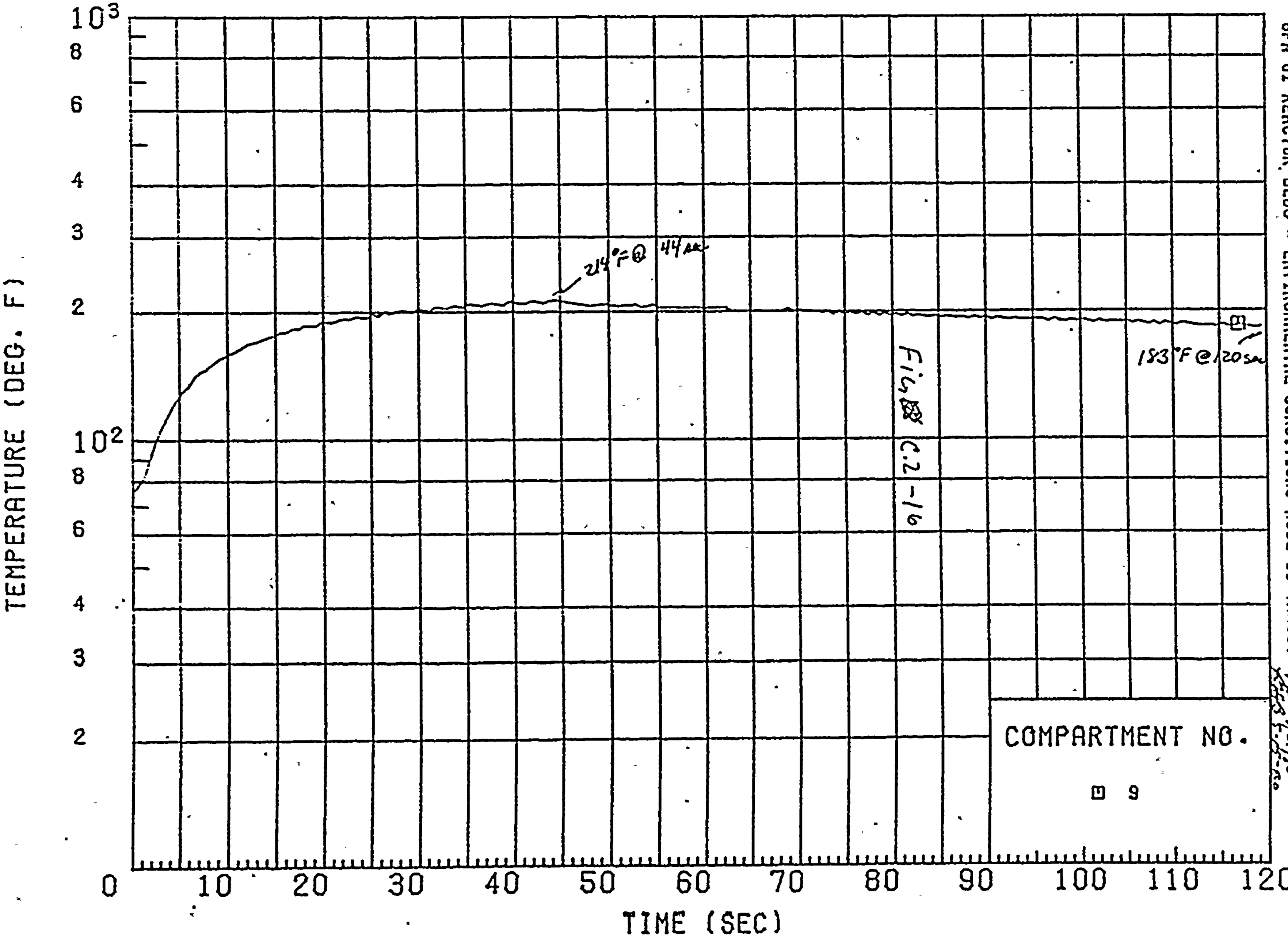
SUBCOMPARTMENT TEMPERATURE HISTORY



SPA (REV. 2) NEG. TI NO.

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RHCU)

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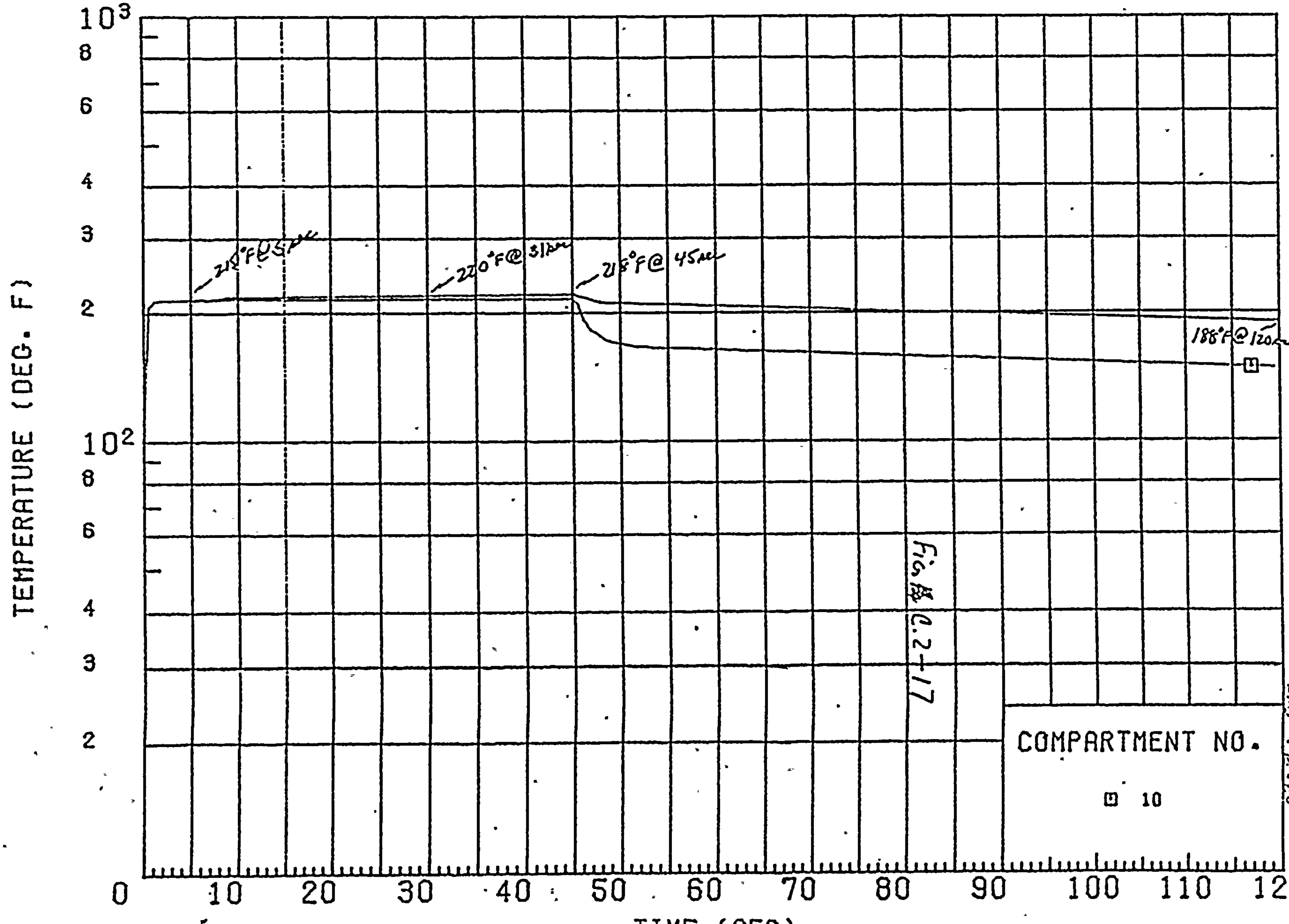
SUBCOMPARTMENT TEMPERATURE HISTORY

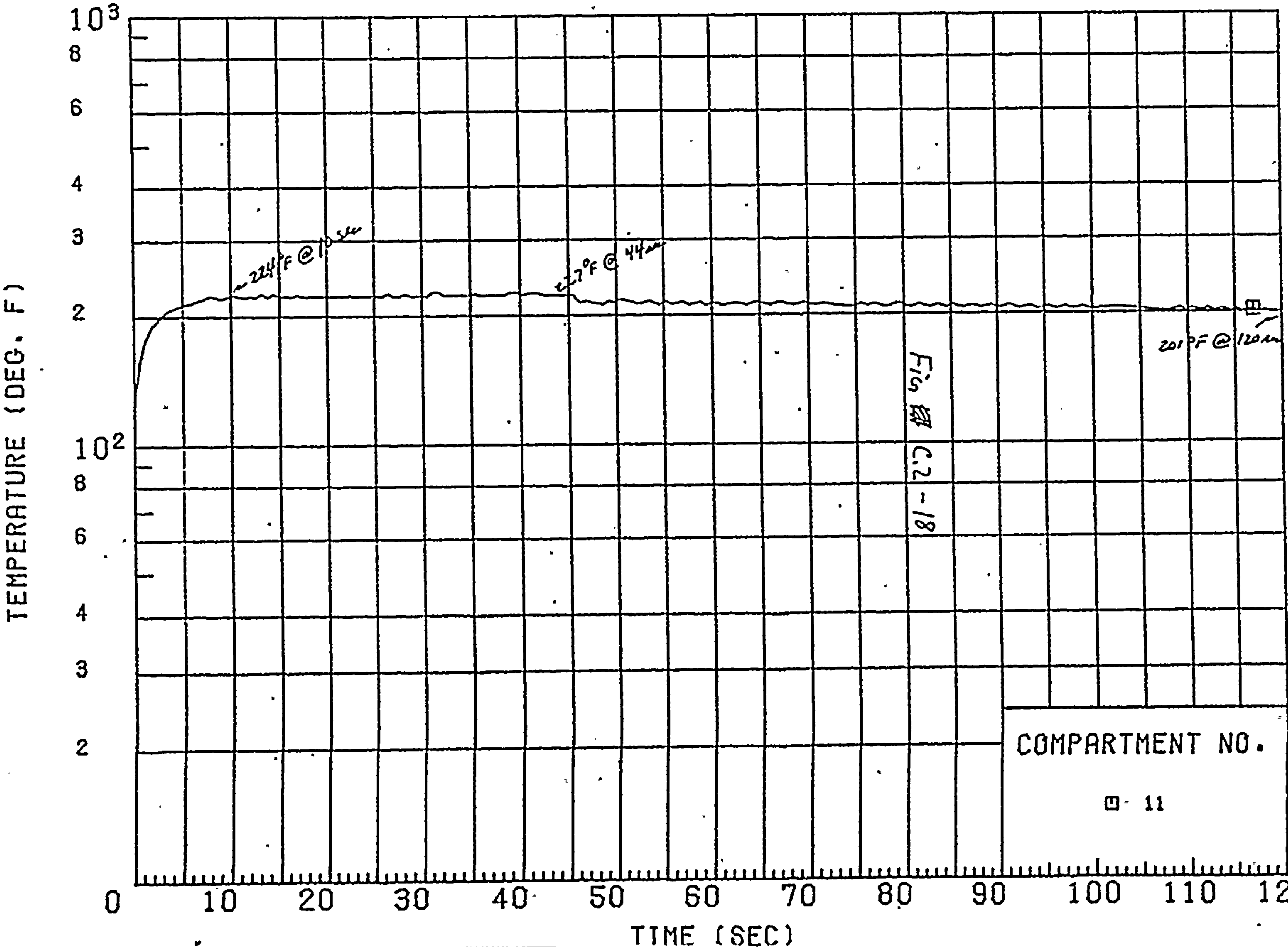


SPA (REV. 2) NEG. TI NO.

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 10 (RHCU)

ANL-1CR

SUBCOMPARTMENT TEMPERATURE HISTORY



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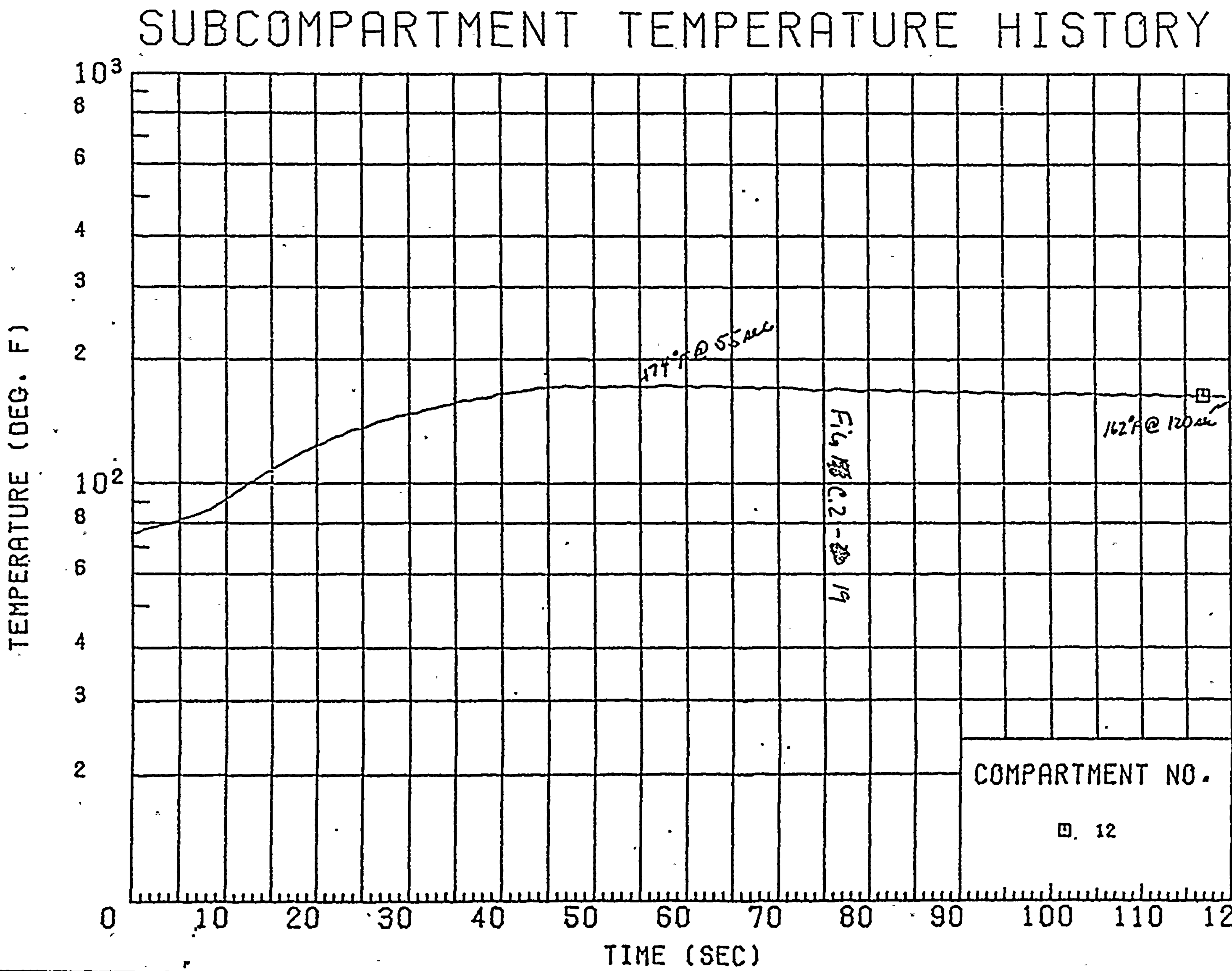
BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RHCU)
NEG. TI NO.



SPA (REV. 2) NEG. TI NO.

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RHCU)

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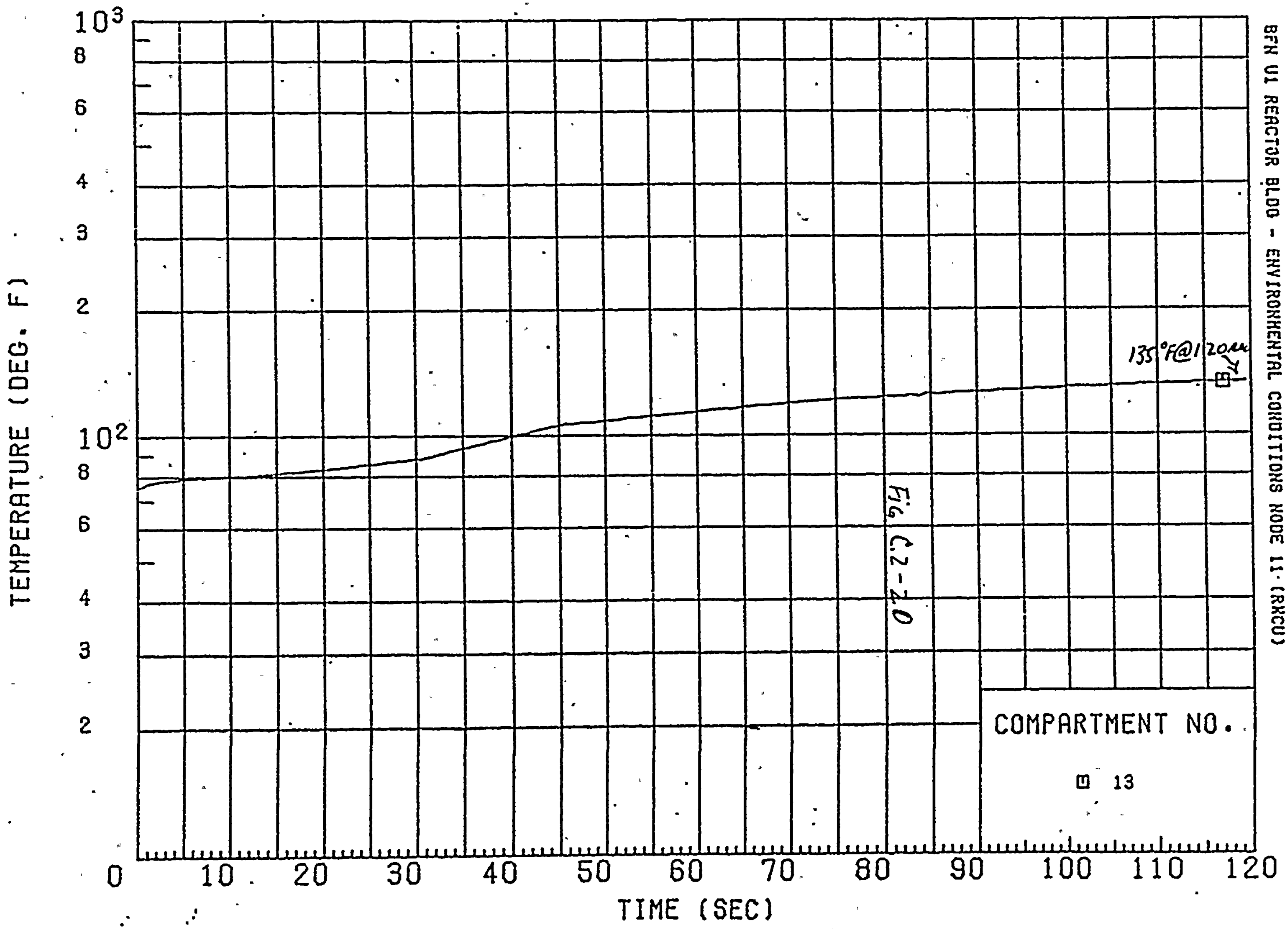
SUBCOMPARTMENT TEMPERATURE HISTORY



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NEG. TI NO.

PAGE . OF

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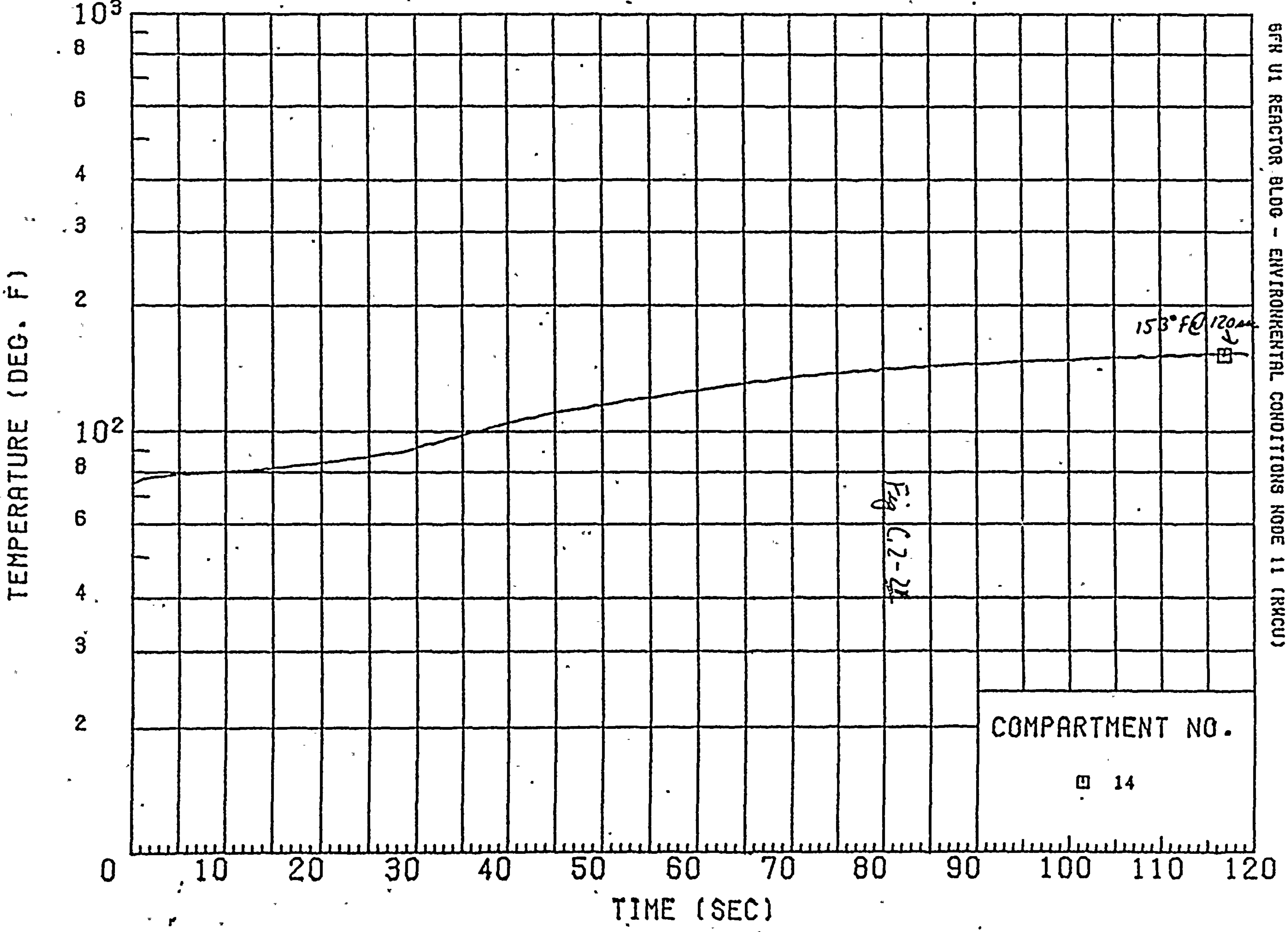

GFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RWCU)

SPA (REV. 2) NEG. TI NO. PAGE OF

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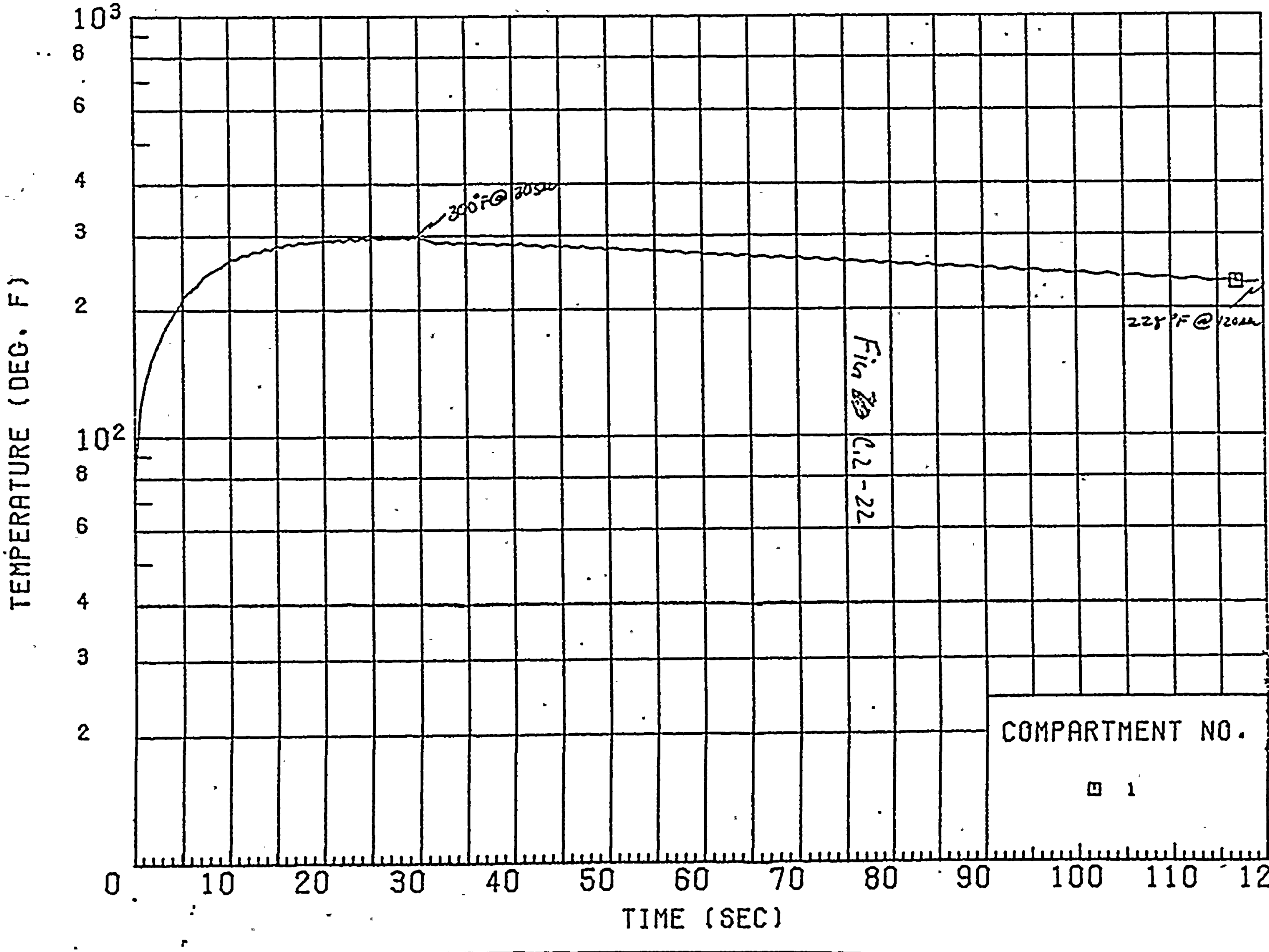

SPA (REV. 2) NEG. TI NO.

DFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 1 (HPCI)

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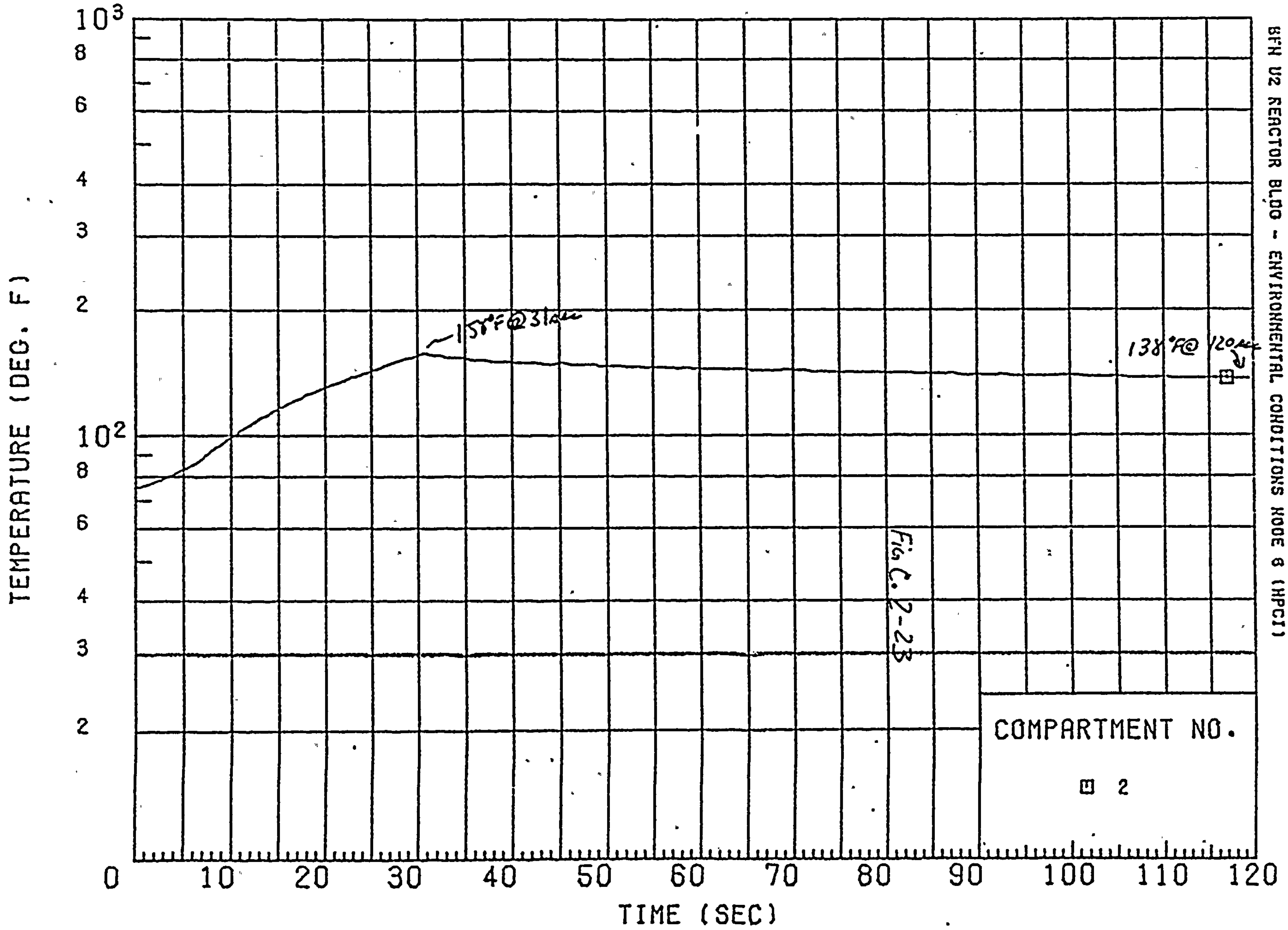
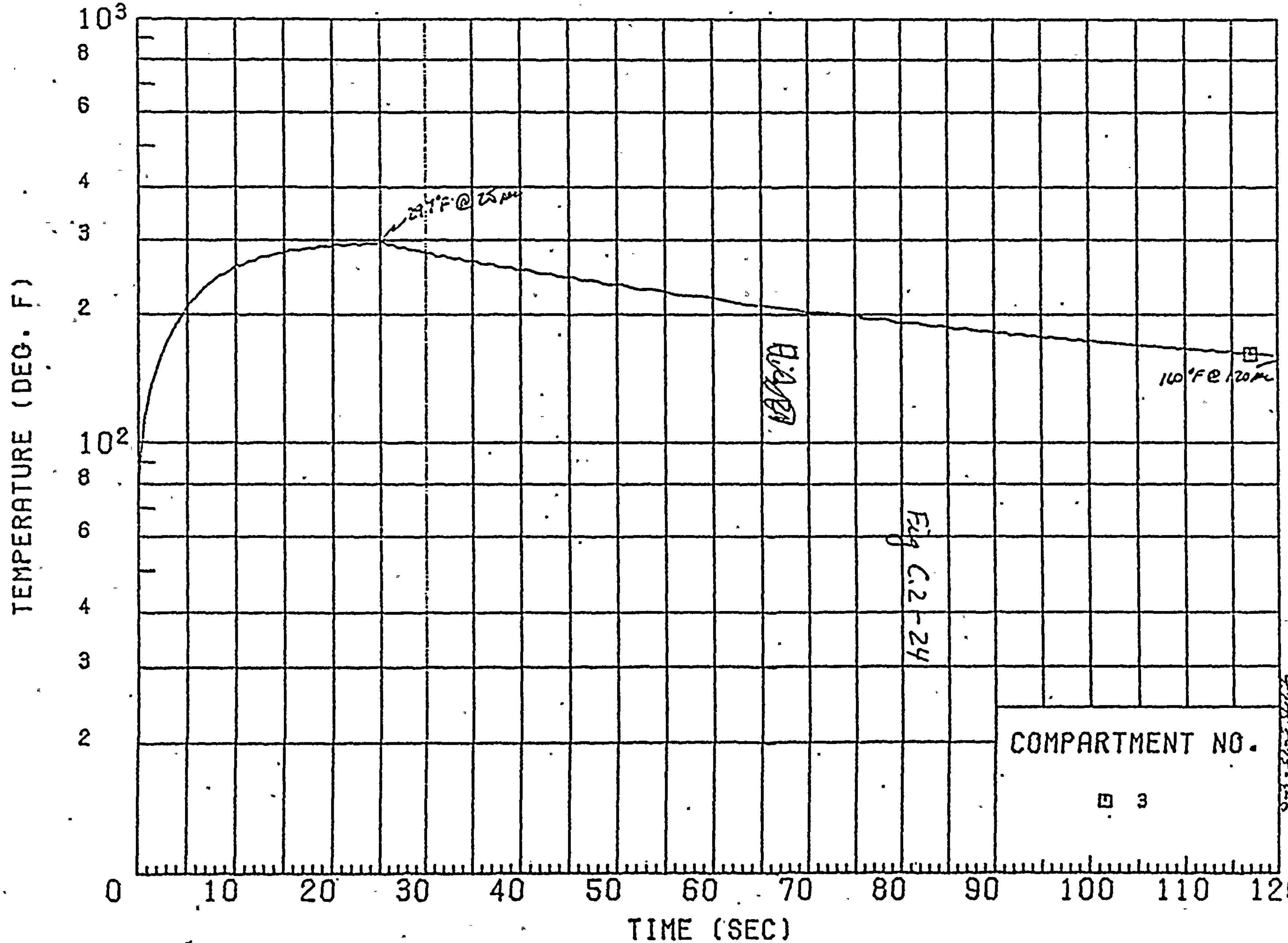
SUBCOMPARTMENT TEMPERATURE HISTORY



SPA (REV. 2) NEG. TI NO.

BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 8 (HPCI)

SUBCOMPARTMENT TEMPERATURE HISTORY



SPA (REV. 2) NEG. TI NO. PAGE OF

BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 6 (HPCI)

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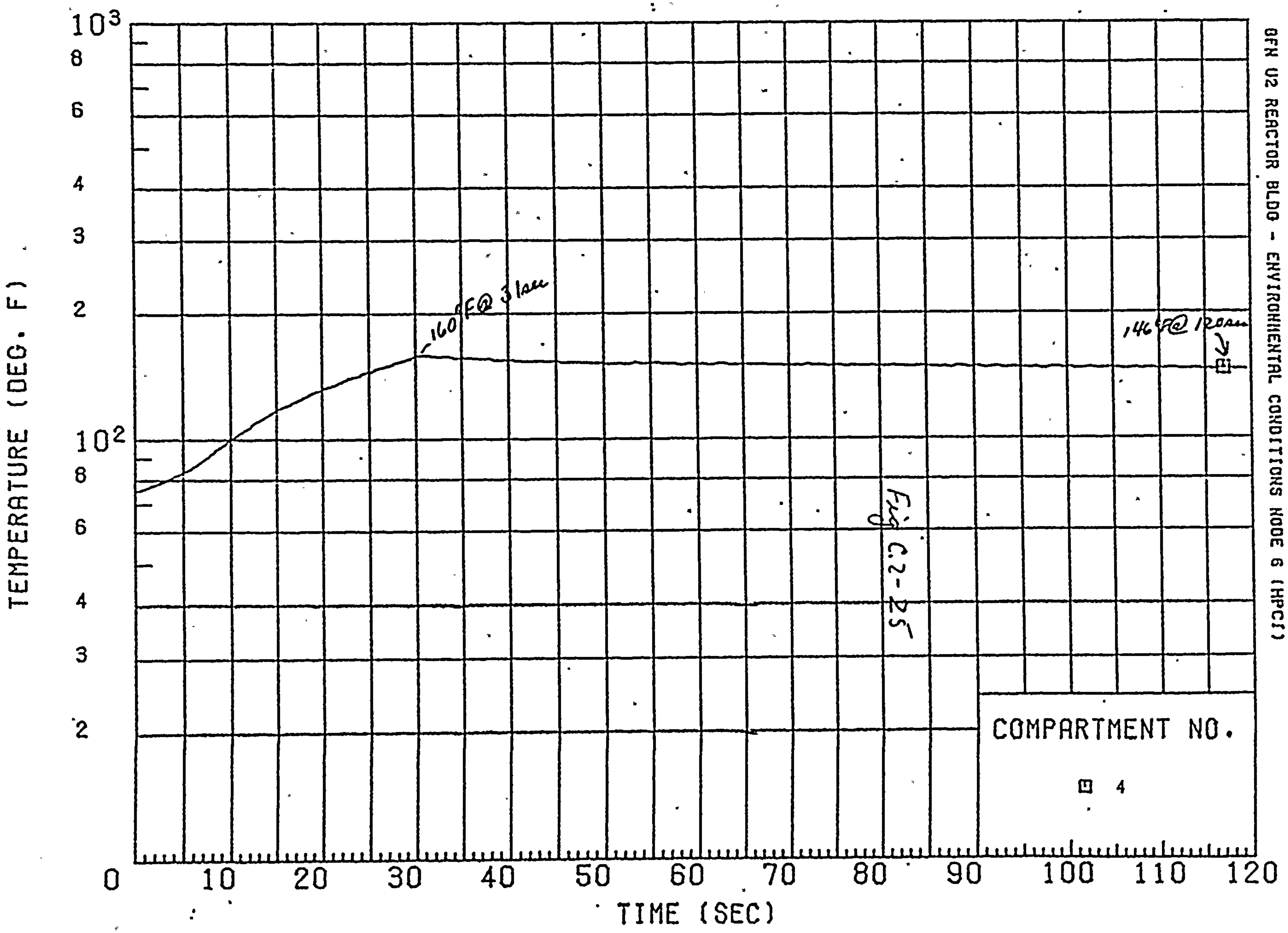

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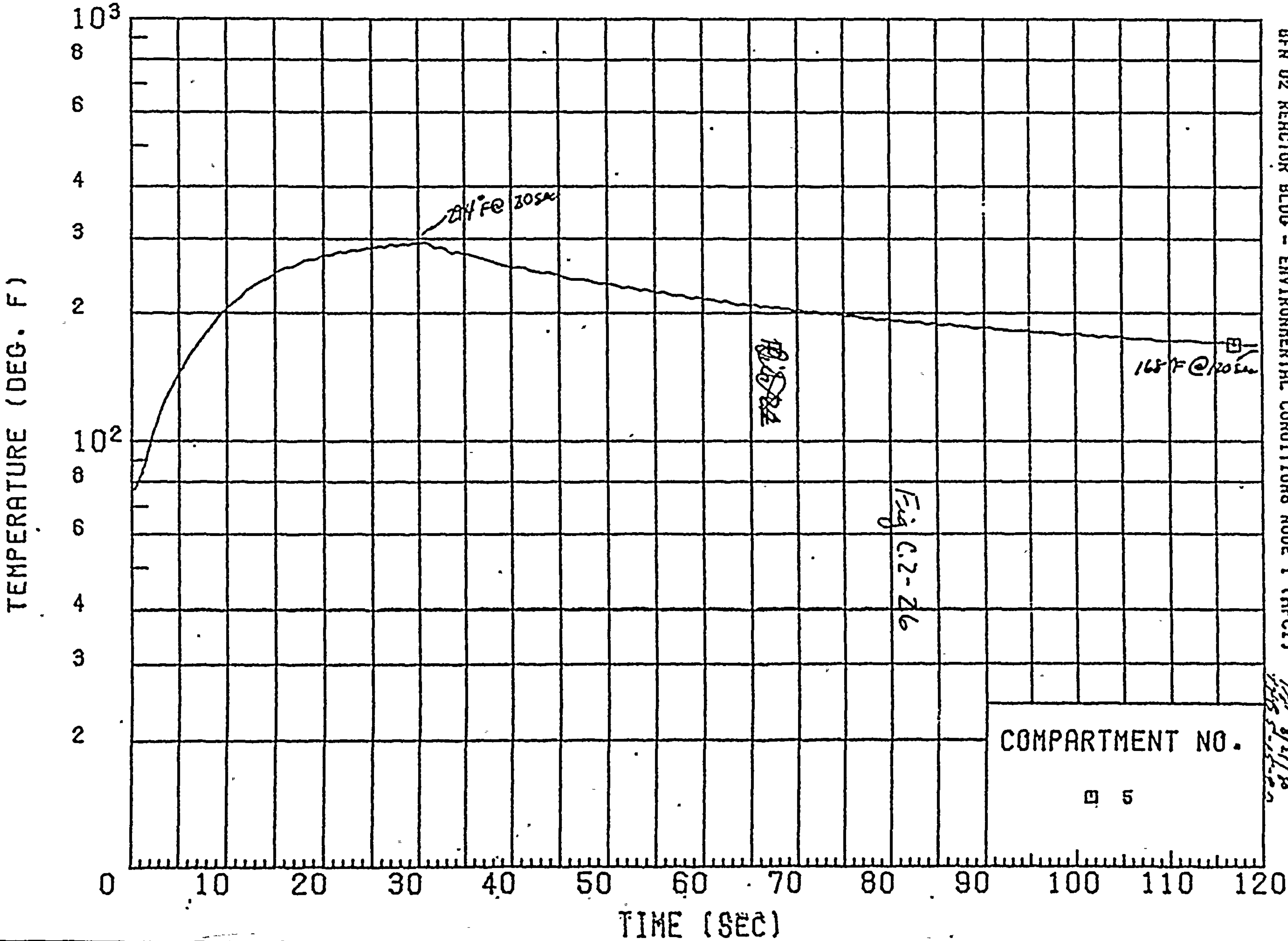

SPA (REV. 2) NEG. TI NO.

BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 1 (HPCI)

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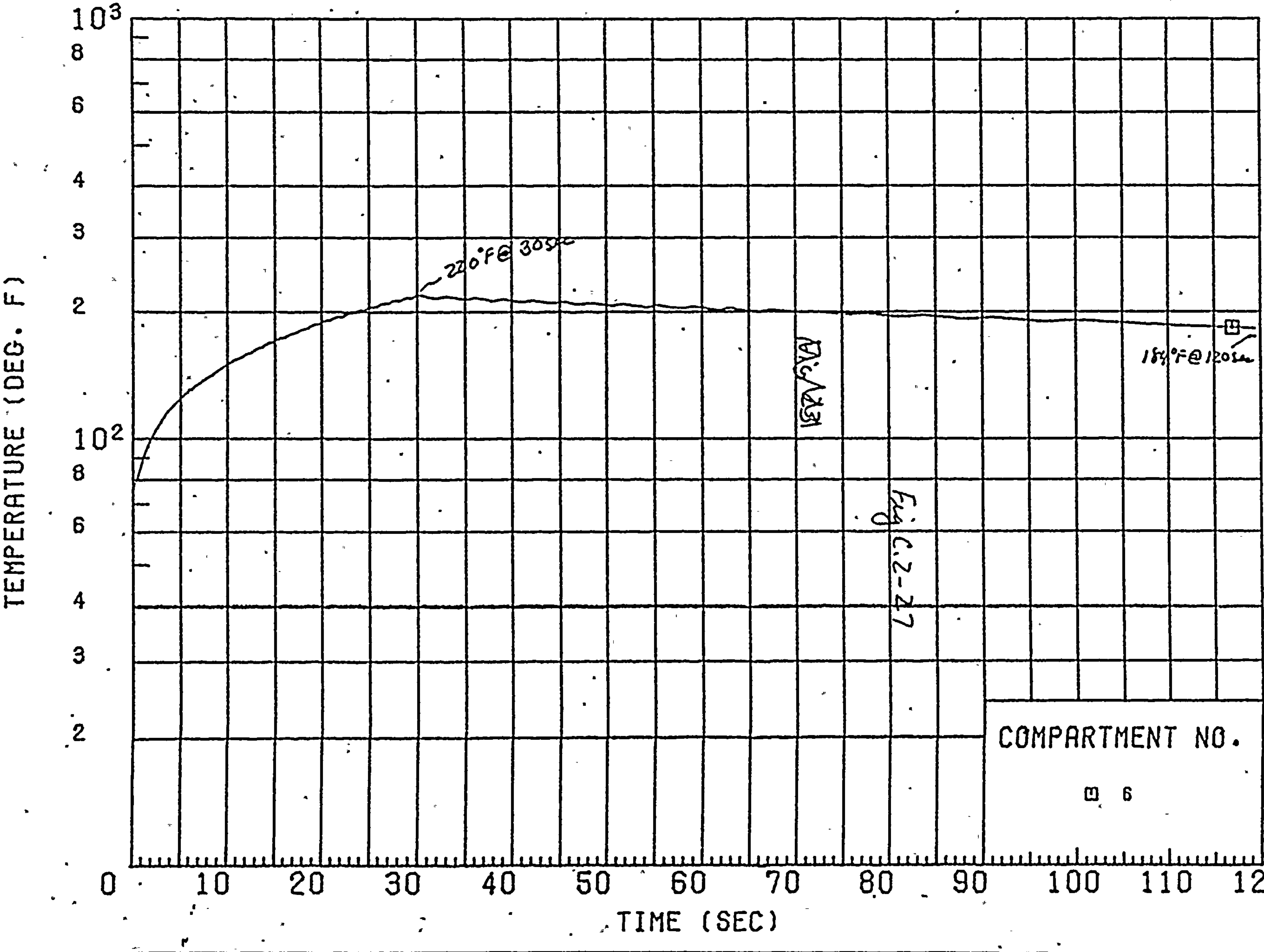
SUBCOMPARTMENT TEMPERATURE HISTORY



SPA (REV. 2)

BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 6 (HPCI)

NEG. TI NO.

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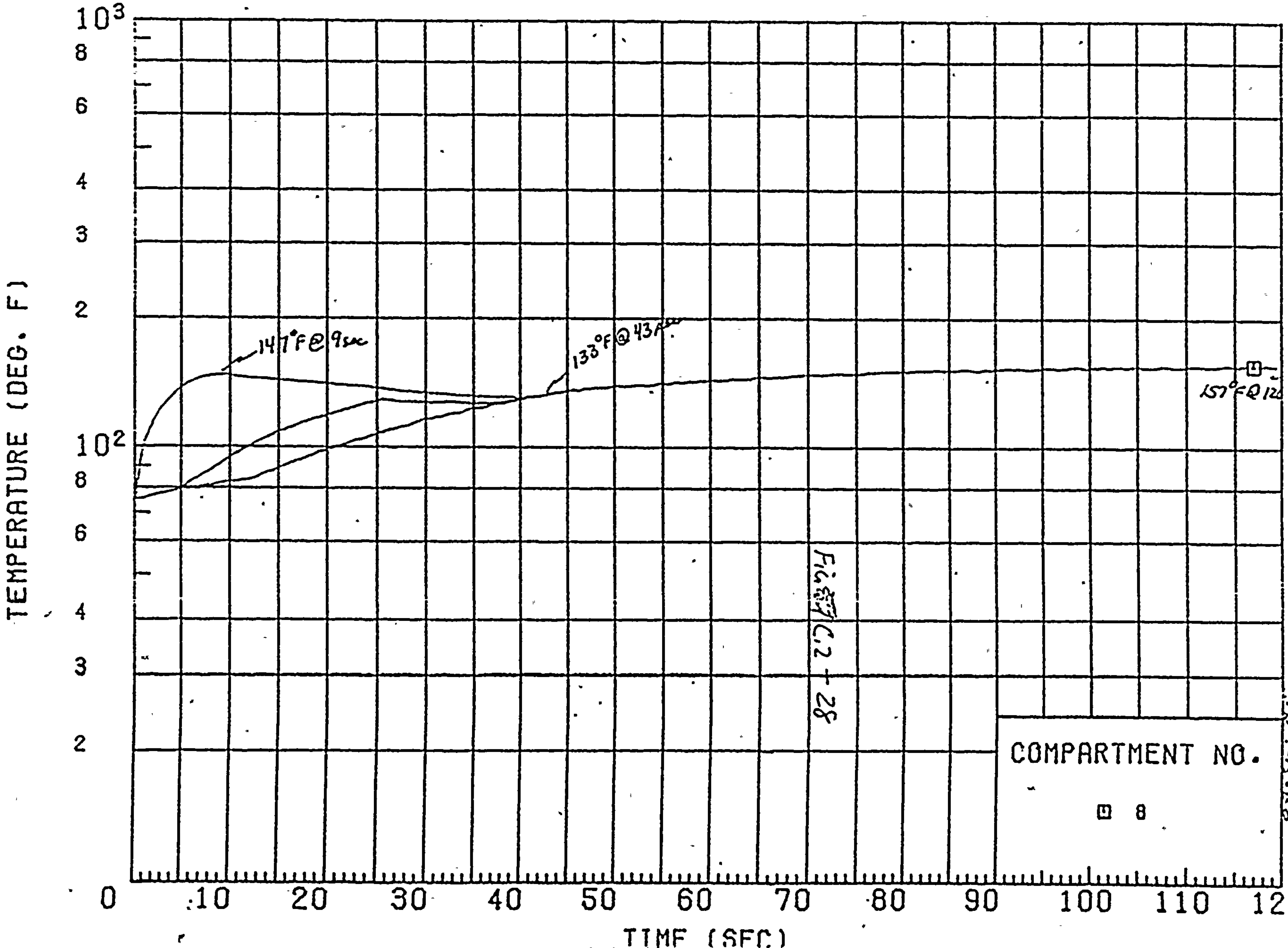
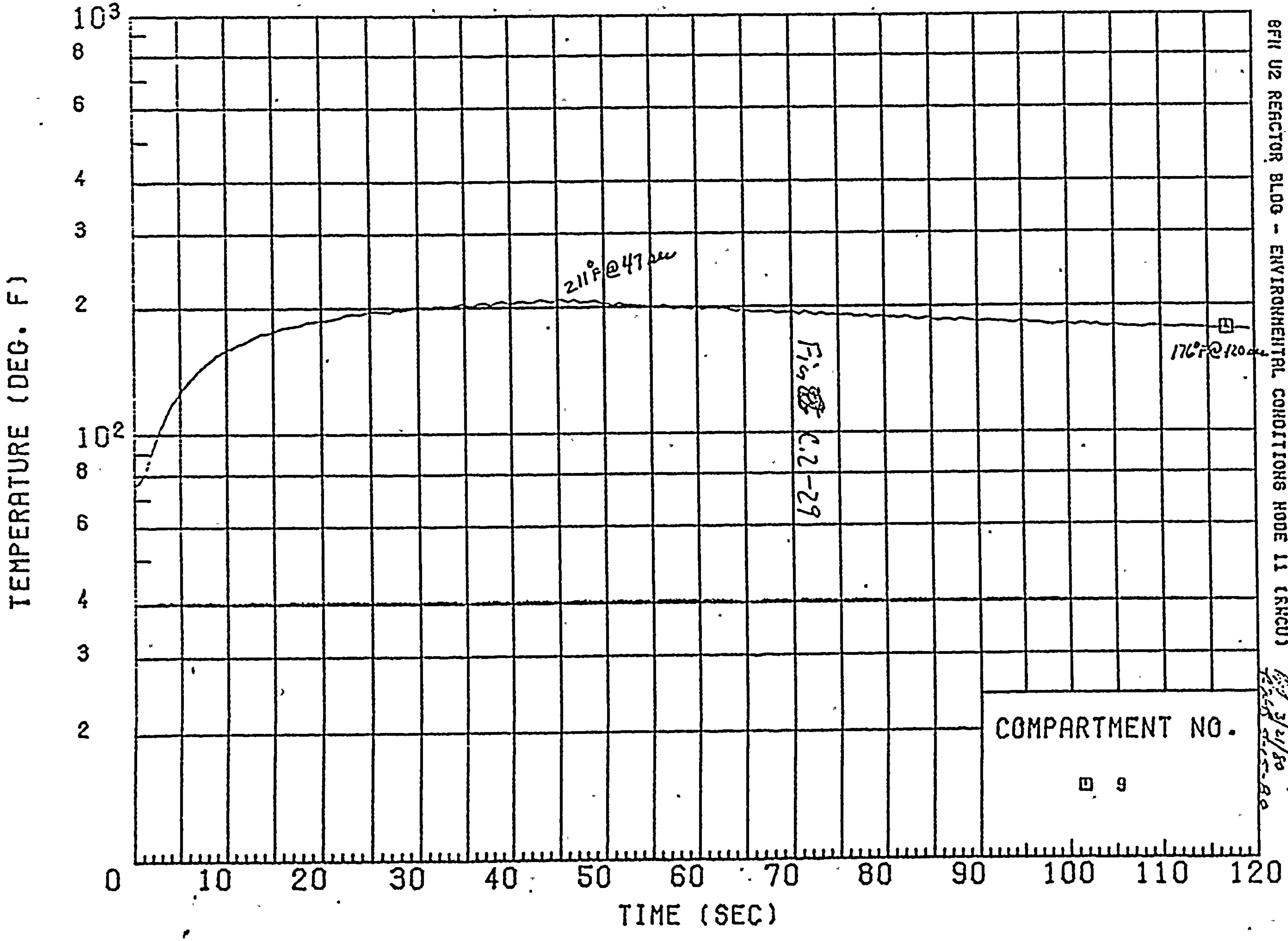
SUBCOMPARTMENT TEMPERATURE HISTORY



SPA (REV. 2)   NEG. TI NO.   PAGE 51 OF

BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 11 (RHCU)

SUBCOMPARTMENT TEMPERATURE HISTORY



SPA (REV. 2)

BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 11 (RHCU)

NEG. TI NO.

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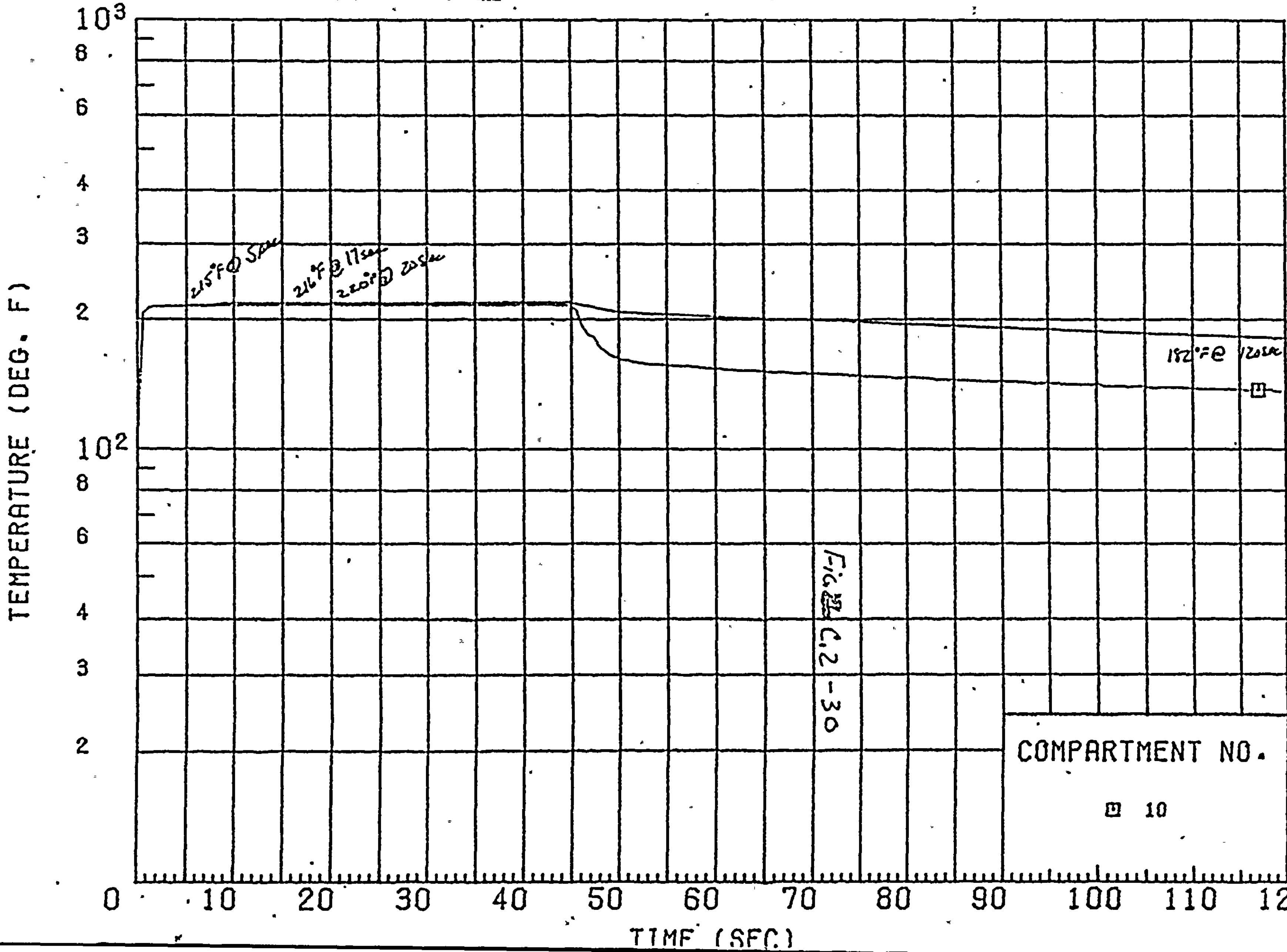
SUBCOMPARTMENT TEMPERATURE HISTORY



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BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 10 (RKCU)

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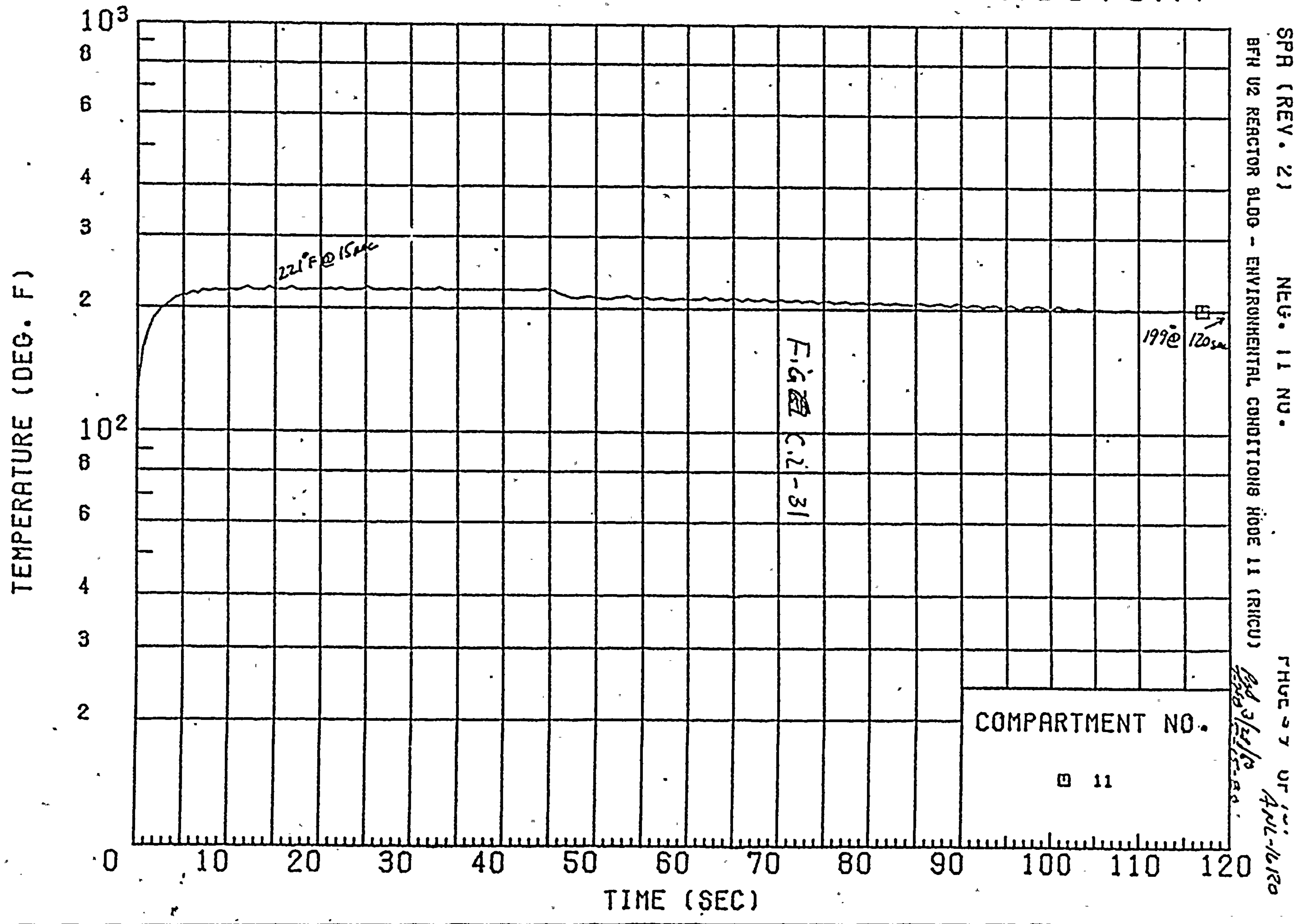
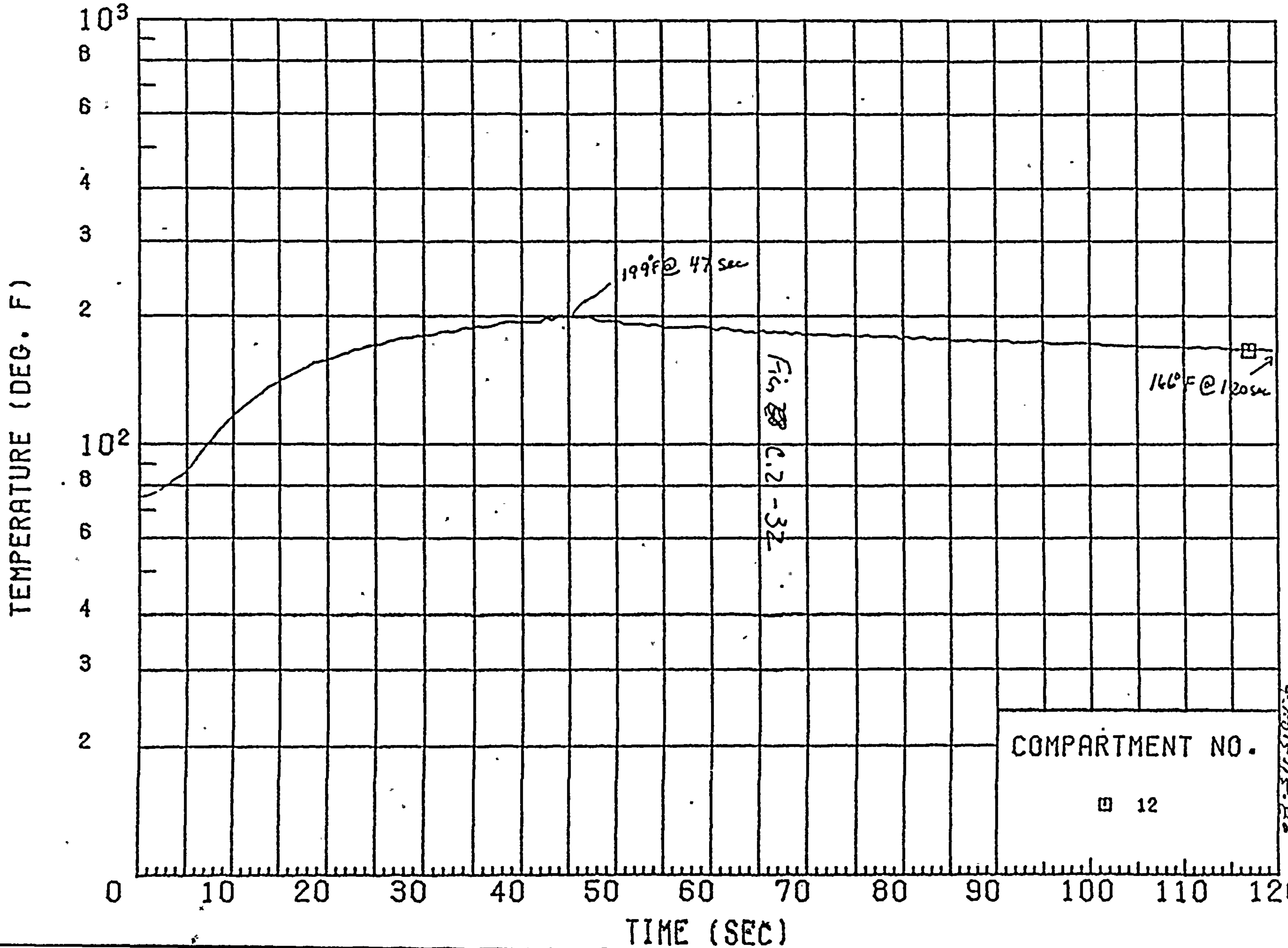
SUBCOMPARTMENT TEMPERATURE HISTORY



SUBCOMPARTMENT TEMPERATURE HISTORY

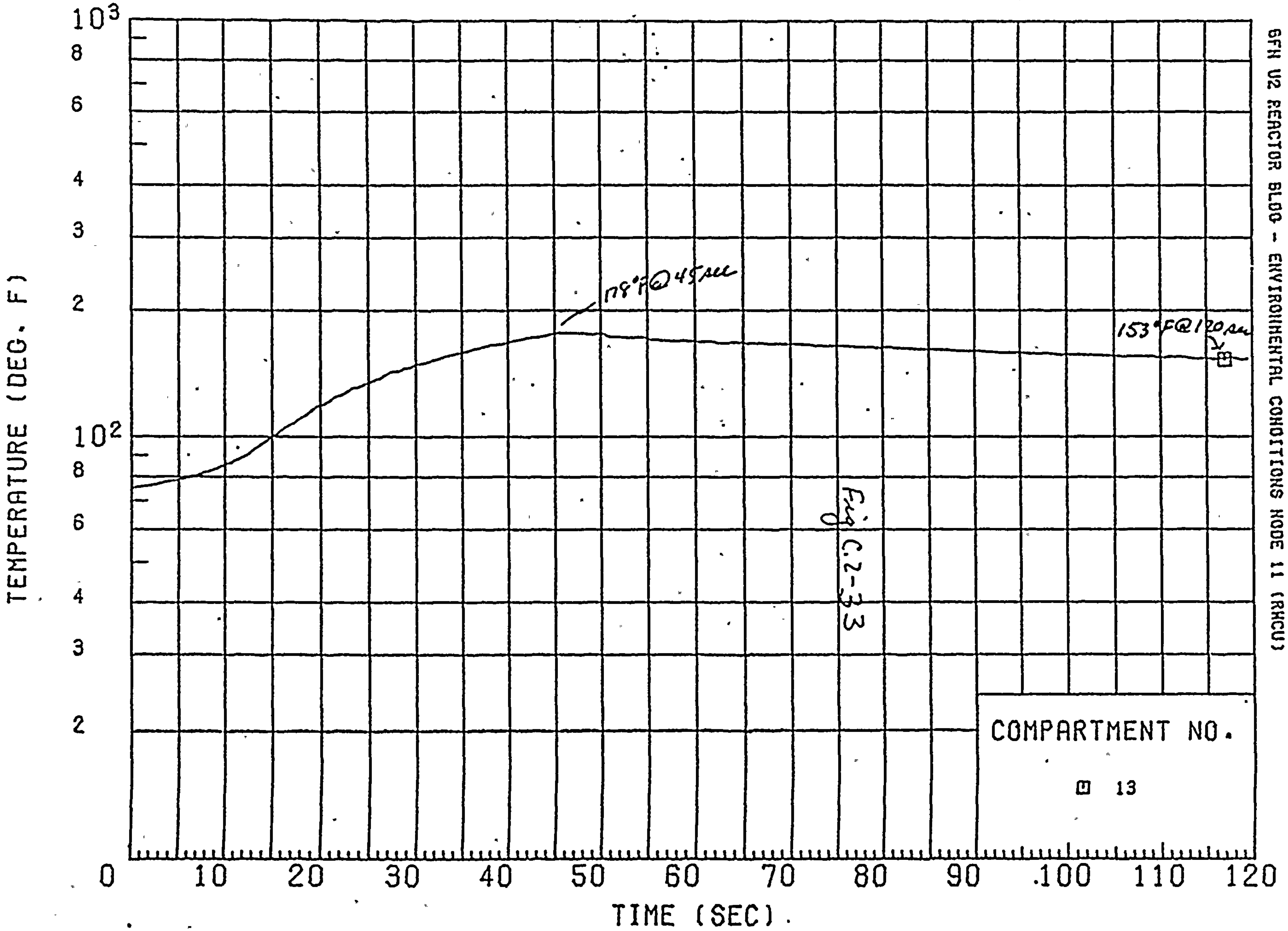


SPA (REV. 2) NEG. TI NO.

BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 11 (RWCU)

PAGE 55 OF 187 ANL-16120

SUBCOMPARTMENT TEMPERATURE HISTORY



SFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RHCU)

SUBCOMPARTMENT TEMPERATURE HISTORY

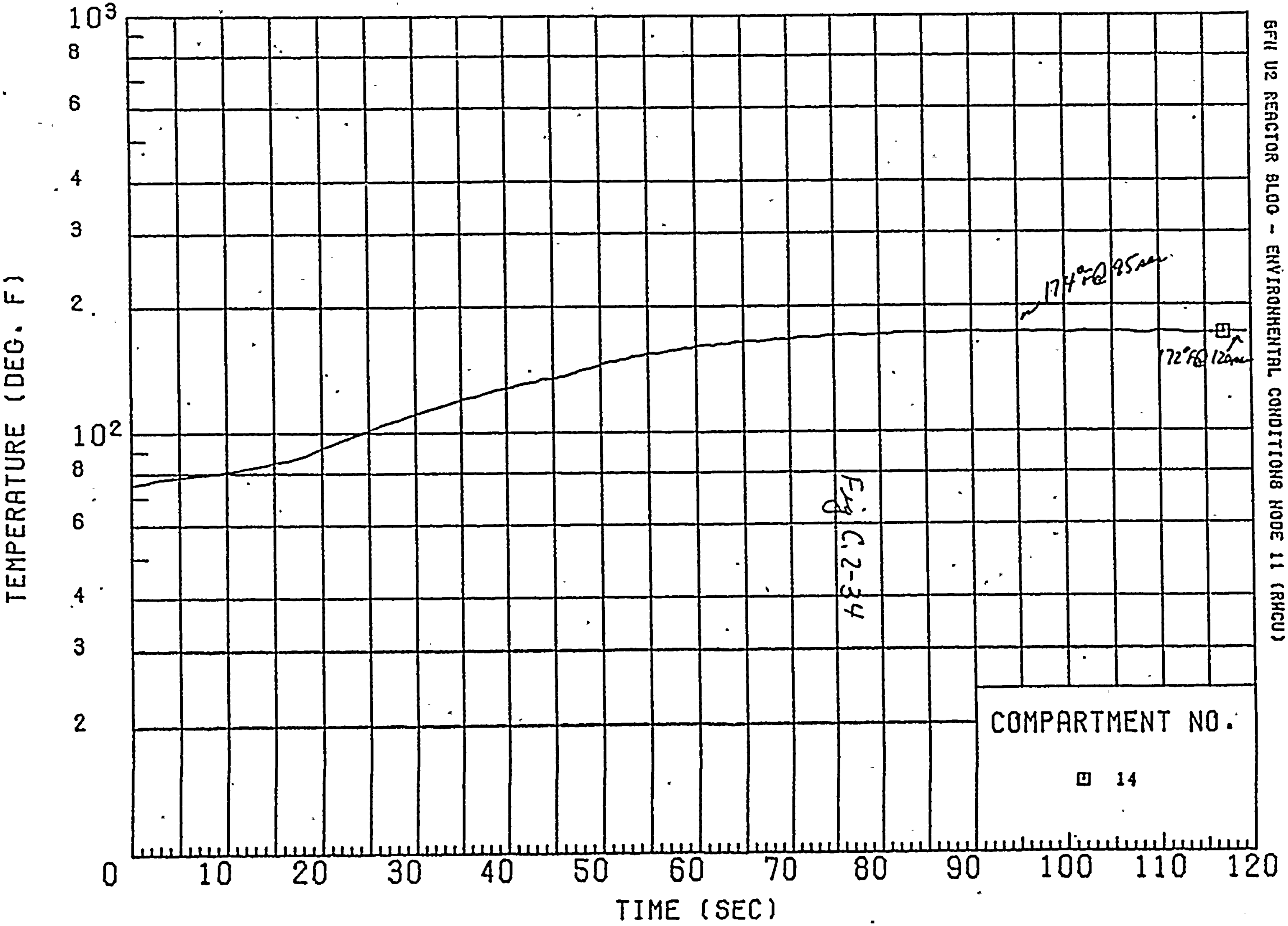
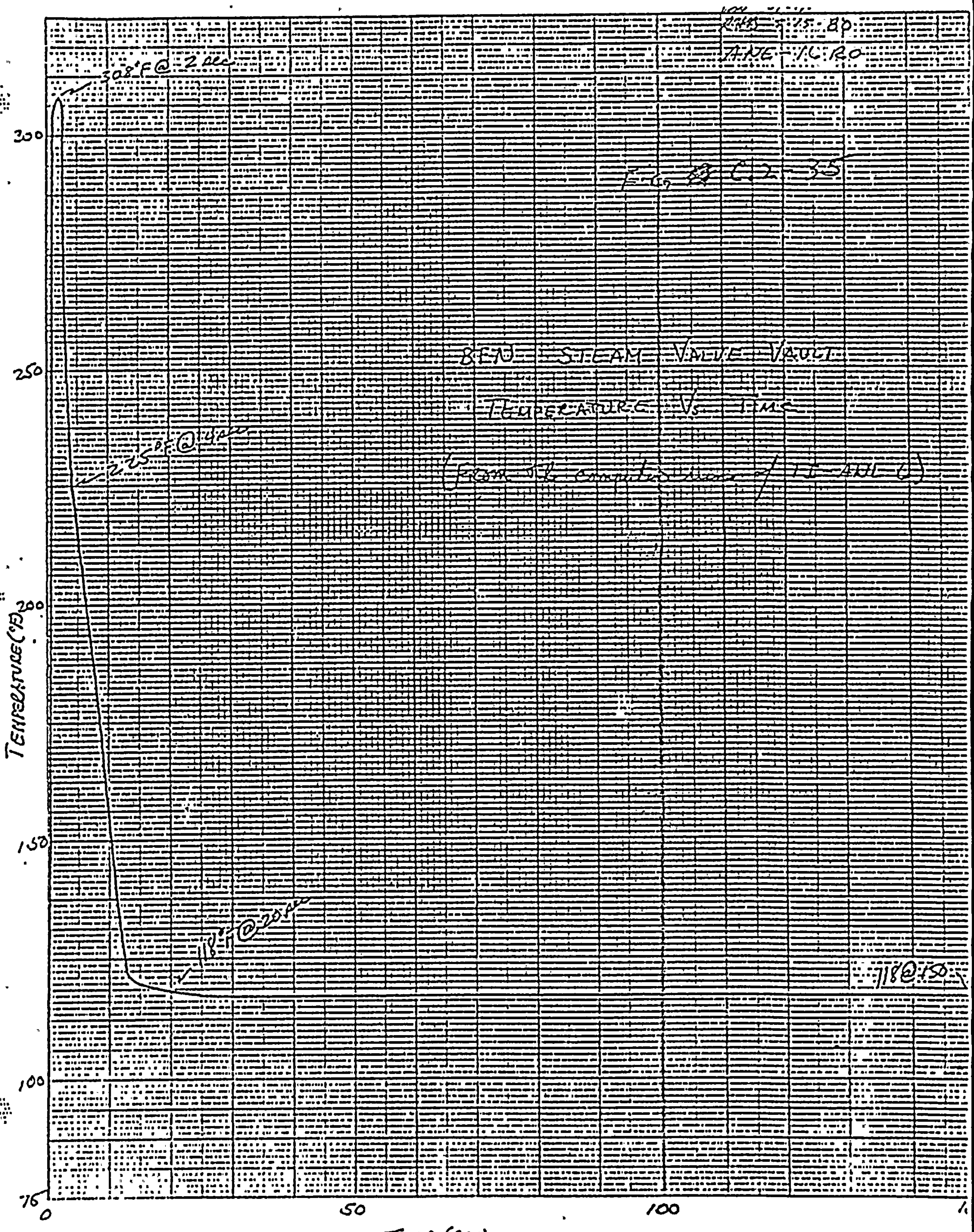


Fig C.2-34

SPA (REV. 2)

GFII U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RHCU)

REV. 11 NO.



NO. 310 20 DIVISIONS PER INCH BOTH WAYS. 150 BY 200 DIVISIONS. codex GRAPH PAPER IN STOCK DIRECT FROM CODEX BOOK CO., NORWOOD, MASS. 02062 PRINTED IN U.S.A.

SECTION 4.0

DESCRIPTION OF PROCEDURES FOR QUALIFICATION EVALUATION

4.1 Definition of Generic Positions and Comparison to the DOR Guidelines

The following are the generic positions which were taken on any electrical equipment in the qualification evaluation (EWS's) when no analysis or test results provide qualification information for a particular parameter (e.g. aging). If a reference is made in the Environment Qualification column to this section, it should be assumed that the specific generic position has been taken.

4.1.1 Margin - In Section 6.0 of the DOR guidelines it is stated that margin only applies to type testing and that the guidelines in Section 4.0 for establishing service conditions include conservatisms which assure margins between the service conditions specified and the actual conditions which could realistically be expected in a design basis event. Based upon the above statements and the fact that all calculations for establishing service conditions meet or exceed the DOR Guidelines given in Section 4.0, no additional margin was considered for qualification by analysis. As stated in DOR Guidelines, Section 6.0, additional margin for the service conditions for type testing needs to be considered only if Section 4.0 and Section 5.2 of the DOR Guidelines are not met; since the guidelines of Section 4.0 are met, margin was considered only if Section 5.2 was not met.

4.1.2 Aging - At the time of procurement of the equipment, documented evidence of aging effects was not a requirement; however, TVA intends to meet the DOR guidelines in Section 7.0. If the equipment contains material subject to aging degradation (the guidelines require that this determination be made), an analysis was done to determine the maintenance or change out interval. When there was insufficient documentation to determine the thermal or radiation aging effects on a piece of equipment, a program of either further analysis of materials,(when a detailed list of materials is obtained), or type testing was instituted. If neither of these options were available, a replacement or relocation plan was established. In general, the procurement specification required equipment whose intended service, determined either by repairs or replacements, was for the design life of the plant for 40 years; therefore, in our engineering judgement the device will be able to perform its safety function in the interim time period required for completely documenting qualification.

4.1.3 Accuracy - As stated in Enclosure 3 to IE Bulletin 79-01B, specified and demonstrated accuracies of all instruments for their trip functions and/or post-accident requirement must be provided. When the documentation did not clearly demonstrate the specified accuracy during the environmental extremes resulting from a DBE, a program of either further search for documentation that address accuracy or type testing was instituted. In our engineering judgement, the following two statements provide justification for continued operation during the interim time period required to obtain completely documented qualification: (1) in general, the procurement specifications required and the vendor's demonstrated accuracies are much more stringent than system requirements, (2) surveillance tests are conducted periodly as required by the technical specifications to confirm the validity of the manufacturer's stated accuracy.

4.1.4 Beta Radaition - According to Section 4.1 of the DOR Guidelines, beta radiation has low penetrating power in comparison to gamma rays of equivalent energy. Of the general classes of electrical equipment in the plant containment (e.g., cables, instrument transmitters, valve operators, containment penetrations), electrical cable is considered the most vulnerable to damage from beta radiation. For other equipment whose enclosure provides adequate shielding, beta radiation need not be considered. For any equipment that is determined unshielded (e.g., cable) or is shielded by sheet metal of 20 gauge or less, an analysis of the qualification of the equipment related to beta radiation was included as attachments to the EWS's.

4.1.5 Gamma Radiation - From Table C-1 in Appendix C in the DOR Guidelines and reference 1 and 2 below, there is substantial test data available to demonstrate that most conventional material used in electrical equipment has gamma radiation threshold exceeding 10^4 rads; the exception is solid-state devices containing N-MOS integrated circuits which have a threshold of 10^3 rads (see Table C-1). Teflon has a threshold for damage of approximately 3.5 x 10^4 rads (for 20 percent decrease in elongation). Electrical properties (e.g., resistivity) of these materials are sufficiently conservative initially, such that substantial changes can be tolerated without causing equipment failures or malfunction.

Threshold is defined from the above referenced table as the radiation exposure required to change at least one physical property of the material. The threshold is not a point of failure or end of useful life, therefore, there is a band of tolerance from the threshold point to the failure point which may vary by an order of magnitude or more.

On the above basis and the existing test data, it is not considered necessary to perform qualification tests or analysis on electrical equipment for radiation of less than 10^4 rads except in clearly identified cases where radiation less than 10^4 rads would degrade the safety function of the equipment.

References:

1. R. K. Thatcher, et. al.
REIC Report No. 36, October 1, 1964
"The Effects on Nuclear Radiation on Electronic Components Including Semi-Conductors"
Radiation Effects Information Center
Battelle Memorial Institute
Columbus, Ohio

2. W. W. Parkinson and L. Sisman
Oak Ridge National Laboratory, Oak Ridge, Tennessee

Nuclear Engineering and Design 17 (1971) 247-280
"The Use of Plastics and Elastomess for Nuclear Radiation"

4.1.6 Operating Data - Substantial percentages of the systems components installed in plant locations other than inside primary containment, have well established industrial rating at or above the limits required for operation during and/or after the required DBE's. In cases where operating data is used as a justification for interim qualification. This qualification will be suplemented at a later date by either type testing and/or further analysis. If neither of these options are available, a replacement plant was instituted.

4.1.7 Type Testing - In Section 5.1 of the DOR Guidelines type testing is preferred but not required for equipment subjected to severe temperature, pressure, and steam service condition. However, analysis is acceptable if supported by test data, for the other service conditions. At the time of equipment procurement type testing was not a required method of proving qualification. To the extent that an analysis is not conclusive to verify qualification per the DOR guidelines, a type testing program or a replacement plan was initiated. TVA will provide justification for the interim operation until adequate qualification information is available to meet the DOR Guidelines.

4.1.8 Relative Humidity - The humidity ranges from 30 to 80 percent for area outside primary containment. The values given in Section 3.0, Table 1, note E of this report are peak values and probability of occurence is extremely low. There are redundant fans servicing areas where there is essential equipment. Most industrial grade electrical equipment can function properly in the reactor zone building ambient humidity.

4.2 Description of Specific Analysis Techniques and Assumptions

There were primarily four types of analysis techniques used for environmental qualification in this report. These techniques were used either as a supplement to type tests that lacked certain information on qualification, or they were used as the primary method of qualification, and/or justification for continued operation. Analysis techniques 1, 2, and 3 below were used to determine the effects of temperature or radiation on material, and analysis technique 4 was used to analyze the relationship of the component being qualified to the system function. The four analysis techniques used were (1) Arrhenius Equation, (2) Material Analysis, (3) 10° C Rule, and (4) System Analysis. A discussion of each techniques follows:

1. Arrhenius Equation. The use of the Arrhenius Model is a method used to evaluate the thermal behavior of electrical equipment under a variety of thermal environments (temperature and time). The use of this model is specified in IE Bulletin 79-01B, Enclosure 4, Page 12.

The significant aging mechanism for electrical equipment is thermal aging. The equivalent thermal aging was calculated from the total tested thermal exposure, as follows, using the Arrhenius Equation, as given in the reference below.

(1) The total tested thermal exposure was converted to an equivalent time at normal service termperature. This time was called t_{total}.

(2) The required accident (LOCA or HELB) exposure was converted to an equivalent time at normal service temperature ($t_{accident}$).

(3) The duration of equivalent thermal aging (t_{age}) was defined as follows:

$$t_{age} = t_{total} - t_{accident}$$

Unless specific activation energies are known, a value of 0.5 eV was assumed. This is conservative in that 0.5 is the minimum activation energy found for typical insulation materials.

Reference: Z. D. Jastrgebsky, The Nature and Properties of Engineering Materials, II - end Edition, John Willey and Sons, 1976.

2. Material Analysis. In this analysis technique, a material list was developed for the component being qualified, and an analysis was done for the thermal and radiation effects on the most sensitive components. This analysis may have included use of the Arrhenius Equation, 10° C Rule, or a reference to list of materials, as per Table C-1, Appendix C, IE Bulletin 79-01B, which gives thermal and radiation effects on individual materials.

3. 10° C Rule. The 10° C rule is an approximation of Arrhenius's Law as applied to insulation material. The Rule was based upon the assumption that for each 10° C rise in temperature above some reference temperature, the useful life is reduced by one-

half. This rule was used in the qualification of several motors.

4. System Analysis. In this method, an analysis was done on the component being qualified as to how this component interfaces with its related system and in the performance of the system function. From this analysis, a determination was made to see if the system function can be performed without the component under qualification, or can be indirectly performed by another device in a system.

SECTION 5.0

SUMMARY OF RESULTS

5.1 Discussion of the EWS, Supporting Information, and Justification for Continued Operation

5.1.1 The System Component Evaluation Work Sheets (EWS) form and instructions were given in Enclosure 3 of IE Bulletin 79-01B to be used for the determination of the environmental qualification of safety-related electrical equipment. The EWS form and instructions were given by NRC to be used to present all the parameters to be considered for environmental qualification. In general, the guidelines for the EWS, as given in the Bulletin, were followed with some modification which further refined and expanded the flexibility of the EWS in defining the data needed for environmental qualification. Several changes were made to the sample EWS given in the bulletin due to the following reasons: 1) space limitations prevented placing all the information required for environmental qualification, 2) a numbering system was needed for organization of the EWS's and appendixes in an auditable form, and 3) quality assurance (QA) was needed to assure completeness and accuracy of the EWS. The most significant changes to the EWS were as follows: 1) use of appendixes, 2) use of permanent notes, 3) required signatures, and 4) use of unique numbering system for the EWS and their appendixes. These changes are discussed below with explanation of how they interface with the EWS later in this section.

1. Appendixes - All information for environmental qualification that could not be placed on the EWS was placed on the appendixes to that EWS. These appendixes include one or more of the following: An environmental analysis, a discussion of a type test and how it qualifies a component, a temperature-pressure accident profile to which qualified (if appropriate), a discussion of outstanding items, and a justification for continued operation in these cases where appropriate.

2. Permanent Note - Due to the similarity of certain specification requirements for all equipment, permanent references have been placed in the documentation reference specification column with notes at the bottom of the EWS giving appropriate sections of this report.

3. Required Signatures - To ensure completeness and accuracy of the EWS signatures of a preparer, reviewer, and quality assurance engineer are required on each of the EWS. Any appendixes for which the preparer or reviewer of the EWS was not directly reponsible will also contain preparer and reviewer signatures.

4. Unique Numbering System of EWS and Appendix - Due to the volume of the EWS's and their appendixes, a unique numbering system has been developed to be placed in the upper left-hand corner next to the sheet number. This numbering is discussed in more detail in section 5.1.2.

5.1.2 Discussion of the Use of the EWS

To elaborate on the uses of the appendixes attached to the EWS, one of the most important uses, as stated previously, was the justification of continued operation. For those EWS in which there are outstanding items that could directly affect the operation of the plant, an NCR was written and its number placed on the EWS in the outstanding item column and on the referenced appendix. The appendixes provide justification for continued operation, which may be by a system analysis of the equipment functions, an environmental qualification analysis for interim qualification, or a comparison to similar components previously qualified. The parameters placed in the various columns of the EWS are those that are the most recently calculated values documented by design calculation and are not necessarily in the last amendment FSAR. The evaluations done on the EWS and its appendixes are made per Enclosure 4 (DOR Guidelines) of the IE Bulletin 79-01B for performing item 4 of the Bulletin.

The detailed changes to the EWS are as follows:

1. Revision 2 in the title to the EWS refers to the EWS printed sheet, whereas the revision number in the upper right-hand corner refers to the revision of the environmental data placed on the printed EWS sheet.

2. Sheet No. The EWS and its associated appendixes has been given a unique numbering system as follows:

   EWS NEB 71-025 Rev 01

NEB	71	025	Rev 01
Branch responsible for contract	System number	Sequential number assigned by each branch	The revision level of that particular sheet

   Appendixes and/or Attachments

NEB 71-025 Rev 1	Appendix 2 or Attachment 2	Rev 1
Number of associated work sheet	Appendix or attachment number	The revision level of that particular sheet

3. Category has been placed in the Equipment Description column as per NUREG-0588, Appendix E, definitions, to clarify the components function. Location given in this column will be by room number which is in section 3.0 of this report as given by note 3 on the EWS. The temperature-pressure values or references given in the Environment Specification column are directly related to the room number.

4. In the Environment Specification column the following changes were made:

   a. Temperature-Pressure. A maximum value was given here or a reference to the figure or table in the report which defined temperature-pressure conditions.

   b. Chemical Spray - Chemical spray is not applicable (N/A) for this report (This is a permanent note) because no chemical injection is used.

   c. Aging. Aging was not a required qualification parameter in the FSAR and therefore is N/A (This is a permanent note); however, TVA addresses the DOR Guideline requirement for aging as described in the introduction to Appendix C of this report.

   d. Submergence. Submergence was not a required parameter in the FSAR; therefore, N/A was entered. (This is permanent note.) For the few devices where submergence was a consideration, the EWS addresses it.

5. In the Environment Qualification column the guidelines below were followed:

   a. Temperature-Pressure. A maximum value was given in this column.or a reference was made to an appendix attached to the EWS.

   b. Chemical Spray. Chemical Spray is N/A for this report since no chemical injection is used. (This is a permanent note.)

6. In the Documentation Reference Specification column permanent numbers have been placed refering to permanent notes at the bottom of the EWS which in turn refer to various sections of the report.

   These are the only notes that were used on the EWS. All other references will be to appendixes or attachments to the EWS as mentioned above.

In general, in any of the columns on the EWS, parameters for environmental qualification or references to NCR's, appendixes or attachments were given to provide additional information.

Facility: Browns Ferry Nuclear Plant
Unit:
Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. (3) ____
Revision ____
Date ____

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Plant ID No. Component	Operating Time			(1)			
Manufacturer:	Temperature (°F)			(4)			
Model Number:	Pressure (PSIA)			(4)			
Function:	Relative Humidity (%)			(4)			
Accuracy: Req'd: Demon: Category:	Chemical Spray	N/A	N/A	(4)			
Service:	Radiation (RAD)			(4)			
Location:	Aging	N/A		(2)			
Flood Level Elev: 552' Above Flood Level: Yes No	Submergence	N/A	N/A	(4)			

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: ____

Reviewed by: ____

QA Acceptance: ____

5.2 Summary of Equipment Qualification Status

The summary of equipment qualification status in Table 5.2 lists each component from the "Master List" and its accompanying status. Column 1 is the TVA plant identification number. In most cases, this number identifies the component generically and the system number and control loop in which the device operates. Column 2 is the generic name which is descriptive of a general type of component. Column 3 is the category into which the present status of qualification falls. The following are the categories: 1) Category I - Components fall into this category if they are qualified by the "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors," 2) Category II - Components fall into this category if they lack documentation to prove qualification to the DOR Guideline, 3) Category III - This is the status of all items which will be requalified by either analysis or type testing or a combination of both of these methods, and 4) Category IV - This is the status representing those items which will be replaced rather than requalified.

Column 4 is the Nonconformance (NCR) Report number for those components which were found to not have adequate qualification documentation or documentation which does not fully demonstrate qualification to the "Guideline for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors." TVA's Division of Engineering Design Engineering Procedure 1.26 was used in the generation of these NCR's.

Column 5 is the Licensee Event Report (LER) number for the LER's which have been generated when a determination was made that reasonable assurance does not exist to ensure that the Class 1E electrical equipment component(s) can perform their safety-related function.

The Table 5.2 lists the components and their status information on a system basis with the exception of generic items. Generic items such as cable, control stations, junction boxes, and terminal blocks are listed with their status at the end of this table.

This table includes items which were identified too late in the evaluation process to be fully incorporated. These are presently being investigated and will be reported on as soon as possible.

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

Table 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
GE-7-104	Valve Assembly			

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

TABLE 5.2

TABLE OF ELECTRICAL EQUIPMENT QUALIFICATIONS STATUS

SYSTEM: Auxiliary Power (APS)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
TS1A (4160-480V)	Transformer	II	BFNEEB8051	
TS1E (4160-480V)	Transformer	II	BFNEEB8018	
TS1B (4160-480V)	Transformer	II	BFNEEB8051	
480V Reactor MOV BD 1C	480V MCC	III	BFNEEB8023	
480V Reactor MOV BD 1D	480V MCC	III	BFNEEB8022	
Motor-Generator Set 1DN	M-G Set	II	BFNEEB8050	
Motor-Generator Set 1DA	M-G Set	II		
Motor-Generator Set 1EN	M-G Set	II		
Motor-Generator Set 1EA	M-G Set	II		
M-G Set 1DN Voltage Regulator Box	Voltage Regulator Box	*		
M-G Set 1DA Voltage Regulator Box	Voltage Regulator Box	*		
M-G Set 1EN Voltage Regulator Box	Voltage Regulator Box	*		
M-G Set 1EA Voltage Regulator Box	Voltage Regulator Box	*		
TS2A (4160-480V)	Transformer	II	BFNEEB8051	
TS2E (4160-480V)	Transformer	II	BFNEEB8018	
TS2B (4160-480V)	Transformer	II	BFNEEB8051	
480V Reactor MOV BD 2C	480V MCC	III	BFNEEB8023	

*M-G Set Voltage Regulator Box has been relocated to a nonharsh environment.

SYSTEM: Auxiliary Power (APS)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
480V Reactor MOV BD 2D	480V MCC	III	BFNEEB8022	
480V Reactor MOV BD 2E	480V MCC	II	BFNEEB8021	
Motor Generator Set 2DN	M-G Set	II	BFNEEB8050	
Motor-Generator Set 2DA	M-G Set	II	"	
Motor-Generator Set 2EN	M-G Set	II	"	
Motor-Generator Set 2EA	M-G Set	II	"	
M-G Set 2DN Voltage Regulator Box	Voltage Regulator Box	*		
M-G Set 2DA Voltage Regulator Box	Voltage Regulator Box	*		
M-G Set 2EN Voltage Regulator Box	Voltage Regulator Box	*		
M-G Set 2EA Voltage Regulator Box	Voltage Regulator Box	*		
480V Reactor MOV BD 3C	480V MCC	III	BFNEEB8019	
480V Reactor MOV BD 3D	480V MCC	II	BFNEEB8020	
Motor-Generator Set 3DN	M-G Set	II	BFNEEB8050	
Motor-Generator Set 3DA	M-G Set	II	"	
Motor-Generator Set 3EN	M-G Set	II	"	
Motor-Generator Set 3EA	M-G Set	II	"	
M-G Set 3DN Voltage Regulator Box	Voltage Regulator Box	*		
M-G Set 3DA Voltage Regulator Box	Voltage Regulator Box	*		
M-G Set 3EN Voltage Regulator Box	Voltage Regulator Box	*		
M-G Set 3EA Voltage Regulator Box	Voltage Regulator Box	*		

*M-G Set Voltage Regulator Box has been relocated to a nonharsh environment.

SYSTEM: Auxiliary Power (APS)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
480V Reactor MOV BD 1E	480V MCC	II	BFNEEB8021	
480V Reactor MOV BD 3E	480V MCC	II	BFNEEB8020	
TS3A (4160V-480V)	Transformer	II	BFNEEB8052	
TS3B (4160V-480V)	Transformer	II	BFNEEB8052	
TS3E (4160V-480V)	Transformer	II	BFNEEB8017	

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATIONS STATUS

SYSTEM: Main Steam Supply (1)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FSV-1-15A	Flow Solenoid Valve	III	BFNNEB8018	
FSV-1-15B	Flow Solenoid Valve	III	"	
FSV-1-15C	Flow Solenoid Valve	III	"	
FSV-1-27A	Flow Solenoid Valve	III	"	
FSV-1-27B	Flow Solenoid Valve	III	"	
FSV-1-27C	Flow Solenoid Valve	III	"	
FSV-1-38A	Flow Solenoid Valve	III	"	
FSV-1-38B	Flow Solenoid Valve	III	"	
FSV-1-38C	Flow Solenoid Valve	III	"	
FSV-1-52A	Flow Solenoid Valve	III	"	
FSV-1-52B	Flow Solenoid Valve	III	"	
FSV-1-52C	Flow Solenoid Valve	III	"	
FCV-1-56	Flow Control Valve	III	BFNNEB8034	
TS-1-17A	Temperature Switch	III	BFNNEB8009	
TS-1-17B	Temperature Switch	III	"	
TS-1-17C	Temperature Switch	III	"	
TS-1-17D	Temperature Switch	III	"	
PSV-1-4	Pressure Solenoid Valve	III	BFNNEB8013	

SYSTEM: Main Steam Supply (1)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PSV-1-5	Pressure Solenoid Valve	III	BFNNEB8013	
PSV-1-18	Pressure Solenoid Valve	III	BFNNEB8031	
~~PSV-1-18~~	~~Pressure Solenoid Valve~~			
PSV-1-19	Pressure Solenoid Valve	III	BFNNEB8013	
PSV-1-22	Pressure Solenoid Valve	III	"	
PSV-1-23	Pressure Solenoid Valve	III	"	
PSV-1-30	Pressure Solenoid Valve	III	BFNNEB8031	
~~PSV-1-30~~	~~Pressure Solenoid Valve~~			
PSV-1-31	Pressure Solenoid Valve	III	BFNNEB8013	
~~PSV-1-31~~	~~Pressure Solenoid Valve~~			
PSV-1-34	Pressure Solenoid Valve	III	BFNNEB8013	
PSV-1-41	Pressure Solenoid Valve	III	"	
~~PSV-1-41~~	~~Pressure Solenoid Valve~~			
PSV-1-42	Pressure Solenoid Valve	III	"	
PSV-1-179	Pressure Solenoid Valve			
PSV-1-180	Pressure Solenoid Valve			
FSV-1-14A	Flow Solenoid Valve	III	BFNNEB8018	
FSV-1-14B	Flow Solenoid Valve	III	"	
FSV-1-14C	Flow Solenoid Valve	III	"	
FSV-1-26A	Flow Solenoid Valve	III	"	
FSV-1-26B	Flow Solenoid Valve	III	"	
FSV-1-26C	Flow Solenoid Valve	III	"	
FSV-1-37A	Flow Solenoid Valve	III	"	
FSV-1-37B	Flow Solenoid Valve	III	"	

SYSTEM: Main Steam Supply (1)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FSV-1-37C	Flow Solenoid Valve	III	BFNNEB8018	
FSV-1-51A	Flow Solenoid Valve	III	"	
FSV-1-51B	Flow Solenoid Valve	III	"	
FSV-1-51C	Flow Solenoid Valve	III	"	
FCV-1-55	Flow Control Valve	III	BFNNEB8034	
PS-1-4	Pressure Switch			
PS-1-5	Pressure Switch			
PS-1-18	Pressure Switch			
PS-1-19	Pressure Switch			
PS-1-22	Pressure Switch			
PS-1-23	Pressure Switch			
PS-1-30	Pressure Switch			
PS-1-31	Pressure Switch			
PS-1-34	Pressure Switch			
PS-1-41	Pressure Switch			
PS-1-42	Pressure Switch			
PS-1-179	Pressure Switch			
PS-1-180	Pressure Switch			
~~FCV-1-14~~	~~Flow Control Valve~~			
~~FCV-1-16~~	~~Flow Control Valve~~			
PDIS-1-13A	Pressure Differential Indicator Switch	III	BFNNEB8010	
PDIS-1-13B	Pressure Differential Indicator Switch	III	"	
PDIS-1-13C	Pressure Differential Indicator Switch	III	"	

SYSTEM: Main Steam Supply (1)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PDIS-1-13D	Pressure Differential Indicator Switch	III	BFNNEB8010	
PDIS-1-25A	Pressure Differential Indicator Switch	III	"	
PDIS-1-25B	Pressure Differential Indicator Switch	III	"	
PDIS-1-25C	Pressure Differential Indicator Switch	III	"	
PDIS-1-25D	Pressure Differential Indicator Switch	III	"	
PDIS-1-36A	Pressure Differential Indicator Switch	III	"	
PDIS-1-36B	Pressure Differential Indicator Switch	III	"	
PDIS-1-36C	Pressure Differential Indicator Switch	III	"	
PDIS-1-36D	Pressure Differential Indicator Switch	III	"	
PDIS-1-50A	Pressure Differential Indicator Switch	III	"	
PDIS-1-50B	Pressure Differential Indicator Switch	III	"	
PDIS-1-50C	Pressure Differential Indicator Switch	III	"	
PDIS-1-50D	Pressure Differential Indicator Switch	III	"	
~~FCV-1-26~~	~~Flow Control Valve~~			
~~FCV-1-27~~	~~Flow Control Valve~~			
~~FCV-1-37~~	~~Flow Control Valve~~			
~~FCV-1-38~~	~~Flow Control Valve~~			
~~FCV-1-51~~	~~Flow Control Valve~~			

SYSTEM: Main Steam Supply (1)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
~~FCV-1-52~~	~~Flow Control Valve~~			
ZS-1-14	Zone Switch	I		
ZS-1-15	Zone Switch	I		
~~FSV-1-38B~~	~~Flow Solenoid Valve~~			
~~FSV-1-38C~~	~~Flow Solenoid Valve~~			
PSV-1-34	Pressure Solenoid Valve			
ZS-1-26 (Qty 6)	Zone Switch	I		
ZS-1-27 (Qty 6)	Zone Switch	I		
ZS-1-37 (Qty 6)	Zone Switch	I		
ZS-1-38 (Qty 6)	Zone Switch	I		
ZS-1-51 (Qty 6)	Zone Switch	I		
ZS-1-52 (Qty 6)	Zone Switch	I		

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TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATIONS STATUS

SYSTEM: Raw Cooling Water (24)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PS-24-133B	Pressure Switch			
PS-24-133A	Pressure Switch			

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TABLE 5.2

TABLE OF ELECTRICAL EQUIPMENT QUALIFICATIONS STATUS

SYSTEM: Control Air System (32)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FSV-32-62	Solenoid Valve	III	BFNEEB8042	
FSV-32-63	Solenoid Valve	III	BFNEEB8042	

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TABLE 5.2

TABLE OF ELECTRICAL EQUIPMENT QUALIFICATIONS STATUS

SYSTEM: Reactor Feedwater System (3)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PS-3-22A	Pressure Switch	III	BFNNEB8011	
PS-3-22B	Pressure Switch	III	"	
PS-3-22C	Pressure Switch	III	"	
PS-3-22D	Pressure Switch	III	"	
PS-3-57A	Pressure Switch	I		
PS-3-57B	Pressure Switch	I		
PS-3-57C	Pressure Switch	I		
PS-3-57D	Pressure Switch	I		
LIS-3-203A	Level Indicator Switch	III	BFNNEB8010	
LIS-3-203B	Level Indicator Switch	III	"	
LIS-3-203C	Level Indicator Switch	III	"	
LIS-3-203D	Level Indicator Switch	III	"	
LIS-3-208A	Level Indicator Switch	III	"	
LIS-3-208B	Level Indicator Switch	III	"	
LIS-3-208C	Level Indicator Switch	III	"	
LIS-3-208D	Level Indicator Switch	III	"	
LIS-3-58C	Level Indicator Switch	III	BFNNEB8017	
LIS-3-56A	Level Indicator Switch	III	"	
LIS-3-56B	Level Indicator Switch	III	"	
LIS-3-56C	Level Indicator Switch	III	"	

SYSTEM: Reactor Feedwater System (3)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
LIS-3-56D	Level Indicator Switch	III	BFNNEB8017	
LITS-3-46B	Level Indicator Temperature Switch	III	"	
LIS-3-184	Level Indicator Switch	III	"	
LIS-3-185	Level Indicator Switch	III	"	
LIS-3-58A	Level Indicator Switch	III	"	
LITS-3-46A	Level Indicator Temperature Switch	III	"	
LITS-3-58B	Level Indicator Temperature Switch	III	"	
LITS-3-58D	Level Indicator Temperature Switch			
PS-3-74A	Pressure Switch	III	BFNNEB8011	
PS-3-74B	Pressure Switch	III	BFNNEB8010	

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TABLE 5.2

TABLE OF ELECTRICAL EQUIPMENT QUALIFICATIONS STATUS

SYSTEM: RHR Service Water System (23)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
TE-23-32	Temperature Element	III	BFNNEB8015	
FCV-23-34	Flow Control Valve	III	BFNNEB8035	
TE-23-35	Temperature Element	III	BFNNEB8015	
FT-23-36	Flow Transmitter	III	BFNNEB8012	
TE-23-38	Temperature Element	III	BFNNEB8015	
FCV-23-40	Flow Control Valve	III	BFNNEB8034	
TE-23-41	Temperature Element	III	BFNNEB8015	
FT-23-42	Flow Transmitter	III	BFNNEB8012	
TE-23-44	Temperature Element	III	BFNNEB8015	
FCV-23-46	Flow Control Valve	III	BFNNEB8034	
TE-23-47	Temperature Element	III	BFNNEB8015	
FT-23-48	Flow Transmitter	III	BFNNEB8012	
TE-23-50	Temperature Element	III	BFNNEB8015	
FCV-23-52	Flow Control Valve	III	BFNNEB8034	
TE-23-53	Temperature Element	III	BFNNEB8015	
FT-23-54	Flow Transmitter	III	BFNNEB8012	
FSV-23-56	Flow Solenoid Valve	III	BFNEEB8031	
FCV-23-57	Flow Control Valve	III	BFNNEB8034	

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TABLE 5.2

TABLE OF ELECTRICAL EQUIPMENT QUALIFICATIONS STATUS

SYSTEM: Sampling and Water Quality (43)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FSV-43-14	Flow Solenoid Valve	I		
FIS-43-13A	Flow Indicator Switch	III	BFNEEB8048	
FIS-43-13B	Flow Indicator Switch	III	BFNEEB8048	
FSV-43-13	Flow Solenoid Valve	III	BFNNEB8031	
FCV-43-13	Flow Control Valve	III	BFNNEB8006	
FCV-43-14	Flow Control Valve	III	BFNNEB8006	

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TABLE 5.2

TABLE OF ELECTRICAL EQUIPMENT QUALIFICATIONS STATUS

SYSTEM: Standby Liquid Control System (63)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
TE-63-2	Temperature Element	III	BFNNEB8009	
~~PT-63-7~~	~~Pressure Transmitter~~			
FCV-63-8A	Flow Control Valve	I		
FCV-63-8B	Flow Control Valve	I		
FIS-63-11	Flow Indicator Switch			
TIC-63-2	Temperature Indicator Control	III	BFNNEB8009	
SLC Pump Motor A	Pump Motor	III	BFNNEB8034	
SLC Pump Motor B	Pump Motor	III	BFNNEB8034	
PI-63-7A	Pressure Indicator			
TC-63-5A	Temperature Control			
TC-63-5B	Temperature Control			

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TABLE 5.2

TABLE OF ELECTRICAL EQUIPMENT QUALIIFICATIONS STATUS

SYSTEM: Primary Containment System (64)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FSV-64-9	Flow Solenoid Valve	III	BFNEEB8039	
FSV-64-10	Flow Solenoid Valve	III	BFNEEB8039	
FSV-64-17	Flow Solenoid Valve	I		
FSV-64-18	Flow Solenoid Valve	I		
FSV-64-19	Flow Solenoid Valve	I		
FSV-64-20	Flow Solenoid Valve	I		
FSV-64-21	Flow Solenoid Valve	I		
FSV-64-29	Flow Solenoid Valve	I		
FSV-64-30	Flow Solenoid Valve	I		
FSV-64-31	Flow Solenoid Valve	I		
FSV-64-32	Flow Solenoid Valve	III	BFNNEB8031	
FSV-64-33	Flow Solenoid Valve	III	"	
FSV-64-34	Flow Solenoid Valve	III	"	
FSV-64-36	Flow Solenoid Valve	III	BFNEEB8039	
FSV-64-40	Flow Solenoid Valve	III	"	
FSV-64-41	Flow Solenoid Valve	III	"	
FSV-64-42	Flow Solenoid Valve	III	"	
FSV-64-43	Flow Solenoid Valve	III	"	

SYSTEM: Primary Containment System (64)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FSV-64-44	Flow Solenoid Valve	III	BFNEEB8036	
FSV-64-45	Flow Solenoid Valve	III	"	
TE-64-52B	Thermocouple	III	BFNEEB8033	
LT-64-54	Level Transmitter	III	BFNNEB8023	
TE-64-55A	Temperature Element	III	BFNNEB8034	
TE-64-55B	Temperature Element	III	BFNNEB8016	
TE-64-55C	Temperature Element	III	BFNNEB8016	
TE-64-55D	Temperature Element	III	BFNNEB8034	
TE-64-55E	Temperature Element	III	"	
TE-64-55F	Temperature Element	III	"	
FCO-64-60A	Flow Control Operator			
FCO-64-60B	Flow Control Operator			
FCO-64-60C	Flow Control Operator			
FCO-64-60D	Flow Control Operator			
LT-64-66	Level Transmitter	III	BFNNEB8023	
TS-64-68	Temperature Sensor	III	BFNMEB8001	
TS-64-69	Temperature Sensor	III	"	
TS-64-70	Temperature Sensor	III	"	
TS-64-71	Temperature Sensor	III	"	
TS-64-72	Temperature Sensor	III	"	
FSV-64-139	Flow Solenoid Valve	III	BFNEEB8037	
FSV-64-140	Flow Solenoid Valve	III	BFNEEB8037	
FSV-64-141	Flow Solenoid Valve	III	BFNEEB8037	
PT-64-51	Pressure Transmitter	IV	BFNNEB8012	

SYSTEM: Primary Containment System (64)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PX-64-51	Power Supply	III	BFNNEB8005	
PDIS-64-20	Pressure Differential Indicator Switch	I		
PDIS-64-21	Pressure Differential Indicator Switch	I		
PS-64-57D	Pressure Switch	III	BFNNEB8020	
PS-64-58A	Pressure Switch	III	"	
PS-64-58B	Pressure Switch	III	"	
PS-64-58C	Pressure Switch	III	"	
PDS-64-15	Pressure Differential Switch	III	BFNEEB8029	
PDM-64-16	Pressure Differential Switch	III	BFNEEB8028	
PDIC-64-16	Pressure Differential Indicator Switch	III	BFNEEB8030	
PDT-64-16	Pressure Differential Transmitter	III	BFNEEB8026	
TE-64-52A	Temperature Element	III	BFNEEB8033	
TE-64-52C	Temperature Element	III	BFNEEB8033	
PDS-64-62A	Pressure Differential Switch	III	BFNEEB8029	
PDS-64-62C	Pressure Differential Switch	III	BFNEEB8029	
FCV-64-20	Flow Control Valve			
FCV-64-21	Flow Control Valve			
FCV-64-19	Flow Control Valve			
FCV-64-18	Flow Control Valve			
FCO-64-43	Flow Control Operator			

SYSTEM: Primary Containment System (64)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PDS-64-62B	Pressure Differential Switch	III	BFNEEB8029	
PDS-64-62D	Pressure Differential Switch	III	BFNEEB8029	
TS-64-73	Temperature Switch	III	BFNMEB8001	
PDS-64-63	Pressure Differential Switch	III	BFMEEB8029	
PDS-64-61A	Pressure Differential Switch	III	BFNEEB8029	
PDS-64-61C	Pressure Differential Switch	III	BFNEEB8029	
PDT-64-64	Pressure Differential Switch	III	BFNEEB8026	
PDM-64-64	Pressure Differential Switch	III	BFNEEB8028	
PDT-64-8	Pressure Differential Transmitter	III	BFNEEB8026	
PDM-64-8	Pressure Differential Monitor	III	BFNEEB8028	
PDIC-64-8	Pressure Differential Indicator Control	III	BFNEEB8030	
PDS-64-61B	Pressure Differential Switch	III	BFNEEB8029	
PDS-64-61D	Pressure Differential Switch	III	BFNEEB8029	
PDS-64-7	Pressure Differential Switch	III	BFNEEB8029	
PS-64-56A	Pressure Switch	III	BFNNEB8020	
PS-64-56B	Pressure Switch	III	BFNNEB8020	

SYSTEM: Primary Containment System (64)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PS-64-56C	Pressure Switch	III	BFNNEB8020	
PS-64-56D	Pressure Switch	III	BFNNEB8020	
PS-64-58D	Pressure Switch	III	BFNNEB8020	
FCO-64-65D	Flow Control Operator			
FCO-64-65A	Flow Control Operator			
FCO-64-65B	Flow Control Operator			
FCO-64-65C	Flow Control Operator			
PS-64-57A	Pressure Switch	III	BFNNEB8020	
PS-64-57B	Pressure Switch	III	BFNNEB8020	
PS-64-57C	Pressure Switch	III	BFNNEB8020	
PT-64-67	Pressure Transmitter	IV	BFNNEB8012	
PDIC-64-64	Pressure Differential	III	BFNEEB8030	
FCO-64-40	Flow Control Operator			
FCO-64-41	Flow Control Operator			
FCO-64-44	Flow Control Operator			
FCO-64-45	Flow Control Operator			
FCO-64-36	Flow Control Operator			
FCV-64-29	Flow Control Valve			
FCV-64-30	Flow Control Valve			
FCV-64-31	Flow Control Valve			
FCV-64-32	Flow Control Valve			
FCV-64-33	Flow Control Valve			
FCV-64-34	Flow Control Valve			
FCV-64-139	Flow Control Valve			

SYSTEM: Primary Containment System (64)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FCV-64-140	Flow Control Valve			
FCV-64-141	Flow Control Valve			
PX-64-54	Power Supply			
FSV-64-139	Flow Solenoid Valve			
FSV-64-140	Flow Solenoid Valve			
FSV-64-141	Flow Solenoid Valve			
PDS-64-62A/C	Pressure Differential Switch	III	BFNEEB8029	
PDS-64-62B/D	Pressure Differential Switch			
PDS-64-61 B/D	Pressure Differential Switch			
PDS-64-61B	Pressure Differential Switch			
PDS-64-61 A/C	Pressure Differential Switch			
PT-64-51	Pressure Transmitter	IV	BFNEEB8012	
FCV-64-18	Flow Control Valve	III	BFNNEB8006	
FCV-64-19	Flow Control Valve	III	"	
FCV-64-29	Flow Control Valve	III	"	
FCV-64-30	Flow Control Valve	III	"	
FCV-64-31	Flow Control Valve	III	"	
FCV-64-32	Flow Control Valve	III	"	
FCV-64-33	Flow Control Valve	III	"	
FCV-64-34	Flow Control Valve	III	"	

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TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: Standby Gas Treatment (65)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FT-65-1	Flow Transmitter	III	BFNEEB8049	

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SYSTEM: Emergency Equipment Cooling Water System (67).

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PT-67-15	Pressure Transmitter	III	BFNEEB8044	
PT-67-16	Pressure Transmitter	III	"	
FCV-67-17	Flow Control Valve	III		
FCV-67-18	Flow Control Valve	III	BFNMEB8001	
PT-67-19	Pressure Transmitter	III	BFNEEB8044	
PT-67-20	Pressure Transmitter	III	"	
FCV-67-21	Flow Control Valve	I		
FCV-67-22	Flow Control Valve	III	BFNMEB8001	
PT-67-23	Pressure Transmitter	III	BFNEEB8044	
PT-67-24	Pressure Transmitter	III	"	
FCV-67-25	Flow Control Valve	I		
FCV-67-26	Flow Control Valve	III	BFNMEB8001	
PX-67-12B	Power Supply			
FSV-67-53	Solenoid Valve	III	BFNEEB8040	
FCV-67-53	Control Valve			
FSV-67-50	Flow Solenoid Valve	III	BFNEEB8041	
FSV-67-51	Flow Solenoid Valve	III	"	

SYSTEM: Emergency Equipment Cooling Water System (

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FM-67-3B	Signal Modifier			
PX-67-3B	Power Supply			
FT-67-9A	Flow Transmitter	III	BFNEEB8047R1	
FT-67-9B	Flow Transmitter			
FM-67-9B	Flow Modifier			
PX-67-9B	Power Supply			
FM-67-12B	Flow Modifier			
FM-67-6B	Flow Modifier			
PX-67-6B	Power Supply			
FS-67-12B	Flow Switch			
FT-67-12A	Flow Transmitter			
FT-67-12B	Flow Transmitter			
FCV-67-50	Flow Control Valve			
FCV-67-51	Flow Control Valve			

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TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: Reactor Water Recirculation (68)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FCV-68-1	Flow Control Valve	III	BFNNEB8034	
FCV-68-3	Flow Control Valve	III	BFNNEB8034	
PS-68-93	Pressure Switch			
PS-68-94	Pressure Switch			
FCV-68-77	Flow Control Valve	III	BFNNEB8034	
FCV-68-79	Flow Control Valve	III	BFNNEB8034	
PS-68-95	Pressure Switch			
PS-68-96	Pressure Switch	III	BFNNEB8010	

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TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: Reactor Water Cleanup System (69)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FCV-69-2	Control Valve	III	BFNNEB8034	
TE-69-29A	Temperature Element	III	BFNNEB8022	
TE-69-29B	Temperature Element	III	"	
TE-69-29C	Temperature Element	III	"	
TE-69-29D	Temperature Element	III	"	
TE-69-29E	Temperature Element	III	"	
TE-69-29F	Temperature Element	III	"	
TE-69-29G	Temperature Element	III	"	
TE-69-39H	Temperature Element	III	"	
TS-69-30A	Temperature Sensor	III	BFNEEB8027	
TS-69-30B	Temperature Sensor	III	"	
TS-69-30C	Temperature Sensor	III	"	
TS-69-30D	Temperature Sensor	III	"	
TS-69-30E	Temperature Sensor	III	"	
TS-69-30F	Temperature Sensor	III	"	
TS-69-30G	Temperature Sensor	III	"	
TS-69-30H	Temperature Sensor	III	"	
ZS-69-1	Zone Switch			

SYSTEM: Reactor Water Cleanup System (69)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
TS-69-29J	Temperature Switch	III	BFNNEB8009	
TS-69-29K	Temperature Switch	III	"	
TS-69-29L	Temperature Switch	III	"	
TS-69-29M	Temperature Switch	III	"	
FCV-69-1	Flow Control Valve	III	BFNNEB8034	

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TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: Reactor Building Closed CW System (70)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FCV-70-47	Flow Control Valve	III	BFNNEB8034	

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TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: Reactor Core Isolation Cooling (71)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FCV-71-2	Flow Control Valve	III	BFNNEB8034	
PS-71-11C	Pressure Switch	III	BFNNEB8011	
PS-71-11D	Pressure Switch	III	"	
FCV-71-25	Flow Control Valve	III	BFNMEB8001	
SE-71-42A	Speed Sensor	III	BFNNEB8025	
SE-71-42B	Speed Sensor	III	"	
TS-71-2A	Temperature Sensor	III	BFNNEB8009	
TS-71-2B	Temperature Sensor	III	"	
TS-71-2C	Temperature Sensor	III	"	
TS-71-2D	Temperature Sensor	III	"	
TS-71-2E	Temperature Sensor	III	"	
TS-71-2F	Temperature Sensor	III	"	
TS-71-2G	Temperature Sensor	III	"	
TS-71-2H	Temperature Sensor	III	"	
TS-71-2J	Temperature Sensor	III	"	
TS-71-2K	Temperature Sensor	III	"	
TS-71-2L	Temperature Sensor	III	"	
TS-71-2M	Temperature Sensor	III	"	
TS-71-2N	Temperature Sensor	III	"	

SYSTEM: Reactor Core Isolation Cooling (71)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
TS-71-2P	Temperature Sensor	III	BFNNEB8009	
TS-71-2R	Temperature Sensor	III	"	
TS-71-2S	Temperature Sensor	III	"	
FCV-71-3	Flow Control Valve	III	BFNNEB8034	
PT-71-4	Pressure Transmitter	III	BFNNEB8012	
FCV-71-8	Flow Control Valve	III	BFNNEB8034	
FCV-71-9	Flow Control Valve			
FCV-71-10	Flow Control Valve	III	BFNNEB8034	
SC-71-10	Speed Control	III	BFNNEB8025	
PT-71-12	Pressure Transmitter	III	BFNNEB8012	
PS-71-13A	Pressure Switch	III	BFNNEB8021	
PS-71-13B	Pressure Switch	III	"	
FCV-71-17	Flow Control Valve	III	BFNNEB8034	
FCV-71-18	Flow Control Valve	III	"	
FCV-71-19	Flow Control Valve	III	"	
PT-71-20	Pressure Transmitter	III	BFNNEB8012	
PS-71-21	Pressure Switch	III	BFNNEB8011	
PS-71-21-1	Pressure Switch	III	BFNNEB8020	
FCV-71-34	Flow Control Valve	III	BFNMEB8001	
PT-71-35	Pressure Transmitter			

SYSTEM: Reactor Core Isolation Cooling (71)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FS-71-36	Flow Switch	III	BFNNEB8005	
FT-71-36	Flow Transmitter	III	BFNNEB8012	
FCV-71-37	Flow Control Valve	III	BFNNEB8034	
FCV-71-38	Flow Control Valve	III	"	
FCV-71-39	Flow Control Valve	III	BFNNEB8034	
TE-71-41A	Temperature Element	III	BFNNEB8022	
TE-71-41B	Temperature Element			
TE-71-41C	Temperature Element	III	BFNNEB8022	
TE-71-41D	Temperature Element	III	"	
PS-71-44	Pressure Switch	III	BFNNEB8025	
TIS-71-45	Temperature Indicator Switch	III	"	
TIS-71-46	Temperature Indicator Switch	III	BFNNEB8025	
FSV-71-6B	Flow Solenoid Valve	III	BFNEEB8035	
PS-71-1A	Pressure Switch	III	BFNNEB8011	
PS-71-1B	Pressure Switch	III	"	
PS-71-1C	Pressure Switch	III	"	
PS-71-1D	Pressure Switch	III	BFNNEB8011	
PDIS-71-1A	Pressure Differential Indicator Switch	III	BFNNEB8011	
PDIS-71-1B	Pressure Differential Indicator Switch	III	BFNNEB8011	

SYSTEM: Reactor Core Isolation Cooling (71)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PS-71-11A	Pressure Switch	III	BFNNEB8011	
PS-71-11B	Pressure Switch	III	"	
FCV-71-59	Flow Control Valve	III	BFNNEB8034	
FIC-71-36A	Flow Indicator Control			
FM-71-36	Signal Modifier	II	BFNNEB8005	
PX-71-4	Power Supply	III	BFNNEB8005	
FT-71-1A	Flow Transmitter			
FT-71-1B	Flow Transmitter			
FSV-71-6A	Flow Solenoid Valve			
PX-71-35	Power Supply			
PX-71-36A	Power Supply			
PX-71-12	Power Supply			
FR-71-36	Flow Recorder			
TS-71-2A	Temperature Sensor			
TS-71-2B	Temperature Sensor			
TS-71-2C	Temperature Sensor			
TS-71-2C	Temperature Sensor			
PT-71-48	Pressure Transmitter	III	BFNNEB8012	
FSV-71-6A	Flow Solenoid Value			
TS-71-9	Temperature Switch			

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: High Pressure Core Injection (73)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FCV-73-3	Flow Control Valve	III	BFNNEB8034	
FCV-73-2	Flow Control Valve	III	BFNNEB8034	
FCV-73-27	Flow Control Valve	III	BFNNEB8034	
PT-73-4	Pressure Transmitter			
SE-73-5	Speed Sensor	III	BFNNEB8025	
SC-73-19	Speed Control	III	BFNNEB8025	
PT-73-21	Pressure Transmitter	III	BFNNEB8012	
FS-73-33	Flow Switch	III	BFNNEB8010	
PS-73-22A	Pressure Switch	III	BFNNEB8021	
PS-73-22B	Pressure Switch	III	"	
PS-73-20B	Pressure Switch	III	BFNNEB8011	
PS-73-20C	Pressure Switch	III	"	
PS-73-20D	Pressure Switch	III	"	
PS-73-20A	Pressure Switch	III	"	
HPCI Aux Oil Pump Mtr	Pump Motor			
TIS-73-52	Temeprature Indicator Switch	III	BFNNEB8025	
PS-73-1A	Pressure Switch	III	BFNNEB8011	
HPCI Tube Oil Cooler		III	BFNNEB8025	

*Outside containment except for HPCI

SYSTEM: High Pressure Core Injection (73)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PS-73-1B	Pressure Switch	III	BFNNEB8011	
PS-73-1C	Pressure Switch	III	"	
PS-73-1D	Pressure Switch	III	"	
PDIS-73-1A	Pressure Differential Indicator Switch	III	"	
PDIS-73-1B	Pressure Differential Indicator Switch	III	"	
FT-73-33	Flow Transmitter	III	BFNNEB8012	
TS-73-2A	Temperature Sensor	I		
TS-73-2B	Temperature Sensor.	I		
TS-73-2C	Temperature Sensor	I		
TS-73-2D	Temperature Sensor	I		
TS-73-2E	Temperature Sensor	III	BFNNEB8009	
TS-73-2F	Temperature Sensor	III		
TS-73-2G	Temperature Sensor	III		
TS-73-2H	Temperature Sensor	III		
TS-73-2J	Temperature Sensor	III		
TS-73-2K	Temperature Sensor	III	BFNNEB8009	
TS-73-2L	Temperature Sensor			
TS-73-2M	Temperature Sensor	III	BFNNEB8009	
TS-73-2N	Temperature Sensor			
TS-73-2P	Temperature Sensor	III	BFNNEB8009	
TS-73-2R	Temperature Sensor			
TS-73-2S	Temperature Sensor			

SYSTEM: High Pressure Core Injection (73)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FCV-73-16	Flow Control Valve			
PCV-73-18B	Pressure Control Valve			
FCV-73-26	Flow Control Valve	III	BFNNEB8034	
FCV-73-30	Flow Control Valve	I		
FCV-73-34	Flow Control Valve	III	BFNNEB8034	
FCV-73-35	Flow Control Valve	III		
FCV-73-36	Flow Control Valve	III		
FCV-73-40	Flow Control Valve	III		
FCV-73-44	Flow Control Valve	III		
TE-73-55A	Temperature Element			
TE-73-55B	Temperature Element	IV	BFNEEB8053	
TE-73-55C	Temperature Element	IV	"	
TE-73-55D	Temperature Element	III	BFNNEB8022	
LS-73-56A	Level Switch	III	BFNEEB8053	
LS-73-56B	Level Switch	III	BFNEEB8053	
LS-73-57A	Level Switch	III	BFNNEB8004	
LS-73-57B	Level Switch	III	"	
FCV-73-64	Flow Control Valve	I		
PT-73-65	Pressure Transmitter			
FCV-73-18	Flow Control Valve	III	BFNNEB8025	
FCV-73-19	Flow Control Valve	III	BFNNEB8025	

SYSTEM: High Pressure Core Injection (73)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PDS-73-53	Pressure Differential			
PX-73-65	Power Supply			
PS-73-47A	Pressure Switch	III	BFNNEB8025	
PS-73-47B	Pressure Switch	III	BFNNEB8025	
PT-73-31	Pressure Transmitter	III	BFNNEB8012	
PS-73-29-1	Pressure Switch			
TS-73-2F	Temperature Sensor	I		
TS-73-2H	Temperature Sensor	I		
FCV-73-18	Flow Control Valve			
FCV-73-19	Flow Control Valve			

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: Residual Heat Removal (74)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FCV-74-1	Flow Control Valve	III	BFNEEB8034	
FCV-74-2	Flow Control Valve	I		
FCV-74-7	Flow Control Valve	I		
PS-74-8A	Pressure Switch	III	BFNNEB8020	
PS-74-8B	Pressure Switch	III	BFNNEB8020	
TE-74-9	Temperature Element	III	BFNNEB8022	
FCV-74-12	Flow Control Valve	III	BFNNEB8034	
FCV-74-13	Flow Control Valve	I		
PS-74-19A	Pressure Switch	III	BFNNEB8020	
PS-74-31B	Pressure Switch	III	BFNNEB8020	
TE-74-21	Pressure Switch	III	BFNNEB8022	
FCV-74-24	Flow Control Valve	III	BFNNEB8034	
FCV-74-25	Flow Control Valve	I		
FCV-74-30	Flow Control Valve	I		
PS-74-31A	Pressure Switch	III	BFNNEB8020	
TE-74-32	Temperature Element	III	BFNNEB8022.	
FCV-74-35	Flow Control Valve	III	BFNNEB8034	
FCV-74-36	Flow Control Valve	I		
PS-74-42A	Pressure Switch	III	BFNNEB8020	
PS-74-42B	Pressure Switch	III	BFNNEB8020	
TE-74-43	Temperature Element	III	BFNNEB8022	
FCV-74-47	Flow Control Valve	III	BFNNEB8034	
FT-74-50	Flow Transmitter	IV.	BFNNEB8012	

SYSTEM: Residual Heat Removal (74)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PT-74-51	Pressure Transmitter	IV	BFNNEB8012	
FCV-74-52	Flow Control Valve	III	BFNNEB8034	
FCV-74-53	Flow Control Valve	III	BFNNEB8034	
FCV-74-60	Flow Control Valve	III	BFNNEB8034	
FCV-74-61	Flow Control Valve	IV	BFNNEB8034	
FT-74-64	Flow Transmitter			
PT-74-65	Pressure Transmitter	IV	BFNNEB8012	
FCV-74-66	Flow Control Valve			
FCV-74-67	Flow Control Valve	III	BFNNEB8034	
FT-74-70	Flow Transmitter	IV	BFNNEB8012	
FCV-74-74	Flow Control Valve	III	BFNNEB8034	
FCV-74-75	Flow Control Valve	III	"	
FCV-74-77	Flow Control Valve	III	"	
TE-74-81	Temperature Element	III	BFNNEB8015	
TE-74-82	Temperature Element	III	"	
TE-74-83	Temperature Element	III	"	
TE-74-84	Temperature Element	III	"	
PT-74-94	Pressure Transmitter	IV	"	
FCV-74-98 1&2	Flow Control Valve	I		
FCV-74-99 1&2	Flow Control Valve	I		
FCV-74-101 1&2	Flow Control Valve	I		
FSV-74-102	Flow Solenoid Valve	III	BFNEEB8040	
FSV-74-103	Flow Solenoid Valve	III	BFNEEB8040	
FSV-74-119	Flow Solenoid Valve	III	BFNEEB8040	

SYSTEM: Residual Heat Removal (74)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FCV-74-57	Flow Control Valve	III	BFNNEB8034	
FCV-74-58	Flow Control Valve	III	"	
FCV-74-59	Flow Control Valve	III	"	
FCV-74-71	Flow Control Valve	III	"	
FCV-74-72	Flow Control Valve	III	"	
FCV-74-73	Flow Control Valve	III	"	
FCV-74-78	Flow Control Valve			
FT-74-56	Flow Transmitter	IV	BFNNEB8012	
TTS-74-136A	Temperature Transmitter Switch			
TTS-74-136B	Temperature Transmitter Switch			
FCV-74-102	Flow Control Valve			
FCV-74-103	Flow Control Valve			
FCV-74-119	Flow Control Valve			
FCV-74-120	Flow Control Valve			
TE-74-95A	Temperature Element	III	BFNNEB8022	
TE-74-95B	Temperature Element	III	"	
TE-74-95C	Temperature Element	III	"	
TE-74-95D	Temperature Element	III	"	
TE-74-95E	Temperature Element	III	"	
TE-74-95F	Temperature Element	III	"	
TE-74-95G	Temperature Element	III	"	
TE-74-95H	Temperature Element	III	"	

SYSTEM: Residual Heat Removal (74)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FSV-74-120	Flow Solenoid Valve	III	BFNEEB8040	
ME-74-137A	Moisture Element			
ME-74-137B	Moisture Element			
MIS-74-137A	Moisture Indicator Switch			
MIS-74-137B	Moisture Indicator Switch			
RHR Pump Motor 1A	Pump Motor	III	BFNNEB8008	
RHR Pump Motor 1B	Pump Motor	III	"	
RHR Pump Motor 1C	Pump Motor	III	"	
RHR Pump Motor 1D	Pump Motor	III	"	
RHR Pump Motor 2A	Pump Motor	III	"	
RHR Pump Motor 2B	Pump Motor	III	"	
RHR Pump Motor 2C	Pump Motor	III	"	
RHR Pump Motor 2D	Pump Motor	III	"	
RHR Pump Motor 3A	Pump Motor	III	"	
RHR Pump Motor 3B	Pump Motor	III	"	
RHR Pump Motor 3C	Pump Motor	III	"	
RHR Pump Motor 3D	Pump Motor	III	"	
FIS-74-50	Flow Indicator Switch			
FIS-74-64	Flow Indicator Switch	III	BFNNEB8012	
FIS-74-69	"	III	BFNNEB8010	
FCV-74-96 2&3	Flow Control Valve	I		
FCV-74-97 2&3	Flow Control Valve	I		
FCV-74-100 2&3	Flow Control Valve	I		
FCV-74-48	Flow Control Valve	II	BFNNEB8034	

SYSTEM: Residual Heat Removal (74)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name
PS-74-8B	Pressure Switch
PS-74-19B	Pressure Switch
PS-74-31B	Pressure Switch
PS-74-42B	Pressure Switch
FCV-74-60	Flow Control Valve

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: Core Spray System (75)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FCV-75-2	Flow Control Valve	III	BFNNEB8034	
PS-75-7	Pressure Switch	III	BFNNEB8021	
FCV-75-9	Flow Control Valve	III	BFNNEB8034	
FCV-75-11	Flow Control Valve	III	BFNNEB8034	
FIS-75-21	Flow Indicator Switch	III	BFNNEB8010	
FCV-75-22	Flow Control Valve	III	BFNNEB8034	
FCV-75-23	Flow Control Valve	III	BFNNEB8034	
PS-75-24	Pressure Switch			
FCV-75-25	Flow Control Valve	III	BFNNEB8034	
PDIS-75-28	Pressure Differential Indicator Switch	III	BFNNEB8010	
FCV-75-30	Flow Control Valve	III	BFNNEB8034	
PS-75-35	Pressure Switch	III	BFNNEB8021	
FCV-75-37	Flow Control Valve	III	BFNNEB8034	
FCV-75-39	Flow Control Valve	III	BFNNEB8034	
PS-75-44	Pressure Switch	III	BFNNEB8021	

SYSTEM: Core Spray System (75)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
PT-75-48	Pressure Transmitter			
FT-75-49	Flow Transmitter	IV	BFNNEB8012	
FIS-75-49	Flow Indicator Switch	III	BFNNEB8010	
FCV-75-50	Flow Control Valve	III	BFNEEB8034	
FCV-75-51	Flow Control Valve	III	BFNNEB8034	
PS-75-52	Pressure Switch			
FCV-75-53	Flow Control Valve	III	BFNNEB8034	
PDIS-75-56	Pressure Differential Indicator Switch	III	BFNNEB8010	
FSV-75-57	Flow Solenoid Valve	III	BFNEEB8059	
FSV-75-58	Flow Solenoid Valve	III	BFNEEB8059	
MIS-75-70A	Moisture Indicator Switch	III	BFNEEB8059	
ME-75-70A	Moisture Element			
MIS-75-70B	Moisture Indicator Switch			
ME-75-70B	Moisture Element			
PS-75-16	Pressure Switch	III	BFNNEB8021	
PT-75-20	Pressure Transmitter			
FT-75-21	Flow Transmitter	IV	BFNNEB8021	
Core Spray Pump Motor 1A	Pump Motor	III	BFNNEB8008	
Core Spray Pump Motor 1B	Pump Motor	III	"	
Core Spray Pump Motor 1C	Pump Motor	III	"	
Core Spray Pump Motor 1D	Pump Motor	III	"	

SYSTEM: Core Spray System (75)

GENERAL EQUIPMENT				
TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
Core Spray Pump Motor 2A	Pump Motor	III	BFNNEB8008	
Core Spray Pump Motor 2B	Pump Motor	III	"	
Core Spray Pump Motor 2C	Pump Motor	III	"	
Core Spray Pump Motor 2D	Pump Motor	III	"	
Core Spray Pump Motor 3A	Pump Motor	III	"	
Core Spray Pump Motor 3B	Pump Motor	III	"	
Core Spray Pump Motor 3C	Pump Motor	III	"	
Core Spray Pump Motor 3D	Pump Motor	III	"	
FSV-75-57	Flow Solenoid Valve	III	BFNEEB8059	
TTS-75-69A	Temperature Transmitter Switch			
TTS-75-69B	Temperature Transmitter Switch			
FSV-75-71	Flow Solenoid Valve			
FSV-75-72	Flow Solenoid Valve			
FSV-75-58	Flow Solenoid Valve	III	BFNEEB8059	

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: Containment Inerting HPCI Torus Room (76)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FSV-76-56	Flow Solenoid Valve	I		
FSV-76-58	Flow Solenoid Valve	I		
FSV-76-60	Flow Solenoid Valve	I		
FSV-76-66	Flow Solenoid Valve	I		
FSV-76-68	Flow Solenoid Valve	I		
FSV-76-49	Flow Solenoid Valve	I		
FSV-76-51	Flow Solenoid Valve	I		
FSV-76-55	Flow Solenoid Valve	I		
FSV-76-57	Flow Solenoid Valve	I		
FSV-76-59	Flow Solenoid Valve	I		
FSV-76-63	Flow Solenoid Valve	I		
FSV-76-65	Flow Solenoid Valve	I		
FSV-76-67	Flow Solenoid Valve	I		
H_2E-76-37	Hydrogen Analyzer			
H_2E-76-37A	Hydrogen Analyzer			
H_2E-76-38	Hydrogen Analyzer			
H_2E-76-38A	Hydrogen Analyzer			
H_2E-76-39	Hydrogen Analyzer			
H_2E-76-39A	Hydrogen Analyzer			
H_2E-76-40	Hydrogen Analyzer			

SYSTEM: Containment Inerting HPCI Torus Room (76)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FSV-76-37A	Flow Solenoid Valve	III	BFNEEB8060R1	NA*
FSV-76-37B	Flow Solenoid Valve	III	"	NA*
FSV-76-39A	Flow Solenoid Valve	III	"	NA*
FSV-76-39B	Flow Solenoid Valve	III	"	NA*
FSV-76-40A	Flow Solenoid Valve	III	"	NA*
FSV-76-40B	Flow Solenoid Valve	III	"	NA*
FSV-76-41A	Flow Solenoid Valve			
FSV-76-41B	Flow Solenoid Valve			
FSV-76-43A	Flow Solenoid Valve			
FSV-76-38A	Flow Solenoid Valve			
FSV-76-38B	Flow Solenoid Valve			
FSV-76-42A	Flow Solenoid Valve	III	BFNEEB8060R1	NA*
FSV-76-42B	Flow Solenoid Valve	III	BFNEEB8060R1	NA*
FSV-76-17	Flow Solenoid Valve	I		
FCV-76-17	Flow Control Valve	III	BFNNEB8019	
FSV-76-18	Flow Solenoid Valve	I		
FSV-76-19	Flow Solenoid Valve	I		
FSV-76-24	Flow Solenoid Valve	I		
FSV-76-44A	Flow Solenoid Valve			
FSV-76-44B	Flow Solenoid Valve			
FSV-76-50	Flow Solenoid Valve			
FSV-76-61	Flow Solenoid Valve			
FSV-76-52	Flow Solenoid Valve			
FSV-76-62	Flow Solenoid Valve			

*System is to be replaced at next available outage - No LER required due to fact that this has already been brought to NRC's attention.

SYSTEM: Containment Inerting HPCI Torus Room (76)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
~~FSV-76-53~~	~~Flow Solenoid Valve~~			
~~FSV-76-54~~	~~Flow Solenoid Valve~~			
~~FSV-76-64~~	~~Flow Solenoid Valve~~			
FCV-76-18	Flow Control Valve	III	BFNNEB8019	
FCV-76-19	Flow Control Valve	III	"	
FCV-76-24	Flow Control Valve	III	"	

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: Radwaste System (77)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
LIS-77-1A	Level Indicator Switch	III	BFNNEB8024	
LIS-77-1B	Level Indicator Switch	III	"	
LS-77-8A	Level Switch	III	BFNNEB8029	
LS-77-8B	Level Switch	III	BFNNEB8029	
LIS-77-14A	Level Indicator Switch	III	BFNNEB8024	
LIS-77-14B	Level Indicator Switch	III	BFNNEB8024	
FCV-77-17A	Flow Control Valve			
FCV-77-17B	Flow Control Valve			
LS-77-17A	Level Switch	III	BFNNEB8029	
LS-77-17B	Level Switch	III	BFNNEB8029	
TE-77-17	Temperature Element	III	BFNNEB8027	
TIS-77-17	Temperature IndicatorSwitch			
LS-77-25A	Level Switch			
LS-77-25E	Level Switch			
LS-77-25F	Level Switch			
Reactor Building Equipment Drain Sump Pump A	Pump Motor	III	BFNMEB8001	

SYSTEM: Radwaste System (77)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
Reactor Building Equipment Drain Sump Pump B	Pump Motor	III	BFNMEB8001	
Reactor Building Floor Drain Sump Pump A	Pump Motor	III	BFNMEB8001	
Reactor Building Floor Drain Sump Pump A	PUmp Motor	III	BFNMEB8001	
Reactor Building Floor Drain Sump Pump B	Pump Motor	III	BFNMEB8001	
Reactor Building Floor Drain Sump Pump B	Pump Motor	III	BFNMEB8001	
LT-77-1A	Level Transmitter	III	BFNNEB8024	
LT-77-1B	Level Transmitter	III	BFNNEB8024	
LT-77-14A	Level Transmitter	III	"	
LT-77-14B	Level Transmitter	III	"	
TE-77-14	Temperature Element	III	BFNNEB8027	
FSV-77-2A	Flow Solenoid Valve	III	BFNNEB8026	
FSV-77-2B	Flow Solenoid Valve	III	"	
FSV-77-15A	Flow Solenoid Valve	III	"	
FSV-77-15B	Flow Solenoid Valve	III	"	
~~ZS-77-2A~~	~~Zone Switch~~			
~~ZS-77-2B~~	~~Zone Switch~~			
~~ZS-77-15A~~	~~Zone Switch~~			

SYSTEM: Radwaste System (77)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
LS-77-25B	Level Switch			
LS-77-25C	Level Switch			
FSV-77-17	Level Switch	IV	BFNEEB8036	
FSV-77-17	Level Switch	IV	BFNEEB8036	
FSV-77-17	Level Switch	IV	BFNEEB8036	
FCV-77-2A	Flow Control Valve	III	BFNNEB8006	
FCV-77-2B	Flow Control Valve	III	BFNNEB8006	
LS-77-25D	Level Switch			
FCV-77-15A	Flow Control Valve			
FCV-77-15B	Flow Control Valve			

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: Fuel Pool Cooling and Demineralizing System (78)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
LS-78-1A	Level Switch	III	BFNNEB8028	
LS-78-1B	Level Switch	III	"	
LS-78-1C	Level Switch	III	"	
LS-78-1D	Level Switch	III	"	
LS-78-1E	Level Switch	III	"	
LS-78-1F	Level Switch	III	"	
LS-78-1G	Level Switch	III	"	
LS-78-2A	Level Switch			
LS-78-2B	Level Switch			
FCV-78-61 1-3	Flow Control Valve	I		
FCV-78-62 1-3	Flow Control Valve	I		
FCV-78-63 1-3	Flow Control Valve	I		
FCV-78-64 1-3	Flow Control Valve	I		
FCV-78-65 1-3	Flow Control Valve	I		
FCV-78-66 1-3	Flow Control Valve	I		
FCV-78-67 1-3	Flow Control Valve	I		
FCV-78-68 1-3	Flow Control Valve	I		
~~FIS-78-5~~	~~Flow Indicator Switch~~			
~~FS-78-51~~	~~Flow Indicator Switch~~			

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: Containment Atmosphere Dilution System (84)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FSV-84-8A	Flow Solenoid Valve	I	N/A	
FSV-84-8B	Flow Solenoid Valve			
FSV-84-8C	Flow Solenoid Valve			
FSV-84-8D	Flow Solenoid Valve			
FT-84-19	Flow Transmitter	III	BFNEEB8047	
FSV-84-19	Flow Solenoid Valve	IV	BFNEEB8038	
FT-84-20	Flow Transmitter	III	BFNEEB8047	
FSV-84-20	Flow Solenoid Valve	III	BFNEEB8038	
FM-84-20B	Flow Modifier	III	BFNEEB8055	
PS-84-21	Pressure Switch	III	BFNEEB8045	
PS-84-22	Pressure Switch	III	BFNEEB8045	
FSV-84-19	Flow Solenoid Valve	IV	BFNEEB8032	
FM-84-19B	Flow Modifier			
FCV-84-19	Flow Control Valve			
FCV-84-20	Flow Control Valve			
FSV-84-20	Flow Solenoid Valve			
FM-84-19B	I/P Converter	III	BFNEEB8055	

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TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: CRD Hydraulic System (85)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
FSV-85-39A	Flow Solenoid Valve	III	BFNNEB8031	
FSV-85-39B	Flow Solenoid Valve			
LS-85-45A	Level Switch	III	BFNNEB8004	
LS-85-45B	Level Switch	III	"	
LS-85-45C	Level Switch	III	"	
LS-85-45D	Level Switch	III	"	
LS-85-45E	Level Switch	III	"	
FCV-85-37C	Flow Control Valve	III	BFNNEB8031	
FSV-85-35A	Flow Solenoid Valve	III	"	
FSV-85-35B	Flow Solenoid Valve	III	"	
FSV-85-37A	Flow Solenoid Valve			
FSV-85-37B	Flow Solenoid Valve			
FSV-85-70A	Flow Solenoid Valve	III	BFNEEB8043	
FSV-85-70B	Flow Solenoid Valve	III	"	
FCV-85-37A	Flow Control Valve	III	BFNNEB8031&8019	
FCV-85-37B	Flow Control Valve	III	" "	
FCV-85-39A	Flow Control Valve	III	BFNNEB8006	
FCV-85-39B	Flow Control Valve	III	BFNNEB8006	

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TABLE 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

SYSTEM: Radiation Monitoring System (90)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
RE-90-133	Primary Element			
RE-90-133A	Primary Element	III	BFNEEB8005	
RE-90-134	Primary Element			
RE-90-134A	Primary Element	III	BFNEEB8005	
RE-90-136	Primary Element	III	BFNNEB8005	
RE-90-137	Primary Element	III	"	
RE-90-138	Primary Element	III	"	
RE-90-139	Primary Element	III	"	
RE-90-140	Primary Element	III	"	
RE-90-141	Primary Element	III	"	
RE-90-142	Primary Element	III	"	
RE-90-143	Primary Element	III	"	
FCV-90-254A	Flow Control Valve			
FCV-90-254B	Flow Control Valve			
FCV-90-255	Flow Control Valve			
FCV-90-257A	Flow Control Valve			
FCV-90-257B	Flow Control Valve			
RE-90-272A	Primary Element			
RE-90-272B	Primary Element			

SYSTEM: Radiation Monitoring System (90)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Status	NCR No.	LER No.
RE-90-273B	Primary Element	III	BFNNEB8005	
RE-90-133A	Primary Element	III	BFNNEB8005	
RE-90-133A	Primary Element			
RE-90-134A	Primary Element			
RE-90-134A	Primary Element			
RE-90-131A	Primary Element	III	BFNEEB8055	
RE-90-131A	Primary Element			
RE-90-131A	Primary Element			
RE-90-283A	Primary Element	III	BFNNEB8005	
RE-90-283B	Primary Element	iii	"	

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Table 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

Cables (PN, PJ, PNJ, PJJ) Located on HELB areas

GENERAL EQUIPMENT

Generic Name	Status	NCR No.	LER No.
Cable (PNJ, PJJ)	II	EEB8005	
" (PN, PJ)	III	EEB8006	

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Table 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

Cable - Polyethylene insulated signal cable in HELB areas

GENERAL EQUIPMENT

Generic Name	Status	NCR No.	LER No.
Cable	III	EEB8007	

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Table 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

Cable - CP, CPJ, CPJJ, PXJ cable in all environments

GENERAL EQUIPMENT

Generic Name	Status	NCR No.	LER No.
Cable	I	None	

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Table 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

Cable - SROAJ (silicone-rubber insulated cable in all environments

GENERAL EQUIPMENT

Generic Name	Status	NCR No.	LER No.
Cable	I	None	

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Table 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

Cable - COAX, triax, and signal cables of cross-linked polyethylene construction in all environments

GENERAL EQUIPMENT

Generic Name	Status	NCR No.	LER No.
Cable	I	None	

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Table 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

Control Stations

GENERAL EQUIPMENT

Generic Name	Status	NCR No.	LER No.
Control Switches	III	EEB8008	

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Table 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

Junction Boxes

GENERAL EQUIPMENT

Generic Name	Status	NCR No.	LER No.
Junction Boxes	III	EEB8009	

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Table 5.2

SUMMARY OF ELECTRICAL EQUIPMENT QUALIFICATION STATUS

Terminal Blocks

GENERAL EQUIPMENT

Generic Name	Status	NCR No.	LER No.
Terminal Blocks	II	EEB8010	

SECTION 6.0

DESCRIPTION OF QUALIFICATION REPLACEMENT PLAN

6.0 Description of Qualification/Replacement Plan

It is TVA's intention to comply fully with the requirements of Bulletin 79-01B. This section addresses the requirements stated in item 4 of the bulletin for "outstanding items." It is not possible to submit a detailed qualification/replacement plan at this time.

The following items have a great impact on our inability to supply a detailed schedule at this time:

a) Limitations on industry's capability for testing large numbers of components.

b) Availability of qualified replacement equipment.

c) Unit outage schedules.

TVA has a contract with Wyle Laboratories to do any testing that is required to prove qualification of any questionable equipment. Wyle will also provide TVA a detailed schedule of all tests they plan to conduct for TVA.

When we receive schedules of testing from Wyle Lab, we will inform the NRC as stated in your letter dated October 1, 1980, from D. G. Eisenhut to licensees of operating plants. TVA will make a best faith effort to test equipment as soon as possible. However, if problems are encountered with either the testing or qualifiability of the equipment, the justification for continued operation will be reviewed as well as a safety review. It is our plan to schedule first the items that have the greatest impact on safety.

The qualification status of all equipment is listed in Table 5.2. The status of all items fall into one of four categories as listed below.

Category I - Components qualified to DOR guidelines.

Category II - Components for which analysis indicating qualification but that lack documentation to prove qualification to DOR guidelines.

Category III - Items that will be qualified by either analysis or type testing or a combination of these methods.

Category IV - Equipment to be replaced.

For Category IV equipment checks were made to determine the availability of qualified equipment on the market. In general, even if qualified equipment is available the delivery has a long and indefinite lead time.

TVA will submit a detailed schedule for qualifying or replacing all open items by February 1, 1981. This schedule will be developed in conjunction with Wyle Labs.

SECTION 7.0

DISCUSSION OF QUALITY ASSURANCE PROGRAM FOR REPORT DEVELOPMENT

7.0 Discussion of the Quality Assurance Program Used for Report Development

The Electrical Equipment Environmental Qualification Report has been prepared under the requirements of the present TVA QA program. TVA QA Topical Report (TVA-TR75-1) provides a description of the inplace QA program. TVA-EN DES engineering procedures applicable to activities involved in the preparation of the qualification report were utilized. Also, some additional QA requirements were applied in preparing the response to IEB 79-01B.

Activities during the preparation of this report were required to be performed in accordance with the procedure, "Electrical Equipment Environmental Qualification Report for Browns Ferry Nuclear Plant - Preparation and Handling." The following has been achieved:

1. A portion of the Equipment Evaluation Worksheets (EWS) and their attachments were reviewed by TVA-EN DES Quality Assurance Branch (QAB) for "QA acceptance." This review was made to ensure that applicable QA program requirements were adequately documented on the EWS and its attachments. Due to the November 1, 1980, deadline for issuance of this report, the QA review of all EWS's was not completed. The QA review is ongoing and any discrepancies or errors will be resolved and discussed in subsequent supplemental responses to IEB 79-01B to NRC.

2. Qualification information used in the preparation of the report was independently reviewed by the responsible contract engineering branch to determine its acceptability for use. Verbal information obtained from a vendor was required to be confirmed by the vendor in writing.

3. TVA-EN DES nonconformance reports were required to be written for all equipment where sufficient qualification data was not presently available to ensure that the equipment would operate in its postulated environment.

The preparation of this report is being continually audited under TVA-EN DES Internal Audit 80-BF1 to verify compliance with applicable procedures and to assure information was correctly obtained and presented in the report. Any audit findings will be resolved promptly.

JFC

APPENDIX A

COMPONENT MASTERLIST

MASTER LIST

The "Master List" provides a listing of the electrical equipment required to function under postulated accident conditions and has been compiled in accordance with action item 1 of IE Bulletin 79-01B. The following information is also provided on the "Master List":

TVA-Plant Identification Number: In most cases this number identifies the component generically, the system number and the control loop the device is in. For components such as pump motors an ID number is not given; therefore, these devices are listed by description.

Generic Name: This name is a general term which describes the component generically.

Location: The location is given in reference to either inside containment (IC) or outside containment (OC). Each device is found in all three units except where noted by the specific unit number (i.e., OC(1,2) for outside containment in units 1 and 2). For components providing common service to all three units, the designation (CS) is used. Actual room location for the component can be found on the EWS Sheet for that item.

Accident Type: This column designates the following type of accident the component is used for:

Accident	Abbreviation
All design basis accidents	All DBA
High energy line break inside containment	HI
High energy line break outside containment	HO
Loss of coolant accident	LOCA
Other:	
Reactor core isolation cooling system	RCIC
High pressure core injection system	HPCI
Reactor water cooling unit system	RWCU

EWS Sheet No.: Complete information on the component is found on the corresponding evaluation work sheet (EWS).

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ELECTRICAL EQUIPMENT REQUIRED
TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Neutron Monitoring System (NM)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
GE-7-104	Valve Assembly	OC	All DBA	NEB-NM-287

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ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Auxiliary Power (APS)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
TS1A (4160-480V)	Transformer	OC (1)	All DBA	EEB-APS-0203
TS1E (4160-480V)	Transformer	OC (1)	All DBA	EEB-APS-0207
TS1B (4160-480V)	Transformer	OC (1)	All DBA	EEB-APS-0204
480V Reactor MOV BD 1C	480V MCC	OC (1)	All DBA	EEB-APS-0204
480V Reactor MOV BD 1D	480V MCC	OC (1)	All DBA	EEB-APS-0007
Motor-Generator Set 1DN	M-G Set	OC (1)	All DBA	EEB-APS-0191
Motor-Generator Set 1DA	M-G Set	OC (1)	All DBA	EEB-APS-0192
Motor-Generator Set 1EN	M-G Set	OC (1)	All DBA	EEB-APS-0193
Motor-Generator Set 1EA	M-G Set	OC (1)	All DBA	EEB-APS-0194
M-G Set 1DN Voltage Regulator Box	Voltage Regulator Box	OC (1)	All DBA	EEB-APS-0191
M-G Set 1DA Voltage Regulator Box	Voltage Regulator Box	OC (1)	All DBA	EEB-APS-0192
M-G Set 1EN Voltage Regulator Box	Voltage Regulator Box	OC (1)	All DBA	EEB-APS-0193
M-G Set 1EA Voltage Regulator Box	Voltage Regulator Box	OC (1)	All DBA	EEB-APS-0194
TS2A (4160-480V)	Transformer	OC (2)	All DBA	EEB-APS-0205
TS2E (4160-480V)	Transformer	OC (2)	All DBA	EEB-APS-0208
TS2B (4160-480V)	Transformer	OC (2)	All DBA	EEB-APS-0206
480V Reactor MOV BD 2C	480V MCC	OC (2)	All DBA	EEB-APS-0210

SYSTEM: Auxiliary Power (APS)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
480V Reactor MOV BD 2D	480V MCC	OC (2)	All DBA	EEB-APS-0008
480V Reactor MOV BD 2E	480V MCC	OC (2)	All DBA	EEB-APS-0010
Motor Generator Set 2DN	M-G Set	OC (2)	All DBA	EEB-APS-0195
Motor-Generator Set 2DA	M-G Set	OC (2)	All DBA	EEB-APS-0196
Motor-Generator Set 2EN	M-G Set	OC (2)	All DBA	EEB-APS-0197
Motor-Generator Set 2EA	M-G Set	OC (2)	All DBA	EEB-APS-0198
M-G Set 2DN Voltage Regulator Box	Voltage Regulator Box	OC (2)	All DBA	EEB-APS-0195
M-G Set 2DA Voltage Regulator Box	Voltage Regulator Box	OC (2)	All DBA	EEB-APS-0196
M-G Set 2EN Voltage Regulator Box	Voltage Regulator Box	OC (2)	All DBA	EEB-APS-0197
M-G Set 2EA Voltage Regulator Box	Voltage Regulator Box	OC (2)	All DBA	EEB-APS-0198
480V Reactor MOV BD 3C	480V MCC	OC (3)	All DBA	EEB-APS-0004
480V Reactor MOV BD 3D	480V MCC	OC (3)	All DBA	EEB-APS-005
Motor-Generator Set 3DN	M-G Set	OC (3)	All DBA	EEB-APS-0199
Motor-Generator Set 3DA	M-G Set	OC (3)	All DBA	EEB-APS-0200
Motor-Generator Set 3EN	M-G Set	OC (3)	All DBA	EEB-APS-0201
Motor-Generator Set 3EA	M-G Set	OC (3)	All DBA	EEB-APS-0202
M-G Set 3DN Voltage Regulator Box	Voltage Regulator Box	OC (3)	All DBA	EEB-APS-0199
M-G Set 3DA Voltage Regulator Box	Voltage Regulator Box	OC (3)	All DBA	EEB-APS-0200
M-G Set 3EN Voltage Regulator Box	Voltage Regulator Box	OC (3)	All DBA	EEB-APS-0201
M-G Set 3EA Voltage Regulator Box	Voltage Regulator Box	OC (3)	All DBA	EEB-APS-0202

SYSTEM: Auxiliary Power (APS)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
480V Reactor MOV BD 1E	480V MCC	OC (3)	All DBA	EEB-APS-0009
480V Reactor MOV BD 3E	480V MCC	OC (3)	All DBA	EEB-APS-0006
TS3A (4160V-480V)	Transformer	OC (3)	All DBA	EEB-APS-0001
TS3B (4160V-480V)	Transformer	OC (3)	All DBA	EEB-APS-0002
TS3E (e160V-480V)	Transformer	OC (3)	All DBA	EEB-APS-0003

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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MASTER LIST

ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Main Steam Supply (1)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FSV-1-15A	Flow Solenoid Valve	OC	All DBA	NEB-1-007
FSV-1-15B	Flow Solenoid Valve	OC	All DBA	NEB-1-007
FSV-1-15C	Flow Solenoid Valve	OC	All DBA	NEB-1-007
FSV-1-27A	Flow Solenoid Valve	OC	All DBA	NEB-1-007
FSV-1-27B	Flow Solenoid Valve	OC	All DBA	NEB-1-007
FSV-1-27C	Flow Solenoid Valve	OC	All DBA	NEB-1-007
FSV-1-38A	Flow Solenoid Valve	OC	All DBA	NEB-1-007
FSV-1-38B	Flow Solenoid Valve	OC	All DBA	NEB-1-007
FSV-1-38C	Flow Solenoid Valve	OC	All DBA	NEB-1-007
FSV-1-52A	Flow Solenoid Valve	OC	All DBA	NEB-1-007
FSV-1-52B	Flow Solenoid Valve	OC	All DBA	NEB-1-007
FSV-1-52C	Flow Solenoid Valve	OC	All DBA	NEB-1-007
FCV-1-56	Flow Control Valve	OC	All DBA	NEB-1-013
TS-1-17A	Temperature Switch	OC	All DBA	NEB-1-008
TS-1-17B	Temperature Switch	OC	All DBA	NEB-1-008
TS-1-17C	Temperature Switch	OC	All DBA	NEB-1-008
TS-1-17D	Temperature Switch	OC	All DBA	NEB-1-008
PSV-1-4	Pressure Solenoid Valve	IC	All DBA	NEB-1-002

SYSTEM: Main Steam Supply (1)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PSV-1-5	Pressure Solenoid Valve	IC	All DBA	NEB-1-002
PSV-1-18	Pressure Solenoid Valve	IC(1,2)	All DBA	NEB-1-002A
PSV-1-18	Pressure Solenoid Valve	IC(3)	All DBA	NEB-1-002A
PSV-1-19	Pressure Solenoid Valve	IC	All DBA	NEB-1-002
PSV-1-22	Pressure Solenoid Valve	IC	All DBA	NEB-1-002
PSV-1-23	Pressure Solenoid Valve	IC	All DBA	NEB-1-002
PSV-1-30	Pressure Solenoid Valve	IC(1,2)	All DBA	NEB-1-002A
PSV-1-30	Pressure Solenoid Valve	IC(3)	All DBA	NEB-1-002A
PSV-1-31	Pressure Solenoid Valve	IC(1,2)	All DBA	NEB-1-002
PSV-1-31	Pressure Solenoid Valve	IC(3)	All DBA	NEB-1-002
PSV-1-34	Pressure Solenoid Valve	IC	All DBA	NEB-1-002
PSV-1-41	Pressure Solenoid Valve	IC(1,2)	All DBA	NEB-1-002
PSV-1-41	Pressure Solenoid Valve	IC(3)	All DBA	NEB-1-002
PSV-1-42	Pressure Solenoid Valve	IC	All DBA	NEB-1-002
PSV-1-179	Pressure Solenoid Valve	IC	All DBA	EEB-1-1001
PSV-1-180	Pressure Solenoid Valve	IC	All DBA	EEB-1-1002
FSV-1-14A	Flow Solenoid Valve	IC	All DBA	NEB-1-005
FSV-1-14B	Flow Solenoid Valve	IC	All DBA	NEB-1-005
FSV-1-14C	Flow Solenoid Valve	IC	All DBA	NEB-1-005
FSV-1-26A	Flow Solenoid Valve	IC	All DBA	NEB-1-005
FSV-1-26B	Flow Solenoid Valve	IC	All DBA	NEB-1-005
FSV-1-26C	Flow Solenoid Valve	IC	All DBA	NEB-1-005
FSV-1-37A	Flow Solenoid Valve	IC	All DBA	NEB-1-005
FSV-1-37B	Flow Solenoid Valve	IC	All DBA	NEB-1-005

SYSTEM: Main Steam Supply (1)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FSV-1-37C	Flow Solenoid Valve	IC	All DBA	NEB-1-005
FSV-1-51A	Flow Solenoid Valve	IC	All DBA	NEB-1-005
FSV-1-51B	Flow Solenoid Valve	IC	All DBA	NEB-1-005
FSV-1-51C	Flow Solenoid Valve	IC	All DBA	NEB-1-005
FCV-1-55	Flow Control Valve	IC	All DBA	NEB-1-012
PS-1-4	Pressure Switch	IC	All DBA	
PS-1-5	Pressure Switch	IC	All DBA	
PS-1-18	Pressure Switch	IC	All DBA	
PS-1-19	Pressure Switch	IC	All DBA	
PS-1-22	Pressure Switch	IC	All DBA	
PS-1-23	Pressure Switch	IC	All DBA	
PS-1-30	Pressure Switch	IC	All DBA	
PS-1-31	Pressure Switch	IC	All DBA	
PS-1-34	Pressure Switch	IC	All DBA	
PS-1-41	Pressure Switch	IC	All DBA	
PS-1-42	Pressure Switch	IC	All DBA	
PS-1-179	Pressure Switch	IC	All DBA	
PS-1-180	Pressure Switch	IC	All DBA	
~~FCV-1-14~~	~~Flow Control Valve~~	~~IC~~	~~All DBA~~	
~~FCV-1-15~~	~~Flow Control Valve~~	~~OC~~	~~All DBA~~	
PDIS-1-13A	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-13B	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-13C	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003

SYSTEM: Main Steam Supply (1)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PDIS-1-13D	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-25A	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-25B	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-25C	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-25D	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-36A	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-36B	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-36C	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-36D	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-50A	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-50B	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-50C	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
PDIS-1-50D	Pressure Differential Indicator Switch	OC	All DBA	NEB-1-003
~~FCV-1-26~~	~~Flow Control Valve~~	~~IC~~	~~All DBA~~	
~~FCV-1-27~~	~~Flow Control Valve~~	~~OC~~	~~All DBA~~	
~~FCV-1-37~~	~~Flow Control Valve~~	~~IC~~	~~All DBA~~	
~~FCV-1-38~~	~~Flow Control Valve~~	~~OC~~	~~All DBA~~	
~~FCV-1-51~~	~~Flow Control Valve~~	~~IC~~	~~All DBA~~	

SYSTEM: Main Steam Supply (1)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
~~FCV-1-52~~	~~Flow Control Valve~~	~~OC~~	~~All DBA~~	
ZS-1-14	Zone Switch	IC	All DBA	EEB-1-1004
ZS-1-15	Zone Switch	OC	All DBA	EEB-1-1003
~~FSV-1-38B~~	~~Flow Solenoid Valve~~	~~IC~~	~~All DBA~~	
~~FSV-1-38C~~	~~Flow Solenoid Valve~~	~~IC~~	~~All DBA~~	
PSV-1-34	Pressure Solenoid Valve	IC	All DBA	
ZS-1-26 (Qty 6)	Zone Switch	IC	All DBA	EEB-1-1005
ZS-1-27 (Qty 6)	Zone Switch	OC	All DBA	EEB-1-1006
ZS-1-37 (Qty 6)	Zone Switch	IC	All DBA	EEB-1-1007
ZS-1-38 (Qty 6)	Zone Switch	OC	All DBA	EEB-1-1008
ZS-1-51 (Qty 6)	Zone Switch	IC	All DBA	EEB-1-1009
ZS-1-52 (Qty 6)	Zone Switch	OC	All DBA	EEB-1-1010

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ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Reactor Feedwater System (3)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PS-3-22A	Pressure Switch	OC	All DBA	NEB-3-015
PS-3-22B	Pressure Switch	OC	All DBA	NEB-3-015
PS-3-22C	Pressure Switch	OC	All DBA	NEB-3-015
PS-3-22D	Pressure Switch	OC	All DBA	NEB-3-015
PS-3-57A	Pressure Switch	OC	All DBA	NEB-3-018
PS-3-57B	Pressure Switch	OC	All DBA	NEB-3-018
PS-3-57C	Pressure Switch	OC	All DBA	NEB-3-018
PS-3-57D	Pressure Switch	OC	All DBA	NEB-3-018
LIS-3-203A	Level Indicator Switch	OC	All DBA	NEB-3-023
LIS-3-203B	Level Indicator Switch	OC	All DBA	NEB-3-023
LIS-3-203C	Level Indicator Switch	OC	All DBA	NEB-3-023
LIS-3-203D	Level Indicator Switch	OC	All DBA	NEB-3-023
LIS-3-208A	Level Indicator Switch	OC	All DBA	NEB-3-023
LIS-3-208B	Level Indicator Switch	OC	All DBA	NEB-3-023
LIS-3-208C	Level Indicator Switch	OC	All DBA	NEB-3-023
LIS-3-208D	Level Indicator Switch	OC	All DBA	NEB-3-023
LIS-3-58C	Level Indicator Switch	OC	All DBA	NEB-3-019
LIS-3-56A	Level Indicator Switch	OC	All DBA	NEB-3-017
LIS-3-56B	Level Indicator Switch	OC	All DBA	NEB-3-017
LIS-3-56C	Level Indicator Switch	OC	All DBA	NEB-3-017

SYSTEM: Reactor Feedwater System (3)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
LIS-3-56D	Level Indicator Switch	OC	All DBA	NEB-3-017
LITS-3-46B	Level Indicator Temperature Switch	OC	All DBA	NEB-3-016
LIS-3-184	Level Indicator Switch	OC	All DBA	NEB-3-022
LIS-3-185	Level Indicator Switch	OC	All DBA	NEB-3-022
LIS-3-58A	Level Indicator Switch	OC	All DBA	NEB-3-019
LITS-3-46A	Level Indicator Temperature Switch	OC	All DBA	NEB-3-016
LITS-3-58B	Level Indicator Temperature Switch	OC	All DBA	NEB-3-020
LITS-3-58D	Level Indicator Temperature Switch	OC	All DBA	
PS-3-74A	Pressure Switch	OC	All DBA	NEB-3-021
PS-3-74B	Pressure Switch	OC	All DBA	NEB-3-021A

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: RHR Service Water System (23)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
TE-23-32	Temperature Element	OC	All DBA	NEB-23-025
FCV-23-34	Flow Control Valve	OC	All DBA	NEB-23-026
TE-23-35	Temperature Element	OC	All DBA	NEB-23-027
FT-23-36	Flow Transmitter	OC	All DBA	NEB-23-028
TE-23-38	Temperature Element	OC	All DBA	NEB-23-025
FCV-23-40	Flow Control Valve	OC	All DBA	NEB-23-026
TE-23-41	Temperature Element	OC	All DBA	NEB-23-027
FT-23-42	Flow Transmitter	OC	All DBA	NEB-23-028
TE-23-44	Temperature Element	OC	All DBA	NEB-23-025
FCV-23-46	Flow Control Valve	OC	All DBA	NEB-23-026
TE-23-47	Temperature Element	OC	All DBA	NEB-23-027
FT-23-48	Flow Transmitter	OC	All DBA	NEB-23-028
TE-23-50	Temperature Element	OC	All DBA	NEB-23-025
FCV-23-52	Flow Control Valve	OC	All DBA	NEB-23-026
TE-23-53	Temperature Element	OC	All DBA	NEB-23-027
FT-23-54	Flow Transmitter	OC	All DBA	NEB-23-028
FSV-23-56	Flow Solenoid Valve	OC(1,2)	All DBA	NEB-23-1001
FCV-23-57	Flow Control Valve	OC(1,2)	All DBA	NEB-23-029

SYSTEM: RHR Service Water System (23)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PX-23-58	Power Supply	OC (CS)	All DBA	
PX-23-60	Power Supply	OC (CS)	All DBA	
PX-23-59	Power Supply	OC (CS)	All DBA	
PX-23-61	Power Supply	OC (CS)	All DBA	

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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SYSTEM: Raw Cooling Water (24)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PS-24-133B	Pressure Switch	OC (3)	All DBA	EEB-24-1002
PS-24-133A	Pressure Switch	OC (3)	All DBA	EEB-24-1001

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Control Air System (32)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FSV-32-62	Solenoid Valve	IC	All DBA	EEB-32-1001
FSV-32-63	Solenoid Valve	IC	All DBA	EEB-32-1002

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Sampling and Water Quality (43)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FSV-43-14	Flow Solenoid Valve	OC	All DBA	NEB-43-032
FIS-43-13A	Flow Indicator Switch	OC	All DBA	EEB-43-1002
FIS-43-13B	Flow Indicator Switch	OC	All DBA	EEB-43-1001
FSV-43-13	Flow Solenoid Valve	IC	All DBA	NEB-43-030
FCV-43-13	Flow Control Valve	IC (1,2)	All DBA	NEB-43-031
FCV-43-14	Flow Control Valve	OC (1,2)	All DBA	NEB-43-033

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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ELECTRICAL EQUIPMENT REQUIRED
TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Standby Liquid Control System (63)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
TE-63-2	Temperature Element	OC	All DBA	NEB-63-035
~~PT-63-7~~	~~Pressure Transmitter~~	~~OC~~	~~All DBA~~	
FCV-63-8A	Flow Control Valve	OC	All DBA	NEB-63-068
FCV-63-8B	Flow Control Valve	OC	All DBA	NEB-63-038
FIS-63-11	Flow Indicator Switch	OC	All DBA	
TIC-63-2	Temperature Indicator Control	OC	All DBA	NEB-63-034
SLC Pump Motor A	Pump Motor	OC	All DBA	NEB-63-037
SLC Pump Motor B	Pump Motor	OC	All DBA	NEB-63-037
PI-63-7A	Pressure Indicator	OC	All DBA	
TC-63-5A	Temperature Control	OC	All DBA	MEB-63-01
TC-63-5B	Temperature Control	OC	All DBA	MEB-63-01

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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ELECTRICAL EQUIPMENT REQUIRED
TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Primary Containment System (64)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FSV-64-9	Flow Solenoid Valve	OC	All DBA	
FSV-64-10	Flow Solenoid Valve	OC	All DBA	
FSV-64-17	Flow Solenoid Valve	OC	All DBA	NEB-64-039
FSV-64-18	Flow Solenoid Valve	OC	All DBA	NEB-64-040
FSV-64-19	Flow Solenoid Valve	OC	All DBA	NEB-64-040
FSV-64-20	Flow Solenoid Valve	OC	All DBA	NEB-64-040
FSV-64-21	Flow Solenoid Valve	OC	All DBA	NEB-64-040
FSV-64-29	Flow Solenoid Valve	OC	All DBA	NEB-64-047A
FSV-64-30	Flow Solenoid Valve	OC	All DBA	NEB-64-047
FSV-64-31	Flow Solenoid Valve	OC	All DBA	NEB-64-047
FSV-64-32	Flow Solenoid Valve	OC	All DBA	NEB-64-053A
FSV-64-33	Flow Solenoid Valve	OC	All DBA	NEB-64-053
FSV-64-34	Flow Solenoid Valve	OC	All DBA	NEB-64-053
FSV-64-36	Flow Solenoid Valve	OC	All DBA	EEB-64-1024
FSV-64-40	Flow Solenoid Valve	OC	All DBA	EEB-64-1028
FSV-64-41	Flow Solenoid Valve	OC	All DBA	EEB-64-1025
FSV-64-42	Flow Solenoid Valve	OC	All DBA	
FSV-64-43	Flow Solenoid Valve	OC	All DBA	

SYSTEM: Primary Containment System (64)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FSV-64-44	Flow Solenoid Valve	OC (1)	All DBA	EEB-64-1029
FSV-64-45	Flow Solenoid Valve	OC (1)	All DBA	EEB-64-1030
TE-64-52B	Thermocouple	OC	All DBA	EEB-64-1027
LT-64-54	Level Transmitter	OC	All DBA	NEB-64-061
TE-64-55A	Temperature Element	OC	All DBA	NEB-64-062
TE-64-55B	Temperature Element	OC	All DBA	NEB-64-063
TE-64-55C	Temperature Element	OC	All DBA	NEB-64-063
TE-64-55D	Temperature Element	OC	All DBA	NEB-64-062
TE-64-55E	Temperature Element	OC	All DBA	NEB-64-062
TE-64-55F	Temperature Element	OC	All DBA	NEB-64-062
FCO-64-60A	Flow Control Operator	OC (1,3)	All DBA	MEB-64-01
FCO-64-60B	Flow Control Operator	OC (1,3)	All DBA	MEB-64-01
FCO-64-60C	Flow Control Operator	OC (1,3)	All DBA	MEB-64-01
FCO-64-60D	Flow Control Operator	OC (1)	All DBA	MEB-64-01
LT-64-66	Level Transmitter	OC	All DBA	NEB-64-067
TS-64-68	Temperature Sensor	OC	All DBA	MEB-64-02
TS-64-69	Temperature Sensor	OC	All DBA	MEB-64-02
TS-64-70	Temperature Sensor	OC	All DBA	MEB-64-02
TS-64-71	Temperature Sensor	OC	All DBA	MEB-64-02
TS-64-72	Temperature Sensor	OC	All DBA	MEB-64-02
FSV-64-139	Flow Solenoid Valve	OC	All DBA	EEB-64-1034
FSV-64-140	Flow Solenoid Valve	OC	All DBA	EEB-64-1022
FSV-64-141	Flow Solenoid Valve	OC	All DBA	EEB-64-1033
~~PT-64-51~~	~~Pressure Transmitter~~	~~OC~~	~~All DBA~~	

SYSTEM: Primary Containment System (64)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PX-64-51	Power Supply	OC	All DBA	NEB-64-060
PDIS-64-20	Pressure Differential Indicator Switch	OC	All DBA	NEB-64-046
PDIS-64-21	Pressure Differential Indicator Switch	OC	All DBA	NEB-64-046
PS-64-57D	Pressure Switch	OC	All DBA	NEB-64-065
PS-64-58A	Pressure Switch	OC	All DBA	NEB-64-066
PS-64-58B	Pressure Switch	OC	All DBA	NEB-64-066
PS-64-58C	Pressure Switch	OC	All DBA	NEB-64-066
PDS-64-15	Pressure Differential Switch	OC	All DBA	EEB-64-1001
PDM-64-16	Pressure Differential Switch	OC	All DBA	EEB-64-1014
PDIC-64-16	Pressure Differential Indicator Switch	OC	All DBA	EEB-64-1016
PDT-64-16	Pressure Differential Transmitter	OC	All DBA	EEB-64-1019
TE-64-52A	Temperature Element	IC	All DBA	EEB-64-1039
TE-64-52C	Temperature Element	IC	All DBA	EEB-64-1040
PDS-64-62A	Pressure Differential Switch	OC	All DBA	EEB-64-1041
PDS-64-62C	Pressure Differential Switch	OC	All DBA	EEB-64-1005
FCV-64-20	Flow Control Valve	OC	All DBA	
FCV-64-21	Flow Control Valve	OC	All DBA	
FCV-64-19	Flow Control Valve	OC	All DBA	
FCV-64-18	Flow Control Valve	OC	All DBA	
FCO-64-43	Flow Control Operator	OC	All DBA	

SYSTEM: Primary Containment System (64)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PDS-64-62B	Pressure Differential Switch	OC	All DBA	EEB-64-1003
PDS-64-62D	Pressure Differential Switch	OC	All DBA	EEB-64-1026
TS-64-73	Temperature Switch	OC	All DBA	MEB-64-02
PDS-64-63	Pressure Differential Switch	OC (1)	All DBA	EEB-64-1012
PDS-64-61A	Pressure Differential Switch	OC (1)	All DBA	EEB-64-1006
PDS-64-61C	Pressure Differential Switch	OC (1)	All DBA	EEB-64-1008
PDT-64-64	Pressure Differential Switch	OC (1)	All DBA	EEB-64-1021
PDM-64-64	Pressure Differential Switch	OC (1)	All DBA	EEB-64-1038
PDT-64-8	Pressure Differential Transmitter	OC (1)	All DBA	EEB-64-1020
PDM-64-8	Pressure Differential Monitor	OC (1)	All DBA	EEB-64-1015
PDIC-64-8	Pressure Differential Indicator Control	OC (1)	All DBA	EEB-64-1017
PDS-64-61B	Pressure Differential Switch	OC (1)	All DBA	
PDS-64-61D	Pressure Differential Switch	OC (1)	All DBA	EEB-64-1009
PDS-64-7	Pressure Differential Switch	OC (1)	All DBA	EEB-64-1011
PS-64-56A	Pressure Switch	OC	All DBA	NEB-64-064
PS-64-56B	Pressure Switch	OC	All DBA	NEB-64-064

SYSTEM: Primary Containment System (64)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PS-64-56C	Pressure Switch	OC	All DBA	NEB-64-064
PS-64-56D	Pressure Switch	OC	All DBA	NEB-64-064
PS-64-58D	Pressure Switch	OC	All DBA	NEB-64-066
FCO-64-65D	Flow Control Operator	IC	All DBA	MEB-64-01
FCO-64-65A	Flow Control Operator	OC (1)	All DBA	MEB-64-01
FCO-64-65B	Flow Control Operator	OC (1)	All DBA	MEB-64-01
FCO-64-65C	Flow Control Operator	OC (1)	All DBA	MEB-64-01
PS-64-57A	Pressure Switch	OC	All DBA	NEB-64-065
PS-64-57B	Pressure Switch	OC	All DBA	NEB-64-065
PS-64-57C	Pressure Switch	OC	All DBA	NEB-64-065
PT-64-67	Pressure Transmitter	OC	All DBA	NEB-64-068
PDIC-64-64	Pressure Differential	OC (1)	All DBA	EEB-64-1018
FCO-64-40	Flow Control Operator	OC	All DBA	
FCO-64-41	Flow Control Operator	OC	All DBA	
FCO-64-44	Flow Control Operator	OC	All DBA	
FCO-64-45	Flow Control Operator	OC	All DBA	
FCO-64-36	Flow Control Operator	OC	All DBA	
FCV-64-29	Flow Control Valve	OC	All DBA	
FCV-64-30	Flow Control Valve	OC	All DBA	
FCV-64-31	Flow Control Valve	OC	All DBA	
FCV-64-32	Flow Control Valve	OC	All DBA	
FCV-64-33	Flow Control Valve	OC	All DBA	
FCV-64-34	Flow Control Valve	OC	All DBA	
FCV-64-139	Flow Control Valve	OC	All DBA	

SYSTEM: Primary Containment System (64)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FCV-64-140	Flow Control Valve	OC	All DBA	
FCV-64-141	Flow Control Valve	OC	All DBA	
PX-64-54	Power Supply	OC	All DBA	
FSV-64-139	Flow Solenoid Valve	OC(1,2)	All DBA	EEB-64-1037
FSV-64-140	Flow Solenoid Valve	OC(1,2)	All DBA	EEB-64-1036
FSV-64-141	Flow Solenoid Valve	OC(3)	All DBA	EEB-64-1035
PDS-64-62A/C	Pressure Differential Switch	OC	All DBA	EEB-64-1005
PDS-64-62B/D	Pressure Differential Switch	OC	All DBA	EEB-64-1026
PDS-64-61 B/D	Pressure Differential Switch	OC (1)	All DBA	EEB-64-1042
PDS-64-61B	Pressure Differential Switch	OC (1)	All DBA	EEB-64-1007
PDS-64-61 A/C	Pressure Differential Switch	OC (1)	All DBA	EEB-64-1010
PT-64-51	Pressure Transmitter	OC	All DBA	NEB-64-059
FCV-64-18	Flow Control Valve	OC	All DBA	NEB-64-041
FCV-64-19	Flow Control Valve	OC	All DBA	NEB-64-043
FCV-64-29	Flow Control Valve	OC	All DBA	NEB-64-048
FCV-64-30	Flow Control Valve	OC	All DBA	NEB-64-050
FCV-64-31	Flow Control Valve	OC	All DBA	NEB-64-052
FCV-64-32	Flow Control Valve	OC	All DBA	NEB-64-054
FCV-64-33	Flow Control Valve	OC	All DBA	NEB-64-056
FCV-64-34	Flow Control Valve	OC	All DBA	NEB-64-056A
PT-64-50	Pressure Transmitter	OC	All DBA	NEB-64-058

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Standby Gas Treatment (65)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FT-65-1	Flow Transmitter	OC (CS)	All DBA	EEB-65-1001

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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SYSTEM: Emergency Equipment Cooling Water System (67)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PT-67-15	Pressure Transmitter	OC (1)	All DBA	EEB-67-1006
PT-67-16	Pressure Transmitter	OC (1)	All DBA	EEB-67-1011
FCV-67-17	Flow Control Valve	OC (1)	All DBA	MEB-67-01
FCV-67-18	Flow Control Valve	IC (1)	All DBA	MEB-67-02
PT-67-19	Pressure Transmitter	OC (2)	All DBA	EEB-67-1010
PT-67-20	Pressure Transmitter	OC (2)	All DBA	EEB-67-1009
FCV-67-21	Flow Control Valve	OC (2)	All DBA	MEB-67-01
FCV-67-22	Flow Control Valve	IC (2)	All DBA	MEB-67-02
PT-67-23	Pressure Transmitter	OC (3)	All DBA	EEB-67-1007
PT-67-24	Pressure Transmitter	OC (3)	All DBA	EEB-67-1008
FCV-67-25	Flow Control Valve	OC (3)	All DBA	MEB-67-01
FCV-67-26	Flow Control Valve	IC (3)	All DBA	MEB-67-02
PX-67-12B	Power Supply	OC (1)	All DBA	
FSV-67-53	Solenoid Valve	OC (CS)	All DBA	EEB-67-1001
FCV-67-53	Control Valve	OC (1)	All DBA	
FSV-67-50	Flow Solenoid Valve	OC	All DBA	EEB-67-1003
FSV-67-51	Flow Solenoid Valve	OC	All DBA	EEB-67-1002

SYSTEM: Emergency Equipment Cooling Water System (67)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FM-67-3B	Signal Modifier	OC (1)	All DBA	
PX-67-3B	Power Supply	OC (1)	All DBA	
FT-67-9A	Flow Transmitter	OC (1)	All DBA	EEB-67-1014
FT-67-9B	Flow Transmitter	OC (1)	All DBA	
FM-67-9B	Flow Modifier	OC (1)	All DBA	
PX-67-9B	Power Supply	OC (1)	All DBA	
FM-67-12B	Flow Modifier	OC (1)	All DBA	
FM-67-6B	Flow Modifier	OC (1)	All DBA	
PX-67-6B	Power Supply	OC (1)	All DBA	
FS-67-12B	Flow Switch	OC	All DBA	
FT-67-12A	Flow Transmitter	OC	All DBA	
FT-67-12B	Flow Transmitter	OC	All DBA	
FCV-67-50	Flow Control Valve	OC	All DBA	
FCV-67-51	Flow Control Valve	OC	All DBA	

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Reactor Water Recirculation (68)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FCV-68-1	Flow Control Valve	IC	All DBA	NEB-68-069
FCV-68-3	Flow Control Valve	IC	All DBA	NEB-68-070
PS-68-93	Pressure Switch	OC (1,2)	All DBA	
PS-68-94	Pressure Switch	OC	All DBA	
FCV-68-77	Flow Control Valve	IC	All DBA	NEB-68-069
FCV-68-79	Flow Control Valve	IC	All DBA	NEB-68-070
PS-68-95	Pressure Switch	OC	All DBA	
PS-68-96	Pressure Switch	OC	All DBA	NEB-68-072A

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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ELECTRICAL EQUIPMENT REQUIRED
TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Reactor Water Cleanup System (69)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FCV-69-2	Control Valve	OC	All DBA	NEB-69-74
TE-69-29A	Temperature Element	OC	HO	NEB-69-76
TE-69-29B	Temperature Element	OC	HO	NEB-69-77
TE-69-29C	Temperature Element	OC	HO	NEB-69-78
TE-69-29D	Temperature Element	OC	HO	NEB-69-78
TE-69-29E	Temperature Element	OC	HO	NEB-69-79
TE-69-29F	Temperature Element	OC	HO	NEB-69-80
TE-69-29G	Temperature Element	OC	HO	NEB-69-79
TE-69-39H	Temperature Element	OC	HO	NEB-69-79
TS-69-30A	Temperature Sensor	OC	HO*	EEB-69-1002
TS-69-30B	Temperature Sensor	OC	HO*	EEB-69-1003
TS-69-30C	Temperature Sensor	OC	HO*	EEB-69-1004
TS-69-30D	Temperature Sensor	OC	HO*	EEB-69-1001
TS-69-30E	Temperature Sensor	OC	HO*	EEB-69-1007
TS-69-30F	Temperature Sensor	OC	HO*	EEB-69-1008
TS-69-30G	Temperature Sensor	OC	HO*	EEB-69-1006
TS-69-30H	Temperature Sensor	OC	HO*	EEB-69-1005
ZS-69-1	Zone Switch	IC	All DBA	

*RWCU only

SYSTEM: Reactor Water Cleanup System (69)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
TS-69-29J	Temperature Switch	OC	HO*	NEB-69-81
TS-69-29K	Temperature Switch	OC	HO*	NEB-69-81
TS-69-29L	Temperature Switch	OC	HO*	NEB-69-81
TS-69-29M	Temperature Switch	OC	HO*	NEB-69-81
FCV-69-1	Flow Control Valve	IC	All DBA	NEB-69-73

*RWCU only

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

Rev: 0
Date: 10/29/80.

MASTER LIST

ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Reactor Building Closed CW System (70)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FCV-70-47	Flow Control Valve	IC	All DBA	NEB-70-82

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

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MASTER LIST

ELECTRICAL EQUIPMENT REQUIRED
TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Reactor Core Isolation Cooling (71)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FCV-71-2	Flow Control Valve	IC	All DBA	NEB-71-85
PS-71-11C	Pressure Switch	OC	HI-HO*	NEB-71-104
PS-71-11D	Pressure Switch	OC	HI-HO*	NEB-71-104
FCV-71-25	Flow Control Valve	OC(1,2,3)	HI-HO*	MEB-71-02
SE-71-42A	Speed Sensor	OC	HI-HO*	NEB-71-122
SE-71-42B	Speed Sensor	OC	HI-HO*	NEB-71-122
TS-71-2A	Temperature Sensor	OC(1)	RCIC	NEB-71-089A
TS-71-2B	Temperature Sensor	OC(1)	RCIC	NEB-71-089A
TS-71-2C	Temperature Sensor	OC(1)	RCIC	NEB-71-089A
TS-71-2D	Temperature Sensor	OC(1)	RCIC	NEB-71-089A
TS-71-2E	Temperature Sensor	OC	RCIC	NEB-71-90
TS-71-2F	Temperature Sensor	OC	RCIC	NEB-71-90
TS-71-2G	Temperature Sensor	OC	RCIC	NEB-71-90
TS-71-2H	Temperature Sensor	OC	RCIC	NEB-71-90
TS-71-2J	Temperature Sensor	OC	RCIC	NEB-71-90
TS-71-2K	Temperature Sensor	OC	RCIC	NEB-71-90
TS-71-2L	Temperature Sensor	OC	RCIC	NEB-71-90
TS-71-2M	Temperature Sensor	OC	RCIC	NEB-71-90
TS-71-2N	Temperature Sensor	OC	RCIC	NEB-71-90

*HELB outside containment except for RCIC

SYSTEM: Reactor Core Isolation Cooling (71)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
TS-71-2P	Temperature Sensor	OC	RCIC	NEB-71-90
TS-71-2R	Temperature Sensor	OC	RCIC	NEB-71-90
TS-71-2S	Temperature Sensor	OC	RCIC	NEB-71-90
FCV-71-3	Flow Control Valve	OC	All DBA	NEB-71-96
PT-71-4	Pressure Transmitter	OC	HI-HO*	NEB-71-99
FCV-71-8	Flow Control Valve	OC	HI-HO*	NEB-71-100
FCV-71-9	Flow Control Valve	OC	HI-HO*	NEB-71-101
FCV-71-10	Flow Control Valve	OC	HI-HO*	NEB-71-102
SC-71-10	Speed Control	OC	HI-HO*	NEB-71-103
PT-71-12	Pressure Transmitter	OC	HI-HO*	NEB-71-105
PS-71-13A	Pressure Switch	OC	HI-HO*	NEB-71-106
PS-71-13B	Pressure Switch	OC	HI-HO*	NEB-71-106
FCV-71-17	Flow Control Valve	OC	HI-HO*	NEB-71-107
FCV-71-18	Flow Control Valve	OC	HI-HO*	NEB-71-108
FCV-71-19	Flow Control Valve	OC	HI-HO*	NEB-71-109
PT-71-20	Pressure Transmitter	OC	HI-HO*	NEB-71-110
PS-71-21	Pressure Switch	OC	HI-HO*	NEB-71-104
PS-71-21-1	Pressure Switch	OC	HI-HO*	NEB-71-112
FCV-71-34	Flow Control Valve	OC	HI-HO*	MEB-71-02
PT-71-35	Pressure Transmitter	OC	HI-HO*	

*HELB outside containment except for RCIC

SYSTEM: Reactor Core Isolation Cooling (71)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FS-71-36	Flow Switch	OC	HI-HO*	NEB-71-115
FT-71-36	Flow Transmitter	OC	HI-HO*	NEB-71-116
FCV-71-37	Flow Control Valve	OC	HI-HO*	NEB-71-117
FCV-71-38	Flow Control Valve	OC	HI-HO*	NEB-71-118
FCV-71-39	Flow Control Valve	OC	HI-HO*	NEB-71-119
TE-71-41A	Temperature Element	OC	RCIC	NEB-71-120
~~TE-71-41B~~	~~Temperature Element~~	~~OC~~	~~RCIC~~	
TE-71-41C	Temperature Element	OC	RCIC	NEB-71-121
TE-71-41D	Temperature Element	OC	RCIC	NEB-71-121
PS-71-44	Pressure Switch	OC	HI-HO*	NEB-71-123
TIS-71-45	Temperature Indicator Switch	OC	HI-HO*	NEB-71-124
TIS-71-46	Temperature Indicator Switch	OC	HI-HO*	NEB-71-125
FSV-71-6B	Flow Solenoid Valve	OC	HI-HO*	EEB-71-1002
PS-71-1A	Pressure Switch	OC	All DBA	NEB-71-84
PS-71-1B	Pressure Switch	OC	All DBA	NEB-71-84
PS-71-1C	Pressure Switch	OC	All DBA	NEB-71-84
PS-71-1D	Pressure Switch	OC	All DBA	NEB-71-84
PDIS-71-1A	Pressure Differential Indicator Switch	OC	HO-RCIC	NEB-71-83
PDIS-71-1B	Pressure Differential Indicator Switch	OC(1,3)	HO-RCIC	NEB-71-83

*HELB outside containment except for RCIC

SYSTEM: Reactor Core Isolation Cooling (71)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PS-71-11A	Pressure Switch	OC(1,3)	HI-HO*	NEB-71-104
PS-71-11B	Pressure Switch	OC(1,3)	HI-HO*	NEB-71-104
FCV-71-59	Flow Control Valve	OC(2,3)	HI-HO*	MEB-71-01
~~FIC-71-36A~~	~~Flow Indicator Control~~	~~OC~~	~~HI-HO*~~	
FM-71-36	Signal Modifier	OC	HI-HO*	NEB-71-114
PX-71-4	Power Supply	OC	HI-HO*	NEB-71-98
FT-71-1A	Flow Transmitter	OC	HI-HO*	
FT-71-1B	Flow Transmitter	OC	HI-HO*	
FSV-71-6A	Flow Solenoid Valve	OC	HI-HO*	
PX-71-35	Power Supply	OC	HI-HO*	
PX-71-36A	Power Supply	OC	HI-HO*	
PX-71-12	Power Supply	OC	HI-HO*	
FR-71-36	Flow Recorder	OC	HI-HO*	
TS-71-2A	Temperature Sensor	OC(2,3)	RCIC	NEB-71-089
TS-71-2B	Temperature Sensor	OC(2,3)	RCIC	NEB-71-089
TS-71-2C	Temperature Sensor	OC(2,3)	RCIC	NEB-71-089
TS-71-2C	Temperature Sensor	OC(2,3)	RCIC	NEB-71-089
PT-71-48	Pressure Transmitter	OC(3)	RCIC	NEB-71-97
FSV-71-6A	Flow Solenoid Value	OC	HI-HO*	EEB-71-1001
TS-71-9	Temperature Switch	OC(3)	RCIC	NEB-71-101

*Outside containment except for RCIC

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

Facility: Browns Ferry Nuclear Generating Plant
Unit: 1, 2, and 3
Docket: 50-259, -260, and -296

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MASTER LIST

ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: High Pressure Core Injection (73)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FCV-73-3	Flow Control Valve	OC	All DBA	NEB-73-147
FCV-73-2	Flow Control Valve	IC	All DBA	NEB-73-130
FCV-73-27	Flow Control Valve	OC	HI-HO	NEB-73-161
PT-73-4	Pressure Transmitter	OC	All DBA	
SE-73-5	Speed Sensor	OC	HI-HO*	NEB-73-148
SC-73-19	Speed Control	OC	HI-HO*	NEB-73-154
PT-73-21	Pressure Transmitter	OC	HI-HO*	NEB-73-154
FS-73-33	Flow Switch	OC	HI-HO*	NEB-73-157
PS-73-22A	Pressure Switch	OC(2,3)	HI-HO*	NEB-73-164
PS-73-22B	Pressure Switch	OC(2,3)	HI-HO*	NEB-73-158
PS-73-20B	Pressure Switch	OC	HI-HO*	NEB-73-158
PS-73-20C	Pressure Switch	OC	HI-HO*	NEB-73-156
PS-73-20D	Pressure Switch	OC	HI-HO*	NEB-73-156
PS-73-20A	Pressure Switch	OC	HI-HO*	NEB-73-156
HPCI Aux Oil Pump Mtr	Pump Motor	OC	HI-HO*	NEB-73-156
TIS-73-52	Temperature Indicator Switch	OC	HI-HO*	NEB-73-173
PS-73-1A	Pressure Switch	OC(1,2)	All DBA	NEB-73-128

*Outside containment except for HPCI

SYSTEM: High Pressure Core Injection (73)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PS-73-1B	Pressure Switch	OC	All DBA	NEB-73-128
PS-73-1C	Pressure Switch	OC	All DBA	NEB-73-128
PS-73-1D	Pressure Switch	OC	All DBA	NEB-73-128
PDIS-73-1A	Pressure Differential Indicator Switch	OC	HO-HPCI	NEB-73-129
PDIS-73-1B	Pressure Differential Indicator Switch	OC	HO-HPCI	NEB-73-129
FT-73-33	Flow Transmitter	OC	HI-HO*	NEB-73-165
TS-73-2A	Temperature Sensor	OC	HPCI	NEB-73-131
TS-73-2B	Temperature Sensor	OC	HPCI	NEB-73-132
TS-73-2C	Temperature Sensor	OC	HPCI	NEB-73-131
TS-73-2D	Temperature Sensor	OC	HPCI	NEB-73-132
TS-73-2E	Temperature Sensor	OC (2,3)	HPCI	NEB-73-135
TS-73-2F	Temperature Sensor	OC (2,3)	HPCI	NEB-73-135
TS-73-2G	Temperature Sensor	OC (2,3)	HPCI	NEB-73-135
TS-73-2H	Temperature Sensor	OC (2,3)	HPCI	NEB-73-135
TS-73-2J	Temperature Sensor	OC	HPCI	NEB-73-141
TS-73-2K	Temperature Sensor	OC	HPCI	NEB-73-142
TS-73-2L	Temperature Sensor	OC	HPCI	NEB-73-141
TS-73-2M	Temperature Sensor	OC	HPCI	NEB-73-142
TS-73-2N	Temperature Sensor	OC	HPCI	NEB-73-141
TS-73-2P	Temperature Sensor	OC	HPCI	NEB-73-142
TS-73-2R	Temperature Sensor	OC	HPCI	NEB-73-141
TS-73-2S	Temperature Sensor	OC	HPCI	NEB-73-142

*Outside containment except for HPCI

SYSTEM: High Pressure Core Injection (73)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FCV-73-16	Flow Control Valve	OC	HI-HO*	
~~PCV-73-18B~~	~~Pressure Control Valve~~	~~OC(1)~~	~~HI-HO*~~	
FCV-73-26	Flow Control Valve	OC(1,2)	HI-HO	NEB-73-160
FCV-73-30	Flow Control Valve	OC(1)	HI-HO*	MEB-73-02
FCV-73-34	Flow Control Valve	OC	HI-HO*	NEB-73-166
FCV-73-35	Flow Control Valve	OC	HI-HO*	NEB-73-167
FCV-73-36	Flow Control Valve	OC(1)	HI-HO*	NEB-73-168
FCV-73-40	Flow Control Valve	OC	HI-HO*	NEB-73-169
FCV-73-44	Flow Control Valve	OC	HI-HO*	NEB-73-170
TE-73-55A	Temperature Element	OC	HPCI	NEB-73-174
TE-73-55B	Temperature Element	OC	HPCI	NEB-73-174
TE-73-55C	Temperature Element	OC	HPCI	NEB-73-175
TE-73-55D	Temperature Element	OC	HPCI	NEB-73-175
LS-73-56A	Level Switch	OC(2)	HI-HO	EEB-73-1003
LS-73-56B	Level Switch	OC(2)	HI-HO	EEB-73-1001
LS-73-57A	Level Switch	OC	HI-HO*	NEB-73-176
LS-73-57B	Level Switch	OC	HI-HO*	NEB-73-176
FCV-73-64	Flow Control Valve	OC(2,3)	HI-HO*	MEB-73-01
PT-73-65	Pressure Transmitter	OC	HI-HO*	
FCV-73-18	Flow Control Valve	OC	HI-HO*	NEB-73-151
FCV-73-19	Flow Control Valve	OC	HI-HO*	NEB-73-155

*Outside containment except for HPCI

SYSTEM: High Pressure Core Injection (73)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PDS-73-53	Pressure Differential	OC	HI-HO*	NEB-73-173A
PX-73-65	Power Supply	OC	HI-HO*	
PS-73-47A	Pressure Switch	OC	HI-HO*	NEB-73-171
PS-73-47B	Pressure Switch	OC	HI-HO*	NEB-73-172
PT-73-31	Pressure Transmitter	OC	HI-HO*	NEB-73-172
PS-73-29-1	Pressure Switch	OC	HI-HO*	NEB-73-162
TS-73-2F	Temperature Sensor	OC (1)	HPCI	NEB-73-136
TS-73-2H	Temperature Sensor	OC (1)	HPCI	NEB-73-136
FCV-73-26	Flow Control Valve	OC (3)	HI-HO	NEB-73-160A
FCV-73-36	Flow Control Valve	OC (2)	HI-HO*	NEB-73-168A
FCV-73-36	Flow Control Valve	OC (3)	HI-HO*	NEB-73-168B
FCV-73-18	Flow Control Valve	OC	HI-HO*	NEB-73-151
FCV-73-19	Flow Control Valve	OC	HI-HO*	NEB-73-155

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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MASTER LIST

ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Residual Heat Removal (74)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FCV-74-1	Flow Control Valve	OC	All DBA	NEB-74-179
FCV-74-2	Flow Control Valve	OC	All DBA	MEB-74-01
FCV-74-7	Flow Control Valve	OC	All DBA	MEB-74-01
PS-74-8A	Pressure Switch	OC	All DBA	NEB-74-180
TE-74-9	Temperature Element	OC	All DBA	NEB-74-181
FCV-74-12	Flow Control Valve	OC	All DBA	NEB-74-179
FCV-74-13	Flow Control Valve	OC	All DBA	MEB-74-01
PS-74-19A	Pressure Switch	OC	All DBA	NEB-74-180
TE-74-21	Pressure Switch	OC	All DBA	NEB-74-181
FCV-74-24	Flow Control Valve	OC	All DBA	NEB-74-179
FCV-74-25	Flow Control Valve	OC	All DBA	MEB-74-01
FCV-74-30	Flow Control Valve	OC	All DBA	MEB-74-01
PS-74-31A	Pressure Switch	OC	All DBA	NEB-74-184
TE-74-32	Temperature Element	OC	All DBA	NEB-74-181
FCV-74-35	Flow Control. Valve	OC	All DBA	NEB-74-179
FCV-74-36	Flow Control Valve	OC	All DBA	MEB-74-01
PS-74-42A	Pressure Switch	OC	All DBA	NEB-74-184A
TE-74-43	Temperature Element	OC	All DBA	NEB-74-181
FCV-74-47	Flow Control Valve	IC	All DBA	NEB-74-186
FT-74-50	Flow Transmitter	OC	All DBA	NEB-74-189

SYSTEM: Residual Heat Removal (74)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PT-74-51	Pressure Transmitter	OC	All DBA	NEB-74-190
FCV-74-52	Flow Control Valve	IC	All DBA	NEB-74-191
FCV-74-53	Flow Control Valve	OC	All DBA	NEB-74-192
FCV-74-60	Flow Control Valve	OC(1,3)	All DBA	NEB-74-196
FCV-74-61	Flow Control Valve	OC	All DBA	NEB-74-197
FT-74-64	Flow Transmitter	OC	All DBA	NEB-74-199
PT-74-65	Pressure Transmitter	OC	All DBA	NEB-74-200
FCV-74-66	Flow Control Valve	IC	All DBA	NEB-74-191
FCV-74-67	Flow Control Valve	IC	All DBA	NEB-74-202
FT-74-70	Flow Transmitter	OC	All DBA	NEB-74-203
FCV-74-74	Flow Control Valve	OC	All DBA	NEB-74-205
FCV-74-75	Flow Control Valve	OC	All DBA	NEB-74-206
FCV-74-77	Flow Control Valve	OC	All DBA	NEB-74-207
TE-74-81	Temperature Element	OC	All DBA	NEB-74-209
TE-74-82	Temperature Element	OC	All DBA	NEB-74-209
TE-74-83	Temperature Element	OC	All DBA	NEB-74-209
TE-74-84	Temperature Element	OC	All DBA	NEB-74-209
PT-74-94	Pressure Transmitter	OC	All DBA	NEB-74-210
FCV-74-98	Flow Control Valve	OC(1,2)	All DBA	MEB-74-01
FCV-74-99	Flow Control Valve	OC(1,2)	All DBA	MEB-74-01
FCV-74-101	Flow Control Valve	OC(1,2)	All DBA	MEB-74-01
FSV-74-102	Flow Solenoid Valve	OC	All DBA	EEB-74-1003
FSV-74-103	Flow Solenoid Valve	OC	All DBA	EEB-74-1004
FSV-74-119	Flow Solenoid Valve	OC	All DBA	EEB-74-1002

SYSTEM: Residual Heat Removal (74)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FSV-74-120	Flow Solenoid Valve	OC	All DBA	EEB-74-1001
ME-74-137A	Moisture Element	OC	All DBA	
ME-74-137B	Moisture Element	OC	All DBA	
MIS-74-137A	Moisture Indicator Switch	OC	All DBA	
MIS-74-137B	Moisture Indicator Switch	OC	All DBA	
RHR Pump Motor 1A	Pump Motor	OC (1)	All DBA	NEB-74-212
RHR Pump Motor 1B	Pump Motor	OC (1)	All DBA	NEB-74-211
RHR Pump Motor 1C	Pump Motor	OC (1)	All DBA	NEB-74-212
RHR Pump Motor 1D	Pump Motor	OC (1)	All DBA	NEB-74-211
RHR Pump Motor 2A	Pump Motor	OC (2)	All DBA	NEB-74-212
RHR Pump Motor 2B	Pump Motor	OC (2)	All DBA	NEB-74-211
RHR Pump Motor 2C	Pump Motor	OC (2)	All DBA	NEB-74-212
RHR Pump Motor 2D	Pump Motor	OC (2)	All DBA	NEB-74-211
RHR Pump Motor 3A	Pump Motor	OC (3)	All DBA	NEB-74-212
RHR Pump Motor 3B	Pump Motor	OC (3)	All DBA	NEB-74-211
RHR Pump Motor 3C	Pump Motor	OC (3)	All DBA	NEB-74-212
RHR Pump Motor 3D	Pump Motor	OC (3)	All DBA	NEB-74-211
FIS-74-50	Flow Indicator Switch	OC (1)	All DBA	NEB-74-188
FIS-74-64	Flow Indicator Switch	OC	All DBA	NEB-74-198
FCV-74-96	Flow Control Valve	OC (2)	All DBA	MEB-74-01
FCV-74-97	Flow Control Valve	OC (2)	All DBA	MEB-74-01
FCV-74-100	Flow Control Valve	OC	All DBA	MEB-74-01
FCV-74-48	Flow Control Valve	IC	All DBA	NEB-74-187

SYSTEM: Residual Heat Removal (74)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FCV-74-57	Flow Control Valve	OC	All DBA	EB-74-193
FCV-74-58	Flow Control Valve	OC	All DBA	NEB-74-194
FCV-74-59	Flow Control Valve	OC	All DBA	NEB-74-195
FCV-74-71	Flow Control Valve	OC	All DBA	NEB-74-204
FCV-74-72	Flow Control Valve	OC	All DBA	NEB-74-194
FCV-74-73	Flow Control Valve	OC	All DBA	NEB-74-195
FCV-74-78	Flow Control Valve	IC	All DBA	
FT-74-56	Flow Transmitter	OC	All DBA	NEB-74-190A
TTS-74-136A	Temperature Transmitter Switch	OC	All DBA	
TTS-74-136B	Temperature Transmitter Switch	OC	All DBA	
FCV-74-102	Flow Control Valve	OC	All DBA	
FCV-74-103	Flow Control Valve	OC	All DBA	
FCV-74-119	Flow Control Valve	OC	All DBA	
FCV-74-120	Flow Control Valve	OC	All DBA	
TE-74-95A	Temperature Element	OC	All DBA	NEB-74-213
TE-74-95B	Temperature Element	OC	All DBA	NEB-74-213A
TE-74-95C	Temperature Element	OC	All DBA	NEB-74-213B
TE-74-95D	Temperature Element	OC	All DBA	NEB-74-213B
TE-74-95E	Temperature Element	OC	All DBA	NEB-74-213C
TE-74-95F	Temperature Element	OC	All DBA	NEB-74-213C
TE-74-95G	Temperature Element	OC	All DBA	NEB-74-213D
TE-74-95H	Temperature Element	OC	All DBA	NEB-74-213D

SYSTEM: Residual Heat Removal (74)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PS-74-8B	Pressure Switch	OC	All DBA	NEB-74-180-A
PS-74-19B	Pressure Switch	OC	All DBA	NEB-74-180-A
PS-74-31B	Pressure Switch	OC	All DBA	NEB-74-184A
PS-74-42B	Pressure Switch	OC	All DBA	NEB-74-1841
FCV-74-60	Flow Control Valve	OC(2)	All DBA	NEB-74-196A

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

Facility: Browns Ferry Nuclear Generating Plant
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Docket: 50-259, -260, and -296

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MASTER LIST

ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Core Spray System (75)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FCV-75-2	Flow Control Valve	OC	All DBA	NEB-75-214
PS-75-7	Pressure Switch	OC	All DBA	NEB-75-216
FCV-75-9	Flow Control Valve	OC	All DBA	NEB-75-217
FCV-75-11	Flow Control Valve	OC	All DBA	NEB-75-214
FIS-75-21	Flow Indicator Switch	OC(1,3)	All DBA	NEB-75-219
FCV-75-22	Flow Control Valve	OC	All DBA	NEB-75-221
FCV-75-23	Flow Control Valve	OC	All DBA	NEB-75-222
PS-75-24	Pressure Switch	OC	All DBA	
FCV-75-25	Flow Control Valve	OC	All DBA	NEB-75-224
PDIS-75-28	Pressure Differential Indicator Switch	OC	All DBA	NEB-75-226
FCV-75-30	Flow Control Valve	OC	All DBA	NEB-75-227
PS-75-35	Pressure Switch	OC	All DBA	
FCV-75-37	Flow Control Valve	OC	All DBA	NEB-75-229
FCV-75-39	Flow Control Valve	OC	All DBA	NEB-75-227
PS-75-44	Pressure Switch	OC	All DBA	NEB-75-229

SYSTEM: Core Spray System (75)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
PT-75-48	Pressure Transmitter	OC	All DBA	
FT-75-49	Flow Transmitter	OC(1,3)	All DBA	NEB-75-233
FIS-75-49	Flow Indicator Switch	OC	All DBA	NEB-75-232
FCV-75-50	Flow Control Valve	OC	All DBA	NEB-75-234
FCV-75-51	Flow Control Valve	OC	All DBA	NEB-75-235
PS-75-52	Pressure Switch	OC(1,3)	All DBA	
FCV-75-53	Flow Control Valve	OC	All DBA	NEB-75-237
PDIS-75-56	Pressure Differential Indicator Switch	OC(1,3)	All DBA	NEB-75-226
FSV-75-57	Flow Solenoid Valve	OC	All DBA	EEB-75-1001
FSV-75-58	Flow Solenoid Valve	OC(1,2)	All DBA	EEB-75-1003
MIS-75-70A	Moisture Indicator Switch	OC	All DBA	
ME-75-70A	Moisture Element	OC	All DBA	
MIS-75-70B	Moisture Indicator Switch	OC	All DBA	
ME-75-70B	Moisture Element	OC	All DBA	
PS-75-16	Pressure Switch	OC	All DBA	NEB-75-216
PT-75-20	Pressure Transmitter	OC(1,3)	All DBA	
FT-75-21	Flow Transmitter	OC(1,3)	All DBA	NEB-75-220
Core Spray Pump Motor 1A	Pump Motor	OC (1)	All DBA	NEB-75-238A
Core Spray Pump Motor 1B	Pump Motor	OC (1)	All DBA	NEB-75-238
Core Spray Pump Motor 1C	Pump Motor	OC (1)	All DBA	NEB-75-238A
Core Spray Pump Motor 1D	Pump Motor	OC (1)	All DBA	NEB-75-238

SYSTEM: Core Spray System (75)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
Core Spray Pump Motor 2A	Pump Motor	OC (2)	All DBA	NEB-75-238A
Core Spray Pump Motor 2B	Pump Motor	OC (2)	All DBA	NEB-75-238
Core Spray Pump Motor 2C	Pump Motor	OC (2)	All DBA	NEB-75-238A
Core Spray Pump Motor 2D	Pump Motor	OC (2)	All DBA	NEB-75-238
Core Spray Pump Motor 3A	Pump Motor	OC (3)	All DBA	NEB-75-238A
Core Spray Pump Motor 3B	Pump Motor	OC (3)	All DBA	NEB-75-238
Core Spray Pump Motor 3C	Pump Motor	OC (3)	All DBA	NEB-75-238A
Core Spray Pump Motor 3D	Pump Motor	OC (3)	All DBA	NEB-75-238
FSV-75-57	Flow Solenoid Valve	OC (3)	All DBA	EEB-75-1002
TTS-75-69A	Temperature Transmitter Switch	OC	All DBA	
TTS-75-69B	Temperature Transmitter Switch	OC	All DBA	
FSV-75-71	Flow Solenoid Valve	OC	All DBA	
FSV-75-72	Flow Solenoid Valve	OC	All DBA	
FSV-75-58	Flow Solenoid Valve	OC (3)	All DBA	EEB-75-1004

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Containment Inerting HPCI Torus Room (76)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FSV-76-56	Flow Solenoid Valve	OC	All DBA	EEB-76-1001
FSV-76-58	Flow Solenoid Valve	OC	All DBA	EEB-76-1005
FSV-76-60	Flow Solenoid Valve	IC	All DBA	EEB-76-1009
FSV-76-66	Flow Solenoid Valve	OC	All DBA	EEB-76-1007
FSV-76-68	Flow Solenoid Valve	OC	All DBA	EEB-76-1004
FSV-76-49	Flow Solenoid Valve	IC	All DBA	EEB-76-1008
FSV-76-51	Flow Solenoid Valve	IC	All DBA	EEB-76-1010
FSV-76-55	Flow Solenoid Valve	IC	All DBA	EEB-76-1013
FSV-76-57	Flow Solenoid Valve	IC	All DBA	EEB-76-1012
FSV-76-59	Flow Solenoid Valve	IC	All DBA	EEB-76-1011
FSV-76-63	Flow Solenoid Valve	IC	All DBA	EEB-76-1003
FSV-76-65	Flow Solenoid Valve	IC	All DBA	EEB-76-1002
FSV-76-67	Flow Solenoid Valve	IC	All DBA	EEB-76-1006
H_2E-76-37	Hydrogen Analyzer	IC	All DBA	NEB-76-243
H_2E-76-37A	Hydrogen Analyzer	IC	All DBA	NEB-76-243
H_2E-76-38	Hydrogen Analyzer	IC	All DBA	NEB-76-243
H_2E-76-38A	Hydrogen Analyzer	IC	All DBA	NEB-76-243
H_2E-76-39	Hydrogen Analyzer	IC	All DBA	NEB-76-243
H_2E-76-39A	Hydrogen Analyzer	IC	All DBA	NEB-76-243
H_2E-76-40	Hydrogen Analyzer	IC	All DBA	NEB-76-243

SYSTEM: Containment Inerting HPCI Torus Room (76)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FSV-76-37A	Flow Solenoid Valve	OC (1,3)	All DBA	EEB-76-1018
FSV-76-37B	Flow Solenoid Valve	OC (1,3)	All DBA	EEB-76-1019
FSV-76-39A	Flow Solenoid Valve	OC (1,2)	All DBA	EEB-76-1016
FSV-76-39B	Flow Solenoid Valve	OC (1,2)	All DBA	EEB-76-1017
FSV-76-40A	Flow Solenoid Valve	OC (1,2)	All DBA	EEB-76-1014
FSV-76-40B	Flow Solenoid Valve	OC (1,2)	All DBA	EEB-76-1015
FSV-76-41A	Flow Solenoid Valve	OC (1,3)	All DBA	
FSV-76-41B	Flow Solenoid Valve	OC (1,3)	All DBA	
FSV-76-43A	Flow Solenoid Valve	OC (1,2)	All DBA	
FSV-76-38A	Flow Solenoid Valve	OC (1)	All DBA	
FSV-76-38B	Flow Solenoid Valve	OC (1)	All DBA	
FSV-76-42A	Flow Solenoid Valve	OC (1)	All DBA	EEB-76-1020
FSV-76-42B	Flow Solenoid Valve	OC (1)	All DBA	EEB-76-1021
FSV-76-17	Flow Solenoid Valve	OC	All DBA	NEB-76-240
FCV-76-17	Flow Control Valve	OC (1,2)	All DBA	NEB-76-239
FSV-76-18	Flow Solenoid Valve	OC	All DBA	NEB-76-241
FSV-76-19	Flow Solenoid Valve	OC	All DBA	NEB-76-241
FSV-76-24	Flow Solenoid Valve	OC	All DBA	NEB-76-242
FSV-76-44A	Flow Solenoid Valve	IC	All DBA	
FSV-76-44B	Flow Solenoid Valve	IC	All DBA	
FSV-76-50	Flow Solenoid Valve	OC	All DBA	
FSV-76-61	Flow Solenoid Valve	IC	All DBA	
FSV-76-52	Flow Solenoid Valve	OC	All DBA	
FSV-76-62	Flow Solenoid Valve	OC	All DBA	

SYSTEM: Containment Inerting HPCI Torus Room (76)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
~~FSV-76-53~~	~~Flow Solenoid Valve~~	~~IC~~	~~All DBA~~	
~~FSV-76-54~~	~~Flow Solenoid Valve~~	~~OC~~	~~All DBA~~	
~~FSV-76-64~~	~~Flow Solenoid Valve~~	~~OC~~	~~All DBA~~	
FCV-76-18	Flow Control Valve	OC	All DBA	NEB-76-239A
FCV-76-19	Flow Control Valve	OC	All DBA	NEB-76-239B
FCV-76-24	Flow Control Valve	OC	All DBA	NEB-76-239C

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Radwaste System (77)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
LIS-77-1A	Level Indicator Switch	IC	All DBA	NEB-77-244
LIS-77-1B	Level Indicator Switch	IC	All DBA	NEB-77-244
LS-77-8A	Level Switch	OC	All DBA	NEB-77-250
LS-77-8B	Level Switch	OC	All DBA	NEB-77-251
LIS-77-14A	Level Indicator Switch	IC	All DBA	NEB-77-244
LIS-77-14B	Level Indicator Switch	IC	All DBA	NEB-77-244
FCV-77-17A	Flow Control Valve	OC	All DBA	
FCV-77-17B	Flow Control Valve	OC	All DBA	
LS-77-17A	Level Switch	OC	All DBA	NEB-77-260
LS-77-17B	Level Switch	OC	All DBA	NEB-77-261
TE-77-17	Temperature Element	OC	All DBA	NEB-77-259
TIS-77-17	Temperature IndicatorSwitch	OC	All DBA	
LS-77-25A	Level Switch	OC	HO	
LS-77-25E	Level Switch	OC	HO	
LS-77-25F	Level Switch	OC	HO	
Reactor Building Equipment Drain Sump Pump A	Pump Motor	OC (1)	All DBA	MEB-77-01

SYSTEM: Radwaste System (77)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
Reactor Building Equipment Drain Sump Pump B	Pump Motor	OC	All DBA	MEB-77-03
Reactor Building Floor Drain Sump Pump A	Pump Motor	OC (1,2)	All DBA	MEB-77-04
Reactor Building Floor Drain Sump Pump A	PUmp Motor	OC (3)	All DBA	MEB-77-05
Reactor Building Floor Drain Sump Pump B	Pump Motor	OC (1,2)	All DBA	MEB-77-06
Reactor Building Floor Drain Sump Pump B	Pump Motor	OC (3)	All DBA	MEB-77-07
LT-77-1A	Level Transmitter	IC	All DBA	NEB-77-244
LT-77-1B	Level Transmitter	IC	All DBA	NEB-77-244
LT-77-14A	Level Transmitter	IC	All DBA	NEB-77-244
LT-77-14B	Level Transmitter	IC	All DBA	NEB-77-244
TE-77-14	Temperature Element	IC	All DBA	NEB-77-252
FSV-77-2A	Flow Solenoid Valve	OC	All DBA	NEB-77-249
FSV-77-2B	Flow Solenoid Valve	OC	All DBA	NEB-77-249
FSV-77-15A	Flow Solenoid Valve	OC	All DBA	NEB-77-249
FSV-77-15B	Flow Solenoid Valve	OC	All DBA	NEB-77-249
~~ZS-77-2A~~	~~Zone Switch~~	~~OC~~	~~All DBA~~	
~~ZS-77-2B~~	~~Zone Switch~~	~~OC~~	~~All DBA~~	
~~ZS-77-15A~~	~~Zone Switch~~	~~OC~~	~~All DBA~~	

SYSTEM: Radwaste System (77)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
~~ZS-77-15B~~	~~Zone Switch~~	~~OC~~	~~All DBA~~	
LS-77-25B	Level Switch	OC	HO	
LS-77-25C	Level Switch	OC	HO	
FSV-77-17	Level Switch	OC (1)	All DBA	EEB-77-1004
FSV-77-17	Level Switch	OC (2)	All DBA	EEB-77-1005
FSV-77-17	Level Switch	OC (3)	All DBA	EEB-77-1006
FCV-77-2A	Flow Control Valve	OC	All DBA	NEB-77-249A
FCV-77-2B	Flow Control Valve	OC	All DBA	NEB-77-249A
LS-77-25D	Level Switch	OC	HO	
FCV-77-15A	Flow Control Valve	OC	All DBA	NEB-77-249B
FCV-77-15B	Flow Control Valve	OC	All DBA	NEB-77-249B

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Fuel Pool Cooling and Demineralizing System (78)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
LS-78-1A	Level Switch	OC	All DBA	NEB-78-262
LS-78-1B	Level Switch	OC	All DBA	NEB-78-262
LS-78-1C	Level Switch	OC	All DBA	NEB-78-262
LS-78-1D	Level Switch	OC	All DBA	NEB-78-265
LS-78-1E	Level Switch	OC	All DBA	NEB-78-265
LS-78-1F	Level Switch	OC	All DBA	NEB-78-265
LS-78-1G	Level Switch	OC	All DBA	NEB-78-265
LS-78-2A	Level Switch	OC	All DBA	
LS-78-2B	Level Switch	OC	All DBA	
FCV-78-61	Flow Control Valve	OC	All DBA	MEB-78-01
FCV-78-62	Flow Control Valve	OC	All DBA	MEB-78-01
FCV-78-63	Flow Control Valve	OC	All DBA	MEB-78-01
FCV-78-64	Flow Control Valve	OC	All DBA	MEB-78-01
FCV-78-65	Flow Control Valve	OC	All DBA	MEB-78-01
FCV-78-66	Flow Control Valve	OC	All DBA	MEB-78-01
FCV-78-67	Flow Control Valve	OC	All DBA	MEB-78-01
FCV-78-68	Flow Control Valve	OC	All DBA	MEB-78-01
~~FIS-78-5~~	~~Flow Indicator Switch~~	~~OC~~	~~All DBA~~	
~~FS-78-51~~	~~Flow Indicator Switch~~	~~OC~~	~~All DBA~~	

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Containment Atmosphere Dilution System (84)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FSV-84-8A	Flow Solenoid Valve	OC (1,2)	All DBA	EEB-84-0110
FSV-84-8B	Flow Solenoid Valve	IC	All DBA	EEB-84-1002
FSV-84-8C	Flow Solenoid Valve	IC	All DBA	EEB-84-1003
FSV-84-8D	Flow Solenoid Valve	OC	All DBA	EEB-84-1013
FT-84-19	Flow Transmitter	OC	All DBA	EEB-84-1008
FSV-84-19	Flow Solenoid Valve	OC (2,3)	All DBA	EEB-84-1005
FT-84-20	Flow Transmitter	OC (1)	All DBA	EEB-84-1004
FSV-84-20	Flow Solenoid Valve	OC	All DBA	EEB-84-1007
FSV-84-19	Flow Solenoid Valve	OC (1)	All DBA	EEB-84-1004
FM-84-20B	Flow Modifier	OC	All DBA	EEB-84-1009
PS-84-21	Pressure Switch	OC	All DBA	EEB-84-1012
PS-84-22	Pressure Switch	OC	All DBA	EEB-84-1011
~~FSV-84-19~~	~~Flow Solenoid Valve~~	~~OC~~	~~All DBA~~	
FM-84-19B	Flow Modifier	OC	All DBA	EEB-84-1010
FCV-84-19	Flow Control Valve	OC	All DBA	
FCV-84-20	Flow Control Valve	OC	All DBA	
FSV-84-20	Flow Solenoid Valve	OC	All DBA	EEB-84-1006

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: CRD Hydraulic System (85)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
FSV-85-39A	Flow Solenoid Valve	OC	All DBA	NEB-85-274
FSV-85-39B	Flow Solenoid Valve	OC	All DBA	NEB-85-273
LS-85-45A	Level Switch	OC	All DBA	NEB-85-276
LS-85-45B	Level Switch	OC	All DBA	NEB-85-276
LS-85-45C	Level Switch	OC	All DBA	NEB-85-276
LS-85-45D	Level Switch	OC	All DBA	NEB-85-276
LS-85-45E	Level Switch	OC	All DBA	NEB-85-276
FCV-85-37C	Flow Control Valve	OC	All DBA	NEB-85-268A
FSV-85-35A	Flow Solenoid Valve	OC(1,2)	All DBA	NEB-85-267
FSV-85-35B	Flow Solenoid Valve	OC(1,2)	All DBA	NEB-85-267
FSV-85-37A	Flow Solenoid Valve	OC(1,2)	All DBA	NEB-85-268
FSV-85-37B	Flow Solenoid Valve	OC(1,2)	All DBA	NEB-85-268
FSV-85-70A	Flow Solenoid Valve	OC(1,2)	All DBA	EEB-85-1001
FSV-85-70B	Flow Solenoid Valve	OC(1,2)	All DBA	EEB-85-1002
FCV-85-37A	Flow Control Valve	OC	All DBA	NEB-85-268A
FCV-85-37B	Flow Control Valve	OC	All DBA	NEB-85-268A
FCV-85-39A	Flow Control Valve	OC	All DBA	NEB-85-272
FCV-85-39B	Flow Control Valve	OC	All DBA	NEB-85-273

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

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ELECTRICAL EQUIPMENT REQUIRED TO FUNCTION UNDER POSTULATED ACCIDENT CONDITIONS

SYSTEM: Radiation Monitoring System (90)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
RE-90-133	Primary Element	OC	All DBA	
RE-90-133A	Primary Element	OC (2)	All DBA	EEB-90-0005
RE-90-134	Primary Element	OC	All DBA	
RE-90-134A	Primary Element	OC (1)	All DBA	EEB-90-0007
RE-90-136	Primary Element	OC	All DBA	NEB-90-279
RE-90-137	Primary Element	OC	All DBA	NEB-90-280
RE-90-138	Primary Element	OC	All DBA	NEB-90-281
RE-90-139	Primary Element	OC	All DBA	NEB-90-282
RE-90-140	Primary Element	OC	All DBA	NEB-90-283
RE-90-141	Primary Element	OC	All DBA	NEB-90-283
RE-90-142	Primary Element	OC	All DBA	NEB-90-284
RE-90-143	Primary Element	OC	All DBA	NEB-90-284
FCV-90-254A	Flow Control Valve	OC	HI, LOCA	
FCV-90-254B	Flow Control Valve	OC	HI, LOCA	
FCV-90-255	Flow Control Valve	OC(1,2)	HI, LOCA	
FCV-90-257A	Flow Control Valve	OC(1,2)	HI, LOCA	
FCV-90-257B	Flow Control Valve	OC	HI, LOCA	
~~RE-90-272A~~	~~Primary Element~~	~~IC~~	~~All DBA~~	
~~RE-90-272B~~	~~Primary Element~~	~~OC~~	~~All DBA~~	

SYSTEM: Radiation Monitoring System (90)

GENERAL EQUIPMENT

TVA Plant Identification Number	Generic Name	Location	Accident Type	EWS Sheet No.
~~RE-90-273B~~	~~Primary Element~~	~~IC~~	~~All DBA~~	~~NEB-90-286A~~
RE-90-133A	Primary Element	OC (3)	All DBA	EEB-90-0006
RE-90-133A	Primary Element	OC (1)	All DBA	EEB-90-0004
RE-90-134A	Primary Element	OC (3)	All DBA	EEB-90-0009
RE-90-134A	Primary Element	OC (2)	All DBA	EEB-90-0008
RE-90-131A	Primary Element	OC (1)	All DBA	EEB-90-0001
RE-90-131A	Primary Element	OC (2)	All DBA	EEB-90-0002
RE-90-131A	Primary Element	OC (3)	All DBA	EEB-90-0003
RE-90-273A	Primary Element	IC	All DBA	NEB-90-286
RE-90-273B	Primary Element	OC	All DBA	NEB-90-286A

Note: Cable, penetrations, handswitches, control stations, junction boxes, and terminal blocks have been handled generically. See appropriate System Index in Appendix C for the EWS numbers.

APPENDIX B

TEMPERATURE - PRESSURE PROFILES AND TABLES

APPENDIX B*

TEMPERATURE - PRESSURE PROFILES AND TABLES

This appendix contains temperature-pressure profiles or tables that are referenced in the "Environment Specification" column on the EWS. There are three tables in this appendix that are used to locate the appropriate figure or table which defines the temperature-pressure values for each room. The temperatures-pressures given in either figures or tables is assumed to linearly return to ambient in 24 hours. The three tables are as follows:

Table B.0 (1,2,3), Room Number, Name, and Plant Location-

This table relates the room number to a room name and to a specific plant location (See attached sheets 1 - 6 for plant locations).

Table B.00 (1,2,3) - Environmental Temperature/Pressures

Curves - Room Number Designation-

This table relates to various room numbers to figures or Table B.1 (1,2,3) which are in this appendix for temperature and pressure.

Table B.1 (1,2,3) - Temperature/Pressure (Selected Areas)-

This table gives selected temperature-pressure values for selected areas that are not contained in a profile.

*The figures and Table B.1 (1, 2, 3) giving temperature, pressure curves, or values in this section correspond to Section 3.0, except for a different numbering sequence.

TABLE B.0 (1,2,3)

Room Number, Name, and Plant Location

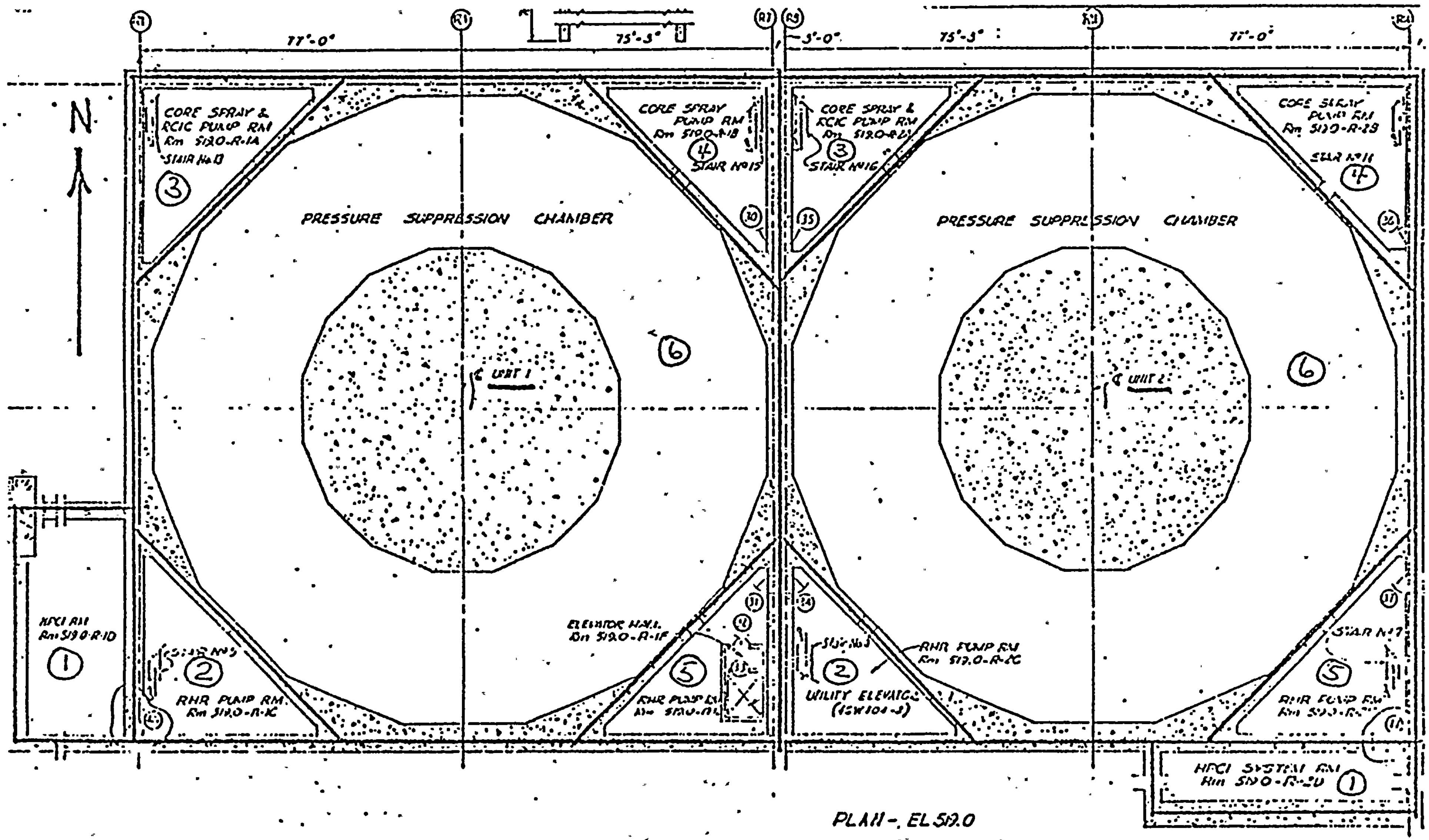
Room No.	Room Name	Plant Location* (Sheet 1-6)
0	Inside Primary Containment (Drywell)	Sheet 2
00	Inside Primary Containemnt (Wetwell)	Wetwell
1	HPCI Pump (or Turbine) Room; elevation 519.0'	Sheet 1
2	S. W. RHR Pump Room; elevation 519.0'	Sheet 1
3	N. W. RICI and Core Spray Pump Room; elevation 519.0'	Sheet 1
4	N. E. Core Spray Pump Room; elevation 519.0'	Sheet 1
5	S. E. RHR Pump Room; elevation 519.0'	Sheet 1
6	Pressure Suppression Chamber (HPCI Torus Room); elevation 519.0'	Sheet 1
7	Main Steam Vault Room	Sheet 2
8	Open Area; elevation 565.0'	Sheet 2
9	Open Areas; elevation 593.0'	Sheet 3
10	RWCU Pump Room; elevation 593.0'	Sheet 3
11	RWCW Heat Exchange Room; elevation 593'	Sheet 3
12	Open Areas; elevation 621.25	Sheet 4
13	South Open Areas; elevation 639.0'	Sheet 5
14	North Open Area; elevation 639.0'	Sheet 5
15	Units 1-3 Refueling Floor; elevation 664.0'	Sheet 6
16	Unit 1-3; elevation 593; RWCU BW receiving tank rm	Sheet 3

*Unit 1 locations same as Unit 3.

TABLE B.0 (1,2,3) (continued)

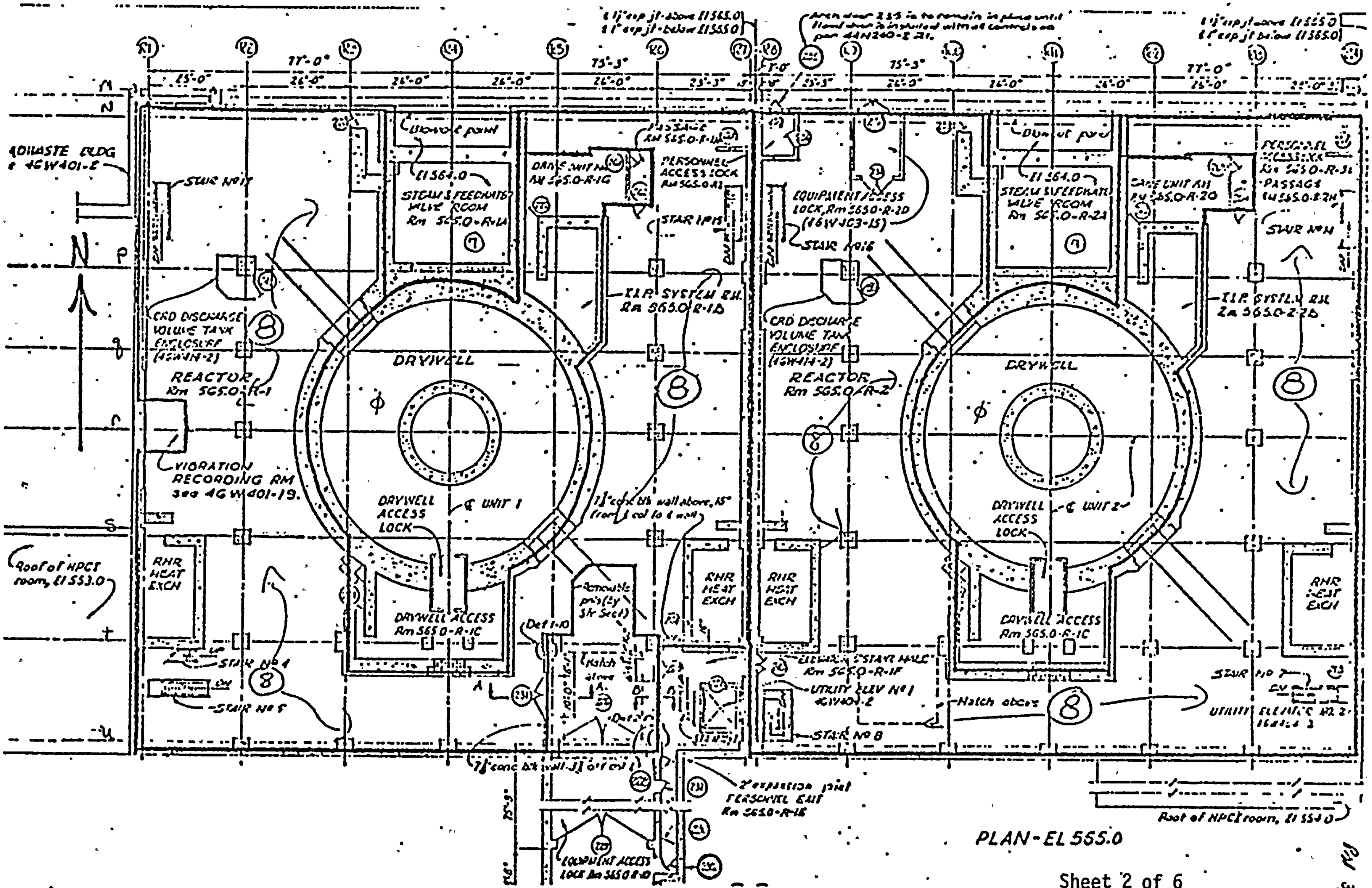
Room Number, Name, and Plant Location

Room No.	Room Name	Plant Location (Sheet 1-6)
17A	Unit 1-3; elevation 639; RWCU Demineralizer A	Sheet 5
17B	Unit 1-3; elevation 639; RWCU Demineralizer B	Sheet 5
18	Unit 1-3; elevation 621.25; Clean up Demin Vlv Rm	Sheet 4



PLAN - EL 519.0

Sheet 1 of 6
Appendix B
TABLE B.0 (1,2,3)

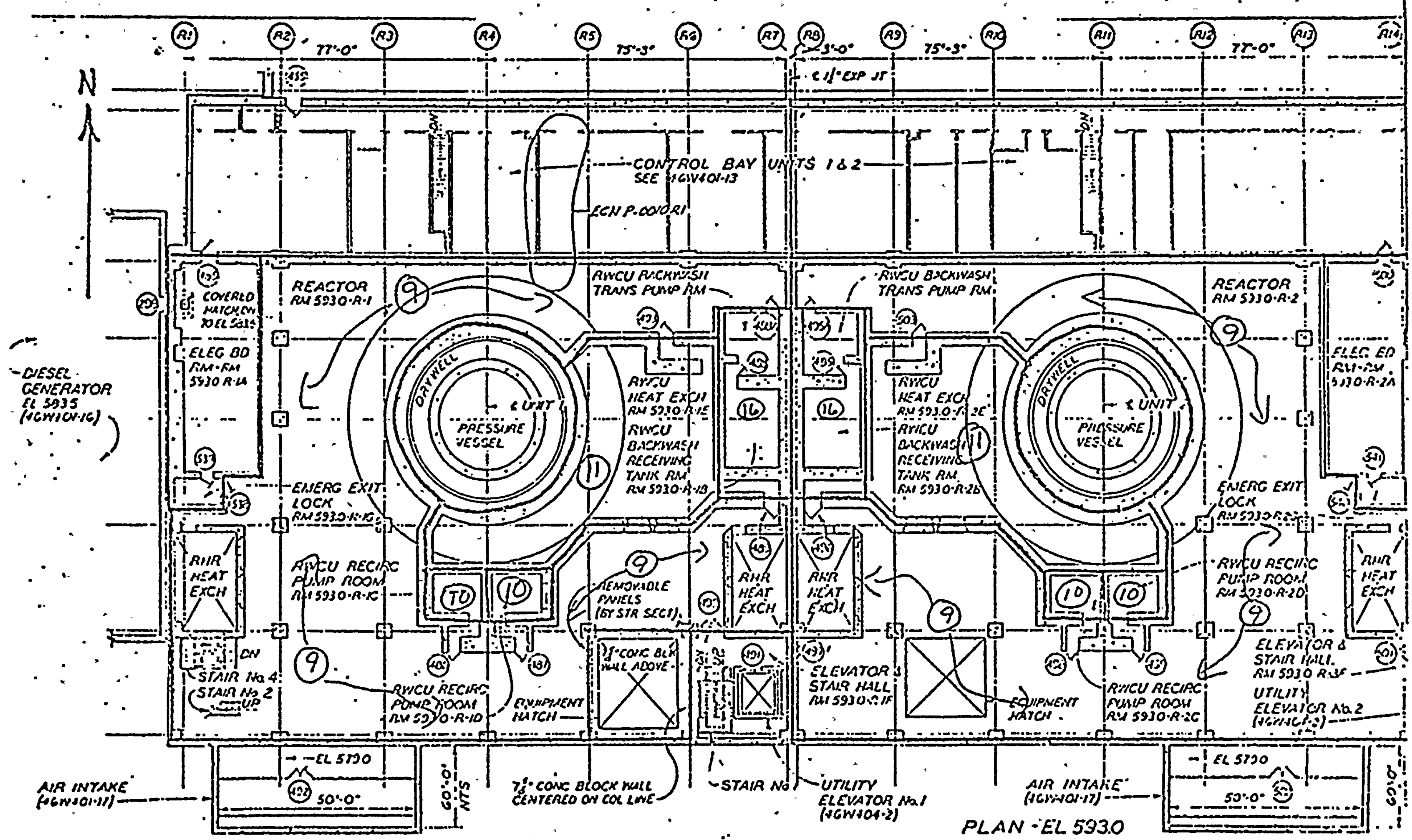


PLAN - EL 555.0

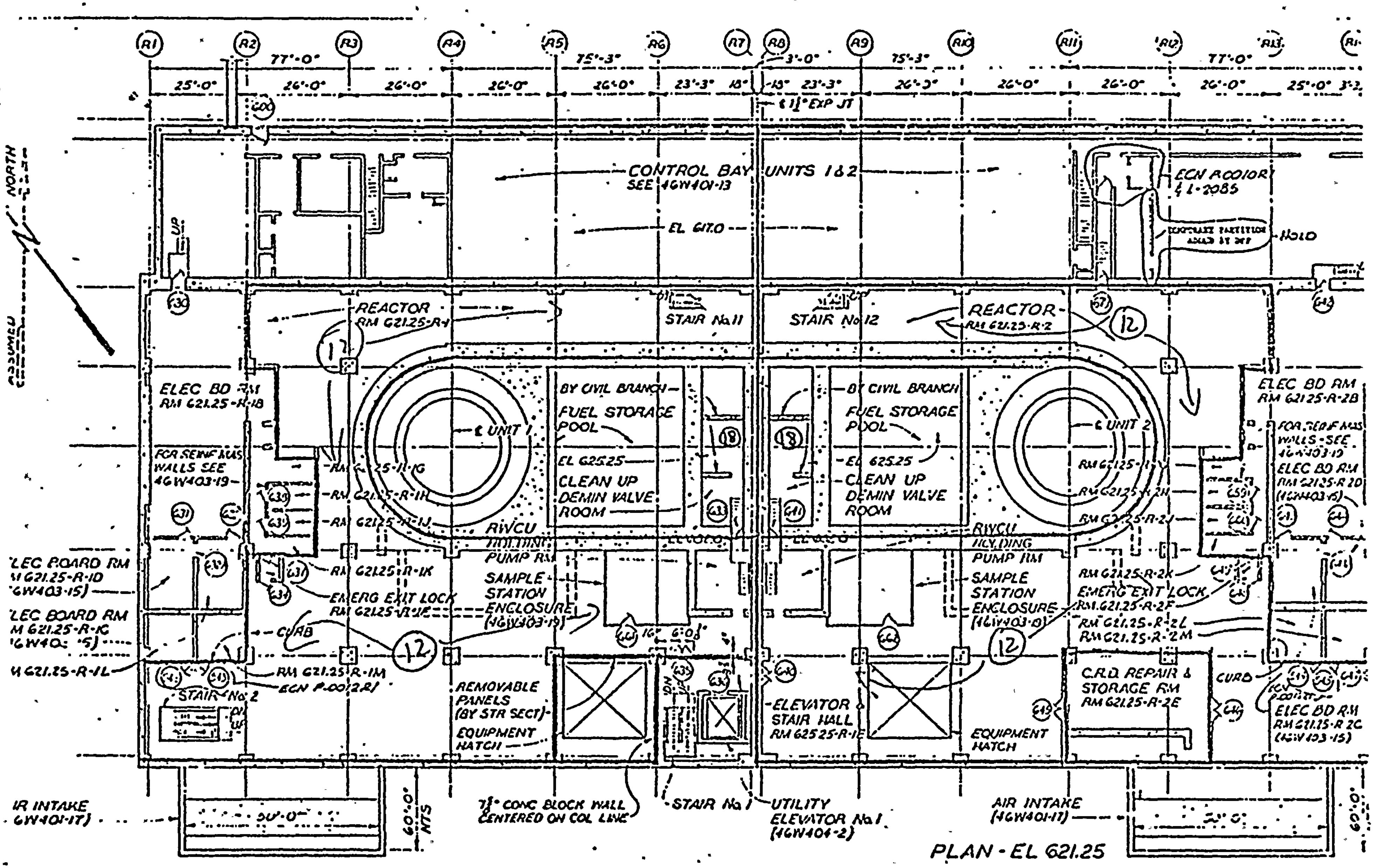
Sheet 2 of 6

Appendix B

TABLE B.0 (1,2,3)

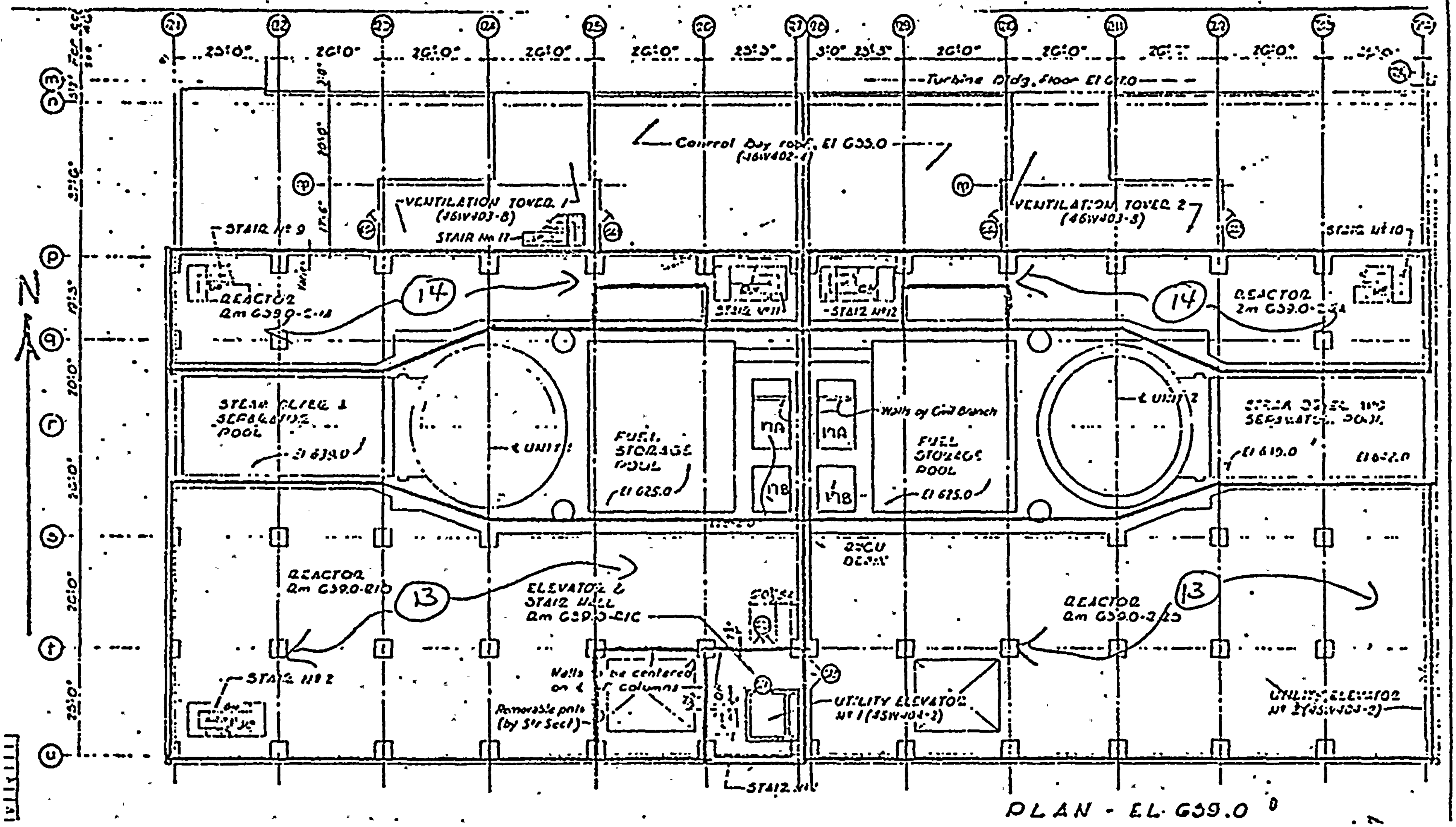


Sheet 3 of 6
Appendix B
TABLE B.0 (1,2,3)

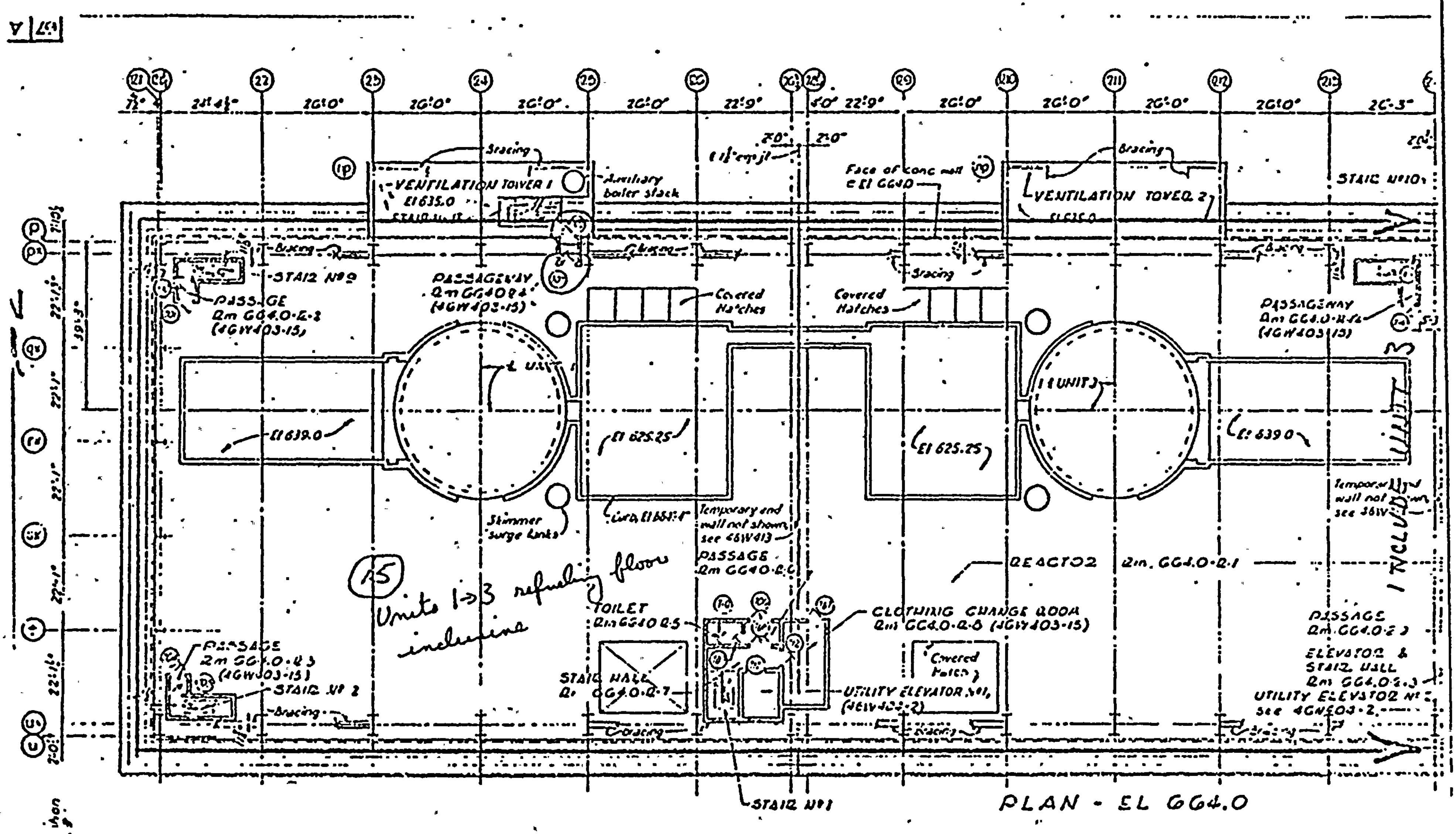


Sheet 4 of 6

Appendix B
TABLE B.0 (1,2,3)



Sheet 5 of 6
Appendix B
TABLE B.0 (1,2,3)



Sheet 6 of 6
Appendix B
TABLE B.0 (1,2,3)

TABLE B.00 (1,2,3)

ENVIRONMENTAL TEMPERATURE/PRESSURE CURVES - ROOM NUMBER DESIGNATIONS*

Room No. Designation	Unit 1 Temperature	Unit 1 Pressure	Units 2 and 3 Temperature	Units 2 and 3 Pressure
0	Figure B.0 (1,2,3)	Figure B.0 (1,2,3)	Figure B.0 (1,2,3)	Figure B.0 (1,2,3)
00 (Wetwell)	B.00 (1,2,3)	B.00.0 (1,2,3)	B.00 (1,2,3)	B.00.0 (1,2,3)
1	B.1 (1)	Table B.1 (1,2,3)	B.1 (2,3)	Table B.1 (1,2,3)
2	B.2 (1)		B.2 (2,3)	
3	B.3 (1)		B.3 (2,3)	
4	B.4 (1)		B.4 (2,3)	
5	B.5 (1)		B.5 (2,3)	
6	B.6 (1)		B.6 (2,3)	
7	B.7 (1)		B.7 (2,3)	
8	B.8 (1)		B.8 (2,3)	
9	B.9 (1)		B.9 (2,3)	
10	B.10 (1)		B.10 (2.3)	
11	B.11 (1)		B.11 (2,3)	
12	B.12 (1)		B.12 (2,3)	
13	B.13 (1)		B.13 (2,3)	
14	B.14 (1)		B.14 (2,3)	
15	Table B.1 (1,2,3)		Table B.1 (1,2,3)	
16	B.16 (1)**		B.16 (2,3)**	

**Same as room 9 for units 1, 2, and 3

TABLE B.00 (1,2,3)

ENVIRONMENTAL TEMPERATURE/PRESSURE CURVES - ROOM NUMBER DESIGNATIONS* (Continued)

Room No. Designation	Unit 1		Units 2 and 3	
	Temperature	Pressure	Temperature	Pressure
17A	Table B.1 (1,2,3)	Table B.1 (1,2,3)	Table B.1 (1,2,3)	Table B.1 (1,2,3)
17B				
18				

*Figure Designation:

Designation applicable only for room 00, pressure curve only

Figure B.0X (1,2,3)

Appendix B Room Number Unit Designation

*Table Designation:

Table number 1 (not unit designation)

Table B.1 (1,2,3)

Appendix B, Unit designation

TABLE B.1 (1,2,3)

TEMPERATURE - PRESSURE (Selected Areas)

Unit 1

Time	Compartment (1)
2 sec	1.3 psig
5 "	1.1 "
11 "	.8 "
30 "	.1 "
50 "	0. "

Unit 2 & 3

Time	Compartment (1),(10),&(11)
Same as for unit 1	

Time	Compartment (10)
.02 sec	2.4 psig
.6 "	.8 "
5 "	1.3 "
45 "	1.3 "
47 "	.2 "

Time	All Remaining Area
1 sec	.1 psig
30 "	.5 "
45 "	.5 "
50 "	.1 "
120 "	0. "

Time	Compartment (11)
1 sec	2.4 psig
10 "	3.4 "
45 "	3.8 "
47 "	.4 "
55 "	.1 "
120 "	0. "

Time	All Remaining Areas
1 "	.1 psig
30 "	.5 "
45 "	.6 "
50 "	.2 "
120 "	0. "

All Units Compartment 7

Time	Steam Valve Vault
.1 sec	1.7 psig
3	7.1 "
4 "	4.5 "
5 "	2.7 "
6 "	2.0 "
10 "	1.8 "
150 "	1.8 "

Temperature-Pressure (Compartment 15, 17A, 17B, 18) - All Units

Room No.	Temperature (^{O} F)	Pressure (PSIA)
15	120	15.0
17A	105	Atm.
17B	105	Atm.
18	110	Atm.

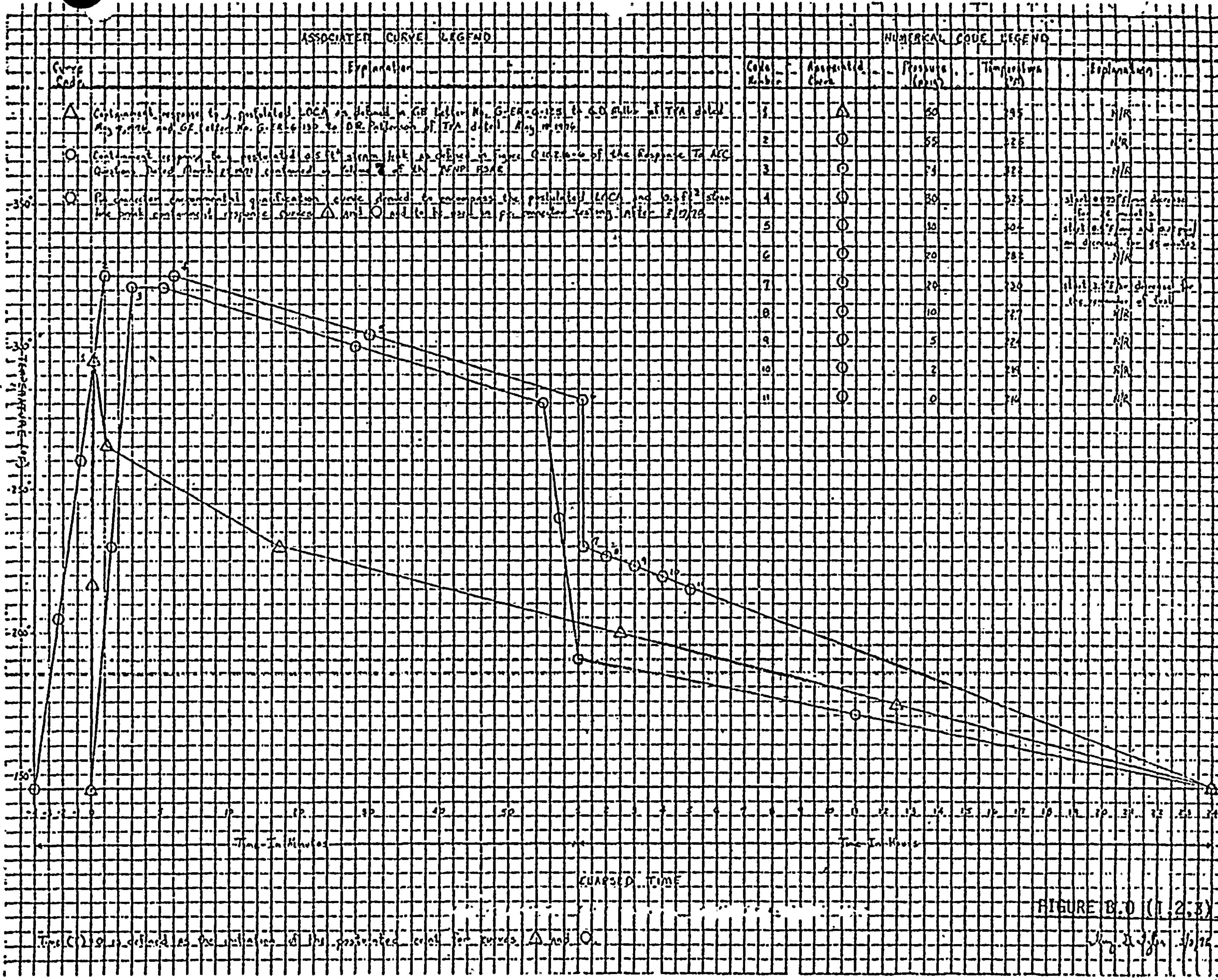
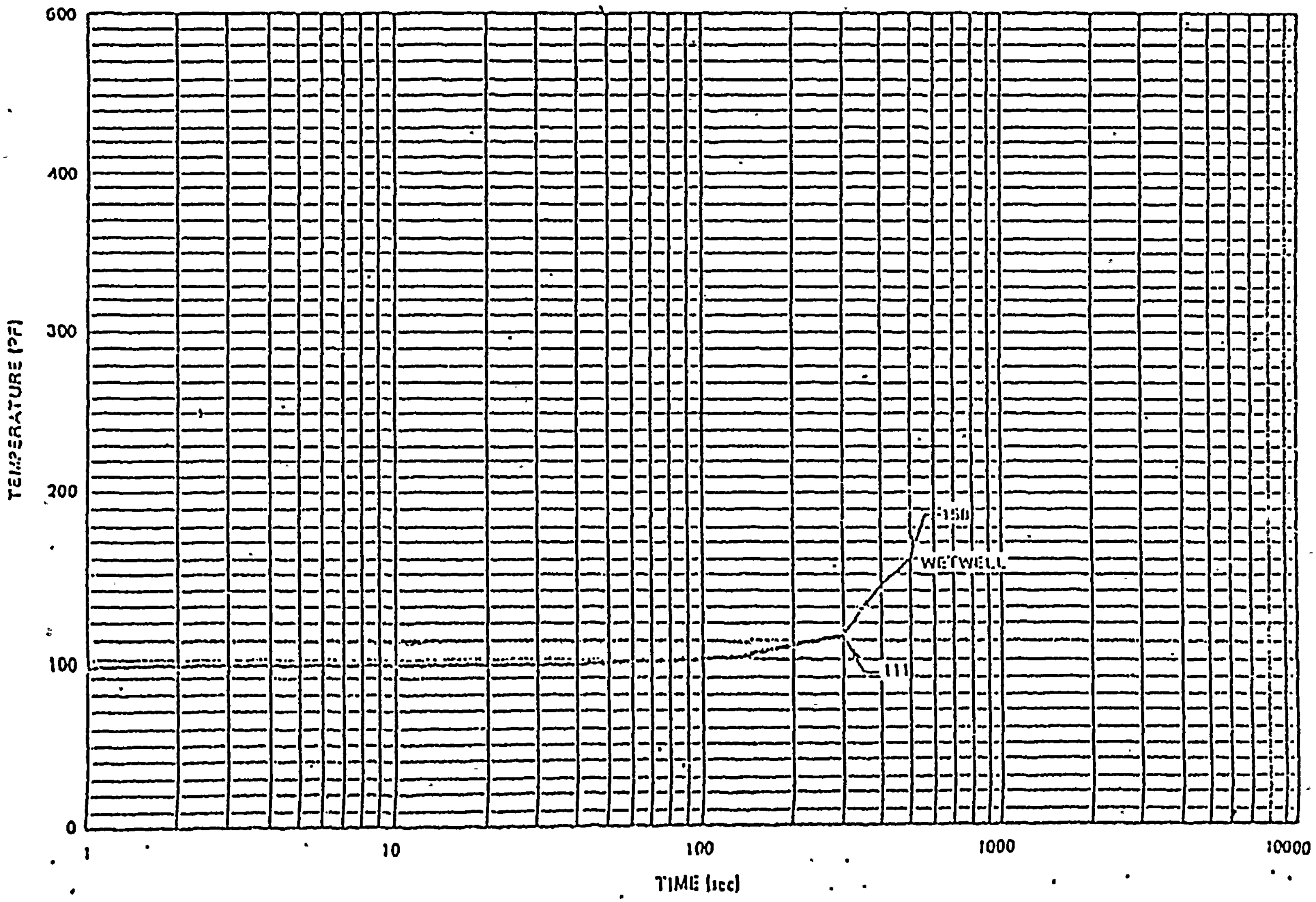


FIGURE B.0 (1,2,3)



10

Figure B.00 (1, 2, 3). IBA Wetwell Temperature Response

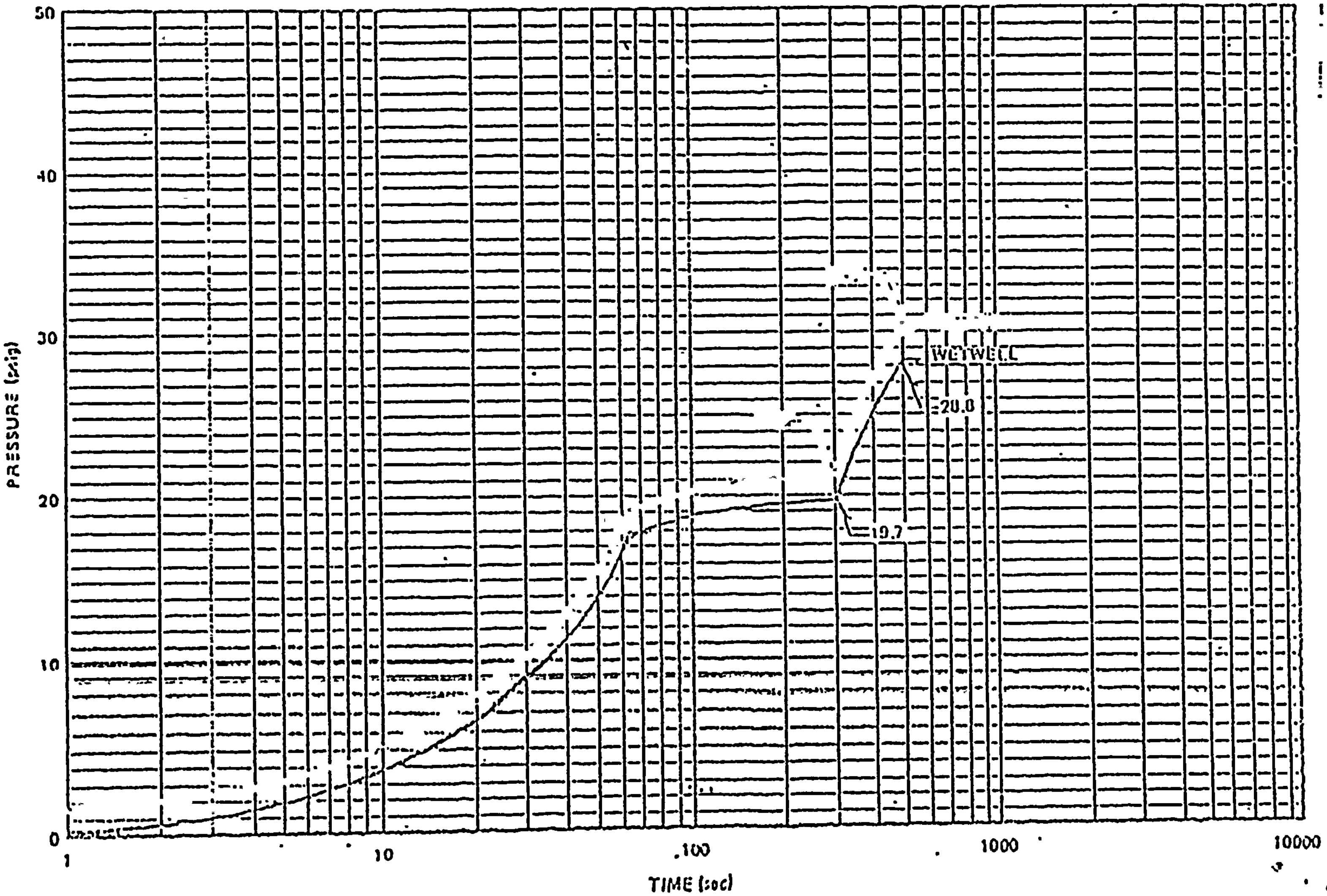
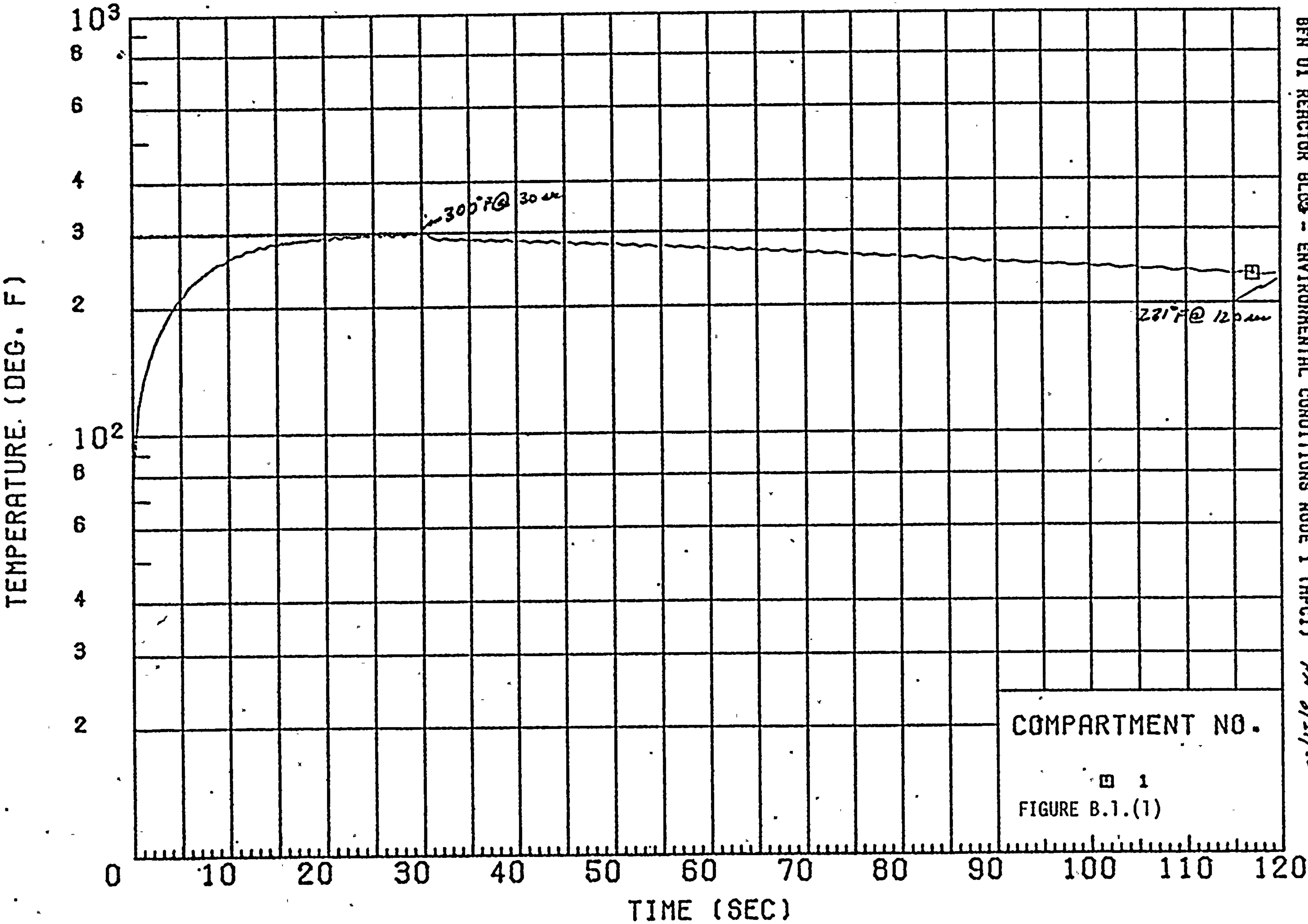


Figure B.00.0(1,2,3) IDA Containment Pressure Response

SUBCOMPARTMENT TEMPERATURE HISTORY



BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 1 (HPCI)

SUBCOMPARTMENT TEMPERATURE HISTORY

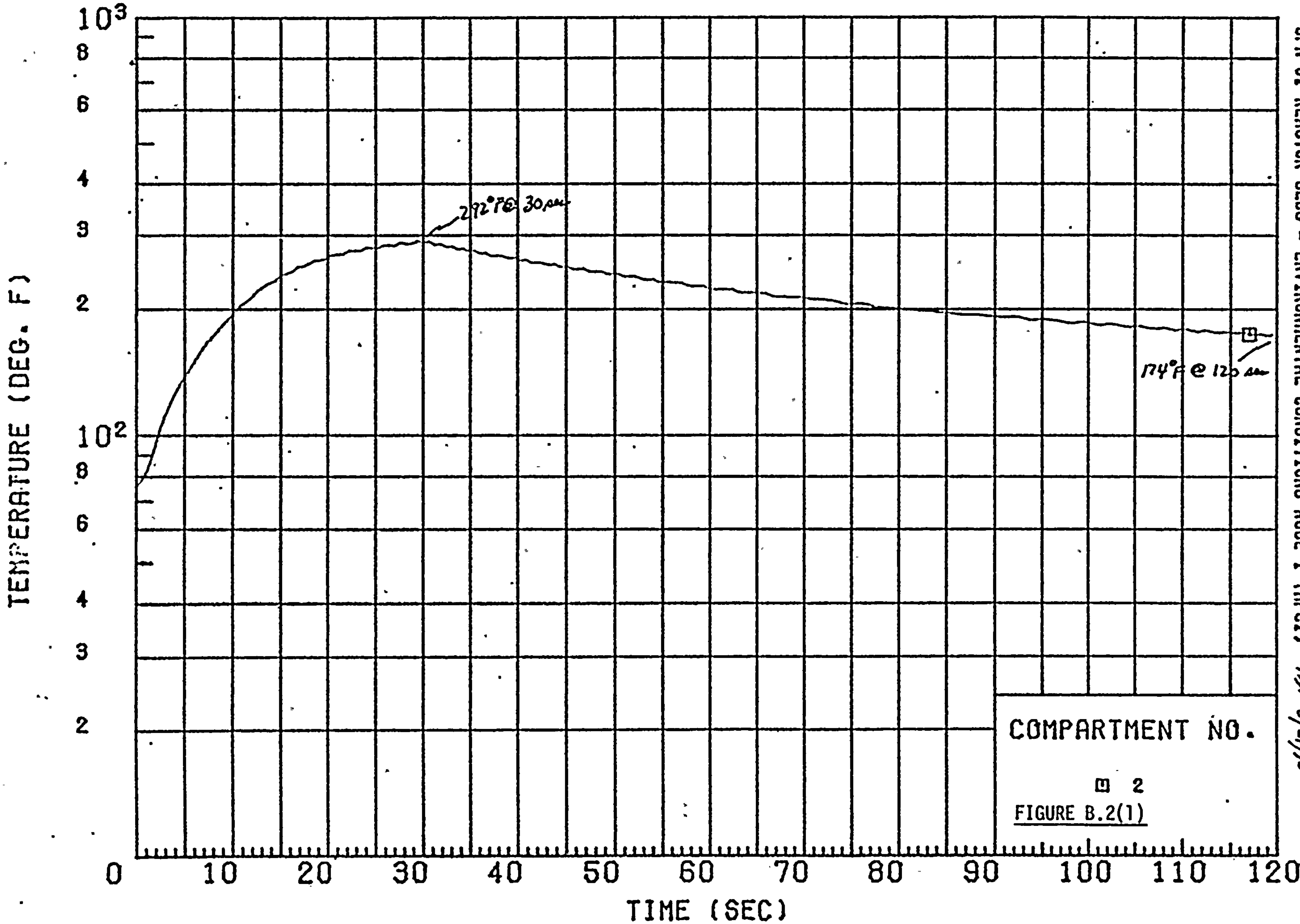


FIGURE B.2(1)

SFH (REV. 2)

NEG. TI NO.

PAGE OF

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 1 (HPCI)

[illegible] 3/21/80

SUBCOMPARTMENT TEMPERATURE HISTORY

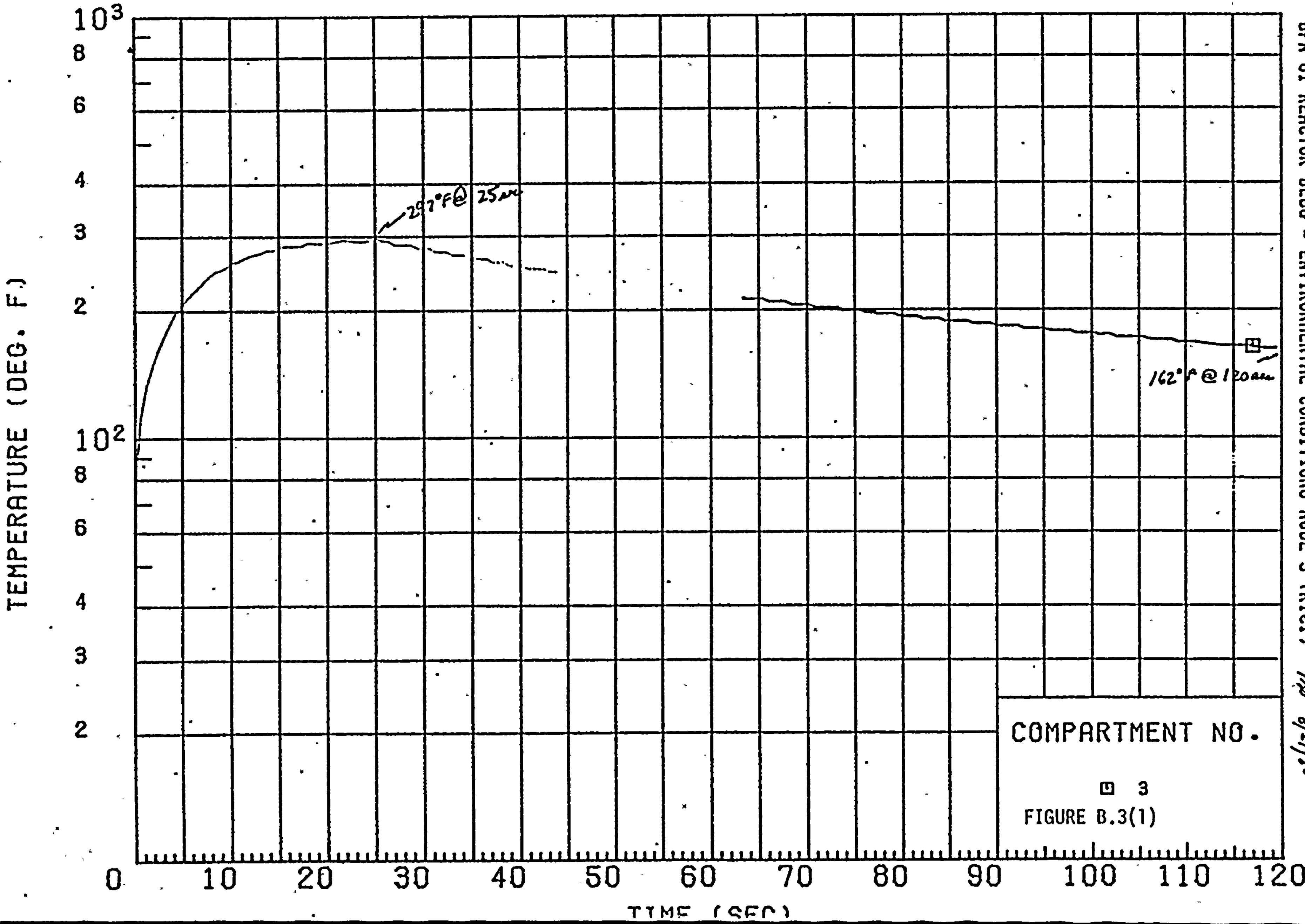


FIGURE B.3(1)

SPA (REV. 2)

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 3 (RICI)

NEQ. TI NO.

PAGE OF

SUBCOMPARTMENT TEMPERATURE HISTORY

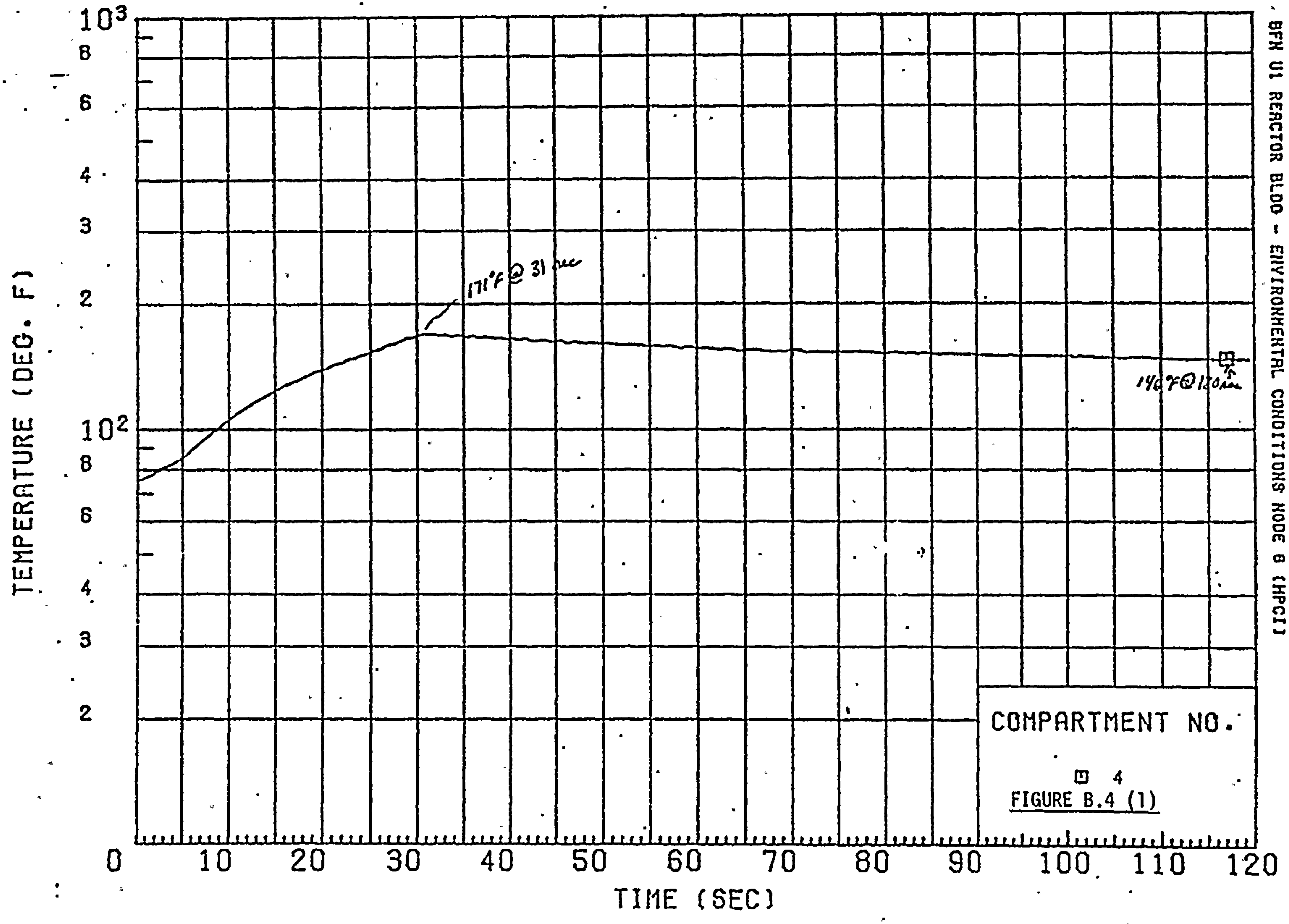


FIGURE B.4 (1)

SPA (REV. 2) NEG. TI NO.

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 8 (HPCI)

PAGE OF

SUBCOMPARTMENT TEMPERATURE HISTORY

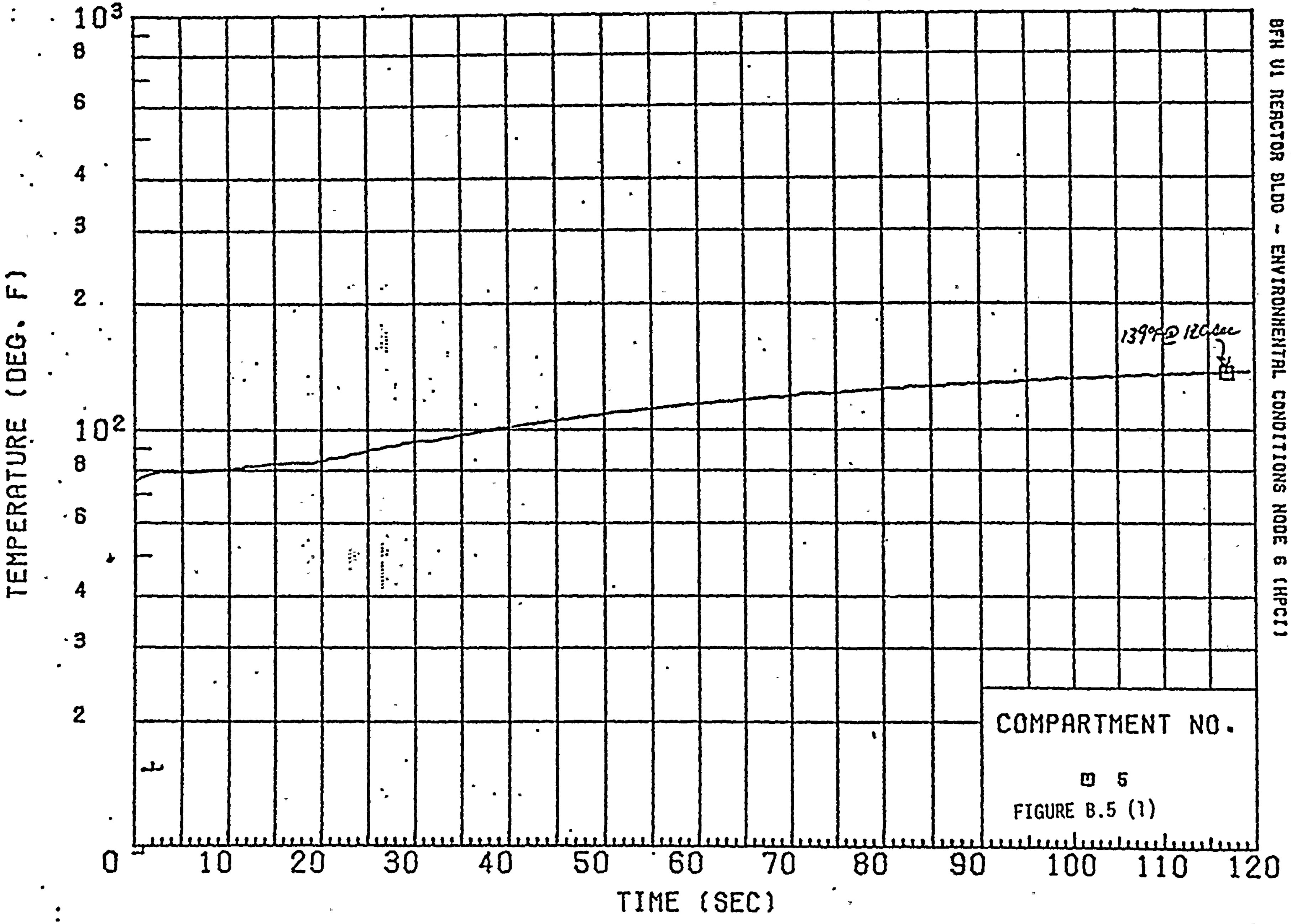


FIGURE B.5 (1)

SPA (REV. 2) NEG. TI NO. PAGE OF

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 6 (HPCI)

SUBCOMPARTMENT TEMPERATURE HISTORY

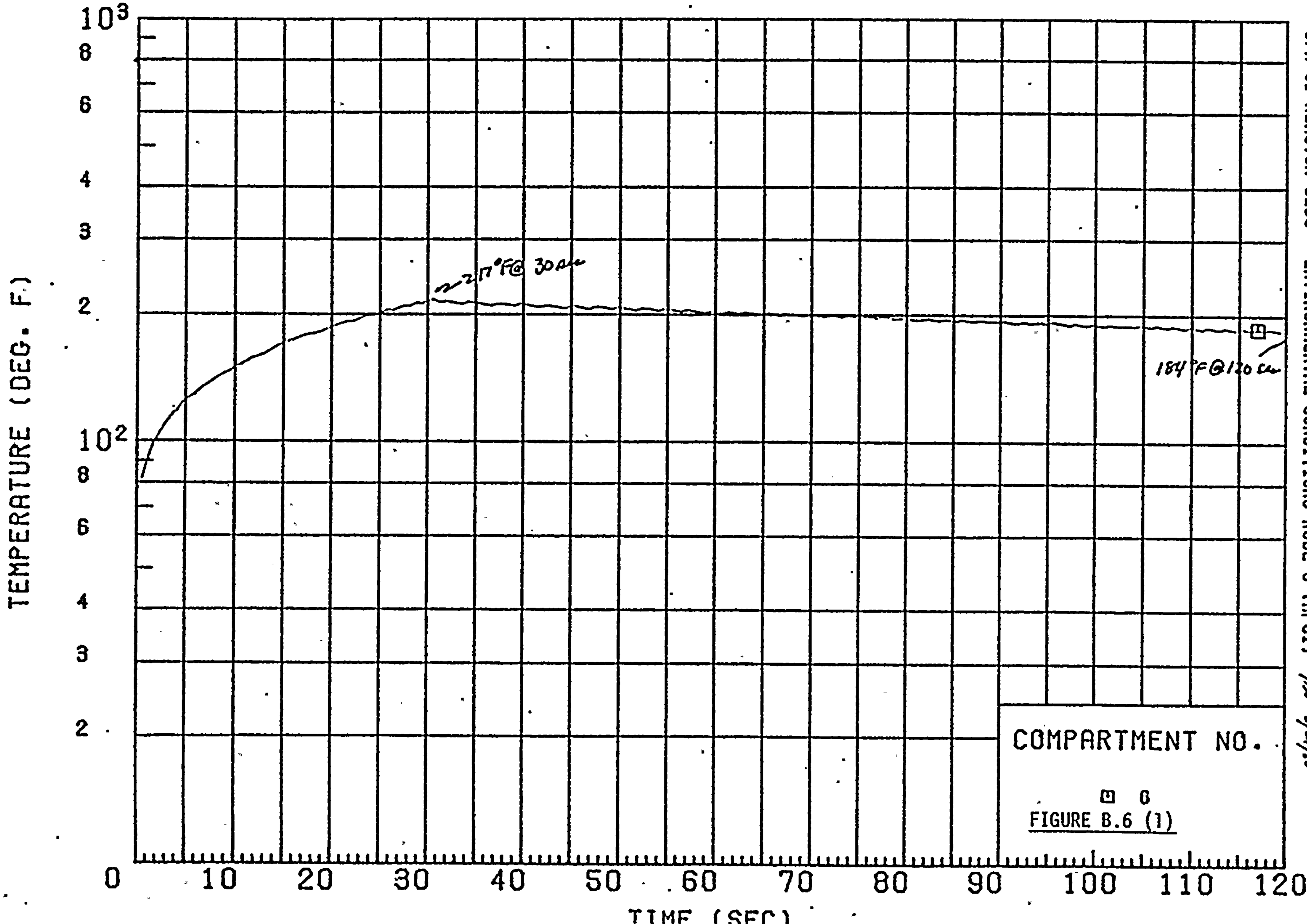


FIGURE B.6 (1)

SPA (REV. 2)

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 6 (HPCI)

NEG. TI NO.

PAGE OF

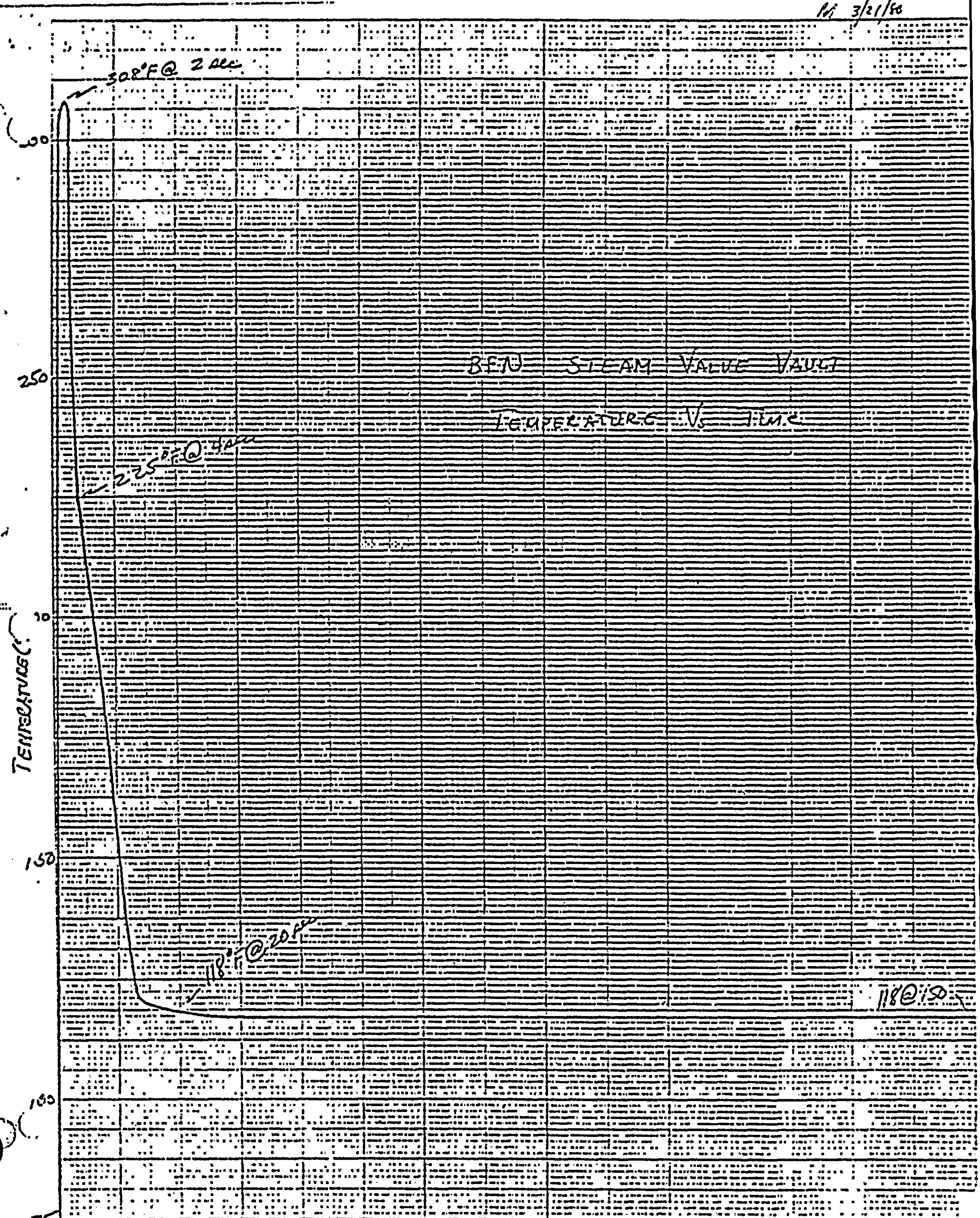
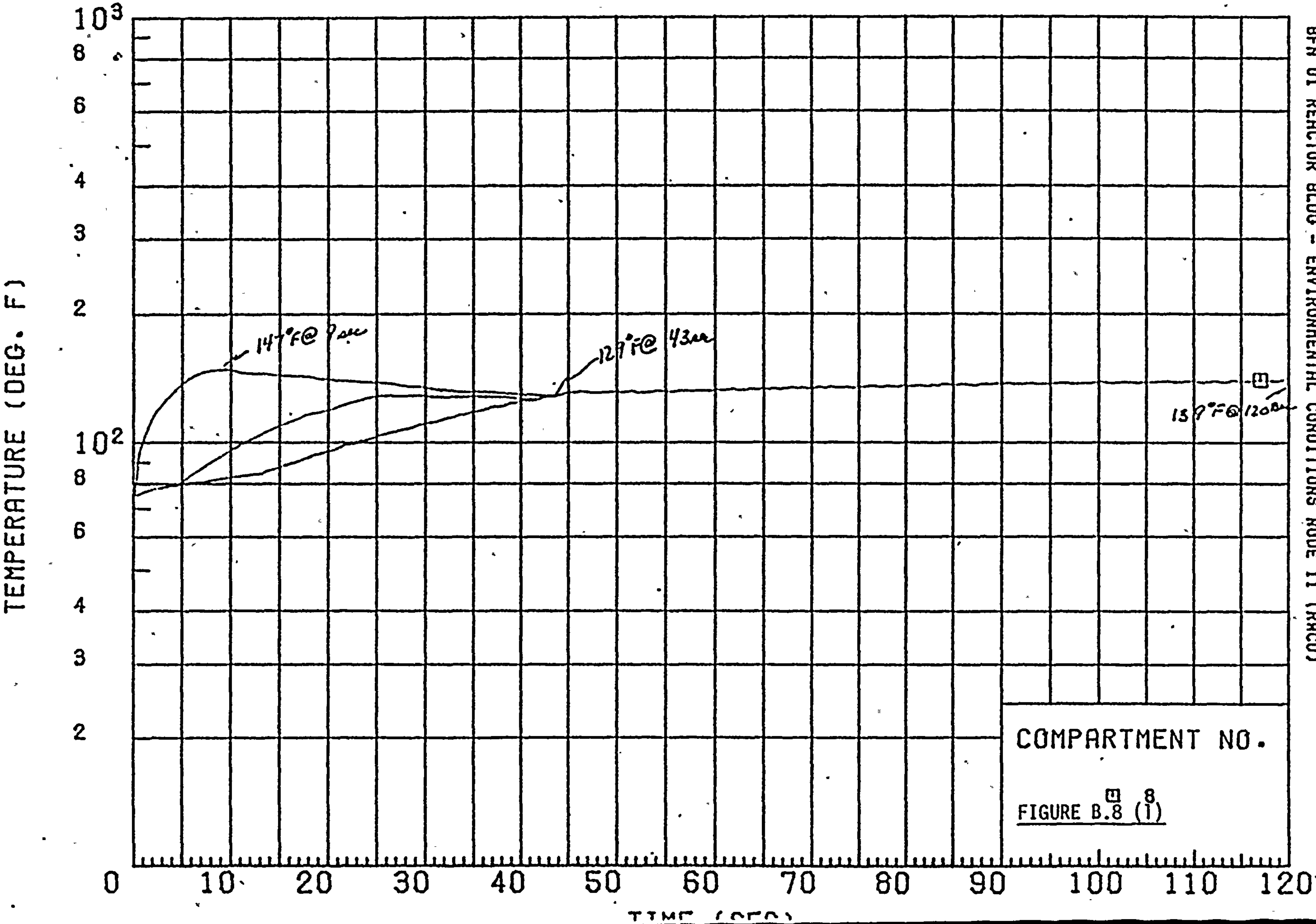

3/21/80
308°F @ 2 sec
300
250
BEN STEAM VALVE VAULT
TEMPERATURE Vs TIME
225°F @ 4 sec
200
TEMPERATURE (°F)
150
118°F @ 20 sec
118 @ 150
100
75
0
50
100
150
TIME (sec)

FIGURE B.7 (1)

SUBCOMPARTMENT TEMPERATURE HISTORY



SUBCOMPARTMENT TEMPERATURE HISTORY

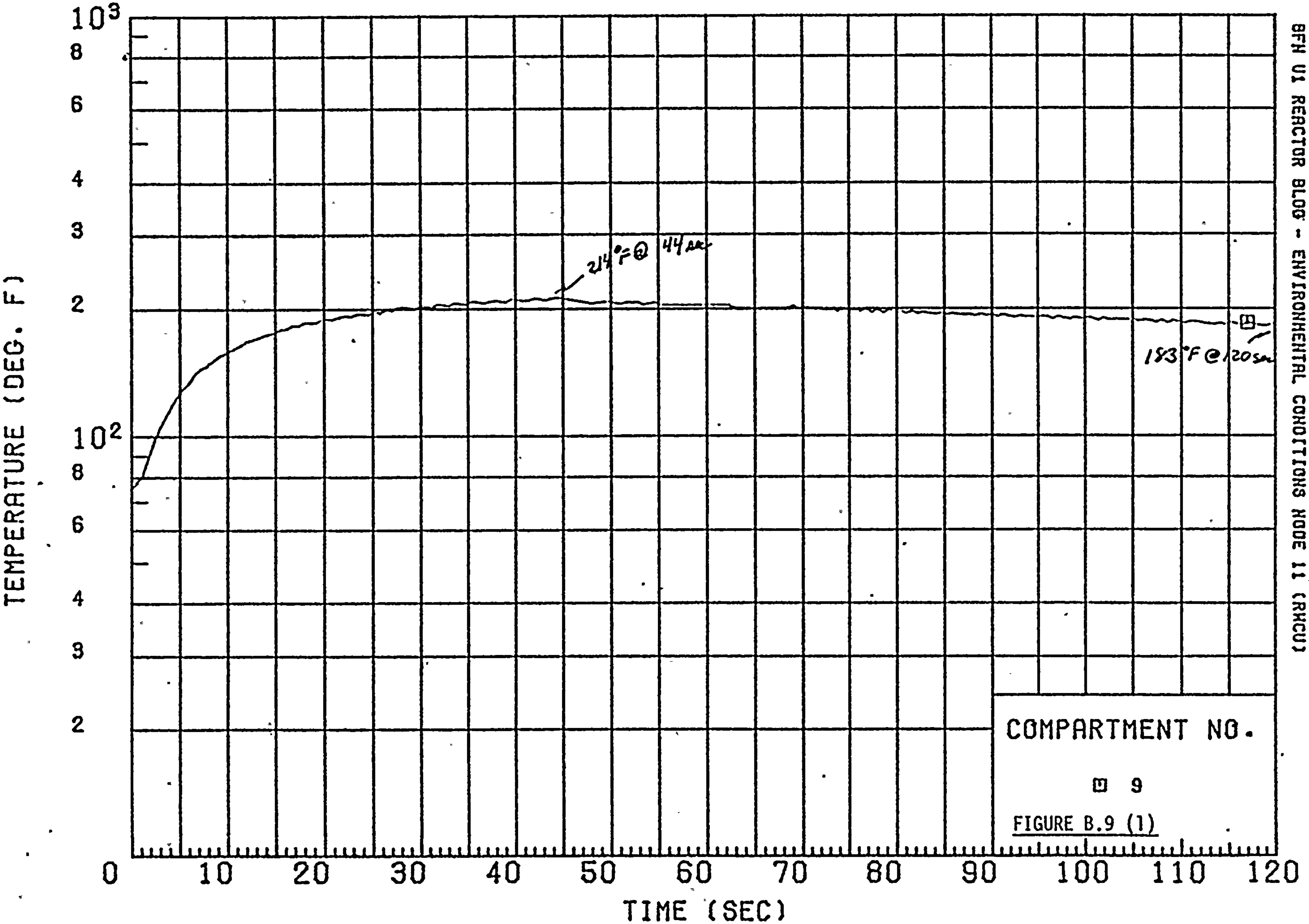


FIGURE B.9 (1)

SPA (REV. 2) NEG. TI NO.

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RHCU)

SUBCOMPARTMENT TEMPERATURE HISTORY

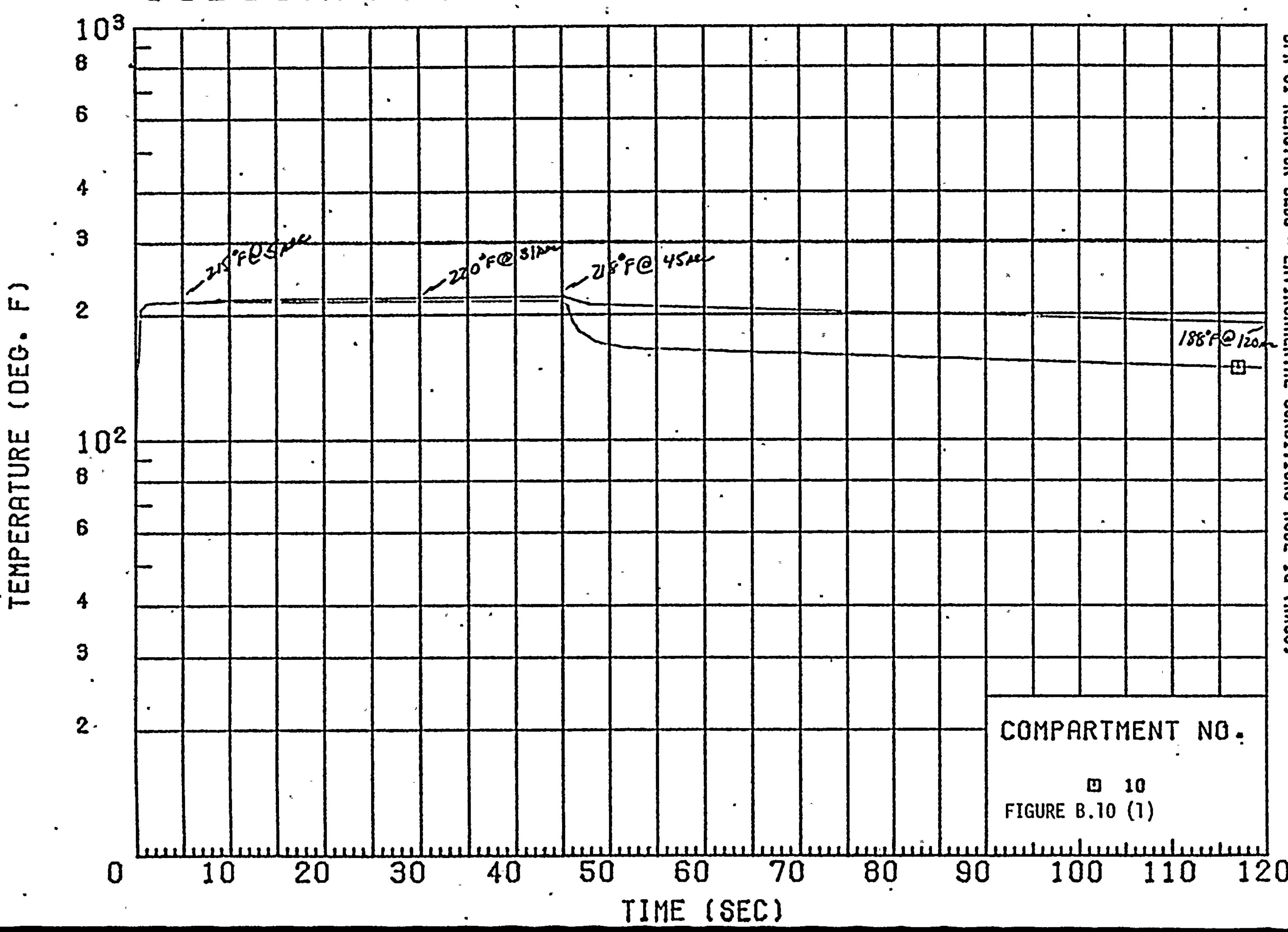


FIGURE B.10 (1)

SPA (REV. 2) NEG. TI NO.

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS HODE 1a (RHCU)

SUBCOMPARTMENT TEMPERATURE HISTORY

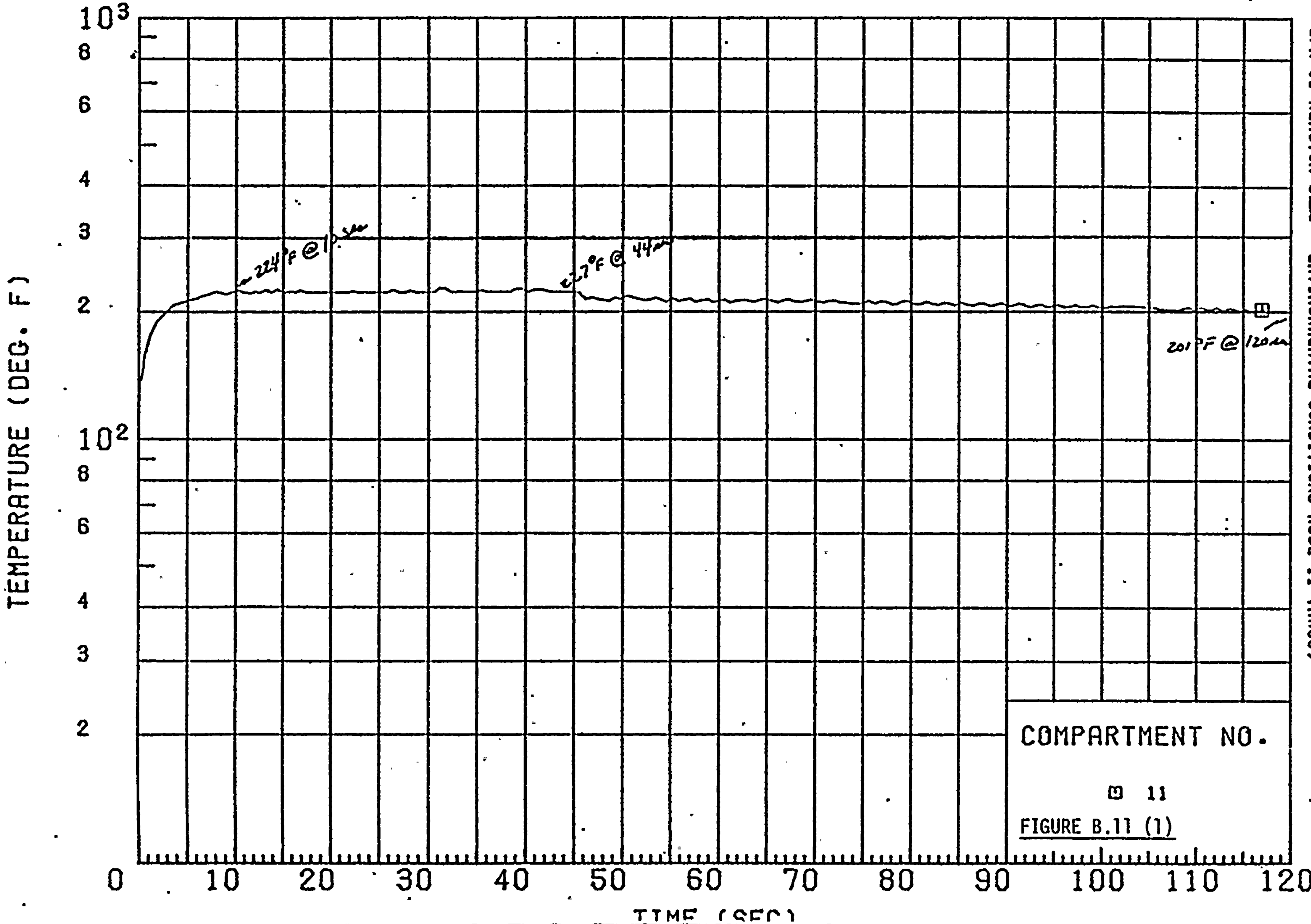


FIGURE B.11 (1)

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RWCU)

SFA (REV. 2)

NEG. TI NO.

SUBCOMPARTMENT TEMPERATURE HISTORY

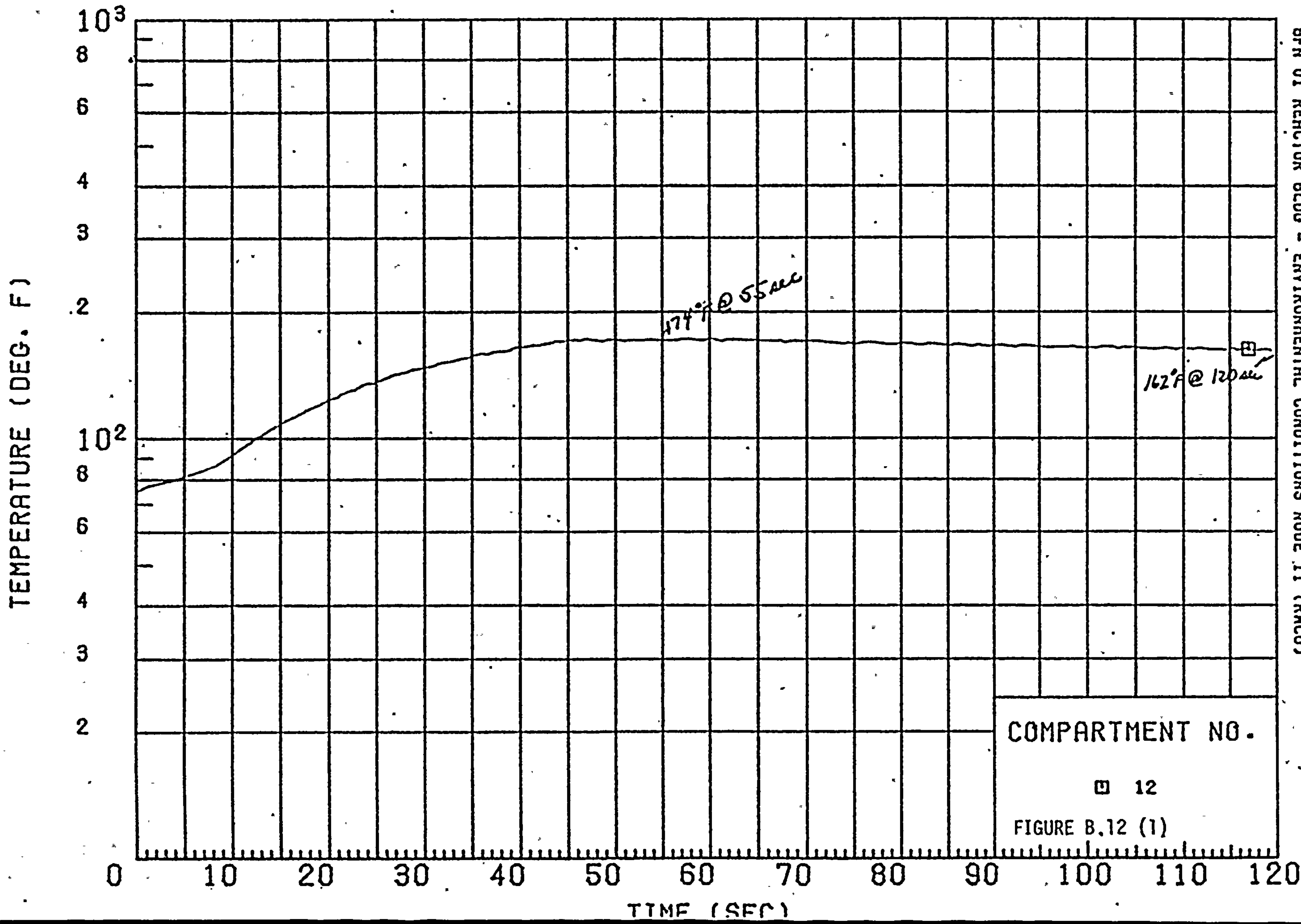


FIGURE B.12 (1)

SPA (REV. 2) NEG. TI NO.

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RWCU)

SUBCOMPARTMENT TEMPERATURE HISTORY

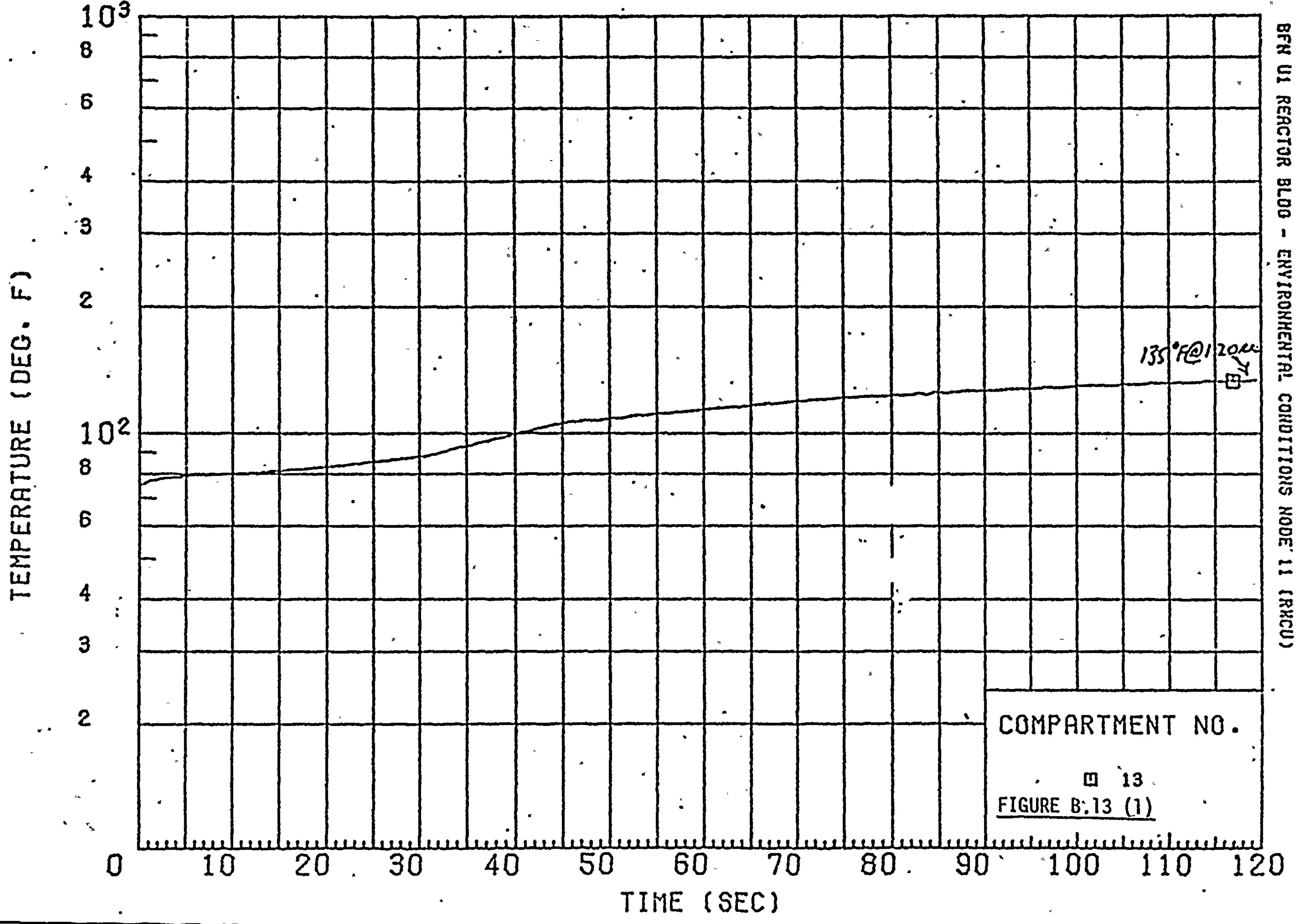


FIGURE B.13 (1)

SPA (REV. 2) NEG. TI NO.

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RXCU)

PAGE OF

SUBCOMPARTMENT TEMPERATURE HISTORY

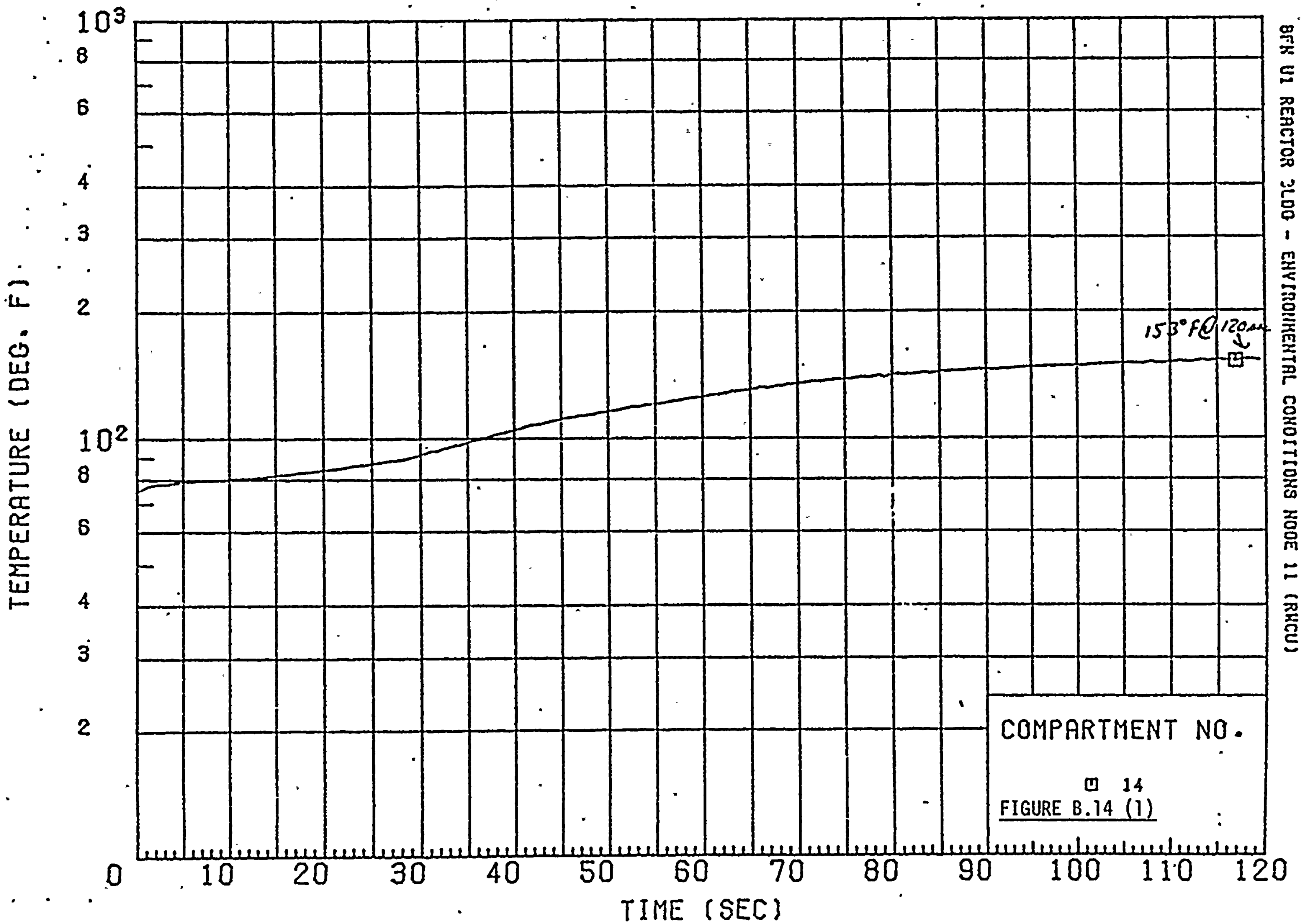


FIGURE B.14 (1)

BFN U1 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RWCU)

SPR (REV. 2) NEG. TI NO. PAGE OF

SUBCOMPARTMENT TEMPERATURE HISTORY

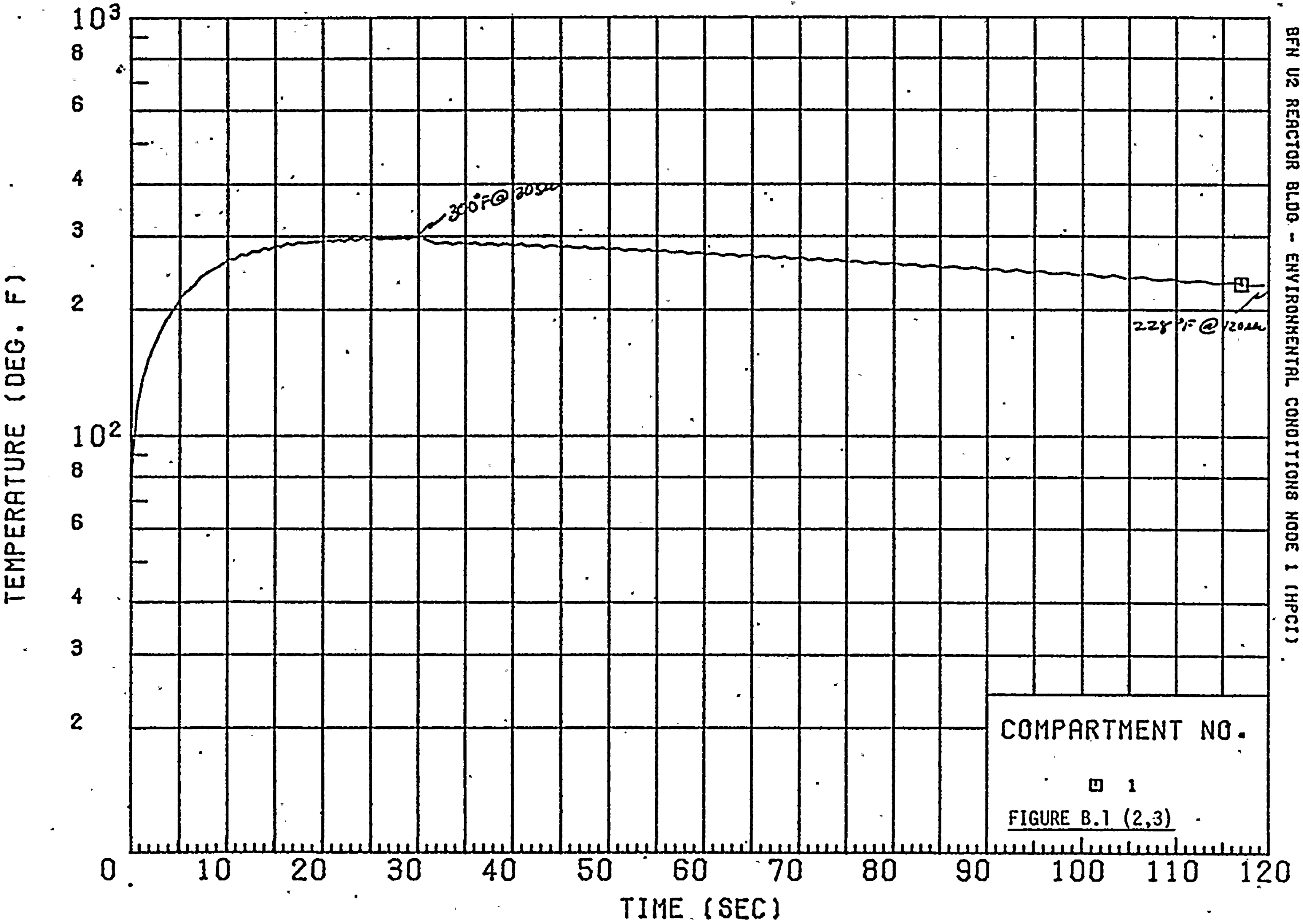


FIGURE B.1 (2,3)

SUBCOMPARTMENT TEMPERATURE HISTORY

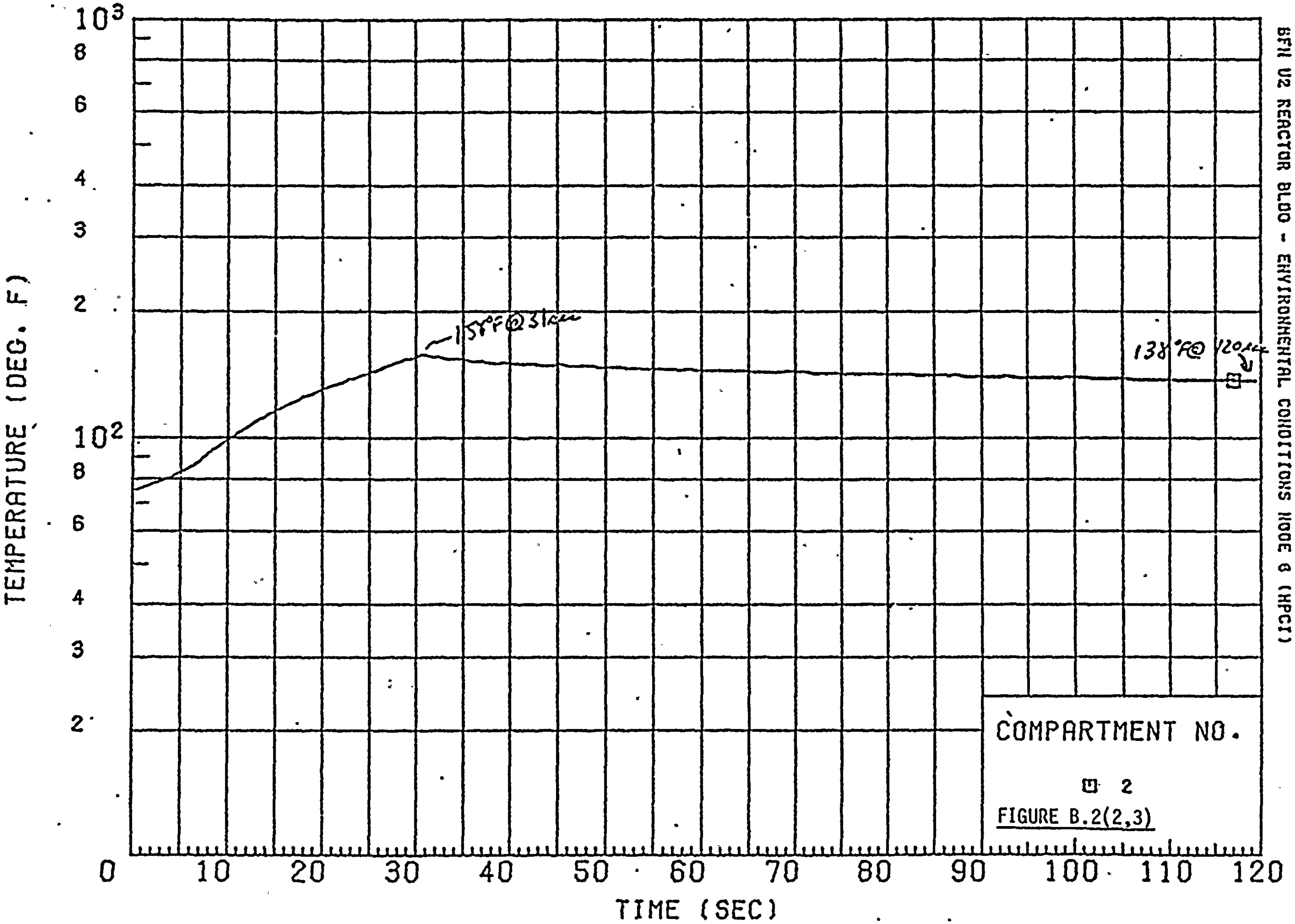
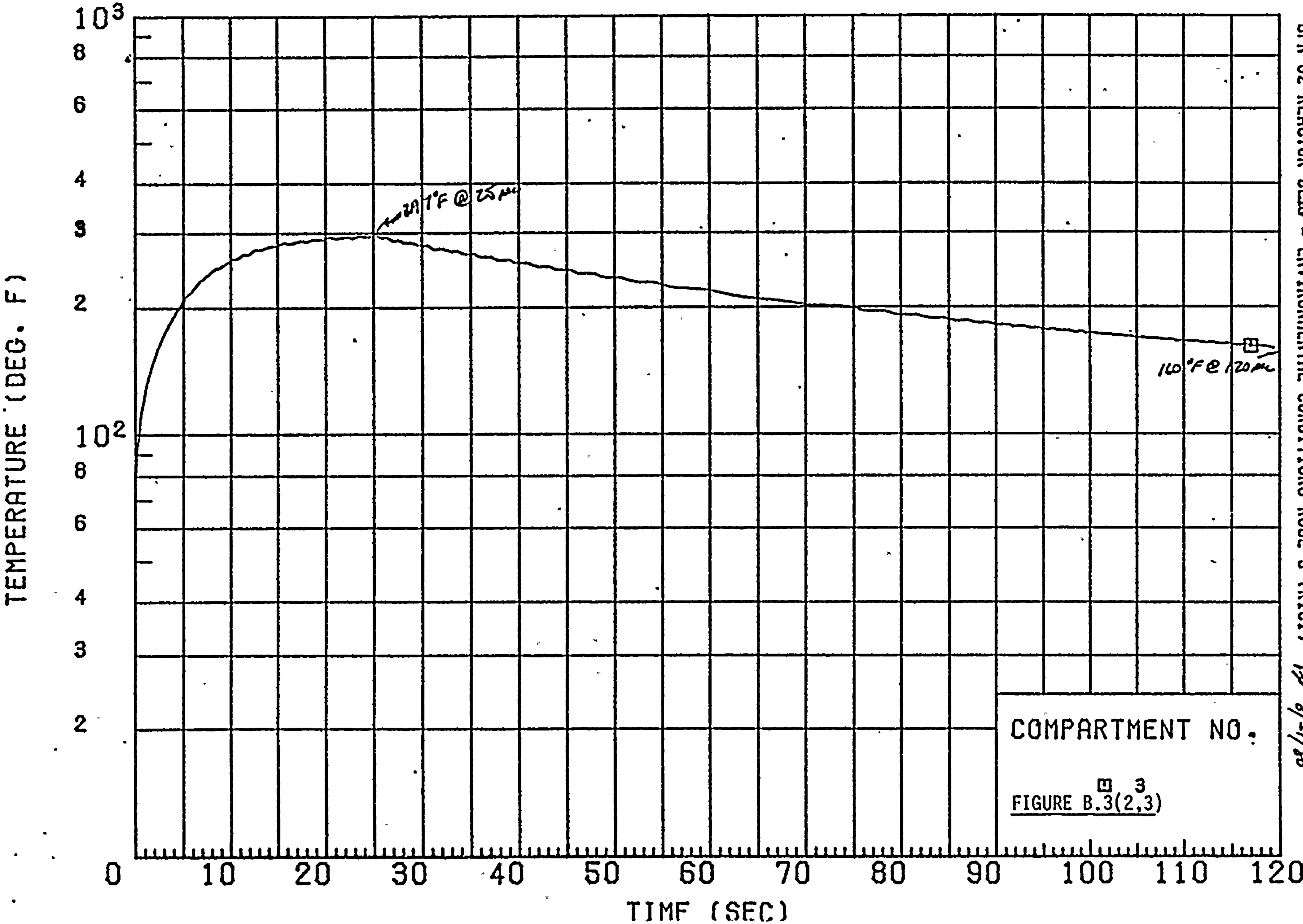


FIGURE B.2(2,3)

SPA (REV. 2) NEG. TI NO. PAGE OF

BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 6 (HPCI)

SUBCOMPARTMENT TEMPERATURE HISTORY

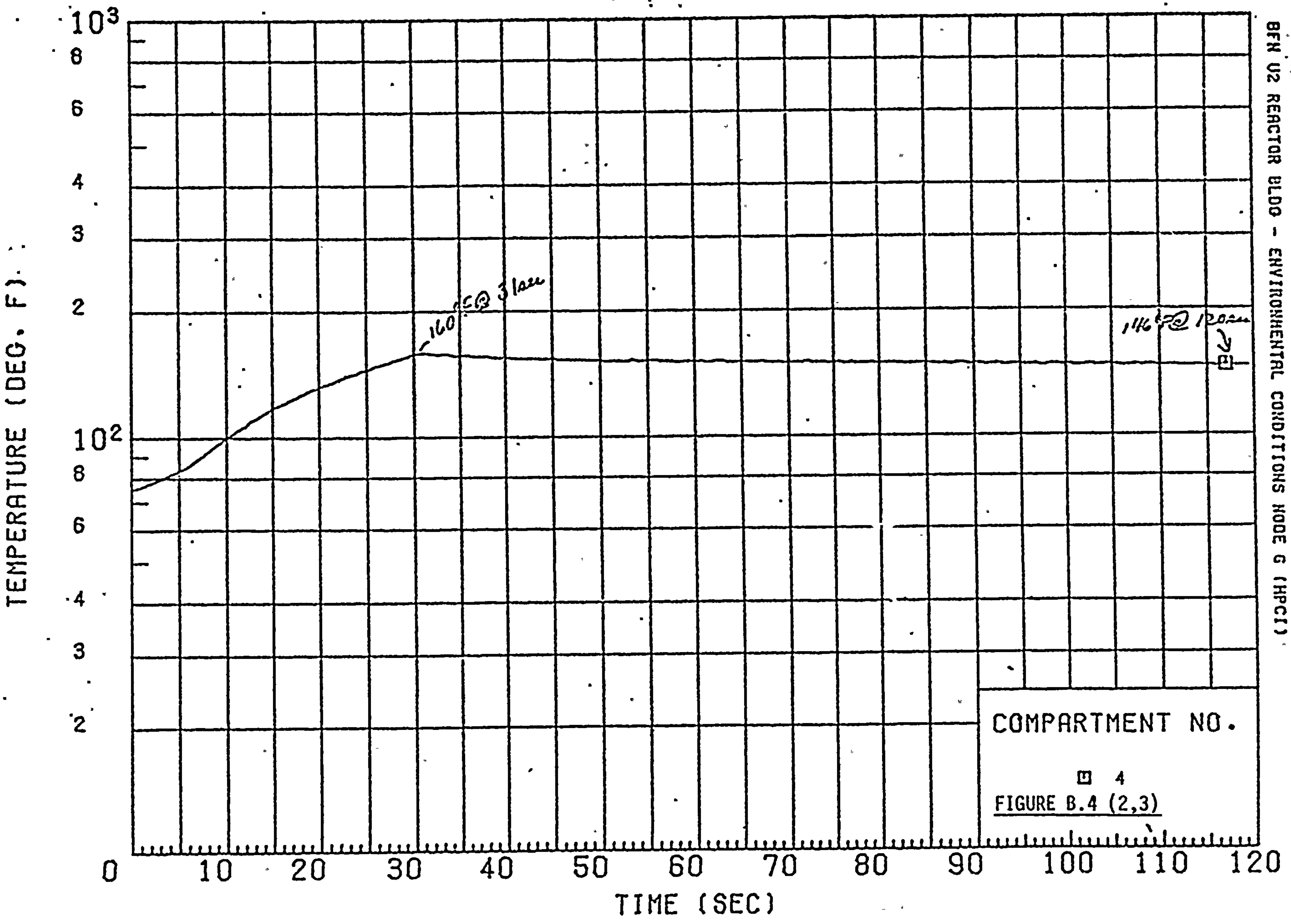


BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 3 (RICI)

SPA (REV. 2) NEG. TI NO.

PAGE OF

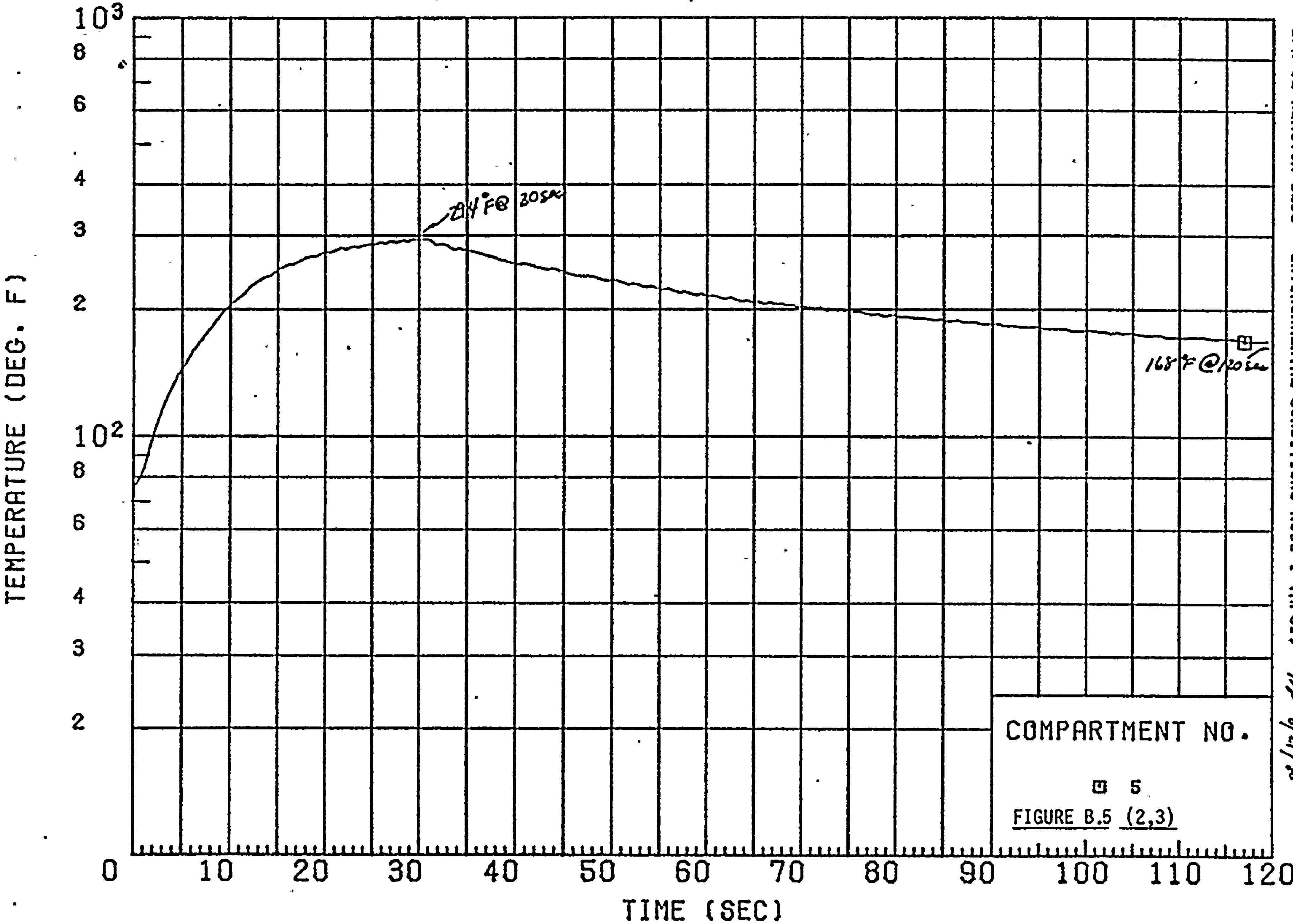
SUBCOMPARTMENT TEMPERATURE HISTORY



BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE G (HPCI)

SPA (REV. 2) NEG. TI NO. PAGE OF

SUBCOMPARTMENT TEMPERATURE HISTORY



BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 1 (HPCI)

SPA (REV. 2) REG. 11 NO. PAGE OF

BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 6 (HPCI)

SUBCOMPARTMENT TEMPERATURE HISTORY

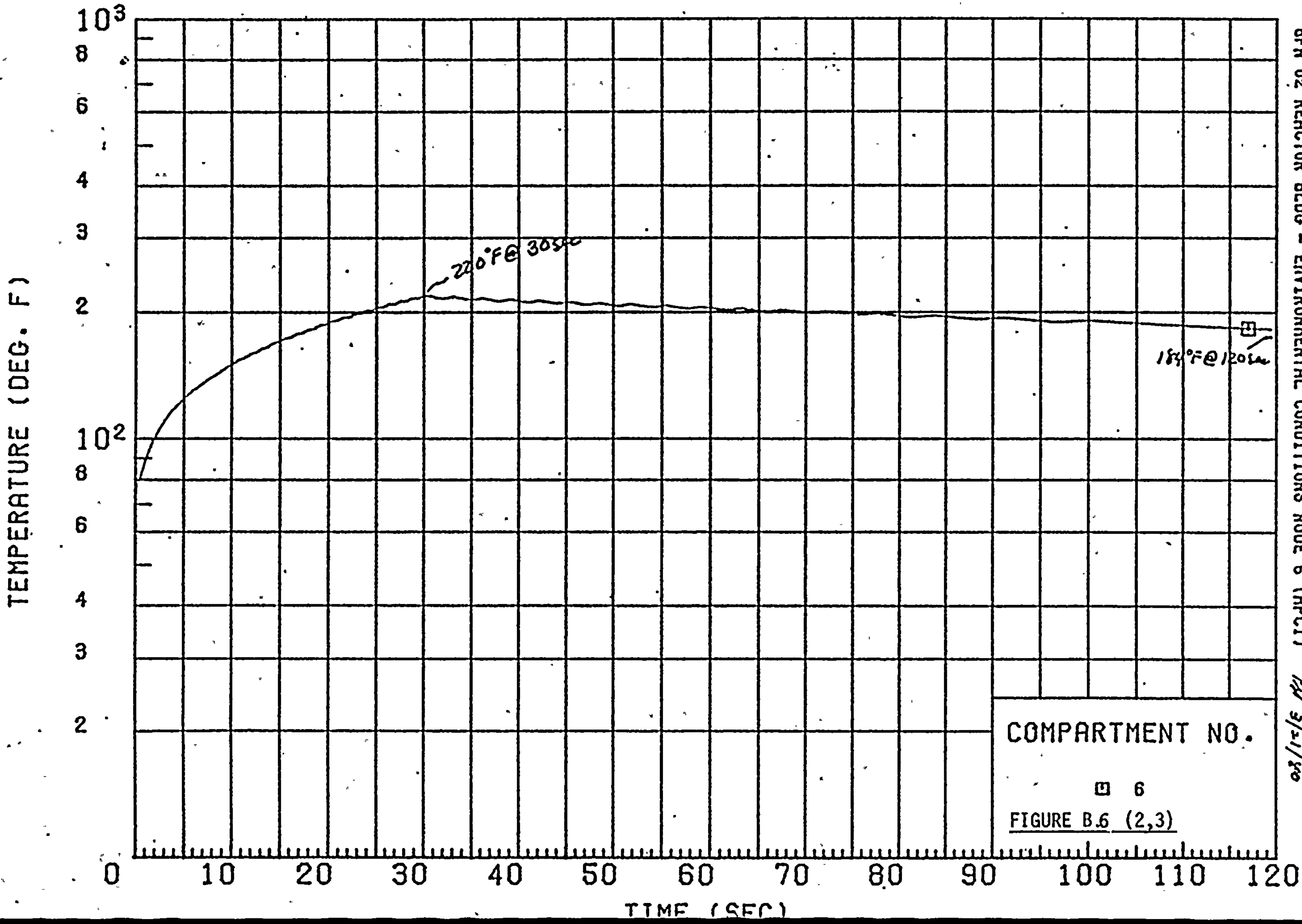


FIGURE B.6 (2,3)

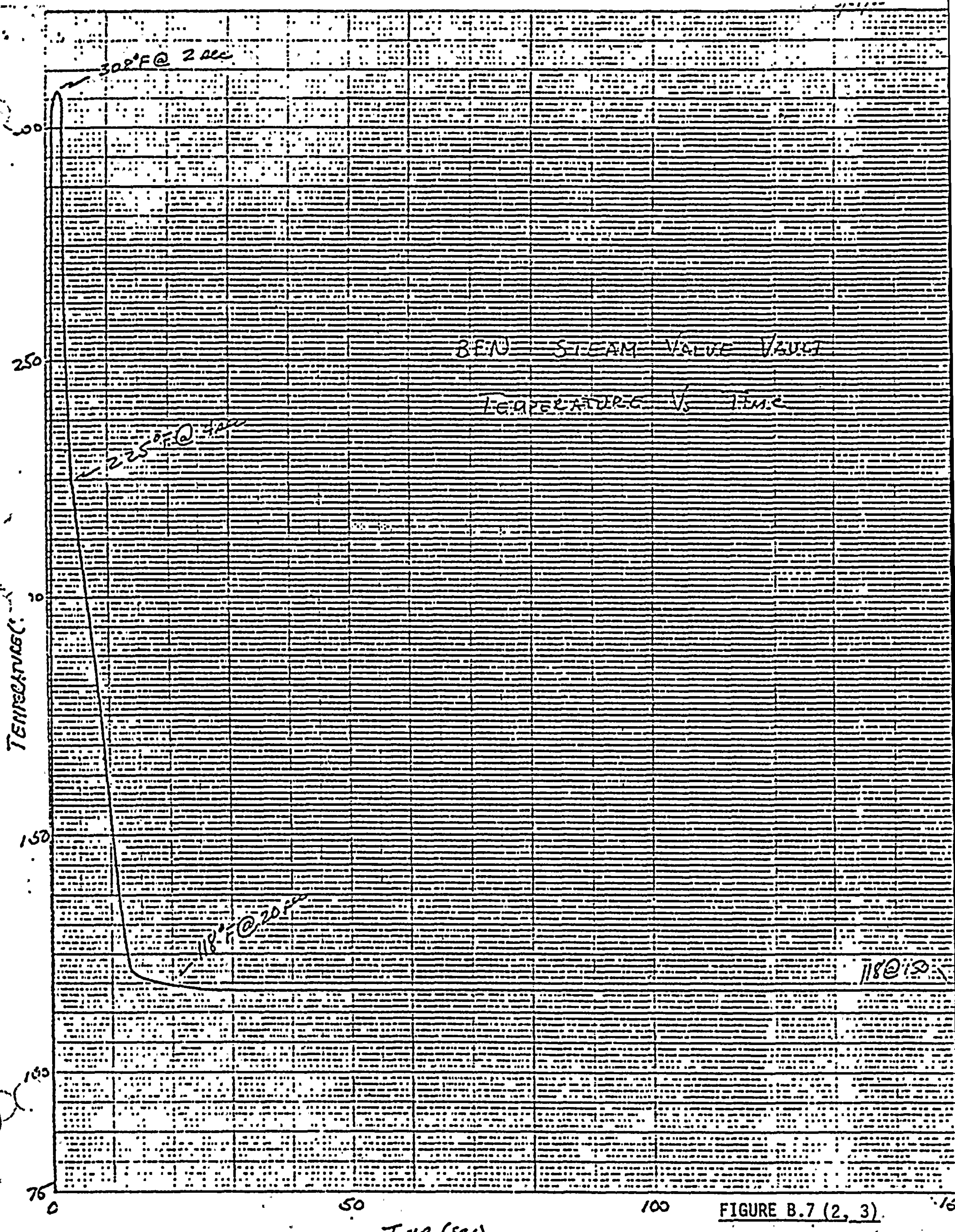
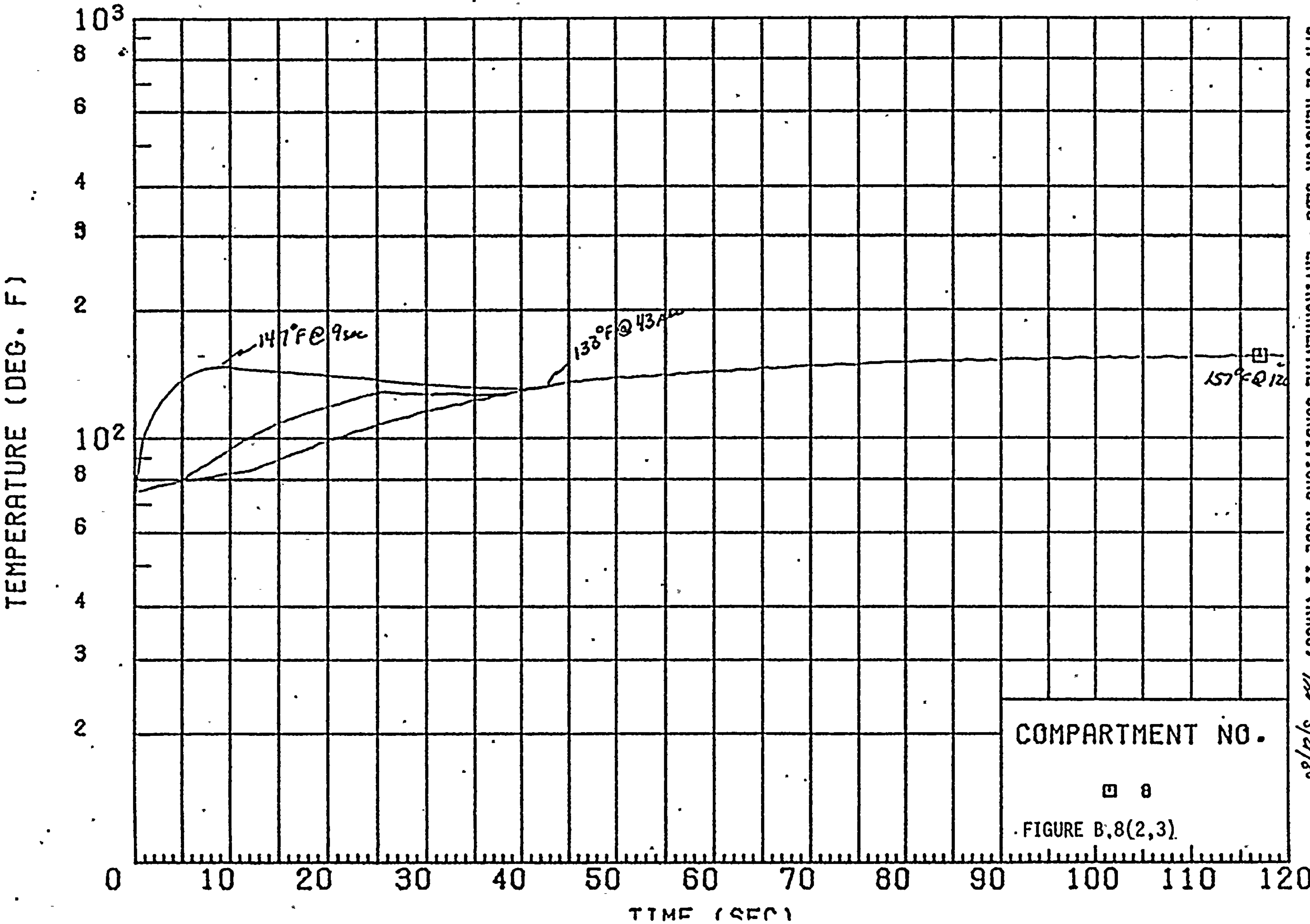

302°F @ 2 sec
300
BEN STEAM VALVE VAULT
TEMPERATURE Vs TIME
250
225°F @ 4 sec
TEMPERATURE (°F)
150
118°F @ 20 sec
118 @ 150
100
75
0
50
100
TIME (sec)

FIGURE B.7 (2, 3)

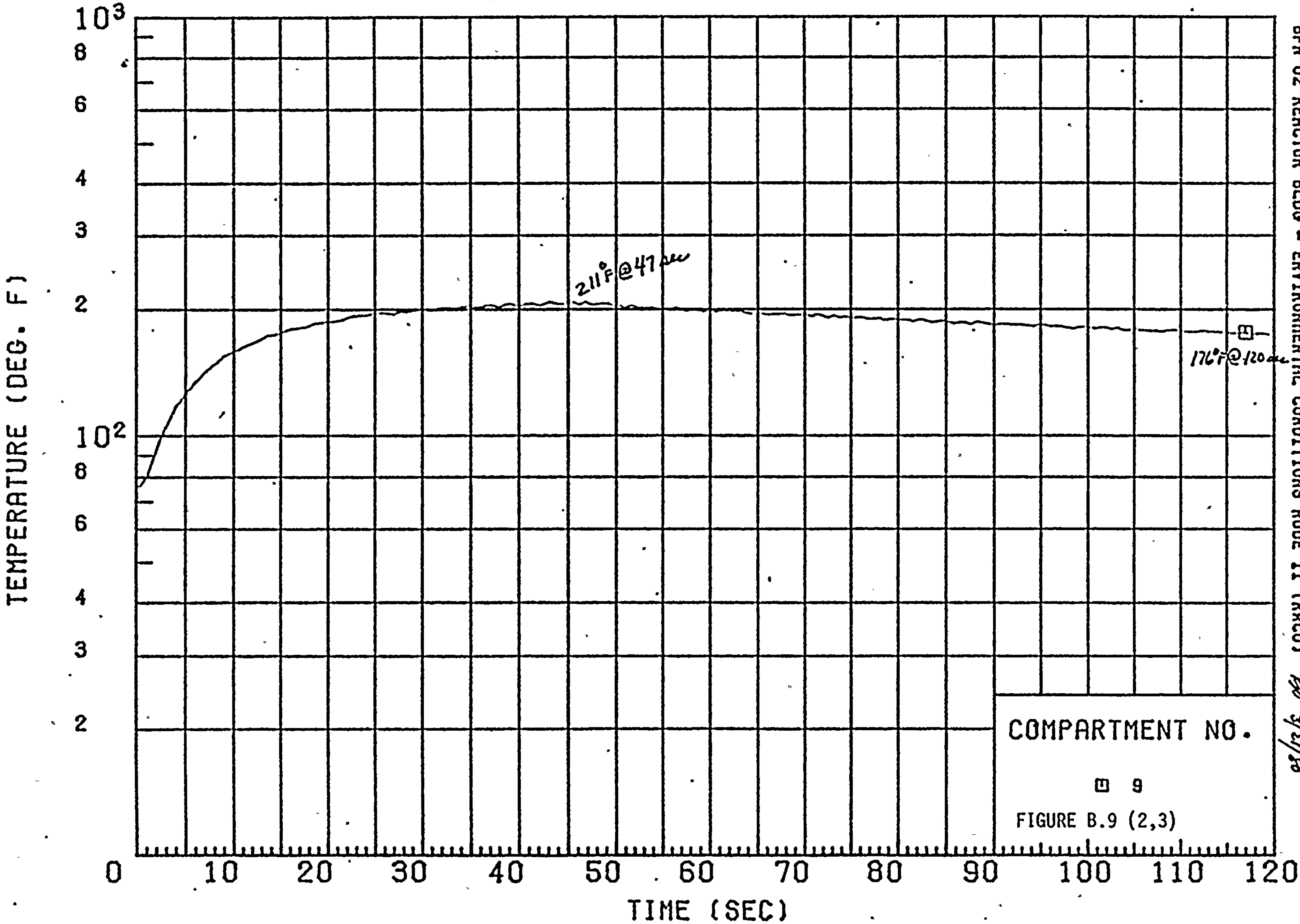
SUBCOMPARTMENT TEMPERATURE HISTORY



BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RHCU)

FIGURE B.8(2,3)

SUBCOMPARTMENT TEMPERATURE HISTORY



BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS MODE 11 (RXCU)

SUBCOMPARTMENT TEMPERATURE HISTORY

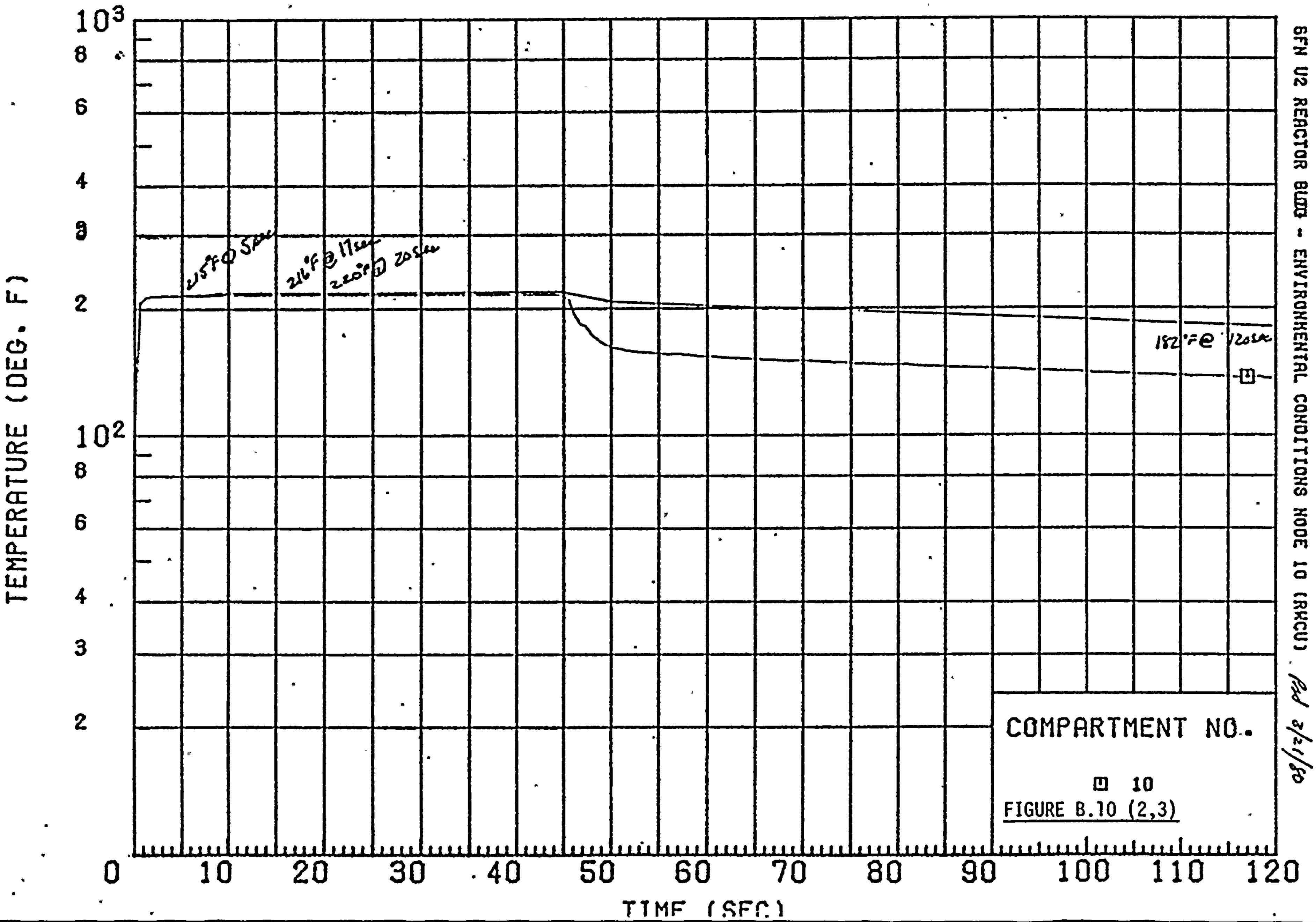
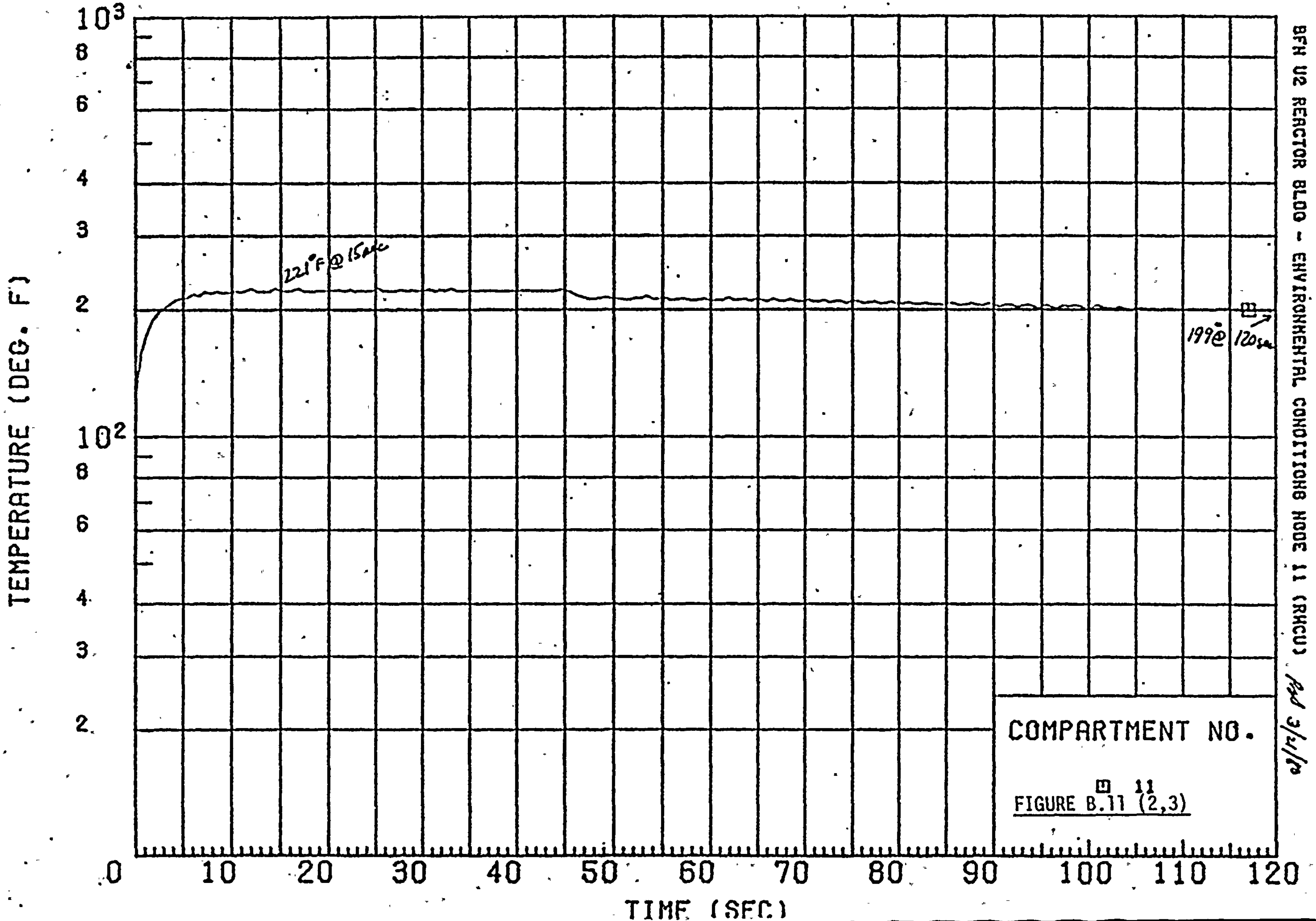


FIGURE B.10 (2,3)

SUBCOMPARTMENT TEMPERATURE HISTORY



SPA (REV. 2) NEG. TI NO. PAGE OF

BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RWCU)

SUBCOMPARTMENT TEMPERATURE HISTORY

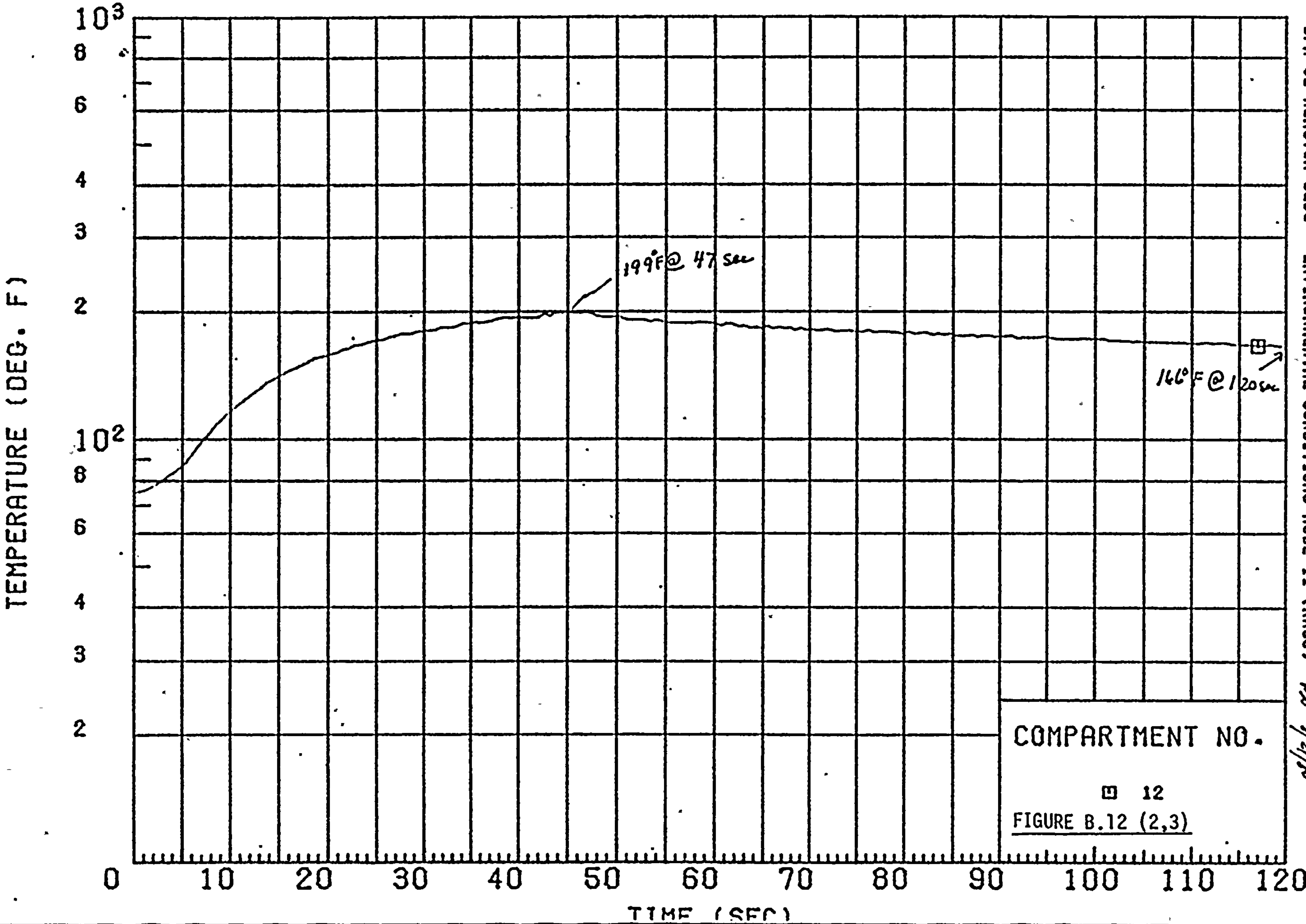


FIGURE B.12 (2,3)

BFN U2 REACTOR BLDG - ENVIRONMENTAL CONDITIONS NODE 11 (RHCU)

SPA (REV. 2) NEG. 11 NO. PAGE OF

SUBCOMPARTMENT TEMPERATURE HISTORY

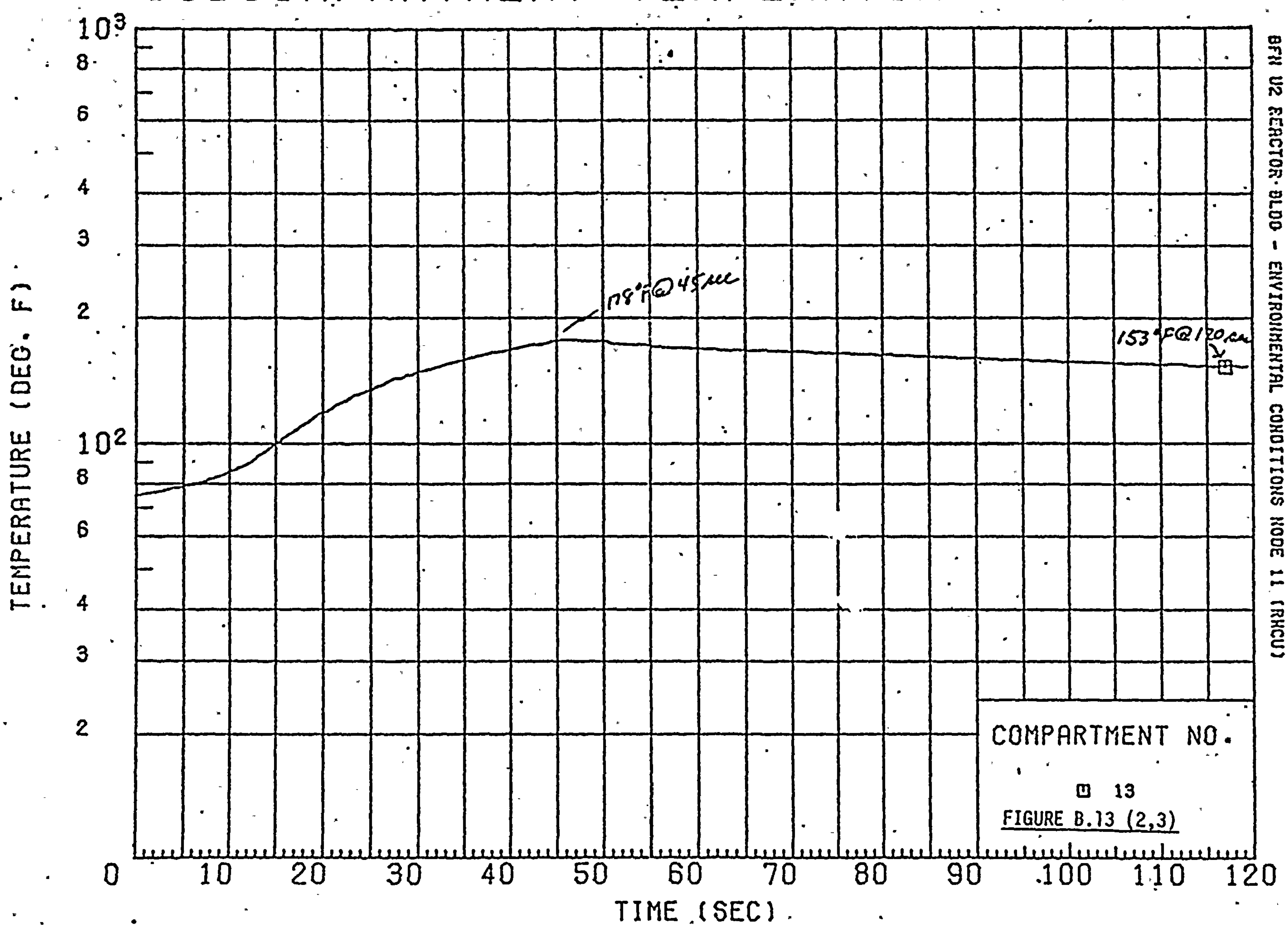


FIGURE B.13 (2,3)

APPENDIX C

EVALUATION WORK SHEETS AND

SUPPORTING INFORMATION

EWS Clarifications and Errata*

1. All information in the columns of all EWS's concerning aging except the Environmental Specification column are to be ignored unless a qualified life has been determined or a reference to an appendix is given. In all other cases, the generic position 4.1.2 was taken which requires further analysis, type test, or a replacement plan.

2. For all EWS written for Rooms "0 (Drywell) and "00" (Wetwell)", the flood level was specified as 552'. This flood level is applicable only for the drywell (Room 0) of the primary containment, whereas, for the torus portion [Room 00 (Wetwell)] the flood level for a EWS written for Room 00 should be ignored and 539' should be used instead.

*For clarification or errata associated with a particular group of EWS's (NEB, MEB, EEB, or EEB generic items), see the front of the indexes for that section.

BROWNS FERRY NUCLEAR PLANT

EVALUATION WORKSHEET INDEX

Sheet No.	Description
EEB-APS-0001	480V Shutdown Board Tfr TS3A - General Electric
-0002	480V Shutdown Board Tfr TS3B - General Electric
-0003	480V Shutdown Board Emer Tfr TS3E - General Electric
-0004	480V Reactor Mov MCC 3C - General Electric
-0005	480V Reactor Mov MCC 3D - International Switchboard Corp.
-0006	480V Reactor Mov MCC 3E - "
-0007	480V Reactor Mov MCC 1D - General Electric
-0008	480V Reactor Mov MCC 2D - "
-0009	480V Reactor Mov MCC 1E - International Switchboard Corp.
-0010	480V Reactor Mov MCC 2E - "
-0191	Motor Generator Sets (Louis Allis)
-0192	" " " " "
-0193	" " " " "
-0194	" " " " "
-0195	" " " " "
-0196	" " " " "
-0197	" " " " "
-0198	" " " " "
-0199	" " " " "
-0200	" " " " "
-0201	" " " " "
-0202	" " " " "
-0203	GE 4160V-480V Shutdown Transformer (TSIA)
-0204	(TSIB)
-0205	(TS2A)
-0206	(TS2B)
-0207	GE 4160V-480V Emergency Shutdown Transformer (TS1E)
-0208	(TS2E)
-0209	GE 480V Motor Control Center (MCC 1C)
-0210	(MCC 2C)

Facility: Browns Ferry Nuclear Plant
Unit: 3
Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. (3) EEB APS-0001
Revision 0
Date 10-22-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX Power Sys Plant ID No. TS3A	Operating Time	1 Year	None	(1)	None	None	Appendix 1&2 NCR No. BFNEEB8052R1
Component Transformer Manufacturer: General Electric	Temperature (°F)	Figure B.12 (2,3)	None	(4)	None	None	↓
Model Number: 11CH2L4	Pressure (PSIA)	Table B.1(1,2,3)	None	(4)	None	None	↓
Function: Power Distribution	Relative Humidity (%)	100 Max	None	(4)	None	None	↓
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 4160V - 480Volt Transformer	Radiation (RAD)	$3.1x10^4$	None	(4)	None	None	BFNEEB8052R1 Appendix 1&2
Location: EL 621, Rm 12	Aging	N/A	None	(2)	None	None	↓
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1. in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. Sieler
Reviewed by: D.R. Webster
QA Acceptance: John F. Frew 10/27/80

EN DES CALCULATIONS

EEB APS-0001
Appendix 1-R0

TITLE		UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation		APS	BFN/3
			SAR SECTION(S) N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS	R1		
N/A	NCR No. BFNEEB8052R1	R2		
KEY NOUNS		R3		
Environmental Qualification				

REV	R0	R1	R2	R3
DATE				
PREPARED	Larry D. Giesler			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES* ADDED BY THIS REV:				
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STATEMENT OF PROBLEM

Qualification documentation for the Class 1E 4160V-480V shutdown board transformer TS3A has not been located for the temperature, humidity, pressure, radiation, aging and operating time.

ABSTRACT

GE submitted test reports for this transformer indicating that it had passed a normal leak test of 5 psi pressure held for a period of 24 hours. Therefore, we can reasonably assume that if the transformer can withstand 5 psi internal pressure, then it can also withstand an equal outside pressure. Also, GE certified that this transformer meets ANSI C57.12-1965 which permits a maximum temperature for Class A insulation of 250°C for short-circuit conditions. Relative humidity will not affect the operation of this transformer because it is sealed and filled with Pyranol insulating liquid. Usual nuclear radiation service conditions allow up to $1x10^5$ rads total integrated 40 years dosage. Therefore, we find that this Class 1E 4160V-480V shutdown board transformer TS3A is qualified for continued operation until confirmation of the above is obtained from the vendor including aging and operating time.

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8052R1.

2. TVA letter of October 10, 1980 (EEB 801010 915), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry W. Gisler

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 3
Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS-0002
Revision 0
Date 10-22-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX Power Sys Plant ID No. TS3B	Operating Time	1 Year	None	(1)	None	None	Appendix 1&2 NCR NO. BFNEEB8052R1
Component Transformer Manufacturer: General Electric	Temperature (°F)	Figure B.12 (2,3)	None	(4)	None	None	↓
Model Number: 11CH2L4	Pressure (PSIA)	Table B.1(1,2,3)	None	(4)	None	None	↓
Function: Power Distribution	Relative Humidity (%)	100-Max	None	(4)	None	None	↓
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 4160V-480V Transformer	Radiation (RAD)	3.1×10^4	None	(4)	None	None	BFNEEB8052R1 Appendix 1&2
Location: EL 621, Rm 12	Aging	N/A	None	(2)	None	None	↓
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1. in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. Bieder
Reviewed by: D.R. Webster
QA Acceptance: John F. [illegible] 10/27/80

EN DES CALCULATIONS

EEB APS-0002
Appendix 1-R0

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation	APS	BFN/3
		SAR SECTION(S): N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No. BFNEEB8052 R1	R1		
		R2		
KEY NOUNS: Environmental Qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	Larry D. Biede			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
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STATEMENT OF PROBLEM

Qualification documentation for the Class 1E 4160V-480V shutdown board transformer TS3B has not been located for the temperature, humidity, pressure, radiation, aging and operating time.

ABSTRACT

GE submitted test reports for this transformer indicating that it had passed a normal leak test of 5 psi pressure held for a period of 24 hours. Therefore, we can reasonably assume that if the transformer can withstand 5 psi internal pressure, then it can also withstand an equal outside pressure. Also, GE certified that this transformer meets ANSI C57.12-1965 which permits a maximum temperature for Class A insulation of 250°C for short-circuit conditions. Relative humidity will not affect the operation of this transformer because it is sealed and filled with Pyranol insulating liquid. Usual nuclear radiation service conditions allow up to 1×10^5 rads total integrated 40 years dosage. Therefore, we find that this Class 1E 4160V-480V shutdown board transformer TS3B is qualified for continued operation until confirmation of the above is obtained from the vendor including aging and operating time.

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8052R1.

2. TVA letter of October 10, 1980 (EEB 801010 915), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Geisler

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 3
Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. (3) EEB APS-0003
Revision 0
Date 10-22-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX Power Sys Plant ID No. TS3E	Operating Time	1 Year	None	(1)	None	None	Appendix 1&2 NCR No. BFNEEB8017 R1
Component Transformer Manufacturer: General Electric	Temperature (°F)	Figure B.13(2,3)	None	(4)	None	None	
Model Number: 11CH2L4	Pressure (PSIA)	Table B.1(1,2,3)	None	(4)	None	None	
Function: Power Distribution	Relative Humidity (%)	100-Max	None	(4)	None	None	
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 4160V-480V Transformer	Radiation (RAD)	3.1×10^4	None	(4)	None	None	BFNEEB8017R1 Appendix 1&2
Location: EL 639, Rm 13	Aging	N/A	None	(2)	None	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1. in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. Bixler
Reviewed by: D.R. Webster
QA Acceptance: John F. [illegible]
10/27/80

EN DES CALCULATIONS

EEB APS-0003
Appendix 1-R0

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation	APS	BFN/3
		SAR SECTION(S) N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS - N/A	BRANCH/PROJECT IDENTIFIERS NCR No. BFNEEB8017R1	R1		
		R2		
KEY NOUNS Environmental Qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	Larry D. Buile			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES* ADDED BY THIS REV:				
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STATEMENT OF PROBLEM

Qualification documentation for the Class 1E 4160V-480V shutdown board emergency transformer TS3E has not been located for the temperature, humidity, pressure, radiation, aging and operating time.

ABSTRACT

GE submitted test reports for this transformer indicating that it had passed a normal leak test of 5 psi pressure held for a period of 24 hours. Therefore, we can reasonably assume that if the transformer can withstand 5 psi internal pressure, then it can also withstand an equal outside pressure. Also, GE certified that this transformer meets ANSI C57.12-1965 which permits a maximum temperature for Class A insulation of 250^{o}C for short-circuit conditions. Relative humidity will not affect the operation of this transformer because it is sealed and filled with Pyranol insulating liquid. Usual nuclear radiation service conditions allow up to 1x10^{5} rads total integrated 40 years dosage. Therefore, we find that this Class 1E 4160V-480V shutdown board emergency transformer TS3E is qualified for continued operation until confirmation of the above is obtained from the vendor including aging and operating time.

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8017R1.

2. TVA letter of October 10, 1980 (EEB 801010 915), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Giesler

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 3
Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS-0004
Revision 0
Date 10-22-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX Power Sys Plant ID No. 480V Reactor MOV BD 3C Component 480V Motor Control Center (MCC)	Operating Time	1 Year	None	(1)	None	None	Appendix 1&2 NCR No. BFNEEB8019R1
Manufacturer: General Electric	Temperature (°F)	Figure B.8(2,3)	None	(4)	None	None	
Model Number: 7700.Series	Pressure (PSIA)	Table B.1(1,2,3)	None	(4)	None	None	
Function: 480V Motor Control	Relative Humidity (%)	100-Max	None	(4)	None	None	
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V Motive and control power distribution	Radiation (RAD)	$5.1x10^5$	None	(4)	None	None	BFNEEB8019R1 Appendix 1&2
Location: EL 565, Rm 8	Aging	N/A	None	(2)	None	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1. in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. Dinler
Reviewed by: D.R. Kelster
QA Acceptance: John T. French 10/27/80

EN DES CALCULATIONS

EEB APS-0004
Appendix 1-R0

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for continued operation	APS	BFN/3
		SAR SECTION(S) N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS	R1		
N/A	NCR No. BFNEEB8019 R1	R2		
KEY NOUNS: Environmental Qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	Larry D. Gisele			
CHECKED	R.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES* ADDED BY THIS REV:				
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STATEMENT OF PROBLEM

Qualification documentation for the 480V Reactor MOV MCC 3C has not been located for pressure, aging, and operation time. Other qualification awaits confirmation by GE of similarity to later contracts and TVA approval of qualification report for current contract.

ABSTRACT

There is evidence that all GE motor control centers provided for Browns Ferry, Hartsville and Phipps Bend Nuclear Plants contain identical components. GE's letter of September 26, 1980 (EEB 801009 050), provided their "IC 7700 Motor Control Center Environmental Qualification Test Report to IEEE 323-1974" for Hartsville and Phipps Bend Nuclear Plants (contract 77K5-820350). This report provides adequate qualification for the temperature, humidity, and radiation service conditions. GE is now scheduling a test to prove that the 7700 series MCC including pneumatic timing relays meet the pressure service conditions. Because the accuracy of the pneumatic timing relays may be affected only during a tornado depressurization event which last at most approximately 5 seconds and a vendor test is now being scheduled to confirm pressure qualification, the Class 1E Reactor MOV MCC 3C is justified for continued operation, based on similarity including aging and operating time.

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8019R1.

2. TVA letter of October 2, 1980 (EEB 801002 915), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Giesler

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 3
Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS-0005
Revision 0
Date 10-22-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX Power Sys Plant ID No. 480V Reactor MOV BD 3D Component 480V Motor Control Center (MCC)	Operating Time	1 Year	None	(1)	None	None	Appendix 1&2 NCR No. BFNEEB8020R1
Manufacturer: International Switchboard Corporation	Temperature (°F)	Figure B.9(2,3)	None	(4)	None	None	
Model Number: N/A	Pressure (PSIA)	Table B.1(1,2,3)	None	(4)	None	None	
Function: 480V Motor Control	Relative Humidity (%)	100-Max	None	(4)	None	None	
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V Motive and control power distribution	Radiation (RAD)	2.1×10^5	None	(4)	None	None	BFNEEB8020R1 Appendix 1&2
Location: EL 593, Rm 9	Aging	N/A	None	(2)	None	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1. in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. Dieck
Reviewed by: C.R. Webster
QA Acceptance: John F. French 10/27/80

EN DES CALCULATIONS

EEB APS-0005
Appendix 1-R0

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation	APS	BFN/3 — SAR SECTION(S) N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No. BFNEEB8020R1	R1		
		R2		
KEY NOUNS: Environmental Qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	Larry D. Guste			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES* ADDED BY THIS REV:				
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STATEMENT OF PROBLEM

Qualification documentation for the 480V Reactor MOV MCC 3D has not been located for the temperature, humidity, pressure radiation, aging, and operating time.

ABSTRACT

References: 1. GE letter to TVA dated September 26, 1980 (EEB 801009 050), with "IC7700 Motor Control Center Environmental Qualification Test Report to IEEE-323-1974". (Contract 77K5-820350 for Hartsville and Phipps Bend Nuclear Plants).

2. GE (NED) letter to TVA dated February 5, 1980 (NEB 800205 117), with Gould-Brown Boveri "Class 1E Electrical Equipment Qualification Summary Report No. 33-52449 QS - Secondary Unit Substation: for IEEE-323-1974. (Contract 77K3-820181 for Hartsville and Phipps Bend Nuclear Plants).

We have compared the Bill of Material provided by International Switchboard Corporation for the 480 volt Reactor MOV MCC 3D with the material list of equipment provided for Hartsville and Phipps Bend Nuclear Plants and find that most of the equipment provided by ISC is similar to that qualified by Reference 1 and 2 for similar service conditions. International Switchboard Corporation is now providing TVA with a quotation for providing the qualification documentation. We find that the Class 1E Reactor MOV MCC 3D is justified for continued operation based on similarity including aging and operating time.

EEB APS-0005
Appendix 2-RO

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8020R1.

2. TVA letter of October 2, 1980 (EEB 801002 916), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Giesler

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 3
Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS-0006
Revision 0
Date 10-22-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX Power Sys Plant ID No. 480V Reactor MOV BD 3E	Operating Time	1 Year	None	(1)	None	None	Appendix 1&2 NCR NO. BFNEEB8020R1
Component 480V Motor Control Center (MCC) Manufacturer: International Switchboard Corporation	Temperature (°F)	Figure B.12(2,3)	None	(4)	None	None	
Model Number: N/A	Pressure (PSIA)	Table B.1(1,2,3)	None	(4)	None	None	
Function: 480V Motor Control	Relative Humidity (%)	100-Max	None	(4)	None	None	
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V Motive and Control Power Distribution	Radiation (RAD)	$3.1x10^4$	None	(4)	None	None	BFNEEB8020R1 Appendix 1&2
Location: EL 621, RM 12	Aging	N/A	None	(2)	None	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1. in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. Greda
Reviewed by: D.R. Webster
QA Acceptance: John F. Freud 10/27/80

EN DES CALCULATIONS

EEB APS-0006
Appendix 1-R0

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation	APS	BFN/3
		SAR SECTION(S) N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No. BFNEEB8020R1	R1		
		R2		
KEY NOUNS: Environmental Qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	Larry D. Geisler			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES* ADDED BY THIS REV:				
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STATEMENT OF PROBLEM

Qualification documentation for the 480 volt Reactor MOV MCC 3E has not been located for the temperature, humidity, pressure, radiation, aging, and operating time.

ABSTRACT

References:

1. GE letter to TVA dated September 26, 1980 (EEB 801009 050), with "IC7700 Motor Control Center Environmental Qualification Test Report to IEEE-323-1974. (Contract 77K5-820350 for Hartsville and Phipps Bend Nuclear Plants).

2. GE (NED) letter to TVA dated February 5, 1980 (NEB 800205 117), with Gould-Brown Boveri's "Class 1E Electrical Equipment Qualification Summary Report No. 33-52449 QS - Secondary Unit Substation" for IEEE 323-1974. (Contract 77K3-820181 for Hartsville and Phipps Bend Nuclear Plants).

We have compared the Bill of Material provided by International Switchboard Corporation for the 480 volt Reactor MOV MCC 3E with the material list of equipment provided for Hartsville and Phipps Bend Nuclear Plants and find that most of the equipment provided by ISC is similar to that qualified by Reference 1 and 2 for similar service conditions. International Switchboard Corporation is now providing TVA with a quotation for providing the qualification documentation. We find that the Class 1E Reactor MOV MCC 3E is justified for continued operation based on similarity, including aging and operating time.

EEB APS-0006
Appendix 2-RO

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8020R1.

2. TVA letter of October 2, 1980 (EEB 801002 916), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursing with the vendor whether the materials used in the equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Geisler

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 1
Docket: 50-259

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. (3) EEB APS-0007
Revision 0
Date 10-22-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX Power Sys Plant ID No. 480V Reactor MOV BD 1D	Operating Time	1 Year	None	(1)	None	None	Appendix 1&2 NCR No. BFNEEB8022R1
Component 480V Motor Control Center (MCC) Manufacturer: General Electric	Temperature (°F)	Figure B.9(1)	None	(4)	None	None	
Model Number: 7700 Series	Pressure (PSIA)	Table B.1(1,2,3)	None	(4)	None	None	
Function: 480V Motor Control	Relative Humidity (%)	100-Max	None	(4)	None	None	
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V Motive and Control Power Distribution	Radiation (RAD)	2.1×10^5	None	(4)	None	None	BFNEEB8022 R1 Appendix 1&2
Location: EL. 593, Rm 9	Aging	N/A	None	(2)	None	None	[illegible]
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1. in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. [illegible]
Reviewed by: D.R. Webster
QA Acceptance: John T. [illegible]
10/27/80

EN DES CALCULATIONS

EEB APS-0007
Appendix 1-RO

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation	APS	BFN/1
		SAR SECTION(S) N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No. BFNEEB8022 R1	R1		
		R2		
KEY NOUNS: Environmental Qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	Larry D. Buile			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES * ADDED BY THIS REV:				
LIST ALL PAGES * DELETED BY THIS REV:				
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STATEMENT OF PROBLEM

Qualification documentation for the 480 volt Reactor MOV MCC 1D has not been located for pressure, aging, and operating time. Other qualification awaits confirmation by GE of similarity to later contracts and TVA approval of qualification report for current contract.

ABSTRACT

There is evidence that all GE motor control centers provided for Browns Ferry, Hartsville and Phipps Bend Nuclear Plants contain identical components. GE's letter of September 26, 1980 (EEB 801009 050), provided their "IC7700 Motor Control Center Environmental Qualification Test Report to IEEE 323-1974" for Hartsville and Phipps Bend Nuclear Plants (contract 77K5-820350). This report provides adequate qualification for the temperature, humidity and radiation service conditions. GE is now scheduling a test to prove that the 7700 series MCC including pneumatic timing relays meet the pressure service conditions. Because the accuracy of the pneumatic timing relays may be affected only during a tornado depressurization event which last at most approximately 5 seconds and a vendor test is now being scheduled to confirm pressure qualification, the Class 1E Reactor MOV MCC 1D is justified for continued operation based on similarity, including aging and operating time.

TVA 10697 (ENDES-7-78) *Use revision log (form TVA 10534) if more room is required

EEB APS-0007
Appendix 2-RO

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8022RI.

2. TVA letter of October 2, 1980 (EEB 801002 913), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Diaz

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 2
Docket: 50-260

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS-0008
Revision 0
Date 10-22-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX Power Sys Plant ID No. 480V Reactor MOV BD 2D	Operating Time	1 Year	None	(1)	None	None	Appendix 1&2 NCR. No. BFNEEB8022R1
Component 480V Motor Control Center (MCC) Manufacturer: General Electric	Temperature (°F)	Figure B.9(2,3)	None	(4)	None	None	
Model Number: 7700 Series	Pressure (PSIA)	Table B.1(1,2,3)	None	(4)	None	None	[illegible]
Function: 480V Motor Control	Relative Humidity (%)	100-Max	None	(4)	None	None	
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V Motive and Control Power Distribution	Radiation (RAD)	2.1×10^5	None	(4)	None	None	BFNEEB8022 R1 Appendix 1&2
Location: EL 593, Rm 9	Aging	N/A	None	(2)	None	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1. in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. Smith
Reviewed by: D.R. Webster
QA Acceptance: John F. [illegible]
10/27/80

EN DES CALCULATIONS

EEB APS-0008
Appendix 1-R0

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation	APS	BFN/2
		SAR SECTION(S) N/A

PREPARING ORGANIZATION
EN DES - EEB

APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS
N/A	NCR No. BFNEEB8022R1

KEY NOUNS
Environmental Qualification

REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
R0		
R1		
R2		
R3		

REV	R0	R1	R2	R3
DATE				
PREPARED				
CHECKED				
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES * ADDED BY THIS REV:				
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STATEMENT OF PROBLEM

Qualification documentation for the 480 volt Reactor MOV MCC 2D has not been located for the pressure, aging, and operating time. Other qualification awaits confirmation by GE of similarity to later contracts and TVA approval of qualification report for current contract.

ABSTRACT

There is evidence that all GE motor control centers provided for Browns Ferry, Hartsville and Phipps Bend Nuclear Plants contain identical components. GE's letter of September 26, 1980 (EEB 801009 050), provided their "IC7700 Motor Control Center Environmental Qualification Test Report to IEEE 323-1974" for Hartsville and Phipps Bend Nuclear Plants (contract 77K5-820350). This report provides adequate qualification for the temperature, humidity and radiation service conditions. GE is now scheduling a test to prove that the 7700 series MCC including pneumatic timing relays meet the pressure service conditions. Because the accuracy of the pneumatic timing relays may be affected only during a tornado depressurization event which last at most approximately 5 seconds and a vendor test is now being scheduled to confirm pressure qualification, the Class 1E Reactor MOV MCC 2D is justified for continued operation based on similarity, including aging and operating time.

EEB APS-0008
Appendix 2-RO

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8022R1.

2. TVA letter of October 2, 1980 (EEB 801002 913), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Guster

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 1
Docket: 50-259

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. EEB APS-0009 (3)
Revision 0
Date 10-22-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX Power Sys Plant ID No. 480V Reactor MOV BD 1E	Operating Time	1 Year	None	(1)	None	None	Appendix 1&2 NCR NO. BFNEEB8021R1
Component 480V Motor Control Center (MCC) Manufacturer:	Temperature (°F)	Figure B.12 (1)	None	(4)	None	None	
International Switchboard Corporation Model Number: N/A	Pressure (PSIA)	Table B.1(1,2,3)	None	(4)	None	None	
Function: 480V Motor Control Accuracy: Req'd: N/A Demon: N/A	Relative Humidity (%)	100-Max	None	(4)	None	None	
Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V Motive and Control Power Distribution Location: EL 621, RM 12	Radiation (RAD)	3.1×10^4	None	(4)	None	None	BFNEEB8021 R1 Appendix 1&2
	Aging	N/A	None	(2)	None	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1. in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. [illegible]
Reviewed by: D.R. Webster
QA Acceptance: John F. French 10/27/80

EN DES CALCULATIONS

EEB APS-0009
Appendix 1-R0

TITLE		UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation		APS	BFN/1
			SAR SECTION(S) N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No. BFNEEB8021 R1	R1		
		R2		
KEY NOUNS: Environmental Qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	Larry D. Guido			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
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STATEMENT OF PROBLEM

Qualification documentation for the 480V Reactor MOV MCC 1E has not been located for the temperature, humidity, pressure, radiation, aging, and operating time.

ABSTRACT

References:

1. GE letter to TVA dated September 26, 1980 (EEB 801009 050), with "IC7700 Motor Control Center Environmental Qualification Test report to IEEE 323-1974" (contract 77K5-820350 for Hartsville and Phipps Bend Nuclear Plants).

2. GE (NEB) letter to TVA dated February 5, 1980 (NEB 800205 117) with Gould-Brown Boveri's "Class 1E Electrical Equipment Qualification Summary Report No. 33-52449 QS - Secondary Unit Substation" for IEEE 323-1974 (Contract 77K3-820181 for Hartsville and Phipps Bend Nuclear Plants).

We have compared the Bill of Material provided by International Switchboard Corporation for the 480 volt Reactor MOV MCC 1E with the material list of equipment provided for Hartsville and Phipps Bend Nuclear Plants and find that most of the equipment provided by ISC is similiar to that qualified by Reference 1 and 2 for similiar service conditions. International Switchboard Corporation is now providing TVA with a quotation for providing the qualification documentation. We find that the Class 1E Reactor MOV MCC 1E is justified for continued operation based on similarity, including aging and operating time.

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8021R1.

2. TVA letter of October 2, 1980 (EEB 801002 917), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4 We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Giesler

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 2
Docket: 50-260

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS-0010
Revision 0
Date 10-22-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX Power Sys Plant ID No. 480V Reactor MOV BD 2E	Operating Time	1 Year	None	(1)	None	None	Appendix 1&2 NCR No. BFNEEB8021 R1
Component 480V Motor Control Center (MCC) Manufacturer: International Switchboard Corporation	Temperature (°F)	Figure B.12 (2,3)	None	(4)	None	None	↓
Model Number: N/A	Pressure (PSIA)	Table B.1(1,2,3)	None	(4)	None	None	↓
Function: 480V Motor Control Accuracy: Req'd: N/A Demon: N/A	Relative Humidity (%)	100-Max	None	(4)	None	None	↓
Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V Motive and Control Power Distribution Location: EL 621, Rm 12	Radiation (RAD)	3.1×10^4	None	(4)	None	None	BFNEEB8021R1 Appendix 1&2
	Aging	N/A	None	(2)	None	None	↓
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1. in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. Fischer
Reviewed by: D.R. Webster
QA Acceptance: John F. French 10/27/80

EN DES CALCULATIONS

EEB APS-0010
Appendix 1-R0

TITLE	UNID SYSTEM(S)	PLANT/UNIT	
Engineering Evaluation for Continued Operation	APS	BFN/2	SAR SECTION(S) N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No. BFNEEB8021 R1	R1		
		R2		
KEY NOUNS: Environmental Qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	Lars O. Giesler			
CHECKED	B.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES* ADDED BY THIS REV:				
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STATEMENT OF PROBLEM

Qualification documentation for the 480 volt Reactor MOV MCC 2E has not been located for the temperature, humidity, pressure, radiation, aging, and operating time.

ABSTRACT

References: 1. GE letter to TVA dated September 26, 1980 (EEB 801009 050), with "IC7700 Motor Control Center Environmental Qualification Test Report to IEEE 323-1974" (contract 77K5-820350 for Hartsville and Phipps Bend Nuclear Plants).

2. GE (NED) letter to TVA dated February 5, 1980 (NEB 800205 117), with Gould-Brown Boveri's "Class 1E Electrical Equipment Qualification Summary Report No. 33-52449 QS - Secondary Unit Substation" for IEEE 323-1974. (contract 77K3-820181 for Hartsville and Phipps Bend Nuclear Plants.)

We have compared the Bill of Material provided by International Switchboard Corporation for the 480 volt Reactor MOV MCC 2E with the material list of equipment provided for Hartsville and Phipps Bend Nuclear Plants and find that most of the equipment provided by ISC is similiar to that qualified by Reference 1 and 2 for similiar service conditions. International Switchboard Corporation is now providing TVA with a quotation for providing the qualification documentation. We find that the Class 1E Reactor MOV MCC 2E is justified for continued operation based on similarity, including aging and operating time.

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8021R1.

2. TVA letter of October 2, 1980 (EEB 801002 917), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Giesler

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 1
Docket: 50-259

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS-0191
Revision 0
Date 10-21-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux. Pwr. Plant ID No. IDN	Operating Time	1 Year	Continuous motor operation 5 min/hr alternator loading.	(1)	Louis Allis document S40EJ4-099-630 10-10-79	Test	BFNEEB8050
Component Motor Generator Sets (LPSI) Manufacturer: Louis Allis Company	Temperature (°F)	Figure B.12 (1)	Peak 93° C 58° C Continuous	(4)	Louis Allis document S40EJ4-099-630 10-10-79	Engineering Analysis + Appendix A	
Model Number: 8-127033	Pressure (PSIA)	Table B.1 (1,2,3)	N/A	(4)	N/A	N/A	N/A
Function: Electrical Isolation of Motor-Operated Valves Accuracy: Req'd: N/A Demon:	Relative Humidity (%)	100%	100%	(4)	TVA Specification 3597	Engineering Analysis + Appendix A	BFNEEB8050
Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480VAC	Radiation (RAD)	8.1x10^4 rad normal plus accident dose	10^5 rads.	(4)	NUREG 0588 material list	Generic material tests + Appendix A	BFNEEB8050
Location: EL 621.25, Rm. 12	Aging	N/A	11.5 years	(2)	See Temperature Row Above		
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: WJ Hyif KL
Reviewed by: D.R. Webster
QA Acceptance: L.L. French 10/28/80

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation		BFN/1,2,3
		SAR SECTION(S)

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No. BFN EEB8050	R1		
		R2		
KEY NOUNS: Environment qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	W B Hoyt IKG			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES* ADDED BY THIS REV:				
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STATEMENT OF PROBLEM

Qualification documentation for the low pressure safety injection motor generator set (contract 78K5-823297) is not available for the temperature, humidity, and radiation environment occurring during a design basis event.

ABSTRACT

The approach which TVA used to establish that the motor generator (MG) set named in NCR BFN EEB 8050 is functionally operable and to determine aging effects for the given operating and accident environments was to combine partial test data with verbal information on the MG set materials to support analytical assumptions and conclusions reached. The environments considered were temperature, humidity, and radiation. From this analysis, TVA has determined that the equipment has a qualified life of 11.5 years minimum. The voltage regulator has been relocated to a nonharsh environment.

. BROWNS FERRY NUCLEAR PLANT

Temperature. The following two areas were addressed to insure the adequacy with respect to the temperature environment of the MG set:

a. Insulation System.

b. Rectifier Diodes.

Temperature rise test data is available for one motor and one alternator supplied with the MG sets. Since we do not have all the temperature rise test data, we have assumed a maximum temperature rise as stated in Louis Allis' letter dated May 21, 1980 (EEB 800602 020), for contract 78K5-823297 for the alternators and as specified in this same contract for the motors. Using this value and the most severe temperature condition, the MG set would experience, the maximum operating temperature was determined. The most severe temperature profile for the rooms in which these MG sets are situated shows a temperature rise to 93° C in 47 seconds, a fall to 75° C by 120 seconds, and then a linear decrease to room temperature (40° C) in 24 hours. The mass of this machine will not instantly respond to this temperature transient; however, the temperature will increase to a value less than the 75° C temperature at the 2-minute point. For conservatism, we assumed that the ambient temperature rose to 58° C for a period of 24 hours. (The value of 58° C was arrived at by taking the temperature-time area of the triangle which results from plotting the linear decrease of temperature from 75° C at the 2-minute time to 40° C at 24 hours. A rectangle of equal area was then plotted for the 24-hour period and the temperature of 58° C was found to maintain the same temperature-time area as the original triangular area.) Vendor documentation (Louis Allis document No. 8-127033 change 5) shows a semilog plot of time in hours versus temperature in degrees Celsius. The insulation system, as demonstrated by this plot, has a life expectancy of 350,000 hours with an ambient temperature of 40° C. The 10° C rule (an approximation of Arrhenius' Law as applied to insulation materials) was used to estimate the operating life of the motor. The 10° C rule states that for each 10° C rise in temperature above some reference temperature at which the material is able to operate without degradation the useful life of the material is halved. Although future vendor documentation will show the temperature transient as having no significant adverse affect on the useful life of this material, we will assume, for extreme conservatism, the ambient will be at 58° C continuously. This will reduce the useful life from 40 years to $40/2^{1.8} = 11.5$ years.

The rectifier diodes used in the alternator field have (per vendor) a normal ambient temperature rating range of -65° to +138° C with a 70-ampere current flowing through them. In this particular application, a current of 27 amperes is flowing through the diode and the junction temperature is therefore lower. This would allow an even larger ambient temperature range. Since the maximum ambient temperature increases to only 93° C, the diodes are adequate for the worst-case temperature.

BROWNS FERRY NUCLEAR PLANT

Humidity. The motor generator set listed on NCR BFNEEB8050 is to be operated in a peak humidity environment of 100 percent. Both the generator and the motor are totally enclosed and fan cooled. Therefore, peak humidity values of 100 percent will not adversely affect this machine. Additionally, the machine is continuously rotating, further reducing insulation susceptability to moisture.

Radiation. The materials for all rotating machinery in environments with greater than 10^4 rads (considered negligible) were identified and their radiation damage threshold compared to the operating and accident environments. The radiation environment including the 40-year normal dose and the integrated accident dose is 3.1×10^4 rads. The materials in the machine include polyester varnish (10^5 rads), silicone varnish (10^9 rads), Nomex (10^8 rads), magnetic wire copper with polyimide hide (10^6 rads), and phenolic (diode support) (7×10^6 rads).

The rectifier diodes are of the diffused type with a silicon substrate and heavily doped with phosphorous and boron (10^{20} electrons/cm^3 and 10^{14} holes/cm^3 respectively, and silicon has 5×10^{22} ATMS/cm^3). Reference Grove, A.S. Physics and Technology of Semiconductor Devices, New York: John Wiley & Son, Incorporated, 1967. Diodes used in a radiation environment must be heavily doped to eliminate carrier removal. As a conservative estimate the radiation dosage of 3.1×10^4 rads would increase the leakage current of the diode by a factor of 10. (A radiation dosage of 18 megarads has increased the leakage current of a smaller geometry diode by a factor of 10). Large diodes have leakage currents in the order of 20 milliamperes at a temperature of 100° C. With the combined radiation dosage and temperature under accident conditions, a 200-milliampere current may result which would not affect the field current of 27 amperes.

Prepared by: WB Hoyt

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 1
Docket: 50-259

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS-0192
Revision 0
Date 10-20-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. 1DA	Operating Time	1 Year	Continuous Motor operation; 5 min/hr Alternator loading	(1)	Louis Allis document S40EJ4-099-630 10-10-79	Test	BFNEEB8050
Component Motor Generator Sets (LPSI) Manufacturer: Louis Allis Company	Temperature (°F)	Figure B.12 (1)	93° C Peak 58° Continuous	(4)	Louis Allis document S40EJ4-099-630 10-10-79	Engineering Analysis + Appendix A	
Model Number: 8-127033	Pressure (PSIA)	Table B.1 (1,2,3)	N/A	(4)	N/A	N/A	N/A
Function: Electrical Isolation of Motor-Operated Valves Accuracy: Req'd: N/A Demon:	Relative Humidity (%)	100%	100%	(4)	TVA Specification 3597	Engineering Analysis + Appendix A	BFNEEB8050
Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	
Service: 480VAC	Radiation (RAD)	3.1×10^4 rad normal plus accident dose	10^5 rads	(4)	NUREG 0588 material list	Generic material tests + Appendix A	BFNEEB8050
Location: EL 621.25, Rm 12	Aging	N/A	11.5 years	(2)	See Temperature Row Above		
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: WB Hopf
Reviewed by: D.R. Webster
QA Acceptance: J.F. French 10/28/80

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation		BFN/1,2,3
		SAR SECTION(S)

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No. BFN EEB8050	R1		
		R2		
KEY NOUNS: Environment qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	W. S. [illegible]			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES * ADDED BY THIS REV:				
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LIST ALL PAGES * CHANGED BY THIS REV:				

STATEMENT OF PROBLEM

Qualification documentation for the low pressure safety injection motor generator set (contract 78K5-823297) is not available for the temperature humidity, and radiation environment occurring during a design basis event.

ABSTRACT

The approach which TVA used to establish that the motor generator (MG) set named in NCR BFN EEB 8050 is functionally operable and to determine aging effects for the given operating and accident environments was to combine partial test data with verbal information on the MG set materials to support analytical assumptions and conclusions reached. The environments considered were temperature, humidity, and radiation. From this analysis, TVA has determined that the equipment has a qualified life of 11.5 years minimum. The voltage regulator has been relocated to a nonharsh environment.

BROWNS FERRY NUCLEAR PLANT

Temperature. The following two areas were addressed to insure the adequacy with respect to the temperature environment of the MG set:

a. Insulation System.

b. Rectifier Diodes.

Temperature rise test data is available for one motor and one alternator supplied with the MG sets. Since we do not have all the temperature rise test data, we have assumed a maximum temperature rise as stated in Louis Allis' letter dated May 21, 1980 (EEB 800602 020), for contract 78K5-823297 for the alternators and as specified in this same contract for the motors. Using this value and the most severe temperature condition, the MG set would experience, the maximum operating temperature was determined. The most severe temperature profile for the rooms in which these MG sets are situated shows a temperature rise to 93° C in 47 seconds, a fall to 75° C by 120 seconds, and then a linear decrease to room temperature (40° C) in 24 hours. The mass of this machine will not instantly respond to this temperature transient; however, the temperature will increase to a value less than the 75° C temperature at the 2-minute point. For conservatism, we assumed that the ambient temperature rose to 58° C for a period of 24 hours. (The value of 58° C was arrived at by taking the temperature-time area of the triangle which results from plotting the linear decrease of temperature from 75° C at the 2-minute time to 40° C at 24 hours. A rectangle of equal area was then plotted for the 24-hour period and the temperature of 58° C was found to maintain the same temperature-time area as the original triangular area.) Vendor documentation (Louis Allis document No. 8-127033 change 5) shows a semilog plot of time in hours versus temperature in degrees Celsius. The insulation system, as demonstrated by this plot, has a life expectancy of 350,000 hours with an ambient temperature of 40° C. The 10° C rule (an approximation of Arrhenius' Law as applied to insulation materials) was used to estimate the operating life of the motor. The 10° C rule states that for each 10° C rise in temperature above some reference temperature at which the material is able to operate without degradation the useful life of the material is halved. Although future vendor documentation will show the temperature transient as having no significant adverse affect on the useful life of this material, we will assume, for extreme conservatism, the ambient will be at 58° C continuously. This will reduce the useful life from 40 years to $40/2^{1.8}$ = 11.5 years.

The rectifier diodes used in the alternator field have (per vendor) a normal ambient temperature rating range of -65° to $+138^{\circ}$ C with a 70-ampere current flowing through them. In this particular application, a current of 27 amperes is flowing through the diode and the junction temperature is therefore lower. This would allow an even larger ambient temperature range. Since the maximum ambient temperature increases to only 93° C, the diodes are adequate for the worst-case temperature.

BROWNS FERRY NUCLEAR PLANT

Humidity. The motor generator set listed on NCR BFNEEB8050 is to be operated in a peak humidity environment of 100 percent. Both the generator and the motor are totally enclosed and fan cooled. Therefore, peak humidity values of 100 percent will not adversely affect this machine. Additionally, the machine is continuously rotating, further reducing insulation susceptability to moisture.

Radiation. The materials for all rotating machinery in environments with greater than 10^4 rads (considered negligible) were identified and their radiation damage threshold compared to the operating and accident environments. The radiation environment including the 40-year normal dose and the integrated accident dose is 3.1×10^4 rads. The materials in the machine include polyester varnish (10^5 rads), silicone varnish (10^9 rads), Nomex (10^8 rads), magnetic wire copper with polyimide hide (10^6 rads), and phenolic (diode support) (7×10^6 rads).

The rectifier diodes are of the diffused type with a silicon substrate and heavily doped with phosphorous and boron (10^{20} electrons/cm^3 and 10^{14} holes/cm^3 respectively, and silicon has 5×10^{22} ATMS/cm^3). Reference Grove, A.S. Physics and Technology of Semiconductor Devices, New York: John Wiley & Son, Incorporated, 1967. Diodes used in a radiation environment must be heavily doped to eliminate carrier removal. As a conservative estimate the radiation dosage of 3.1×10^4 rads would increase the leakage current of the diode by a factor of 10. (A radiation dosage of 18 megarads has increased the leakage current of a smaller geometry diode by a factor of 10). Large diodes have leakage currents in the order of 20 milliamperes at a temperature of 100° C. With the combined radiation dosage and temperature under accident conditions, a 200-milliampere current may result which would not affect the field current of 27 amperes.

Prepared by: WB Hegel

Reviewed by: D.R. Webster

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Facility: Browns Ferry Nuclear Plant
Unit: 1
Docket: 50-259

(3)
Sheet No. EEB APS-0193
Revision 0
Date 10-20-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. IEN	Operating Time	1 Year	Continuous motor operation; 5 min/hr alternator loading	(1)	Louis Allis document S40EJ4-099-630 10-10-79	Test	BFNEEB8050
Component Motor Generator Sets (LPSI) Manufacturer: Louis Allis Company	Temperature (°F)	Figure B.13 (1)	93° C Peak 58° Continuous	(4)	Louis Allis document S40EJ3-099-630 10-10-79	Engineering Analysis + Appendix A	
Model Number: 8-127033	Pressure (PSIA)	Table B.1 (1,2,3)	N/A	(4)	N/A	N/A	N/A
Function: Electrical Isolation of Motor-Operated Valves	Relative Humidity (%)	100%	100%	(4)	TVA Specification 3597	Engineering Analysis + Appendix A	BFNEEB8050
Accuracy: Req'd: N/A Demon: Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480VA	Radiation (RAD)	3.1×10^4 rads normal plus accident dose	10^5 rads	(4)	NUREG 0588 material list	Generic material tests + Appendix A	BFNEEB8050
Location: EL 639.0, RM 13	Aging	N/A	11.5 years	(2)	See Temperature Row Above		
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: WBKopf
Reviewed by: D.R. Webster
QA Acceptance: J. F. French 10/28/80

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation		BFN/1,2,3
		SAR SECTION(S)

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS	R1		
N/A	NCR No. BFN EEB8050	R2		
KEY NOUNS: Environment qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	V. B. Gentry [signature]			
CHECKED	D.K. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
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STATEMENT OF PROBLEM

Qualification documentation for the low pressure safety injection motor generator set (contract 78K5-823297) is not available for the temperature humidity, and radiation environment occurring during a design basis event.

ABSTRACT

The approach which TVA used to establish that the motor generator (MG) set named in NCR BFN EEB 8050 is functionally operable and to determine aging effects for the given operating and accident environments was to combine partial test data with verbal information on the MG set materials to support analytical assumptions and conclusions reached. The environments considered were temperature, humidity, and radiation. From this analysis, TVA has determined that the equipment has a qualified life of 11.5 years minimum. The voltage regulator has been relocated to a nonharsh environment.

BROWNS FERRY NUCLEAR PLANT

Temperature. The following two areas were addressed to insure the adequacy with respect to the temperature environment of the MG set:

a. Insulation System.

b. Rectifier Diodes.

Temperature rise test data is available for one motor and one alternator supplied with the MG sets. Since we do not have all the temperature rise test data, we have assumed a maximum temperature rise as stated in Louis Allis' letter dated May 21, 1980 (EEB 800602 020), for contract 78K5-823297 for the alternators and as specified in this same contract for the motors. Using this value and the most severe temperature condition, the MG set would experience, the maximum operating temperature was determined. The most severe temperature profile for the rooms in which these MG sets are situated shows a temperature rise to 93° C in 47 seconds, a fall to 75° C by 120 seconds, and then a linear decrease to room temperature (40° C) in 24 hours. The mass of this machine will not instantly respond to this temperature transient; however, the temperature will increase to a value less than the 75° C temperature at the 2-minute point. For conservatism, we assumed that the ambient temperature rose to 58° C for a period of 24 hours. (The value of 58° C was arrived at by taking the temperature-time area of the triangle which results from plotting the linear decrease of temperature from 75° C at the 2-minute time to 40° C at 24 hours. A rectangle of equal area was then plotted for the 24-hour period and the temperature of 58° C was found to maintain the same temperature-time area as the original triangular area.) Vendor documentation (Louis Allis document No. 8-127033 change 5) shows a semilog plot of time in hours versus temperature in degrees Celsius. The insulation system, as demonstrated by this plot, has a life expectancy of 350,000 hours with an ambient temperature of 40° C. The 10° C rule (an approximation of Arrhenius' Law as applied to insulation materials) was used to estimate the operating life of the motor. The 10° C rule states that for each 10° C rise in temperature above some reference temperature at which the material is able to operate without degradation the useful life of the material is halved. Although future vendor documentation will show the temperature transient as having no significant adverse affect on the useful life of this material, we will assume, for extreme conservatism, the ambient will be at 58° C continuously. This will reduce the useful life from 40 years to $40/2^{1.8} = 11.5$ years.

The rectifier diodes used in the alternator field have (per vendor) a normal ambient temperature rating range of -65° to +138° C with a 70-ampere current flowing through them. In this particular application, a current of 27 amperes is flowing through the diode and the junction temperature is therefore lower. This would allow an even larger ambient temperature range. Since the maximum ambient temperature increases to only 93° C, the diodes are adequate for the worst-case temperature.

BROWNS FERRY NUCLEAR PLANT

Humidity. The motor generator set listed on NCR BFNEEB8050 is to be operated in a peak humidity environment of 100 percent. Both the generator and the motor are totally enclosed and fan cooled. Therefore, peak humidity values of 100 percent will not adversely affect this machine. Additionally, the machine is continuously rotating, further reducing insulation susceptability to moisture.

Radiation. The materials for all rotating machinery in environments with greater than 10^4 rads (considered negligible) were identified and their radiation damage threshold compared to the operating and accident environments. The radiation environment including the 40-year normal dose and the integrated accident dose is 3.1×10^4 rads. The materials in the machine include polyester varnish (10^5 rads), silicone varnish (10^9 rads), Nomex (10^8 rads), magnetic wire copper with polyimide hide (10^6 rads), and phenolic (diode support) (7×10^6 rads).

The rectifier diodes are of the diffused type with a silicon substrate and heavily doped with phosphorous and boron (10^{20} electrons/cm^3 and 10^{14} holes/cm^3 respectively, and silicon has 5×10^{22} ATMS/cm^3). Reference Grove, A.S. Physics and Technology of Semiconductor Devices, New York: John Wiley & Son, Incorporated, 1967. Diodes used in a radiation environment must be heavily doped to eliminate carrier removal. As a conservative estimate the radiation dosage of 3.1×10^4 rads would increase the leakage current of the diode by a factor of 10. (A radiation dosage of 18 megarads has increased the leakage current of a smaller geometry diode by a factor of 10). Large diodes have leakage currents in the order of 20 milliamperes at a temperature of 100^0 C. With the combined radiation dosage and temperature under accident conditions, a 200-milliampere current may result which would not affect the field current of 27 amperes.

Prepared by: [illegible signature]

Reviewed by: D.R. Helster

Facility: Browns Ferry Nuclear Plant
Unit: 1
Docket: 50-259

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS-0194
Revision 0
Date 10-20-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. IEA	Operating Time	1 Year	Continuous motor operation; 5 min/hr alternator loading	(1)	Louis Allis document S40EJ4-099-630 10-10-79	Test	BFNEEB8050
Component Motor Generator Sets (LPSI) Manufacturer: Louis Allis Company	Temperature (°F)	Figure B.13 (1)	93° Peak 58° C continuous	(4)	Louis Allis document S40EJ4-099-630 10-10-79	Engineering Analysis + Appendix A	
Model Number: 8-127033	Pressure (PSIA)	Table B.1 (1,2,3)	N/A	(4)	N/A	N/A	N/A
Function: Electrical Isolation of Motor-Operated Valves	Relative Humidity (%)	100%	100%	(4)	TVA Specification 3597	Engineering Analysis + Appendix A	BFNEEB8050
Accuracy: Req'd: N/A Demon: Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480VAC	Radiation (RAD)	3.1×10^4 rads normal plus accident dose	10^5 rads	(4)	NUREG 0588 material list	Generic material tests + Appendix A	BFNEEB8050
Location: EL 639.0, Rm 13	Aging	N/A	11.5 years	(2)	See Temperature Row Above		
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: WB Hoff
Reviewed by: D.R. Webster
QA Acceptance: J. F. French 10/28/80

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation		BFN/1,2,3
		SAR SECTION(S)

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS	R1		
N/A	NCR No. BFN EEB8050	R2		
KEY NOUNS: Environment qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	W. Gilley JR			
CHECKED	D.K. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
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STATEMENT OF PROBLEM

Qualification documentation for the low pressure safety injection motor generator set (contract 78K5-823297) is not available for the temperature humidity, and radiation environment occurring during a design basis event.

ABSTRACT

The approach which TVA used to establish that the motor generator (MG) set named in NCR BFN EEB 8050 is functionally operable and to determine aging effects for the given operating and accident environments was to combine partial test data with verbal information on the MG set materials to support analytical assumptions and conclusions reached. The environments considered were temperature, humidity, and radiation. From this analysis, TVA has determined that the equipment has a qualified life of 11.5 years minimum. The voltage regulator has been relocated to a nonharsh environment.

BROWNS FERRY NUCLEAR PLANT

Temperature. The following two areas were addressed to insure the adequacy with respect to the temperature environment of the MG set:

a. Insulation System.

b. Rectifier Diodes.

Temperature rise test data is available for one motor and one alternator supplied with the MG sets. Since we do not have all the temperature rise test data, we have assumed a maximum temperature rise as stated in Louis Allis' letter dated May 21, 1980 (EEB 800602 020), for contract 78K5-823297 for the alternators and as specified in this same contract for the motors. Using this value and the most severe temperature condition, the MG set would experience, the maximum operating temperature was determined. The most severe temperature profile for the rooms in which these MG sets are situated shows a temperature rise to 93° C in 47 seconds, a fall to 75° C by 120 seconds, and then a linear decrease to room temperature (40° C) in 24 hours. The mass of this machine will not instantly respond to this temperature transient; however, the temperature will increase to a value less than the 75° C temperature at the 2-minute point. For conservatism, we assumed that the ambient temperature rose to 58° C for a period of 24 hours. (The value of 58° C was arrived at by taking the temperature-time area of the triangle which results from plotting the linear decrease of temperature from 75° C at the 2-minute time to 40° C at 24 hours. A rectangle of equal area was then plotted for the 24-hour period and the temperature of 58° C was found to maintain the same temperature-time area as the original triangular area.) Vendor documentation (Louis Allis document No. 8-127033 change 5) shows a semilog plot of time in hours versus temperature in degrees Celsius. The insulation system, as demonstrated by this plot, has a life expectancy of 350,000 hours with an ambient temperature of 40° C. The 10° C rule (an approximation of Arrhenius' Law as applied to insulation materials) was used to estimate the operating life of the motor. The 10° C rule states that for each 10° C rise in temperature above some reference temperature at which the material is able to operate without degradation the useful life of the material is halved. Although future vendor documentation will show the temperature transient as having no significant adverse affect on the useful life of this material, we will assume, for extreme conservatism, the ambient will be at 58° C continuously. This will reduce the useful life from 40 years to $40/2^{1.8}$ = 11.5 years.

The rectifier diodes used in the alternator field have (per vendor) a normal ambient temperature rating range of -65° to +138° C with a 70-ampere current flowing through them. In this particular application, a current of 27 amperes is flowing through the diode and the junction temperature is therefore lower. This would allow an even larger ambient temperature range. Since the maximum ambient temperature increases to only 93° C, the diodes are adequate for the worst-case temperature.

BROWNS FERRY NUCLEAR PLANT

Humidity. The motor generator set listed on NCR BFNEEB8050 is to be operated in a peak humidity environment of 100 percent. Both the generator and the motor are totally enclosed and fan cooled. Therefore, peak humidity values of 100 percent will not adversely affect this machine. Additionally, the machine is continuously rotating, further reducing insulation susceptability to moisture.

Radiation. The materials for all rotating machinery in environments with greater than 10^4 rads (considered negligible) were identified and their radiation damage threshold compared to the operating and accident environments. The radiation environment including the 40-year normal dose and the integrated accident dose is 3.1×10^4 rads. The materials in the machine include polyester varnish (10^5 rads), silicone varnish (10^9 rads), Nomex (10^8 rads), magnetic wire copper with polyimide hide (10^6 rads), and phenolic (diode support) (7×10^6 rads).

The rectifier diodes are of the diffused type with a silicon substrate and heavily doped with phosphorous and boron (10^{20} electrons/cm^3 and 10^{14} holes/cm^3 respectively, and silicon has 5×10^{22} ATMS/cm^3). Reference Grove, A.S. Physics and Technology of Semiconductor Devices, New York: John Wiley & Son, Incorporated, 1967. Diodes used in a radiation environment must be heavily doped to eliminate carrier removal. As a conservative estimate the radiation dosage of 3.1×10^4 rads would increase the leakage current of the diode by a factor of 10. (A radiation dosage of 18 megarads has increased the leakage current of a smaller geometry diode by a factor of 10). Large diodes have leakage currents in the order of 20 milliamperes at a temperature of 100° C. With the combined radiation dosage and temperature under accident conditions, a 200-milliampere current may result which would not affect the field current of 27 amperes.

Prepared by: WB Hold
Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 2
Docket: 50-260

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS-0195
Revision 0
Date 10-20-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. 2DN	Operating Time	1 Year	Continuous motor operation; 5 min/hr alternator loading	(1)	Louis Allis document S40EJ4-099-630 10-10-79	Test	BFNEEB8050
Component Motor Generator Sets (LPSI) Manufacturer: Louis Allis Company	Temperature (°F)	Figure B.12 (2,3)	93° C Peak 58° C Continuous	(4)	Louis Allis document S40EJ4-099-630 10-10-79	Engineering Analysis + Appendix A	
Model Number: 8?127033	Pressure (PSIA)	Table B.1 (1,2,3)	N/A	(4)	N/A	N/A	N/A
Function: Electrical Isolation of Motor-Operated Valves Accuracy: Req'd: N/A Demon: N/A	Relative Humidity (%)	100%	100%	(4)	TVA Specification 3597	Engineering Analysis + Appendix A	BFNEEB8050
Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480VA	Radiation (RAD)	3.1×10^4 rads normal plus accident dose	10^5 rads	(4)	NUREG 0588 material list	Generic Material tests + Appendix A	BFNEEB8050
Location: EL 621.25, Rm 12	Aging	N/A	11.5 years	(2)	See Temperature Row Above		
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: W3Hipf
Reviewed by: D.R. Webster
QA Acceptance: L.F. Frumah
10/28/80

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation		BFN/1,2,3
		SAR SECTION(S)

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS	R1		
N/A	NCR No. BFN EEB8050	R2		
KEY NOUNS: Environment qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	W Dittoff (signature) JK			
CHECKED	D.L. Webster (signature)			
SUBMITTED				
APPROVED				
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STATEMENT OF PROBLEM

Qualification documentation for the low pressure safety injection motor generator set (contract 78K5-823297) is not available for the temperature, humidity, and radiation environment occurring during a design basis event.

ABSTRACT

The approach which TVA used to establish that the motor generator (MG) set named in NCR BFN EEB 8050 is functionally operable and to determine aging effects for the given operating and accident environments was to combine partial test data with verbal information on the MG set materials to support analytical assumptions and conclusions reached. The environments considered were temperature, humidity, and radiation. From this analysis, TVA has determined that the equipment has a qualified life of 11.5 years minimum. The voltage regulator has been relocated to a nonharsh environment.

BROWNS FERRY NUCLEAR PLANT

Temperature. The following two areas were addressed to insure the adequacy with respect to the temperature environment of the MG set:

a. Insulation System.

b. Rectifier Diodes.

Temperature rise test data is available for one motor and one alternator supplied with the MG sets. Since we do not have all the temperature rise test data, we have assumed a maximum temperature rise as stated in Louis Allis' letter dated May 21, 1980 (EEB 800602 020), for contract 78K5-823297 for the alternators and as specified in this same contract for the motors. Using this value and the most severe temperature condition, the MG set would experience, the maximum operating temperature was determined. The most severe temperature profile for the rooms in which these MG sets are situated shows a temperature rise to 93^{o} C in 47 seconds, a fall to 75^{o} C by 120 seconds, and then a linear decrease to room temperature (40^{o} C) in 24 hours. The mass of this machine will not instantly respond to this temperature transient; however, the temperature will increase to a value less than the 75^{o} C temperature at the 2-minute point. For conservatism, we assumed that the ambient temperature rose to 58^{o} C for a period of 24 hours. (The value of 58^{o} C was arrived at by taking the temperature-time area of the triangle which results from plotting the linear decrease of temperature from 75^{o} C at the 2-minute time to 40^{o} C at 24 hours. A rectangle of equal area was then plotted for the 24-hour period and the temperature of 58^{o} C was found to maintain the same temperature-time area as the original triangular area.) Vendor documentation (Louis Allis document No. 8-127033 change 5) shows a semilog plot of time in hours versus temperature in degrees Celsius. The insulation system, as demonstrated by this plot, has a life expectancy of 350,000 hours with an ambient temperature of 40^{o} C. The 10^{o} C rule (an approximation of Arrhenius' Law as applied to insulation materials) was used to estimate the operating life of the motor. The 10^{o} C rule states that for each 10^{o} C rise in temperature above some reference temperature at which the material is able to operate without degradation the useful life of the material is halved. Although future vendor documentation will show the temperature transient as having no significant adverse affect on the useful life of this material, we will assume, for extreme conservatism, the ambient will be at 58^{o} C continuously. This will reduce the useful life from 40 years to $40/2^{1.8}$ = 11.5 years.

The rectifier diodes used in the alternator field have (per vendor) a normal ambient temperature rating range of -65^{o} to +138^{o} C with a 70-ampere current flowing through them. In this particular application, a current of 27 amperes is flowing through the diode and the junction temperature is therefore lower. This would allow an even larger ambient temperature range. Since the maximum ambient temperature increases to only 93^{o} C, the diodes are adequate for the worst-case temperature.

BROWNS FERRY NUCLEAR PLANT

Humidity. The motor generator set listed on NCR BFNEEB8050 is to be operated in a peak humidity environment of 100 percent. Both the generator and the motor are totally enclosed and fan cooled. Therefore, peak humidity values of 100 percent will not adversely affect this machine. Additionally, the machine is continuously rotating, further reducing insulation susceptability to moisture.

Radiation. The materials for all rotating machinery in environments with greater than 10^4 rads (considered negligible) were identified and their radiation damage threshold compared to the operating and accident environments. The radiation environment including the 40-year normal dose and the integrated accident dose is 3.1×10^4 rads. The materials in the machine include polyester varnish (10^5 rads), silicone varnish (10^9 rads), Nomex (10^8 rads), magnetic wire copper with polyimide hide (10^6 rads), and phenolic (diode support) (7×10^6 rads).

The rectifier diodes are of the diffused type with a silicon substrate and heavily doped with phosphorous and boron (10^{20} electrons/cm^3 and 10^{14} holes/cm^3 respectively, and silicon has 5×10^{22} ATMS/cm^3). Reference Grove, A.S. Physics and Technology of Semiconductor Devices, New York: John Wiley & Son, Incorporated, 1967. Diodes used in a radiation environment must be heavily doped to eliminate carrier removal. As a conservative estimate the radiation dosage of 3.1×10^4 rads would increase the leakage current of the diode by a factor of 10. (A radiation dosage of 18 megarads has increased the leakage current of a smaller geometry diode by a factor of 10). Large diodes have leakage currents in the order of 20 milliamperes at a temperature of 100° C. With the combined radiation dosage and temperature under accident conditions, a 200-milliampere current may result which would not affect the field current of 27 amperes.

Prepared by: ~~ŁB~~ *[illegible signature]*

Reviewed by: *D.R. [illegible signature]*

Facility: Browns Ferry Nuclear Plant
Unit: 2
Docket: 50-260

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS-0196
Revision 0
Date 10-20-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. 2DA	Operating Time	1 Year	Continuous motor operation; 5 min/hr alternator loading	(1)	Louis Allis document S40EJ4-099-630 10-10-79	Test	BFNEEB8050
Component Motor Generator Sets (LPSI) Manufacturer: Louis Allis Company	Temperature (^{o}F)	Figure B.13 (2,3)	93^{0} Peak 58^{0} C Continuous	(4)	Louis Allis document S40EJ4-099-630 10-10-79	Engineering Analysis + Appendix A	
Model Number: 8-127033	Pressure (PSIA)	Table B.1 (1,2,3)	N/A	(4)	N/A	N/A	N/A
Function: Electrical Isolation of Motor-Operated Valves	Relative Humidity (%)	100%	100%	(4)	TVA Specification 3597	Engineering Analysis + Appendix A	BFNEEB8050
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V AC	Radiation (RAD)	$3.1x10^4$ rads normal plus accident dose	10^5 rads	(4)	NUREG 0588 material list	Generic Material tests + Appendix A	BFNEEB8050
Location: EL 639.0, Rm 13	Aging	N/A	11.5 years	(2)	See Temperature Row Above		
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: WBHopf
Reviewed by: O.R. Webster
QA Acceptance: L.F. French 10/28/80

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation		BFN/1,2,3
		SAR SECTION(S)

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS	R1		
N/A	NCR No. BFN EEB8050	R2		
KEY NOUNS: Environment qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	V B H...			
CHECKED	D.R. Webster			
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APPROVED				
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STATEMENT OF PROBLEM

Qualification documentation for the low pressure safety injection motor generator set (contract 78K5-823297) is not available for the temperature, humidity, and radiation environment occurring during a design basis event.

ABSTRACT

The approach which TVA used to establish that the motor generator (MG) set named in NCR BFN EEB 8050 is functionally operable and to determine aging effects for the given operating and accident environments was to combine partial test data with verbal information on the MG set materials to support analytical assumptions and conclusions reached. The environments considered were temperature, humidity, and radiation. From this analysis, TVA has determined that the equipment has a qualified life of 11.5 years minimum. The voltage regulator has been relocated to a nonharsh environment.

 *Use revision log (form TVA 10534) if more room is required

BROWNS FERRY NUCLEAR PLANT

Temperature. The following two areas were addressed to insure the adequacy with respect to the temperature environment of the MG set:

a. Insulation System.

b. Rectifier Diodes.

Temperature rise test data is available for one motor and one alternator supplied with the MG sets. Since we do not have all the temperature rise test data, we have assumed a maximum temperature rise as stated in Louis Allis' letter dated May 21, 1980 (EEB 800602 020), for contract 78K5-823297 for the alternators and as specified in this same contract for the motors. Using this value and the most severe temperature condition, the MG set would experience, the maximum operating temperature was determined. The most severe temperature profile for the rooms in which these MG sets are situated shows a temperature rise to 93^{0} C in 47 seconds, a fall to 75^{0} C by 120 seconds, and then a linear decrease to room temperature (40^{0} C) in 24 hours. The mass of this machine will not instantly respond to this temperature transient; however, the temperature will increase to a value less than the 75^{0} C temperature at the 2-minute point. For conservatism, we assumed that the ambient temperature rose to 58^{0} C for a period of 24 hours. (The value of 58^{0} C was arrived at by taking the temperature-time area of the triangle which results from plotting the linear decrease of temperature from 75^{0} C at the 2-minute time to 40^{0} C at 24 hours. A rectangle of equal area was then plotted for the 24-hour period and the temperature of 58^{0} C was found to maintain the same temperature-time area as the original triangular area.) Vendor documentation (Louis Allis document No. 8-127033 change 5) shows a semilog plot of time in hours versus temperature in degrees Celsius. The insulation system, as demonstrated by this plot, has a life expectancy of 350,000 hours with an ambient temperature of 40^{0} C. The 10^{0} C rule (an approximation of Arrhenius' Law as applied to insulation materials) was used to estimate the operating life of the motor. The 10^{0} C rule states that for each 10^{0} C rise in temperature above some reference temperature at which the material is able to operate without degradation the useful life of the material is halved. Although future vendor documentation will show the temperature transient as having no significant adverse affect on the useful life of this material, we will assume, for extreme conservatism, the ambient will be at 58^{0} C continuously. This will reduce the useful life from 40 years to $40/2^{1.8} = 11.5$ years.

The rectifier diodes used in the alternator field have (per vendor) a normal ambient temperature rating range of -65^{0} to $+138^{0}$ C with a 70-ampere current flowing through them. In this particular application, a current of 27 amperes is flowing through the diode and the junction temperature is therefore lower. This would allow an even larger ambient temperature range. Since the maximum ambient temperature increases to only 93^{0} C, the diodes are adequate for the worst-case temperature.

BROWNS FERRY NUCLEAR PLANT

Humidity. The motor generator set listed on NCR BFNEEB8050 is to be operated in a peak humidity environment of 100 percent. Both the generator and the motor are totally enclosed and fan cooled. Therefore, peak humidity values of 100 percent will not adversely affect this machine. Additionally, the machine is continuously rotating, further reducing insulation susceptability to moisture.

Radiation. The materials for all rotating machinery in environments with greater than 10^4 rads (considered negligible) were identified and their radiation damage threshold compared to the operating and accident environments. The radiation environment including the 40-year normal dose and the integrated accident dose is 3.1×10^4 rads. The materials in the machine include polyester varnish (10^5 rads), silicone varnish (10^9 rads), Nomex (10^8 rads), magnetic wire copper with polyimide hide (10^6 rads), and phenolic (diode support) (7×10^6 rads).

The rectifier diodes are of the diffused type with a silicon substrate and heavily doped with phosphorous and boron (10^{20} electrons/cm^3 and 10^{14} holes/cm^3 respectively, and silicon has 5×10^{22} ATMS/cm^3). Reference Grove, A.S. Physics and Technology of Semiconductor Devices, New York: John Wiley & Son, Incorporated, 1967. Diodes used in a radiation environment must be heavily doped to eliminate carrier removal. As a conservative estimate the radiation dosage of 3.1×10^4 rads would increase the leakage current of the diode by a factor of 10. (A radiation dosage of 18 megarads has increased the leakage current of a smaller geometry diode by a factor of 10). Large diodes have leakage currents in the order of 20 milliamperes at a temperature of 100° C. With the combined radiation dosage and temperature under accident conditions, a 200-milliampere current may result which would not affect the field current of 27 amperes.

Prepared by: WB Heyl

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 2
Docket: 50-260

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB 4PS-D197
Revision 0
Date 10-20-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX PWR Plant ID No. 2EN	Operating Time	1 Year	Continuous motor operation; 5 min/hr alternator loading	(1)	Louis Allis document S40EJ4-099-630 10-10-79	Test	BFNEEB8050
Component Motor Generator Sets (LPSI) Manufacturer: Louis Allis Company	Temperature (°F)	Figure B.13 (2,3)	93° Peak 58° C Continuous	(4)	Louis Allis document S40EJ4-099-630 10-10-79	Engineering Analysis + Appendix A	
Model Number: 8-127033	Pressure (PSIA)	Table B.1 (1,2,3)	N/A	(4)	N/A	N/A	N/A
Function: Electrical Isolation of Motor-Operated Valves Accuracy: Req'd: N/A Demon: N/A	Relative Humidity (%)	100%	100%	(4)	TVA Specification 3597	Engineering Analysis + Appendix A	BFNEEB8050
Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V AC	Radiation (RAD)	$3.1x10^4$ rads normal plus accident dose	10^5 rads	(4)	NUREG 0588 material list	Generic Material tests + Appendix A	BFNEEB8050
Location: EL 639.0, Rm 13	Aging	N/A	11.5years	(2)	See Temperature Row Above		
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: WBHoyt
Reviewed by: D.R. Webster
QA Acceptance: J.T. French 10/28/80

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation		BFN/1,2,3
		SAR SECTION(S)

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No. BFN EEB8050	R1		
		R2		
KEY NOUNS: Environment qualification.		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	[signature]			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
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STATEMENT OF PROBLEM

Qualification documentation for the low pressure safety injection motor generator set (contract 78K5-823297) is not available for the temperature humidity, and radiation environment occurring during a design basis event.

ABSTRACT

The approach which TVA used to establish that the motor generator (MG) set named in NCR BFN EEB 8050 is functionally operable and to determine aging effects for the given operating and accident environments was to combine partial test data with verbal information on the MG set materials to support analytical assumptions and conclusions reached. The environments considered were temperature, humidity, and radiation. From this analysis, TVA has determined that the equipment has a qualified life of 11.5 years minimum. The voltage regulator has been relocated to a nonharsh environment.

BROWNS FERRY NUCLEAR PLANT

Temperature. The following two areas were addressed to insure the adequacy with respect to the temperature environment of the MG set:

a. Insulation System.

b. Rectifier Diodes.

Temperature rise test data is available for one motor and one alternator supplied with the MG sets. Since we do not have all the temperature rise test data, we have assumed a maximum temperature rise as stated in Louis Allis' letter dated May 21, 1980 (EEB 800602 020), for contract 78K5-823297 for the alternators and as specified in this same contract for the motors. Using this value and the most severe temperature condition, the MG set would experience, the maximum operating temperature was determined. The most severe temperature profile for the rooms in which these MG sets are situated shows a temperature rise to 93^{o} C in 47 seconds, a fall to 75^{o} C by 120 seconds, and then a linear decrease to room temperature (40^{o} C) in 24 hours. The mass of this machine will not instantly respond to this temperature transient; however, the temperature will increase to a value less than the 75^{o} C temperature at the 2-minute point. For conservatism, we assumed that the ambient temperature rose to 58^{o} C for a period of 24 hours. (The value of 58^{o} C was arrived at by taking the temperature-time area of the triangle which results from plotting the linear decrease of temperature from 75^{o} C at the 2-minute time to 40^{o} C at 24 hours. A rectangle of equal area was then plotted for the 24-hour period and the temperature of 58^{o} C was found to maintain the same temperature-time area as the original triangular area.) Vendor documentation (Louis Allis document No. 8-127033 change 5) shows a semilog plot of time in hours versus temperature in degrees Celsius. The insulation system, as demonstrated by this plot, has a life expectancy of 350,000 hours with an ambient temperature of 40^{o} C. The 10^{o} C rule (an approximation of Arrhenius' Law as applied to insulation materials) was used to estimate the operating life of the motor. The 10^{o} C rule states that for each 10^{o} C rise in temperature above some reference temperature at which the material is able to operate without degradation the useful life of the material is halved. Although future vendor documentation will show the temperature transient as having no significant adverse affect on the useful life of this material, we will assume, for extreme conservatism, the ambient will be at 58^{o} C continuously. This will reduce the useful life from 40 years to $40/2^{1.8}$ = 11.5 years.

The rectifier diodes used in the alternator field have (per vendor) a normal ambient temperature rating range of -65^{o} to +138^{o} C with a 70-ampere current flowing through them. In this particular application, a current of 27 amperes is flowing through the diode and the junction temperature is therefore lower. This would allow an even larger ambient temperature range. Since the maximum ambient temperature increases to only 93^{o} C, the diodes are adequate for the worst-case temperature.

BROWNS FERRY NUCLEAR PLANT

Humidity. The motor generator set listed on NCR BFNEEB8050 is to be operated in a peak humidity environment of 100 percent. Both the generator and the motor are totally enclosed and fan cooled. Therefore, peak humidity values of 100 percent will not adversely affect this machine. Additionally, the machine is continuously rotating, further reducing insulation susceptability to moisture.

Radiation. The materials for all rotating machinery in environments with greater than 10^4 rads (considered negligible) were identified and their radiation damage threshold compared to the operating and accident environments. The radiation environment including the 40-year normal dose and the integrated accident dose is 3.1×10^4 rads. The materials in the machine include polyester varnish (10^5 rads), silicone varnish (10^9 rads), Nomex (10^8 rads), magnetic wire copper with polyimide hide (10^6 rads), and phenolic (diode support) (7×10^6 rads).

The rectifier diodes are of the diffused type with a silicon substrate and heavily doped with phosphorous and boron (10^{20} electrons/cm^3 and 10^{14} holes/cm^3 respectively, and silicon has 5×10^{22} ATMS/cm^3). Reference Grove, A.S. Physics and Technology of Semiconductor Devices, New York: John Wiley & Son, Incorporated, 1967. Diodes used in a radiation environment must be heavily doped to eliminate carrier removal. As a conservative estimate the radiation dosage of 3.1×10^4 rads would increase the leakage current of the diode by a factor of 10. (A radiation dosage of 18 megarads has increased the leakage current of a smaller geometry diode by a factor of 10). Large diodes have leakage currents in the order of 20 milliamperes at a temperature of 100° C. With the combined radiation dosage and temperature under accident conditions, a 200-milliampere current may result which would not affect the field current of 27 amperes.

Prepared by: [signature]

Reviewed by: D. R. [signature]

Facility: Browns Ferry Nuclear Plant
Unit: 2
Docket: 50-260

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS-0198
Revision 0
Date 10-20-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX PWR Plant ID No. 2EA	Operating Time	1 Year	Continuous motor operation; 5 min/hr alternator loading	(1)	Louis Allis document S40EJ4-099-630 10-10-79	Test	BFNEEB8050
Component Motor Generator Sets (LPSI) Manufacturer: Louis Allis Company	Temperature (°F)	Figure B.12 (2,3)	93° Peak 58° C Continuous	(4)	Louis Allis document S40EJ4-099-630 10-10-79	Engineering Analysis + Appendix A	
Model Number: 8-127038	Pressure (PSIA)	Table B.1 (1,2,3)	N/A	(4)	N/A	N/A	N/A
Function: Electrical Isolation of Motor-Operated Valves	Relative Humidity (%)	100%	100%	(4)	TVA Specification 3597	Engineering Analysis + Appendix A	BFNEEB8050
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V AC	Radiation (RAD)	3.1x10^4 rads normal plus accident dose	10^5 rads	(4)	NUREG 0588 material list	Generic Material tests + Appendix A	BFNEEB8050
Location: EL 621.25, Rm 12	Aging	N/A	11.5years	(2)	See Temperature Row Above		
Flood Level Elev: 552' Above Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: WBHoff
Reviewed by: D.R. Webster
QA Acceptance: J.J. French
10/28/80

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation		BFN/1,2,3
		SAR SECTION(S)

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS	R1		
N/A	NCR No. BFN EEB8050	R2		
KEY NOUNS: Environment qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	W Bilyk			
CHECKED	D.R. Webster			
SUBMITTED				
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STATEMENT OF PROBLEM

Qualification documentation for the low pressure safety injection motor generator set (contract 78K5-823297) is not available for the temperature, humidity, and radiation environment occurring during a design basis event.

ABSTRACT

The approach which TVA used to establish that the motor generator (MG) set named in NCR BFN EEB 8050 is functionally operable and to determine aging effects for the given operating and accident environments was to combine partial test data with verbal information on the MG set materials to support analytical assumptions and conclusions reached. The environments considered were temperature, humidity, and radiation. From this analysis, TVA has determined that the equipment has a qualified life of 11.5 years minimum. The voltage regulator has been relocated to a nonharsh environment.

BROWNS FERRY NUCLEAR PLANT

<u>Temperature</u>. The following two areas were addressed to insure the adequacy with respect to the temperature environment of the MG set:

a. Insulation System.

b. Rectifier Diodes.

Temperature rise test data is available for one motor and one alternator supplied with the MG sets. Since we do not have all the temperature rise test data, we have assumed a maximum temperature rise as stated in Louis Allis' letter dated May 21, 1980 (EEB 800602 020), for contract 78K5-823297 for the alternators and as specified in this same contract for the motors. Using this value and the most severe temperature condition, the MG set would experience, the maximum operating temperature was determined. The most severe temperature profile for the rooms in which these MG sets are situated shows a temperature rise to 93° C in 47 seconds, a fall to 75° C by 120 seconds, and then a linear decrease to room temperature (40° C) in 24 hours. The mass of this machine will not instantly respond to this temperature transient; however, the temperature will increase to a value less than the 75° C temperature at the 2-minute point. For conservatism, we assumed that the ambient temperature rose to 58° C for a period of 24 hours. (The value of 58° C was arrived at by taking the temperature-time area of the triangle which results from plotting the linear decrease of temperature from 75° C at the 2-minute time to 40° C at 24 hours. A rectangle of equal area was then plotted for the 24-hour period and the temperature of 58° C was found to maintain the same temperature-time area as the original triangular area.) Vendor documentation (Louis Allis document No. 8-127033 change 5) shows a semilog plot of time in hours versus temperature in degrees Celsius. The insulation system, as demonstrated by this plot, has a life expectancy of 350,000 hours with an ambient temperature of 40° C. The 10° C rule (an approximation of Arrhenius' Law as applied to insulation materials) was used to estimate the operating life of the motor. The 10° C rule states that for each 10° C rise in temperature above some reference temperature at which the material is able to operate without degradation the useful life of the material is halved. Although future vendor documentation will show the temperature transient as having no significant adverse affect on the useful life of this material, we will assume, for extreme conservatism, the ambient will be at 58° C continuously. This will reduce the useful life from 40 years to $40/2^{1.8} = 11.5$ years.

The rectifier diodes used in the alternator field have (per vendor) a normal ambient temperature rating range of -65° to $+138^{\circ}$ C with a 70-ampere current flowing through them. In this particular application, a current of 27 amperes is flowing through the diode and the junction temperature is therefore lower. This would allow an even larger ambient temperature range. Since the maximum ambient temperature increases to only 93° C, the diodes are adequate for the worst-case temperature.

BROWNS FERRY NUCLEAR PLANT

Humidity. The motor generator set listed on NCR BFNEEB8050 is to be operated in a peak humidity environment of 100 percent. Both the generator and the motor are totally enclosed and fan cooled. Therefore, peak humidity values of 100 percent will not adversely affect this machine. Additionally, the machine is continuously rotating, further reducing insulation susceptability to moisture.

Radiation. The materials for all rotating machinery in environments with greater than 10^4 rads (considered negligible) were identified and their radiation damage threshold compared to the operating and accident environments. The radiation environment including the 40-year normal dose and the integrated accident dose is 3.1 x 10^4 rads. The materials in the machine include polyester varnish (10^5 rads), silicone varnish (10^9 rads), Nomex (10^8 rads), magnetic wire copper with polyimide hide (10^6 rads), and phenolic (diode support) (7 x 10^6 rads).

The rectifier diodes are of the diffused type with a silicon substrate and heavily doped with phosphorous and boron (10^{20} electrons/cm^3 and 10^{14} holes/cm^3 respectively, and silicon has 5 x 10^{22} ATMS/cm^3). Reference Grove, A.S. Physics and Technology of Semiconductor Devices, New York: John Wiley & Son, Incorporated, 1967. Diodes used in a radiation environment must be heavily doped to eliminate carrier removal. As a conservative estimate the radiation dosage of 3.1 x 10^4 rads would increase the leakage current of the diode by a factor of 10. (A radiation dosage of 18 megarads has increased the leakage current of a smaller geometry diode by a factor of 10). Large diodes have leakage currents in the order of 20 milliamperes at a temperature of 100° C. With the combined radiation dosage and temperature under accident conditions, a 200-milliampere current may result which would not affect the field current of 27 amperes.

Prepared by: ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ WBH/pl

Reviewed by: D. R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 3
Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB APS 0199
Revision 0
Date 10-20-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX PWR Plant ID No. 3DN	Operating Time	1 Year	Continuous motor operation; 5 min/hr alternator loading	(1)	Louis Allis document S40EJ4-099-630 10-10-79	Test	BFNEEB8050
Component Motor Generator Sets (LPSI) Manufacturer: Louis Allis Company	Temperature (^{o}F)	Figure B.12 (2,3)	93^{0} Peak 58^{0} Continuous	(4)	Louis Allis document S40EJ4-099-630 10-10-79	Engineering Analysis + Appendix A	
Model Number: 8-127033	Pressure (PSIA)	Table B.1 (1,2,3)	N/A	(4)	N/A	N/A	N/A
Function: Electrical Isolation of Motor-Operated Valves	Relative Humidity (%)	100%	100%	(4)	TVA Specification 3597	Engineering Analysis + Appendix A	BFNEEB8050
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V AC	Radiation (RAD)	$3.1x10^{4}$ rads normal plus accident dose	10^{5} rads	(4)	NUREG 0588 material list	Generic Material tests + Appendix A	BFNEEB8050
Location: EL 621.25, Rm 12	Aging	N/A	11.5years	(2)	See Temperature Row Above		
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: WJ Hy
Reviewed by: D.R. Webster
QA Acceptance: J. F. French 10/28/80

EN DES CALCULATIONS

TITLE
Engineering Evaluation for Continued Operation

UNID SYSTEM(S)

PLANT/UNIT BFN/1,2,3

SAR SECTION(S)

PREPARING ORGANIZATION
EN DES - EEB

APPLICABLE DESIGN DOCUMENTS
N/A

BRANCH/PROJECT IDENTIFIERS
NCR No.
BFN EEB8050

KEY NOUNS
Environment qualification

REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
R0		
R1		
R2		
R3		

REV	R0	R1	R2	R3
DATE				
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STATEMENT OF PROBLEM

Qualification documentation for the low pressure safety injection motor generator set (contract 78K5-823297) is not available for the temperature humidity, and radiation environment occurring during a design basis event.

ABSTRACT

The approach which TVA used to establish that the motor generator (MG) set named in NCR BFN EEB 8050 is functionally operable and to determine aging effects for the given operating and accident environments was to combine partial test data with verbal information on the MG set materials to support analytical assumptions and conclusions reached. The environments considered were temperature, humidity, and radiation. From this analysis, TVA has determined that the equipment has a qualified life of 11.5 years minimum. The voltage regulator has been relocated to a nonharsh environment.

 *Use revision log (form TVA 10534) if more room is required

BROWNS FERRY NUCLEAR PLANT

Temperature. The following two areas were addressed to insure the adequacy with respect to the temperature environment of the MG set:

a. Insulation System.

b. Rectifier Diodes.

Temperature rise test data is available for one motor and one alternator supplied with the MG sets. Since we do not have all the temperature rise test data, we have assumed a maximum temperature rise as stated in Louis Allis' letter dated May 21, 1980 (EEB 800602 020), for contract 78K5-823297 for the alternators and as specified in this same contract for the motors. Using this value and the most severe temperature condition, the MG set would experience, the maximum operating temperature was determined. The most severe temperature profile for the rooms in which these MG sets are situated shows a temperature rise to 93^{o} C in 47 seconds, a fall to 75^{o} C by 120 seconds, and then a linear decrease to room temperature (40^{o} C) in 24 hours. The mass of this machine will not instantly respond to this temperature transient; however, the temperature will increase to a value less than the 75^{o} C temperature at the 2-minute point. For conservatism, we assumed that the ambient temperature rose to 58^{o} C for a period of 24 hours. (The value of 58^{o} C was arrived at by taking the temperature-time area of the triangle which results from plotting the linear decrease of temperature from 75^{o} C at the 2-minute time to 40^{o} C at 24 hours. A rectangle of equal area was then plotted for the 24-hour period and the temperature of 58^{o} C was found to maintain the same temperature-time area as the original triangular area.) Vendor documentation (Louis Allis document No. 8-127033 change 5) shows a semilog plot of time in hours versus temperature in degrees Celsius. The insulation system, as demonstrated by this plot, has a life expectancy of 350,000 hours with an ambient temperature of 40^{o} C. The 10^{o} C rule (an approximation of Arrhenius' Law as applied to insulation materials) was used to estimate the operating life of the motor. The 10^{o} C rule states that for each 10^{o} C rise in temperature above some reference temperature at which the material is able to operate without degradation the useful life of the material is halved. Although future vendor documentation will show the temperature transient as having no significant adverse affect on the useful life of this material, we will assume, for extreme conservatism, the ambient will be at 58^{o} C continuously. This will reduce the useful life from 40 years to $40/2^{1.8}$ = 11.5 years.

The rectifier diodes used in the alternator field have (per vendor) a normal ambient temperature rating range of -65^{o} to +138^{o} C with a 70-ampere current flowing through them. In this particular application, a current of 27 amperes is flowing through the diode and the junction temperature is therefore lower. This would allow an even larger ambient temperature range. Since the maximum ambient temperature increases to only 93^{o} C, the diodes are adequate for the worst-case temperature.

BROWNS FERRY NUCLEAR PLANT

Humidity. The motor generator set listed on NCR BFNEEB8050 is to be operated in a peak humidity environment of 100 percent. Both the generator and the motor are totally enclosed and fan cooled. Therefore, peak humidity values of 100 percent will not adversely affect this machine. Additionally, the machine is continuously rotating, further reducing insulation susceptability to moisture.

Radiation. The materials for all rotating machinery in environments with greater than 10^4 rads (considered negligible) were identified and their radiation damage threshold compared to the operating and accident environments. The radiation environment including the 40-year normal dose and the integrated accident dose is 3.1×10^4 rads. The materials in the machine include polyester varnish (10^5 rads), silicone varnish (10^9 rads), Nomex (10^8 rads), magnetic wire copper with polyimide hide (10^6 rads), and phenolic (diode support) (7×10^6 rads).

The rectifier diodes are of the diffused type with a silicon substrate and heavily doped with phosphorous and boron (10^{20} electrons/cm^3 and 10^{14} holes/cm^3 respectively, and silicon has 5×10^{22} ATMS/cm^3). Reference Grove, A.S. Physics and Technology of Semiconductor Devices, New York: John Wiley & Son, Incorporated, 1967. Diodes used in a radiation environment must be heavily doped to eliminate carrier removal. As a conservative estimate the radiation dosage of 3.1×10^4 rads would increase the leakage current of the diode by a factor of 10. (A radiation dosage of 18 megarads has increased the leakage current of a smaller geometry diode by a factor of 10). Large diodes have leakage currents in the order of 20 milliamperes at a temperature of 100° C. With the combined radiation dosage and temperature under accident conditions, a 200-milliampere current may result which would not affect the field current of 27 amperes.

Prepared by: WB Heyd

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 3
Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2) (3)

Sheet No. EEB APS-0200
Revision 0
Date 10-20-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX PWR Plant ID No. 3DA	Operating Time	1 Year	Continuous motor operation; 5 min/hr alternator loading	(1)	Louis Allis document S40EJ4-099-630 10-10-79	Test	BFNEEB8050
Component Motor Generator Sets (LPSI) Manufacturer: Louis Allis Company	Temperature (°F)	Figure B.12 (2,3)	93° Peak 58°C Continuous	(4)	Louis Allis document S40EJ4-099-630 10-10-79	Engineering Analysis + Appendix A	
Model Number: 8-127033	Pressure (PSIA)	Table B.1 (1,2,3)	N/A	(4)	N/A	N/A	N/A
Function: Electrical Isolation of Motor-Operated Valves	Relative Humidity (%)	100%	100%	(4)	TVA Specification 3597	Engineering Analysis + Appendix A	BFNEEB8050
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V AC	Radiation (RAD)	$3.1x10^4$ rads normal plus accident dose	10^5 rads	(4)	NUREG 0588 material list	Generic Material tests + Appendix A	BFNEEB8050
Location: EL 621.25, Rm. 12	Aging	N/A	11.5 years	(2)	See Temperature Row Above		
Flood Level Elev: 552' Above Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: WBHipp
Reviewed by: D.R. Webster
QA Acceptance: J.F. French 10/28/80

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation		BFN/1,2,3
		SAR SECTION(S)

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No.. BFN EEB8050	R1		
		R2		
KEY NOUNS: Environment qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	W. B. Hagg [signature]			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
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STATEMENT OF PROBLEM

Qualification documentation for the low pressure safety injection motor generator set (contract 78K5-823297) is not available for the temperature humidity, and radiation environment occurring during a design basis event.

ABSTRACT

The approach which TVA used to establish that the motor generator (MG) set named in NCR BFN EEB 8050 is functionally operable and to determine aging effects for the given operating and accident environments was to combine partial test data with verbal information on the MG set materials to support analytical assumptions and conclusions reached. The environments considered were temperature, humidity, and radiation. From this analysis, TVA has determined that the equipment has a qualified life of 11.5 years minimum. The voltage regulator has been relocated to a nonharsh environment.

 *Use revision log (form TVA 10534) if more room is required

BROWNS FERRY NUCLEAR PLANT

Temperature. The following two areas were addressed to insure the adequacy with respect to the temperature environment of the MG set:

a. Insulation System.

b. Rectifier Diodes.

Temperature rise test data is available for one motor and one alternator supplied with the MG sets. Since we do not have all the temperature rise test data, we have assumed a maximum temperature rise as stated in Louis Allis' letter dated May 21, 1980 (EEB 800602 020), for contract 78K5-823297 for the alternators and as specified in this same contract for the motors. Using this value and the most severe temperature condition, the MG set would experience, the maximum operating temperature was determined. The most severe temperature profile for the rooms in which these MG sets are situated shows a temperature rise to 93^{0} C in 47 seconds, a fall to 75^{0} C by 120 seconds, and then a linear decrease to room temperature (40^{0} C) in 24 hours. The mass of this machine will not instantly respond to this temperature transient; however, the temperature will increase to a value less than the 75^{0} C temperature at the 2-minute point. For conservatism, we assumed that the ambient temperature rose to 58^{0} C for a period of 24 hours. (The value of 58^{0} C was arrived at by taking the temperature-time area of the triangle which results from plotting the linear decrease of temperature from 75^{0} C at the 2-minute time to 40^{0} C at 24 hours. A rectangle of equal area was then plotted for the 24-hour period and the temperature of 58^{0} C was found to maintain the same temperature-time area as the original triangular area.) Vendor documentation (Louis Allis document No. 8-127033 change 5) shows a semilog plot of time in hours versus temperature in degrees Celsius. The insulation system, as demonstrated by this plot, has a life expectancy of 350,000 hours with an ambient temperature of 40^{0} C. The 10^{0} C rule (an approximation of Arrhenius' Law as applied to insulation materials) was used to estimate the operating life of the motor. The 10^{0} C rule states that for each 10^{0} C rise in temperature above some reference temperature at which the material is able to operate without degradation the useful life of the material is halved. Although future vendor documentation will show the temperature transient as having no significant adverse affect on the useful life of this material, we will assume, for extreme conservatism, the ambient will be at 58^{0} C continuously. This will reduce the useful life from 40 years to $40/2^{1.8}$ = 11.5 years.

The rectifier diodes used in the alternator field have (per vendor) a normal ambient temperature rating range of -65^{0} to $+138^{0}$ C with a 70-ampere current flowing through them. In this particular application, a current of 27 amperes is flowing through the diode and the junction temperature is therefore lower. This would allow an even larger ambient temperature range. Since the maximum ambient temperature increases to only 93^{0} C, the diodes are adequate for the worst-case temperature.

BROWNS FERRY NUCLEAR PLANT

Humidity. The motor generator set listed on NCR BFNEEB8050 is to be operated in a peak humidity environment of 100 percent. Both the generator and the motor are totally enclosed and fan cooled. Therefore, peak humidity values of 100 percent will not adversely affect this machine. Additionally, the machine is continuously rotating, further reducing insulation susceptability to moisture.

Radiation. The materials for all rotating machinery in environments with greater than 10^4 rads (considered negligible) were identified and their radiation damage threshold compared to the operating and accident environments. The radiation environment including the 40-year normal dose and the integrated accident dose is 3.1×10^4 rads. The materials in the machine include polyester varnish (10^5 rads), silicone varnish (10^9 rads), Nomex (10^8 rads), magnetic wire copper with polyimide hide (10^6 rads), and phenolic (diode support) (7×10^6 rads).

The rectifier diodes are of the diffused type with a silicon substrate and heavily doped with phosphorous and boron (10^{20} electrons/cm^3 and 10^{14} holes/cm^3 respectively, and silicon has 5×10^{22} ATMS/cm^3). Reference Grove, A.S. Physics and Technology of Semiconductor Devices, New York: John Wiley & Son, Incorporated, 1967. Diodes used in a radiation environment must be heavily doped to eliminate carrier removal. As a conservative estimate the radiation dosage of 3.1×10^4 rads would increase the leakage current of the diode by a factor of 10. (A radiation dosage of 18 megarads has increased the leakage current of a smaller geometry diode by a factor of 10). Large diodes have leakage currents in the order of 20 milliamperes at a temperature of 100^0 C. With the combined radiation dosage and temperature under accident conditions, a 200-milliampere current may result which would not affect the field current of 27 amperes.

Prepared by:
Reviewed by: D.R.

Facility: Browns Ferry Nuclear Plant
Unit: 3
Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. EER APS-0201 (3)
Revision 0
Date 10-20-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: AUX PWR Plant ID No. 3EN	Operating Time	1 Year	Continuous motor operation; 5 min/hr alternator loading	(1)	Louis Allis document S40EJ4-099-630 10-10-79	Test	BFNEEB8050
Component Motor Generator Sets (LPSI) Manufacturer: Louis Allis Company	Temperature (°F)	Figure B.12 (2,3)	93° Peak 58°C CONTINUOUS	(4)	Louis Allis document S40EJ4-099-630 10-10-79	Engineering Analysis + Appendix A	
Model Number: 8-127033	Pressure (PSIA)	Table B.1 (1,2,3)	N/A	(4)	N/A	N/A	N/A
Function: Electrical Isolation of Motor-Operated Valves Accuracy: Req'd: N/A	Relative Humidity (%)	100%	100%	(4)	TVA Specification 3597	Engineering Analysis + Appendix A	BFNEEB8050
Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V AC	Radiation (RAD)	3.1x10⁴ rads normal plus accident dose	10⁵ rads except diodes	(4)	NUREG 0588 material list	Generic Material tests + Appendix A	BFNEEB8050
Location: EL 621.25, Rm 12	Aging	N/A	11.5 years	(2)	See Temperature Row Above		
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: WBHipf
Reviewed by: D.R. Webster
QA Acceptance: J.F. French
10/28/80

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation		BFN/1,2,3
		SAR SECTION(S)

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS	R1		
N/A	NCR No. BFN EEB8050	R2		
KEY NOUNS: Environment qualification		R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	W. B[illegible]			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
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STATEMENT OF PROBLEM

Qualification documentation for the low pressure safety injection motor generator set (contract 78K5-823297) is not available for the temperature, humidity, and radiation environment occurring during a design basis event.

ABSTRACT

The approach which TVA used to establish that the motor generator (MG) set named in NCR BFN EEB 8050 is functionally operable and to determine aging effects for the given operating and accident environments was to combine partial test data with verbal information on the MG set materials to support analytical assumptions and conclusions reached. The environments considered were temperature, humidity, and radiation. From this analysis, TVA has determined that the equipment has a qualified life of 11.5 years minimum. The voltage regulator has been relocated to a nonharsh environment.

*Use revision log (form TVA 10534) if more room is required

BROWNS FERRY NUCLEAR PLANT

Temperature. The following two areas were addressed to insure the adequacy with respect to the temperature environment of the MG set:

a. Insulation System.

b. Rectifier Diodes.

Temperature rise test data is available for one motor and one alternator supplied with the MG sets. Since we do not have all the temperature rise test data, we have assumed a maximum temperature rise as stated in Louis Allis' letter dated May 21, 1980 (EEB 800602 020), for contract 78K5-823297 for the alternators and as specified in this same contract for the motors. Using this value and the most severe temperature condition, the MG set would experience, the maximum operating temperature was determined. The most severe temperature profile for the rooms in which these MG sets are situated shows a temperature rise to 93° C in 47 seconds, a fall to 75° C by 120 seconds, and then a linear decrease to room temperature (40° C) in 24 hours. The mass of this machine will not instantly respond to this temperature transient; however, the temperature will increase to a value less than the 75° C temperature at the 2-minute point. For conservatism, we assumed that the ambient temperature rose to 58° C for a period of 24 hours. (The value of 58° C was arrived at by taking the temperature-time area of the triangle which results from plotting the linear decrease of temperature from 75° C at the 2-minute time to 40° C at 24 hours. A rectangle of equal area was then plotted for the 24-hour period and the temperature of 58° C was found to maintain the same temperature-time area as the original triangular area.) Vendor documentation (Louis Allis document No. 8-127033 change 5) shows a semilog plot of time in hours versus temperature in degrees Celsius. The insulation system, as demonstrated by this plot, has a life expectancy of 350,000 hours with an ambient temperature of 40° C. The 10° C rule (an approximation of Arrhenius' Law as applied to insulation materials) was used to estimate the operating life of the motor. The 10° C rule states that for each 10° C rise in temperature above some reference temperature at which the material is able to operate without degradation the useful life of the material is halved. Although future vendor documentation will show the temperature transient as having no significant adverse affect on the useful life of this material, we will assume, for extreme conservatism, the ambient will be at 58° C continuously. This will reduce the useful life from 40 years to $40/2^{1.8}$ = 11.5 years.

The rectifier diodes used in the alternator field have (per vendor) a normal ambient temperature rating range of -65° to +138° C with a 70-ampere current flowing through them. In this particular application, a current of 27 amperes is flowing through the diode and the junction temperature is therefore lower. This would allow an even larger ambient temperature range. Since the maximum ambient temperature increases to only 93° C, the diodes are adequate for the worst-case temperature.

BROWNS FERRY NUCLEAR PLANT

Humidity. The motor generator set listed on NCR BFNEEB8050 is to be operated in a peak humidity environment of 100 percent. Both the generator and the motor are totally enclosed and fan cooled. Therefore, peak humidity values of 100 percent will not adversely affect this machine. Additionally, the machine is continuously rotating, further reducing insulation susceptability to moisture.

Radiation. The materials for all rotating machinery in environments with greater than 10^4 rads (considered negligible) were identified and their radiation damage threshold compared to the operating and accident environments. The radiation environment including the 40-year normal dose and the integrated accident dose is 3.1×10^4 rads. The materials in the machine include polyester varnish (10^5 rads), silicone varnish (10^9 rads), Nomex (10^8 rads), magnetic wire copper with polyimide hide (10^6 rads), and phenolic (diode support) (7×10^6 rads).

The rectifier diodes are of the diffused type with a silicon substrate and heavily doped with phosphorous and boron (10^{20} electrons/cm^3 and 10^{14} holes/cm^3 respectively, and silicon has 5×10^{22} ATMS/cm^3). Reference Grove, A.S. Physics and Technology of Semiconductor Devices, New York: John Wiley & Son, Incorporated, 1967. Diodes used in a radiation environment must be heavily doped to eliminate carrier removal. As a conservative estimate the radiation dosage of 3.1×10^4 rads would increase the leakage current of the diode by a factor of 10. (A radiation dosage of 18 megarads has increased the leakage current of a smaller geometry diode by a factor of 10). Large diodes have leakage currents in the order of 20 milliamperes at a temperature of 100° C. With the combined radiation dosage and temperature under accident conditions, a 200-milliampere current may result which would not affect the field current of 27 amperes.

Prepared by: [illegible]

Reviewed by: D. R. [illegible]

Facility: Browns Ferry Nuclear Plant
Unit: 3
Docket: 50-296

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. (3) EEB APS-0202
Revision 0
Date 10-20-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. 3EA	Operating Time	1 Year	Continuous motor operation; 5 min/hr alternator loading	(1)	Louis Allis document S40EJ4-099-630 10-10-79	Test	BFNEEB8050
Component Motor Generator Sets (LPSI) Manufacturer: Louis Allis Company	Temperature (°F)	Figure B.12 (2,3)	93^0 Peak 58^0C Continuous	(4)	Louis Allis document S40EJ4-099-630 10-10-79	Engineering Analysis + Appendix A	
Model Number: 8-127033	Pressure (PSIA)	Table B.1 (1,2,3)	N/A	(4)	N/A	N/A	N/A
Function: Electrical Isolation of Motor-Operated Valves	Relative Humidity (%)	100%	100%	(4)	TVA Specification 3597	Engineering Analysis + Appendix A	BFNEEB8050
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V AC	Radiation (RAD)	$3.1x10^4$ rads normal plus accident dose	10^5 rads except diodes	(4)	NUREG 0588 material list	Generic Material tests + Appendix A	BFNEEB8050
Location: EL 621.25, Rm 12	Aging	N/A	11.5 years	(2)	See Temperature Row Above		
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: W.G. Hopp
Reviewed by: G.R. Webster
QA Acceptance: J.J. French 10/28/80

EN DES CALCULATIONS

TITLE: Engineering Evaluation for Continued Operation		UNID SYSTEM(S)	PLANT/UNIT: BFN/1,2,3
			SAR SECTION(S)
PREPARING ORGANIZATION: EN DES - EEB			
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No. BFN EEB8050		
KEY NOUNS: Environment qualification			

REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
R0		
R1		
R2		
R3		

REV	R0	R1	R2	R3
DATE				
PREPARED	W. B. [illegible]			
CHECKED	D. R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
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STATEMENT OF PROBLEM

Qualification documentation for the low pressure safety injection motor generator set (contract 78K5-823297) is not available for the temperature, humidity, and radiation environment occurring during a design basis event.

ABSTRACT

The approach which TVA used to establish that the motor generator (MG) set named in NCR BFN EEB 8050 is functionally operable and to determine aging effects for the given operating and accident environments was to combine partial test data with verbal information on the MG set materials to support analytical assumptions and conclusions reached. The environments considered were temperature, humidity, and radiation. From this analysis, TVA has determined that the equipment has a qualified life of 11.5 years minimum. The voltage regulator has been relocated to a nonharsh environment.

BROWNS FERRY NUCLEAR PLANT

<u>Temperature</u>. The following two areas were addressed to insure the adequacy with respect to the temperature environment of the MG set:

a. Insulation System.

b. Rectifier Diodes.

Temperature rise test data is available for one motor and one alternator supplied with the MG sets. Since we do not have all the temperature rise test data, we have assumed a maximum temperature rise as stated in Louis Allis' letter dated May 21, 1980 (EEB 800602 020), for contract 78K5-823297 for the alternators and as specified in this same contract for the motors. Using this value and the most severe temperature condition, the MG set would experience, the maximum operating temperature was determined. The most severe temperature profile for the rooms in which these MG sets are situated shows a temperature rise to 93° C in 47 seconds, a fall to 75° C by 120 seconds, and then a linear decrease to room temperature (40° C) in 24 hours. The mass of this machine will not instantly respond to this temperature transient; however, the temperature will increase to a value less than the 75° C temperature at the 2-minute point. For conservatism, we assumed that the ambient temperature rose to 58° C for a period of 24 hours. (The value of 58° C was arrived at by taking the temperature-time area of the triangle which results from plotting the linear decrease of temperature from 75° C at the 2-minute time to 40° C at 24 hours. A rectangle of equal area was then plotted for the 24-hour period and the temperature of 58° C was found to maintain the same temperature-time area as the original triangular area.) Vendor documentation (Louis Allis document No. 8-127033 change 5) shows a semilog plot of time in hours versus temperature in degrees Celsius. The insulation system, as demonstrated by this plot, has a life expectancy of 350,000 hours with an ambient temperature of 40° C. The 10° C rule (an approximation of Arrhenius' Law as applied to insulation materials) was used to estimate the operating life of the motor. The 10° C rule states that for each 10° C rise in temperature above some reference temperature at which the material is able to operate without degradation the useful life of the material is halved. Although future vendor documentation will show the temperature transient as having no significant adverse affect on the useful life of this material, we will assume, for extreme conservatism, the ambient will be at 58° C continuously. This will reduce the useful life from 40 years to $40/2^{1.8} = 11.5$ years.

The rectifier diodes used in the alternator field have (per vendor) a normal ambient temperature rating range of -65° to +138° C with a 70-ampere current flowing through them. In this particular application, a current of 27 amperes is flowing through the diode and the junction temperature is therefore lower. This would allow an even larger ambient temperature range. Since the maximum ambient temperature increases to only 93° C, the diodes are adequate for the worst-case temperature.

BROWNS FERRY NUCLEAR PLANT

Humidity. The motor generator set listed on NCR BFNEEB8050 is to be operated in a peak humidity environment of 100 percent. Both the generator and the motor are totally enclosed and fan cooled. Therefore, peak humidity values of 100 percent will not adversely affect this machine. Additionally, the machine is continuously rotating, further reducing insulation susceptability to moisture.

Radiation. The materials for all rotating machinery in environments with greater than 10^4 rads (considered negligible) were identified and their radiation damage threshold compared to the operating and accident environments. The radiation environment including the 40-year normal dose and the integrated accident dose is 3.1×10^4 rads. The materials in the machine include polyester varnish (10^5 rads), silicone varnish (10^9 rads), Nomex (10^8 rads), magnetic wire copper with polyimide hide (10^6 rads), and phenolic (diode support) (7×10^6 rads).

The rectifier diodes are of the diffused type with a silicon substrate and heavily doped with phosphorous and boron (10^{20} electrons/cm^3 and 10^{14} holes/cm^3 respectively, and silicon has 5×10^{22} ATMS/cm^3). Reference Grove, A.S. Physics and Technology of Semiconductor Devices, New York: John Wiley & Son, Incorporated, 1967. Diodes used in a radiation environment must be heavily doped to eliminate carrier removal. As a conservative estimate the radiation dosage of 3.1×10^4 rads would increase the leakage current of the diode by a factor of 10. (A radiation dosage of 18 megarads has increased the leakage current of a smaller geometry diode by a factor of 10). Large diodes have leakage currents in the order of 20 milliamperes at a temperature of 100° C. With the combined radiation dosage and temperature under accident conditions, a 200-milliampere current may result which would not affect the field current of 27 amperes.

Prepared by: [illegible]

Reviewed by: D. R. [illegible]

Facility: Browns Ferry Nuclear Plant
Unit: 1
Docket: 50-259

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. (3) EEB-APS-0203
Revision 0
Date 10-30-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. TS-1A Component Transformer	Operating Time	1 Year	None	(1)	None	None	BFNEEB8051 R1 Appendix 1&2
Manufacturer: General Electric	Temperature (°F)	Figure B.12 (1)	None	(4)	None	None	
Model Number: N/A	Pressure (PSIA)	Table B.1 (1,2,3)	None	(4)	None	None	
Function: Power Distribution	Relative Humidity (%)	100 max	None	(4)	None	None	
Accuracy: Req'd: N/A Demon: N/A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Category: A Service: 4160V-480V Transformers Location: El 621, Rm 12	Radiation (RAD)	$3.1x10^4$	None	(4)	None	None	BFNEEB8051 R1 Appendix 1&2
	Aging	N/A	None	(2)	None	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. Bierla

Reviewed by: D.R. Webster

QA Acceptance:

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT / SAR SECTION(S)
Engineering Evaluation for Continued Operation	APS	BFN/1 / N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No. BFNEEB8051; R1	R1		
		R2		
KEY NOUNS: Environmental Qualification		R3		

REV	R0	R1	R2	R3
DATE	10/30/80			
PREPARED	Larry D. Guist			
CHECKED	D.K. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES* ADDED BY THIS REV:				
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STATEMENT OF PROBLEM

Qualification documentation for the Class 1E 4160V-480V shutdown board transformer TS 1A has not been located for the temperature, humidity, pressure, radiation, aging, and operating time.

ABSTRACT

GE submitted test reports for this transformer indicating that it had passed a normal leak test of 5-psi pressure held for a period of 24 hours. Therefore, we can reasonably assume that if the transformer can withstand 5-psi internal pressure, then it can also withstand an equal outside pressure., Also, GE certified that this transformer meets ANSI C57.12-1965 which permits a maximum temperature for Class A insulation of 250°C for short-circuit conditions. Relative humidity will not affect the operation of this transformer because it is sealed and filled with Pyranol insulating liquid. Usual nuclear radiation service conditions allow up to 1 x 10^5 rads total integrated 40 years dosage. Therefore, we find that this Class 1E 4160V-480V shutdown board transformer TS1A is qualified for continued operation until confirmation of the above is obtained from the vendor including aging and operating time.

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8051, R1.

2. TVA letter of October 10, 1980 (EEB 801010 915), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available on identical equipment, and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Giesler

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 1
Docket: 50-259

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. (3) EEB-APS-0204
Revision 0
Date 10-30-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. TS 1B Component Transformer	Operating Time	1 Year	None	(1)	None	None	BFNEEB8051 R1 Appendix 1&2
Manufacturer: General Electric	Temperature (°F)	Figure B.12 (1)	None	(4)	None	None	
Model Number: N/A	Pressure (PSIA)	Table B.1 (1,2,3)	None	(4)	None	None	
Function: Power Distribution	Relative Humidity (%)	100 max	None	(4)	None	None	
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 4160V-480V Transformers Location: El 621, Rm 12	Radiation (RAD)	$3.1x10^4$	None	(4)	None	None	BFNEEB8051 R1 Appendix 1&2
	Aging	N/A	None	(2)	None	None	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry L. Gissler

Reviewed by: D.R. Webster

QA Acceptance:

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT / SAR SECTION(S)
Engineering Evaluation for Continued Operation	APS	BFN/1 / N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS: N/A	BRANCH/PROJECT IDENTIFIERS: NCR No. BFNEEB8051, R1	R1		
		R2		
KEY NOUNS: Environmental Qualification		R3		

REV	R0	R1	R2	R3
DATE	10/10/80			
PREPARED	Larry D. Bissler			
CHECKED	D. L. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
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STATEMENT OF PROBLEM

Qualification documentation for the Class 1E 4160V-480V shutdown board transformer TS 1B has not been located for the temperature, humidity, pressure, radiation, aging, and operating time.

ABSTRACT

GE submitted test reports for this transformer indicating that it had passed a normal leak test of 5-psi pressure held for a period of 24 hours. Therefore, we can reasonably assume that if the transformer can withstand 5-psi internal pressure, then it can also withstand an equal outside pressure. Also, GE certified that this transformer meets ANSI C57.12-1965 which permits a maximum temperature for Class A insulation of 250°C for short-circuit conditions. Relative humidity will not affect the operation of this transformer because it is sealed and filled with Pyranol insulating liquid. Usual nuclear radiation service conditions allow up to 1 x 10^5 rads total integrated 40 years dosage. Therefore, we find that this Class 1E 4160V-480V shutdown board transformer TS 1B is qualified for continued operation until confirmation of the above is obtained from the vendor including aging and operating time.

EEB-APS-0204

Appendix 2, Rev 0

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8051, R1.

2. TVA letter of October 10, 1980 (EEB 801010 915), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available on identical equipment, and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Giesler

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 2
Docket: 50-260

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No.(3) EEB-APS-0205
Revision 0
Date 10-30-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. TS-2A	Operating Time	1 Year	None	(1)	None	None	BFNEEB8051 R1 Appendix 1&2
Component Transformer Manufacturer: General Electric	Temperature (°F)	Figure B.12 (2,3)	None	(4)	None	None	↓
Model Number: N/A	Pressure (PSIA)	Table B.1 (1,2,3)	None	(4)	None	None	↓
Function: Power Distribution	Relative Humidity (%)	100 max	None	(4)	None	None	↓
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 4160V-480V Transformers	Radiation (RAD)	3.1×10^4	None	(4)	None	None	BFNEEB8051 R1 Appendix 1&2
Location: El 621, Rm 12	Aging	N/A	None	(2)	None	None	↓
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry C. Geisler

Reviewed by: D.R. Webster

QA Acceptance: ____________

EEB-APS- 0205
Appendix 1, Rev 0

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation	APS	BFN/2
		SAR SECTION(S) N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS	R1		
N/A	NCR No. BFNEEB8051, R1	R2		
KEY NOUNS: Environmental Qualification		R3		

REV	R0	R1	R2	R3
DATE	10/30/80			
PREPARED	Larry D. Guile			
CHECKED	D. L. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
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STATEMENT OF PROBLEM

Qualification documentation for the Class 1E 4160V-480V shutdown board transformer TS 2A has not been located for the temperature, humidity, pressure, radiation, aging, and operating time.

ABSTRACT

GE submitted test reports for this transformer indicating that it had passed a normal leak test of 5-psi pressure held for a period of 24 hours. Therefore, we can reasonably assume that if the transformer can withstand 5-psi internal pressure, then it can also withstand an equal outside pressure. Also, GE certified that this transformer meets ANSI C57.12-1965 which permits a maximum temperature for Class A insulation of 250°C for short-circuit conditions. Relative humidity will not affect the operation of this transformer because it is sealed and filled with Pyranol insulating liquid. Usual nuclear radiation service conditions allow up to 1 x 10^5 rads total integrated 40 years dosage. Therefore, we find that this Class 1E 4160V-480V shutdown board transformer TS 2A is qualified for continued operation until confirmation of the above is obtained from the vendor including aging and operating time.

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB80 51, R1.

2. TVA letter of October 10, 1980 (EEB 801010 915), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available on identical equipment, and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Geisler

Reviewed by: D. R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 2
Docket: 50-260

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB-APS-0206
Revision 0
Date 10-30-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. TS2B Component Transformer	Operating Time	1 Year	None	(1)	None	None	BFNEEB8051 R1 Appendix 1&2
Manufacturer: General Electric	Temperature (°F)	Figure B.12 (2,3)	None	(4)	None	None	↓
Model Number: N/A	Pressure (PSIA)	Table B.1 (1,2,3)	None	(4)	None	None	↓
Function: Power Distribution	Relative Humidity (%)	100 max	None	(4)	None	None	↓
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 4160V-480V Transformers	Radiation (RAD)	3.1×10^4	None	(4)	None	None	BFNEEB8051 R1 Appendix 1&2
Location: El 621, Rm 12	Aging	N/A	None	(2)	None	None	↓
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. Giesle

Reviewed by: G.R. Webster

QA Acceptance: ____________

EEB-APS-0206
Appendix 1, Rev 0

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation	APS	BFN/2
		SAR SECTION(S): N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS	R1		
N/A	NCR No. BFNEEB8051, R1	R2		
KEY NOUNS: Environmental Qualification		R3		

REV	R0	R1	R2	R3
DATE	10/30/80			
PREPARED	Larry D. Birch			
CHECKED	S.A. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
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STATEMENT OF PROBLEM

Qualification documentation for the Class 1E 4160V-480V shutdown board transformer TS2B has not been located for the temperature, humidity, pressure, radiation, aging, and operating time.

ABSTRACT

GE submitted test reports for this transformer indicating that it had passed a normal leak test of 5-psi pressure held for a period of 24 hours. Therefore, we can reasonably assume that if the transformer can withstand 5-psi internal pressure, then it can also withstand an equal outside pressure. Also, GE certified that this transformer meets ANSI C57.12-1965 which permits a maximum temperature for Class A insulation of 250°C for short-circuit conditions. Relative humidity will not affect the operation of this transformer because it is sealed and filled with Pyranol insulating liquid. Usual nuclear radiation service conditions allow up to 1 x 10^5 rads total integrated 40 years dosage. Therefore, we find that this Class 1E 4160V-480V shutdown board transformer TS2B is qualified for continued operation until confirmation of the above is obtained from the vendor including aging and operating time.

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8051, R1.

2. TVA letter of October 10, 1980 (EEB 801010 915), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available on identical equipment, and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Bisler

Reviewed by: D.R. H. Aisler

Facility: Browns Ferry Nuclear Plant
Unit: 1
Docket: 50-259

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No.(3) EEB-APS-0207
Revision 0
Date 10-30-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. TS-1E	Operating Time	1 Year	None	(1)	None	None	BFNEEB8018 R1 Appendix 1&2
Component Transformer Manufacturer: General Electric	Temperature (°F)	Figure B.13 (1)	None	(4)	None	None	↓
Model Number: N/A	Pressure (PSIA)	Table B.1 (1,2,3)	None	(4)	None	None	↓
Function: Power Distribution	Relative Humidity (%)	100 max	None	(4)	None	None	↓
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 4160V-480V Transformers	Radiation (RAD)	$3.1x10^4$	None	(4)	None	None	BFNEEB8018 R1 Appendix 1&2
Location: El 639, Rm 13	Aging	N/A	None	(2)	None	None	↓
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. Bircher

Reviewed by: D.R. Webster

QA Acceptance: ____________

EEB-APS- 0207

Appendix 2, Rev 0

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8018, R1.

2. TVA letter of October 10, 1980 (EEB 801010 915), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available on identical equipment, and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Gisler

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 2
Docket: 50-260

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No.(3) EEB-APS-0208
Revision 0
Date 10-30-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. TS-2E	Operating Time	1 Year	None	(1)	None	None	BFNEEB8018 R1 Appendix 1&2
Component Transformer Manufacturer: General Electric	Temperature (°F)	Figure B.13 (2,3)	None	(4)	None	None	↓
Model Number: N/A	Pressure (PSIA)	Table B.1 (1,2,3)	None	(4)	None	None	↓
Function: Power Distribution	Relative Humidity (%)	100 max	None	(4)	None	None	↓
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 4160V-480V Transformers	Radiation (RAD)	$3.1x10^4$	None	(4)	None	None	BFNEEB8018 R1 Appendix 1&2
Location: El 639, Rm 13	Aging	N/A	None	(2)	None	None	↓
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Guy D. Bieler

Reviewed by: D.K. Wilder

QA Acceptance: ____________

EN DES CALCULATIONS

TITLE Engineering Evaluation for Continued Operation		UNID SYSTEM(S) APS	PLANT/UNIT BFN/2 SAR SECTION(S) N/A
PREPARING ORGANIZATION EN DES - EEB			
APPLICABLE DESIGN DOCUMENTS N/A	BRANCH/PROJECT IDENTIFIERS NCR No. BFNEEB8018, R1		
KEY NOUNS Environmental Qualification			

REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
R0		
R1		
R2		
R3		

REV	R0	R1	R2	R3
DATE	10-30-80			
PREPARED	Larry D Lind[illegible]			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
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STATEMENT OF PROBLEM

Qualification documentation for the Class 1E 4160V-480V shutdown board transformer TS2E has not been located for the temperature, humidity, pressure, radiation, aging, and operating time.

ABSTRACT

GE submitted test reports for this transformer indicating that it had passed a normal leak test of 5-psi pressure held for a period of 24 hours. Therefore, we can reasonably assume that if the transformer can withstand 5-psi internal pressure, then it can also withstand an equal outside pressure. Also, GE certified that this transformer meets ANSI C57.12-1965 which permits a maximum temperature for Class A insulation of 250°C for short-circuit conditions. Relative humidity will not affect the operation of this transformer because it is sealed and filled with Pyranol insulating liquid. Usual nuclear radiation service conditions allow up to 1 x 10^5 rads total integrated 40 years dosage. Therefore, we find that this Class 1E 4160V-480V shutdown board transformer TS2E is qualified for continued operation until confirmation of the above is obtained from the vendor including aging and operating time.

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8018, R1.

2. TVA letter of October 10, 1980 (EEB 801010 915), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available on identical equipment, and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Gisler

Reviewed by: D.R. Webster

EEB-APS-0209
Appendix 1, Rev 0

EN DES CALCULATIONS

TITLE	UNID SYSTEM(S)	PLANT/UNIT
Engineering Evaluation for Continued Operation	APS	BFN/1
		SAR SECTION(S) N/A

PREPARING ORGANIZATION		REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
EN DES - EEB		R0		
APPLICABLE DESIGN DOCUMENTS	BRANCH/PROJECT IDENTIFIERS	R1		
N/A	NCR No. BFNEEB8023, R1	R2		
KEY NOUNS		R3		

REV	R0	R1	R2	R3
DATE	10-30-80			
PREPARED	Larry D. Guest			
CHECKED	D.R. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES* ADDED BY THIS REV:				
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STATEMENT OF PROBLEM

Qualification documentation for the 480V Reactor MOV MCC 1C has not been located for pressure, aging, and operation time. Other qualification awaits confirmation by GE of similarity to later contracts and TVA approval of qualification report for current contract.

ABSTRACT

There is evidence that all GE motor control centers provided for Browns Ferry, Hartsville, and Phipps Bend Nuclear Plants contain identical components. GE's letter of September 26, 1980 (EEB 801009 050), provided their "IC 7700 Motor Control Center Environmental Qualification Test Report to IEEE 323-1974" for Hartsville and Phipps Bend Nuclear Plants (contract 77K5-820350). This report provides adequate qualification for the temperature, humidity, and radiation service conditions. GE is now scheduling a test to prove that the 7700 series MCC including pneumatic timing relays meet the pressure service conditions. Because the accuracy of the pneumatic timing relays may be affected only during a tornado depressurization event which lasts at most approximately 5 seconds and a vendor test is now being scheduled to confirm pressure qualification, the Class 1E Reactor MOV MCC 1C is justified for continued operation, based on similarity including aging and operating time.

EEB-APS-0209

Appendix 2, Rev 0

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8023, R1.

2. TVA letter of October 2, 1980 (EEB 801002 915), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available on identical equipment, and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Beisler

Reviewed by: D.R. Webster

Facility: Browns Ferry Nuclear Plant
Unit: 2
Docket: 50-260

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. (3) EEB-APS-0210
Revision 0
Date 10-30-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Aux Pwr Plant ID No. 480V Reactor MOV BD 2C	Operating Time	1 Year	None	(1)	None	None	BFNEEB8023 R1 Appendix 1&2
Component 480V Motor Control Center (MCC) Manufacturer: General Electric	Temperature (°F)	Figure B.8 (2,3)	None	(4)	None	None	↓
Model Number: 7700 Series	Pressure (PSIA)	Table B.1 (1,2,3)	None	(4)	None	None	↓
Function: 480V Motor Control	Relative Humidity (%)	100 max	None	(4)	None	None	↓
Accuracy: Req'd: N/A Demon: N/A Category: A	Chemical Spray	N/A	N/A	(4)	N/A	N/A	N/A
Service: 480V Motive and Control Power Distribution Location: El 565', Rm 8	Radiation (RAD)	$5.1x10^5$	None	(4)	None	None	BFNEEB8023 R1 Appendix 1&2
	Aging	N/A	None	(2)	None	None	↓
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: Larry D. Gish

Reviewed by: D. R. Webster

QA Acceptance:

EN DES CALCULATIONS

TITLE: Engineering Evaluation for Continued Operation

UNID SYSTEM(S): APS

PLANT/UNIT: BFN/ 2

SAR SECTION(S): N/A

PREPARING ORGANIZATION: EN DES - EEB

APPLICABLE DESIGN DOCUMENTS: N/A

BRANCH/PROJECT IDENTIFIERS: NCR No. BFNEEB80 23, R1

KEY NOUNS:

REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
R0		
R1		
R2		
R3		

REV	R0	R1	R2	R3
DATE	10-30-80			
PREPARED	Larry D. Deile			
CHECKED	B.K. Webster			
SUBMITTED				
APPROVED				
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES * ADDED BY THIS REV:				
LIST ALL PAGES * DELETED BY THIS REV:				
LIST ALL PAGES * CHANGED BY THIS REV:				

STATEMENT OF PROBLEM

Qualification documentation for the 480V Reactor MOV MCC 2C has not been located for pressure, aging, and operation time. Other qualification awaits confirmation by GE of similarity to later contracts and TVA approval of qualification report for current contract.

ABSTRACT

There is evidence that all GE motor control centers provided for Browns Ferry, Hartsville, and Phipps Bend Nuclear Plants contain identical components. GE's letter of September 26, 1980 (EEB 801009 050), provided their "IC 7700 Motor Control Center Environmental Qualification Test Report to IEEE 323-1974" for Hartsville and Phipps Bend Nuclear Plants (contract 77K5-820350). This report provides adequate qualification for the temperature, humidity, and radiation service conditions. GE is now scheduling a test to prove that the 7700 series MCC including pneumatic timing relays meet the pressure service conditions. Because the accuracy of the pneumatic timing relays may be affected only during a tornado depressurization event which lasts at most approximately 5 seconds and a vendor test is now being scheduled to confirm pressure qualification, the Class 1E Reactor MOV MCC 2C is justified for continued operation, based on similarity including aging and operating time.

EEB-APS-0210

Appendix 2, Rev 0

ADDITIONAL INFORMATION

1. Lack of qualification documentation noted on NCR No. BFNEEB8023, R1.

2. TVA letter of October 2, 1980 (EEB 801002 915), has been sent to the vendor asking if qualification information for temperature, humidity, pressure, and radiation is available on identical equipment, and if so, when it will be submitted to TVA. Our letter asked the vendor to submit this information by November 15, 1980.

3. Environment Specification represents "worst-case" service conditions.

4. We are actively pursuing with the vendor whether the materials used in this equipment are susceptible to radiation and thermal aging and to provide a basis for establishing equipment operating life.

Prepared by: Larry D. Greiten

Reviewed by: D.R. Webster

BROWNS FERRY NUCLEAR PLANT
EVALUATION WORKSHEET INDEX

EWS	Description
EEB 1-1001	Solenoid Valve - Target Rock - 1/2 SMS-A-01-1
-1002	↓
-1003	Limit Switch - Namco -EA740-50100
-1004	
-1005	
-1006	
-1007	
-1008	
-1009	
-1010	↓
EEB 23-1001	Solenoid Valve - Atkomatic Valve Co. - 15830WP-VPI
EEB 24-1001	Pressure Switch - Meletron Corp. - 2121-32A
-1002	↓
EEB 32-1001	Solenoid Valve - AAA - S02
-1002	↓
EEB 43-1001	Flow Indicating Switch - Fischer & Porter - 10A2235A-55
-1002	↓
EEB 64-1001	Pressure Differential Switch - Dwyer - 3302
-1002	
-1003	
-1004	
-1005	
-1006	
-1007	
-1008	
-1009	
-1010	
-1011	
-1012	↓
-1013	Solenoid Valve - ASCO - HB830281RU
-1014	Pressure Differential Modifier - Honeywell - A7165A-1078
-1015	↓
-1016	Pressure Differential Control Indicator - Fischer & Porter - 53EL3311BB1B
-1017	
-1018	↓
-1019	Pressure Differential Transmitter - Fischer & Porter - 10B2494TBAB

BROWNS FERRY NUCLEAR PLANT
EVALUATION WORKSHEET INDEX

EWS	Description
EEB 64-1020	Pressure Differential Transmitter - Fischer & Porter - 10B2494TBAB
-1021	Pressure Differential Switch - Fischer & Porter - 10B2494TBAB
-1022	Solenoid Valve - ASCO - HV200-924-2
-1023	Solenoid Valve - ASCO - HB830281RU
-1024	
-1025	
-1026	Pressure Differential Switch - Dwyer - 3302
-1027	Temperature Element - Weed - SP601-1A-A-3-C-275-5N4-2
-1028	Solenoid Valve - ASCO - HB830281RU
-1029	
-1030	
-1031	
-1032	
-1033	Solenoid Valve - ASCO - HV200-924-1F
-1034	Solenoid Valve - ASCO - HV200-924-2
-1035	
-1036	Solenoid Valve - ASCO - HV200-924-1F
-1037	
-1038	Pressure Differential Modifier - Honeywell - A7165A-1078
-1039	Temperature Detector - Weed - SP601-1A-A-3-C-275-SN4-2
-1040	Temperature Detector - Weed - SP601-1A-A-3-C-275-SN4-2
-1041	Pressure Differential Switch - Dwyer - 3302
-1042	
EEB 65-1001	Flow Transmitter - GE/MAC - 50-554212BK223
EEB 67-1001	Solenoid Valve - ASCO - HT8262A203E
-1002	
-1003	
-1004	Limit Switch - Namco - Series EA-750
-1005	Flow Transmitter - GE/MAC - 555
-1006	Pressure Transmitter - Bailey (GE/MAC) - 551
-1007	
-1008	
-1009	
-1010	
-1011	

BROWNS FERRY NUCLEAR PLANT
EVALUATION WORKSHEET INDEX

EWS	Description
EEB 69-1001	Temperature Switch - Fenwal - 18002-27
-1002	
-1003	
-1004	
-1005	
-1006	
-1007	
-1008	
EEB 71-1001	Solenoid Valve - ASCO - HTX8300B614
-1002	
EEB 73-1001	Level Switch - Robertshaw - SL-200
-1002	Pressure Transmitter - Rosemount - 1151GP8EZZLMPBOI
-1003	Level Switch - Robertshaw - SL-200
-1004	Power Supply - Rosemount - SPS-2102-P
EEB 74-1001	Solenoid Valve - ASCO - 8300C61U
-1002	
-1003	
-1004	
EEB 75-1001	Solenoid Valve - ASCO - HTX8300C61U
-1002	Solenoid Valve - ASCO - HB830081F
-1003	Solenoid Valve - ASCO - HTX8300C61U
-1004	
-1005	Solenoid Valve - ASCO - HB830081F
EEB 76-1001	Solenoid Valve - Valcor - 526D
-1002	
-1003	
-1004	
-1005	
-1006	
-1007	
-1008	
-1009	
-1010	
-1011	
-1012	
-1013	

BROWNS FERRY NUCLEAR PLANT
EVALUATION WORKSHEET INDEX

EWS	Description
EEB 76-1014	Solenoid Valve - ASCO - HT8262A203E
-1015	
-1016	
-1017	
-1018	
-1019	
-1020	Solenoid Valve
-1021	Solenoid Valve
EEB 77-1011	Level Switch - Robertshaw - 351
-1002	
-1003	
-1004	Solenoid Valve - ASCO - HB830081RF
-1005	Solenoid Valve - ASCO - 8300C6RU
-1006	Solenoid Valve - ASCO - 8300C61U
-1007	Level Switch - Robertshaw - 351
-1008	
EEB 84-1001	Solenoid Valve - Target Rock - 73FF-05
-1002	
-1003	
-1004	Solenoid Valve - ASCO - T8210C87
-1005	Solenoid Valve - ASCO - HT8211C94
-1006	
-1007	D/P Transmitter - Bailey (GE/MAC) - 555
-1008	
-1009	I/P Converter - Fisher Controls - 546
-1010	
-1011	Pressure Switch - Custom Components - 630GH
-1012	
-1013	Solenoid Valve - Target Rock - 73FF-005
EEB 85-1001	Solenoid Valve - ASCO - WPHT8316E36
-1002	
EEB-90-0001	Radiation Element - Nuclear Measurements Corp.
-0002	
-0003	
-0004	
-0005	
-0006	
-0007	
-0008	
-0009	

Facility: Browns Ferry Nuclear Plant
Unit: 1,2,3
Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No.(3) EEB 1-1001
Revision 0
Date 10/27/80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Main Steam Plant ID No. PSV-1-179	Operating Time	1 Year	None	(1)	None	None	NCR No. BFNEEB8057
Component Solenoid Valve Manufacturer: Target Rock	Temperature (°F)	Figure B.0 (1,2,3)		(4)			
Model Number: 1/2 SMS-A-01-1	Pressure (PSIA)	Figure B.0 (1,2,3)		(4)			
Function: Relief Valve	Relative Humidity (%)	100%		(4)			
Accuracy: Req'd: N/A Demon:	Chemical Spray	N/A	N/A	(4)			
Category: B Service: Main Steam Line A	Radiation (RAD)	$2x10^8$	None	(4)			
Location: 0	Aging	N/A	None	(2)			
Flood Level Elev: 552' Above Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.

(2) See Section 4.1.2 in 79-01B report.

(3) All notes and other information not on these sheets are on the attached appendix sheets.

(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: C. Dean Helton

Reviewed by: [illegible]

QA Acceptance:

Justification for Continued Operation

These valves have been qualified by Target Rock to the following levels:

Temperature	:	$340^{o}F$
Pressure	:	65 PSIG
Relative Humidity	:	100%
Radiation	:	3.4×10^{7}

This is all documented in Target Rock report No. 2199 dated 1-9-79, which is proprietary information for G.E. and not available to TVA.

The valves are required to operate in the following environment:

Temperature	:	$325^{o}F$
Pressure	:	69.7 PSIA
Relative Humididy	:	100%
Radiation	:	2×10^{8}

The operating conditions to which these valves will be subjected are well within the levels to which they have been tested in all areas except radiation.

The failure modes of these valves have been reviewed and are all in the desired direction. Degradation of seats will also result in alignment to the desired position.

The above information shows justification for continued use of the valves. However, due to lack of sufficient documentation, TVA will either type-test this valve or replace it with a type-tested valve.

Facility: Browns Ferry Nuclear Plant
Unit: 1,2,3
Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB 1-1002
Revision 0
Date 10/27/80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Main Steam Plant ID No. PSV-1-180	Operating Time	1 Year	None	(1)	None	None	NCR No. BFNRRN8057
Component Solenoid Valve Manufacturer: Target Rock	Temperature (°F)	Figure B.0 (1,2,3)		(4)			
Model Number: 1/2 SMS-A-01-1	Pressure (PSIA)	Figure B.0 (1,2,3)		(4)			
Function: Relief Valve	Relative Humidity (%)	100%		(4)			
Accuracy: Req'd: N/A Demon: Category: B	Chemical Spray	N/A	N/A	(4)			
Service: Main Steam Line D	Radiation (RAD)	$2x10^8$	None	(4)			
Location: 0	Aging	N/A	None	(2)			
Flood Level Elev: 552' Above Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: C. Dean Helton
Reviewed by: [illegible]
QA Acceptance:

Justification for Continued Operation

These valves have been qualified by Target Rock to the following levels:

Temperature	:	340^{o}F
Pressure	:	65 PSIG
Relative Humidity	:	100%
Radiation	:	3.4×10^{7}

This is all documented in Target Rock report No. 2199 dated 1-9-79, which is proprietary information for G.E. and not available to TVA.

The valves are required to operate in the following environment:

Temperature	:	325^{o}F
Pressure	:	69.7 PSIA
Relative Humididy	:	100%
Radiation	:	2×10^{8}

The operating conditions to which these valves will be subjected are well within the levels to which they have been tested in all areas except radiation.

The failure modes of these valves have been reviewed and are all in the desired direction. Degradation of seats will also result in alignment to the desired position.

The above information shows justification for continued use of the valves. However, due to lack of sufficient documentation, TVA will either type-test this valve or replace it with a type-tested valve.

Facility: Browns Ferry Nuclear Plant
Unit: 1,2,3
Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB 1-1003
Revision 0
Date 10-22-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Main Steam System Plant ID No. ZS-1-15	Operating Time	1 Day	30 Days	(1)	ACME Cleveland Development Co. Test Report DTD 2/20/78	Sequential Test	NONE
Component Limit Switch Manufacturer: NAMCO	Temperature (°F)	Figure B.7 (1) Figure B.7 (2,3)	Appx. 1 340	(4)			
Model Number: EA740-50100	Pressure (PSIA)	Table B.1 (1,2,3)	Appx. 1 70	(4)			
Function: Scram Trip	Relative Humidity (%)	100	100	(4)			
Accuracy: Req'd: N/A Demon:	Chemical Spray	N/A	N/A	(4)			
Category: A Service: Main Steam Line A Outboard Isol. Vlv.	Radiation (RAD)	2.03×10^6	2×10^8	(4)			
Location: 7	Aging	N/A	7 Years	(2)	Appx. 2	Analysis	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: C. Dean Hellon
Reviewed by: [illegible]
QA Acceptance: W. E. [illegible] 10-27-80

APPENDIX 1, SHEET 1 OF 1
EEB 1-1003 REV.0

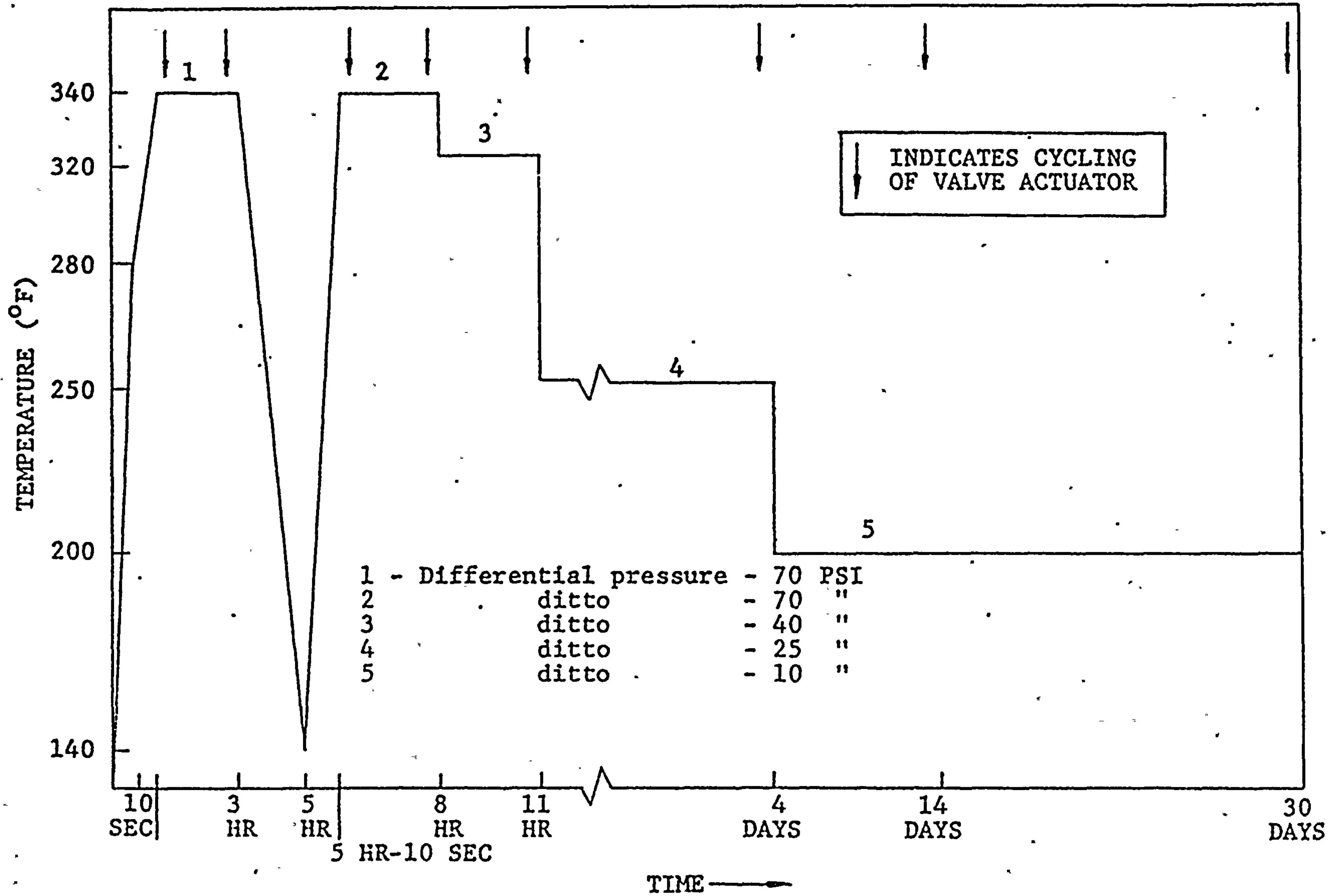


Fig 1
Test Chamber Temperature Profile for Accident Environment Simulation
(Taken from IEEE Standard 382-1972)

E.L.

EDSC-1005

APPENDIX Z

AGING ANALYSIS FOR NAMCO EA740 REV 0

COMPUTED MJD DATE 10-23-80

CHECKED DATE

Establishing Qualified Life at Base service Conditions

A. Aging due to heat aging (reference ACME-CLEVELAND DEVELOPMENT CO TEST REPORT DTD 2-20-78)

T_t = Temp of Aging Test = 200°F = $\frac{5}{9}(200-32)$°C = (93.3+273.15) = 366.48

t_t = Time of Aging Test = 200 hr

t_{a1} = equivalent age at service conditions

T_{a1} = NORMAL Service Temp = 140°F = $\frac{5}{9}(140-32)$°C = 60°C = 333.15

*Assume E_a = 0.958 eV

$$\ln \frac{t_{a1}}{t_t} = \frac{E_a}{K}\left(\frac{1}{T_{a1}} - \frac{1}{T_t}\right)$$

$$\ln \frac{t_{a1}}{200} = \frac{0.958\,eV \times 1.602\times10^{-19}}{1.38\times10^{-23}}\left(\frac{1}{333.15} - \frac{1}{366.48}\right)$$

$$\ln \frac{t_{a1}}{200} = 3.036$$

$$t_a = 200\,e^{3.036} = 4164 \text{ hrs.}$$

B. Aging due to LOCA Test

Time = 0 – 10 sec – negligable effect

Time 10 sec – 3 hr

T_t = 340°F = 171°C = 444.26°K

t_t = ~3 hr.

$$\ln \frac{t_a}{3} = 1.1121\times10^{4}\left(\frac{1}{333.15} - \frac{1}{444.26}\right)$$

$$\ln \frac{t_a}{3} = 8.349$$

$$t_a = 3\,e^{8.349} = 12675.56 \text{ hrs.}$$

NAMCO LIMIT SWITCHES

COMPUTED ______ DATE ______

CHECKED ______ DATE ______

Time 2-5hr Conservative Temp = 240°F for 2hrs = 388.7

$T_t = 240$

$t_t = 2hr$

$\ln \frac{t_a}{2} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{388.7}\right)$

$\ln \frac{t_a}{2} = 4.77$

$t_a = 2e^{4.77} = 236 \text{ hr}$

Time 5-8 hr $T_t = 240$

$t_t = 3$ same as 10 ~~3~~ 3 hrs

$t_a = 12675.56$

Time = 8-11 hrs $T_t = 320°F = 160°C = 433.15°C$

$t_t = 3 \text{ hrs}$

$\ln \frac{t_t}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{433.15}\right)$

$\ln \frac{t_t}{3} = 7.7$

$t_t = 3e^{7.7} = 6669.2 \text{ hrs}$

Time 11hr - 4 days $T_t = 250F = 121°C = 394.26°K$

$t_t = 85 \text{hrs}$

$\ln \frac{t}{85} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{394.26}\right) = 5.174$

$t = 85e^{5.174} = 15013 \text{ hr}$

4days - 30days $t_t = 624 hrs$
$T_t = 200F = 366.48°K$

$\ln \frac{t_a}{624} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{366.48} \right) = 3.036$

$t_a = 624 e^{3.036} = 12991$ hrs

Total age at Service Conditions

$t_{a_{TOTAL}} = \Sigma t_a$

$t_{a_{TOTAL}} = 4164 + 12675 + 236 + 12675 + 6669 + 15013 + 12991$

$t_{a_{TOTAL}} = 64.423$ hrs = 2684 days = 7.35 yrs

REV0

COMPUTED ____ DATE ____

CHECKED ____ DATE ____

Aging due to LOCA in plant.

TIME - 4 — 6 minutes $T_t = 325°F = 163°C = 435.9\ °K$

$t = 10\ min$

$$\ln \frac{t_a}{.167hr} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9} \right) = 7.87$$

$$t_a = 0.167 \cdot e^{7.87} = 437 \text{ hours}$$

TIME 6 - 34 min ∴ conservatively estimated $T_t = 325°F = 435.9°K$

$t_t = 28\ min = 0.467\ hr$

$$\ln \frac{t_a}{.467} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9} \right) = 7.87$$

$$t_a = .467\ e^{7.87} = 1222.4\ hr.$$

Time 34 ~~min - 1.25 hr~~ conservatively estimated at $T_t = 300°F = 148°C = 422K$

$t_t = 41\ min = 0.68\ hr$

$$\ln \frac{t_a}{.68} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{422} \right) = 7.028$$

$$t_a = .68 \cdot e^{7.028} = 766.9 \cdot hrs$$

TIME = 1.25 — 6 hrs — ~~$T_t = 230F$~~ = 110C = 383.15 K

$t_t = 4.75\ hr$

$$t_a = 4.75 e^{4.356}$$

$$t_a = 370\ hrs$$

Time 6 - 12 hrs $T_t = 215 = 101C = 374.8K$

$t_t = 6\ hrs$

$$t_a = 6e^{3.71}$$

$$t_a = 245.3\ hrs$$

COMPUTED ____ DATE ____
CHECKED ____ DATE ____

TIME 12-18 hrs $T_t = 190 = 88°C = 361 K$

$t_t = 6$ hrs

$t_a = 6e^{2.569}$

$t_a = 78.$

TIME 18-24 $T_t = 170°F = 77°C = 350K$

$t_a = 6e^{1.577} = 29.0$ hrs

Total Aging due to LOCA

$t_{aL} = 3148.4$ hrs

Maximum Lifetime before LOCA

$$T_{BL} = \underset{T_a}{64423} - \underset{t_{aL}}{3148.4} = 61274 \text{ hrs}$$

$t_{BL} = 6.99$ yrs

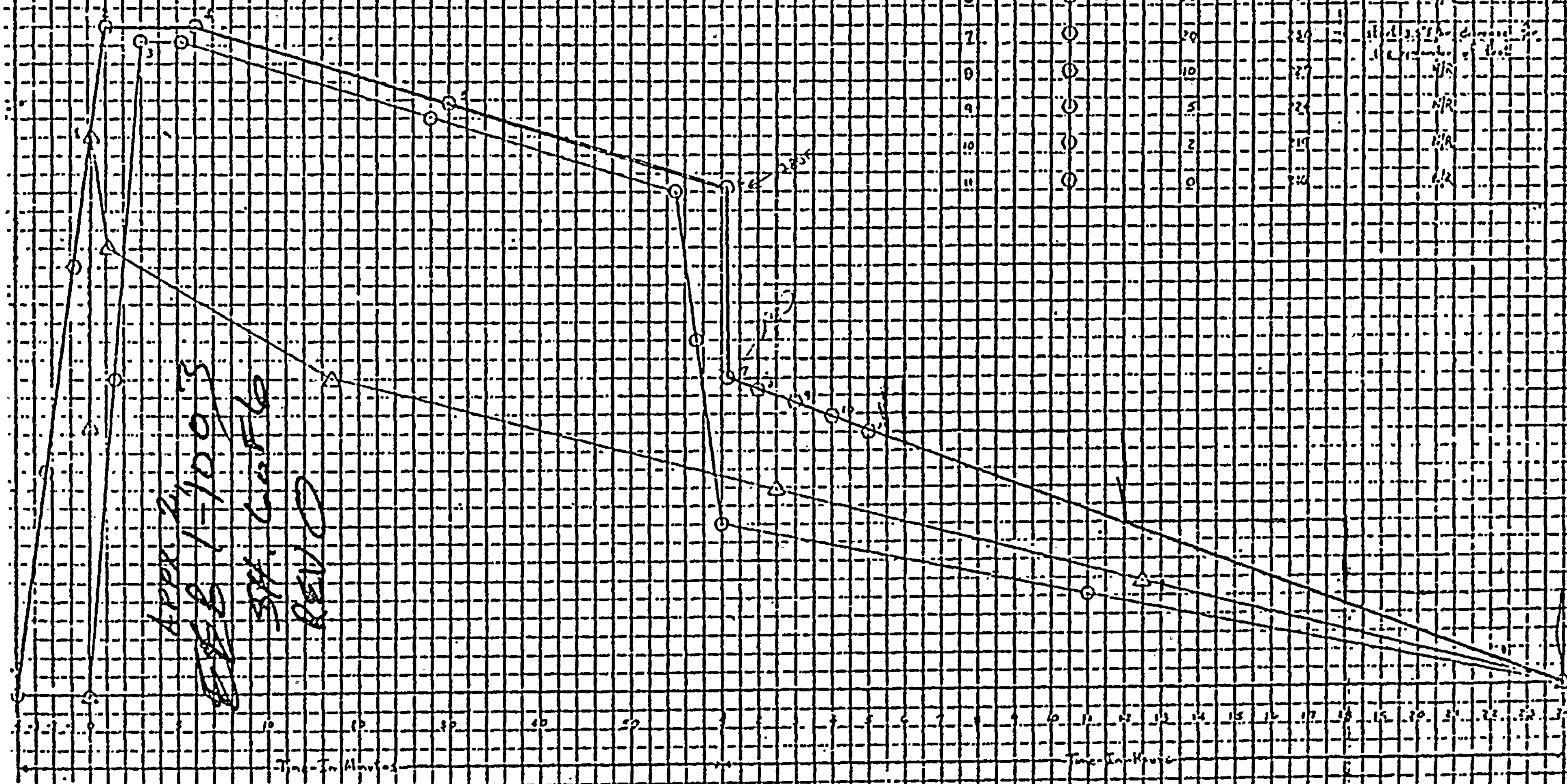
APPX 2
EEB 1-1005
3H, 6 of 6
REV 0

Additional Curve Legend

Curve Code	Explanation
△	Containment response to a postulated LOCA as defined in [illegible] letter No. [illegible] to [illegible] of TVA dated Aug 1976 and GE letter [illegible] to DR. Patterson of TVA dated Aug 1976
○	Containment response to a postulated [illegible] steam break as defined in [illegible] of the Response To NRC [illegible]
○	PJH connector environmental qualification curve drawn to encompass the postulated LOCA and [illegible] steam line break containment response curves △ and ○ and to be used in the connector testing [illegible]

Qualification Curve Points

Cable Number	Associated Curve	Pressure (psig)	Temperature (°F)	Explanation
1	△	56	295	N/R
2	○	65	325	N/R
3	○	24	322	N/R
4	○	20	325	[illegible]
5	○	30	304	[illegible]
6	○	20	282	N/R
7	○	20	280	[illegible]
8	○	10	227	N/R
9	○	5	224	N/R
10	○	2	219	N/R
11	○	0	212	N/R



ELAPSED TIME

PJH CONNECTOR ENVIRONMENTAL QUALIFICATION CURVE No. 2

Time (T) 0 is defined as the initiation of the postulated event for curves △ and ○.

Facility: Browns Ferry Nuclear Plant
Unit: 1, 2, 3
Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

Sheet No. (3) EEB 1-1004
Revision 0
Date 10-22-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTAND ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Main Steam System Plant ID No. ZS-1-14	Operating Time	1 Day	30 Days	(1)	ACME-Cleveland Development Co. Test Report DTD 2/20/78	Sequential Test	NONE
Component Limit Switch Manufacturer: NAMCO	Temperature (°F)	Figure B.0 (1,2,3)	Appx. 1 340	(4)			
Model Number: EA740-50100	Pressure (PSIA)	Figure B.0 (1,2,3)	Appx. 1 70	(4)			
Function: Scram Trip	Relative Humidity (%)	100	100	(4)			
Accuracy: Req'd: N/A Demon: Category: A	Chemical Spray	N/A	N/A	(4)			
Service: Main Steam Line A Inboard Isol Vlv	Radiation (RAD)	2×10^8	2×10^8	(4)			
Location: 0	Aging	N/A	7 Years	(2)	Appx. 2	Analysis	
Flood Level Elev: 552' Above Flood Level: Yes X No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: C. Dean Hel...
Reviewed by:
QA Acceptance: W.E. ... 10-27-

APPENDIX 1, SHEET 1 OF 1
EEB 1-1004 REV. 0

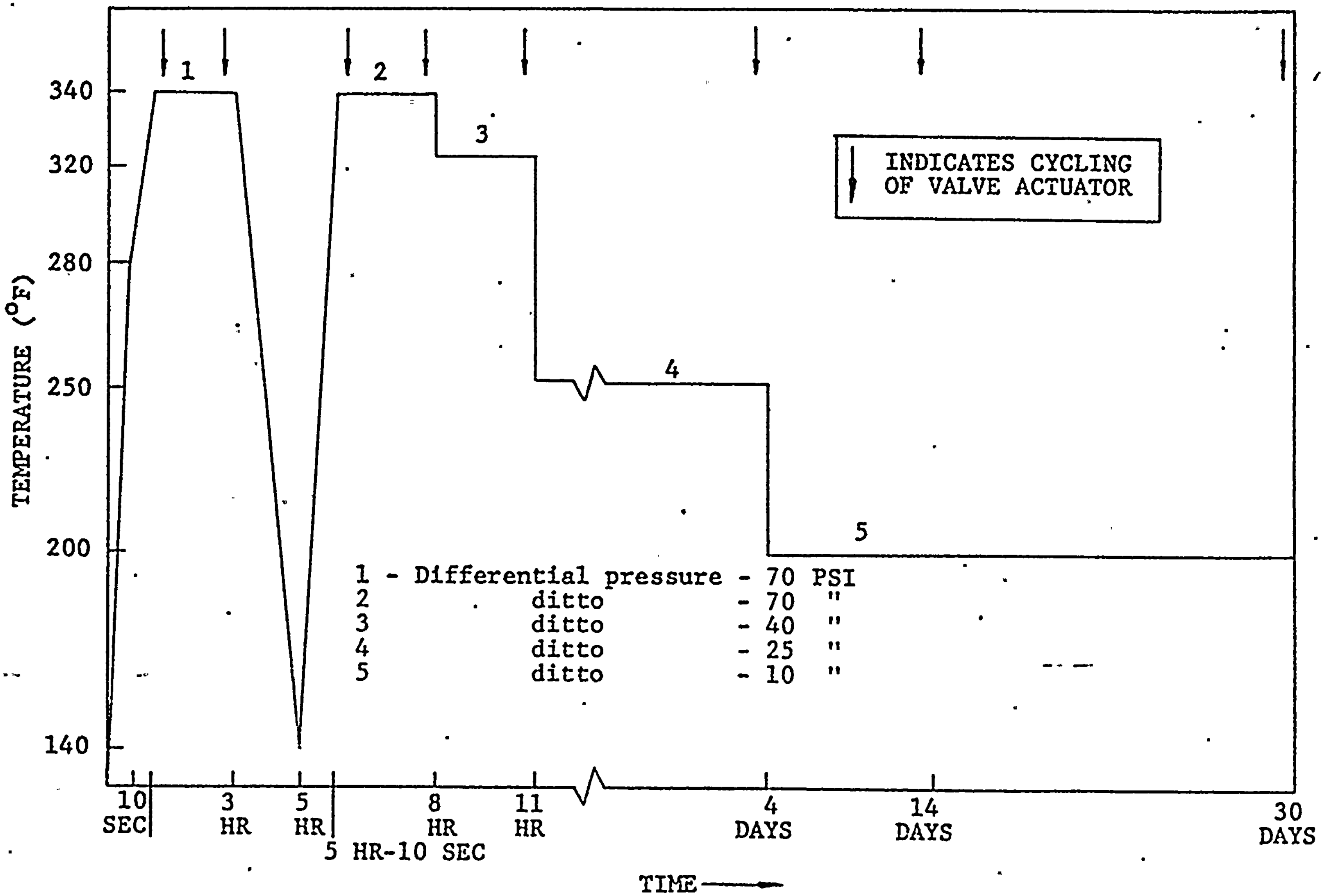


Fig 1
Test Chamber Temperature Profile for Accident Environment Simulation
(Taken from IEEE Standard 382-1972)

E.J.L.

AGING ANALYSIS FOR NAMCO EA740 REV 0

COMPUTED MHD DATE 10-23-80
CHECKED DATE

Establishing Qualified Life at Base service Conditions

A. Aging due to heat aging (reference ACME-CLEVELAND DEVELOPMENT CO TEST REPORT DTD 2-20-78.)

T_t = Temp of Aging Test = 200°F = $\frac{5}{9}(200-32)$°C = (93.3+273.15) = 366.48
t_t = Time of Aging Test = 200 hr
t_{a1} = equivalent age at service conditions
T_{a1} = NORMAL Service Temp = 140°F = $\frac{5}{9}(140-32)$°C = 60°C = 333.15
Assume Ea = 0.958eV

$$\ln \frac{t_{a1}}{t_t} = \frac{E_a}{K}\left(\frac{1}{T_{a1}} - \frac{1}{T_t}\right)$$

$$\ln \frac{t_{a1}}{200} = \frac{0.958\ eV \times 1.602 \times 10^{-19}}{1.38 \times 10^{-23}}\left(\frac{1}{333.15} - \frac{1}{366.48}\right)$$

$$\ln \frac{t_{a1}}{200} = 3.036$$

$$t_a = 200\, e^{3.036} = 4164 \text{ hrs.}$$

B. Aging due to LOCA Test

Time = 0 – 10 sec – negligable effect

Time 10 sec – 3 hr
T_t = 340°F = 171°C = 444.26 °K
t_t = ~3 hr

$$\ln \frac{t_a}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{444.26}\right)$$

$$\ln \frac{t_a}{3} = 8.349$$

$$t_a = 3\, e^{8.349} = 12675.56 \text{ hrs.}$$

NAMCO LIMIT SWITCHES

COMPUTED ______ DATE ______
CHECKED ______ DATE ______

Time 2-5hr Conservative Temp = 240°F for 2 hrs = 388.7

$T_t = 240$

$t_t = 2\,hr$

$$\ln \frac{t_a}{2} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{388.7} \right)$$

$$\ln \frac{t_a}{2} = 4.77$$

$$t_a = 2e^{4.77} = 236\,hr$$

Time 5-8 hr $T_t = 340$

$t_t = 3$ same as 10-2 hrs

$$t_a = 12675.56$$

Time = 8-11 hrs $T_t = 320°F = 160°C = 433.15°C$

$t_t = 3\,hrs$

$$\ln \frac{t_t}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{433.15} \right)$$

$$\ln \frac{t_t}{3} = 7.7$$

$$t_t = 3e^{7.7} = 6669.2\,hrs$$

Time 11hr - 4 days $T_t = 250F = 121°C = 394.26°K$

$t_t = 85\,hrs$

$$\ln \frac{t}{85} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{394.26} \right) = 5.174$$

$$t = 85e^{5.174} = 15013\ hr$$

COMPUTED ____ DATE ____
CHECKED ____ DATE ____

4 days - 30 days $t_t = 624 hrs$
$T_t = 200F = 366.48°K$

$$\ln \frac{t_a}{624} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{366.48} \right) = 3.036$$

$$t_a = 624\, e^{3.036} = 12991 \text{ hrs}$$

Total age at service conditions

$$t_{a\,TOTAL} = \Sigma t_a$$

$$t_{a\,TOTAL} = 4164 + 12675 + 236 + 12675 + 6669 + 15013 + 12991$$

$$\therefore\ t_{a\,TOTAL} = 64.423 \text{ hrs} = 2684 \text{ days} = 7.35 \text{ yrs}$$

COMPUTED ______ DATE ______
CHECKED ______ DATE ______

Aging due to LOCA in plant.

TIME - 4 — 6 minutes $T_t = 325°F = 163°C = 435.9\ °K$
$t = 10\ min$

$$\ln \frac{t_a}{.167\,hr} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9} \right) = 7.87$$

$$t_a = 0.167\, e^{7.87} = 437 \text{ hours}$$

TIME 6 — 34 min conservatively estimated $T_t = 325°F = 435.9°K$
$t_t = 28\ min = 0.467\ hr$

$$\ln \frac{t_a}{.467} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9} \right) = 7.87$$

$$t_a = .467\, e^{7.87} = 1222.4 \text{ hr.}$$

Time 34 min ~~1.25 hr~~ conservatively estimated at $T_t = 300°F = 148°C = 422K$
$t_t = 41\ min = 0.68\ hr$

$$\ln \frac{t_a}{.68} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{422} \right) = 7.028$$

$$t_a = .68\, e^{7.028} = 766.9 \text{ hrs}$$

TIME = 1.25 — 6 hrs — T_t = 230F = 110C = 383.15 K
$t_t = 4.75\ hr$

$$t_a = 4.75\, e^{4.356}$$
$$\therefore t_a = 370 \text{ hrs}$$

Time 6 - 12 hrs $T_t = 215 = 101C = 374.8K$
$t_t = 6\ hrs$

$$t_a = 6\, e^{3.71}$$
$$t_a = 245.3 \text{ hrs}$$

COMPUTED ____ DATE ____
CHECKED ____ DATE ____

TIME 12-18 hrs $T_t = 190 = 88°C = 361 K$

$t_t = 6$ hrs

$t_a = 6e^{2.569}$

$t_a = 78.$

TIME 18-24 $T_t = 170°F = 77°C = 350K$

$t_a = 6e^{1.577} = 29.0$ hrs

Total Aging due to LOCA

$t_{aL} = 3148.4$ hrs

Maximum Lifetime before LOCA

$T_a - t_{aL}$

$t_{BL} = 64423 - 3148.4 = 61274$ hrs

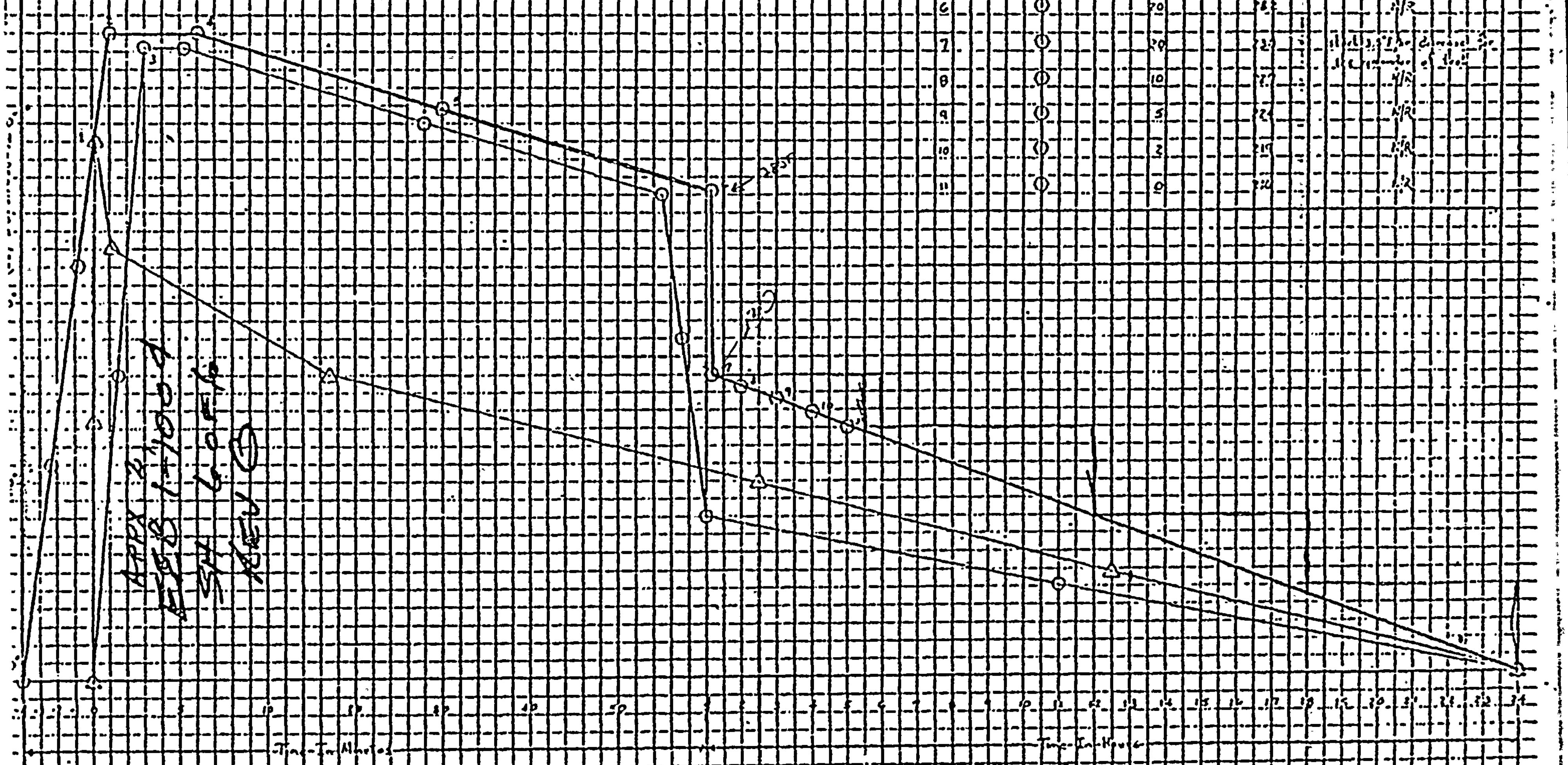
$t_{BL} = 6.99$ yrs

Analytical Curve Legend

Curve Code	Explanation
△	Containment response to a postulated LOCA as defined in GE letter No. [illegible] to [illegible] of TVA dated Aug [illegible], and GE letter No. [illegible] to DR. [illegible] of TVA dated Aug [illegible]
○	Containment response to a postulated 0.5 ft² steam leak as defined in [illegible] of the Response To NRC [illegible] [illegible] contained in [illegible] of the [illegible]
○	PJK connector environmental qualification curve drawn to encompass the postulated LOCA and 0.5 ft² steam leak containment response curves △ and ○ and to be used in [illegible] testing [illegible]

Numerical Curve Legend

Code Number	Associated Curve	Pressure (psig)	Temperature (°F)	Explanation
1	△	50	295	N/R
2	○	55	325	N/R
3	○	54	323	N/R
4	○	20	323	[illegible]
5	○	30	304	[illegible]
6	○	20	282	N/R
7	○	20	22[illegible]	[illegible]
8	○	10	227	N/R
9	○	5	224	N/R
10	○	2	219	N/R
11	○	0	212	N/R



ELAPSED TIME

PJK CONNECTOR ENVIRONMENTAL QUALIFICATION CURVE NO 2

The (1) is defined as the initiation of the postulated event for curves △ and ○.

Jim [illegible] 3/3/[illegible]

Facility: Browns Ferry Nuclear Plant
Unit: 1,2,3
Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB 1-1005
Revision 0
Date 10-21-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Main Steam Plant ID No. ZS-1-26 (Qty 6) Component Limit Switch Manufacturer: Namco Model Number: EA740-50100 Function: Scram Trip Accuracy: Req'd: N/A Demon: Category: A Service: Main Stm Line B Inboard Isln Vlv Location: 0	Operating Time	1 Day	30 Days	(1)	ACME-Cleveland Devel. Co. Test Report DTD 2-20-78	Sequential Test	None
	Temperature (^{o}F)	Figure B.0 (1,2,3)	Appx. 1 340	(4)			
	Pressure (PSIA)	Figure B.0 (1,2,3)	70 Appx. 1	(4)			
	Relative Humidity (%)	100	100	(4)			
	Chemical Spray	N/A	N/A	(4)			
	Radiation (RAD)	See 4.1.4 2×10^8	2×10^8	(4)			
	Aging	N/A	7 Years	(2)	Appx. 2	Analysis	
Flood Level Elev: 552' Above Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: C. Dean Hell

Reviewed by: Richard L. Bier

QA Acceptance: W.E. Trouth 10-2

APPENDIX 1, SHEET 1 OF 1
EEB1-1005, REV. 0

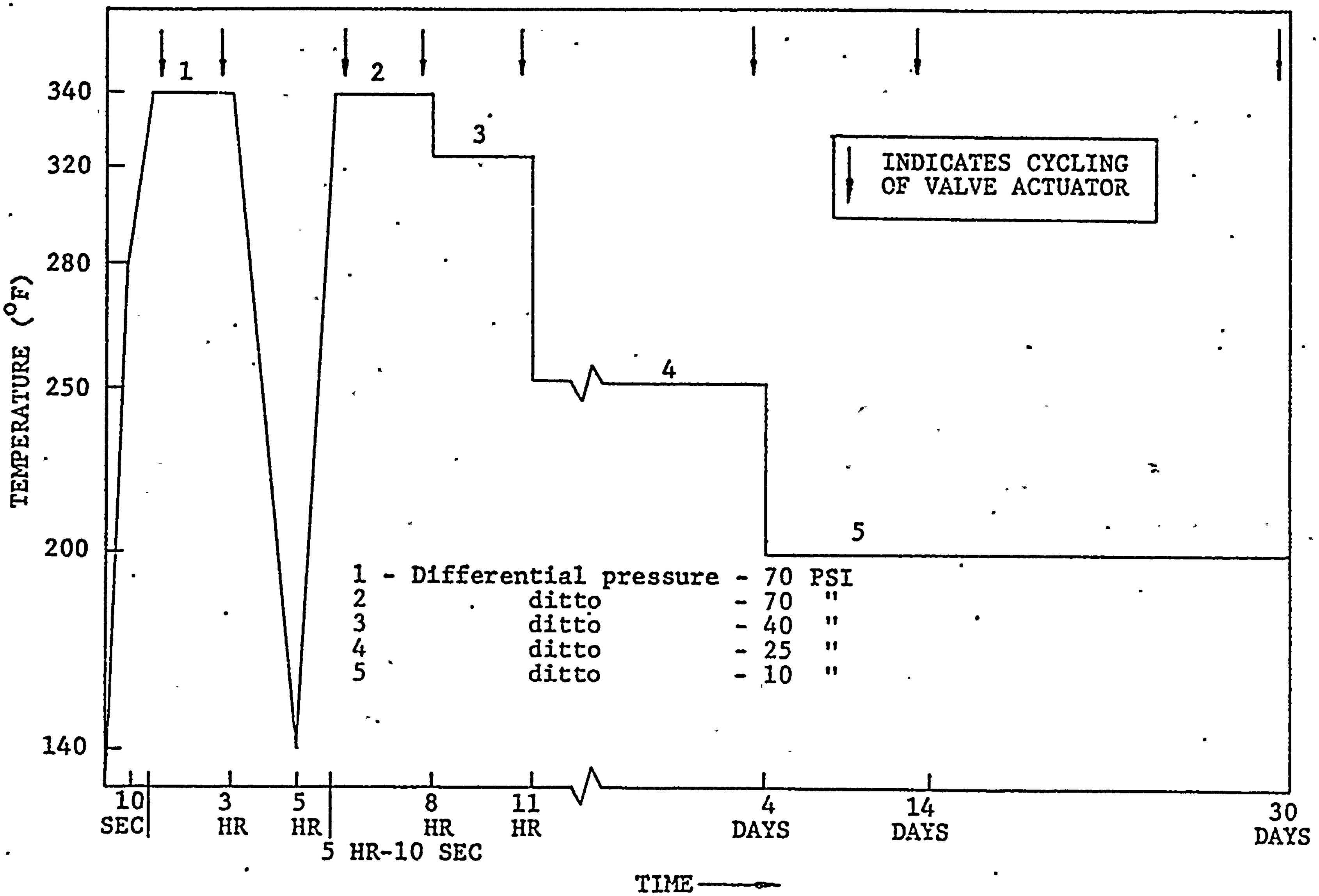


Fig 1
Test Chamber Temperature Profile for Accident Environment Simulation
(Taken from IEEE Standard 382-1972)

E.F.L.

APPENDIX Z

AGING ANALYSIS FOR NAMCO EA740

COMPUTED MJD DATE 10-23-80
CHECKED DATE

Establishing Qualified Life at Base service Conditions

A. Aging due to heat aging (reference ACME-CLEVELAND DEVELOPMENT CO TEST REPORT DTD 2-20-78.)

T_t = Temp of Aging Test = 200°F = $\frac{5}{9}(200-32)$°C = (93.3+273.15) = 366.48
t_t = Time of Aging Test = 200 hr
t_{a1} = equivalent age at service conditions
T_{a1} = NORMAL Service Temp = 140°F = 5/9 (140-32)°C = 60°C = 333.15
Assume E_a = 0.958 eV

$$\ln \frac{t_{a1}}{t_t} = \frac{E_a}{K}\left(\frac{1}{T_{a1}} - \frac{1}{T_t}\right)$$

$$\ln \frac{t_{a1}}{200} = \frac{0.958\,\text{eV} \times 1.602 \times 10^{-19}}{1.38 \times 10^{-23}}\left(\frac{1}{333.15} - \frac{1}{366.48}\right)$$

$$\ln \frac{t_{a1}}{200} = 3.036$$

$$t_a = 200\, e^{3.036} = 4164 \text{ hrs.}$$

B. Aging due to Loca Test

Time = 0 → 10 sec - negligable effect

Time 10 sec - 3 hr
T_t = 340°F = 171°C = 444.26 °K
t_t = ~3 hr.

$$\ln \frac{t_a}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{444.26}\right)$$

$$\ln \frac{t_a}{3} = 8.349$$

$$t_a = 3\, e^{8.349} = 12675.56 \text{ hrs.}$$

NAMCO LIMIT SWITCHES

COMPUTED ______ DATE ______

CHECKED ______ DATE ______

Time 3-5hr   Conservative Temp = 240°F for 1 hr = 388.7

$T_t = 240$

$t_t = 2\,hr$

$$\ln \frac{t_a}{2} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{388.7} \right)$$

$$\ln \frac{t_a}{2} = 4.77$$

$$t_a = e^{4.77} = 118\ hr$$

Time 5-8 hr $T_t = 340$

$t_t = 3$ SAME AS 1 to 3 hrs

$$t_a = 12675.56$$

Time = 8-11 hrs $T_t = 320°F = 160°C = 433.15°C$

$t_t = 3\,hrs$

$$\ln \frac{t_t}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{433.15} \right)$$

$$\ln \frac{t_t}{3} = 7.7$$

$$t_t = 3 e^{7.7} = 6669.2\ hrs$$

Time 11hr - 4 days $T_t = 250F = 121°C = 394.26°K$

$t_t = 85\,hrs$

$$\ln \frac{t}{85} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{394.26} \right) = 5.174$$

$$t = 85 e^{5.174} = 15013\ hr$$

COMPUTED ______ DATE ______
CHECKED ______ DATE ______

4 days - 30 days $t_t = 624 \text{ hrs}$

$T_t = 200F = 366.48°K$

$$\ln \frac{t_a}{624} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{366.48} \right) = 3.036$$

$$t_a = 624\, e^{3.036} = 12991 \text{ hrs}$$

Total age at service conditions

$$t_{a_{TOTAL}} = \Sigma t_a$$

$$t_{a_{TOTAL}} = 4164 + 12675 + 236 + 12675 + 6669 + 15013 + 12991$$

$$t_{a_{TOTAL}} = 64423 \text{ hrs} = 2684 \text{ days} = 7.35 \text{ yrs}$$

COMPUTED ______ DATE ______
CHECKED ______ DATE ______

Aging due to LOCA in plant.

TIME 4 – 6 minutes $T_t = 325°F = 163°C = 435.9°K$

$t_t = 10\,min$

$$\ln \frac{t_a}{.167\,hr} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9} \right) = 7.87$$

$$t_a = 0.167\, e^{7.87} = 437 \text{ hours}$$

TIME 6 – 34 min conservatively estimated $T_t = 325°F = 435.9°K$

$t_t = 28\,min = 0.467\,hr$

$$\ln \frac{t_a}{.467} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9} \right) = 7.87$$

$$t_a = .467\, e^{7.87} = 1222.4 \text{ hr}$$

Time 34 min – 1.25 hrs conservatively estimated at $T_t = 300°F = 148°C = 422K$

$t_t = 46\,min = 0.68\,hr$

$$\ln \frac{t_a}{.68} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{422} \right) = 7.028$$

$$t_a = .68\, e^{7.028} = 766.9 \text{ hrs}$$

TIME = 1.25 – 6 hrs $T_t = 230F = 110C = 383.15K$

$t_t = 4.75\,hr$

$$t_a = 4.75\, e^{4.356}$$

$$t_a = 370 \text{ hrs}$$

Time 6 – 12 hrs $T_t = 215 = 101C = 374.8K$

$t_t = 6\,hrs$

$$t_a = 6\, e^{3.71}$$

$$t_a = 245.3 \text{ hrs}$$

COMPUTED ______ DATE ______
CHECKED ______ DATE ______

TIME 12-18 hrs $T_t = 190 = 88°C = 361 K$

$t_t = 6$ hrs

$t_a = 6e^{2.569}$

$t_a = 78.$

TIME 18-24 $T_t = 170°F = 77°C = 350K$

$t_a = 6e^{1.577} = 29.0$ hrs

Total Aging due to LOCA

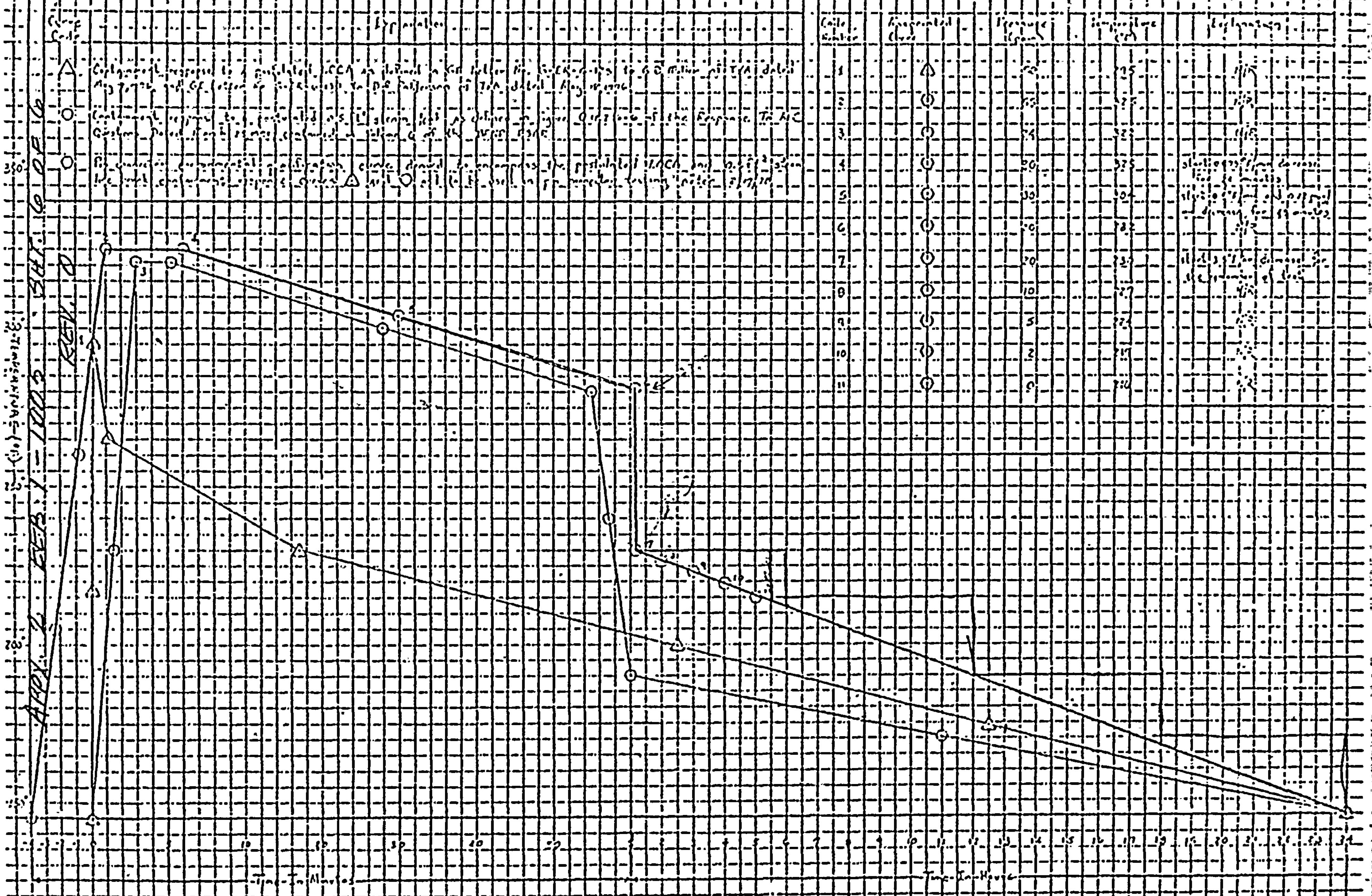
$t_{aL} = 3148.4$ hrs

Maximum Lifetime before LOCA

$$t_{BL} = \overset{T_a}{64423} - \overset{t_{aL}}{3148.4} = 61274 \text{ hrs}$$

$t_{BL} = 6.99$ yrs

APPX. 2 EEB 1-1003 SHT. 6 OF 6
REV. 0



ELAPSED TIME

PIN CONNECTOR ENVIRONMENTAL QUALIFICATION CURVES NO. 2

Facility: Browns Ferry Nuclear Plant
Unit: 1,2,3
Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB 1-1006
Revision 0
Date 10-21-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Main Steam Plant ID No. ZS-1-27 (Qty 6)	Operating Time	1 Day	30 Days	(1)	ACME-Cleveland Devel. Co. Test Report DTD 2-20-78	Sequential Test	None.
Component Limit Switch Manufacturer: Namco	Temperature (°F)	Figure B.7 (1) Figure B.7 (2,3)	Appx. 1 340	(4)			
Model Number: EA740-50100	Pressure (PSIA)	Table B.1 (1,2,3)	Appx. 1 70	(4)			
Function: Scram Trip	Relative Humidity (%)	100	100	(4)			
Accuracy: Req'd: N/A Demon:	Chemical Spray	N/A	N/A	(4)			
Category: A Service: Main Stm Line B Outboard Isln Vlv	Radiation (RAD)	2.03×10^6	2×10^8	(4)			
Location: 7	Aging	N/A	7 Years	(2)	Appx. 2	Analysis	
Flood Level Elev: 552' Above Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: [illegible]
Reviewed by: [illegible]
QA Acceptance: [illegible]

APPENDIX 1, SHEET 1 OF 1
EEB1-1006, REV. 0

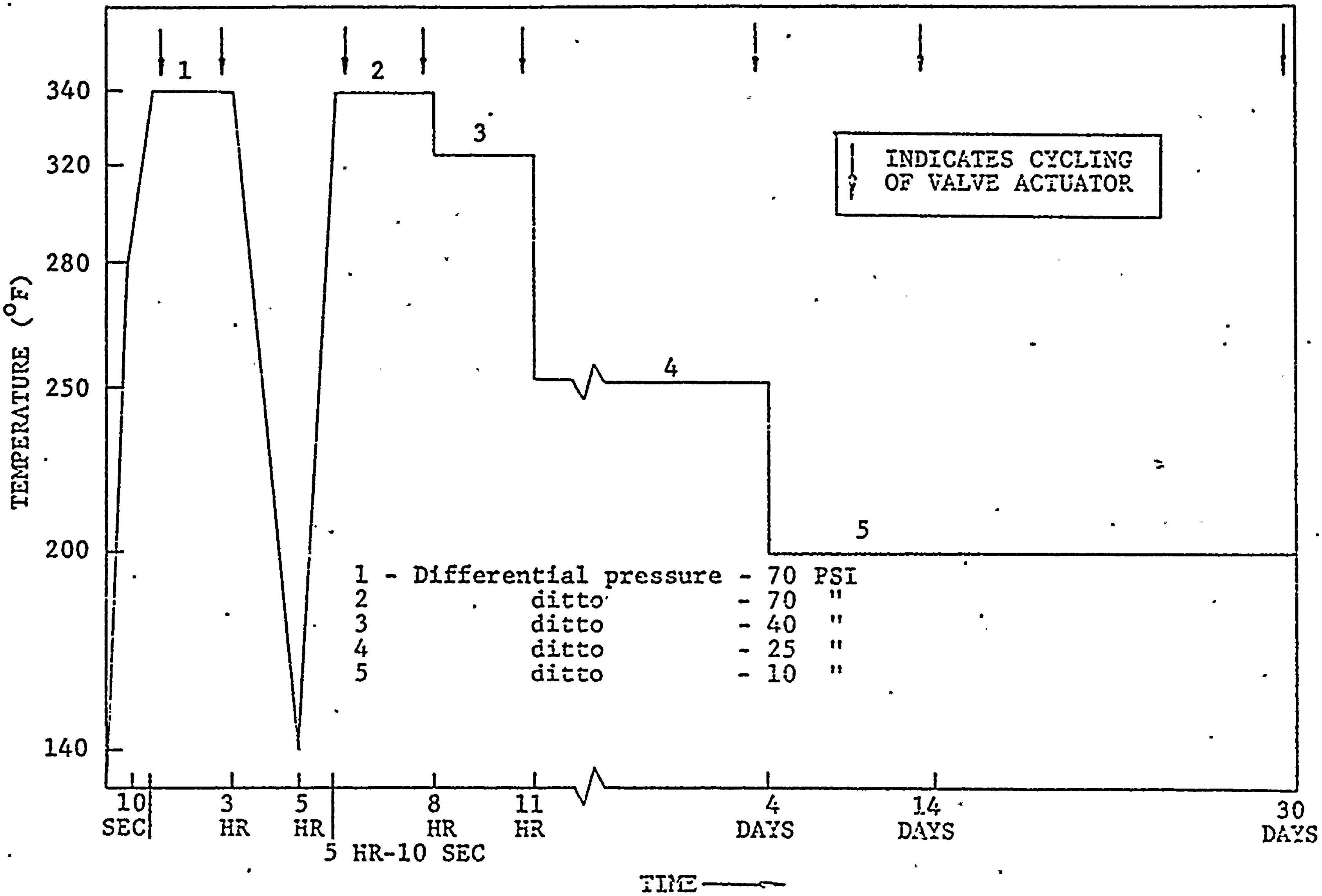


Fig 1
Test Chamber Temperature Profile for Accident Environment Simulation
(Taken from IEEE Standard 382-1972)

E.J.L.

A GING ANALYSIS FOR NAMCO EA740 REV D

COMPUTED MJD DATE 10-23-80
CHECKED DATE

Establishing Qualified Life at Base service Conditions

A. Aging due to heat aging (reference ACME-CLEVELAND DEVELOPMENT CO TEST REPORT DTD 2-20-78)

T_t = Temp. of Aging Test = 200°F = $\frac{5}{9}(200-32)$°C = (93.3+273.15) = 366.48
t_t = Time of Aging Test = 200 hr
t_{a1} = equivalent Age at service conditions
T_{a1} = NORMAL Service Temp = 140°F = $\frac{5}{9}(140-32)$°C = 60°C = 333.15
∴ Assume E_a = 0.958 eV

$$\ln\frac{t_{a1}}{t_t} = \frac{E_a}{K}\left(\frac{1}{T_{a1}} - \frac{1}{T_t}\right)$$

$$\ln\frac{t_{a1}}{200} = \frac{0.958\text{ eV} \times 1.602\times10^{-19}}{1.38\times10^{-23}}\left(\frac{1}{333.15} - \frac{1}{366.48}\right)$$

$$\ln\frac{t_{a1}}{200} = 3.036$$

$$t_a = 200\, e^{3.036} = 4164 \text{ hrs.}$$

B. Aging due to LOCA Test

Time = 0 → 10 sec – negligible effect

Time 10 sec – 3 hr
T_t = 340°F = 171°C = 444.26 °K
t_t = ~3 hr

$$\ln\frac{t_a}{3} = 1.1121\times10^{4}\left(\frac{1}{333.15} - \frac{1}{444.26}\right)$$

$$\ln\frac{t_a}{3} = 8.349$$

$$t_a = 3\, e^{8.349} = 12675.56 \text{ hrs.}$$

NAMCO LIMIT SWITCHES

COMPUTED ______ DATE ______
CHECKED ______ DATE ______

Time 3-5hr Conservative Temp = 240°F for 2hrs = 388.7

$T_t = 240$

$t_t = 2 hr$

$$\ln \frac{t_a}{2} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{388.7} \right)$$

$$\ln \frac{t_a}{2} = 4.77$$

$$t_a = 2 e^{4.77} = 236 hr$$

Time 5-8 hr $T_t = 340$

$t_t = 3$ same as 10-3 hrs

$$t_a = 12675.56$$

Time = 8-11 hrs $T_t = 320°F = 160°C = 433.15°C$

$t_t = 3 hrs$

$$\ln \frac{t_t}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{433.15} \right)$$

$$\ln \frac{t_t}{3} = 7.7$$

$$t_t = 3 e^{7.7} = 6669.2 hrs.$$

Time 11hr - 4 days $T_t = 250F = 121°C = 394.26°K$

$t_t = 85hrs$

$$\ln \frac{t}{85} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{394.26} \right) = 5.174$$

$$t = 85 e^{5.174} = 15013 \text{ hr}$$

COMPUTED ______ DATE ______

CHECKED ______ DATE ______

4 days - 30 days $t_a = 624 hrs$

$T_t = 200F = 366.48°K$

$\ln \frac{t_a}{624} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{366.48} \right) = 3.036$

$t_a = 624 e^{3.036} = 12991$ hrs

Total age at Service Conditions

$t_{a\,TOTAL} = \Sigma t_a$

$t_{a\,TOTAL} = 4164 + 12675 + 236 + 12675 + 6669 + 15013 + 12991.$

$t_{a\,TOTAL} =$ 64.423 hrs = 2684 days = 7.35 yrs

COMPUTED ______ DATE ______
CHECKED ______ DATE ______

Aging due to LOCA in plant

TIME - 4 — 6 minutes $T_t = 325°F = 163°C = 435.9\ °K$
$t = 10\ min$

$$\ln \frac{t_a}{.167\,hr} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9}\right) = 7.87$$

$$t_a = 0.167\, e^{7.87} = 437 \text{ hours}$$

TIME 6 - 34 min ∴ conservatively estimated $T_t = 325°F = 435.9°K$
$t_t = 28\,min = 0.467\,hr$

$$\ln \frac{t_a}{.467} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9}\right) = 7.87$$

$$t_a = .467\, e^{7.87} = 1222.4\ hr.$$

Time 34 min ~~- 1.25 hr~~ conservatively estimated at $T_t = 300°F = 148°C = 422K$
$t_t = 46\,min = 0.68\,hr$

$$\ln \frac{t_a}{.68} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{422}\right) = 7.028$$

$$t_a = .68\, e^{7.028} = 766.9\ hrs$$

TIME = 1.25 — 6 hrs — ~~T_t = 230F~~ = 110C = 383.15 K
$t_t = 4.75\ hr$

$$t_a = 4.75\, e^{4.356}$$

$$\therefore t_a = 370\ hrs$$

Time 6 - 12 hrs $T_t = 215 = 101C = 374.8K$
$t_t = 6\ hrs$

$$t_a = 6\, e^{3.71}$$

$$t_a = 245.3\ hrs$$

COMPUTED ______ DATE ______
CHECKED ______ DATE ______

TIME: 12-18 hrs $T_t = 190 = 88°C = 361 K$

$t_t = 6$ hrs

$t_a = 6e^{2.569}$

$t_a = 78.$

TIME 18-24 $T_t = 170°F = 77°C = 350K$

$t_a = 6e^{1.577} = 29.0$ hrs

Total Aging due to LOCA

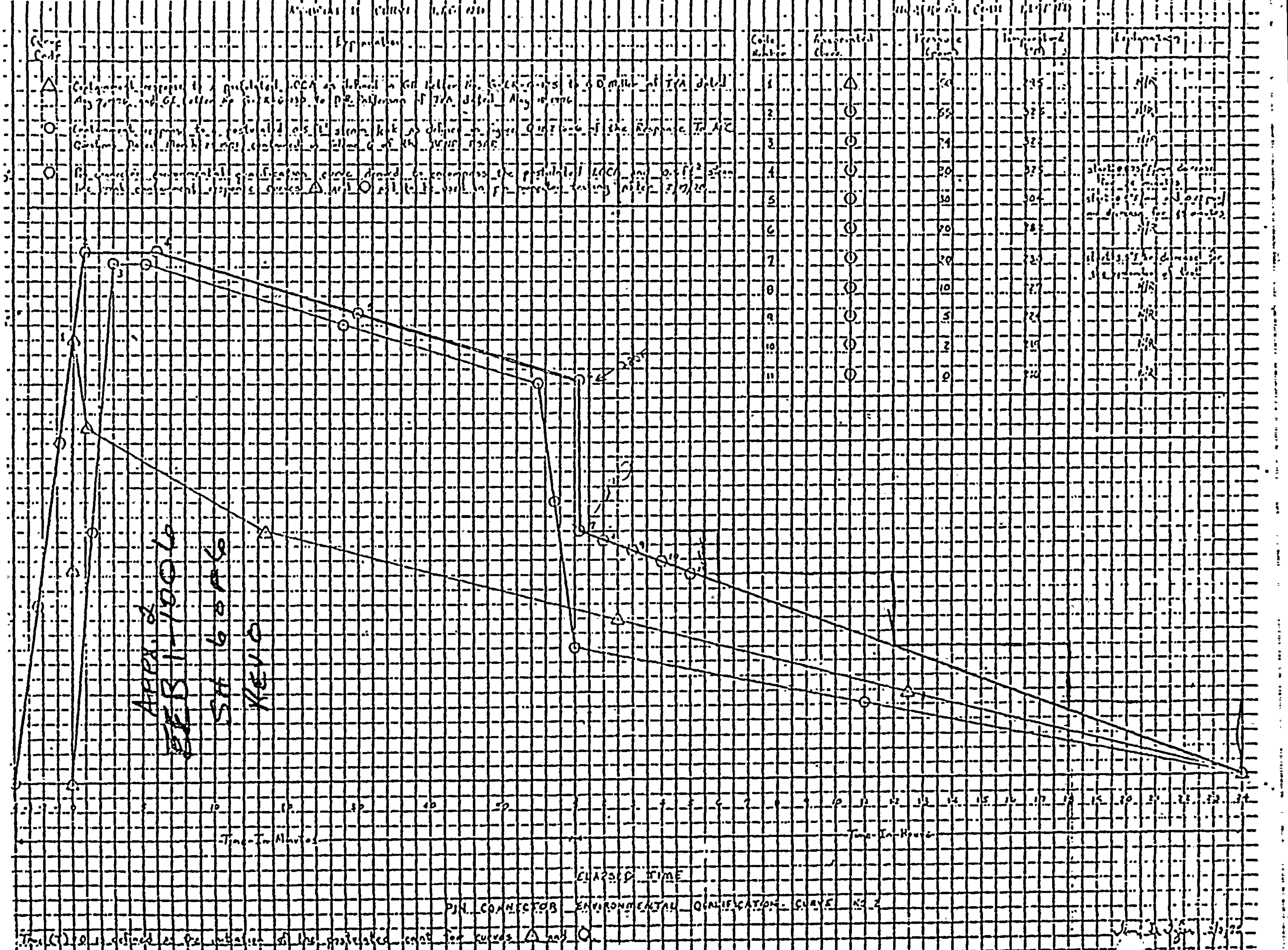
$t_{aL} = 3148.4$ hrs

Maximum Lifetime before LOCA

$T_a - t_{aL}$

$t_{BL} = 64423 - 3148.4 = 61274$ hrs

$t_{BL} = 6.99$ yrs


APPX. 2
EEB 1-1006
SH 6 OF 6
REV 0
Time In Minutes
Time In Hours
ELAPSED TIME
PIN CONNECTOR ENVIRONMENTAL QUALIFICATION CURVE No. 2

Facility: Browns Ferry Nuclear Plant
Unit: 1,2,3
Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2) (3)

Sheet No. EEB 1-1007
Revision 0
Date 10-21-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDING ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Main Steam Plant ID No. ZS-1-37 (Qty 6) Component Limit Switch Manufacturer: Namco Model Number: EA740-50100 Function: Scram Trip Accuracy: Req'd: N/A Demon: Category: A Service: Main Stm Line C Inboard Isln Vlv Location: 0	Operating Time	1 Day	30 Days	(1)	ACME-Cleveland Devel. Co. Test Report DTD 2-20-78	Sequential Test	None
	Temperature (^{o}F)	Figure B.0 (1,2,3)	Appx. 1 340	(4)			
	Pressure (PSIA)	Figure B.0 (1,2,3)	Appx. 1 70	(4)			
	Relative Humidity (%)	100	100	(4)			
	Chemical Spray	N/A	N/A	(4)			
	Radiation (RAD)	See 4.1.4 2×10^{8}	2×10^{8}	(4)			
	Aging	N/A	7 Years	(2)	Appx. 2	Analysis	
Flood Level Elev: 552' Above Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: C. Dean [illegible]
Reviewed by: [illegible]
QA Acceptance: W. E. [illegible] 10/24/[illegible]

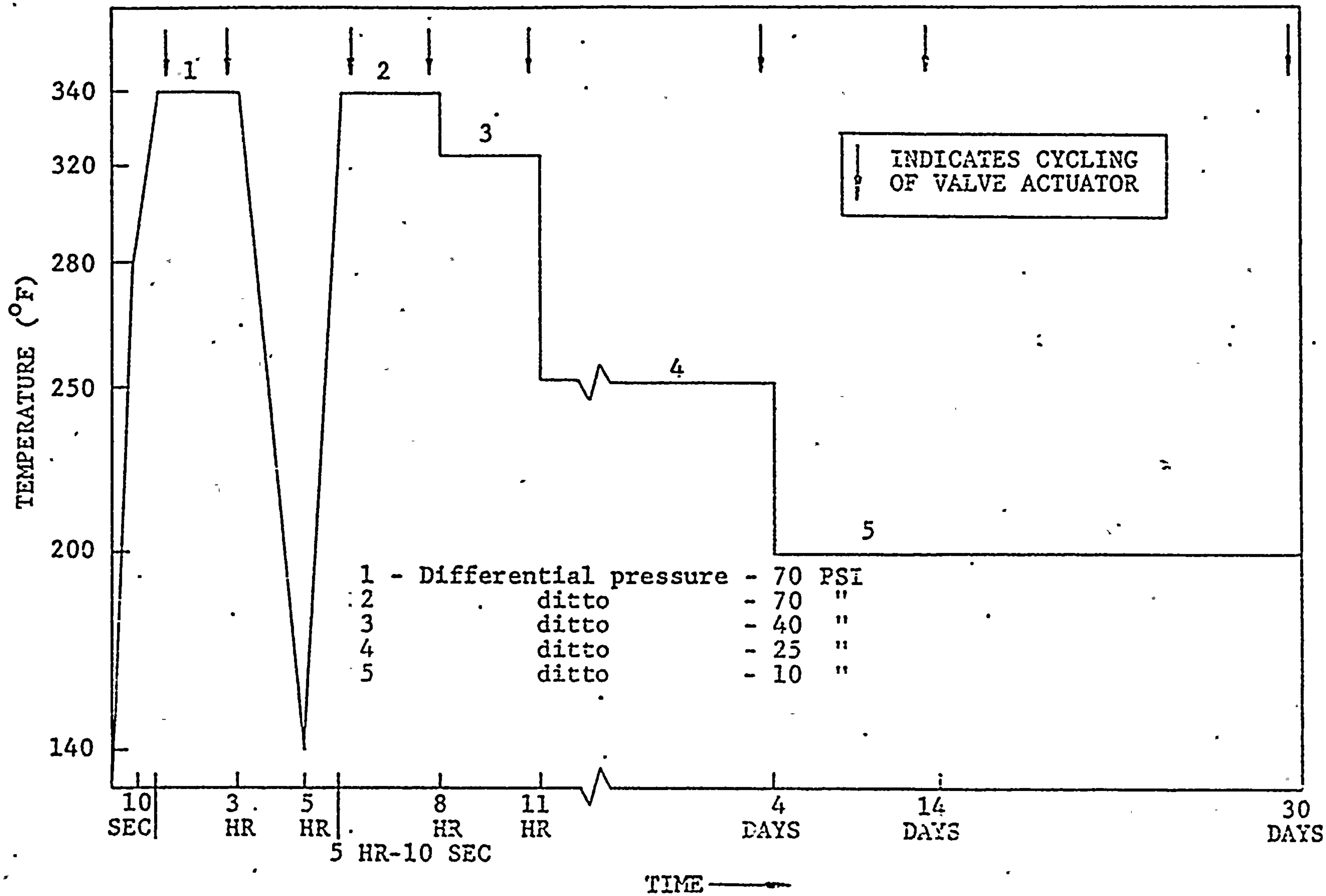


Fig 1
Test Chamber Temperature Profile for Accident Environment Simulation
(Taken from IEEE Standard 382-1972)

E.L.

APPENDIX Z

AGING ANALYSIS FOR NAMCO EA740

COMPUTED MJD DATE 10-23-80

CHECKED ___ DATE ___

Establishing Qualified Life at Base service Conditions

A. Aging due to heat aging (reference ACME-CLEVELAND DEVELOPMENT CO TEST REPORT DTD 2-20-78)

T_t = Temp. of Aging Test = $200°F = \frac{5}{9}(200-32)°C = (93.3 + 273.15) = 366.48$

t_t = Time of Aging Test = 200 hr

t_{a1} = equivalent age at service conditions

T_{a1} = NORMAL Service Temp = $140°F = \frac{5}{9}(140-32)°C = 60°C = 333.15$

Assume $E_a = 0.958\,eV$

$$\ln \frac{t_{a1}}{t_t} = \frac{E_a}{K}\left(\frac{1}{T_{a1}} - \frac{1}{T_t}\right)$$

$$\ln \frac{t_{a1}}{200} = \frac{0.958\,eV \times 1.602 \times 10^{-19}}{1.38 \times 10^{-23}}\left(\frac{1}{333.15} - \frac{1}{366.48}\right)$$

$$\ln \frac{t_{a1}}{200} = 3.036$$

$$t_a = 200\,e^{3.036} = 4164 \text{ hrs.}$$

B. Aging due to LOCA Test

Time = 0 - 10 sec - negligable effect

Time 10 sec - 3 hr

$T_t = 340°F = 171°C = 444.26\,°K$

$t_t = \sim 3$ hr.

$$\ln \frac{t_a}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{444.26}\right)$$

$$\ln \frac{t_a}{3} = 8.349$$

$$t_a = 3\,e^{8.349} = 12675.56 \text{ hrs.}$$

NAMCO LIMIT SWITCHES

COMPUTED ________ DATE ________

CHECKED ________ DATE ________

Time 2-5hr Conservative Temp = 240°F for 2hrs = 388.7

$T_t = 240$

$t_t = 2\,hr$

$$\ln \frac{t_a}{2} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{388.7}\right)$$

$$\ln \frac{t_a}{2} = 4.77$$

$$t_a = 2e^{4.77} = 236\,hr$$

Time 5-8 hr $T_t = 340$

$t_t = 3$ SAME AS 10 - 3 hrs

$$t_a = 12675.56$$

Time = 8-11 hrs $T_t = 320°F = 160°C = 433.15°C$

$t_t = 3\,hrs$

$$\ln \frac{t_t}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{433.15}\right)$$

$$\ln \frac{t_t}{3} = 7.7$$

$$t_t = 3e^{7.7} = 6669.2\,hrs.$$

Time 11hr - 4 days $T_t = 250F = 121°C = 394.26°K$

$t_t = 85\,hrs$

$$\ln \frac{t}{85} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{394.26}\right) = 5.174$$

$$t = 85e^{5.174} = 15013\ hr$$

COMPUTED ____ DATE ____
CHECKED ____ DATE ____

4 days - 30 days $t_a = 624$ hrs

$T_a = 200F = 366.48\,°K$

$$\ln \frac{t_a}{624} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{366.48} \right) = 3.036$$

$$t_a = 624\, e^{3.036} = 12991 \text{ hrs}$$

Total age at service conditions

$$t_{a\,TOTAL} = \Sigma t_a$$

$$t_{a\,TOTAL} = 4164 + 12675 + 236 + 12675 + 6669 + 15013 + 12991$$

$$t_{a\,TOTAL} = 64.423 \text{ hrs} = 2684 \text{ days} = 7.35 \text{ yrs}$$

COMPUTED ____ DATE ____
CHECKED ____ DATE ____

Aging due to LOCA in plant.

TIME - 4 — 6 minutes $T_t = 325°F = 163°C = 435.9\ °K$
$t = 10\ min$

$$\ln \frac{t_a}{.167\ hr} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9}\right) = 7.87$$

$$t_a = 0.167\ e^{7.87} = 437\ \text{hours}$$

TIME 6 - 34 min ∴ conservatively estimated $T_t = 325°F = 435.9°K$
$t_t = 28\ min = 0.467\ hr$

$$\ln \frac{t_a}{.467} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9}\right) = 7.87$$

$$t_a = .467\ e^{7.87} = 1222.4\ hr.$$

Time 34 min - ~~1.25 hr~~ conservatively estimated at $T_t = 300°F = 148°C = 422K$
$t_t = 41\ min = 0.68\ hr$

$$\ln \frac{t_a}{.68} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{422}\right) = 7.028$$

$$t_a = .68\ e^{7.028} = 766.9\ hrs$$

TIME = 1.25 — 6 hrs — ~~T_t = 230F~~ = 110C = 383.15K
$t_t = 4.75\ hr$

$t_a = 4.75\ e^{4.336}$

$t_a = 370\ hrs$

Time 6 - 12 hrs $T_t = 215 = 101C = 374.8K$
$t_t = 6\ hrs$

$t_a = 6\ e^{3.71}$

$t_a = 245.3\ hrs$

COMPUTED ______ DATE ______

CHECKED ______ DATE ______

TIME 12-18 hrs $T_t = 190 = 88°C = 361K$

$t_t = 6 \text{ hrs}$

$t_a = 6e^{2.569}$

$t_a = 78.$

TIME 18-24 $T_t = 170°F = 77°C = 350K$

$t_a = 6e^{1.577} = 29.0 \text{ hrs}$

Total aging due to LOCA

$t_{aL} = 3148.4 \text{ hrs}$

Maximum Lifetime before LOCA

$$T_a - t_{aL}$$

$T_{BL} = 64423 - 3148.4 = 61274 \text{ hrs}$

$t_{BL} = 6.99 \text{ yrs}$

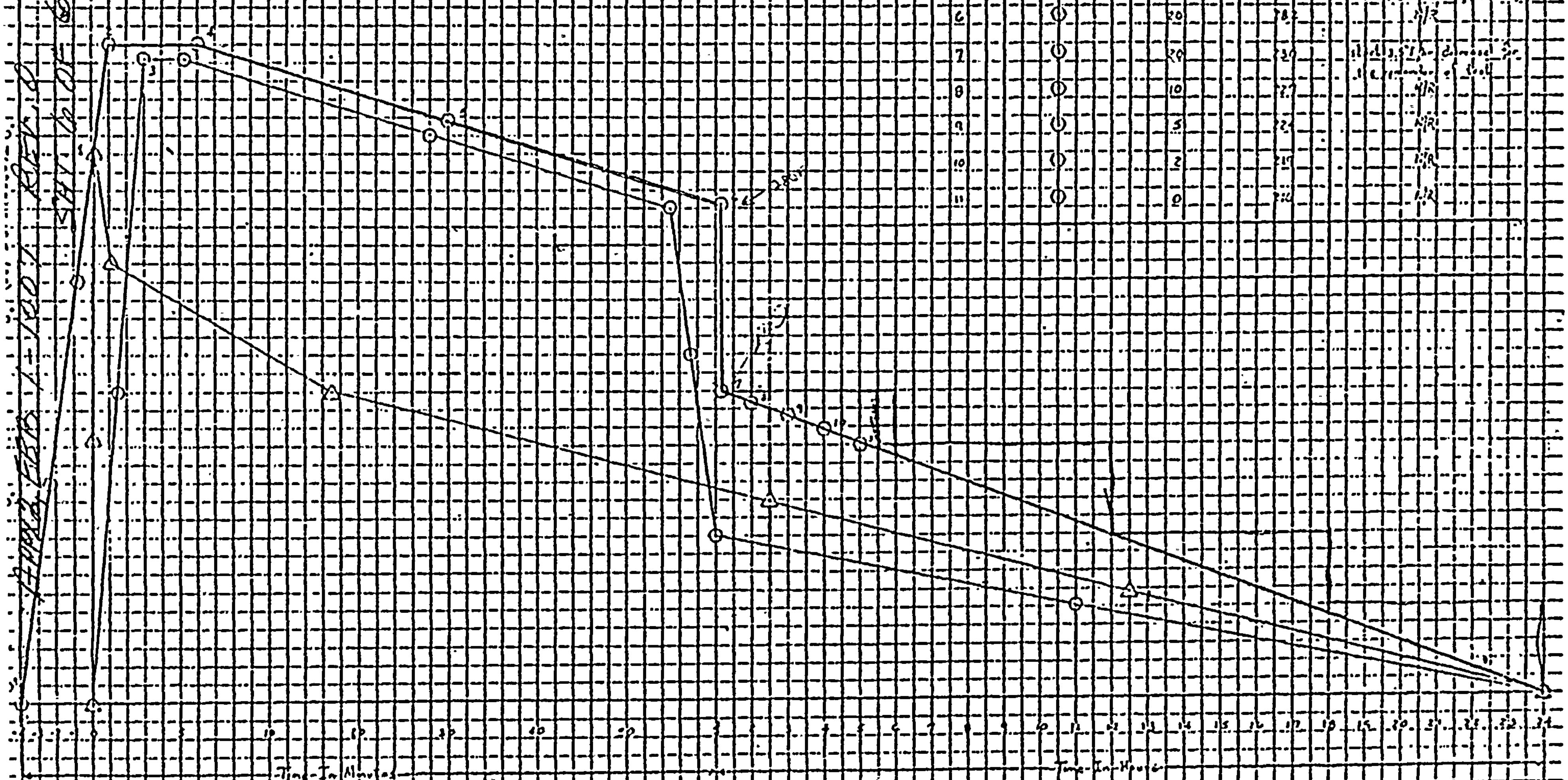
APPX B EBB 1-1201 REV. 0
SHT 6 OF 6

ADDITIONAL CURVE LEGEND

Curve Code	Explanation
△	Containment response to a postulated LOCA as defined in [illegible] dated May [illegible] and GE letter [illegible] to DR. [illegible] of TVA dated May [illegible]
○	Containment response to a postulated [illegible] steam break as defined in figure [illegible] of the Response To NRC [illegible]
○	Pin connector environmental qualification curve drawn to encompass the postulated LOCA and [illegible] steam line break containment response curves △ and ○ [illegible]

ADDITIONAL CURVE LEGEND

Code Number	Associated Curve	Pressure (psig)	Temperature (°F)	Explanation
1	△	[illegible]	[illegible]	N/R
2	○	55	325	N/R
3	○	54	[illegible]	N/R
4	○	20	[illegible]	[illegible]
5	○	30	304	[illegible]
6	○	20	[illegible]	N/R
7	○	20	[illegible]	[illegible]
8	○	10	[illegible]	N/R
9	○	5	[illegible]	N/R
10	○	2	[illegible]	N/R
11	○	0	[illegible]	N/R



ELAPSED TIME

PIN CONNECTOR ENVIRONMENTAL QUALIFICATION CURVE No. 2

The (☉) ○ is defined as the envelope of the postulated curves for curves △ and ○.

Facility: Browns Ferry Nuclear Plant
Unit: 1,2,3
Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB 1-1008
Revision 0
Date 10-21-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDI ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Main Steam Plant ID No. ZS-1-38 (Qty 6)	Operating Time	1 Day	30 Days	(1)	ACME-Cleveland Devel. Co. Test Report DTD 2-20-78	Sequential Test	None.
Component Limit Switch Manufacturer: Namco	Temperature (°F)	Figure B.7 (1) Figure B.7 (2,3)	Appx. 1 340	(4)			
Model Number: EA740-50100	Pressure (PSIA)	Table B.1 (1,2,3)	70 Appx. 1	(4)			
Function: Scram Trip	Relative Humidity (%)	100	100	(4)			
Accuracy: Req'd: N/A Demon:	Chemical Spray	N/A	N/A	(4)			
Category: A Service: Main Stm Line C Outboard Isln Vlv	Radiation (RAD)	2.03×10^6	2×10^8	(4)			
Location: 7	Aging	N/A	7 Years	(2)	Appx. 2	Analysis	
Flood Level Elev: 552' Above Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes: (1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: C. Dean [illegible]
Reviewed by: Richard L. [illegible]
QA Acceptance: W.E. [illegible] 10-2[illegible]

APPENDIX 1, SHEET 1 OF 1
EEB1-1008, REV. 0

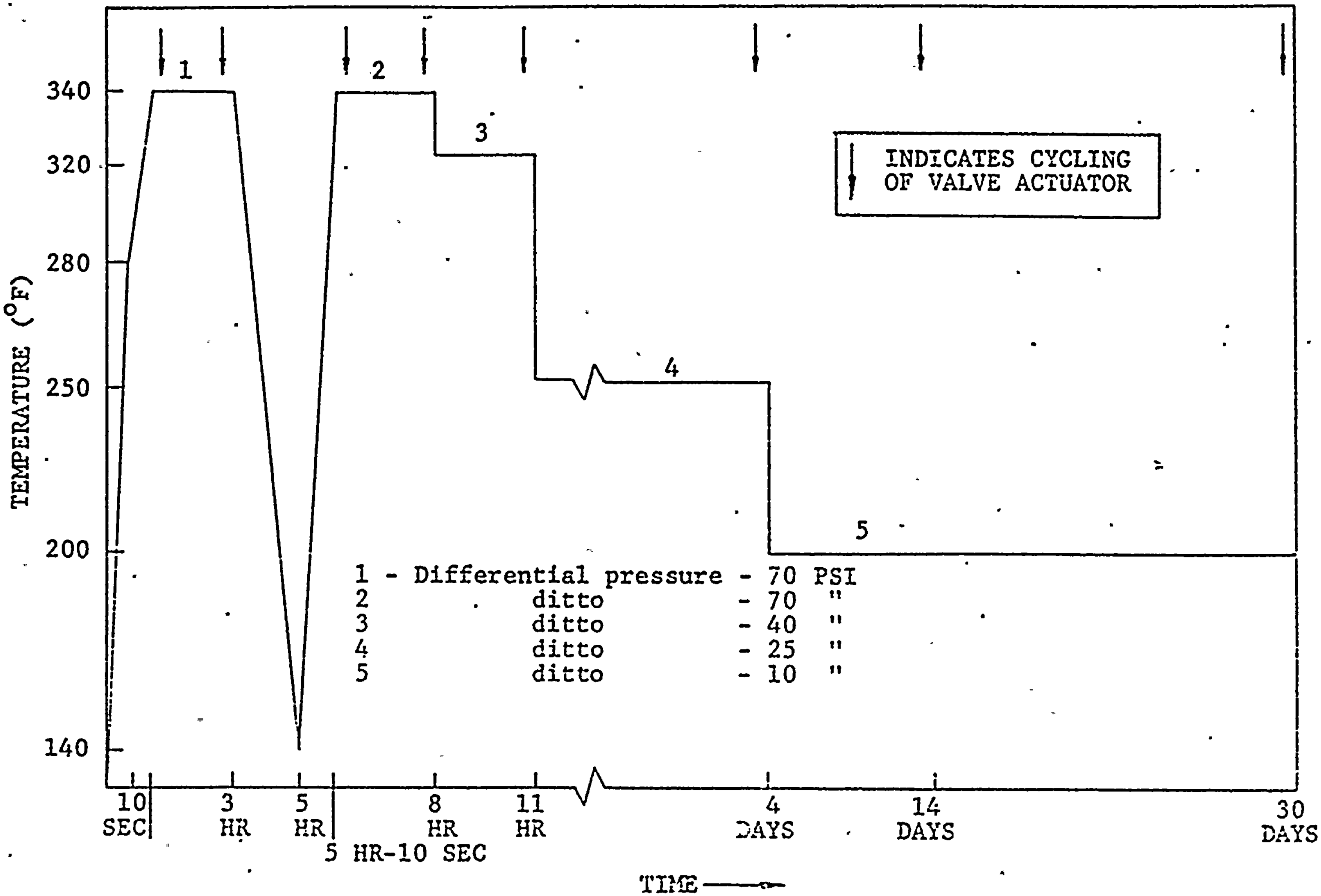


Fig 1
Test Chamber Temperature Profile for Accident Environment Simulation
(Taken from IEEE Standard 382-1972)

E.J.

AGING ANALYSIS FOR NAMCO EA740

COMPUTED MJD DATE 10-23-80
CHECKED DATE

Establishing Qualified Life at Base service Conditions

A. Aging due to heat aging (reference ACME-CLEVELAND DEVELOPMENT CO TEST REPORT DTD 2-20-78)

T_t = Temp of Aging Test = 200°F = $\frac{5}{9}(200-32)$°C = (93.3+273.15) = 366.48
t_t = Time of Aging Test = 200 hr
t_{a1} = equivalent age at service conditions
T_{a1} = NORMAL Service Temp = 140°F = $\frac{5}{9}(140-32)$°C = 60°C = 333.15
*Assume Ea = 0.958 eV

$$\ln\frac{t_{a1}}{t_t} = \frac{E_a}{K}\left(\frac{1}{T_{a1}} - \frac{1}{T_t}\right)$$

$$\ln\frac{t_{a1}}{200} = \frac{0.958\,eV \times 1.602\times10^{-19}}{1.38\times10^{-23}}\left(\frac{1}{333.15} - \frac{1}{366.48}\right)$$

$$\ln\frac{t_{a1}}{200} = 3.036$$

$$t_a = 200\,e^{3.036} = 4164 \text{ hrs.}$$

B. Aging due to LOCA Test

Time = 0 → 10 sec – negligable effect

Time 10 sec – 3 hr
T_t = 340°F = 171°C = 444.26 °K
t_t = ~3 hr

$$\ln\frac{t_a}{3} = 1.1121\times10^{4}\left(\frac{1}{333.15} - \frac{1}{444.26}\right)$$

$$\ln\frac{t_a}{3} = 8.349$$

$$t_a = 3\,e^{8.349} = 12675.56 \text{ hrs.}$$

NAMCO LIMIT SWITCHES

COMPUTED ______ DATE ______

CHECKED ______ DATE ______

Time 3-5hr Conservative Temp = 240°F for 2hrs = 388.7

$T_t = 240$

$t_t = 2hr$

$$\ln \frac{t_a}{2} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{388.7}\right)$$

$$\ln \frac{t_a}{2} = 4.77$$

$$t_a = 2e^{4.77} = 236\ hr$$

Time 5-8 hr $T_t = 340$

$t_t = 3$ same as 10 sec-3 hrs

$$t_a = 12675.56$$

Time = 8-11 hrs $T_t = 320°F = 160°C = 433.15°C$

$t_t = 3\ hrs$

$$\ln \frac{t_t}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{433.15}\right)$$

$$\ln \frac{t_t}{3} = 7.7$$

$$t_t = 3e^{7.7} = 6669.2\ hrs$$

Time 11hr - 4 days $T_t = 250F = 121°C = 394.26°K$

$t_t = 85hrs$

$$\ln \frac{t}{85} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{394.26}\right) = 5.174$$

$$t = 85e^{5.174} = 15013\ hr$$

COMPUTED ______ DATE ______

CHECKED ______ DATE ______

4 days - 30 days $t_t = 624$ hrs

$T_t = 200F = 366.48°K$

$$\ln \frac{t_a}{624} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{366.48} \right) = 3.036$$

$$t_a = 624\, e^{3.036} = 12991 \text{ hrs}$$

Total age at Service Conditions

$$t_{a\,TOTAL} = \Sigma t_a$$

$$t_{a\,TOTAL} = 4164 + 12675 + 236 + 12675 + 6669 + 15013 + 12991$$

$$t_{a\,TOTAL} = 64423 \text{ hrs} = 2684 \text{ days} = 7.35 \text{ yrs}$$

COMPUTED ______ DATE ______
CHECKED ______ DATE ______

Aging due to LOCA in plant.

TIME - 4 — 6 minutes $T_t = 325°F = 163°C = 435.9\ °K$
$t_t = 10\ min$

$$\ln \frac{t_a}{.167\ hr} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9} \right) = 7.87$$

$$t_a = 0.167\ e^{7.87} = 437\ \text{hours}$$

TIME 6 - 34 min conservatively estimated $T_t = 325°F = 435.9°K$
$t_t = 28\ min = 0.467\ hr$

$$\ln \frac{t_a}{.467} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9} \right) = 7.87$$

$$t_a = .467\ e^{7.87} = 1222.4\ hr.$$

Time ~~34 min - 1.25 hr~~ conservatively estimated at $T_t = 300°F = 148°C = 422K$
$t_t = 41\ min = 0.68\ hr$

$$\ln \frac{t_a}{.68} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{422} \right) = 7.028$$

$$t_a = .68\ e^{7.028} = 766.9\ hrs$$

TIME = 1.25 — 6 hrs — $T_t = 230F = 110C = 383.15K$
$t_t = 4.75\ hr$

$$t_a = 4.75\ e^{4.336}$$

$$t_a = 370\ hrs$$

Time 6 - 12 hrs $T_t = 215 = 101C = 374.8K$
$t_t = 6\ hrs$

$$t_a = 6e^{3.71}$$

$$t_a = 245.3\ hrs$$

COMPUTED ______ DATE ______

CHECKED ______ DATE ______

TIME 12-18 hrs $T_t = 190 = 88°C = 361 K$

$t_t = 6$ hrs

$t_a = 6e^{2.569}$

$t_a = 78.$

TIME 18-24 $T_t = 170°F = 77°C = 350K$

$t_a = 6e^{1.577} = 29.0$ hrs

Total Aging due to LOCA

$t_{aL} = 3148.4$ hrs

Maximum Lifetime before LOCA

$T_a - t_{aL}$

$t_{BL} = 64423 - 3148.4 = 61274$ hrs

$t_{BL} = 6.99$ yrs

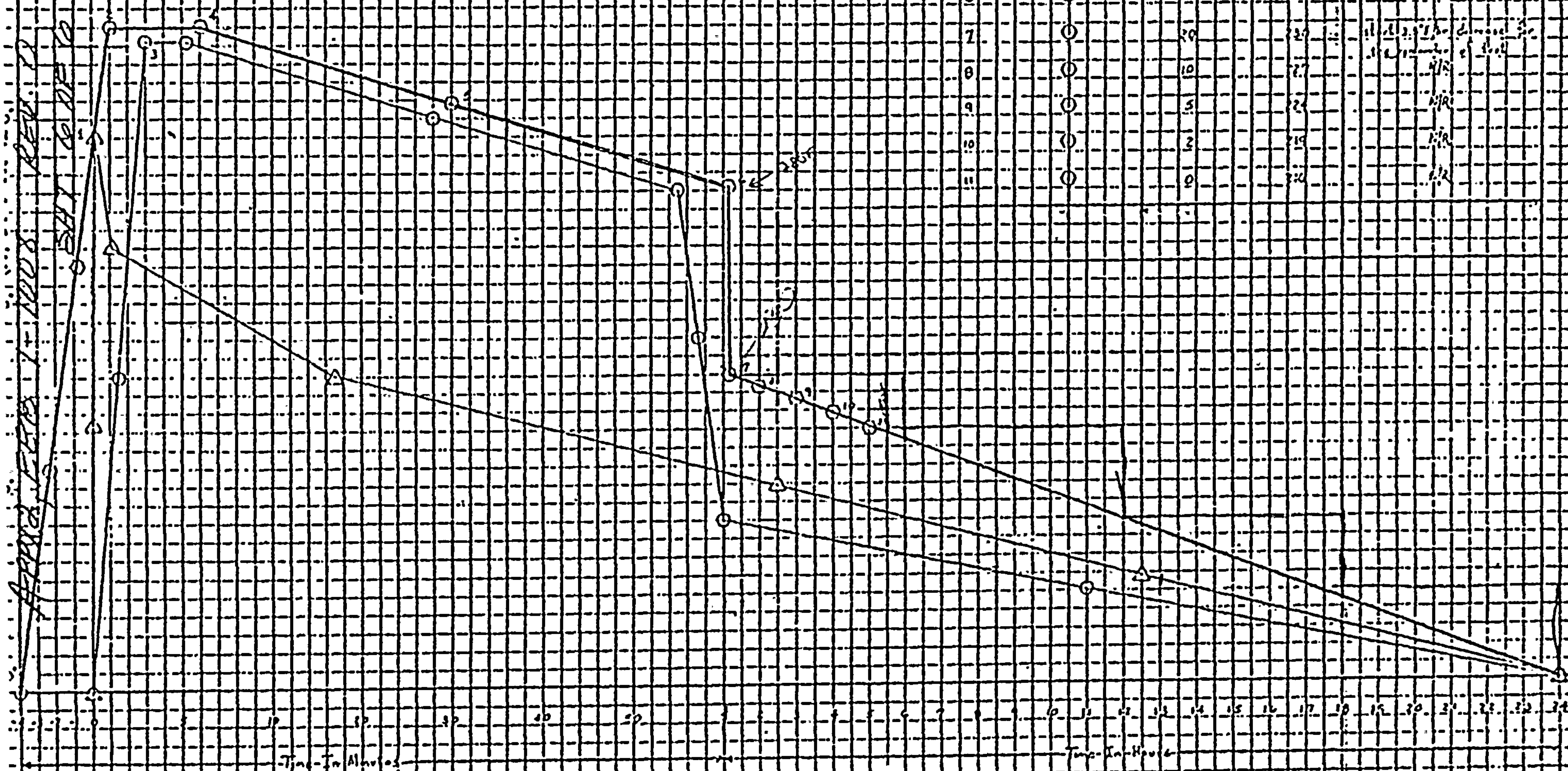
APPX 2, EEB 1-1008 REV 0
SHT 6 OF 6

Accident Curve Legend

Curve Code	Explanation
△	[illegible]
○	[illegible]
○	[illegible]

Accident Curve Points

Code Number	Associated Curve	Pressure (psig)	Temperature (°F)	Explanation
1	△	55	295	N/R
2	○	55	325	N/R
3	○	24	32[illegible]	N/R
4	○	20	325	[illegible]
5	○	30	304	[illegible]
6	○	20	282	N/R
7	○	20	[illegible]	[illegible]
8	○	10	[illegible]	N/R
9	○	5	[illegible]	N/R
10	○	2	219	N/R
11	○	0	[illegible]	N/R



ELAPSED TIME

PIN CONNECTOR ENVIRONMENTAL QUALIFICATION CURVE NO. 2

[illegible] defined as the [illegible] of the pressure [illegible] for curves △ and ○

Facility: Browns Ferry Nuclear Plant
Unit: 1,2,3
Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB 1-1009.
Revision 0
Date 10-21-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDI ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Main Steam Plant ID No. ZS-1-51 (Qty 6) Component Limit Switch	Operating Time	1 Day	30 Days	(1)	ACME-Cleveland Devel. Co. Test Report DTD 2-20-78	Sequential Test	None
Manufacturer: Namco	Temperature (^{o}F)	Figure B.0 (1,2,3)	Appx. 1 340	(4)			
Model Number: EA740-50100	Pressure (PSIA)	Figure B.0 (1,2,3)	70 Appx. 1	(4)			
Function: Scram Trip	Relative Humidity (%)	100	100	(4)			
Accuracy: Req'd: N/A Demon: Category: A	Chemical Spray	N/A	N/A	(4)			
Service: Main Stm Line D Inboard Isln Vlv Location: 0	Radiation (RAD)	See 4.1.4 2×10^8	2×10^8	(4)			
	Aging	N/A	7 Years	(2)	Appx. 2	Analysis	
Flood Level Elev: 552' Above Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: C. Dean Heli
Reviewed by: Richard J. K
QA Acceptance: W.E. Tan 10-24

APPENDIX 1, SHEET 1 OF 1
EEB1-1009, REV. 0

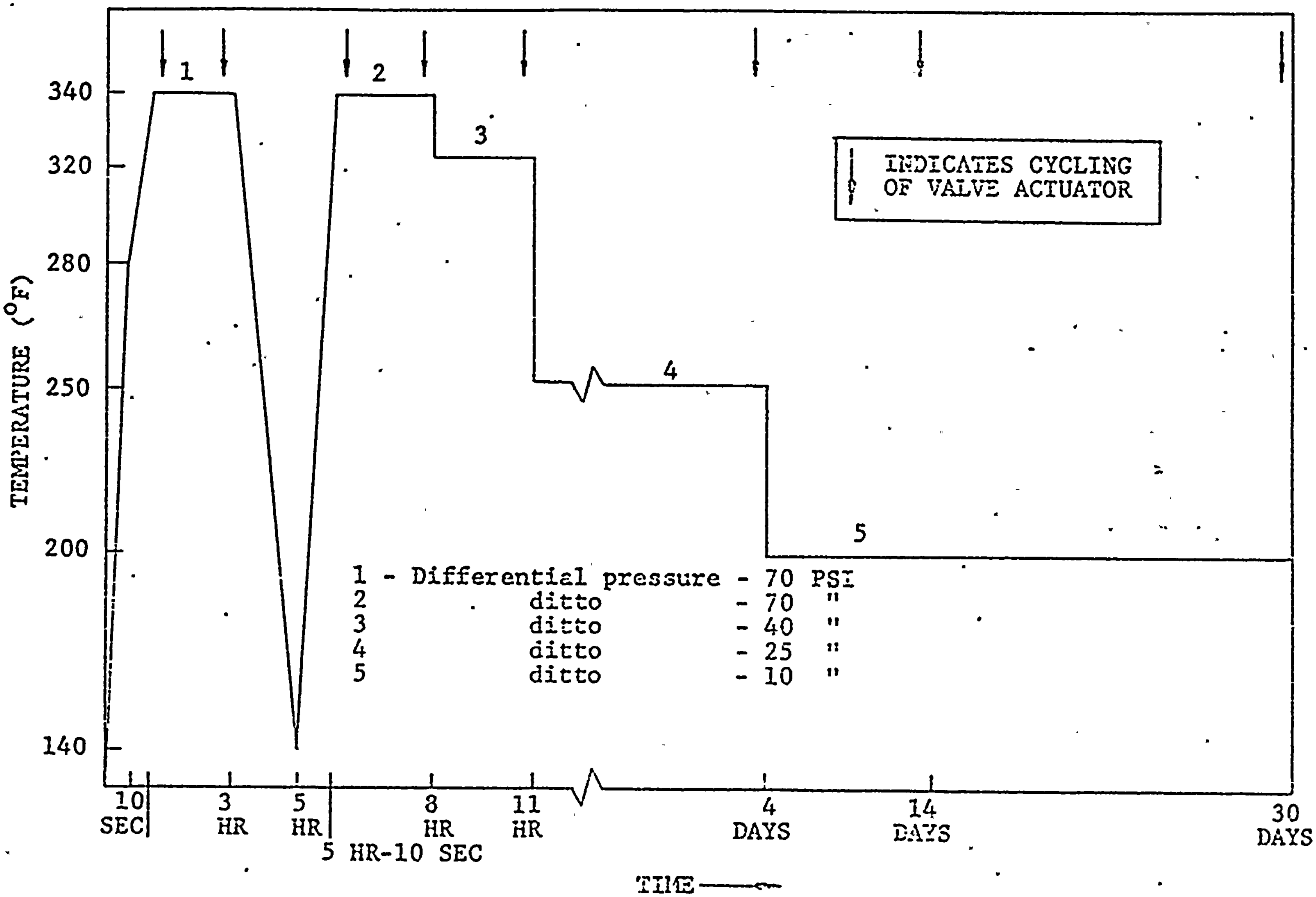


Fig 1
Test Chamber Temperature Profile for Accident Environment Simulation
(Taken from IEEE Standard 382-1972)

APPENDIX 2

AGING ANALYSIS FOR NAMCO EA740 REV 0

COMPUTED MJD DATE 10-23-80
CHECKED DATE

Establishing Qualified Life at Base service Conditions

A. Aging due to heat aging (reference ACME-CLEVELAND DEVELOPMENT CO TEST REPORT DTD 2-20-78)

T_t = Temp of Aging Test = $200°F = \frac{5}{9}(200-32)°C = (93.3+273.15) = 366.48$
t_t = Time of Aging Test = 200 hr
t_{a1} = equivalent age at service conditions
T_{a1} = NORMAL Service Temp = $140°F = \frac{5}{9}(140-32)°C = 60°C = 333.15$
*Assume $E_a = 0.958$ eV

$$\ln \frac{t_{a1}}{t_t} = \frac{E_a}{K}\left(\frac{1}{T_{a1}} - \frac{1}{T_t}\right)$$

$$\ln \frac{t_{a1}}{200} = \frac{0.958\text{ eV} \times 1.602 \times 10^{-19}}{1.38 \times 10^{-23}}\left(\frac{1}{333.15} - \frac{1}{366.48}\right)$$

$$\ln \frac{t_{a1}}{200} = 3.036$$

$$t_a = 200\, e^{3.036} = 4164 \text{ hrs.}$$

B. Aging due to LOCA Test

Time = 0 - 10 sec - negligable effect

Time 10 sec - 3 hr
$T_t = 340°F = 171°C = 444.26\,°K$
$t_t = \sim 3$ hr.

$$\ln \frac{t_a}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{444.26}\right)$$
$$\ln \frac{t_a}{3} = 8.349$$

$$t_a = 3\, e^{8.349} = 12675.56 \text{ hrs.}$$

NAMCO LIMIT SWITCHES

COMPUTED ______ DATE ______

CHECKED ______ DATE ______

Time 3-5hr Conservative Temp = 240°F for 2hrs = 388.7

$T_t = 240$

$t_t = 2hr$

$$\ln \frac{t_a}{2} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{388.7} \right)$$

$$\ln \frac{t_a}{2} = 4.77$$

$$t_a = 2e^{4.77} = 236 \text{ hr}$$

Time 5-8 hr $T_t = 340$

$t_t = 3$ same as 10sec-3 hrs

$$t_a = 12675.56$$

Time = 8-11 hrs $T_t = 320°F = 160°C = 433.15°C$

$t_t = 3$ hrs

$$\ln \frac{t_t}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{433.15} \right)$$

$$\ln \frac{t_t}{3} = 7.7$$

$$t_t = 3e^{7.7} = 6669.2 \text{ hrs.}$$

Time 11hr - 4 days $T_t = 250F = 121°C = 394.26°K$

$t_t = 85$hrs

$$\ln \frac{t}{85} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{394.26} \right) = 5.174$$

$$t = 85e^{5.174} = 15013 \text{ hr}$$

COMPUTED ______ DATE ______

CHECKED ______ DATE ______

4 days - 30 days $t_a = 624$ hrs

$T_t = 200F = 366.48°K$

$\ln \frac{t_a}{624} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{366.48} \right) = 3.036$

$t_a = 624 e^{3.036} = 12991$ hrs

Total age at Service Conditions.

$t_{a\,TOTAL} = \Sigma t_a$

$t_{a\,TOTAL} = 4164 + 12675 + 236 + 12675 + 6669 + 15013 + 12991$

$\therefore t_{a\,TOTAL} = 64423$ hrs $= 2684$ days $= 7.35$ yrs

COMPUTED ______ DATE ______

CHECKED ______ DATE ______

Aging due to LOCA in plant

TIME - 4 — 6 minutes $T_t = 325°F = 163°C = 435.9°K$

$t = 10\,min$

$$\ln \frac{t_a}{.167\,hr} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9}\right) = 7.87$$

$$t_a = 0.167\,e^{7.87} = 437 \text{ hours}$$

TIME 6 – 34 min conservatively estimated $T_t = 325°F = 435.9°K$

$t_t = 28\,min = 0.467\,hr$

$$\ln \frac{t_a}{.467} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9}\right) = 7.87$$

$$t_a = .467\,e^{7.87} = 1222.4\,hr.$$

Time 34 min ~~1.25 hr~~ conservatively estimated at $T_t = 300°F = 148°C = 422K$

$t_t = 46\,min = 0.68\,hr$

$$\ln \frac{t_a}{.68} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{422}\right) = 7.028$$

$$t_a = .68\,e^{7.028} = 766.9\,hrs$$

TIME = 1.25 — 6 hrs — $T_t = 230F = 110C = 383.15K$

$t_t = 4.75\,hr$

$$t_a = 4.75\,e^{4.356}$$

$$t_a = 370\,hrs$$

Time 6 – 12 hrs $T_t = 215 = 101C = 374.8K$

$t_t = 6\,hrs$

$$t_a = 6\,e^{3.71}$$

$$t_a = 245.3\,hrs$$

COMPUTED ______ DATE ______

CHECKED ______ DATE ______

TIME 12-18 hrs $T_t = 190 = 88°C = 361\,K$

$t_t = 6\,hrs$

$t_a = 6e^{2.569}$

$t_a = 78.$

TIME 18-24 $T_t = 170°F = 77°C = 350\,K$

$t_a = 6e^{1.577} = 29.0\,hrs$

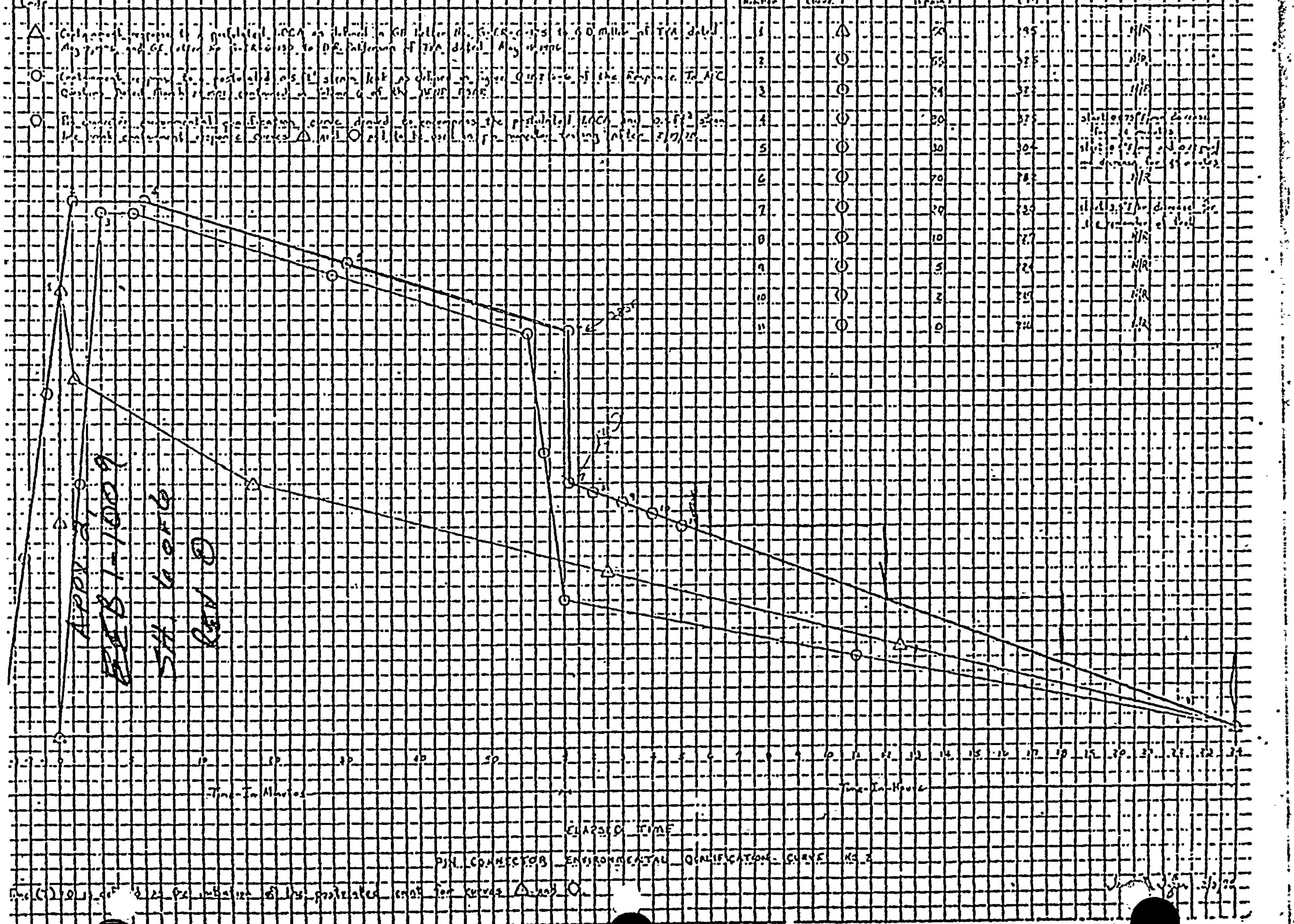
Total Aging due to LOCA

$t_{aL} = 3148.4\,hrs$

Maximum Lifetime before LOCA

$t_{BL} = \underset{T_e}{64423} - \underset{t_{aL}}{3148.4} = 61274\,hrs$

$t_{BL} = 6.99\,yrs$



APPX. 2
EEB 1-1009
SH. 6 OF 6
REV 0
N/R
ELAPSED TIME
DJN CONNECTOR ENVIRONMENTAL QUALIFICATION CURVE

Facility: Browns Ferry Nuclear Plant
Unit: 1,2,3
Docket:

SYSTEM COMPONENT EVALUATION WORK SHEET (Rev 2)

(3)
Sheet No. EEB 1-1010
Revision 0
Date 10-21-80

EQUIPMENT DESCRIPTION	ENVIRONMENT			DOCUMENTATION REF		QUALIFICATION METHOD	OUTSTANDI ITEMS
	Parameter	Specification	Qualification	Specification	Qualification		
System: Main Steam Plant ID No. ZS-1-52 (Qty 6) Component Limit Switch Manufacturer: Namco Model Number: EA740-50100 Function: Scram Trip Accuracy: Req'd: N/A Demon: Category: A Service: Main Steam Line D Outboard Isln Vlv Location: 7	Operating Time	1 Day	30 Days	(1)	ACME-Cleveland Devel. Co. Test Report DTD 2-20-78	Sequential Test	None
	Temperature (^oF)	Figure B.7 (1) Figure B.7 (2,3)	Appx. 1 340	(4)			
	Pressure (PSIA)	Table B.1 (1,2,3)	Appx. 1 70	(4)			
	Relative Humidity (%)	100	100	(4)			
	Chemical Spray	N/A	N/A	(4)			
	Radiation (RAD)	2.03×10^6	2×10^8	(4)			
	Aging	N/A	7 Years	(2)	Appx. 2	Analysis	
Flood Level Elev: 552' Above Flood Level: Yes x No	Submergence	N/A	N/A	(4)	N/A	N/A	N/A

Notes:
(1) See Section 2.4 in 79-01B report.
(2) See Section 4.1.2 in 79-01B report.
(3) All notes and other information not on these sheets are on the attached appendix sheets.
(4) See Section 3.0 and/or Appendix B in 79-01B report.

Prepared by: C. Dean Hel...

Reviewed by: Richard T. Be...

QA Acceptance: W. E. Tenth 10-2...

APPENDIX 1, SHEET 1 OF 1
EEB1-1010, REV. 0

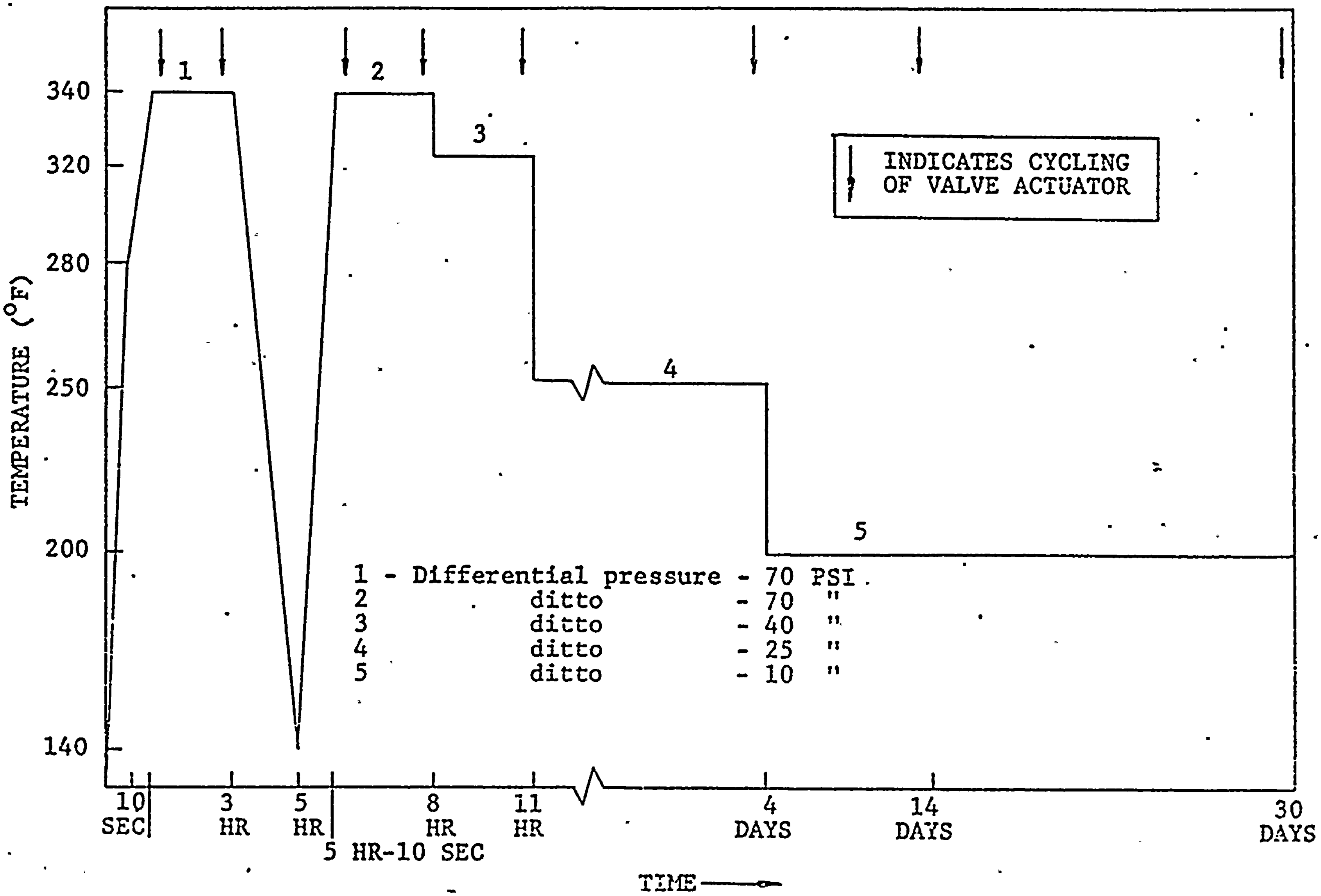


Fig 1
Test Chamber Temperature Profile for Accident Environment Simulation
(Taken from IEEE Standard 382-1972)

APPENDIX Z

AGING ANALYSIS FOR NAMCO EA740

COMPUTED MJD DATE 10-23-80

CHECKED DATE

Establishing Qualified Life at Base service Conditions

A. Aging due to heat aging (reference: ACME-CLEVELAND DEVELOPMENT CO TEST REPORT DTD 2-20-78)

T_t = Temp. of Aging Test = 200°F = $\frac{5}{9}(200-32)$°C = (93.3+273.15) = 366.48

t_t = Time of aging Test = 200 hr

t_{a1} = equivalent age at service conditions

T_{a1} = NORMAL Service Temp = 140°F = $\frac{5}{9}(140-32)$°C = 60°C = 333.15

*Assume E_a = 0.958 eV

$$\ln \frac{t_{a1}}{t_t} = \frac{E_a}{K}\left(\frac{1}{T_{a1}} - \frac{1}{T_t}\right)$$

$$\ln \frac{t_{a1}}{200} = \frac{0.958\,eV \times 1.602 \times 10^{-19}}{1.38 \times 10^{-23}}\left(\frac{1}{333.15} - \frac{1}{366.48}\right)$$

$$\ln \frac{t_a}{200} = 3.036$$

$$t_a = 200\, e^{3.036} = 4164 \text{ hrs.}$$

B. Aging due to LOCA Test

Time = 0 → 10 sec - negligible effect

Time 10 sec - 3 hr

T_t = 340°F = 171°C = 444.26 °K

t_t = ~3 hr.

$$\ln \frac{t_a}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{444.26}\right)$$

$$\ln \frac{t_a}{3} = 8.349$$

$$t_a = 3\, e^{8.349} = 12675.56 \text{ hrs.}$$

NAMCO LIMIT SWITCHES

COMPUTED ______ DATE ______

CHECKED ______ DATE ______

Time 3-5hrs Conservative Temp = 240°F for 2hrs = 388.7

$T_t = 240$

$t_t = 2\,hr$

$$\ln \frac{t_a}{2} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{388.7}\right)$$

$$\ln \frac{t_a}{2} = 4.77$$

$$t_a = 2e^{4.77} = 236\,hr$$

Time 5-8 hr $T_t = 340$

$t_t = 3$ same as 10 sec 3 hrs

$$t_a = 12675.56$$

Time = 8-11 hrs $T_t = 320°F = 160°C = 433.15°C$

$t_t = 3\,hrs$

$$\ln \frac{t_t}{3} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{433.15}\right)$$

$$\ln \frac{t_t}{3} = 7.7$$

$$t_t = 3e^{7.7} = 6669.2\,hrs.$$

Time 11hr - 4 days $T_t = 250F = 121°C = 394.26°K$

$t_t = 85\,hrs$

$$\ln \frac{t}{85} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{394.26}\right) = 5.174$$

$$t = 85e^{5.174} = 15013\ hr$$

COMPUTED ____ DATE ____
CHECKED ____ DATE ____

4 days - 30 days $t_t = 624 hrs$

$T_t = 200F = 366.48°K$

$\ln \frac{t_a}{624} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{366.48} \right) = 3.036$

$t_a = 624 e^{3.036} = 12991$ hrs

Total age at Service Conditions

$t_{a\,TOTAL} = \Sigma t_a$

$t_{a\,TOTAL} = 4164 + 12675 + 236 + 12675 + 6669 + 15013 + 12991$

$t_{a\,TOTAL} = 64.423$ hrs $= 2684$ days $= 7.35$ yrs

COMPUTED ______ DATE ______
CHECKED ______ DATE ______

Aging due to LOCA in plant.

TIME - 4 — 6 minutes $T_t = 325°F = 163°C = 435.9 °K$
$t = 10$ min

$$\ln \frac{t_a}{.167\,hr} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9}\right) = 7.87$$

$$t_a = 0.167\, e^{7.87} = 437 \text{ hours}$$

TIME 6 - 34 min ... conservatively estimated $T_t = 325°F = 435.9°K$
$t_t = 28\,min = 0.467\,hr$

$$\ln \frac{t_a}{.467} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{435.9}\right) = 7.87$$

$$t_a = .467\, e^{7.87} = 1222.4 \text{ hr.}$$

Time 34 min - ~~1.25 hr~~ conservatively estimated at $T_t = 300°F = 148°C = 422K$
$t_t = 41\,min = 0.68\,hr$

$$\ln \frac{t_a}{.68} = 1.1121 \times 10^4 \left(\frac{1}{333.15} - \frac{1}{422}\right) = 7.028$$

$$t_a = .68\, e^{7.028} = 766.9 \text{ hrs}$$

TIME = 1.25 — 6 hrs - T_t = 230F = 110C = 383.15K
$t_t = 4.75$ hr

$t_a = 4.75\, e^{4.356}$
$\therefore t_a = 370$ hrs

Time 6 - 12 hrs $T_t = 215 = 101C = 374.8K$
$t_t = 6$ hrs
$t_a = 6 e^{3.71}$
$t_a = 245.3$ hrs

COMPUTED ____ DATE ____

CHECKED ____ DATE ____

TIME 12-18 hrs $T_t = 190 = 88°C = 361 K$

$t_t = 6$ hrs

$t_a = 6e^{2.569}$

$t_a = 78.$

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$t_a = 6e^{1.577} = 29.0$ hrs

Total Aging due to LOCA

$t_{aL} = 3148.4$ hrs

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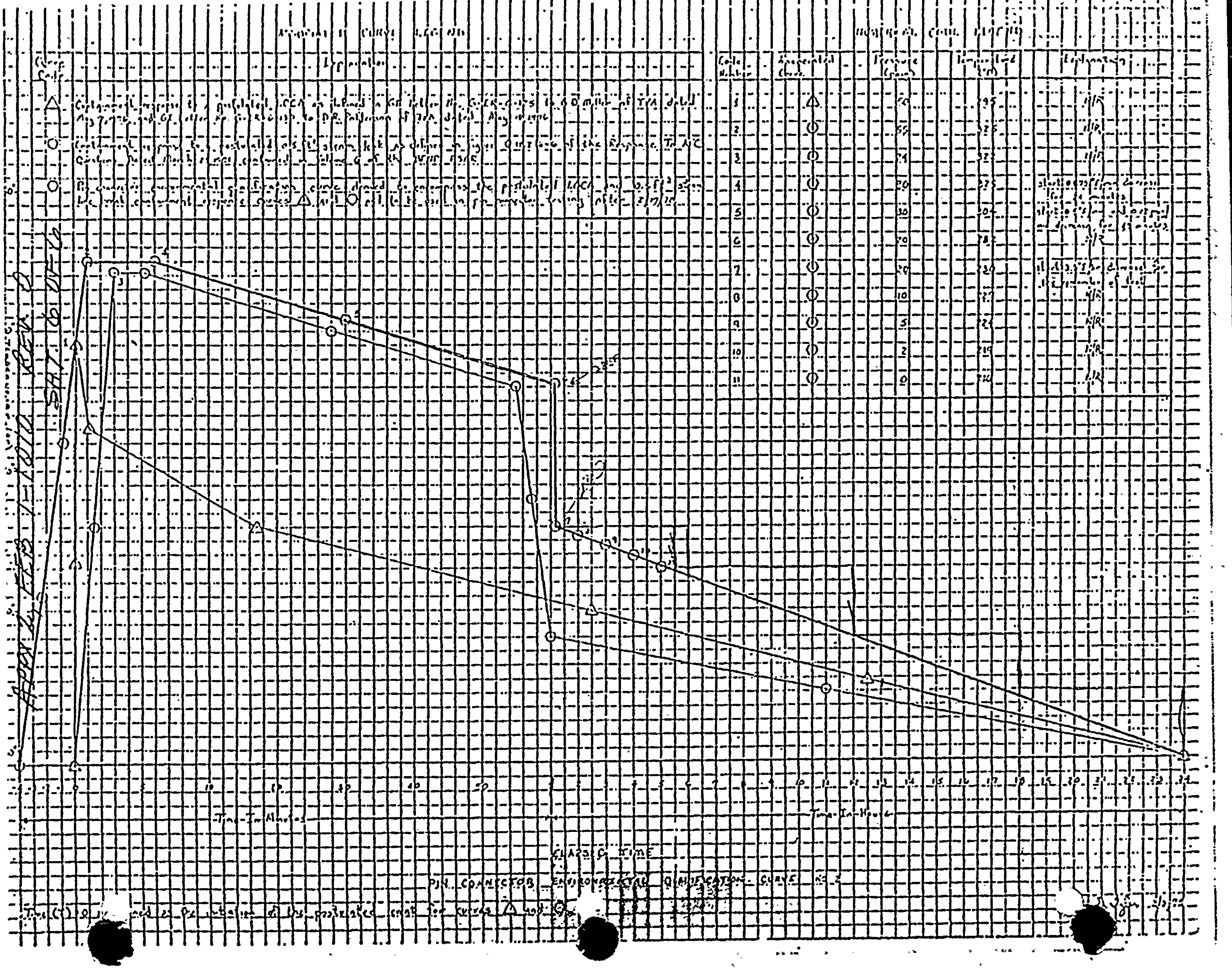
$$T_{BL} = \underset{T_a}{64423} - \underset{t_{aL}}{3148.4} = 61274 \text{ hrs}$$

$t_{BL} = 6.99$ yrs



APPX 2, EEB 1-1010 REV 0
SHT 6 OF 6
Curve Code
Explanation
Code Number
Time In Minutes
Time In Hours
ELAPSED TIME
PIN CONNECTOR ENVIRONMENTAL QUALIFICATION CURVE NO. 2