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DRAWINGS CITED IN THIS CHAPTER*

DRAWING*	SUBJECT
M-89	P&ID Standby Gas Treatment System, Units 1 and 2
M-94	P&ID Low Pressure Core Spray (LPCS) System, Unit 1
M-95	P&ID High Pressure Core Spray (HPCS) System, Unit 1
M-100	P&ID Control Rod Drive Hydraulic Piping System, Unit 1
M-130	P&ID Containment Combustible Gas Control System
M-140	P&ID Low Pressure Core Spray (LPCS) System, Unit 2
M-141	P&ID High Pressure Core Spray (HPCS) System, Unit 2
M-146	P&ID Control Rod Drive Hydraulic Piping System, Unit 2
M-1443	P&ID Control Room Air Conditioning System
M-1468	P&ID Refrigerant Piping Control Room HVAC System
M-3443	HVAC C&I Details Control Room Air Conditioning System

* The listed drawings are included as "General References" only; i.e., refer to the drawings to obtain additional detail or to obtain background information. These drawings are not part of the UFSAR. They are controlled by the Controlled Documents Program.

CHAPTER 6.0 - ENGINEERED SAFETY FEATURES

The engineered safety features of LaSalle County Station are those systems whose actions are essential to a safety action required to mitigate the consequences of postulated accidents. The features can be divided into five general groups as follows: containment systems, emergency core cooling systems (ECCS), habitability systems, fission product removal and control systems and other systems. The LSCS engineered safety features, listed by their appropriate general grouping, are given below:

GROUP	SYSTEM
Containment Systems	
	Primary Containment
	Secondary Containment
	Containment Heat Removal System
	Combustible Gas Control System
	Containment Isolation System
Emergency Core Cooling System	
	High-Pressure Core Spray System (HPCS)
	Low-Pressure Core Spray System (LPCS)
	Low-Pressure Coolant Injection System (LPCI)
	Automatic Depressurization System (ADS)
Habitability Systems	
	Control Room HVAC
Fission Product Removal and Control Systems	
	Standby Gas Treatment System
	Emergency Make-Up Air Filter System

GROUP	SYSTEM
Other Systems	Main Steamline Isolation Valve Isolated Condenser Leakage Treatment Method

6.1 ENGINEERED SAFETY FEATURE MATERIALS

The materials utilized in the LSCS engineered safety feature systems have been selected on the basis of an engineering review and evaluation for compatibility with:

a. the normal and accident service conditions of the (engineered safety feature) ESF system,

b. the normal and accident environmental conditions associated with the ESF system,

c. the maximum expected normal and accident radiation levels to which the ESF will be subjected, and

d. other materials to preclude material interactions that could potentially impair the operation of the ESF systems.

The materials selected for the ESF systems are expected to function satisfactorily in their intended service without adverse effects on the service, performance or operation of any ESF.

6.1.1 Metallic Materials

In general, all metallic materials used in ESF systems comply with the material specifications of Section II of the ASME Boiler and Pressure Vessel Code. Pressure-retaining materials of the ESF systems comply with the stringent quality requirements of their applicable quality group classification and ASME B&PV Code, Section III classification. Adherence to these requirements assures materials of the highest quality for the ESF systems. In those cases where it is not possible to adhere to the ASME material specifications, metallic materials have been selected in compliance with other nationally recognized standards, e.g., ASTM, where practicable, or chosen in compliance with current industry practice.

6.1.1.1 Materials Selection and Fabrication

Metallic materials in ESF systems have, in general, been designed for a service life of 40 years, with due consideration of the effects of the service conditions upon the properties of the material, as required by Section III of the ASME B&PV Code, Article NC-2160.

Pressure retaining components of the ECCS have been designed with the following corrosion allowances, in compliance with the general requirement of Section III of the ASME B&PV Code, Article NC-3120:

a. Ferritic Materials

1. water service 0.08 inches

2. steam service 0.120 inches

b. Austenitic Materials 0.0024 inches

For ESF systems other than ECCS, appropriate corrosion allowances, considering the service conditions to which the material will be subjected, have been applied.

The metallic materials of the ESF systems have been evaluated for their compatibility with core and containment spray solutions. No radiolytic or pyrolytic decomposition of ESF material will occur during accident conditions, and the integrity of the containment or function of any other ESF will not be effected by the action of core or containment spray solutions.

Material specification for the principal pressure-retaining ferritic, austenitic, and nonferrous metals in each ESF component are listed in Table 6.1-1. Materials that would be exposed to the core cooling water and containment sprays in the event of a loss-of-coolant accident are identified in this table. Sensitization of austenitic stainless steel is prevented by the following actions:

a. Design specifications for austenitic stainless steel components require that the material be cleaned using halide free cleaning solutions and that special care be exercised in the fabrication, shipment, storage, and construction to avoid contaminants.

b. Design specifications call for ASME material, which is to be supplied in the solution annealed condition.

c. Design specifications prohibit the use of materials that have been exposed to sensitizing temperatures in the range of 800° F to 1500° F.

Cold-worked austenitic stainless steels with yield strengths greater than 90,000 psi are not utilized in ESF systems. Therefore, there are no compatibility problems with core cooling water or the containment sprays.

Metallic reflective thermal insulation is used exclusively inside the primary containment. Premoulded non-hydrophobic Microtherm MPS Insulation with the water resistant Agricoat coating enclosed in a 24 gauge stainless steel jacket is installed on the Unit 2 RVWLIS piping, 2BN86A-3/4" and 2NB88A-3/4", and the main steam high-flow instrument piping, 2MSC6AD-3/4" inside primary containment. Premoulded non-hydrophobic Microtherm MPS insulation enclosed in

24 gauge stainless steel jacket is installed on Unit 1 RVWLIS piping 1NB09A-2", 1NB09B-1", 1NB88A-1", 1NB24A-2", and 1NB24B-1", and the main steam high-flow instrument piping, 1MSC6AK-3/4", inside primary containment. The aforementioned Microtherm Insulation is also installed on the Unit 1 main steam high-flow instrument piping, 1MSC6AK-3/4", inside primary containment.

ARMAFLEX insulation is installed on the chilled water system inside primary containment.

Outside containment, calcium silicate or an engineering approved alternative thermal insulation is utilized. Design specifications on the nonmetallic insulation require that it be in accordance with Regulatory Guide 1.36, in order to avoid the possibility of chloride induced stress corrosion cracking in austenitic stainless steel in contact with the insulation.

To avoid hot cracking (fissuring) during weld fabrication and assembly of austenitic stainless steel components of the ESF, the design specifications require the following:

a. Maximum delta ferrite content for wrought and duplex cast components is 5% - 15%.

b. Chemical analyses are performed on undiluted weld deposits, or alternately, on the wire, consumable insert, etc., to verify the delta ferrite content.

c. Delta ferrite content in weld metal is determined using magnetic measurement devices.

d. Maximum interpass temperature shall not exceed 350°F during welding.

e. Test results as discussed above are included in the qualification test report.

f. Weld materials meet the requirements of Section III.

g. Production welds are examined to verify that the specified delta-ferrite levels are met.

h. Welds not meeting these levels are unacceptable and must be removed.

6.1.1.2 Composition, Compatibility and Stability of Containment and Core Spray Coolants

The core sprays have two possible sources of coolant. The HPCS system is supplied from either the cycled condensate storage tank or the suppression pool. The normal source of water for HPCS is the suppression pool. The capability remains for the HPCS system to draw a suction on the cycled condensate tank because the piping to the tank is installed, but isolated by a blind flange. Establishment of this flowpath is under administrative control. The LPCS and LPCI are supplied from the suppression pool only. Water quality in both of these sources is maintained at a high level of purity with the possible exception of potentially high soluble-iron metallic impurities. Additional discussion of the water qualities are given in Subsections 6.1.3, 9.2.7, and 9.2.11. Limited corrosion inhibitors or other additives (such as zinc and noble metals) are present in either source.

The containment spray utilizes the suppression pool as its source of supply. No radiolytic or pyrolytic decomposition of ESF materials are induced by the containment sprays. The containment sprays should not be a source of stress-corrosion cracking in austenitic stainless steel during a LOCA.

6.1.2 Organic Materials

Table 6.1-2 lists all the organic compounds that exist within the containment in significant amounts. All these materials in ESF components have been evaluated with regard to the expected service conditions, and have been found to have no adverse effects on service, performance, or operation.

The dry well liner and coated exposed metal surfaces inside containment are prime coated with an inorganic zinc compound that has been fully qualified in accordance with ANSI standards N101.2, N101.4, and N512 , with the exception of a small quantity (44 gallons) used on pipe hangers and snubber attachments and recirculating pump motors. Uncoated metal surfaces shall be evaluated for acceptability. No radiolytic or pyrolytic decomposition or interaction with other ESF materials will occur.

6.1.3 Postaccident Chemistry

The post-accident chemical environment inside the primary containment will consist of water from the suppression pool and the cycled condensate storage tank, i.e. water sources for the high pressure core spray, low pressure core spray, low pressure core injection, reactor core isolation cooling and containment spray. The suppression pool may contain trace amounts of corrosion inhibiting chemicals such as hydrogen, zinc and noble metals. Additionally, portions of the Reactor Building Closed Cooling Water (RBCCW) system and the Primary Containment Chilled Water (PCCW) system are inside the containment. Both systems contain limited amounts of corrosion inhibitors, and have portions of their piping inside containment classified as Seismic Category 2. During a Design Basis Accident (DBA) either or both of these systems can fail and release the corrosion inhibitors to the suppression pool before isolation. Due to the limited quantity (trace amounts) of these chemicals in the secondary systems and the dilution factor as a result of a DBA, the water will be approximately neutral (pH = 7), and there will be no adverse affect to equipment, coatings or other materials during ECCS or RCIC operation.

TABLE 6.1-1
(SHEET 1 OF 5)

PRINCIPAL PRESSURE-RETAINING
MATERIAL FOR ESF COMPONENTS

I. Containment Systems	
A. Primary Containment	
1. Containment Walls	4500 psi Concrete
*2. Drywell Liner	SA-516, Grade 60
*3. Suppression Chamber Liner	SA-240, Type 304
*4. Drywell Head	SA-516, Grade 70
*5 Penetrations	
a. Drywell	SA-333, Grade 1 or 6 (Seamless)
b. Suppression Chamber	SA-312, Grade TP 304 (Seamless)
*6. Equipment Hatch	SA-516, Grade 70
*7. Personnel Access Hatch	
a. Drywell	SA-516, Grade 70
b. Suppression Chamber	SA-240, Type 304
*8. Suppression Vent Downcomers	SA-240, Type 304
*9. Vacuum Relief Piping	
a. Drywell to Suppression Chamber Penetration	SA-106, Grade B
b. Suppression Chamber Penetration	SA-312, Grade TP 304 (Seamless)
10. Vacuum Relief Valves	SA-105

*Indicates that material may be subjected to containment spray or core cooling water in the event of a loss-of-coolant accident.

TABLE 6.1-1
(SHEET 2 OF 5)

*11. Pressure Retaining Bolts	
a. Drywell	SA-320, Grade L43
	SA-193, Grade B7
	SA-194, Grade 7
b. Suppression Chamber	SA-193, Class 2, Grade B8C, Type 347
	SA-194, Class 2, Grade 83, Type 347
B. Secondary Containment	
1. Ducts	A-526
2. Dampers	A-285, Grade B
	A-181, Grade 1
C. Containment Heat Removal System	
1. RHR Pumps	A-516, Grade 70
2. RHR Heat Exchanger	
a. Shell Side	SA-516, Grade 70
b. Tube Side	SA-249, Grade TP 304L
*3. Piping	SA-106, Grade B
*4. Valves	SA-216, Grade WCB or SA-105
*5. Pressure-Retaining Bolting	SA-193, Grade B7
*6. Welding Material	SFA-5.18E70S-3(F-6, A-1)
D. Containment Isolation System	
*1. Piping	SA-106, Grade B or SA-312, Grade TP 304
*2. Valves	SA-216, Grade WCB or SA-105 or SA-182, Grade 316L or Grade F316 or SA-351, Grade C8FM or SA-351 Grade CF3

*Indicates that material may be subjected to containment spray or core cooling water in the event of a loss-of-coolant accident.

TABLE 6.1-1
(SHEET 3 OF 5)

*3. Pressure-Retaining Bolting	SA-193, Grade B7
*4. Welding Material	SFA-5.18E70S-3 (F-6, A-1)
E. Combustible Gas Control System	
1. Piping	SA-106, Grade B
2. Valves	SA-216, Grade WCB
3. Recombiner	SA-358, Grade 304
4. Blower	
5. Pressure-Retaining Bolting	SA-193, Grade B7
6. Welding Material	SFA-5.18E70S-3 (F-6, A-1)
II. Emergency Core Cooling System	
A. High-Pressure Core Spray	
1. Pump	A-516, Grade 70
2. Piping	
*a. Inside Reactor Building	SA-106, Grade B
b. Outside Reactor Building	SA-409, Grade TP 304
*3. Valves	SA-216, Grade WCB or SA-105
*4. Pressure-Retaining Bolting	SA-193, Grade B7
*5. Welding Materials	SFA-5.18E70S-3 (F-6, A-1)
B. Low-Pressure Core Spray	
1. Pump	A-516, Grade 70
*2. Piping	SA-106, Grade B
*3. Valves	SA-216, Grade WCB or SA-105

*Indicates that material may be subjected to containment spray or core cooling water in the event of a loss-of-coolant accident

TABLE 6.1-1
(SHEET 4 OF 5)

*4. Pressure-Retaining Bolting	SA-193, Grade B7
*5. Welding Materials	SFA-5.18E70S-3 (F-6, A-1)
A. Low-Pressure Coolant Injection	
1. RHR Pump	A-516, Grade 70
*2. Piping	SA-106, Grade B
*3. Valves	SA-216, Grade WCB or SA-105
*4. Pressure-Retaining Bolting	SA-193, Grade B7
*5. Welding Materials	SFA-5.18E70S-3 (F-6, A-1)
B Automatic Depressurization System	
*1. Piping	
a. Inlet	SA-155, Grade KCF70
b. Outlet	SA-106, Grade B
*2. Valves	
III. Habitability System	
A. Blowers	A-283, A-242
B. Dampers	A-285, Grade B
	A-181, Grade 1
C. Ducts	A-526
D. Housing	A-36
IV. Fission Product Removal and Control System	
A. Standby Gas Treatment System	
1. a. Piping (Downstream of Filter Unit)	SA-106, Grade B
b. Piping (Upstream of Filter Unit)	A-106, Grade B
2. Housing	A-36

*Indicates that material may be subjected to containment spray or core cooling water in the event of a loss-of-coolant accident.

TABLE 6.1-1
(SHEET 5 OF 5)

3. Valves	SA-216, Grade WCB or SA-105, or SA-516, Grade 7
4. Dampers	A-285, Grade B
	A-181, Grade 1
5. Blowers	A-283, A-242
6. Pressure-Retaining Bolting	
a. Pressure-Retaining Bolting (Downstream of Filter Unit)	SA-193, Grade B7
b. Pressure-Retaining Bolting (Upstream of Filter Unit)	A-193, Grade B7
7. Welding Materials	SFA-5.18E70S-3 (F-6,A-1)
B. Emergency Air Filter System	
1. Ducts	A-526
2. Dampers	A-285, Grade B
	A-181, Grade 1
3. Housing	A-36
4. Blower	A-283, A-242

V. Other Systems

A. Main Steamline Isolation Valve Leakage Control System (Deleted)

*Indicates that material may be subjected to containment spray or core cooling water in the event of a loss-of-coolant accident

TABLE 6.1-2
(SHEET 1 OF 2)

ORGANIC MATERIALS WITHIN THE
PRIMARY CONTAINMENT

MATERIAL	USE	QUANTITY
Acrylomitrile Butadiene/PVC Foam Rubber	ARMAFLEX Insulation on the Chilled Water Piping	Throughout Drywell
Chlorosulfinated Polyethylene (Hypalon)	Low Voltage Electrical Power Cable Jacketing and Insulation Material	Throughout Drywell
Etylene Propylene Rubber (EPR)	Low Voltage Electrical Power Cable Jacketing and Insulation Material	Throughout Drywell
High Temperature Ethylene Propylene	Medium Voltage Electrical Power Cable Jacketing and Insulation Material	Throughout Drywell
Hypalon/Hypalon	Instrumentation Cable Insulation/Jacketing Material	Throughout Drywell
EPR/Hypalon	Instrumentation Cable Insulation/Jacketing Material	Throughout Drywell
Agricoat	Water Resistant Coating on the Premoulded non-hydrophobic Microtherm MPS Insulation	25.8 ft^2 - Unit 2
Cross-Linked Polyolefin/Alkaneimide Polymer	Instrumentation Coaxial and Triaxial Insulation/ Jacketing Material	Throughout Drywell
Modified Phenolic	Coating for Exposed Carbon Steel Surfaces	16 ft^3
Modified Phenolic Surfacer	Coating for Exposed Concrete Surfaces	17 ft^3
Modified Phenolic Finish	Coating for Exposed Concrete Surfaces	5 ft^3

TABLE 6.1-2
(SHEET 2 OF 2)

MATERIAL	USE	QUANTITY
Alkyd Primer and Finish	Pipe hangers and Snubber Attachments and GE Recirculating Pump	44 gal.
Lube Oil	Reactor Recirculation Pump Motor (2 motors/unit)	145 gal. in Unit 1 120 gal. in Unit 2
Silicone Fluid (SF 1147, GE)	MSIV Hydraulic Fluid (4 valves within containment)	1 ½ gal. per valve
Non-separating high temperature grease	Drywell cooling area coolers	< 1 gal.
Fyrquel EHC	Recirculation Control Valve Hydraulic Fluid (2 valves)	118 gal. per valve
Silicone Fluid	Lisega Hydraulic Snubbers	< 1 ½ gal. per snubber
Fiberglass Reinforced Silicone Fabric	1 (2) RF01 and 1 (2) RE02 Sump Cover Mat	400 ft^2 per unit
Silicone Sealant	1 (2) RF01 and 1 (2) RE02 Sump Cover Mat	< 1 gal. per unit

6.2 CONTAINMENT SYSTEMS

6.2.1 Containment Functional Design

This section establishes the design bases for the primary containment structure, describes the major design features of the structure, and presents an evaluation of the capacity of the containment to perform its required safety function during all normal and postulated accident conditions described in this UFSAR.

6.2.1.1 Containment Structure

6.2.1.1.1 Design Bases

The primary containment structure has been designed to meet the following safety design bases:

a. Containment Vessel Design

1. The containment structure has the capability to withstand the peak transient pressures and temperatures that could occur due to the postulated design-basis accident (DBA).

2. The containment has the capability to maintain its functional integrity indefinitely after the postulated DBA.

3. The containment structure also withstands the peak environmental transient pressures and temperatures associated with the postulated small line break inside the drywell.

4. The containment structure has also been designed to withstand the coincident fluid jet forces associated with the flow from the postulated rupture of any pipe within the containment.

5. The containment has also been designed to withstand the hydrodynamic forces associated with a DBA and safety-relief valve discharge, as described in the LaSalle Design Assessment Report. Design loading combinations are also described in the design assessment report: Design pressure and temperature, and the major containment design parameters are listed in Table 6.2-1.

b. Containment Subcompartment Design

The internal structures of the containment have been designed to accommodate the peak transient pressures and temperatures associated with the postulated design-basis accident (DBA). The effects of subcompartment pressurization for the postulated pipe ruptures have been evaluated. Subcompartment pressurization is more fully discussed in Subsection 6.2.1.2.

c. Containment Internals Design

The drywell floor has been designed to withstand a downward acting differential pressure of 25 psig in combination with the normal operating loads and safe shutdown earthquake (SSE). The drywell floor has also been designed to accommodate an upward acting deck differential pressure of 5 psig, in order to account for the wetwell pressure increase that could occur after a loss-of-coolant accident (LOCA).

d. Containment Design for Mass and Energy Release

1. The maximum postulated release of mass and energy to the containment is based upon the instantaneous circumferential rupture of a 24- inch reactor recirculation line or a 26-inch main steamline.

2. The effects of metal-water reactions and other chemical reactions following the DBA can be accommodated in the containment design.

e. Energy Removal Features

The RHR system, through the containment cooling mode, is utilized to remove energy from the containment following a LOCA by circulating the suppression pool water through a residual heat removal (RHR) heat exchanger for cooling, and returning the water to the pool through the low-pressure core injection (LPCI) in the reactor pressure vessel (RPV) or the suppression chamber spray header. The containment spray mode of the RHR system can also be utilized to condense steam and reduce the temperature in the drywell following a LOCA. A more detailed description is available in Subsection 6.2.2. The RHR containment cooling mode energy removal capability is not affected by a single failure in the system, since a completely redundant loop is available to perform this function. Two redundant loops of the containment spray system are also provided.

f. Pressure Reduction Features

The containment vent system directs the flow from postulated pipe ruptures to the pressure suppression pool, and distributes such flow uniformly throughout the pool, to condense the steam portion of the flow rapidly, and to limit the pressure differentials between the drywell and wetwell during various postaccident cooling modes.

g. Hydrostatic Loading Design

The containment design permits filling the containment system drywell with water to a level 1 foot below the refueling floor to permit removal of fuel assemblies during postaccident recovery.

h. Impact Loading Design

The containment system is protected against missiles from internal or external sources and excessive motion of pipes that could directly or indirectly jeopardize containment integrity.

i. Containment Leakage Design

The containment limits leakage during and following the postulated DBA to values less than leakage rates that would result in offsite doses greater than 10 CFR 100.

j. Containment Leakage Testability

It is possible to conduct periodical leakage tests as may be appropriate to confirm the integrity of the containment at calculated peak pressure resulting from the postulated DBA.

For the purposes of the containment structure design, the design-basis accident (DBA) is defined as a mechanical failure of the reactor primary system equivalent to the circumferential rupture of one of the recirculation lines. During the DBA, the long-term peak suppression pool temperature shall not exceed the design temperature.

6.2.1.1.2 Design Features

The primary containment is a concrete structure with the exception of the drywell head and access penetrations, which are fabricated from steel. The major components are shown in Figure 3.8-1. The concrete is designed to resist all loads associated with the design-basis accident.

The primary containment walls have a steel liner, which acts as a low leakage barrier for release of fission products.

The walls of the primary containment are posttensioned concrete; the base mat is conventional reinforced concrete. The dividing floor between the drywell and suppression chamber is conventional reinforced concrete and is supported on a cylindrical base at its center, on a series of concrete columns and from the containment wall at the periphery of the slab.

The drywell floor is rigidly connected to the primary containment wall. A full moment and shear connection is provided by dowels and shear lugs welded to the reinforced liner plate as shown in Figure 3.8-4. The thermal expansion is accounted for in the containment design; the resulting forces and moments are accommodated within the allowable stress limits.

The primary containment walls support the reactor building floor loads and, in addition, also serve as the biological shield. A detailed discussion of the structural design bases is given in Chapter 3.0. The codes, standards, and guides applied in the design of the containment structure and internal structures are identified in Chapter 3.0.

The walls of the primary containment structure are posttensioned, using the BBRV system of posttensioning utilizing parallel lay, unbonded type tendons. The tendons are fabricated from 90 one-quarter inch diameter, cold drawn, stress relieved, prestressing grade wire. Each tendon is encased in a conduit. The walls are prestressed both vertically and horizontally for floor elevations below 820 feet. The horizontal tendons are placed in a 240° system using three buttresses as anchorages with the tendons staggered so that two-thirds of the tendons at each buttress terminate at that buttress. For floor elevations above 820 feet, the horizontal tendons are placed in a 360° system using two buttresses as anchorages. Access to the tendon anchorages is maintained to allow for periodic inspection. For a typical layout of hoop tendons, see Figure 3.8-11. A typical layout of the vertical tendons is illustrated in Figure 3.8-11.

All liner joints have full penetration welds. The field welds have leaktightness testing capability by having a small steel channel section welded over each liner weld. Fittings are provided in the channel for leak testing of the liner welds under pressure. The actual containment leakage boundary during normal operation and accident conditions consists of the liner and liner joint butt welds when the leak test channel is vented to the containment atmosphere and the combined containment liner, liner joint butt welds, containment liner leak test channels, channel fillet welds and the leak test connections when the leak test channel test connection plugs are installed. The liner anchorage system considers the effects of temperature, negative pressure, prestressing, and stress transfer around penetrations.

Drywell

The drywell is a steel-lined posttensioned concrete vessel in the shape of a truncated cone having a base diameter of approximately 83 feet and a top diameter of 32 feet.

The floor of the drywell serves both as a pressure barrier between the drywell and suppression chamber and as the support structure for the reactor pedestal and downcomers. The drywell head is bolted at a steel ring girder attached to the top of the concrete containment wall and is sealed with a double seal. The double seal on the head flange provides a plenum for determining the leaktightness of the bolted connection. The base of the ring serves as the top anchorage for the vertical prestressing tendons and the top of the ring serves as anchorage for the drywell head.

The drywell houses the reactor and its associated auxiliary systems. The primary function of the drywell is to contain the effects of a design-basis recirculation line break and direct the steam released from a pipe break into the suppression chamber pool. The drywell is designed to resist the forces of an internal design pressure of 45 psig in combination with thermal, seismic, and other forces as outlined in Chapter 3.0.

The drywell is provided with a 12-foot diameter equipment hatch for removal of equipment for maintenance and an air lock for entry of personnel into the drywell. Under normal plant operations, the equipment hatch is kept sealed and is opened only when the plant is shut down for refueling and/or maintenance.

The equipment hatch is covered with a steel dished head bolted to the hatch opening frame which is welded to the steel liner. A double seal is utilized to ensure leaktightness when the hatch is subjected to either an internal or external pressure. The space between the double seal serves as a plenum for leak testing the hatch seal.

The personnel air lock is a cylindrical intake welded to the steel liner. The double doors are interlocked to maintain containment integrity during operation.

All welds that make up the vapor barrier have test channels to permit leak testing of the welds: When the leak test channel test connections are plugged, the leak test channel is part of the vapor barrier.

The primary containment ventilation system, as described in Subsection 9.4.9, is provided to maintain drywell temperatures at approximately 135° F during normal plant operation.

The primary containment vent and purge system, as described in Subsection 9.4.10, is designed to purge potentially radioactive gases from the drywell and suppression chamber prior to and during personnel access to the containment.

Containment penetration cooling is provided on high temperature penetrations through the primary containment wall by the reactor building closed cooling water system. The penetrations served by this system and the design basis for the cooling loads are described in Subsection 9.2.3.

Pressure Suppression Chamber and Vent System

The primary function of the suppression chamber is to provide a reservoir of water capable of condensing the steam flow from the drywell and collecting the noncondensable gases in the suppression chamber air space. The suppression chamber is a stainless steel-lined posttensioned concrete vessel in the shape of a cylinder, having an inside diameter of 86 feet 8 inches. The foundation mat serves as the base of the suppression chamber. The suppression chamber is designed for the same internal pressure as the drywell in combination with the thermal, seismic, and other forces. The liner design and testing are the same as covered previously within this subsection (6.2.1.1.1.2).

The entire suppression chamber is lined with stainless steel. The drywell floor support columns are also provided with a stainless steel liner on the outside surface.

Two 36-inch diameter openings are provided for access into the suppression chamber for inspection. Under normal plant operation, these access openings are kept sealed. They are opened only when the plant is shut down for refueling and/or maintenance. The access openings are located in the cylindrical walls of the chamber 14 feet 2 inches above the suppression pool water level. The access openings are closed using a bolted steel hatch cover. The hatch cover is designed with a double seal and test plenum to ensure leaktightness.

The suppression chamber vent system consists of 98 downcomer pipes open to the drywell and submerged 12 feet 4 inches below the low water level of the suppression pool, providing a flow path for uncondensed steam into the water. Each downcomer has a 23.5-inch internal diameter. The downcomers project 6 inches above the drywell floor to prevent flooding from a broken line. Each vent pipe opening is shielded by a 1-inch thick steel deflector plate to prevent overloading any single vent pipe by direct flow from a pipe break to that particular vent. The principal parameters for design of the primary containment, suppression pool, reactor building and the vent downcomers are listed in Table 6.2-1.

Vacuum Relief System

Vacuum relief valves are provided between the drywell and suppression chamber to prevent exceeding the drywell floor negative design pressure and backflooding of the suppression pool water into the drywell.

In the absence of vacuum relief valves, drywell flooding could occur following isolation of a blowdown in the drywell. Condensation of blowdown steam on the drywell walls and structures could result in a negative pressure differential between the drywell and suppression chamber.

The vacuum relief valves are designed to equalize the pressure between the drywell and wetwell air space regions so that the reverse pressure differential across the diaphragm floor will not exceed the design value of five pounds per square inch.

The vacuum relief valves (four assemblies) are outside the primary containment and form an extension of the primary containment boundary. The vacuum relief valves are mounted in special piping which connects the drywell and suppression chamber, and are evenly distributed around the suppression chamber air volume to prevent any possibility of localized pressure gradients from occurring due to geometry. In each vacuum breaker assembly, two local manual butterfly valves, one on each side of the vacuum breaker, are provided as system isolation valves should failure of the vacuum breaker occur.

The vacuum relief valves are instrumented with redundant position indication and are indicated in the main control room. The valves are provided with the capability for local manual testing. The position indication requirements for the vacuum relief valves are located in the Administrative Technical Requirements. (References 21, 22, and 23)

This design provides adequate assurance of limiting the differential pressure between the drywell and suppression chamber and assures proper valve operation and testing during normal plant operation.

No vacuum relief valves are provided between the drywell and the reactor building atmosphere. The concrete containment structure has the ability to accommodate subatmospheric pressures of approximately 5 psi absolute.

6.2.1.1.3 Design Evaluation

The key design parameters for the pressure suppression containment being provided for the LaSalle County Station (LSCS) are listed in Table 6.2-1.

These design parameters are not determined from a single accident event but from an envelope of accident conditions. As a result, there is no single design-basis accident (DBA) for this containment system.

The containment system was analyzed originally at 3434 MWt reactor power. Since then, the containment system evaluation was performed for a reactor power of 3559 MWt by analyzing the limiting events at this power level. The results for 3559 MWt power are included in this section, while keeping most of the original analysis results for 3434 MWt power as a reference analysis for historical purposes.

A maximum drywell and suppression chamber pressure of 39.6 psig and 30.6 psig, respectively is predicted near the end of the blowdown phase of a loss-of-coolant accident (LOCA) transient. Approximately the same peak pressure occurs for either the break of a recirculation line or a main steamline. Both accidents are evaluated at 3434 MWt.

For 3559 MWt reactor power, the maximum containment pressure is predicted to be 39.9 psig in the drywell and 27.9 psig in the suppression chamber for the recirculation line break. The main steamline break was not reevaluated for the uprated power level.

The most severe drywell temperature condition is predicted for a small primary system rupture above the reactor water level that results in the blowdown of reactor steam to the drywell. Based upon the thermodynamic conditions this would produce high temperature steam in the drywell.

In order to demonstrate that breaks smaller than the rupture of the largest primary system pipe will not exceed the containment design parameters, the blowdown phase of an intermediate size break is evaluated. Containment design conditions are not exceeded for this or the other break sizes.

All of the analyses assume that the primary system and containment are at the maximum normal operating conditions. References are provided that describe relevant experimental verification of the analytical models used to evaluate the containment response.

Table 6.2-1 provides a listing of the key design parameters of the LSCS primary containment system including the design characteristics of the drywell, suppression chamber and the pressure suppression vent system.

Table 6.2-2 provides the performance parameters of the related engineered safety feature systems which supplement the design conditions of Table 6.2-1 for containment cooling purposes during postaccident operation. Performance parameters given include those applicable to full capacity operation and to those reduced capacities employed for containment analyses.

6.2.1.1.3.1 Accident Response Analysis

The containment functional evaluation performed at 3434 MWt is based upon the consideration of several postulated accident conditions resulting in release of reactor coolant to the containment. These accidents include:

a. an instantaneous guillotine rupture of a recirculation line,

b. an instantaneous guillotine rupture of a main steam-line,

c. an intermediate size liquid line rupture, and

d. a small size steamline rupture.

Energy release from these accidents is reported in Subsection 6.2.1.3.

The accident response analysis based on the GE calculations remains applicable to and bounds the SPC ATRIUM-9B fuel. This is determined based on the containment response being dependent on the amount of energy in the system, the containment design, and the failure modes that allow the pressurization to occur rather than the fuel type. The amount of energy in the system is based on initial conditions and the assumed blowdown. As the blowdown assumed for the containment response analysis as shown in Tables 6.2-18 and 6.2-19 bound the blowdown predicted by the SPC LOCA methodology and results, less energy would be released to the containment using the SPC blowdown. For this reason SPC ATRIUM-9B fuel and LOCA results are considered to be bound by the current GE accident response analysis results for the containment.

For 3559 MWt reactor power, the limiting event, an instantaneous guillotine rupture of a recirculation line, was analyzed to perform the containment functional evaluation. The analysis at 3559 MWt was performed in accordance with the Generic Guidelines for General Electric Boiling Water Reactor Power Uprate, NEDC-31897P-A (Reference 24). This analysis employed essentially the same methodology, while taking a more detailed modeling approach for the reactor vessel blowdown evaluation. The analysis results for 3559 MWt reactor power are included at the end of this subsection under the heading “Evaluation at 3559 MWt Reactor Power,” after a description of the original 3434 MWt analysis which is kept as a reference analysis for historical purposes.

6.2.1.1.3.1.1 Recirculation Line Rupture

The instantaneous guillotine rupture of a main recirculation line results in the maximum flow rate of primary system fluid and energy into the drywell as illustrated in Figure 6.2-1 by the diagram showing the location of a recirculation line break.

Immediately following the rupture, the flow out of both sides of the break will be limited to the maximum allowed by critical flow considerations. Figure 6.2-1 shows a schematic view of the flow paths to the break. Flow in the suction side of the recirculation pump will correspond to critical flow in the 2.565 square foot pipe cross section. Flow in the discharge side of the recirculation pump will correspond to critical flow at the ten jet pump nozzles associated with the broken loop, providing an effective break area of 0.468 ft^2. In addition, there is a 4- inch cleanup line crosstie that will add 0.080 ft^2 to the critical flow area, yielding a total of 3.113 ft^2.

Assumptions for Reactor Blowdown

The response of the reactor coolant system during the blowdown period of the accident is analyzed using the following assumptions:

a. At the time the recirculation pipe breaks, the reactor is operating at the most severe condition that maximizes the parameter of interest; that is, primary containment pressure.

b. The recirculation line is considered to be severed instantly. This results in the most rapid coolant loss and depressurization, with coolant being discharged from both ends of the break.

c. The reactor is shut down at the time of accident initiation because of void formation in the core region. Scram also occurs in less than 1 second from receipt of the high drywell pressure signal. The difference between shutdown at time zero and 1 second is negligible.

d. The vessel depressurization flow rates are calculated using Moody's critical flow model (Reference 1) assuming "liquid only" outflow, since this assumption maximizes the energy release to the containment: "Liquid only" outflow requires that all vapor formed in the RPV by bulk flashing rises to the surface rather than being entrained in the existing flow. Some of the vapor would be entrained and would significantly reduce the RPV discharge flow rates. Moody's critical flow model, which assumes annular, isentropic flow, thermodynamic flow, thermodynamic phase equilibrium, and maximized slip ratio, accurately predicts vessel outflows through small diameter orifices. However, actual rates through larger flow areas are less than the model indicates because of the effects of a near homogeneous two- phase flow pattern and phase nonequilibrium. This effect is in addition to the reduction caused by vapor entrainment, discussed previously.

e. The core decay heat and the sensible heat released in cooling the fuel to 545° F are included in the reactor pressure vessel depressurization calculation: The rate of energy release is calculated using a conservatively high heat transfer coefficient throughout the depressurization period. By maximizing the assumed energy release rate, the RPV is maintained at nearly rated pressure for approximately 20 seconds. The high RPV pressure increases the calculated blowdown flowrates; this is conservative for containment analysis purposes. With the RPV fluid temperature remaining near 545° F, however, the calculated release of sensible energy stored below 545° F is negligible during the first 20 seconds. The sensible energy is released later, but does not affect the peak drywell pressure. The small effect of sensible energy release on the long-term suppression pool temperature is included.

f. The main steam isolation valves are assumed to start closing at 0.5 seconds after the accident. They are assumed to be fully closed in the shortest possible time of 3 seconds following closure initiation. Actually, the closure signal for the main steam isolation valves is expected to occur from low water level, so these valves may not receive a signal to close for more than 4 seconds, and the closing time could be as long as 5 seconds. By assuming rapid closure of these valves, the RPV is maintained at a high pressure, which maximizes the discharge of high energy steam and water into the primary containment: In addition, the rapid closure of the main steam isolation valves cuts off motive power to the steam-driven feedwater pumps.

g. Reactor feedwater flow is assumed to stop instantaneously at time zero. Since cooler feedwater flow tends to depressurize the RPV, thereby reducing the discharge of steam and water into the primary containment, this assumption is considered conservative and consistent with that of assumption f.

With respect to suppression pool temperature, this assumption has been supplemented with an additional evaluation. The purpose being to evaluate the suppression pool long term temperature response. For this evaluation, the feedwater is assumed to have been injected into the suppression pool, by the end of the recirculation piping break blowdown phase (at 600 seconds), in order to assess long term peak pool temperature. See paragraph entitled "Evaluation of Post-LOCA Feedwater Injection" in this section.

h. A complete loss of offsite power occurs simultaneously with the pipe break. This condition results in the loss of power conversion system equipment and also requires that all vital systems for long-term cooling be supported by onsite power supplies.

Assumptions for Containment Pressurization

The pressure response of the containment during the blowdown period of the accident is analyzed using the following assumptions:

a. Thermodynamic equilibrium exists in the drywell and suppression chamber. Since nearly complete mixing is achieved, the analysis assumes complete mixing, which is in the conservative direction.

b. The fluid flowing through the drywell-to-suppression chamber vents is formed from a homogeneous mixture of the fluid in the drywell. The use of this assumption results in complete liquid carry-over into the drywell vents.

c. The fluid flow in the drywell-to-suppression chamber vents is compressible except for the liquid phase.

d. No heat loss from the gases inside the primary containment is assumed. This adds extra conservatism to the analysis; that is, the analysis will tend to predict higher containment pressures than would actually result.

Assumptions for Long-Term Cooling

Following the blowdown period, the emergency core cooling systems (ECCS) discussed in Section 6.3 provide water for core flooding and long-term decay heat removal. The containment pressure and temperature response during this period are analyzed using the following assumptions:

a. The LPCI pumps are used to flood the core prior to 600 seconds after the accident. The high-pressure core spray (HPCS) is assumed available for the entire accident.

b. After 600 seconds, the LPCI pump flow may be diverted from the RPV to the containment spray. This is a manual operation. Actually, the containment spray need not be activated at all to keep the containment pressure below the containment design pressure. Prior to activation of the containment cooling mode (arbitrarily assumed at 600 seconds after the accident), all of the LPCI pump flow will be used only to flood the core.

c. The effect of decay energy, stored energy, and energy from the metal-water reaction on the suppression pool temperature are considered.

d. During the long-term containment response (after depressurization of the reactor vessel is complete) the suppression pool is assumed to be the only heat sink in the containment system.

e. After approximately 600 seconds, the RHR heat exchangers are activated to remove energy from the containment via recirculation cooling from the suppression pool with the RHR service water systems.

f. The performance of the ECCS equipment during the long-term cooling period is evaluated for each of the following three cases of interest:

   Case A - Offsite Power Available

   All ECCS equipment and containment spray operating.

   Case B - Loss of Offsite Power

   Minimum diesel power available for ECCS and containment spray.

   Case C - Same as Case B (except no containment spray)

Initial Conditions for Accident Analyses

Table 6.2-3 provides the initial reactor coolant system and containment conditions used in all the accident response evaluations. The tabulation includes parameters for the reactor, the drywell, the suppression chamber and the vent system. A supplementary safety evaluation has also been performed, as discussed in

Section 6.2.1.8, to evaluate an increase in the initial suppression pool temperature value to 105° F.

Table 6.2-4 provides the initial conditions and numerical values assumed for the recirculation line break accident as well as the sources of energy considered prior to the postulated pipe rupture. The assumed conditions for the reactor blowdown are also provided.

The mass and energy release sources and rates for the containment response analyses are given in Subsection 6.2.1.3.

Short-Term Accident Response

The calculated containment pressure and temperature responses for the recirculation line break are shown in Figures 6.2-2 and 6.2-3 respectively. The calculated peak drywell pressure is 39.6 psig, which is 12% below the containment design pressure of 45 psig.

The suppression chamber is pressurized by the carryover of noncondensables from the drywell and by heatup of the suppression pool. As the vapor formed in the drywell is condensed in the suppression pool, the temperature of the suppression chamber water approaches 150° F and the suppression chamber pressure stabilizes at approximately 30 psig. The drywell pressure stabilizes at a slightly higher pressure, the difference being equal to the downcomer submergence. During the RPV depressurization phase, most of the noncondensable gases in the drywell initially are forced into the suppression chamber. However, following the depressurization the noncondensables will redistribute between the drywell and suppression chamber via the vacuum breaker system. This redistribution takes place as pressure is decreased by the steam condensation process occurring in the drywell.

The LPCI and LPCS systems supply sufficient core cooling water to control core heatup and limit metal-water reaction to less than 0.2%. After the RPV is flooded to the height of the jet pump nozzles, the excess flow discharges through the recirculation line break into the drywell. This flow of water (steam flow is negligible) transports the core decay heat out of the RPV, through the broken recirculation line, in the form of hot water which flows into the suppression chamber via the drywell to suppression chamber vent system. This flow, in addition to heat losses to the drywell walls, provides a heat sink for the drywell atmosphere, causes a depressurization of the containment, and redistributes the noncondensables as the steam in the drywell is condensed.

Table 6.2-8 provides the peak pressure, temperature, and time parameters for the recirculation line break as predicted for the conditions of Table 6.2-1 and in correspondence with Figures 6.2-2 and 6.2-3. The transient peak calculated drywell floor (deck) differential pressure is 24.2 psid, which is 3.2% below the design sustained differential pressure of 25 psid.

During the blowdown period of the LOCA, the pressure suppression vent system conducts the flow of the steam-water gas mixture in the drywell to the suppression pool for condensation of the steam. The pressure differential between the drywell and suppression pool controls this flow versus time. Figure 6.2-4 provides the mass flow versus time relationship through the vent system for this accident. A supplementary evaluation has been performed for the addition of feedwater to the suppression pool to assess the impact on long term pool temperature. This evaluation estimates that the peak short term pool temperature will increase by an additional 15.4° F. This results in a short term pool temperature (at 600 seconds) of approximately 166° F . For further discussion, see Section 6.2.1.1.3.1.1 in the paragraph titled, "Evaluation of Post-LOCA Feedwater Injection."

Long-Term Accident Responses

In order to assess the adequacy of the containment following the initial blowdown transient, an analysis was made of the long-term temperature and pressure response following the accident. The analysis assumptions are those discussed previously for the three cases of interest. The initial pressure response of the containment (the first 600 seconds after the break) is the same for each case.

Case A - All ECCS Equipment Operating (with containment spray)

This case assumes that offsite a-c power is available to operate all cooling systems. During the first 600 seconds following the pipe break, the high-pressure core spray (HPCS), low-pressure core spray (LPCS), and all three LPCI pumps are assumed operating. All flow is injected directly into the reactor vessel.

After 600 seconds, both RHR heat exchangers are activated to remove energy from the containment. During this mode of operation the flow from two of the LPCI pumps is routed through the RHR heat exchanger, where it is cooled before being discharged into the containment spray header.

The containment pressure response to this set of conditions is shown as curve A in Figure 6.2-5. The corresponding drywell and suppression pool temperature responses are shown as curve A in Figures 6.2-6 and 6.2-7. After the initial blowdown and subsequent depressurization due to core spray and LPCI core flooding, energy addition due to core decay heat results in a gradual pressure and temperature rise in the containment. When the energy removal rate of the RHR exceeds the energy addition rate from the decay heat, the containment pressure and temperature reach a second peak value and decrease gradually. Table 6.2-5 summarizes the cooling equipment operation, the peak containment pressure following the initial blowdown peak, and the peak suppression pool temperature.

Case B - Loss of Offsite Power (with containment spray)

This case assumes no offsite power is available following the accident with only minimum diesel power. The containment spray is operating and injecting into the drywell after 600 seconds. During this mode of operation the LPCI flow through one RHR heat exchanger is discharged into the containment spray nozzles.

The containment response to this set of conditions is shown as curve B in Figure 6.2-5. The corresponding dyrwell and suppression pool temperature responses are shown as curve B in Figures 6.2-6 and 6.2-7. A summary of this case is given in Table 6.2-5.

Case C - Loss of Offsite Power (no containment spray)

This case assumes that no offsite power is available following the accident, with only minimum diesel power. For the first 600 seconds following the accident, one HPCS and two LPCI pumps are used to cool the core. After 600 seconds the spray may be manually activated to further reduce containment pressure if desired. This analysis assumes that the spray is not activated.

After 600 seconds, one RHR heat exchanger is activated to remove energy from the containment. During this mode of operation, one of the two LPCI pumps is shut down and the service water pumps to the RHR heat exchanger are activated. The LPCI flow is cooled by the RHR heat exchanger before being discharged into the reactor vessel.

The containment pressure response to this set of conditions is shown as curve C in Figure 6.2-5. The corresponding drywell and suppression pool temperature responses are shown as curve C in Figures 6.2-6 and 6.2-7. A summary of this case is given in Table 6.2-5.

When comparing the "spray" Case B with the "no spray" Case C, the same duty on the RHR heat exchanger is obtained since the suppression pool temperature response is approximately the same as shown in Figure 6.2-7. Thus, the same amount of energy is removed from the pool whether the exit flow from the RHR heat exchanger is injected into the reactor vessel or into the drywell as spray. However, the peak containment pressure is higher for the "no spray" case, but the pressure is still much less than the containment design pressure of 45 psig. (Subsection 6.2.2.3 describes the containment cooling mode of the RHR system.)

A supplemental evaluation has been performed for the purpose of evaluating the suppression pool long term temperature response. For this evaluation, the feedwater is assumed to have been injected into the suppression pool, by the end of the recirculation piping break blowdown phase (at time t = 600 seconds), in order to assess long term peak pool temperature. See paragraph entitled "Evaluation of Post-LOCA Feedwater Injection" in this section. Additionally, a slightly reduced RHR pump flow rate of 7200 gpm (versus 7450 gpm) has been evaluated, as discussed in Section 6.2.2.3.4. Both of these evaluations are evaluated for the DBA-LOCA in Reference 18. The results indicate an increase in the long term peak suppression pool temperature of approximately 8 F due to the feedwater injection and an approximately 1.5° F increase due to the lower RHR flow rate. The 200° F peak pool temperature given in Table 6.2-5 is not exceeded. Plant specific safety evaluations have been performed and have concluded that the existing DBA-LOCA analyses referenced above bounds these effects on the containment response.

Energy Balance During Accident

In order to establish an energy distribution as a function of time (short term, long term) for this accident, the following energy sources and sinks are required:

a. blowdown energy release rates,

b. decay heat rate and fuel relaxation energy,

c. sensible heat rate,

d. pump heat rate, and

e. heat removal rate from suppression pool.

Items a, b, and c are provided in Subsection 6.2.1.3. The pump heat rate value that has been used in the evaluation of the containment response to a LOCA for Case A is 4881 Btu/sec. A complete energy balance for the recirculation line break accident is given in Table 6.2-6 for the reactor system, the containment, and the containment cooling systems at time zero, at the time of peak drywell pressure, at the end of reactor blowdown, and at the time of the long-term second peak pressure reached in the containment.

The energy and mass balance have been annotated to include the effects of feedwater coastdown/injection on the long term peak suppression pool temperature. See paragraph entitled "Evaluation of Post-LOCA Feedwater Injection" in this section and footnote in Table 6.2-6.

Chronology of Accident Events

The complete description of the containment response to the design-basis recirculation line break has been given above. Results for this accident are shown in Figures 6.2-2 through 6.2-7. A chronological sequence of events for this accident from time zero is provided in Table 6.2-7.

The original and 1988 General Electric containment analysis (references 8 & 17), assumed feedwater flow stopped at the initiation of the LOCA. This assumption is conservative for an assessment on the peak cladding temperature (PCT) or containment pressure and temperature response. However, in order to make a more conservative analysis on the suppression pool predicted temperatures, the feedwater energy due to feedwater pump coastdown, or depressurization and resulting feedwater liquid carryover to the pool, should be taken into account in the suppression pool energy balance. A supplementary evaluation was performed to assess the impact on peak suppression pool temperature due to the addition of energy from the feedwater system. (Reference 18)

For this evaluation, the feedwater mass downstream of the 2nd Low Pressure Feedwater Heater is injected into the vessel. The feedwater upstream of this feedwater heater is at a temperature less than 212° F and would not be expected to be injected into the vessel during a DBA-LOCA. The mechanism for FW injection into the vessel during a LOCA with loss of onsite power is flashing of feedwater liquid when the vessel drops below the saturation pressure corresponding to the feedwater liquid temperature. Thus, only feedwater initially at a temperature above 212° F is assumed to flash and be injected into the vessel. This is conservative since vessel pressures are expected to remain higher than atmospheric pressure during the period when the peak pool temperature occurs. The latest revision of plant piping drawings were used as input to determine the feedwater volume.

Additionally, the sensible energy in the feedwater system metal is also added to the feedwater liquid injected into the vessel. It is conservatively assumed that the feedwater flowing into the vessel and coming into contact with hotter feedwater piping metal downstream, will instantaneously achieve thermal equilibrium with the hotter feedwater system metal. This maximizes the metal sensible energy transfer to the feedwater.

For the analysis, all feedwater mass and energy is injected to the vessel and subsequently transferred to the suppression pool by 600 seconds into the LOCA event. This is modeled by adding all the feedwater mass and energy input at time t = 600 seconds. Based on this previous discussion, this analysis provides a conservative estimate of the amount of energy addition to the pool due to feedwater injection.

The results indicate an increase in the long term peak suppression pool temperature of approximately 8° F (Reference 18). The 200° F peak pool temperature given in Table 6.2-5 is not exceeded.

Evaluation at 3559 MWt Reactor Power

The analysis of an instantaneous guillotine rupture of a recirculation line at 3559 MWt reactor power, Reference 25, employed essentially the same methodology as the 3434 MWt analysis, except for the RPV blowdown calculation in the short-term containment response analysis. The blowdown calculation was performed using the LAMB break flow model (Reference 26), which models physical phenomena in the pipe and vessel in a more detailed manner. The LAMB break flow rate and enthalpy calculated at initial reactor power of 3559 MWt and initial pressure of 1025 psig were used as input to the containment analysis model in the short-term analysis. For the analysis of the long-term containment response, Case C, which was the limiting case among the three cases (Cases A, B, and C) analyzed at 3434 MWt reactor power, was analyzed at 3559 MWt. The analysis of Case C at 3559 MWt had the same assumptions as the original analysis at 3434 MWt with respect to the availability of the ECCS pumps and RHR heat exchanger. The key input assumptions updated for the analysis at 3559 MWt are: a) the core decay heat is based on the ANSI/ANS 5.1-1979 decay heat model with a two-sigma uncertainty adder (the decay heat calculations also include contributions from miscellaneous actinides and activation products consistent with the recommendation of GE SIL 636.); and b) the water in the feedwater system continues to flow into the RPV until all feedwater above 212°F is depleted to maximize pool heat-up.

Table 6.2-a shows initial conditions assumed for the analysis of the design basis recirculation line rupture at 3559 MWt. The analysis results are tabulated and plotted, as follows. Tables 6.2-5a and 6.2-8a show a summary of the analysis results for the long-term and short-term responses, respectively. The short-term containment pressure and temperature responses are plotted in Figures 6.2-2a and 6.2-3a, respectively. Figure 6.2-5a provides the long-term containment pressure response. The long-term drywell airspace and pool temperature responses are given in Figure 6.2-6a and 6.2-7a respectively.

6.2.1.1.3.1.2 Main Steamline Break

The main steamline break, which is not the limiting event with respect to the containment response, was not analyzed at a reactor power of 3559 MWt. The original analysis at 3434 MWt is presented in this subsection.

The sequence of events immediately following the rupture of a main steamline between the reactor vessel and the flow limiter has been determined. The flow on both sides of the break will accelerate to the maximum allowed by critical flow considerations. In the side adjacent to the reactor vessel, the flow will correspond to critical flow in the 2.98-ft^2 steamline cross section. Blowdown through the other side of the break can occur because the steamlines are all interconnected at a point upstream of the turbine by the bypass header. This interconnection allows primary system fluid to flow from the three unbroken steamlines, through the header and back into the drywell via the broken line. Flow will be limited by critical flow in the 0.94-ft^2 steamline flow restrictor. The total effective flow area is thus 3.92 ft^2, which is the sum of the steamline cross-sectional area and the flow restrictor area. Subsection 6.2.1.3 provides information on the mass and energy release rates.

Immediately following the break, the total steam flow rate leaving the vessel would be approximately 12,000 lb/sec, which exceeds the steam generation rate in the core of 4,500 lb/sec. This steam flow to steam generation mismatch causes an initial depressurization of the reactor vessel at a rate of 50 psi/sec. The void formation in the reactor vessel water causes a rapid rise in the water level, and it is conservatively assumed that the water level reaches the vessel steam nozzles 1 second after the break occurs. The water level rise time of 1 second is the minimum that could occur under any reactor operating condition. From that time on, a two-phase mixture would be discharged from the break. During the first second of the blowdown, the blowdown flow will consist of saturated reactor steam. This steam will enter the containment in a super-heated condition of approximately 330° F.

Figures 6.2-8 and 6.2-9 show the pressure and temperature response of the drywell and containment during the primary system blowdown phase of the accident.

Figure 6.2-9 shows that the drywell atmosphere temperature approaches 330° F after 1 second of primary system steam blowdown. At that time, the water level in the vessel will reach the steamline nozzle elevation and the blowdown flow will change to a two-phase mixture. This increased flow causes a more rapid drywell pressure rise. However, the peak differential pressure is 24.2 psid, which occurs shortly after the vent clearing transient. As the blowdown proceeds, the primary system pressure and fluid inventory will decrease and this will result in reduced break flow rates.

As a consequence, the flow rate in the vent system also starts to decrease, and this results in a decreasing differential pressure between the drywell and containment.

Table 6.2-8 presents the peak pressures, peak temperatures, and times of this accident as compared to the recirculation line break.

Approximately 50 seconds after the start of the accident, the primary system pressure will have dropped to the drywell pressure and the blowdown will be over. At this time the drywell will contain pure steam, and the drywell and suppression chamber pressures will stabilize at approximately 30 and 25 psig, respectively; the difference corresponds to the hydrostatic pressure at the lower end of the submerged vents.

The drywell and containment will remain in this equilibrium condition until the reactor pressure vessel refloods. During this period, the emergency core cooling pumps will be injecting cooling water from the suppression pool into the reactor. This injection of water will eventually flood the reactor vessel to the level of the steamline nozzles, and at this time, the ECCS flow will spill into the drywell. The water spillage will condense the steam in the drywell and thus reduce the drywell pressure. As soon as the drywell pressure drops below the suppression chamber pressure, the drywell vacuum breakers will open and noncondensable gases from the suppression chamber will flow back into the drywell. This process will continue until the pressures in the two regions equalize and stabilize at approximately 7.5 psig.

6.2.1.1.3.1.3 Intermediate Breaks

The intermediate-size break, which is not the limiting event with respect to the containment response, was not analyzed at a reactor power of 3559 MWt. The original analysis at 3434 MWt is presented in this subsection.

The failure of a recirculation line results in the most severe pressure loading on the drywell structure. However, as part of the containment performance evaluation, the consequences of intermediate breaks are also analyzed. This classification covers those breaks for which the blowdown will result in reactor depressurization and operation of the ECCS. This subsection describes the consequences to the containments of a 0.1-ft^2 break below the RPV water level. This break area was chosen as being representative of the intermediate size break area range. These breaks can involve either reactor steam or liquid blowdown.

Following the 0.1-ft^2 break, the drywell pressure increases at approximately 1 psi/sec. This drywell pressure transient is sufficiently slow so that the dynamic effect of the water in the vents is negligible and the vents will clear when the drywell-to-wetwell differential pressure is equal to the vent submergence pressure. For the LSCS containment design, the maximum distance between the pool surface and the bottom of the vents is 12 feet 10 inches. Thus, the water level in the vents will reach this point when the drywell-to-containment pressure differential reaches 5.2 psid.

Figures 6.2-10 and 6.2-11 show the drywell and wetwell pressure and temperature response, respectively. The ECCS response is discussed in Section 6.3. Approximately 5 seconds after the 0.1-ft^2 break occurs, air, steam, and water will start to flow from the drywell to the suppression pool; the steam will be condensed and the air will enter the wetwell free space. After 5 seconds there will be a constant pressure differential of 5.2 psid between the drywell and wetwell. The continual purging of drywell air to the suppression chamber will result in a gradual pressurization of both the wetwell and drywell to about 22 and 27 psig, respectively. Some continuing containment pressurization will occur because of the gradual pool heatup.

The ECCS will be initiated by the 0.1-ft^2 break and will provide emergency cooling of the core. The operation of these systems is such that the reactor will be depressurized in approximately 600 seconds. This will terminate the blowdown phase of the transient. The drywell will be at approximately 27 psig and the suppression chamber at approximately 22 psig.

In addition, the suppression pool temperature will be the same as following the DBA because essentially the same amount of primary system energy would be released during the blowdown. After reactor depressurization, the flow through the break will change to suppression pool water that is being injected into the RPV by the ECCS. This flow will condense the drywell steam and will eventually cause the drywell and containment pressures to equalize in the same manner as following a recirculation line rupture.

The subsequent long-term suppression pool and containment heatup transient that follows is essentially the same as for the recirculation break.

From this description, it can be concluded that the consequences of an intermediate size break are less severe than those from a recirculation line rupture.

6.2.1.1.3.1.4 Small Size Breaks

The small-size break, which is not the limiting event with respect to the containment response, was not analyzed at a reactor power of 3559 MWt. The original analysis at 3434 MWt is presented in this subsection.

Reactor System Blowdown Considerations

This subsection discusses the containment transient associated with small primary system blowdowns. The sizes of primary system ruptures in this category are those blowdowns that will not result in reactor depressurization due either to loss of reactor coolant or automatic operation of the ECCS equipment. Following the occurrence of a break of this size, it is assumed that the reactor operators will initiate an orderly plant shutdown and depressurization of the reactor system. The thermodynamic process associated with the blowdown of primary system fluid is one of constant enthalpy. If the primary system break is below the water level, the blowdown flow will consist of reactor water. Blowdown from reactor pressure to the drywell pressure will flash approximately one-third of this water to steam and two-thirds will remain as liquid. Both phases will be at saturation conditions corresponding to the drywell pressure. Thus, if the drywell is at atmospheric pressure, the steam and liquid associated with a liquid blowdown would be at 212° F. Similarly, if the containment is assumed to be at its design pressure, the reactor coolant will blow down to approximately 293° F steam and water.

If the primary system rupture is located so that the blowdown flow consists of reactor steam only, the resultant steam temperature in the containment is significantly higher than the temperature associated with liquid blowdown. This is because the enthalpy of high-energy saturated steam is nearly twice that of saturated liquid. The higher enthalpy will result in a superheat condition. For example, decompression of 1000-psia steam to atmospheric pressure will result in 298° F superheated steam (86° F of superheat).

Based upon this thermodynamic process, it is concluded that a small reactor steam leak will impose the most severe temperature conditions on the drywell structures and the safety equipment in the drywell. For larger steamline breaks, the superheat temperature is nearly the same as for small breaks, but the duration of the high-temperature condition is less. This is because the larger breaks will depressurize the reactor more rapidly than the orderly reactor shutdown that is assumed to terminate the small break.

Containment Response

For drywell design consideration, the following sequence of events is assumed to occur. With the reactor and containment operating at the maximum normal conditions, a small break occurs that allows blowdown of reactor steam to the drywell. The resulting pressure increase in the drywell will lead to a high drywell pressure signal that will scram the reactor and activate the containment isolation system. The drywell pressure will continue to increase at a rate dependent upon the size of the steam leak. This pressure increase will lower the water level in the vents until the level reaches the bottom of the vents. At this time, air and steam will start to enter the suppression pool. The steam will be condensed and the air will be carried over to the suppression chamber free space. The air carry-over will result in a gradual pressurization of the containment at a rate dependent upon the size of the steam leak. Once all the drywell air is carried over to the suppression chamber, pressurization of the containment will cease and the system will reach an equilibrium condition with the drywell pressure at 27 psig and the suppression chamber at approximately 22 psig. The drywell will contain only superheated steam, and continued blowdown of reactor steam will condense in the suppression pool.

Recovery Operations

The reactor operators will be alerted to the incident by the high drywell pressure signal and the reactor scram. For the purposes of evaluating the duration of the superheat condition in the drywell, it is assumed that their response is to cool down the reactor in an orderly manner using any method, but limiting the reactor cooldown rate to 100° F per hour. The normal method to achieve recovery is by use of the high pressure core spray in conjunction with the automatic depressurization system. This feed and bleed process can be utilized until the reactor is depressurized. Depending upon their availability and the situation, other methods such as the use of turbine bypass valves in conjunction with the main condenser can be utilized to achieve depressurization. This will result in the reactor primary system being depressurized within 6 hours.

Drywell Design Temperature Considerations

For drywell design purposes, it is assumed that there is a blowdown of reactor steam for the 6-hour cooldown period. The corresponding design temperature is determined by finding the combination of primary system pressure and containment pressure that produces the maximum superheat temperature. Thus for design purposes, this results in a temperature condition of 340° F.

6.2.1.1.3.2 Accident Analysis Models

The short-term pressurization analytical models, assumptions, and methods used by GE to evaluate the containment response during the reactor blowdown phase of a LOCA are described in References 2 and 3.

Once the RPV blowdown phase of the LOCA is over, a fairly simple model of the drywell and suppression chamber may be used. During the long-term, post-blowdown containment cooling mode, the ECCS flow path is a closed loop and the suppression pool mass will be constant. Schematically, the cooling model loop is shown in Figure 6.2-12. Since there is no storage other than in the suppression pool (the RPV is reflooded during the blowdown phase of the accident), the mass flowrates shown in the figure are equal, thus:

$$\dot{m}_{D_O} = \dot{m}_{S_O} = \dot{m}_{eccs} \; .$$

Analytical Assumptions

The key assumptions employed in the model are as follows:

a. The drywell and suppression chamber atmosphere are both saturated (100% relative humidity).

b. The drywell atmosphere temperature is equal to the temperature of the coolant spilling from the RPV, or to the spray temperature if the sprays are activated.

c. The suppression chamber atmosphere temperature is equal to the suppression pool temperature or to the spray temperature if the sprays are activated.

d. No credit is taken for heat losses from the primary containment or to the containment internal structures.

Energy Balance Considerations

The rate of change of energy in the suppression pool, E_p, is given by:

$$\frac{d}{dt}\left(E_p\right) = \frac{d}{dt}\left(M_{w_s} \cdot h_s\right)$$
$$= h_s \cdot \frac{d}{dt}\left(M_{w_s}\right) + M_{w_s} \cdot \frac{d}{dt}\left(h_s\right)$$

Since $\frac{d}{dt}(M_{w_s}) = 0$ (because there is no storage), and for water at the conditions that will exist in the containment:

$$\frac{d}{dt}\left(h_s\right) = C_p \cdot \frac{d}{dt}\left(T_s\right)$$

where:

C_p = 1.0 for the specific heat of pool water, Btu/ lb-°F
T_s = pool temperature, °F.

The pool energy balance yields:

$$M_{w_s} \, C_p \cdot \frac{d}{dt}\left(T_s\right) = \dot{m}_{D_o} \, h_D \; \dot{m}_{s_o} \, h_s \cdot$$

This equation can be rearranged to yield:

$$\frac{d}{dt}\left(T_S\right) = \frac{\dot{m}_{D_O}\, h_D - m_{S_O}\, h_S}{M_{W_S}}.$$

An energy balance on the RHR heat exchanger yields

$$h_c = h_s - \frac{q_{H_x}}{\dot{m}_{s_o}} \qquad (6.2\text{-}3)$$

where:

h_c = enthalphy of ECCS flow entering the reactor, Btu/lb.

Similarly, an energy balance on the RPV will yield:

$$h_D = h_c - \frac{\dot{q}_D + \dot{q}_e}{\dot{m}_{eccs}}.$$

Combining Equations 6.2-1, 6.2-2, 6.2-3, and 6.2-4 gives

$$\frac{d}{dt}\left(T_S\right) = \frac{\dot{q}_D + \dot{q}_e - \dot{q}_{H_X}}{\dot{M}_{W_S}}.$$

This differential equation is integrated by finite difference techniques to yield the suppression pool temperature transient.

Containment Thermodynamic Conditions

Once the energy equations are solved, the drywell and suppression chamber atmospheric temperatures can be calculated.

For the case in which no containment spray is operating, the suppression chamber temperature, T_w, at any time will be equal to the current temperature of the pool, T_s, and the drywell temperature, T_d, will be equal to the temperature of the fluid leaving the RPV. Thus:

$$T_D = T_s + \frac{\dot{q}_D + \dot{q}_e - \dot{q}_{H_X}}{\dot{m}_{eccs}}$$

and $T_w = T_s$.

For the case in which the containment spray is assumed to be operating, both the drywell and suppression chamber atmosphere will be at the spray temperature, T_{sp}

where:

$$T_{sp} = T_s - \frac{\dot{q}_{H_X}}{\dot{m}_{eccs}}$$

and, $T_D = T_w = T_{sp}$.

Using the suppression chamber and drywell atmosphere temperatures, and assumption (a) (drywell and suppression chamber saturated), it is possible to solve for the containment total pressures, since:

$$P_D = P_{a_D} + P_{v_D} \qquad (6.2\text{-}6)$$

$$P_s = P_{a_s} + P_{v_s} \qquad (6.2\text{-}7)$$

where:

P_D = drywell total pressure, psia,

P_{a_D} = partial pressure of air in drywell, psia,

P_{v_D} = partial pressure of water vapor in drywell, psia,

P_s = suppression chamber total pressure, psia,

P_{a_s} = partial pressure of air in the suppression chamber, psia,

P_{v_s} = partial pressure of water vapor in the suppression chamber, psia,

and, from the Ideal Gas Law:

$$P_{a_D} = \frac{M_{a_D} RT_D}{V_D \, 144} \quad (6.2\text{-}8)$$

$$P_{a_s} = \frac{M_{a_s} RT_w}{V_s \, 144} \quad (6.2\text{-}9)$$

where:

M_{a_D} = mass of air in drywell, lb,

M_{as} = mass of air in the suppression chamber, lb,

R = gas constant ft-lbf/lb

V_D = drywell free volume, ft^3.

V_s = suppression chamber free volume, ft^3.

With known values of T_D and T_w , Equations 6.2-6, 6.2-7, 6.2-8 and 6.2-9 can be solved by transient analysis and iteration. This iteration procedure is also used to calculate the unknown quantities M_{a_D} and M_{as}.

Solution of Equations

The transient analysis is based on successive time step integration of the suppression pool temperature. When this integration has been performed and the value of T_s at the end of a time step has been calculated, a pressure balance is made. Using values of M_{a_D} and M_{as} from the end of the previous time step and the updated values of T_D and T_s, a check is made to see if P_s is greater than or equal to P_D using Equations 6.2-6, 6.2-7, 6.2-8, and 6.2-9. If P_s is greater than or equal to P_D, then the two values are made equal. The vacuum breakers between the drywell and suppression chamber are provided to ensure that P_s cannot be greater than P_D.

Hence, with

$$P_D = P_s$$

and knowing that:

$$M_{a_D} + M_{a_s} = \text{constant}; \qquad (6.2\text{-}10)$$

where the constant is the known total initial mass of air in the suppression chamber and drywell prior to the accident, Equations 6.2-6, 6.2-7, 6.2-8, and 6.2-9 can be solved for M_{a_s}, M_{a_D}, and P_s/P_D.

It is conservatively assumed that the total mass of air remains constant, which ignores any containment leakage that might occur during the transient.

If, as a result of the end-of-time-step pressure check,

$$P_S \le P_D \le P_S + \frac{H}{V_W},$$

where:

H	=	submergence of vents, ft, and
V_w	=	specific volume of fluid in vent, ft^3/lb

then the pressure in the drywell is higher than the pressure in the suppression chamber but not sufficiently so to depress the water to the bottom of the vents and thus permit air to flow from the drywell to the suppression chamber. Under these circumstances, no air transfer is assumed to have occurred during the time step, and Equations 6.2-6, 6.2-7, 6.2-8, and 6.2-9 are solved using the updated temperatures with the same M_{a_s} and M_{a_D} values from the previous time step.

If the end-of-time step pressure check shows:

$$P_D \ge P_S + \frac{H}{V_W}$$

then the drywell pressure is set to the value:

$$P_D = P_S + \frac{H}{V}. \qquad (6.2\text{-}11)$$

This requires that the drywell pressure never exceed the suppression chamber pressure by more than the hydrostatic head associated with the submergence of the vents. To maintain this condition, some transfer of drywell air to the suppression chamber will be required. The amount of air transfer is calculated by using Equation 6.2-10 and combining Equations 6.2-6, 6.2-7, 6.2-8, 6.2-9 and 6.2-11 to give:

$$P_{v_D} + \frac{M_{a_D} R T_D}{144 V_D} = P_{v_s} + \frac{M_{a_s} R T_w}{144 V_s} + \frac{H}{v_w}$$

which can be solved for the unknown air masses. The total pressures can then be determined.

6.2.1.1.4 Negative Pressure Design Evaluation

Containment negative pressure has been addressed in Chapter 3.0 and in the Design Assessment Report.

6.2.1.1.5 Suppression Pool Bypass Effects

Protection Against Bypass Paths

The pressure boundary between drywell and suppression chamber including the vent pipes, vent header, and downcomers are fabricated, erected, and inspected by nondestructive examination methods in accordance with and to the acceptance standards of the ASME Code Section III, Subsection B, 1971 (Summer 1972 Addenda). This special construction, inspection and quality control ensures the integrity of this boundary. The design pressure and temperature for this boundary was established at 25 psid and 340° F, which is substantially greater than conditions during a DBA. Actual peak accident differential pressure and temperature across this boundary will be less than their design values during a LOCA. In addition a stainless steel liner has been provided between the drywell and the wetwell as described in Chapter 3.0.

All penetrations of this boundary except the vacuum breaker seats and suppression pool temperature monitoring probe penetrations and testing penetrations are welded. All penetrations are available for periodic visual inspection.

The following paragraphs describe the evaluation of the steam bypass event at 3434MWt. The limiting event was analyzed for a reactor power level of 3559 MWt, and it was concluded that this reactor power has no significant impact on the suppression pool steam bypass.

Reactor Blowdown Conditions and Operator Response

In the highly unlikely event of a reactor depressurization to the drywell accompanied by a simultaneous open bypass path between the drywell and suppression chamber, several postulated conditions may occur. For a given primary system break area, the maximum allowable leakage capacity can be determined when the containment pressure reaches the design pressure at the end of reactor blowdown. The most limiting conditions would occur for those primary system break sizes which do not cause rapid reactor depressurization. This corresponds to breaks of less than approximately 0.4 ft^2 which require some operator action to terminate the reactor blowdown.

Immediately after the postulated conditions given above for a small primary system break, there would be a fairly rapid rise in containment pressure as the noncondensable gases in the drywell are carried over to the suppression chamber. During this portion of the transient, it is assumed that the plant operators are unaware that a leakage path exists. Under normal circumstances, the maximum pressure that can occur in the suppression chamber is approximately 25 psig. This is the pressure that would result if all of the noncondensable gases initially in the containment are carried over to the suppression chamber free space. For the maximum allowable leakage calculations, it was assumed that the plant operators realize a leakage path exists only when the suppression chamber pressure reaches 30 psig. For conservatism, an additional 10-minute delay is assumed before any corrective action is taken to terminate the transient. The corrective action is also assumed to take 5 minutes to be effective. At that time, the containment pressure would be equal to the design pressure if the allowable leakage had occurred. The specific type of corrective action taken after 10 minutes is not accounted for in the analysis. The operators have several options available to them. If the source of the leakage is undefined, they could depressurize the primary system via either the main condenser or relief valves, or they could activate the containment sprays.

Analytical Assumptions

When calculating the allowable leakage capacities for a spectrum of break sizes, the following assumptions are made:

a. Flow through the postulated leakage path is pure steam. For a given leakage path, if the leakage flow consists of a mixture of liquid and vapor, the total leakage mass flowrate is higher, but the steam flowrate is less than for the case of pure steam leakage. Since the steam entering the suppression chamber free space results in the additional containment pressurization, this is a conservative assumption.

b. There is no condensation of the leakage flow on either the suppression pool surface or the containment and vent system structures. Since condensation acts to reduce the suppression chamber pressure, this is a conservative assumption. For an actual containment there will be condensation, especially for the larger primary system breaks where vigorous agitation at the pool surface will occur during blowdown.

Analytical Results

The LSCS containment has been analyzed to determine the allowable leakage between the drywell and suppression chamber.

Figure 6.2-13 shows the allowable leakage capacity $(A/\sqrt{K})$ as a function of primary system break area. A is the area of the leakage flow path and K is the total geometric loss coefficient associated with the leakage flow path.

The maximum allowable leakage capacity is at $(A/\sqrt{K})$ = .030 ft^2. Since a typical geometric loss factor would be 3 or greater, the maximum allowable leakage area would be .052 ft^2. This corresponds to a 3-inch line size.

Figure 6.2-13 is a composite of two curves.

If the break area is greater than approximately 0.4 ft^2, reactor depressurization will terminate the transient and allow higher leakage. However break areas less than 0.4 ft^2 result in continued reactor blowdown which limits the allowable leakage. Figure 6.2-14 shows the containment response associated with breaks larger than 0.4 ft^2. The containment pressure would reach design pressure at the end of reactor blowdown. Figure 6.2-15 shows the same response for a typical small break less than 0.4 ft^2. The containment pressure would reach design conditions, in this case, approximately 5 minutes after operator action.

6.2.1.1.6 Suppression Pool Dynamic Loads

The manner in which suppression pool dynamic loads resulting from postulated loss-of-coolant accidents, transients, and seismic events have been integrated into the LSCS design is completely described in the LaSalle Design Assessment Report, which was submitted with the FSAR as a reference document. The load histories, load combinations, and analyses are all presented in detail in this referenced report. A safety relief valve in-plant test was conducted on unit 1 as committed by Commonwealth Edison per NUREG-0519. A report entitled "Commonwealth Edison Proprietary LaSalle County I In-Plant S/RV Test Initial Evaluation Report" was submitted March 4, 1983 (C. W. Schroeder to A. Schwencer) and resubmitted October 14, 1983 (C.W. Schroeder to H.R. Denton). The document contains information and data demonstrating the adequacy of existing design basis hydrodynamic loads resulting from safety/relief valve actuation.

Supplementary evaluations have been performed, as discussed in Section 6.2.1.8, to verify that an increase in the initial suppression pool temperature (from 100° F to 105° F) would not significantly impact the dynamic loading scenarios associated with containment response to postulated LOCAs and SRV operation.

Containment Dynamic Loads were evaluated for power uprate to 3489MWt in Reference 25. The evaluation shows the LOCA and SRV loads remain within the defined limits.

6.2.1.1.7 Asymmetric Loading Conditions

The manner in which potential asymmetric loads were considered for LSCS is fully described in the Design Assessment Report. A description of the analytical models utilized for these analyses, as well as a description of the containment testing program, is also presented in this report.

6.2.1.1.8 Containment Ventilation System

The primary containment ventilation system is discussed in Section 9.4.

6.2.1.1.9 Postaccident Monitoring

A description of the postaccident monitoring system is provided in Section 7.5.

6.2.1.1.10 Drywell-to-Wetwell Vacuum Breaker Valves Evaluation for LOCA Loads

During the pool swell phase of a loss-of-coolant accident, air flows from the drywell through the vent pipes and the suppression pool into the suppression chamber air space resulting in a rise of the suppression pool surface and compression of the air space region above it. This transient wetwell air space pressurization may cause the vacuum breaker valves to experience high opening and closing impact velocities. To estimate the valve disc actuation velocities, the Mark II Owner's Group developed a vacuum breaker valve dynamic model described in NEDE-22178-P(1), "Mark II Containment Drywell-to-Wetwell Vacuum Breaker Models," August 1982, which describes the generic methodology used to calculate the response of the drywell-to-wetwell vacuum breaker to certain transients in the Mark II containment. The LaSalle plant, however, is unique in that it is the only domestic Mark II plant which has its vacuum breakers located outside containment. Because of this feature, the Mark II Owners Group model was modified to take credit for the pressure losses associated with the external piping and isolation valves which connect the vacuum breaker between the wetwell and drywell at LaSalle. In a letter dated December 28, 1982, CECo submitted a report to the NRC, CDI-82-33, "Reanalysis of the LaSalle Wetwell-to-Drywell Vacuum breakers under Pool Swell Loading Condition," December 1982, outlining the valve modeling improvement which have been made to take credit for the pressure losses associated with vacuum breaker piping. This report documents the reduction of the valve impact velocities during pool swell which are attributed to the use of a more realistic hydrodynamic torque on the valve disc. This analysis has been accepted by the NRC. However, because the hydrodynamic loads associated with a loss-of-coolant accident were not considered in the original design of the vacuum breaker, CECo decided to modify the vacuum breakers to improve performance and reliability, and to further increase the margin of safety. The modifications included material upgrade and/or dimensional changes to strengthen eccentric shaft, hinge arms, hinge plates, fasteners and a load distribution device to reduce the severity of the vacuum breaker pallet opening impact loading. The modified design was tested under an applied mechanical force which produced an opening pallet impact velocity of 20.2 radians/second and a closing impact velocity of 25.8 radians/second. The predicted pallet impact velocities for LaSalle are an opening impact velocity of 16.6 radians/second and a closing impact velocity of 24.2 radians/second. After testing, the vacuum breaker leak rate was verified to be within the acceptable limit. The test results verified the operability and functional capability of the vacuum breaker well in excess of the predicted opening and closing impact velocities, and, thus, demonstrated that the modified LaSalle vacuum breakers will function properly under pool swell induced impact loadings with a considerable margin of safety.

6.2.1.1.11 Impact of Increased Initial Suppression Pool Temperature

Supplementary safety evaluations have been performed, as discussed in Section 6.2.1.8, to verify that an increase in the initial suppression pool temperature (from 100° F to 105° F) would not significantly impact the consequences of the various containment line break analyses.

6.2.1.2 Containment Subcompartments

For the most part, the drywell is a large continuous volume interrupted at various locations by piping, grating, ventilation ducting, etc. The only two volumes within the drywell which can be classified as subcompartments are the annular volume between the biological shield and the reactor pressure vessel, and the volume bounded by the drywell head and the reactor vessel head. These regions are referred to as the biological shield annulus and head cavity, respectively, and require special design consideration resulting from the postulation of line breaks in these volumes.

6.2.1.2.1 Design Bases

The methodology used to determine the containment subcompartment pressurization loads and the results pertaining to the pressurization loads documented herein are applicable to reactor operation at or below the bounding thermal power level of 3559 MWt (Reference 30).

Biological Shield Annulus

Pressure transients within the biological shield annulus are important for two considerations: (1) determination of the design conditions for the shield wall, and (2) determination of the tipping forces on the reactor pressure vessel. It is not a priori clear that one line break will yield the most severe conditions for both considerations. Therefore, consequences of two line breaks were studied: (a) a complete circumferential failure of one of the two recirculation outlet lines at the safe end to pipe weld, and (b) a complete circumferential failure of one of the six feedwater lines at the safe end to pipe weld. While it was assumed that the recirculation line break with its high mass and energy blowdown rates yields most severe shield wall loads, the break of the feedwater line was added to determine the most severe conditions on the vessel. The pressure transients following either postulated break were used in determination of shield wall and pressure vessel design adequacy.

The performed pressurization analyses for the postulated recirculation line break and feedwater line break were based on the nodalization schemes depicted on Figures 6.2-16 and 6.2-17, respectively. Both nodalization schemes were given careful consideration to assure correct local and overall pressure responses.

Recirculation Line Break

The sudden injection of the subcooled liquid into the shield penetration (Node 35) and adjoining annulus initially causes a significant fraction of the liquid to flash to steam, pressurizing the penetrations and annulus. The responses of the penetration volume and adjoining subcompartments are shown on Figure 6.2-18. Within 10 milliseconds after the postulated break both flows out of the penetration have choked. Some 10 milliseconds later, both the penetration pressure and the pressure in the surrounding annulus node peak, reflecting subcooling and inventory effects addressed in the blowdown flow rates. Flow into the annulus initially proceeds in all directions, but soon swings preferentially upward in response to increasing pressures within the dead-ended skirt region. By 0.1 second into the transient, the pressures in and about the penetration have stabilized and shortly after (by 0.5 seconds), the differential pressures across the shield wall have begun to decrease (Figure 6.2-21). The differential pressure across the shield wall peaks at 115 psid in the region immediately around the penetration. Peak differential pressure across the shield door in the penetration, however, reaches 325 psid.

Feedwater Line Break

Pressurization effects of the postulated feedwater line break are much less pronounced than for the recirculation break. Much of the injected fluid finds its way up and out of the annulus and over the top of the shield wall and into the drywell. Nevertheless, the differential pressure across the shield wall surrounding the penetration peaks at 50 psid, while the differential pressure across the shield door in the penetration reaches 205 psid (Figure 6.2-22). By 0.5 second into the transient all the differential pressures across the shield wall have peaked and are decreasing (Figure 6.2-23).

The break area for the recirculation line break was assumed to be time dependent and limited by effects of pipe restraints (see Attachment 6A). The feedwater line break was assumed to provide instantaneous full size break area. Both break models included the effects of subcooled liquid inventory in the determination of mass and energy flux data.

No margins were applied to the calculated differential pressures for this final pressurization analysis.

Head Cavity

The head cavity area was analyzed for specific line breaks. They were: 1) a break of the recirculation outlet line within the drywell; and 2) a break of the main steamline within the drywell; and, 3) a simultaneous break of the head spray line and the RPV head vent line within the head cavity. These analyses were carried out to establish the pressure differentials that would exist across the refueling bulkhead plate as a result of these accident conditions. The break of the recirculation outlet line, the drywell DBA, was found to produce the highest pressure differential across the refueling bulkhead plate, a value of 9.0 psid upward. The simultaneous break of the head spray line and RPV head vent line caused a pressure differential of 7.0 psid downward. The main steamline data are not presented due to the fact that the recirculation line break produced the higher differential pressure value.

The break size, mass flow rate, and energy content for the recirculation line were defined in Subsection 6.2.1.1.3.1 and Table 6.2-18. The supporting assumptions for these data are also supplied in the same subsection. The break size, mass flow rate, and energy content for the head spray line were determined using Moody's flow through the 3.72-inch diameter head spray nozzle at reactor conditions with a multiplier of 1.0. Flow from the other side of the head spray line break was neglected. In addition, the simultaneous break of the RPV head vent line was considered because of the lack of whip restraints on the head spray line. The break size, mass flow rate, and energy content for the RPV head vent line were determined using Moody's flow at reactor conditions with a multiplier of 1.0. The RPV head vent line was postulated to rupture at the four-to-two inch reducer in the line located in the head cavity. The flow occurred at both ends of the break, one having a diameter of 4.0 inches and the other 2.0 inches.

No margin was applied to the results, since the analysis was done for the final design, and a margin is not required for that situation. However, a margin does exist, and this is indicated in Tables 6.2-11 and 6.2-12.

6.2.1.2.2 Design Features

Biological Shield Annulus

The biological shield annulus is an annular space 48.7 feet high and about 2 feet thick formed by the reactor pressure vessel and its skirt and the biological shield wall. The shield wall is provided with 32 penetrations to allow for routing for the lines connected to the vessel. The shield wall is also pierced to provide 2 HVAC openings and 2 reactor skirt access doors. The 3-1/2 inch thermal insulation divides the shield annulus, except for the lower skirt portion, into 2 almost equal annului. The inner steel shell of the annulus is spanned with vertical and horizontal stiffeners which extend 5 inches into the annulus. Egress to the drywell at the top of the shield is partially blocked by the gusset plates supporting the reactor vessel stabilizers (Figures 3.8-23). The penetrations in the shield wall are designed with shield doors with a gap of approximately 3 inches between the doors and the thermal insulation on the penetrating lines. Figure 3.8-39 provides an exterior wall stretchout of the shield wall.

In the annulus pressurization analysis, it was assumed that following the postulated line break the vessel insulation within the annulus was instantaneously displaced to the shield wall. The vessel insulation support structure remains in its original configuration. Venting of the annulus into the drywell was possible through the annulus between the pipe and shield doors in the 32 nozzle penetrations in the shield wall and by means of an opening at the top of the shield wall above which the insulation was assumed to blow out instantaneously when the pressure across the insulation above the shield wall reaches 3 psid. Other possible vent paths such as HVAC openings, reactor skirt access doors, and insulation blowout panels were assumed to remain closed.

Head Cavity

Note: The current flow paths have been changed to include the two manholes between the head cavity and the drywell and the four ducted HVAC vents have been modified by the addition of discharge nozzles. The impact of this change has been evaluated and it has been determined that the analysis presented here is bounding.

The physical system, shown in Figure 3.8-1, was modeled as three node with two flow paths for this analysis. The head cavity, drywell, and wetwell are all described by single volumes. The model for the simultaneous break of the head spray and RPV head vent lines in the head cavity is shown in Figure 6.2-19, and that for the recirculation line break in the drywell in Figure 6.2-20. The pertinent data regarding the volumes and flow paths are given in Tables 6.2-11 through 6.2-14. There are eight HVAC vents in the refueling bulkhead plate: four sixteen-inch diameter supply vents, and four eighteen-inch diameter return vents. The return vents have ductwork attached to them. All of the HVAC (supply and return) were modeled for the postulated break in the head cavity since the pressure in the return vents with the ductwork would always be greater than the drywell pressure. However, only the supply vents were considered to allow flow for the breaks in the drywell. It was assumed that the HVAC return ductwork would be crushed by the fast rising drywell pressure. The downcomer vents between the drywell and wetwell were modeled as one flow path with a valve in the path set to open at 0.824 second for the recirculation line break. The 0.824 second was taken as a conservative estimate of the time normally required to clear the downcomer vents. At this time, the entire vent area becomes available for pressure relief of the drywell and head cavity region. The simultaneous head spray line and RPV head vent line break is a much smaller break and results in a relatively slow pressurization of the drywell. A valve was again used in the flow path, but in this instance, the valve opening was dependent upon the drywell pressure exceeding the hydrostatic head at the downcomer exit. The opening differential pressure used was 5.2 psid which is equivalent to a 12-foot downcomer submergence. The flow was carried over directly into the wetwell air volume. No credit was taken for condensation. The flow through both flow paths was taken to be a completely homogeneous mixture.

6.2.1.2.3 Design Evaluation

Biological Shield Annulus

The RELAP 4 Mod 3 computer code was used to perform the analyses. The assumptions made in modeling the problem were in accordance with the applicable USNRC guidelines.

The mass and energy blowdown rates were determined according to the methods described in Attachment 6.A.

Initial conditions in the annulus and drywell are indicated in Tables 6.2-9 and 6.2-10.

In subsonic flow conditions, two flow models were used, as defined in RELAP 4 Mode 3: (a) compressible flow, single stream model was used for the path of major flow direction, and (b) incompressible flow without momentum flux model was used for flow paths other than the paths of the major flow direction. For sonic flow conditions the Moody or sonic choking model were specified with the multiplier 0.6 for the Moody choking model. Homogeneous flow was assumed for the vent mixture.

The biological shield annulus between the reactor pressure vessel and the shield wall was modeled differently for each of the two postulated line breaks. In either case, advantage was taken of the near symmetry of the annular space across the vertical plane passing through the centerline of the failed line.

Nodalization of the biological shield annulus was determined on the basis of natural geometric boundaries and the constraint that the pressure drop within a node be reasonably low as compared to pressure drop across the boundaries of the node. Nodal boundaries were suggested by the presence of the reinforcing steel, thermal insulation support structure and nozzles. Significant pressure drops near the break suggested smaller nodes (by and large limited with two successive obstructions) around the penetration than elsewhere (Figures 6.2-37 and 6.2-38). Therefore the assumption was made that since RELAP 4 allows input of loss coefficients only at the junctions between nodes, the junctions should be placed at points where major pressure losses occur. Furthermore, it may be concluded that increasing the number of junctions (by making smaller nodes) beyond this point will yield no improvement in the accuracy of the results.

To test this hypothesis, a sensitivity study was performed on the sacrificial shield nodalization. Using the original nodalization (Figure 6.2-39) as a basis, an "equivalent" model was run which maintained the nodalization near the break but drastically reduced the number of nodes further from the break (Figure 6.2-40). This model demonstrated identical pressure response close to the break and only minor differences away from the break (Figures 6.2-41 and 6.2-42). This indicated that the nodalization far from the break was sufficiently refined in the original model and that the "equivalent" model could be used to simulate a response close to the break.

Two additional models were run. The first combined the nodes closest to the break into one large node (Figure 6.2-43). The pressure response was not consistent with the original runs (Figures 6.2-44 and 6.2-45). This indicated that a model which does not locate node boundaries at all flow restrictions close to the break is not acceptable. The last model substituted six nodes for the three original nodes, causing junctions to occur at locations which coincide with no actual flow restriction (Figure 6.2-46). This model showed a net increase of 5% in the force caused by the pressures in the area being investigated. An examination of the axial and circumferential pressure distributions showed only minor differences (Figures 6.2-47 and 6.2-48).

The sensitivity study indicates that the original nodalization provides an adequate description of the pressurization of the sacrificial shield annulus. An increase in the complexity of the RELAP 4 model would not result in a significant change in the results.

As previously indicated, half of the annulus was nodalized in case of either postulated line break; for the recirculation line break half-annulus consisted of 35 nodes and the half-drywell of 3 nodes (Table 6.2-9), while for the feedwater line break the half-annulus consisted of 29 nodes and the half-drywell of 3 nodes (Table 6.2-10). Volume of each node was calculated as a net volume, that is, the respective volume of the annulus including the volume of penetrations (if any) was corrected for the volume of the insulation and nozzles. The junctions, 85 and 69 for the recirculation line break and feedwater line break respectively, were assigned the smallest flow area anywhere between the centers of two volumes. All partial loss coefficients, k_j's, were derived from Reference 6. The total loss coefficient k_t was then determined by adding the weighted partial loss coefficients in series:

$$k_t = \sum_i K_i \left(\frac{A_t}{A_i} \right)^2$$

where A_t is the junction area and A_i is the area within the junction and pertaining to the partial loss coefficient k. When parallel paths, j, were combined, the following relations were utilized:

$$A_t = \sum_j A_j$$

$$K_t = \left[\sum_i \left(\frac{A_i}{A_t} \frac{1}{\sqrt{k_i}} \right) \right]^{-2}$$

Only similar junctions were combined in this manner (like 2 or more penetrations connecting drywell with the same volume of the annulus), other junctions were modeled separately.

Inertia coefficients were similarly calculated using simplified conservative approximations to the integrated junction characteristics. Thus, for the junctions with only minor variations, in cross-sectional flow area along the junction, the inertia, I, was approximated by:

$$I = \frac{1}{A_t} \sum_i L_i$$

where L_i is the distance along the junction where junction's cross-sectional area is A_i. In cases where there appear major variations in the cross-sectional flow area (constriction in the conduit) the inertia was estimated by:

$$I = \frac{L_1 - d}{A_1} + \frac{L_o + 2d}{A_o} + \frac{L_2 - d}{A_2}$$

where d is a "characteristic" diameter of the constriction of length L_o and with area A_o (for an orifice the characteristic diameter is taken to be the diameter of the orifice). L_1, A_1 and L_2, A_2 are the length and flow area of the conduit partitioned by the constriction. In special cases, where the constriction is not an ordinary orifice, a variation of the above relation was used to evaluate I.

Parallel paths were characterized by:

$$I = \left(\sum_j \frac{1}{I_j} \right)^{-1}$$

To further illustrate methods of determination of the junction characteristics, treatment of selected representative junctions will be shown in detail. The junctions are those for the recirculation line break nodalization scheme: 9, 47, 72.

Junction 9 connects the break volume (node 35), which consists of the half-annulus in the recirculation line penetration extended from the shield door to the reactor vessel, with the surrounding annular node (34). The minimum junction area was in this case within the break volume, half of the annular area formed by the recirculation line and the penetration wall was calculated to be 7.04 ft^2. In determining the loss coefficient for this junction, Diagram 11-9, Reference 6, was utilized. An upper limit value was set at 0.85 and considered the only loss for this junction.

The inertia coefficient, I, for the junction was calculated as a sum of two contributions: (a) inertia through the half-annulus of the penetration (0.23), and (b) an upper limit estimate of the inertia within the annulus, node 34 (0.07), totaling 0.30 ft^{-1}.

Junction 47 is a vertical junction connecting nodes 16 and 21. The junction area is the related annulus cross-section area reduced by two constrictions, stiffener and the thermal insulation support structure. Although the constrictions appear at different elevations (11 inches apart), they were assumed at the same elevation. This assumption leads to the junction area of 7.72 ft^2 (upstream volume flow area is 11.87 ft^2 and the flow area of the downstream volume is 12.36 ft^2). The loss coefficient was estimated using Diagram 4-9 of Reference 6, at 0.66 for flow area 7.72 ft^2. The total junction loss coefficient is therefore 0.67. The junction area is characterized by the radial width of 1.45 feet. This width was taken as the characteristic length, d, for the purposes of the inertia coefficient determination. Then, using a variation of the above described relation for I,

$$I = \frac{d}{A_o} + \frac{L - d}{A_2}$$

it was found that I = 0.45 ft^{-1}.

Junction 72 is an example of the vent path through the line penetration and connects annular node 28 with the containment node 37. The actual penetration is located on the boundary between nodes 28 and 29. For this reason, only half of the penetration was treated as the junction 72.

The minimum area of the junction is the cross-sectional area of the half of annulus between the shield door and penetration line. It was determined to be 9.71 ft^2. Half-penetration flow area was calculated at 5.33 ft^2. The inertia coefficient for this junction was determined on the basis of the above areas and the characteristic diameter as being the hydraulic diameter at the penetration exit (3.3 ft^{-1}). The loss coefficient for the junction was, however, determined for the whole penetration and it consisted of a friction loss (0.02 for A = 10.65 ft^2), turning losses at the nozzle and contraction-expansion losses at the shield doors. The turning losses were approximated with losses in the branch of a tee section as shown in Diagram 7-21, Reference 6, and estimated at 1.05 based on the penetration area 10.65 ft^2. The loss at the shield door was approximated with a loss due to a discharge from a straight conduit through a thick-walled orifice or grid, Diagram 11-28, Reference 6, and calculated at 1.69 based on the penetration exit area 1.424 ft^2. Then the total loss coefficient based on the area 1.424 ft^2 is 1.71, which is the loss coefficient of the junction.

A complete review of all volume and junction parameters as used in the analyses is given in Tables 6.2-9, 6.2-10, 6.2-24, and 6.2-25. Tables of junction characteristics include an indication whether the junction was choked during the analysis. The junctions closer to the break volume choked very early in the transient; an indication that the pressurization was hardly a function of either assigned loss coefficients or inertia coefficients.

Mass and energy blowdown rates used in the analysis are given in Tables 6.2-26 and 6.2-27.

Figure 6.2-18 depicts the calculated differential pressures across the biological shield wall (doors) for the postulated recirculation line break. Figures 6.2-49 and 6.2-50 show final pressure distribution in axial and circumferential direction, respectively also for the recirculation line break. Figures 6.2-22, 6.2-51, and 6.2-52 give the same information for the postulated feedwater line break.

Head Cavity

Note: The current flow paths have been changed to include the two manholes between the head cavity and the drywell and the four ducted HVAC vents have been modified by the addition of discharge nozzles. The impact of this change has been evaluated and it has been determined that the analysis presented here is bounding.

The computer code utilized for this investigation was RELAP4/Mod 5 (Reference 7) as received from the Argonne Code Center. A listing of the input for each case (Tables 6.2-15 and 6.2-16) is provided to demonstrate the options of the code that were utilized to obtain a solution. The mass and energy inputs were taken from Table 6.2-18 for the recirculation line break, and calculated based on Moody's flow model with a multiplier of 1.0 for the simultaneous head spray line and RPV head vent line break. The details regarding the data contained in Table 6.2-18 are given in Subsection 6.2.1.1.3.1. The basic assumptions utilized in the analysis are given below.

a. Thermodynamic equilibrium exists in each containment subcompartment. The containment option of the RELAP4/MOD5 computer code was utilized which allows for the flow of air, water vapor, and liquid between the nodes.

b. The constituents of the fluid flowing through the subcompartment vents are based on a homogeneous mixture of the fluid in the subcompartment. The consequences of this assumption result in complete liquid carry-over through subcompartment vents.

c. No heat loss from the gases inside the primary containment is assumed. This adds extra conservatism to the analysis, i.e., the analysis will tend to predict higher containment pressures than would actually exist.

d. Incompressible single-stream flow without momentum flux was used for all junctions.

e. The Moody model for critical flow was used when choking occurred in a junction.

f. The stagnation properties which include dynamic velocity effects were used to determine the flow rate in conjunction with the Moody model.

g. A contraction coefficient of 0.6 was implemented with the junction flow areas which reduces the flow and retains higher pressures closer to the break. In addition, a contraction coefficient of 1.0 was utilized for the fill junction which was used to simulate the break.

h. The reactor pressure vessel head insulation remains in place and retains its structural integrity during any postulated accident. This is conservative since the RPV head cavity volume is minimized which will result in higher pressures in the head cavity.

i. The manholes between the head cavity and the drywell are assumed to be closed. This reduces the flow area between the volumes increasing the differential pressure across the bulkhead.

j. All of the HVAC vents (supply and return) are modeled for the postulated break in the head cavity since the pressure in the return vents with the ductwork would always be greater than the drywell pressure. However, only the supply vents are considered to allow flow for the breaks in the drywell. It is assumed that the HVAC return ductwork would be crushed by the rising drywell pressure.

k. To simplify the input to RELAP4/MOD5, the flow area properties of the HVAC vents are combined into one equivalent vent.

l. The downcomers are represented by an equivalent single flow path with a flow area equal to the sum of the actual flow areas.

m. The modeling of downcomer clearing the initiation of flow into the wetwell was modeled in two ways. In the case of the recirculation line break, the downcomer clearing is extremely rapid. To accurately simulate this, the model would have to be rather complex due to the large inertial and frictional effects present in the downcomer. This complexity was avoided by making use of an accident chronology shown in Table 6.2-7 which found the vent clearing time to be 0.824 second. A valve was placed in the flow path and opened 0.824 second after the line break. The simultaneous head spray line and RPV head vent line break is a much smaller break and results in a relatively slow pressurization of the drywell. A valve was again used in the flow path, but in this instance, the valve opening was dependent upon the drywell pressure exceeding the hydrostatic head at the downcomer exit. The opening differential pressure used was 5.2 psid which is equivalent to a 12-foot downcomer submergence.

n. No significant depressurization of the reactor pressure vessel occurs during the postulated break.

o. The simultaneous pipe break of the head spray line and the RPV head vent line was considered because of the lack of whip restraints on the head spray line. The resultant whip of the head spray line is assumed to rupture the RPV head vent line. Neither the RCIC nor the RHR system is operating during the time of the head spray line break, i.e., the RHR-RCIC stop valve is assumed to be closed during the time of the accident. The RPV head vent line is connected at the RPV head and at the main steam header. Therefore, a break in this line results in a two direction blowdown, one side feeds directly from the RPV, and other feeds from the main steamline. The head spray line has a limiting flow area at the head spray nozzle which has a diameter of 3.72 inches. The RPV head vent line is postulated to rupture at the 4-inch to 2-inch reducer in the line located in the head cavity. The steam flow occurs at both ends of the break, one having a diameter of 4.0 inches and the other 2.0 inches. The total flow area was determined to be 0.163 square feet. All of the flows are assumed to have the same RPV conditions which are a pressure of 1050.0 psia and an enthalpy of 1190.0 Btu/lbm. Utilizing Moody's choked flow tables from RELAP4/MOD5, a maximum flow of 2200.0 lbm/sec-ft^2 or 357.9 lbm/sec was calculated. This is used as a constant flow rate for the break in the head cavity.

p. The mass and energy release rates used for the recirculation line break are those given in Table 6.2-18. The break sizes are specified in Subsection 6.2.1.1.3.1.1 and the details regarding line size, break size, orifice size, etc., are given in Table 6.2-4.

q. RELAP4/MOD5 lacks the ability to model steam condensation in the suppression pool. This limitation has no effect on the results obtained prior to vent clearing but will result in an overestimation of the pressure rise in the wetwell after vent clearing. Since the maximum differential pressure across the refueling bulkhead occurs very shortly after downcomer vent clearing in the case of the recirculation line break, the effect is negligible. However, it is noted that the long-term pressure values are not realistic because of this modeling method. In the case of the break in the head cavity, flow through the downcomers does not begin until long after the peak differential pressure across the refueling bulkhead plate occurs.

r. The initial conditions are taken to be the normal operating conditions as given in Table 6.2-3 except with a relative humidity of 0.1%. In the head cavity and drywell the initial pressure is 15.45 psia, the initial temperature is 135° F and the relative humidty is 0.1%. In the wetwell the initial pressure is 15.45 psia, the initial temperature is 100° F and the relative humidity is 0.1%.

The node and flow path data specifics are given in Tables 6.2-11 and 6.2-12 for the simultaneous break of the head spray and RPV head vent lines and Tables 6.2-13 and 6.2-14 for the recirculation line break. The nodes and flow paths are graphically depicted in Figure 6.2-19 for the simultaneous break of the head spray line and RPV head vent line, and Figure 6.2-20 for the recirculation line break.

A description of the loss coefficient determination for the flow paths is provided. This problem has only two flow paths to consider. The first path connects the head cavity to the drywell and consists of eight ports through the bulkhead plate. Four of these ports are the HVAC supply ports for the head cavity and do not have any ductwork attached to them. The remaining four ports are the HVAC return ducts from the head cavity and have ductwork attached to them. All of the HVAC vents (supply and return) were modeled for the postulated break in the head cavity since the pressure in the return vents with the ductwork would always be greater than the drywell pressure. The losses considered were the turning losses of the fluid around the RPV head from the break to the HVAC ports in the bulkhead. These losses are very small since the turning radius around the RPV head is so large. Therefore, this loss was neglected. The ports without the ductwork were considered as thick-edged orifices. This loss coefficient was determined using Diagram 4-14 of Reference 6 and was calculated to be 1.52. The ports with the ductwork consist of a 24-inch to 18-inch diameter reducer followed by ductwork which includes a series of elbows and one tee. The flow finally exits into the drywell through one of the tee branches. Diagrams 3-9, 6-1, and 7-25 of Reference 6 were used to calculate the loss coefficient and it was determined to be 4.62. Since the flow through the ports with and without ductwork is parallel, the losses were combined for parallel flow and the total loss coefficient was calculated, as described in Subsection 6.2.1.2.3, to be 2.62. The flow area for this case is the total of the minimum flow areas through each of the eight HVAC vents. The total flow area was determined to be 11.12 square feet. For the recirculation line break within the drywell, only the supply vents which are without ductwork were considered to allow for flow. It is assumed that the HVAC return ductwork would crush because the drywell pressure would be greater than the pressure in the ductwork. The loss coefficient for this case is calculated for the ports without the ductwork. The loss coefficient was determined as mentioned earlier and was calculated to be 1.52. The flow area for this case was determined to be 4.92 square feet.

The loss coefficient for the second flow path, through the downcomers, was taken from Table 6.2-1 and is 5.2. No attempt was made to model the inertial effects of the clearing transient. The path was treated as a valve that opened at a prespecified time of 0.824 second for the recirculation line break. For the simultaneous head spray line and RPV head vent line break, the path was treated as a valve that opened when the drywell pressure exceeded the hydrostatic head of 5.2 psid which is equivalent to a 12-foot downcomer submergence. The path model considers no inertial effects; this is a conservative approach, since it has the effect of making the pressure differentials across the bulkhead plate higher.

Figure 6.2-24 depicts the pressure histories of the head cavity and drywell for the break in the head cavity and the recirculation line break in the head cavity and the recirculation line break in the drywell. The pressure differential histories across the bulkhead plate for the break in the head cavity and the recirculation line break in the drywell are shown in Figure 6.2-25. The peak pressure differential for each break was found to be 9.0 psid upward for the recirculation line break and 7.0 psid downward for the simultaneous head spray line and RPV head vent line break. The differential pressure history as shown for the simultaneous break of the head spray line and RPV head vent line shows two differential pressure peaks. The first differential pressure peak is due to the sudden pressurization of the head cavity and the second peak is due to the sudden opening of the downcomers at a pressure differential between the drywell and wetwell of 5.2 psid. This second peak is erroneous because no inertial effects were modelled in the downcomer flow path and therefore was not considered as the design downward differential pressure. The design pressure differential is 10.6 psid in both directions. This provides for a margin factor of approximately 1.2 at the final design stage.

6.2.1.2.4 Impact of Increased Initial Suppression Pool Temperature

Supplementary safety evaluations have been performed, as discussed in Section 6.2.1.8, to verify that an increase in the initial suppression pool temperature would not significantly impact the consequences of this accident scenario.

6.2.1.3 Mass and Energy Release Analyses for Postulated Loss-of-Coolant Accidents

This section contains a description of the transient energy release rates from the reactor primary system to the containment system following a LOCA with minimum ESF performance. In general, a very conservative analytical approach is taken in that all possible sources of energy are accounted for, whereas the suppression pool is assumed to be the only available heat sink. No credit is taken for either the heat that will be stored in the suppression chamber and drywell structures, or the heat that will be transmitted through the containment and dissipated to the environment.

The analysis at 3559 MWt used essentially the same methodology as the analysis at 3434 MWt, except for the RPV blowdown in the short-term containment response analysis, as noted in Subsection 6.2.1.1.3. The break flow rate and enthalpy used for the short-term containment response analysis at 3559 MWt are given in Table 6.2-18a. For the analysis of the long-term containment response, one of the key input assumptions updated for the analysis at 3559 MWt is that the core decay heat is based on the ANSI/ANS 5.1-1979 decay heat model with a two sigma uncertainty adder. The core decay heat values used in the 3559 MWt analysis are provided in Table 6.2-20a. The following subsections explain how the transient mass and release rates from the vessel to the containment were determined for the original analysis at 3434 MWt.

6.2.1.3.1 Mass and Energy Release Data

Table 6.2-18 provides the mass and enthalpy release data for the containment DBA, recirculation line break. Blowdown steam and liquid flow rates and their respective enthalpies are reported for a 24-hour period following the accident. Figures 6.2-26 and 6.2-27 show the blowdown flow rates for the recirculation lines break graphically. This data was employed in the DBA containment pressure-temperature transient analyses reported in Subsection 6.2.1.1.3.1.

Table 6.2-19 provides the mass and enthalpy release data for the main steamline break. Blowdown data is presented for a 24-hour period following the accident. Figure 6.2-28 shows the vessel blowdown flow rates for the main steamline break as a function of time after the postulated rupture. This information has been employed in the containment response analyses presented in Subsection 6.2.1.1.3.1.

6.2.1.3.2 Energy Sources

The reactor coolant system conditions prior to the design basis recirculation line break are presented in Tables 6.2-3 and 6.2-4. Reactor blowdown calculations for containment response analyses are based upon these conditions during a loss-of-coolant accident.

Following each postulated accident event, the stored energy in the reactor system and the energy generated by fission product decay will be released. The rate of release of core decay heat for the evaluation of the containment response to a LOCA is provided in Table 6.2-20 as a function of time after accident initiation. This data is based upon a normalization factor of 3440 MWt and includes the energy of fuel relaxation.

Following a LOCA, the sensible energy stored in the reactor primary system metal will be transferred to the recirculating ECCS water and will thus contribute to the suppression pool and containment heatup. Figure 6.2-29 shows the temperature transients of the various primary system structures which contribute to this sensible energy transfer. Figure 6.2-30 shows the variation of the sensible heat content of the reactor vessel and internal structures during a recirculation line break accident based upon the temperature transient responses.

6.2.1.3.3 Effects of Metal-Water Reaction

The containment systems shall accommodate the effects of metal-water reactions and other chemical reactions following a postulated DBA. The amount of metal-water reaction is limited to values consistent with the performance objectives of the emergency core cooling systems (ECCS).

6.2.1.3.4 Impact of Increased Initial Suppression Pool Temperature

Supplementary safety evaluations have been performed, as discussed in Section 6.2.1.8, to verify that an increase in the initial suppression pool temperature would not significantly impact the consequences of this accident scenario.

6.2.1.4 Mass and Energy Release Analysis for Postulated Secondary System Pipe Ruptures Inside Containment (PWR)

Not applicable.

6.2.1.5 Minimum Containment Pressure Analysis for Performance Capability Studies on Emergency Core Cooling System (PWR)

Not applicable.

6.2.1.6 Testing and Inspection

Containment testing and inspection programs are fully described in Subsection 6.2.6 and in Chapter 14.0 of the FSAR. The requirements and bases for acceptability are outlined completely in the Technical Specifications.

6.2.1.7 Instrumentation Requirements

A complete description of the instrumentation employed for monitoring the containment conditions and actuating those systems and components having a safety function is presented in Chapter 7.0.

6.2.1.8 Evaluation of 105° F Suppression Pool Initial Temperature

Temperature limits on the suppression pool for Boiling Water Reactors (BWR) with Mark II containment were implemented to minimize the potential for high amplitude loads on the pool during accident events. However, some of the limits were implemented with excessive conservatism because the loading phenomena were not completely understood. This suppression pool temperature limit has therefore been historically chosen based on the maximum expected service water temperature. For LaSalle County Station Units 1 and 2, the licensing safety evaluations were based upon a 100° F suppression pool water temperature, which was equivalent to the Ultimate Heat Sink design temperature limit.

Hot weather in Illinois can cause the temperature of the ultimate heat sink to rise to the point where the suppression pool temperature limit of 100° F may be exceeded. However, the ultimate heat sink design limit will not be exceeded. To prevent an unnecessary plant shutdown during a period of high electrical demand, plant specific safety evaluations have been performed (References 10-20) to demonstrate that plant operation with higher suppression pool temperature is acceptable, i.e., the plant safety limits will still be met with the higher temperatures.

The suppression pool was designed to function as both a heat sink and an emergency water source during transient and accident events as discussed throughout section 6.2. Therefore, performance of the following evaluations were required to support a 5° F increase in the initial suppression pool temperature as LaSalle County Station Units 1 and 2:

a) Containment loads associated with SRV operation including air clearing loads and steam condensation loads.

b) Containment response associated with LOCA events including the peak pressure and temperature design limits, condensation capability, condensation oscillation loads (CO), and chugging loads.

c) Equipment performance for design basis events including the impact on the core cooling capability of the ECCS and the parameters which could impact the operability of the ECCS pumps (such as NPSH availability, etc.).

d) Equipment and ECCS performance for other non-LOCA events, e.g., ATWS.

For each of these cases the evaluation showed that the increase of the initial suppression pool temperature would have an insignificant impact on the existing design margin for the suppression pool and ECC systems. Peak local pool temperature will increase by 3° F at a 105° F initial pool bulk temperature for SRV related events.*

The results of this evaluation were submitted to the NRC (Reference 11), and an approved license amendment to change the maximum suppression pool temperature limit to 105° F was received (Reference 12). The Ultimate Heat Sink design temperature limit is changed to 104° F in Reference 32.

6.2.2 Containment Heat Removal System

The containment heat removal system function is accomplished by the containment cooling mode of the RHR system. The system is also equipped with spray headers in the drywell and suppression chamber areas. However, no credit was taken for these spray headers for either heat removal or fission product control following a LOCA.

6.2.2.1 Design Bases

The containment heat removal system, consisting of the suppression pool cooling system, is an integral part of the RHR system. It meets the following safety design bases:

a. The source of water for restoring RPV coolant inventory is located within the containment to establish a closed cooling-water path.

b. A closed loop flow path between the suppression pool and the RHR heat exchangers is established so that the heat removal capability of these heat exchangers can be utilized.

c. This system, in conjunction with the ECC systems, has such diversity and redundancy that no single failure can result in its inability to cool the core adequately (Subsection 6.3.1).

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* Peak bulk suppression pool temperature, in the case of LOCA events, is still approximately 10° F below the allowable values.

d. To ensure that the RHR containment cooling subsystem operates satisfactorily following a LOCA, each active component shall be testable during operation of the nuclear system.

6.2.2.2 System Design

The containment cooling subsystem is an integral part of the RHR system, as described in Subsection 5.4.7. The piping and instrumentation diagram is given in Drawing Nos. M-96 (sheets 1-4) and M-142 (sheets 1-4). Redundancy is achieved by having two complete containment cooling systems.

Consideration of the fouling of heat exchangers and the selection of temperatures for heat exchanger design are discussed in Subsection 5.4.7.

6.2.2.3 Design Evaluation

In the event of the postulated LOCA, the short-term energy release from the reactor primary system will be dumped to the suppression pool. This will cause a pool temperature rise of approximately 46° F. Subsequent to the accident, fission product decay heat will result in a continuing energy dump to the pool. Unless this energy is removed from the primary containment system, it will eventually result in unacceptable suppression pool temperatures and containment pressures. The containment cooling mode of the RHR system is used to remove heat from the suppression pool.

A supplementary evaluation has been performed for the addition of feedwater to the suppression pool to assess the impact on long term pool temperature. This evaluation estimates that the peak short term pool temperature will increase by an additional 15.4° F. This results in a short term pool temperature (at 600 seconds) of approximately 166° F. Further details are given in Section 6.2.1.1.3.1.1 in the paragraph titled, "Evaluation of Post-LOCA Feedwater Injection".

6.2.2.3.1 RHR Containment Cooling Mode

When the RHR system is in the containment cooling mode, the pumps draw water from the suppression pool, pass it through the RHR heat exchangers, and inject it back either to the suppression pool or to the RPV.

In order to evaluate the adequacy of the RHR system, the following limiting case is postulated:

a. Reactor initially at maximum power.

b. Isolation scram occurs.

c. Manual depressurization discharges heat to suppression pool.

d. Suppression pool cooling is established approximately 10 minutes after the technical specification limit for pool water temperature is reached.

A complete discussion of the suppression pool temperature transients is contained in Chapter 6 of the LSCS-DAR.

The suppression pool temperature transients have been analyzed based on an increased initial suppression pool temperature of 105° F as discussed in Section 6.2.1.8. The scenarios analyzed are based on those specified in NUREG-0783, Reference 15 provides the results of this analysis. For all analyzed cases the long term suppression pool temperature is less than 200° F.

6.2.2.3.2 Summary of Containment Cooling Analysis

When calculating the long term, post LOCA pool temperature transient, it is assumed that one RHR heat exchanger loop is not available, the suppression pool level initially is at the technical specification minimum, the suppression pool temperature initially is at the technical specification maximum, and the design RHR heat exchanger fouling factors are used. No credit is taken for heat loss to environs or to the pool structures.

The resultant suppression pool transient maximum temperature for 3434 MWt is 200° F (see References 8, 15, 16, 17, and 18). It is concluded that even with the very conservative assumptions described above, the RHR system in the containment cooling mode can meet its design objective of safely terminating the limiting case temperature transient. See subsection 6.2.2.3.5 for impact of power uprate to 3489 MWt.

6.2.2.3.3 Impact of Increased Initial Suppression Pool Temperature

Supplementary evaluations have been performed, as discussed in Section 6.2.1.8, to verify that an increase in the initial suppression pool temperature would not impact the ability of the RHR containment cooling system to meet its design objective.

6.2.2.3.4 Impact of Reduced RHR Suppression Pool Cooling Flow Rate

The original and 1988 General Electric containment analyses (references 8 & 17), has been supplemented with an evaluation which considers an RHR pump flow rate during the suppression pool cooling of 7200 gpm. As noted in Table 6.2-2, the previous analysis used a flow rate of 7450 gpm. Although the RHR pump is capable of such performance, the minimum required Technical Specification flow per specification SR 3.6.2.3.2 is only 7200 gpm. Since suppression pool cooling is only initiated after 600 seconds into the DBA-LOCA, the affect of this lower flow rate will be seen as slightly lower efficiency for the RHR heat exchanger and a higher long term suppression pool temperature. The results of the Reference 18 General Electric analysis indicate an increase in the long term pool temperature of 1.5° F for the DBA-LOCA case.

For cases which involve SRV blowdown to the suppression pool the lower RHR pump flow rate was assessed in S&L Calculation 3C7-0181-003, Rev. 3 (Reference 15) and the effect on the peak suppression pool temperature was an increase of less than or equal to 1° F in the peak suppression pool temperature. For all cases examined, the highest peak pool temperature calculated is 195° F which is still less than 200° F peak temperature for all cases analyzed. Thus, complete steam condensation is assured with these elevated pool temperatures.

6.2.2.3.5 Impact of Power Uprate

The resultant post-LOCA maximum suppression pool temperature at 102% of uprated reactor thermal power, 3559 MWt, is 196.1° F, as shown in Table 6.2-5a. The maximum suppression pool temperature at 3559 MWt for NUREG-0783 events is 190.7° F as evaluated in Reference 31.

The suppression pool limit for events with SRV discharge is evaluated in References 25 and 27. In the NRC's Safety Evaluation of Reference 28 for the elimination of local suppression pool temperature limits for plants with T-Quenchers, an additional concern was raised on the potential transfer of non-condensed SRV steam plumes to ECCS suction strainers. An analysis was performed in Reference 29 that modeled the steam plume formation, determined the extent of steam plume projection, and verified that the plume can not enter ECCS suction strainers. However, the analysis determined the existence of a potential steam ingestion concern for the "K" SRV and the Reactor Core Isolation Cooling (RCIC) suction strainer, if the temperature of the suppression pool is above 200° F. Administrative controls have been implemented to caution the operators on the use of "K" SRV and RCIC simultaneously when the suppression pool temperature is above 200° F.

6.2.2.3.6 Sensitivity of Initiation Time of RHR Containment Cooling Mode

A one-time sensitivity analysis was performed to determine the impact on the peak suppression pool temperature, if the start of the RHR Containment Cooling Mode is delayed for longer than 10 minutes, following a DBA-LOCA. Manual operator action from the main control room is needed, in order for Suppression pool cooling to be initiated. These actions could require up to a few minutes to accomplish (accounting for valve stroke times, etc.). The impact on peak suppression pool temperature was studied if the start of suppression pool cooling is delayed from 10 minutes to 30 minutes.

The study utilized power uprate decay heat loads. The results of this study indicate there is a very small impact on peak suppression pool temperature. The 30 minute case results in an increase of 1.24 deg-F, added to the current analysis peak of 193 deg-F, results in a postulated peak temperature of less than 195 deg-F. This peak temperature does not challenge the suppression pool design limits. The operator actions to re-align RHR are anticipated to require much less time than the additional 20 minutes of this analysis. The increase in peak suppression pool temperature is concluded to be negligible (i.e. less than 1 deg-F) for these anticipated starting times which are only a few minutes longer than 10 minutes.

6.2.2.4 Test and Inspections

The operational testing and the periodic inspection of components of the containment heat removal system are described in Subsection 5.4.7.4.

6.2.2.5 Instrumentation Requirements

Suppression pool cooling by the RHR system is manually initiated from the control room where sufficient instrumentation is provided for that purpose.

6.2.3 Secondary Containment Functional Design

The Secondary Containment consists of the Reactor Building, the equipment access structure, and a portion of the main steam tunnel and has a minimum free volume of 2,875,000 cubic feet.

The reactor building completely encloses the reactor and its primary containment. The structure provides secondary containment when the primary containment is closed and in service, and primary containment when the primary containment is open, as it is during the refueling period. The reactor building houses the refueling and reactor servicing equipment, the new and spent fuel storage facilities, and other reactor auxiliary or service equipment, including the reactor core isolation cooling system, reactor water cleanup demineralizer system, standby liquid control system, control rod drive system equipment, the emergency core cooling system, and electrical equipment components.

6.2.3.1 Design Bases

The functional capability of the ventilation system to maintain negative pressure in the secondary containment with respect to outdoors is discussed in Subsection 9.4.2.

6.2.3.2 System Design

The reactor building is designed and constructed in accordance with the design criteria outlined in Chapter 3.0. The reactor building exterior walls and superstructure up to the refueling floor are constructed of reinforced concrete.

Above the level of the refueling floor, the building structure is fabricated of structural steel members, insulated siding and a metal roof. Joints in the superstructure paneling are detailed to assure leaktightness. Penetrations of the reactor building are designed with leakage characteristics consistent with leakage requirements of the entire building. The reactor building is designed to limit the inleakage to 100% of the reactor building free volume per day at a negative interior pressure of 0.25 inch H_20 gauge, while operating the standby gas treatment system. The building structure above the refueling floor is also designed to contain a negative interior pressure of 0.25 inch H_20 gauge.

Personnel entrance to the reactor building is through an interlocking double door airlock. Rail car access openings in the reactor building at elevation 710 feet 6 inches provided with double doors to assure that building access will not interfere with maintaining integrity of the secondary containment.

Ventilation for the reactor building is provided by means of a once-through ventilation system. Outdoor air is filtered then evaporatively or chilled glycol cooled to *reduce the supply air dry bulb temperature to increase the sensible cooling capacity of this air. This air is then preheated as required to satisfy the plant operating conditions.

The equipment is arranged as follows: outside air inlet, filter, chilled glycol/heating coil evaporative *cooler (abandoned-in-place), resistive heating coils, and supply fans. Three 50% vane axial fans are provided, two of which normally operate and one which serves as a standby.

Supply air is distributed to the reactor building by means of a duct system to provide equipment cooling in various areas as required. Air is routed from clean areas to areas with progressively greater contamination potential. Pressure differential control dampers are used as required to maintain negative pressures in potentially contaminated cubicles. All exhaust air is routed through a return duct system to the exhaust fans.

All supply air delivered to the refueling floor level is exhausted from the periphery of the spent fuel and equipment storage pools and the reactor well. This air is routed directly to the main system exhaust duct. Three vane axial exhaust fans are provided, two of which normally operate and one of which serves as a standby. The discharge from the exhaust fans is routed to the plant vent where the air is discharged to the atmosphere. All exhaust air is monitored for radiation.

Normal ventilation systems are not required to operate during accident conditions and are automatically shut down whenever the standby gas treatment system starts. The equipment for this system is not powered from essential buses. To

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* Note: The evaporative coolers are abandoned-in-place.

maintain the integrity of the secondary containment, two isolation dampers are provided in the supply air duct between the supply fan discharge and the penetration through the secondary containment wall.

The secondary containment structure protects the equipment in the building from externally generated missiles. Piping systems within the secondary containment have been analyzed for high energy pipe breaks outside primary containment and pipe whip restraints are provided as required. The effects of jet impingment have also been analyzed and included in the design of the structure and pipe whip restraints. For more information on high energy pipe breaks outside primary containment see Appendix C.

The isolation features and isolation signals for secondary containment are discussed in Section 6.5, Chapter 7.0 and Subsection 9.4.2.

6.2.3.3 Design Evaluation

The design evaluation of secondary containment ventilation system and atmospheric cleanup system is given in Section 6.5 and Subsection 9.4.2.

6.2.3.4 Test and Inspections

The program for initial performance testing is outlined in the Technical Specifications. Periodic functional testing of the secondary containment and secondary containment isolation system is described in the Technical Specifications.

6.2.3.5 Instrumentation Requirements

The instrumentation to be employed for the monitoring and actuation of the standby gas treatment system is fully described in Chapter 7.0.

The instrumentation used for the monitoring and actuation of the ventilation and cleanup system is discussed in Subsections 7.3.8 and 7.6.1.2.

6.2.4 Containment Isolation System

The primary objective of the containment isolation system is to provide protection against the release of radioactive materials to the environment through the fluid system lines penetrating the containment. This objective is accomplished by ensuring that isolation barriers are provided in all fluid lines that penetrate primary containment, and that automatic closure of the appropriate isolation valves occurs.

6.2.4.1 Design Bases

The design requirements for containment isolation barriers are:

a. The capability of closure or isolation of pipes or ducts that penetrate the containment is provided to ensure a containment barrier sufficient to maintain leakage within permissible limits.

b. The arrangements of isolation valving and the criteria used to establish the isolation provisions conform to the requirements of General Design Criteria 54 through 57, as discussed in Section 3.1.

c. The design of all containment isolation valves and associated piping and penetrations is Seismic Category I.

d. Containment isolation valves and associated piping and penetrations meet the requirements of the ASME Boiler and Pressure Vessel Code, Section III, for Class 1 or 2 components, as applicable.

e. Isolation valves, actuators, and controls are protected against loss of safety function from missiles and accident environments.

f. Containment isolation valves provide the necessary isolation of the containment in the event of accidents or other conditions to limit the untreated release of radioactive materials from the containment in excess of the design limits.

g. Appropriate isolation valves are automatically closed by the signals listed in Table 6.2-21. The criteria for assigning isolation signals to their associated isolation valves is described in Subsection 7.3.2. Once the isolation function is initiated, it goes to completion.

h. Redundancy and physical separation are required in the electrical and mechanical design to ensure that no single failure in the system prevents the system from performing its safety function.

The governing conditions under which containment isolation becomes mandatory are high drywell pressure or low water level in the reactor vessel. One or both of these signals initiate closure of isolation valves not required for emergency shutdown of the plant. These same signals also initiate the ECCS. The valves associated with an ECCS may be closed remote manually from the control room or close automatically, as appropriate.

Excess flow check valves are used as a means of automatic isolation on all static instrument sensing lines that penetrate the drywell containment and connect to either the reactor pressure boundary or the drywell atmosphere. The valve is located downstream of the root valve and as close as practical to the outside surface of the containment. This valve is automatically closed to restrict flow in case of a sensing line break outside containment.

Backfill Injection lines have been added to the reference legs originating from Condensing Chambers 1(2) B21-D004A/B/C/D to comply with NRC Bulletin 93-03. These lines use two simple check valves in series to accomplish the outboard containment isolation function. It is acceptable to use the two simple check valves instead of one excess flow check valve for the backfill injection lines because these lines would not need the built-in bleed flow path in an excess flow check valve to reopen when appropriate. The 4 lbs./hr. CRD flow would reopen the check valves when it is available. If it is not available, it is not appropriate to reopen the check valves. This meets the Regulatory Guide 1.11 "... the valve should reopen automatically or be capable of being reopened readily under the conditions that prevail when reopening is appropriate. It should not be necessary to break a line to reopen a closed valve."

In addition, there is no instrument reading that will be significantly effected by the closure of these check valves.

Dead-end instrument sensing lines that are in communication with the reactor pressure boundary and penetrate the primary containment are equipped with 1/4 inch orifice as close to the process as possible inside the drywell.

6.2.4.2 System Design

Table 6.2-21 presents the design information regarding the containment isolation provisions for fluid system lines and instrument lines penetrating the containment. Containment isolation signals are identified in Table 6.2-21 and valve arrangements are represented in Figure 6.2-31.

The plant protection system signals that initiate closure of the containment isolation valves are listed in Table 7.3-2.

The isolation provisions follow the requirements of General Design Criteria 54, 55, 56, and 57. General Design Criteria 54 applies to all of the containment isolation valves. Compliance with General Design Criteria 55, 56, and 57 is described below. The justification for this design is also presented.

6.2.4.2.1 Evaluation Against General Design Criterion 55

Feedwater Line

Each feedwater line forming a part of the reactor coolant pressure boundary is provided with a swing type check valve on Unit 1 and a swing type check valve on Unit 2 inside the containment, and a nonslam type, air operated testable check valve outside the containment, as close as practicable to the containment wall. In addition, a motor-operated gate valve is installed upstream of the outside isolation valve to provide long-term isolation capability.

During a postulated LOCA, it is desirable to maintain reactor coolant makeup from all available sources. Therefore, it would not improve safety to install a feedwater isolation valve that closed automatically on signals indicating a LOCA, and, thereby, eliminate a source of reactor makeup. The provision of the check valves, however, ensure the prevention of a significant loss of reactor coolant inventory and offer immediate isolation should a break occur in the feedwater line. For this reason, the outermost valve does not automatically isolate upon signal from the protection system. The valve is remote manually closed from the main control room to provide long-term leakage protection upon operator determination that continued makeup from the feedwater system is unavailable or unnecessary.

In addition, the outboard check valve is provided with a special actuator that performs the following functions:

a. The actuator is capable of partially moving the valve disc into the flow stream during normal plant operation in order to ensure that the valve is not bound in the open position. The actuator is not capable of fully closing the valve against flow, however, and there is no significant disruption of feedwater flow.

b. The actuator is capable of applying a seating force to the valve at low differential pressures and abnormal conditions. This improves the leaktightness capability of the valves. The actuator will be utilized during leak testing.

<u>ECCS Lines to the RPV</u>

The subject penetration(s) meet the alternate primary containment isolation criteria of NUREG 0800 “Standard Review Plan for the review of Safety Analysis Reports for Nuclear Power Plants” (SRP) instead of the explicit requirements of GDC 55.

The HPCS, LPCS, and LPCI lines penetrate the drywell and inject coolant directly into the reactor pressure vessel. Isolation is provided on each of these lines by a normally closed check valve inside the containment and a normally closed motor-operated gate valve located outside the containment, as close as practicable to the exterior wall of the containment. If a loss-of-coolant accident occurred, each of these valves would be required to open to supply coolant to the RPV. The motor-operated gate valves are automatically opened by their appropriate signals, and the check valves are opened by the coolant flow in the line. The opening capability of the check valve can be tested by monitoring flow through the valve into the reactor vessel.

Control Rod Drive Lines

The control rod drive system, has two types of lines to the RPV; the insert and withdraw lines that penetrate the drywell and connect to the control rod drive.

The control rod drive insert and withdraw lines can be isolated by the solenoid valves outside the primary containment. These lines that extend outside the primary containment are small, and terminate in a system that is designed to prevent out-leakage. Solenoid valves normally are closed, but open on rod movement and during reactor scram. In addition, a ball check valve located in the control rod drive flange housing automatically seals the insert line in the event of a break.

RHR and RCIC Head Spray Lines

The subject penetration(s) meet the alternative primary containment isolation criteria of NUREG 0800 “Standard Review Plan for the review of Safety Analysis Reports for Nuclear Power Plants” (SRP) instead of the explicit requirements of GDC 55.

The RHR and RCIC head spray lines meet outside the containment to form a common line which penetrates the drywell and discharges directly into the reactor pressure vessel. The testable check valve inside the drywell is normally closed. The testable check valve is located as close as practicable to the reactor pressure vessel. Three types of valves, a testable check valve, a normally closed motor-operated remote manual gate valve, and a normally closed motor-operated automatic globe valve, are located outside the containment. The check valve assures immediate isolation of the containment in the event of a line break. The globe valve on the RHR line receives an automatic isolation signal while the gate valve on the RCIC line is remote manually actuated to provide long-term leakage control.

Standby Liquid Control System Lines

The standby liquid control system line penetrates the drywell and connects to the reactor pressure vessel. In addition to a simple check valve inside the drywell, a check valve together with an explosive actuated valve are located outside the drywell. Since the standby liquid control line is a normally closed, nonflowing line, rupture of this line is extremely remote. The explosive actuated valve, though, functions as a third isolation valve. This valve provides an absolute seal for long-term leakage control as well as preventing leakage of sodium pentaborate into the reactor pressure vessel during normal reactor operation.

Reactor Water Cleanup System

The reactor water cleanup (RWCU) pumps, heat exchangers, and filter demineralizers are located outside the primary containment. The return line from the filter demineralizers connects to the feedwater line outside the containment between the outside containment feedwater check valve and the outboard motor-operated gate valve. Isolation of this line is provided by the feedwater system check valve inside the containment, the feedwater check valve outside the containment, and a motor-operated gate valve which provides a long term isolation capability.

During the postulated loss-of-coolant accident, it is desirable to maintain reactor coolant makeup. For this reason, valves which automatically isolate upon signal are not included in the design of the system. Consequently, a third valve is required to provide long-term leakage control. Should a break occur in the reactor water cleanup return line, the check valves would prevent significant loss of inventory and offer immediate isolation, while the outermost isolation valve would provide long-term leakage control.

Recirculation Pump Seal Water Supply Line

The recirculation pump seal water line extends from the recirculation pump through the drywell and connects to the CRD supply line outside the primary containment. The seal water line forms a part of the reactor coolant pressure boundary, therefore the consequences of failing this line have been evaluated. This evaluation shows that the consequences of breaking this line is less severe than that of failing an instrument line. The recirculation pump seal water line is 3/4-inch Class B from the recirculation pump through the second check valve (located outside the containment). From this valve to the CRD connection the line is Class D. Should this line be postulated to fail and either one of the check valves is assumed not to close (single active failure), the flow rate through the broken line has been calculated to be substantially less than that permitted for a broken instrument line. Therefore, the two check valves in series provide sufficient isolation capability for postulated failure of this line.

RHR Shutdown Cooling Return Line

The subject penetration(s) meet the alternative primary containment isolation criteria of NUREG 0800 “Standard Review Plan for the review of Safety Analysis Reports for Nuclear Power Plants” (SRP) instead of the explicit requirements of GDC 55.

The shutdown cooling return lines are connected to the reactor recirculation pump discharge lines. The isolation valve arrangement on these lines is identical to that on the ECCS lines connected to the RPV. However, the motor-operated valve outside containment closes automatically upon receipt of an isolation signal.

RHR Shutdown Cooling Suction Line

The penetration (M-7) has been protected by a relief valve mounted between the inboard automatic isolation and the containment penetration. This relief valve was added in response to NRC Generic Letter GL 96-06 concerns for isolated line overpressurization during a LOCA.
Because the RHR Shutdown Cooling piping up to and including the outer containment penetration automatic isolation valve is part of the RCPB, the penetration configuration must meet GDC 55.

Reactor Recirculation System Sample Line

The Reactor Recirculation sample line is a 3/4" line that is an extension of the RCPB to the outboard isolation valve. The containment penetration (M-36) has an automatic isolation inside containment and an automatic isolation outside containment. A 3/4" bypass line with a check valve has been added around the inboard isolation valve in response to Generic Letter 96-06. The check valve will open to relieve penetration overpressurization following a LOCA. Manual valves between the check valve and the RR 24" process line will be maintained locked open, when required for overpressure protection, to assure a vent path for overpressure protection.

The two automatic valves and the inboard check valve meet the requirements of GDC 55.

6.2.4.2.2 Evaluation Against General Design Criterion 56

Primary Containment Chilled Water System

The Primary Containment Chilled Water System (PCCW) consists of two independent trains of cooling for the primary containment atmosphere. Each train penetrates the containment with a supply and return line. Each line has an inboard and an outboard automatic isolation valve. Each penetration (M-25, M-27, M-28, M-26) has been protected by a relief valve mounted between the inboard automatic isolation and the containment penetration. These relief valves were added in response to NRC Generic Letter GL 96-06 concerns for isolated line overpressurization during a LOCA.

The penetration configuration must meet GDC 56.

RCIC Turbine Exhaust Vacuum Breaker Line
Minimum Flow Bypass

The RCIC turbine exhaust line is provided with a vacuum breaker system to prevent condensation of the exhaust steam from inducing a vacuum in the line. The vacuum relief line connects the turbine exhaust line to the suppression chamber atmosphere. Two check valves in-series in the line prevent steam from exhausting to the vapor space above the pool, and two motor-operated globe valves, one on either side of the aforementioned check valves, provide remote manual isolation capability for the RCIC turbine exhaust vacuum breaker line.

Combustible Gas Control and Post-LOCA Atmosphere Sampling Lines

The post-LOCA sampling system lines which penetrate the containment and connect to the drywell and suppression chamber air volume are each equipped with a single divisional fail-open, solenoid operated isolation valve located outside and as close to the containment as possible. The combustible gas control system lines which penetrate the containment are equipped with two normally closed motor-operated valves in series, located outside containment, remote manually actuated from the control room. These valves provide assurance of isolating these lines in the event of a break and also provide long-term leakage control. In addition, the piping is considered an extension of containment boundary since it must be available for long-term usage following a design basis loss-of-coolant accident, and, as such, is designed to the same quality standards as the primary containment. Thus, the need for isolation is conditional.

Containment Vent and Purge and Containment Drain Lines

The drywell and suppression chamber vent and purge and containment drain lines have test isolation capabilities commensurate with the importance to safety of isolating these lines. Each line has two normally closed, instrument air powered, air cylinder actuated valves located outside the primary containment. The air cylinders are operated by solenoid valves connected to the control logic. Containment isolation requirements are met on the basis that the purge and drain lines are normally closed, low-pressure lines constructed to the same quality standards as the containment and meet the Branch Technical Position CSB 6-4. These isolation valves are interlocked to preclude opening of the valves while a containment isolation signal exists. Furthermore, the consequences of a break in these lines result in no significant safety consideration.

Drywell and Suppression Chamber Air Sampling Lines

The air sampling lines are used for continuously drawing containment air during normal operation as part of the leak detection system. These lines are equipped with two normally open, solenoid operated, spring to close valves in series, located outside and as close as possible to the containment. This manner of routing the system piping reduces the number of containment penetrations and minimizes the potential pathways for radioactive material release. In addition, the piping upstream of the air sampling isolation valves is considered an extension of the containment since it must be available for long-term usage following a design basis loss-of-coolant accident. The piping is part of the post-LOCA atmosphere sampling system, and as such, is designed and fabricated to the same quality standards as the containment. Containment isolation requirements are met on the basis that these lines are low-pressure lines constructed to the same quality standards as the containment furthermore, the consequences of a break in these lines result in no significant safety consideration.

Service Air and Clean Condensate Supply Lines

The Service Air and Clean Condensate supply lines, which penetrate the containment, provide air and water service connectors inside the drywell during reactor shutdown and outages. These lines are equipped with two manually operated valves which are locked closed during reactor operations. In addition, each line is equipped with a spool piece which is removed and respective blank flanges installed during reactor operations. The valves and spool pieces are located outside of and as close as possible to the containment. This manner of routing the system piping reduces the number of containment penetrations. Since these lines are isolated during reactor operations, the potential pathways for radioactive material release is minimized. Furthermore, the consequences of a break in these lines result in no significant safety consideration.

Reactor Building Closed Cooling Water System

The Reactor Building Closed Cooling Water System (RBCCW) inside containment consists of a closed loop providing cooling for the reactor recirculation pump heat loads and penetration heat loads. The system penetrates the containment with a supply and return line. Each line has an inboard and an outboard automatic isolation valve. Each penetration (M-16, M-17) has been protected by a relief valve mounted between the inboard automatic isolation and the containment penetration. These relief valves were added in response to NRC Generic Letter GL 96-06 concerns for isolated line overpressurization during a LOCA.

The penetration configuration must meet GDC 56.

Primary Containment Chilled Water System

The Primary Containment Chilled Water System (PCCW) consists of two independent trains of cooling for the primary containment atmosphere. Each train penetrates the containment with a supply and return line. Each line has an inboard and an outboard automatic isolation valve. Each penetration (M-25, M-27, M-28, M-26) has been protected by a relief valve mounted between the inboard automatic isolation and the containment penetration. These relief valves were added in response to NRC Generic Letter GL 96-06 concerns for isolated line overpressurization during a LOCA.

The penetration configuration must meet GDC 56.

6.2.4.2.3 Evaluation Against General Design Criterion 57

Lines penetrating the primary containment for which neither Criterion 55 nor Criterion 56 govern comprise the closed system isolation valve group.

Influent and effluent lines of this group are isolated by automatic or remote manual isolation valves located as closely as possible to the containment boundary.

ECCS Pump Test Lines and Minimum Flow Bypass Lines

The LPCS, HPCS, and RHR pump test and minimum flow bypass lines have isolation capabilities. All the pump test lines are equipped with normally closed motor-operated globe valve outside the containment that is opened only during pump testing. The RHR pump test lines discharge below the surface of the suppression pool. Thus, the lines are not directly open to the containment atmosphere, since the pool acts to seal the discharge from the containment. The LPCS and HPCS lines discharge into the air space above the suppression pool surface. All the test lines are low-pressure lines, constructed to the same quality standards as the containment. All valves can be remote manually operated from the main control room, and close automatically on a system start signal.

The minimum flow bypass line on the HPCS has a normally closed motor-operated gate valve located outside the containment while the LPCS and RHR are minimum flow bypass lines equipped with a normally open motor-operated gate valve. A high speed valve is utilized to assure that pump minimum flow requirements are met. The LPCS and RHR valves are closed when adequate flow in the pump discharge lines is established. The minimum flow bypass lines connect into the associated pump test lines outside the containment. This reduces the number of penetrations through the primary containment, thus minimizing the potential pathways for radioactive material release.

RCIC Turbine Exhaust, Vacuum Pump Discharge and RCIC Pump Minimum Flow Bypass

The RCIC turbine exhaust and vacuum pump discharge lines which penetrate the containment and connect to the suppression chamber are equipped with a normally open, motor-operated, remote manually actuated valve located as close to the containment as possible. The RCIC turbine exhaust line motor-operated isolation valve is a gate valve and the RCIC vacuum pump discharge line moter-operated isolation valve is a globe valve. In addition, there is a simple check valve upstream of the motor-operated valve which provides positive actuation for immediate isolation in the event of a break upstream of this valve. The gate valve in the RCIC turbine exhaust is designed to be locked open in the control room and interlocked to preclude opening of the inlet steam valve to the turbine while the turbine exhaust valve is not in a full open position. The RCIC vacuum pump discharge line is also normally open but has no requirement for interlocking with the steam inlet valve to the turbine. The RCIC pump minimum flow bypass line is isolated by a normally closed motor-operated globe valve with a check valve installed upstream. This valve is controlled by sensors in the RCIC pump discharge line flow and pressure. The valve is also remote manually controlled from the main control room.

The RCIC turbine exhaust line is also provided with a vacuum breaker system to prevent condensation of the exhaust steam from inducing a vacuum in the line. The vacuum relief line connects the turbine exhaust line to the suppression chamber atmosphere.

Two check valves in-series in the line prevent steam from exhausting to the vapor space above the pool, and two motor-operated globe valves provide remote manual isolation capability for the vacuum breaker line.

ECCS and RCIC Safety/Relief Valves

The safety/relief valves which serve the RHR shutdown cooling line located outside primary containment, RHR Pumps A and C suction lines, RHR Pumps A, B, and C discharge lines, RHR Heat Exchanger drain lines to the RCIC System, LPCS and HPCS suction drain lines, RHR Pumps A and B suction drain lines and discharge drain lines, RHR Pump C discharge drain line, LPCS Pump suction and pump discharge lines, and the HPCS Pump suction line and water leg pump discharge line, discharge water into the air space above the suppression pool surface. The safety/relief valve on RHR Pump B suction line discharges water below the suppression pool surface. The safety/relief valves on the RHR Heat Exchangers Shell Side and the RCIC steam supply lines to the RHR Heat Exchangers discharge steam below the suppression pool surface. The safety/relief valves are normally closed and provide a containment barrier in the lines. The thermal expansion safety/relief valve on the Unit 1 HPCS pump discharge line discharges water to the reactor building equipment drains and is normally closed. The thermal expansion safety/relief valve on the Unit 2 HPCS pump discharge line discharges water to the Unit 2 HPCS Pump Room and is normally closed. The safety/relief valves on the RCIC Lube Oil Cooler Supply Line, the RCIC System Pump suction line, and the RCIC Barometric Condenser discharge water to the reactor building equipment drains and are normally closed. Block valves cannot be added to the safety/relief valve discharge lines because they would preclude proper operation of the safety/relief valves, and are prohibited by the piping codes.

ECCS and RCIC Pump Suction Lines

The RHR, RCIC, LPCS, and HPCS suction lines contain motor-operated, remote manually actuated, gate valves which provide assurance of isolating these lines in the event of a break. These valves also provide long-term leakage control. In addition, the suction piping from the suppression chamber is considered an extension of containment since it must be available for long-term usage following a design basis loss-of-coolant accident, and as such is designed to the same quality standards as the containment. Thus, the need for isolation is conditional since the ECCS pumps take suction from the suppression pool in order to mitigate the consequences of LOCA. Therefore, their proper position for performing their safety fuction is open, not closed.

It should also be noted that the suction line of the ECCS pumps serves as the source of supply to the water leg pumps, which keep the ECCS discharge lines filled to avoid hydrodynamic effects on ECCS pump initiation. Isolating these water leg pumps from their supply source would degrade rather than improve the safe operation of the plant. However, the suction lines are provided with a motor-operated gate valve that can be remote manually closed from the control room, if required by a system line break or other highly unlikely event.

6.2.4.2.4 Miscellaneous

Compliance with regulatory guides is addressed in Appendix B.

The isolation valves have been designed against loss of function from missiles, jet forces, pipe whip, and earthquake. The containment isolation valves and valve operators have been designed to operate under normal plant and postulated accident conditions. The effects of radiation, humidity, pressure and temperature both inside and outside the containment, as defined in Chapter 3.0, have been accounted for in the valve design.

Containment isolation valves are provided with adequate mechanical redundancy to preclude common mode failures. The power supplies to the inboard isolation valves are provided from a separate electrical division than those that supply the outboard isolation valves. Therefore, a common mode failure in one electrical division would not prevent containment isolation. The vent and purge valves consist of Air Operated Valves and Motor Operated Valves. See Table 6.2-21 for specific valve characteristics.

A complete list of Primary Containment Isolation Valves is contained in Table 6.2-28.

A leak detection system has been provided to detect leakage for determining when to isolate the affected systems that require remote manual isolation. This leak detection system is described in Subsection 5.2.5.

The design provisions for testing the leakage rates of the containment isolation valves are shown in the valve arrangement drawings, Figure 6.2-31 as referenced in Table 6.2-21. The test connections indicated consist of a double-valved test line with provision for a pressure gauge attachment.

The design provision for testing the leakage rates of the containment isolation valves 2FC086 and 2FC115 is shown on valve arrangement drawing, Figure 6.2-31, Sheet 10C, Detail "AD". The test connection indicated consists of a single valve test line with a provision for a pressure gauge attachment.

6.2.4.3 Design Evaluation

The main objective of the containment isolation system is to provide protection by preventing releases to the environment of radioactive materials. Redundancy is provided in design aspects to satisfy the requirement that an active failure of a single valve or component does not prevent containment isolation: Mechanical components are redundant, as shown by the isolation valve arrangements.

Electrical redundancy is provided in isolation valve arrangements to eliminate dependence on a single power source to attain isolation. Electrical cables for isolation valves in the same process line have been routed separately. Cables have been selected based upon the specific environment to which they will be subjected.

Provisions ensure that the position of all nonpowered isolation valves is maintained. For all powered valves, the position is indicated in the main control room. A discussion of the instrumentation and controls associated with the isolation valves is given in Chapter 7.0.

In single failure analysis of electrical systems, no distinction is made between mechanically active or passive components; all fluid system components such as valves are considered "electrically active" whether or not "mechanical" action is required.

Electrical systems as well as mechanical systems are designed to meet the single failure criterion for both mechanically active and passive fluid system components regardless of whether that component is required to perform a safety action. Even though a component such as an electrically operated valve is not designed to receive a signal to change state (open or closed) in a safety scheme, it is assumed as a single failure that the system component changes state or fails. Electrically operated valves include valves that are electrically piloted but air operated as well as valves that are directly operated by an electrical device. In addition, all electrically operated valves that are automatically actuated also can be manually actuated from the main control room. Therefore, a single failure in any electrical system is analyzed regardless of whether the loss of a safety function is caused by component failing to perform a requisite mechanical motion or a component performing an unnecessary mechanical motion.

6.2.4.4 Tests and Inspections

A discussion of the testing and inspection pertaining to isolation valves is provided in Subsection 6.2.6, the Technical Specifications, and Table 6.2-21.

6.2.5 Combustible Gas Control in Containment

In order to assure that the containment integrity is not endangered due to the generation of combustible gases following a postulated LOCA, systems for controlling the relative concentrations of such gases are provided within the plant. The system includes subsystems for mixing the containment atmosphere, monitoring hydrogen concentration, reducing combustible gas concentrations, and, as a backup, purging. The hydrogen recombining function of the hydrogen recombiners is abandoned in place.

6.2.5.1 Design Bases

The hydrogen recombining function of the hydrogen recombiners is abandoned in place. The valves that provide RHR cooling water to the hydrogen recombiners are also abandoned in place in the closed position. The blower and associated piping are not abandoned and remain operational to maintain the drywell mixing function. The design basis information for the hydrogen recombination function remains for historical reference.

The following design bases were used for the combustible gas control system design:

a. A double-ended rupture of a main recirculation line results in the most rapid coolant loss and reactor depressurization, with the coolant being discharged from both ends of the break. The noncondensable gas initially in the drywell is forced into the suppression chamber during the RPV depressurization phase. This transfer process takes place through downcomers that connect the drywell and suppression chambers. The postulated metal-water reaction begins in the core region and is assumed to produce hydrogen immediately after the recirculation pipe breaks. The reaction would last 2 minutes during which 0.945% of the active Zircaloy fuel cladding has reacted. The radiolysis of the coolant in the core region, water sump on the drywell floor and suppression pool also is assumed to begin immediately. The hydrogen and oxygen thus generated will evolve to drywell and suppression chamber atmospheres.

b. The combustible gas control system has the capability for monitoring the hydrogen concentration in drywell and suppression chamber and alarming as the hydrogen concentration reaches 4%. It also has the capability of mixing the atmospheres of both drywell and suppression chamber. It also will control the combustible gas concentrations in the primary containment without reliance on purging and without the release of radioactive material to the environment.

c. The primary systems for combustible gas control, including measuring, meet the design, quality assurance, redundancy, energy source, and instrumentation requirements for an engineered safety feature system according to Appendix A of 10 CFR 50.

d. The combustible gas control system will be activated after a LOCA in time to assure that the hydrogen concentration does not exceed 4 volume percent of hydrogen in either the drywell or wetwell atmospheres. In addition, the LSCS containment is nitrogen inerted to an oxygen concentration of 4% by volume. This is below the combustible limit of oxygen in hydrogen but still provides enough oxygen to react with all the hydrogen that would be produced by the metal water reaction.

e. One recombiner system is provided for each nuclear unit. Each recombiner is capable of being cross-connected to the other unit to provide 100% redundancy. The recombiners are located outside of the primary containment in an accessible area and, therefore, routine maintenance, testing and/or inspection can be performed during normal plant operation or shutdown conditions.

f. The components of the combustible gas control system are protected from missiles and pipe whip to assure proper operation under accident conditions as required for safety-related systems. The system has been designed to perform in the event of failure of any one of its active components.

g. The combustible gas control systems are designed as Seismic Category I devices. As previously mentioned, the units are capable of being cross-connected to provide redundancy and are further capable of withstanding the temperature and pressure transients resulting from a LOCA. All components that can be subjected to containment atmosphere are capable of withstanding the humidity, temperature, pressure, and radiation conditions in the containment following a LOCA.

h. The combustible gas control system is designed to remain operable in the postaccident environment in the reactor building. Components subjected to the reactor containment postaccident environment are likewise designed for those conditions.

i. The combustible gas control system recombiner units are located outside of the primary containment in an accessible area. They can be inspected or tested during normal plant operation or during shutdown conditions.

j. The hydrogen recombiner units are fixed units that are permanently installed; therefore, it is not necessary to have the ability to transport them.

k. The recombiner units are remotely started from the control room and the local control panel in the auxiliary electric equipment room. They are designed such that there are no local operating adjustments required on a unit operating in a post-LOCA environment. This fact eliminates the necessity of biological shielding.

6.2.5.2 System Design

The combustible gas control system consists of four subsystems: a mixing system, a hydrogen monitoring system, two hydrogen recombiners, and a purge system. The design features of these four systems are described in the following sections.

The hydrogen recombining function of the hydrogen recombiners is abandoned in place. The valves that provide RHR cooling water to the hydrogen recombiners are also abandoned in place in the closed position. The blower and associated piping are not abandoned and remain operational to maintain the drywell mixing function. The design basis information for the hydrogen recombination function remains for historical reference.

Hydrogen Mixing System

The function of the mixing subsystem is to ensure that local concentrations with greater than 4% hydrogen cannot occur within the primary containment following a LOCA.

The atmospheres of both drywell proper and suppression chamber area, each of which is a single compartment, are well mixed. The mixing is achieved by natural convection processes. Natural convection occurs as a result of the temperature difference between the bulk gas space in the vessel and the containment wall. The natural convective action is enhanced by the momentum of steam emitted from the point of rupture. There are two interior subcompartments where gases may not achieve thorough mixing with the bulk containment atmosphere. The drywell head area, which is for reactor vessel refueling purposes, is one such subcompartment. The other is the control rod drive area immediately below the reactor pressure vessel. The physical arrangements and/or location of the monitoring system and the hydrogen recombiner system are such that concentrations above the 4% limit of combustible gases will not occur.

The atmosphere between the drywell and suppression pools will be mixed during the depressurization phase of the LOCA. The hydrogen recombiner units will also serve to affect mixing between these two compartments. The hydrogen recombiner will take suction on the drywell and discharge to the suppression pool. This will in turn cause the atmosphere from the suppression pool to circulate into the drywell via the vacuum breaker lines.

The monitoring system will alert the operator of the concentration within these subcompartments and the positions of the effluent and suction points of the recombiner will preclude the building of concentrations above the limit in these areas as well as the drywell and wetwell proper.

Hydrogen Monitoring System

The hydrogen monitoring system forms a part of the primary containment monitoring system which is discussed in Subsection 7.5.2.

Hydrogen Recombiner System

The concentration of combustible gases in the primary containment (drywell and suppression pool areas) following a LOCA is controlled by the hydrogen recombiner system. The combustible gas control system contains one hydrogen recombiner per reactor unit. The hydrogen recombiner is located outside of the primary containment. The amount of Hydrogen in the effluent gas being returned to the wetwell shall not exceed 0.1% by volume. The system will process the primary containment atmosphere at a rate of at least 125 scfm using a blower to supply containment gases to the recombiner. The recombination process takes place within the recombiner as a result of an exothermic reaction. The steam is then cooled and the resulting water and remaining gases are returned to the primary containment. Suction is taken from the drywell area, and the discharge is returned to the suppression pool area above water level.

The hydrogen recombiner unit is skid mounted and is an integral package. All pressure containing equipment including piping between components is considered as an extension of the containment and, therefore, is designed as ASME III Class 2. The skid and the equipment mounted on it are designed to meet Seismic Category I requirements. The hydrogen recombiner system is designed to accommodate conditions present in the containment (temperature and pressure) following a LOCA event. Piping and instrumentation for the system are shown in Drawing No. M-130. The hydrogen recombiner unit, which requires a 1-2 hour warmup period, is initiated manually from the control room and the local control panel in the aux. electric equipment room. It is initiated prior to primary containment hydrogen concentration reaching 3 volume percent which occurs approximately 5 hours after the accident. Based on the original core loading, the time at which containment hydrogen generation reaches 4 volume percent varies with fuel types located in the core. However, this is acceptable based on Design Basis described in Section 6.2.5.1.d. Once placed in operation, the system continues to operate until it is manually shut down when an adequate margin below the hydrogen concentration design limit is reached. The operation of the system can be tested from the control room or the auxiliary equipment room. The test consists of energizing the blower and heaters and observing system operation to see if components are performing properly. Flow and pressure measurement devices are periodically calibrated.

The hydrogen recombiner system is serviced by electrical power and cooling water systems, which are placed in operation concurrent with a loss-of-coolant accident. Cooling water required for the operation of the system is taken from the residual heat removal system. The cooling water is utilized to cool the water vapor and the residual gases leaving the recombiner prior to returning them to the containment. All hydrogen recombiner unit cooling water is returned to the suppression pool.

Each recombiner unit has the capability of serving either containment; therefore, there is 100% redundancy of all components and controls.

All functions and controls necessary to start the combustible gas control system are also located in the control room and in the auxiliary electric equipment room which is readily accessible from the control room.

6.2.5.3 Design Evaluation

The hydrogen recombining function of the hydrogen recombiners is abandoned in place. The valves that provide RHR cooling water to the hydrogen recombiners are also abandoned in place in the closed position. The blower and associated piping are not abandoned and remain operational to maintain the drywell mixing function. The design basis information for the hydrogen recombination function remains for historical reference.

6.2.5.3.1 General

In evaluating the combustible gas control system design, it was found necessary to consider:

a. hydrogen generated in the post-LOCA environment,

b. resultant drywell and containment concentrations, and

c. the functional requirements of the combustible gas control system.

The following analytical results are provided:

a. The beta, gamma, and beta plus gamma energy release rates plotted as functions of time (Figure 6.2-32).

b. The integrated beta, gamma and beta plus gamma energy release plotted as functions of time (Figure 6.2-33).

c. The integrated production of combustible gas within the containment (drywell and suppression chamber) plotted as a function of time for each source (i.e., metal-water reaction and radiolysis) (Figure 6.2-34).

d. The concentration of combustible gas in the drywell and suppression chamber plotted as a function of time, if uncontrolled (Figure 6.2-35). This curve establishes the basis for activation of the combustible gas control system.

e. The combustible gas concentration in the containment (drywell and suppression chamber) plotted as a function of time with (125 scfm) 100% recombiner capacity initiated at 5 hours after LOCA (Figure 6.2-36).

6.2.5.3.2 Sources of Hydrogen

Short-Term Hydrogen Generation

In the period immediately after the LOCA, hydrogen is generated by both radiolysis and metal-water reaction. However, in evaluating short-term hydrogen generation, the contribution from radiolysis is insignificant when compared to the hydrogen generated by the metal-water reaction. The only metal-water reaction considered to be significant is reaction of water with the zirconium fuel cladding which produces hydrogen by the following reaction:

$$Zr + 2H_2O \rightarrow ZrO_2 + 2H_2$$

Based on loss-of-coolant accident calculational procedures and the analyses of emergency core cooling system (ECCS) performance in conformance with 10 CFR 50.46 and Appendix K, the extent of the above chemical reaction is estimated to be 0.1% of the fuel cladding material. However, the metal-water reaction-generated hydrogen based on a core-wide penetration of 0.00023 inches for 764 bundles with each bundle containing 101 pounds of zirconium in the active fuel cladding, results in a 0.945% metal-water reaction. Therefore, 0.945% of fuel cladding, which is greater than five times the maximum amount calculated in accordance with 10 CFR 50.46, is assumed to react with water to produce hydrogen. The duration of this reaction is assumed to be 120 seconds with a constant reaction rate. The resulting hydrogen is assumed to be uniformly distributed in the drywell containment. This assumption is supported by the test data reported in BNWL 1592 of July 1971. Figure 6.2-34 presents the accumulated hydrogen generation as a result of this chemical reaction.

Long-Term Hydrogen Generation

Hydrogen is also produced by decomposition of water due to absorption of the fission product decay energy immediately after LOCA.

$$2H_2O \rightarrow 2H_2 + O_2$$

Generation of hydrogen and oxygen due to radiolysis of coolant water is an important factor in determining the long-term gas mixture composition within the containment compartments. Conservative assumptions were used to determine the fission product distribution model that applies after the accident and, therefore, the hydrogen generation rates. The incore radiolysis contributes hydrogen to the drywell, and radiolysis of the suppression pool water contributes hydrogen directly to the suppression chamber. Hydrogen is also discharged from the radiolysis of sump water on drywell floor into the drywell atmosphere. The total decay energy utilized in the analyses was based on American Nuclear Society Standard ANS 5.1-1979 multiplied by a factor of 1.2, conservatively assuming a 1000-day reactor operating time at constant full power level to determine the fission product buildup. Halogen and noble gas inventories were determined from TID-14844.

Hydrogen can also be formed by corrosion of metals in the containment. The significant portion of this source is from the corrosion of zinc and aluminum. Since the spray system uses only demineralized water for the purpose of reducing temperature and pressure inside the drywell, the corrosion of aluminum and zinc will contribute a negligible amount of hydrogen to the containment atmosphere. Hydrogen is, during normal operation of the plant, dissolved in the primary system water. Figure 6.2-35 presents the accumulated hydrogen and oxygen generation from both chemical reaction and radiolysis decomposition of water.

6.2.5.3.3 Accident Description

A complete description of the post-LOCA conditions is found in Subsection 6.2.1 and Section 6.3.

Following the postulated LOCA, the postulated metal-water reaction begins in the core region and is assumed to produce hydrogen immediately after the recirculation pipe breaks. The reaction lasts 2 minutes during which 0.945% of the active zircaloy fuel cladding reacts. The radiolysis of the coolant in the core region, water sump on the drywell floor and suppression pool is assumed to begin immediately. The hydrogen and oxygen thus generated will evolve to drywell and suppression chamber atmospheres. The hydrogen concentration in the drywell would, after about 15 hours, approach the flammability limit if uncontrolled. The hydrogen recombiner system is manually activated before the hydrogen concentration reaches 3 volume percent. The recombiner system takes gases from the drywell atmosphere, recombines the hydrogen with oxygen to form water vapor, and returns the resulting cooled water and remaining gases to the suppression chamber. The pressure buildup in the suppression chamber due to the operation of recombiner system taking suction on the drywell and discharging to the suppression pool will cause the opening of the vacuum breaker valves between the drywell and suppression chamber. As a result, the flow of the gas mixture from the wetwell to the drywell will balance the negative pressure differential between two volumes and will also result in lower concentrations due to the influx of the wetwell gases.

6.2.5.3.4 Analysis

Based on the above hydrogen sources and the accident description, the hydrogen concentration in the drywell and suppression chamber is calculated as a function of time. In formulating the model of the Mark II containment for these calculations, a conservative assumption is made, namely the interchange of mass between the drywell and the suppression chamber through downcomers which takes place during blowdown process is neglected, that is, no hydrogen is removed from the drywell except through the recombiner system. This assumption is conservative, as it results in a shorter time for the drywell hydrogen concentration to reach the flammability limit. Furthermore, the hydrogen and oxygen gases can flow back to the drywell from suppression chamber through vacuum breakers due to pressure increase in the suppression chamber by the operation of the recombiner system.

Table 6.2-22 gives all of the necessary parameters used to determine the amount of hydrogen generation in the LSCS analysis. The results of the analyses are presented in Figures 6.2-35 and 6.2-36. It was determined that the uncontrolled hydrogen concentration in the drywell eventually reaches 4% by volume (dry basis) approximately 15 hours after the LOCA. The suppression chamber hydrogen concentration was determined to be 3.0% by volume due to radiolytic hydrogen generation. Prior to the drywell concentration reaching 3% by volume, a recombiner system is activated. A single system is designed to keep the hydrogen concentration below 4% by volume at all times until radiolytic generation has ceased. The performance of the recombiner system, which is initiated 5 hours after LOCA, is shown in Figure 6.2-36. The hydrogen concentration is 3.0% by volume at the time of initiation. Thus, the use of a single 125 scfm recombiner system provides effective control of hydrogen concentration and, therefore, would prevent the formation of combustible gas mixture in both drywell and suppression chamber.

6.2.5.4 Testing and Inspections

Each active component of the combustible gas control system is testable during normal reactor power operation.

The combustible gas control systems and the containment purge system will be tested periodically to assure that they will operate correctly. Preoperational tests of the combustible gas control system are conducted during the final stages of plant construction prior to initial startup (Chapter 14.0). These tests assure correct functioning of all controls, instrumentation, recombiners, piping, and valves. System reference characteristics, such as pressure differentials and flow rates, are documented during the preoperational tests and are used as base points for measurements in subsequent operational tests.

6.2.5.5 Instrumentation Requirements

The instrumentation provisions for actuating the combustible gas control system and monitoring the system are described in Subsection 7.3.5.

6.2.6 Containment Leakage Testing

This section presents the testing program for the reactor containment, containment penetrations and containment isolation barriers that comply with the requirements of the General Design Criteria and Appendix J to 10 CFR 50. Each of the tests described in this Subsection was performed as a preoperational and will be performed as a periodic test.

6.2.6.1 Containment Integrated Leakage Rate Test

Following the completion of the construction, repair, inspection, and testing of welded joints, penetrations, and mechanical closures including the satisfactory completion of the structural integrity tests as described in Subsection 3.8.1.7, a preoperational containment leakage rate test was performed to verify that the actual containment leak rate does not exceed the design limits. In order to ensure a successful integrated leak rate test, local leakage tests (Type B and C tests) were performed on penetrations and isolation valves, and repairs are made, if necessary, to ensure that leakage through the containment isolation barriers does not exceed the design limits.

An integrated leakage rate test is then performed on the entire containment in order to determine that the total leakage (exclusive of MSIV leakage) through containment isolation barriers does not exceed the maximum allowable leakage rate of 0.635% per day at the calculated peak containment internal pressure at 39.9 psig. The pertinent test data, including test pressures and acceptance criteria, is presented in Table 6.2-23.

Pretest requirements have been described in the preoperational test abstract included in Chapter 14.0 of the FSAR. As stated therein, power operated isolation valves will be closed by their actuators prior to the start of the integrated leakage rate test.

During the integrated leak rate test the containment systems are configured as follows;

a. Reactor building closed cooling water - lined up for normal operation; isolation valves closed and system filled.

b. Primary containment chilled water - lined up for normal operation; isolation valves closed and system filled.

c. Residual heat removal - One loop lined up in shutdown cooling mode. Other loops lined up in low-pressure coolant injection standby mode and isolated, containment and suppression pool spray flow paths isolated, full flow test lines isolated, reactor head cooling flow path isolated, minimum flow isolated, shutdown cooling discharge line isolated on standby system and condensate discharge from RHR heat exchangers shell side flow path isolated; system filled.

d. Low-pressure core spray - system filled and isolated.

e. High-pressure core spray - system filled and isolated.

f. Reactor core isolation cooling - isolation valves closed; RCIC condensate filled and isolated. RCIC full flow test return line to suppression pool filled and isolated.

g. Reactor water cleanup - suction line filled and isolated; return line filled and isolated.

h. Standby liquid control - lines filled and isolated.

i. Control rod drive - lined up in scram conditions; pumps off, system filled.

j. Reactor recirculation system - pumps off, system filled.

k. RPV and primary containment instrumentation - lines filled and vented to containment instrumentation to the RPV or drywell will be opened.

l. Neutron monitoring sytem (TIP) - TIPs will be fully withdrawn and the ball valves closed.

m. Floor and equipment drains - sumps pumped down to low water level, isolation valves closed.

n. Clean condensate - drained and vented, isolation valves closed, spool piece removed and blind flange installed or filled and isolated and system leakage added to type A result.

o. Service air - vented, isolation valves closed, spool piece removed and blind flange installed.

p. Feedwater - filled and isolated.

q. Main steam - filled, isolation valves closed.

r. Containment monitoring - post-LOCA monitoring system open to containment, pumps off, valves open; drywell monitoring and sampling system isolated, pumps off.

s. Post-LOCA hydrogen control - lined up for unit operation, isolation valves open or isolated and system leakage added to type A result.

t. Primary containment instrument air - all accumulators vented, isolation valves closed.

u. Fuel Pool Cooling - Cycled Condensate to Refueling Bellows filled and isolated, Reactor Well Drain filled and isolated.

v. All accessible liner leak test channel plugs are verified installed.

The Type C leak rates for the following penetrations are added to the Type A test results on a Minimum-Path Basis:

a. reactor building closed cooling water,

b. primary containment chilled water,

c. RHR shutdown cooling suction,

d. reactor core isolation cooling steam supply,

e. reactor water cleanup suction,

f. reactor water sample,

g. floor and equipment drains,

h. inboard MSIV drain,

i. Feedwater Lines,

j. RCIC Full Flow Test Return Line to Suppression Pool.

k. Cycled Condensate to Refueling Bellows

l. Reactor Well Drain

Measures will be taken to ensure stabilization of the containment conditions prior to containment leakage rate testing.

The test method utilized is the absolute method, as described in ANSI/ANS 56.8-1994. The test procedure, test equipment and facilities, period of testing, and verification of leak test accuracy also follow the recommendations of ANSI/ANS 56.8-1994.

The acceptance criteria for the preoperational containment integrated leakage rate test are in compliance with the criteria given in Appendix J of 10 CFR 50. except as noted below. Structural verification test acceptance criteria are described in Subsection 3.8.1.7.

The acceptance criteria for the periodic containment integrated leakage rate test are in compliance with the criteria given in 10CFR50 Appendix J Option B, NRC Reg Guide 1.163, NEI-94-01, Rev. 0, and ANSI/ANS 56.8-1994. The As-Found Type A test leakage must be less than the acceptance criterian of 1.0 La (Primary Containment overall leakage rate acceptance criterion). During the first unit startup following testing (prior to entering a mode where containment integrity is required) the As-Left Type A leakage rate shall not exceed 0.75 La.

6.2.6.2 <u>Containment Penetration Leakage Rate Test</u>

Containment penetrations whose design incorporates resilient seals, gaskets, or sealant compounds; air lock door seals, equipment and access doors with resilient seals or gaskets; and other such penetrations received a preoperational and will be periodically leak tested in accordance with Appendix J of 10 CFR 50 except as noted in the following paragraph.

The following penetrations were preoperationally and will be periodically tested to Type B criteria:

a. equipment access hatch,

b. personnel air lock, by (when containment integrity is required, the personnel airlock should be tested within 7 days after each containment access except when the airlock is being used for multiple entries, then at least once per 30 days, by verifying seal leakage to be less than or equal to 5 scfh when the gap between the door seals is pressurized to greater than or equal to 10 psig - exception to 10 CFR 50 Appendix J) overall air lock leakage rate is less than or equal to 0.05 La when tested at greater than or equal to Pa.

c. drywell head,

d. suppression chamber access hatches,

e. CRD removal hatch,

f. electrical penetrations,

g. TIP penetration flanges, SA flange and MC flange,

h. Drywell to suppression pool vacuum breaker and associated manual isolation valves flanges and actuator seals,

i. Vent and purge isolation valve flanges, and packing

j. HPCS minimum flow line branch line 1(2)HP20C-2" Blind flanges

k. RCIC spectacle flange 1(2)E51-D316 blind flange half when required. See Table 6.2-21 note 49.

l. ECCS Relief Valves Discharging to Suppression Pool Inbound (Containment Side) Flanges.

It should be noted that no pipe penetrations are provided with expansion bellows. The containment penetration is an anchor point in the system, and the thermal movements have been accounted for on this basis. Therefore, no leakage rate testing of expansion bellows penetration assemblies will be required.

Test methods utilized to determine containment penetration leak rates are described as follows:

a. Equipment Access, CRD Removal, and Suppression Chamber Acess

The equipment access hatch has been furnished with a double-gasketed flange and bolted dished door, as shown in Figure 3.8-34. The CRD removal and suppression chamber access hatches have been furnished with a double-gasketed flange and bolted door. Provision is made to test pressurize the space between the double gaskets of the door flanges and the doors.

b. Personnel Air Lock

The personnel lock is constructed as a double-door, latched, welded steel vessel, as shown in Figure 3.8-33. The space between the air doors can be pressurized to peak containment pressure through the test connections provided. Each of the doors are provided with a test connection for pressurizing between the seals.

In addition, all four shaft seal assemblies are provided with a test connection to allow for individual shaft seal leak test.

c. Drywell Head

A double-gasketed seal and test tap, as shown in Figure 3.8-5, is provided for leak rate testing of the drywell head.

d. Electrical Penetrations

Each electrical penetration, as represented in Figure 3.8-21 and listed in Table 3.8-1 (with an "E" penetration number), is provided with a pressure gauge to monitor leakage. The double-gasketed and O-ring seals are provided with a test connection for leak rate testing.

e. Tip Penetration Flanges, Clean Condensate (MC) and Service Air (SA) Penetrations

Each TIP MC or SA penetration flange is provided with a double-gasketed seal and a test connection for type B leak testing.

f. Drywell to Suppression Pool Vacuum Breakers

Each drywell to suppression pool vacuum breaker has two double-gasketed flanges and a manual actuator O-ring and shaft seal. These seals are provided with test connections for leak testing. The Vacuum Breaker line manual isolation valves have a double-gasketed flange on the inboard or containment side provided with test connections for leak testing. The outboard flanges on the manual isolation valves are leak tested by pressurizing the entire vacuum breaker line and performing soap bubble test on the outboard flange. The stem seal or packing of these valves will be tested either locally or by primary containment pressurization and subsequent soap bubble inspection.

g. Vent and Purge Isolation Valves

Each inboard vent and purge valve has a double-gasketed flanged seal on its containment side. These seals are provided with test connections for leak testing. The stem packing of these valves is also provided with a test connection for packing leak test. See also Table 6.2-21 Note 41.

h. HPCS Minimum Flow Line Blind Flanges

One double-gasketed blind flange is installed on each of the HPCS minimum flow line branch connections 1(2)HP20C-2". These flanges are provided with a test connection for type B leak testing.

i. RCIC Spectacle Flange 1(2)E51-D316

The installed blind flange half of spectacle flange 1(2)E51-D316 is tested by pressurizing with air the upstream RCIC full flow test return line to Condensate Storage Tank and then check for leaks at the flange upstream gasket joint. Done when required per Table 6.2-21 note 49.

j. ECCS Relief Valves' Containment Side Flanges are Type B tested by one of the following methods: Test Port/Testable Gasket; Primary Containment Pressurization and subsequent soap bubble inspection; Special Test Equipment mounted over the flange thus pressurizing against the gasket.

Test pressures are given in Table 6.2-23.

The acceptance criteria for the preoperational containment penetration leakage rate test is in compliance with the criteria given in Appendix J of 10 CFR 50. The periodic test acceptance criteria is established in accordance with the LaSalle County Station Local Leak Rate Test Program, and also is in agreement with Appendix J Option B of 10 CFR 50, NRC Regulatory Guide 1.163, Nuclear Energy Institute NEI-94-01 Rev. 0, and ANSI/ANS-56.8-1994.

6.2.6.3 Containment Isolation Valve Leakage Rate Test

Those containment isolation valves that are to receive a Type C test are so indicated in Table 6.2-21.

Test taps for leakage rate testing have been provided on the lines associated with the containment isolation valves. These taps are indicated on the valve arrangement drawings associated with Table 6.2-21. The test method is as described in Appendix J of 10 CFR 50. Test pressures are shown in Table 6.2-23.

The acceptance criteria for the leakage rate testing is given in Table 6.2-23 and the Primary Containment Leak Rate Testing Program.

6.2.6.4 Scheduling and Reporting of Periodic Tests

The periodic leakage test schedule is given in the LaSalle County Station Leak Rate Test Program.

6.2.6.5 Special Testing Requirements

The secondary containment will be tested as required by the Technical Specifications.

6.2.7 References

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2. A. J. James, "The General Electric Pressure Suppression Containment Analytical Model, (NEDO-10320), April 1971.

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4. K. V. Moore and W. H. Ratting, "RELAP 4-A Computer Program for Transient Thermal-Hydraulic Analysis, "ANCR-1127, Aerojet Nuclear Company, December 1973.

5. F. J. Moody, "Maximum Rate of a Single Component, Two Phase Mixture," Journal of Heat Transfer, Transactions, American Society of Mechanical Engineers, Vol. 87, No. 1, February 1965.

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7. "RELAP 4/MOD5 A Computer Program for Transient Thermal- Hydraulic Analysis of Nuclear Reactors and Related Systems," ANCR-NUREG-1335, Aerojet Nuclear Company, September 1976.

8. NEI 94-01, Rev. 0, July 26, 1995, Nuclear Energy Institute Industry Guideline for Implementing Performance-Based Option of 10CFR Part 50 Appendix J.

9. ANSI/ANS 56.8-1994, American National Standard for Containment System Leakage Testing Requirements.

10. GE Document EAS-49-0888, "Justification of Continued Operation With Increased Suppression Pool Temperature at LaSalle County Station," Revision 1, August 1988. (Proprietary)

11. Technical Specification Submittal Letter Sections 3.6.2.1 and 4.6.2.1, dated 10-07-88.

12. Amendment 67 for Unit 1 (Facility Operating License NFP-11), and Amendment 49 for Unit 2 (Facility Operating License NFP-18), dated July 7, 1989.

13. Calc. L001799, Rev. 0, "Assessment of Containment Line Base Mat Reactor Pedestal, Downcomer Bracing, Drywell Floor & Suppression Pool Columns for Suppression Pool Temperature Increase."

14. Calc. L001800, Rev. 0, "Assessment of Containment Wall for Suppression Pool Temperature Increase"

15. Calc. L001810, Rev. 0, "Impact of Increase in the Suppression Pool Temperature at LaSalle on Design Basis Suppression Pool Dynamic Loads."

16. Letter from ComEd NFS dated 5-07-98, Nuclear Fuel Services Letter, NFS:BSA:98-055, dated 5-08-98, from R.W. Tsai to G. Campbell, "Impact of Initial Suppression Pool Temperature on Hydrogen Generation"

17. Calc. 3C7-0181-003, Rev. 3, "Suppression Pool Temperature Transient Studies"

18. General Electric Letter Report GE-NE-B13-01920-013, January 1998, "Current Suppression Pool Water Temperatures Following a Design Basis Accident for LaSalle County Station Units 1 and 2"

19. General Electric Report EAS-083-1188, "Elimination of the High Suppression Pool Temperature Limit for LaSalle County Station Units 1 & 2", dated November 1988.

20. General Electric Letter Report GE-NE-T23-00762-00-01, July 1998, "Evaluation of Peak Suppression Pool Temperature with Assumption of Feedwater Coastdown and Reduced RHR Flow Rate During Long-Term Containment Cooling"

21. Letter from J. A. Benjamin (ComEd) to U. S. NRC, “Request for a Change to the Technical Specifications, 'Vacuum Relief System'” dated August 6, 1999.

22. Letter from J. A. Benjamin (ComEd) to U. S. NRC, “Supplemental Information to Request for a Change to the Technical Specifications to Vacuum Relief System” dated November 15, 1999.

23. Letter dated December 21, 1999 from D. M. Skay to O. D. Kingsley, “Issuance of Amendments, approved amendment 138 for LaSalle Unit 1 and amendment 122 for LaSalle Unit 2.”

24. Licensing Topical Report, “Generic Guidelines for General Electric Boiling Water Reactor Power Uprate,” NEDC-31897P-A, May 1992.

25. LaSalle County Station Power Uprate Project, Task 400, "Containment System Response,” GE-NE-A1300384-02-01R1, Revision 1, October 1999 (and Task Report Changes based on Steam Plume Analysis, GE-LPUP-332, dated 5/4/2000).

26. General Electric Company, “General Electric Company Analytical Model for Loss-of Coolant Analysis in Accordance with 10CFR50 Appendix K,” NEDO-20566A, September 1986.

27. ComEd letter to NRC, "Response to Request for Additional Information License Amendment Request for Power Uprate Operation," dated 3/31/2000.

28. General Electric Company, NEDO-30832, “Elimination of Limit on Local Suppression Pool Temperature for SRV Discharge with Quenchers,” Class I, December 1984, (NRC approved version with NRC Safety Evaluation Report issued as NEDO-30832-A, Class I, May 1995).

29. General Electric Analysis of LaSalle Steam Plume Ingestion Potential, NSA 00-116, dated 3/29/2000.

30. LaSalle County Station Power Uprate Project, Task 401, "Annulus Pressurization,” GE-NE-A1300384-06-01, Revision 0, June 1999.

31. Design Analysis No. L-002874, Rev. 0, “LaSalle County Station Power Uprate Project Task 400: Containment System Response (GE-NG-A1300384-02-01 R3) Revision 3”.

32. EC #334017, Rev. 0, “Increased Cooling Water Temperature Evaluation to a new Maximum Allowable of 104°F.”

TABLE 6.2-1
(SHEET 1 OF 2)

CONTAINMENT DESIGN PARAMETERS

	DRYWELL	SUPPRESSION CHAMBER
A. Drywell and Suppression Chamber		
1. Internal design pressure, psig	45	45
2. External design pressure, psig	5	5
3. Drywell deck design differential pressure, psid		
a) Downward	25	25
b) Upward	5	5
4. Design temperature, °F	340	275
5. Drywell (including vents) net free volume, ft^3	229,538	
6. Design leak ratio, %/day @ 45 psig	0.5	0.5
7. Suppression chamber free volume, ft^3		
a) minimum		164,800
b) maximum		168,100
8. Suppression chamber water volume		
a) Minimum, ft^3		128,800
b) Maximum, ft^3		131,900
9. Pool cross-section area, ft^2		
a) Water surface (excluding pedestal and drywell floor support columns)		4999
b) Total		5899
10. Pool depth (normal), ft		26.5

TABLE 6.2-1
(SHEET 2 OF 2)

	DRYWELL	SUPPRESSION CHAMBER
B. Vent System		
1. Number of downcomers		98
2. Internal downcomer diameter, in.		23.5
3. Total vent area, ft^2*		295
4. Downcomer submergence*		12 ft 4 in. (maximum)
5. Downcomer loss factor*		5.2

* The actual limiting area is 232 ft^2 based on the opening size through the downcomer protective covers (top hats). The corresponding loss factor is 3.2. However, since the analysis requires that the entrance losses, pipe losses and exit losses be based on a single area, the higher loss factor of 5.2 was utilized, resulting in a higher pressure and, therefore, a more conservative analysis.

TABLE 6.2-2
(SHEET 1 OF 2)

ENGINEERED SAFETY SYSTEMS INFORMATION FOR CONTAINMENT RESPONSE ANALYSES
(AT 3434 MWt)

	CONTAINMENT ANALYSIS VALUE*			
	FULL CAPACITY	CASE A	CASE B	CASE C
A. Drywell Spray System (RHR system)				
1. Number of pumps	2	2	1	0
2. Number of lines	2	2	1	0
3. Number of headers	2	2	1	0
4. Spray flow rate, gpm/pump	6700	6700	6700	0
5. Spray thermal efficiency, %	---	---	---	---
B. Suppression Pool Spray (RHR system)				
1. Number of pumps	2	2	1	0
2. Number of lines	2	2	1	0
3. Number of headers	1	1	1	0
4. Spray flow rate, gpm/pump	450	450	450	0
5. Spray thermal efficiency, %	---	---	---	---
C. Containment Cooling System (RHR system)				
1. Number of pumps	2	2	1	1
2. Pump capacity, gpm/pump	7450**		7450	
3. Heat exchangers				
a. Type - inverted U-tube, single pass shell, multipass tubes, vertical mounting				
b. Number	2	2	1	1
c. Heat transfer area, ft^2 /unit	11,000	11,000	11,000	11,000
d. Overall heat transfer coefficient, Btu/hr - ft^2 - °F	215			

* Cases A, B, and C defined in Table 6.2-5.

** A supplementary evaluation has been performed for a slightly reduced RHR pump flow rate of 7200 gpm (suppression pool cooling mode); as discussed in Section 6.2.2.3.4 long term suppression pool temperature is not significantly impacted and the peak long term pool temperature does not exceed the 200°F maximum value given in Table 6.2-5.

TABLE 6.2-2
(SHEET 2 OF 2)

	FULL CAPACITY	CONTAINMENT ANALYSIS VALUE*		
		CASE A	CASE B	CASE C
e. Secondary coolant flow rate per exchanger, lb/hr	3.7×10^6	---	3.7×10^6	---
f. Design service water temperature (CSCS)				
Minimum, °F	32			
Maximum, °F	100	100	100	100
D. ECCS Systems:				
1. High-pressure core spray (HPCS)				
a. Number of pumps	1	1	1	1
b. Number of lines	1	1	1	1
c. Flow rate, gpm	6200	6200	6200	6200
2. Low-pressure core spray (LPCS)				
a. Number of pumps	1	1	0	0
b. Number of lines	1	1	0	0
c. Flow rate (rated), gpm/line	6250	6250	0	0
d. Number of headers	2	2	0	0
3. Low-pressure coolant injection (LCPI)				
a. Number of pumps	3	3	1	1
b. Number of lines	3	3	1	1
c. Flow rate, gpm/line	7067	7067	7067	7067
4. Residual heat removal (RHR)				
a. Pump flow rate:				
Shell side	7450**			
Tube side	7400			
b. Source of cooling water		RHR service water		
c. Flow begins, seconds		Manual, approximately 600 ***		
E. Automatic Depressurization System				
1. Total number of safety/relief valves	18			
2. Number actuated on ADS	7			

*** Refer to Section 6.2.2.3.6 for further discussion on the sensitivity of this time period.

* Cases A, B, and C defined in Table 6.2-5.

TABLE 6.2-3
(SHEET 1 OF 2)
(AT 3434 MWt)

INITIAL CONDITIONS EMPLOYED
IN CONTAINMENT RESPONSE ANALYSES

A. Reactor Coolant System (at 105% rated steam flow and at normal liquid levels)

1.	Reactor power level, MWt	3434
2.	Average coolant pressure, psig	1025
3.	Average coolant temperature, °F	550
4.	Mass of reactor coolant system liquid, lbm	676,700
5.	Mass of reactor coolant system steam, lbm	24,900
6.	Liquid plus steam energy, Btu	380×10^6
7.	Volume of water in vessel, ft^3	11,175
8.	Volume of steam in vessel, ft^3	9,640
9.	Volume of water in recirculation loops, ft^3	1,030
10.	Volume of steam in steamlines, ft^3	1,030
11.	Volume of water in feedwater line, ft^3	20,778*
12.	Volume of water in miscellaneous lines, ft^3	191
13.	Total reactor coolant volume, ft^3	22,712
14.	Stored water	
	a. Condensate storage tank, gal	350,000
	b. Fuel storage pool, ft^3	50,000

* Does not represent the feedwater volume used in post-LOCA feedwater coastdown/injection evaluation. This evaluation is discussed in detail in Section 6.2.1.1.3.1.1 in paragraph titled, "Evaluation of Post-LOCA Feedwater Injection".

TABLE 6.2-3
(SHEET 2 OF 2)

B. Containment	Drywell	Suppression Chamber
1. Pressure, psig	0.75	0.75
2. Inside temperature, °F	135	100*
3. Outside temperature, °F	104	104
4. Relative humidity, %	20	100
5. Service water temperature (CSCS), °F	100	100
6. Water volume, ft^3 (minimum)	---	128,800
7. Vent submergence, (maximum)	---	12 ft 4 in.

*As discussed in Section 6.2.1.8 supplementary evaluations have been satisfactorily completed with a 105°F initial suppression pool temperature.

TABLE 6.2-3A

INITIAL CONDITIONS EMPLOYED IN CONTAINMENT RESPONSE ANALYSIS (AT 3559 MWt)

A.	Reactor Coolant System	
1.	Reactor power level, MWt	3559
2.	Average coolant pressure, psig	1025

B.	Containment	Drywell	Suppression Chamber
1.	Pressure, psig	0.75	0.75
2.	Inside temperature, °F	135	105
3.	Relative humidity, %	20	100
4.	Service water temperature (CSCS), °F (1)	100	100
5.	Water volume, ft^3 (minimum)	----	128,800*
	(maximum)		131,900*
6.	Vent submergence, ft (minimum)	----	11.7
	(maximum)		12.33

*Conservative values used in Reference 22.

(1) Evaluated for post-accident peak of 104°F in Reference 32.

TABLE 6.2-4

MASS AND ENERGY RELEASE DATA FOR
ANALYSIS OF WATER POOL PRESSURE-SUPPRESSION
CONTAINMENT ACCIDENTS
(AT 3434 MWt)

A. Effective accident break area (total), ft^2	3.113
Pipe ID, in.	21.686
B. Components of effective break area:	
1. Recirculation line area, ft^2	2.565
2. Cleanup line area, ft^2	0.080
3. Jet pumps area, ft^2	0.468
C. Break area/vent area ratio	0.010
D. Primary system energy distribution*	
1. Steam energy, 10^6 Btu	29.6
2. Liquid energy, 10^6 Btu	355.3
3. Sensible energy, 10^6 Btu	
a. Reactor vessel	106.1
b. Reactor internals (less core)	58.6
c. Primary system piping	34.6
d. Fuel**	25.2
E. Assumptions used in pressure transient analysis	
1. Feedwater valve closure time	Instantaneous See Note 1
2. MSIV closure time (sec)	3.5
3. Scram time (sec)	< 1
4. Liquid carryover, %	100
5. Turbine stop valve closure (sec)	0.2

* All energy values except fuel are based on a 32°F datum.
** Fuel energy is based on a datum of 285°F.

Note 1 This assumption has been supplemented for a conservative evaluation on the peak long term suppression pool temperature. This supplemental evaluation postulates the addition of feedwater mass and energy injected at time t=600 seconds after LOCA. Section 6.2.1.1.3.1.1 in the paragraph titled, "Evaluation of Post-LOCA Feedwater Injection" discusses this in further detail.

TABLE 6.2-5

LOSS OF COOLANT ACCIDENT LONG TERM
PRIMARY CONTAINMENT RESPONSE SUMMARY
(AT 3434 MWt)

CASE	LPCI AND/OR LPCS PUMPS	SERVICE WATER PUMPS	CONTAINMENT SPRAY (gal/min)	HPCS (gal/min)	LPCI AND/OR LPCS (gal/min)	PEAK POOL TEMPERATURE (°F) **	SECONDARY PEAK PRESSURE (psig)
A	3/1	4	14,134	6200	21,200/ 6,250	168.4	5.3
B	1/0	2	7,067	6200	7067/0	200	9.6
C	1/0	2	0	6200	7067/0	200++	14.2

** Supplementary evaluations have been performed, as discussed in Section 6.2.1.8, based on an increase in the initial suppression pool temperature (from 100°F to 105°F), the peak suppression pool bulk temperature is less than 200°F.

++ A supplementary evaluation, for the effect on long term peak pool temperature, has been performed for the addition of feedwater mass and energy at t=600 seconds and a reduced RHR pump flow in the suppression pool cooling mode (7200 gpm versus 7450 gpm). The 200°F peak pool temperature given above is not exceeded.

TABLE 6.2-5A

LOSS OF COOLANT ACCIDENT LONG TERM
PRIMARY CONTAINMENT RESPONSE SUMMARY
(AT 3559 MWt)

CASE	LPCI AND/OR LPCS PUMPS	SERVICE WATER PUMPS	CONTAINMENT SPRAY (gal/min)	HPCS (gal/min)	LPCI AND/OR LPCS (gal/min)	PEAK POOL TEMPERATURE* (°F)	PRIMARY PEAK SUPPRESSION CHAMBER PRESSURE (PSIG)	SECONDARY SUPPRESSION CHAMBER PEAK PRESSURE (psig)
C	1/0	2	0	6200	7200 **	196.1	27.9	12.4

* See Figures 6.2-5A, 6.2-6A and 6.2-7A for long term containment responses vs. time.

** RHR flow through heat exchanger (Reference 20)

TABLE 6.2-6

ENERGY BALANCE FOR DESIGN-BASIS RECIRCULATION LINE BREAK ACCIDENT

(AT 3434 MWt)

	PRIOR TO DBA (0 sec)	AT TIME OF PEAK PRESSURE DIFFERENCE (0.75 at Recirc.)	AT END OF BLOWDOWN (~53 sec)	AT TIME OF PEAK CONTAINMENT PRESSURE (~27009 sec - minimum ECCS available; ~7047 sec - all ECCS Available)	UNIT
1. Reactor coolant (vessel & pipe inventory)	414.0 x 10^6	400 x 10^6	11.8 x 10^6	45.6 x 10^6 /41.8 x 10^6	Btu
2. Fuel and cladding	34.0				
Fuel	34.8 x 10^6	32.3 x 10^6	12.8 x 10^6	4.07 x 10^6 /3.72 x 10^6	Btu
Cladding	3.05 x 10^6	3.05 x 10^6	2.99 x 10^6	0.956 x 10^6 /0.904 x 10^6	Btu
3. Core internals, also reactor coolant piping pumps & valves	91.2 x 10^6	91.2 x 10^6	91.2 x 10^6	31.4 x 10^6 /55.5 x 10^6	Btu
4. Reactor vessel metal	107.0 x 10^6	107.0 x 10^6	107.0 x 10^6	37 x 10^6 /64.4 x 10^6	Btu
5. Reactor coolant piping, pumps and valves	Included in (3)				
6. Blowdown enthalpy	NA	546	NA	NA	Btu/lbm
7. Decay heat	0	.402920 x 10^6	8.802 x 10^6	1020 x 10^6 /383.0 x 10^6	Btu
8. Metal-water reaction heat	0	0	0.02 x 10^6	.471 x 10^6 /.471 x 10^6	Btu
9. Drywell structures	Storage Capacitance Neglected			Btu	
10. Drywell air	1.52 x 10^6	1.73 x 10^6	0	1.77 x 10^6 /158 x 10^6	Btu
11. Drywell steam	0.335 x 10^6	7.41 x 10^6	25.7 x 10^6	7.06 x 10^6 /5.32 x 10^6	Btu
12. Containment air	1.17 x 10^6	1.17 x 10^6	2.77 x 10^6	1.41 x 10^6 /1.49 x 10^6	Btu
13. Containment steam	0.522 x 10^6	0.522 x 10^6	1.29 x 10^6	5.57 x 10^6 /2.86 x 10^6	Btu
14. Suppression pool water	887 x 10^6	887 x 10^6	1300 x 10^6	1770 x 10^6 /1490 x 10^6	Btu
15. Heat transferred by heat exchangers	0	0	0	752 x 10^6 /260 x 10^6	Btu

NOTE 1: Results of analysis for MS and recirc line breaks are approximately the same; however, the progress of the events is more rapid for the MS break than for the recirc.

Note 2: A supplementary evaluation, for the effect on long term peak pool temperature, has been performed for the addition of feedwater mass and energy injection at t=600 seconds, the total additional energy calculated due to the feedwater volume and the feedwater piping metal sensible heat is 2.07 x E08 Btu. (Ref. 18).

TABLE 6.2-7

ACCIDENT CHRONOLOGY
DESIGN-BASIS RECIRCULATION LINE BREAK ACCIDENT
(AT 3434 MWt)

	TIME (sec)	
	ALL ECCS IN OPERATION	MINIMUM ECCS AVAILABLE
Vents cleared	0.824	0.824
Drywell reaches peak pressure	20.14	20.14
Maximum positive differential pressure occurs	0.831	0.831
Initiation of the ECCS	30	30
End of blowdown	52.15	52.15
Vessel reflooded	( )	109.53
Introduction of RHR heat exchanger	(approx.) 600*	(approx.) 600*
Containment reaches peak secondary pressure	10,915	27,009

* Refer to Section 6.2.2.3.6 for further discussion on the sensitivity of this time period.

TABLE 6.2-8

SUMMARY OF ACCIDENT RESULTS FOR
CONTAINMENT RESPONSE TO RECIRCULATION LINE AND
STEAMLINE BREAKS
(AT 3434 MWt)

A. Accident Parameters	RECIRCULATION LINE BREAK *	STEAMLINE BREAK
1. Peak drywell pressure, psig	39.6	32
2. Peak drywell deck differential pressure, psid	24.2	17.5
3. Time(s) of peak pressures, sec	22	11
4. Peak drywell temperature, °F	286	320
5. Peak suppression chamber pressure, psig	30.6	25
6. Time of peak suppression chamber pressure, sec	144	50
7. Peak suppression pool temperature during blowdown, °F	148**	100**
8. Peak suppression pool temperature, long term, °F	200++	
9. Calculated drywell margin, %	12	
10. Calculated suppression chamber margin, %	32	
11. Calculated deck differential pressure margin, %	3.2	

*See Figures 6.2-2 and 6.2-5 for plots of pressures vs time.
See Figures 6.2-3 and 6.2-7 for plots of temperatures vs time.

** As discussed in Section 6.2.1.8 supplementary evaluations have been satisfactorily completed with a 105°F initial suppression pool temperature.

++ See Notes in Table 6.2-5.

TABLE 6.2-8A

SUMMARY OF ACCIDENT RESULTS FOR
SHORT-TERM CONTAINMENT RESPONSE TO RECIRCULATION
LINE BREAK
(AT 3559 MWt)

A. Accident Parameters	RECIRCULATION LINE BREAK *
1. Peak drywell pressure, psig	39.9
2. Peak drywell deck differential pressure, psid	22.4
3. Peak drywell temperature, °F	286

*See Figure 6.2-2A for short-term pressure response vs time.
See Figure 6.2-3A for short-term temperature response vs time.

TABLE 6.2-9

SUBCMPARTMENT NODAL DESCRIPTION RECIRCULATION OUTLET LINE BREAK WITH SHIELDING DOORS

NODE NUMBER	DESCRIPTION	VOLUME (ft^3)	HEIGHT (ft)	FLOW CROSS-SECTIONAL AREA (ft)	BOTTOM ELEVATION (ft)	INITIAL CONDITIONS TEMP, (°F)	PRESS, (psia)	HUMID, *(%)	CALC. PEAK PRESS DIFF, (psid)
1	Lower Reactor Skirt	100.6	5.07	18.40	755.29	550.	15.45	0.1	47.9
2	Lower Reactor Skirt	100.6	5.07	18.40	755.29	550.	15.45	0.1	48.0
3	Lower Reactor Skirt	100.6	5.07	18.40	755.29	550.	15.45	0.1	47.4
4	Lower Reactor Skirt	150.9	5.07	23.36	755.29	550.	15.45	0.1	47.9
5	Lower Reactor Skirt	150.9	5.07	23.36	755.29	550.	15.45	0.1	48.1
6	Upper Reactor Skirt	121.0	7.47	20.98	760.36	550.	15.45	0.1	47.9
7	Upper Reactor Skirt	121.0	7.47	20.98	760.36	550.	15.45	0.1	48.0
8	Upper Reactor Skirt	121.0	7.47	20.98	760.36	550.	15.45	0.1	47.5
9	Upper Reactor Skirt	181.5	7.47	25.64	760.36	550.	15.45	0.1	48.1
10	Upper Reactor Skirt	181.5	7.47	25.64	760.36	550.	15.45	0.1	47.8
11	Lower Recirc. Noz. Sect.	39.87	6.92	10.02	767.83	550.	15.45	0.1	74.2
12	Lower Recirc. Noz. Sect.	54.28	4.90	10.50	767.83	550.	15.45	0.1	47.3
13	Lower Recirc. Noz. Sect.	61.94	4.90	10.50	767.83	550.	15.45	0.1	48.2
14	Lower Recirc. Noz. Sect.	81.43	4.90	13.47	767.83	550.	15.45	0.1	48.2
15	Lower Recirc. Noz. Sect.	80.54	4.90	13.47	767.83	550.	15.45	0.1	46.4
16	Upper Recirc. Noz. Sect.	26.77	2.67	8.43	774.75	550.	15.45	0.1	72.0
17	Upper Recirc. Noz. Sect.	52.18	4.69	10.30	772.73	550.	15.45	0.1	45.2
18	Upper Recirc. Noz. Sect.	52.18	4.69	10.30	772.73	550.	15.45	0.1	40.9
19	Upper Recirc. Noz. Sect.	78.28	4.69	13.27	772.73	550.	15.45	0.1	37.7
20	Upper Recirc. Noz. Sect.	77.39	4.69	13.27	772.73	550.	15.45	0.1	37.2
21	Mid-Section	67.48	6.41	12.44	777.42	550.	15.45	0.1	39.5
22	Mid-Section	67.48	6.41	12.44	777.42	550.	15.45	0.1	39.2
23	Mid-Section	67.48	6.41	12.44	777.42	550.	15.45	0.1	36.7
24	Mid-Section	101.2	6.41	15.52	777.42	550.	15.45	0.1	36.0
25	Mid-Section	101.2	6.41	15.52	777.42	550.	15.45	0.1	35.9
26	LPCI Noz. Sect.	171.1	9.59	18.61	783.83	550.	15.45	0.1	27.6
27	LPCI Noz. Sect.	155.8	9.59	18.61	783.83	550.	15.45	0.1	27.3
28	LPCI Noz. Sect.	155.8	9.59	18.61	783.83	550.	15.45	0.1	26.7
29	LPCI Noz. Sect.	171.1	9.59	18.61	783.83	550.	15.45	0.1	26.5
30	Feedwater Noz. Sect.	155.8	8.81	17.86	793.42	550.	15.45	0.1	19.3
31	Feedwater Noz. Sect.	153.4	8.81	17.86	793.42	550.	15.45	0.1	19.0
32	Feedwater Noz. Sect.	143.9	8.81	17.86	793.42	550.	15.45	0.1	18.9
33	Feedwater Noz. Sect.	164.1	8.81	17.86	793.42	550.	15.45	0.1	19.0
34	Annulus Receiver	19.76	6.92	10.02	767.83	550.	15.45	0.1	115.1
35	Break Node	19.52	4.92	7.04	769.56	550.	15.45	0.1	322.0
36	Upper Drywell	16315.	41.0	400.	793.42	135.	15.45	15.0	--
37	Mid-Drywell	11665.	12.1	965.	781.32	135.	15.45	15.0	--
38	Lower Drywell	82775.	44.7	1850.	736.62	135.	15.45	15.0	--

* Relative humidity.

TABLE 6.2-10

SUBCOMPARTMENT NODAL DESCRIPTION FEEDWATER LINE BREAK WITH SHIELDING DOORS

NODE NUMBER	DESCRIPTION	VOLUME (ft^3)	HEIGHT (ft)	FLOW CROSS-SECTIONAL AREA (ft)	BOTTOM ELEVATION (ft)	INITIAL CONDITIONS			CALC. PEAK PRESS DIFF, (psid)
						TEMP, (°F)	PRESS, (psia)	HUMID, *(%)	
1	Lower Reactor Skirt	150.9	5.07	23.36	755.29	550.	15.45	0.1	14.0
2	Lower Reactor Skirt	150.9	5.07	23.36	755.29	550.	15.45	0.1	14.0
3	Lower Reactor Skirt	150.9	5.07	23.36	755.29	550.	15.45	0.1	14.0
4	Lower Reactor Skirt	150.9	5.07	23.36	755.29	550.	15.45	0.1	14.1
5	Upper Reactor Skirt	181.5	7.47	23.80	760.36	550.	15.45	0.1	14.0
6	Upper Reactor Skirt	181.5	7.47	23.80	760.36	550.	15.45	0.1	13.9
7	Upper Reactor Skirt	181.5	7.47	23.80	760.36	550.	15.45	0.1	14.0
8	Upper Reactor Skirt	181.5	7.47	23.80	760.36	550.	15.45	0.1	14.1
9	Recirc. Noz. Sect.	159.7	9.59	17.83	767.83	550.	15.45	0.1	14.4
10	Recirc. Noz. Sect.	157.9	9.59	17.83	767.83	550.	15.45	0.1	14.1
11	Recirc. Noz. Sect.	157.9	9.59	17.83	767.83	550.	15.45	0.1	13.6
12	Recirc. Noz. Sect.	167.4	9.59	17.83	767.83	550.	15.45	0.1	13.4
13	Mid-Section	67.48	6.41	12.44	777.42	550.	15.45	0.1	18.2
14	Mid-Section	67.48	6.41	12.44	777.42	550.	15.45	0.1	15.5
15	Mid-Section	67.48	6.41	12.44	777.42	550.	15.45	0.1	14.0
16	Mid-Section	101.2	6.41	15.79	777.42	550.	15.45	0.1	13.5
17	Mid-Section	101.2	6.41	15.79	777.42	550.	15.45	0.1	13.3
18	LPCI Noz. Sect.	100.8	9.59	15.52	783.83	550.	15.45	0.1	17.7
19	LPCI Noz. Sect.	110.0	9.59	15.52	783.83	550.	15.45	0.1	16.1
20	LPCI Noz. Sect.	116.1	9.59	15.52	783.83	550.	15.45	0.1	14.3
21	LPCI Noz. Sect.	171.1	9.59	18.61	783.83	550.	15.45	0.1	13.0
22	LPCI Noz. Sect.	155.8	9.59	18.61	783.83	550.	15.45	0.1	12.6
23	Annulus Receiver	45.22	10.58	13.39	793.42	550.	15.45	0.1	50.8
24	Feedwater Noz. Sect.	55.63	10.58	13.39	793.42	550.	15.45	0.1	36.9
25	Feedwater Noz. Sect.	116.2	10.58	16.48	793.42	550.	15.45	0.1	21.3
26	Feedwater Noz. Sect.	131.5	10.58	16.48	793.42	550.	15.45	0.1	11.5
27	Feedwater Noz. Sect.	176.7	10.58	19.57	793.42	550.	15.45	0.1	10.5
28	Feedwater Noz. Sect.	171.8	10.58	19.57	793.42	550.	15.45	0.1	10.3
29	Break Node	16.12	4.00	5.42	796.75	550.	15.45	0.1	201.6
30	Lower Drywell	16315.	41.00	400.	793.42	135.	15.45	15.0	--
31	Mid Drywell	11665.	12.10	965.	781.32	135.	15.45	15.0	--
32	Upper Drywell	82775.	44.70	1850.	736.62	135.	15.45	15.0	--

* Relative humidity.

TABLE 6.2-11

SUBCOMPARTMENT NODAL DESCRIPTION

SIMULTANEOUS BREAK OF THE HEAD SPRAY LINE AND RPV HEAD VENT LINE IN THE HEAD CAVITY

					INITIAL CONDITIONS				DBA BREAK CONDITIONS					
Volume No.	Description	Height, ft	Cross-Sectional Area, ft^2	Volume ft^3	Temp. °F	Press. psia	Humid. *%	Break Loc. Vol. No.	Break Line	Break Area, ft^2	Break Type	Calc. Peak Press Diff. psid	Design Peak Press Diff. psid	Design Margin %
1	Head Cavity	15.57	261.5	4072.	135.	15.45	0.1	1	1RI24B-6 + 1NB13A-4	.163	Double-ended guillotine break	7.0 nodes 1 to 2	10.6	150
2	Drywell	79.74	2315.0	184664.	135.	15.45	0.1							
3	Wetwell	33.87	5198.0	176085.	100**	15.45	0.1							

* Relative humidity
The peak differential pressure across the bulkhead plate ($P_{node\ 1}$ - $P_{node\ 2}$) for this case = 7.0 psid
Design differential pressure across the bulkhead plate = 10.6 psid
** As discussed in Section 6.2.1.8 supplementary evaluations have been satisfactorily completed with a 105ºF initial suppression pool temperature.

TABLE 6.2-12

SUBCOMPARTMENT NODAL DESCRIPTION
RECIRCULATION LINE BREAK IN THE DRYWELL

					INITIAL CONDITIONS				DBA BREAK CONDITIONS					
Volume No.	Description	Height, ft	Cross-Sectional Area, ft^2	Volume ft^3	Temp. °F	Press. psia	Humid.* %	Break Loc. Vol. No.	Break Line	Break Area, ft^2	Break Type	Calc. Peak Press Diff. psid	Design Peak Press Diff. psid	Design Margin %
1	Head Cavity	15.57	261.5	4072.	135.	15.45	0.1							
2	Drywell	79.74	2315.0	177049.	135.	15.45	0.1	2	Recirculation line	3.216	Double-ended guillotine	9.0	10.6	118
3	Wetwell	33.87	5198.0	176085.	100**	15.45	0.1							

* Relative humidity

The peak differential pressure across the bulkhead plate ($P_{node1} - P_{node\ 2}$) for this case = -9.0 psid

The design differential pressure across the bulkhead plate = 10.6 psid

** As discussed in Section 6.2.1.8 supplementary evaluations have been satisfactorily completed with a 105°F initial suppression pool temperature.

TABLE 6.2-13

SUBCOMPARTMENT VENT PATH DESCRIPTION

SIMULTANEOUS BREAK OF THE HEAD SPRAY LINE AND RPV HEAD VENT LINE IN THE HEAD CAVITY

VENT PATH NO	FROM VOL. NODE NO.	TO VOL. NODE NO.	DESCRIPTION OF VENT PATH FLOW				HEAD LOSS, K				
			CHOKED UNCHOKED	AREA** ft2	LENGTH** ft	HYDRAULIC DIAMETER ft	FRICTION K, ft/d	TURNING LOSS, K	EXPANSION, K	CONTRACTION, K	TOTAL
1	1	2	HVAC vents through bulkhead plate choked		6.12	3.76	-	-	-	-	2.62
2*	2	3	98-24 inch downcomers unchoked	295.00	70.8	19.38	-	-	-	-	1.90
3	0	1	Break of head spray line & RPV head vent line in head cavity fill	0.163	0.0	0.46	-	-	-	-	0.00

* Opened on a differential pressure of 5.2 psid

** Length/Area is the inertial term input directly into RELAP4 / MOD5

TABLE 6.2-14

SUBCOMPARTMENT VENT PATH DESCRIPTION

RECIRCULATION LINE BREAK IN THE DRYWELL

VENT PATH NO	FROM VOL. NODE NO.	TO VOL. NODE NO.	DESCRIPTION OF VENT PATH FLOW CHOKED UNCHOKED	AREA** ft2	LENGTH** ft	HYDRAULIC DIAMETER ft	HEAD LOSS, K FRICTION K, ft/d	TURNING LOSS, K	EXPANSION, K	CONTRACTION, K	TOTAL
1	1	2	HVAC vents without ductwork through bulkhead plate unchoked	11.12	6.12	3.76	-	-	-	-	2.62
2*	2	3	98-24 inch downcomers unchoked	295.00	70.8	19.38	-	-	-	-	1.90
3	0	2	Recirculation line break in drywell fill	1.00	0.00	0.46	-	-	-	-	0.00

* Opened on a differential pressure of 5.2 psid
** Length/Area is the inertial term input directly into RELAP4 / MOD5

TABLE 6.2-15

SIMULTANEOUS BREAK OF THE HEAD SPRAY
LINE AND RPV HEAD VENT LINE IN THE HEAD CAVITY
INPUT DATA*

```
-  LASALLE – HEAD CAVITY PRESSURIZATION – 3C7-0476-003 REV 0 4266-00
* PROBLEM DIMENSIONS
 010001    -2   9   5   3   3   0   0   3   0   1   0   1   0   0   0   0   0   3

* PROBLEM CONSTANTS
 010002    0.0   1.0

* EDIT VARIABLES
 020000    AP  1   AP  2   AP  3   JW  2   AH  1   JW  1   TD  1   FD  1   AD  1

* TIME STEP DATA
 030010    1   50   0   0   0.01     0.00005    2.0
 030020    1   50   0   0   0.002    0.00005    3.5
 030030    1   50   0   0   0.0005   0.00005    3.9
 030040    1   50   0   0   0.01     0.00005    8.0
 030050    1   50   0   0   0.1      0.00005    30.0

* TRIP CONTROLS
 040010    1   1   0   0   20.0   0.0
 040020    2   4   2   3   5.2    0.0
 040030    3   1   0   0   0.0    0.0

* VOLUME DATA
 050011    0 0   15.45   135.   .001     4072.   15.57   0.   0    261.5   18.3   819.73   0
 050021    0 0   15.45   135.   .001   184664.   79.74   0.   0   2315.0   54.3   740.00   0
 050031    0 0   15.45   100.   .001   176085.   33.87   0.   0   5198.0   81.4   706.14   0

* JUNCTION DATA
 080011    1   2   0   0   0.     11.12      819.73   .55   2.62   2.62   0   1  0   3   0.   .6   -100
 080021    2   3   0   1     0.0  295.000    740.00   .24   1. 9   1. 9   0   1   0   30   .6   -100.
 080031    0   1   1   0   357.9   0.16267   827.52   .00   0.0    0.0    0   1   0   30.  1.   -100.

* VALVE DATA CARDS
 110010    -2    0   0   0.   0.   0.   0.

* FILL TABLE CARDS
 130100    3   1   2   3   'LBS/SEC'   550.   1.   0.
 130101    0   2200.   30.   2200.
```

* RELAP4/MOD5 computer code utilized for analysis.

TABLE 6.2-16

RECIRCULATION LINE BREAK INPUT DATA*

```
= LASALLE – HEAD CAVITY PRESSURIZATION – 3C7-0476-003 REV 0 4266-00
* RECIRCULATION LINE BREAK
* 4 HVAC INLET VENTS AVAILABLE FOR FLOW INTO HEAD CAVITY
* PROBLEM DIMENSIONS
 010001    -2  9  2  3  3  0  0  3  0  1  0  1  0  0  0  0  0  3

* PROBLEM CONSTANTS
 010002    0.0  1.0

* EDIT VARIABLES
 020000    AP 1   AP 2   AP 3   JW 2   AH 2   JW 1   TD 1   FD 1   TD 2

* TIME STEP DATA
 030010    1  50  0  0  0.005  0.00005   2.0
 030020    1  50  0  0  0.01   0.00005   30.0

* TRIP CONTROLS
 040010    1  1  0  0  10.0   0.0
 040020    2  1  0  0  0.824  0.0
 040030    3  1  0  0  0.0    0.0

* VOLUME DATA
 050011    0 0  15.45  135.  .001    4072.  15.57  0.  0   261.5  18.3  819.73  0
 050021    0 0  15.45  135.  .001  177049.  79.74  0.  0  2315.0  54.3  740.00  0
 050031    0 0  15.45  100.  .001  176085.  33.87  0.  0  5198.0  81.4  706.14  0

* JUNCTION DATA
 080011    1  2  0  0  0.  4.92  819.73  .83  1.52  1.52  0  1  0  3  0.  .6  -100.
 080021    2  3  0  1  0.0  295.000  740.00  .24  1. 9  1. 9  0  1  0  3  0.  .6  -100.
 080031    0  2  1  0  25690.  1.  770.  .00  0.0  0.0  0  1  0  3  0.  1.  -100.

* VALVE DATA CARDS
 110010    -2  0  0  0.  0.  0.  0.

* FILL TABLE CARDS
 130100    3  4  9  1   'LBS/SEC'
 *         TIME         FLOW       ENTHALPY
 130101    0.0000       22710.0    532.0
 130102    0.0016       22710.0    532.0
 130103    0.0017       34060.0    532.0
 130104    1.5500       34060.0    532.0
 130105    1.5600       27550.0    532.0
 130106    1.7500       27550.0    532.0
 130107    1.7600       24840.0    547.0
 130108    1.9800       24840.0    547.0
 130109    10.1100      24320.0    538.0
```

---

* RELAP4/MOD5 computer code utilized for analysis.

TABLE 6.2-17

MAIN STEAMLINE BREAK INPUT DATA

LISTING OF INPUT DATA FOR CASE 1

```
= DATA SET 071576-2RLASALLE STUDY 3C7-0476-003  09.8.026-3.0  RELAP4 – MAIN STEAM
* PROBLEM DIMENSIONS
010001   -2      9       2       3       3       0       0       7       0       1       0       5       0       0       0       0       0  * PROB-DIM
* PROBLEM CONSTANTS
010002   0.0     1.0
* EDIT VARIABLES
020000   AP      1       AP      2       AP      3       JW      2       AH      2       JW      1       TD      1       FD      1       TD      2
* TIME STEPS
030010   1       50      0       0       0.005   0.00005 2.0
030020   1       50      0       0       0.01    0.00005 10.0
 * TRIP CONTROLS
040010   1       1       0       0       10.0    0.0
040020   2       1       0       0       0.75    0.0
040030   3       1       0       0       0.5     0.0
* VOLUME DATA CARDS - - 3.7 – P8.9
050011   0       0       15.45   -1.     0.556   4077.   15.57   15.57   0       261.5   0.      819.73
050021   0       0       15.45   -1.     0.556   177049. 79.74   79.74   0       2315.   0.      740.00
050031   0       0       15.45   -1.     0.524   176085. 33.87   33.87   0       5198.   0.      706.14
* JUNCTION DATA CARDS 08XXXY – 3.10 – P 91
080011   2       1       0       0       0.      6.213   819.73  0.84    1.56    0.      1       0       0       0       0.      0.6     1 0
080021   2       3       0       1       0.      295.    740.00  0.24    1.9     0.      1       0       0       0       0       0.6     1.0
080031   0       2       1       0       8646.0  1.      770.    0.      0.      0.      0       0       0       0       0 0  * M-STREAM
080041   0       2       2       0       0.      1.      770.    0.      0.      0.      0       0       0       0       0 0  * M-STREAM
080051   0       2       3       0       0.      1.      770.    0.      0.      0.      0       0       0       0       0 0  * M-STREAM
080061   0       2       4       0       0.      1.      770.    0.      0.      0.      0       0       0       0       0 0  * M-STREAM
080071   0       2       5       0       0.      1.      770.    0.      0.      0.      0       0       0       0       0 0   *M-STREAM
* VALVE DATA CARDS 11XXX0 - - 3.16 P97
110010   -2      0.      0.      0.      0.
* FILL TABLE DATA CARDS – 13XXYY         -- 3.18    P.98
130100   4       3       0       0       1.0     547.75          0.0     8646.   1.0     8646.
130101   1.01    0.0     10.0    0.0
130200   6       3       0       0       1.0     547.43          0.0     0.0     1.0     0.0
130201   1.01    920.2   4.39    1319.0          4.4     0.0     10.0    0.0
130300   4       3       0       0       1.0     545.55          0.0     0.0     4.39    0.0
130301   4.40    1319.0          10.14   2051.00
130400   6       3       0       0       0.0     547.67          0.0     0.0     0.99    0.0
130401   1.0     28390.0         4.39    27460.0         4.4     0.0     10.0    0.0
130500   4       3       0       0       0.0     547.08  0.0     0.0     4.39    0.0
130501   4.40    27460.0         10.14   24430.00
*
```

TABLE 6.2-18

REACTOR BLOWDOWN DATA FOR RECIRCULATION LINE BREAK
(AT 3434 MWt)

TIME (sec)	STEAM FLOW (lb/sec)	LIQUID FLOW (lb/sec)	STEAM ENTHALPY (Btu/lb)	LIQUID ENTHALPY (Btu/lb)
0	0	22710	1195.3	532.0
0.0016	0	22710	1195.3	532.0
0.0017	0	34060	1195.3	532.0
1.55	0	34060	1195.3	532.0
1.56	0	27550	1195.3	532.0
1.75	0	27550	1195.3	532.0
1.76	0	24840	1192.0	547.0
1.98	0	24810	1192.0	547.0
10.11	0	24320	1193.8	538.8
20.61	0	23460	1196.5	526.0
20.64	3084	11930	1196.5	526.3
25.11	2813	8872	1201.6	493.4
30.01	2382	6175	1204.5	456.6
35.01	1844	3934	1204.3	416.3
40.01	1272	2431	1201.0	374.9
46.87	139	2410	1177.4	261.3
46.94	290	0	1177.0	259.9
47.62	44	0	1173.5	248.4
47.69	0	0	1173.3	247.5

TABLE 6.2-18A
REACTOR BLOWDOWN FOR RECIRCULATION LINE BREAK
(AT 3559 MWT)

Time (sec)	Break Flow Rate (lbm/sec)	Time (sec)	Break Flow Enthalpy (Btu/lbm)
0	0.	0.	516.8
0.003906	$3.698x10^4$	5.768	535.8
0.7676	$3.558x10^4$	8.096	544.6
2.268	$3.084x10^4$	8.283	544.7
2.768	$2.892x10^4$	8.689	558.1
3.768	$2.653x10^4$	10.19	553.4
5.143	$2.497x10^4$	11.13	550.
8.283	$2.549x10^4$	11.47	774.2
9.189	$2.456 x10^4$	11.69	860.4
11.13	$2.453 x10^4$	11.88	880.6
11.47	$1.466 x10^4$	11.92	880.
11.6	$1.160 x10^4$	12.83	818.3
11.84	$9.661x10^3$	13.08	819.6
12.39	$9.116 x10^3$	14.08	789.4
12.83	$9.808 x10^3$	15.27	744.8
13.33	$9.702 x10^3$	18.27	685.5
16.27	$1.071 x10^4$	21.58	652.7
18.83	$1.027 x10^4$	24.45	639.6
24.45	$8.853 x10^3$	27.2	635.
32	$5.568 x10^3$	32	635.2

TABLE 6.2-19

REACTOR BLOWDOWN DATA FOR MAIN STEAMLINE BREAK
(AT 3434 MWt)

TIME (sec)	STEAM FLOW (lb/sec)	LIQUID FLOW (lb/sec)	STEAM ENTHALPY (Btu/lb)	LIQUID ENTHALPY (Btu/lb)
0.0	11770	0	1190.9	550.9
0.19	11600	0	1191.3	549.1
0.194	8577	0	1191.3	549.1
0.999	8369	0	1192.3	545.3
1.0	899	28450	1192.3	545.3
4.0	1169	27230	1193.4	540.8
10.1	1248	19050	1195.9	529.2
20.38	1730	14680	1200.6	501.3
30.13	1874	9762	1204.2	462.4
40.0	1545	4932	1204.0	409.6
50.0	552	3058	1192.4	322.0
55.32	8.4	253	1173.4	247.9
55.44	0	0	1173.0	246.7

TABLE 6.2-20

CORE DECAY HEAT FOLLOWING LOCA

FOR CONTAINMENT ANALYSIS

(AT 3334 MWT)

TIME (Seconds)	NORMALIZED CORE HEAT*
0	1.0
0.9	0.9330
2.1	0.7662
5.0	0.5005
6.93	0.3850
9.03	0.2955
15.93	0.1491
30.0	0.0471
10^2	0.0381
10^3	0.0223
10^4	0.0119
10^5	0.00668
10^6	0.00267
3×10^6	0.00190

*Normalized Power = 3434 MWt
Includes fuel relaxation energy

TABLE 6.2-20A

CORE DECAY HEAT FOLLOWING LOCA

FOR CONTAINMENT ANALYSIS

(AT 3559 MWt)

TIME (Seconds)	NORMALIZED CORE HEAT*
0.0	1.0
1.0	0.589
4.0	0.577
10.0	0.377
20.0	0.117
40.0	0.0466
60.0	0.0421
80.0	0.0399
120.0	0.0375
1,000.0	0.0211
10,000.0	0.0108
20,000.0	0.00903
40,000.0	0.00762
80,000.0	0.00634

*Normalized Power = 3559 MWt
Includes fission energy, decay energy, fuel relaxation energy, and metal-water reaction energy

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14,15)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
M-1 TO M-4	55	Main Steam (includes drain line)	Steam	26 26 1 1/2	No No No	A (b) A (b) A (b)	Detail (a)	1&2B21-F022A,B,C,D 1&2B21-F028A,B,C,D 1&2B21-F067A,B,C,D	Inside Outside Outside	Yes (Note 30) Yes (Note 30) Yes (Note 30)	N/A 11 N/A
M-5 & M-6	55	Reactor Feed (includes connection to RWC)	Condensate	24 24 24 4	No No No No	AC (b) AC (b) A (b) A (b)	Detail (b)	1&B21-F010A,B 1&2B21-F032A,B 1&2B21-F065A,B 1&2G33-F040	Inside Outside Outside Outside	Yes Yes Yes Yes	N/A N/A 43 N/A
M-7	55	RHRS/Shutdown Suction	Reactor Water	20 20 3/4	No No No	A (b) A (b) A(b)	Detail (ah)	1&2E12-F009 1&2E12-F008 1&2E12-F460	Inside Outside Inside	Yes Yes Yes	N/A 8 N/A
M-8 & M-9	55 (Note 28)	RHRS/Shutdown Return	Reactor Water	12 12 2	No No No	AC (a) A (b) A (a)	Detail (d)	1&2E12-F050A,B 1&2E12-F053A,B 1&2E12-F099A,B	Inside Outside Inside	No (Note 28) Yes No (Note 28)	N/A 3 N/A
M-10	55 (Note 28)	LPCS Injection	Suppression Pool Water	12 12	Yes Yes	AC (a) A (b)	Detail (AJ)	1&2E21-F006 1&2E21-F005	Inside Outside	No (Note 28) Yes	N/A 3
M-11	55 (Note 28)	HPCS Injection	Suppression Pool Water	12 12	Yes Yes	AC (a) A (b)	Detail (AJ)	1&2E22-F005 1&2E22-F004	Inside Outside	No (Note 28) Yes	N/A 3
M-12 to M-14	55 (Note 28)	RHR/LPCI Injection	Suppression Pool Water	12 12	Yes Yes	AC (a) A (b)	Detail (AJ)	1&2E12-F041A,B,C 1&2E12-F042A,B,C	Inside Outside	No (Note 28) Yes	N/A 7
M-15	55	Steam to RCIC System (Includes Rhr Supply)	Steam	10 1 10 4	Yes Yes No Yes	A (b) A (b) A (b) A (b)	Detail (e)	1&2E51-F063 1&2E51-F076 1(2)E51-D324 1&2E51-F008	Inside Inside Outside Outside	Yes Yes Yes Yes	N/A N/A 13 max. N/A
M-16	56	Cooling Water Supply	Demineralized Water	6 6 3/4	No No No	A (b) A (b) A(b)	Detail (f)	1&2WR029 1&2WR179 1&2WR225	Outside Inside Inside	Yes Yes Yes	4 N/A N/A
M-17	56	Cooling Water Return	Demineralized Water	6 6 3/4	No No No	A (b) A (b) A(b)	Detail (f)	1&2WR040 1&2WR180 1&2WR226	Outside Inside Inside	Yes Yes Yes	5 N/A N/A
M-18 & M-19	56	RHRS/Containment Spray	Suppression Pool Water	16	No No	A (b) A (b)	Detail (g)	1&2E12-F017A,B 1&2E12-F016A,B	Outside Outside	Yes Yes	N/A 11
M-20	56	Drywell Purge	Air	26 26 1 1/2 1 1/2 8	No No No No No	A (b) A (b) A (b) A (b) A (b)	Detail (s) Detail (s) Detail (s) Detail (s)	1&2VQ030 1&2VQ029 1&2VQ047 1&2VQ048 1&2VQ042	Outside Outside Outside Outside Outside	Yes Yes Yes Yes Yes	N/A 10 N/A 10 max. 10 max.

Summary of Lines Penetrating the Primary Containment

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CODE CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
M-1 to M-4	AO Globe AO Globe MO Gate	1 1 1	Auto Auto Auto	RM RM RM	O O O	C C C	C C C	C C As is	C,D,E,H,P,RM C,D,E,H,P,RM C,D,E,H,P,RM	3 to 5 3 to 5 Standard	ESS 2 ESS 1 ESS 1	Note (1,20) Note (1) Note (48)
M-5 to M-6	Swing Check U1/Swing Check U2 AO No Slam-Check MO Gate MO Gate	1 1 2 2	Process Process RM RM	NA RM M M	O O O O	C C C O	C C C C	NA NA As is As is	Rev. Flow B,F,Rev. Flow RM(Note 34) RM(Note 34)	Instantaneous Instantaneous Standard Standard	NA ESS 2 ESS 1 ESS 1	Note (17) Note (20, 53, 54)
M-7	MO Gate MO Gate Relief	1 1 2	Auto Auto Process	RM RM N/A	C C C	O O C	C C C	As is As is C	A,D,U,RM A,D,U,RM N/A	40 sec 40 sec Instantaneous	ESS 2 ESS 1 N/A	Note (51) 1E12-F008
M-8 & M-9	No Slam-Check MO Globe MO Globe	1 1 1	Process Auto Auto	NA RM RM	C C C	O O O	C C C	NA As is As is	Rev. Flow A,D,U,RM A,D,F,U,RM	Instantaneous 29 sec Standard	ESSA 2 ESS 1 ESS 1	Note (3)
M-10	No Slam-Check MO Gate	1 1	Process Auto	NA RM	C C	C C	O O	NA As is	Rev. Flow RM (Notes 31, 36)	Instantaneous Standard	ESS 1 ESS 1	Note (3) Note (51)
M-11	No Slam-Gate MO Gate	1 1	Process Auto	NA RM	C C	C C	O O	NA As is	Rev. Flow RM (Notes 31, 36)	Instantaneous Standard	ESS 3 ESS 3	Note (3) Note (51)
M-12 to M-14	No Slam-Gate MO Gate	1 1	Process Auto	NA RM	C C	C C	O O	NA As is	Rev. Flow RM (Notes 31, 36)	Instantaneous Standard	Note (22) Note (22)	Note (3) Note (51)
M-15	MO Gate MO Globe NA MO Gate	1 1 1 1	Auto Auto NA Auto	RM RM NA RM	O C C O	O C C O	O O C C	As is As is NA As is	D,RM D,RM NA D,RM	15 sec Standard NA Standard	ESS 2 ESS 2 NA ESS 1	Note (20) Note (20) Note (60)
M-16	MO Gate MO Gate Relief	2 2 2	Auto Auto Process	RM RM N/A	O O C	O O C	C C C	As is As is C	B,F,RM B,F,RM N/A	Standard Standard N/A	ESS 1 ESS 2 N/A	
M-17	MO Gate MO Gate Relief	2 2 2	Auto Auto Process	RM RM N/A	O O C	O O C	C C C	As is As is C	B,F,RM B,F,RM N/A	Standard Standard N/A	ESS 1 ESS 2 N/A	
M-18 & M-19	MO Gate MO Gate	2 2	Auto Auto	RM RM	C C	C C	C C	As is As is	G,RM G,RM	Standard Standard	Note (22) Note (22)	Note (2,20,52,54) Note (2, 51, 52)
M-20	AO Butterfly AO Butterfly MO Globe MO Globe AO Butterfly	2 2 2 2 2	Auto Auto Auto Auto Auto	RM RM RM RM RM	C C O O C	C C C C O	C C C C C	C C As is As is C	B,F,Y,Z,RM B,F,Y,Z,RM B,F,Y,Z,RM B,F,Y,Z,RM B,F,Y,Z,RM	10 sec 10 sec 23 sec 23 sec 10 sec	ESS 2 ESS 1 ESS 2 ESS 1 ESS 1	Note (8,20,41,46,50,54) Note (8,46) Note (20,54)) Note (46)

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14,15)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
M-21	56 56 (Note 32)	Vent from Drywell Drywell Pressure	Air Air	26 2 26 2 3/4	No No No No No	A(b) A(b) A(b) A(b) C	Detail (h) Detail (w)	1&2VQ034 1&2VQ035 1&2VQ036 1&2VQ068 1&2CM102	Outside Outside Outside Outside Outside	Yes Yes Yes Yes No	N/A N/A 23 max N/A 10 max.
M-21	55 (Note 33)	RPV Level and Pressure	Reactor Water	3/4	Yes	C	Detail (AB)	1B21-F571	Outside	No	10 max.
M-22	55	Main Stream Drains	Stream-Water Mixture	3 3	No No	A(b) A(b)	Detail (c)	1&2B21-F016 1&2B21-F019	Inside Outside	Yes Yes	N/A 6
M-23		Spare (Unit 1)									
M-23	56	Combustible Gas Control Drywell Suction	AIR/Vapor Mixture	4 4	Yes Yes	A(b) A(b)	Detail (g)	2HG001B 2HG002B	Outside Outside	Yes Yes	N/A 10
M-24		Spare									
M-25 & M-26	56	Chilled Water Supply	Demineralized Water	8 8 3/4	No No No	A(b) A(b) A(b)	Detail (AF)	1&2VP063A,B 1&2VP113A,B 1&2VP198A,B	Outside Inside Inside	Yes Yes Yes	6 N/A N/A
M-27 & M-28	55	Chilled Water Return	Demineralized Water	8 8 3/4	No No No	A(b) A(b) A(b)	Detail (AF)	1&2VP053A,B 1&2VP114A,B 1&2VP197A,B	Outside Inside Inside	Yes Yes Yes	6 N/A N/A

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CODE CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
M-21	AO Butterfly MO Globe AO Butterfly MO Globe Excess Flow Check	2 2 2 2 2	Auto Auto Auto Auto Process	RM RM RM RM N/A	C C C C O	C C C C O	C C C C O	C As is C As is N/A	F,B,Y,Z,RM F,B,Y,Z,RM F,B,Y,Z,RM F,B,Y,Z,RM F,B,Y,Z,RM	10 Sec 5 Sec 10 Sec 5 Sec Instantaneous	ESS 2 ESS 2 ESS 1 ESS 1 NA	Note (8,20,41,46,54) Note (8,20) Note (8,46) Note (8)
M-21	EFCV	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	Note (23,33)
M-22	MO Gate MO Gate	1 1	Auto Auto	RM RM	O O	C C	C C	As is As is	C,D,E,H,P,RM C,D,E,H,P,RM	Standard Standard	ESS 2 ESS 1	Note (20),(51) Note (51)
M-23												
M-23	MO Gate MO Globe	2 2	RM RM	M M	C C	C C	O O	As is As is	RM(Note 37) RM(Note 37)	Standard Standard	Note (23) Note (23)	Note (20,54)
M-24												
M-25 TO M-26	MO Gate MO Butterfly Relief	2 2 2	Auto Auto Process	RM RM N/A	O O C	O O C	C C C	As is As is N/A	B,F,RM B,F,RM Process	Standard Standard N/A	ESS 1 ESS 2 N/A	 Note (20) Note (20)
M-27 & M-28	MO Gate MO Butterfly Relief	2 2 2	Auto Auto Process	RM RM N/A	O O C	O O C	C C C	As is As is N/A	B,F,RM B,F,RM Process	Standard Standard N/A	ESS 1 ESS 2 N/A	 Note (20) Note (20)

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14,15)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
M-29	55 (Note 28)	RCIC RPV Head Spray (Includes RHR Head Spray)	Condensate	6 6 6 6	Yes Yes Yes Yes	AC(a) AC(a) A(b) A(b)	Detail (i)	1 &2E51-F066 1 &2E51-F065 1 &2E51-F013 1 &2E12-F023	Inside Outside Outside Outside	No (Note 28) No (Note 28) Yes Yes	N/A N/A 20 Max (Unit 1) 10 Max (Unit 2) N/A
M-30	55	Reactor Cleanup	Reactor Water	6 6	No No	A(b) A(b)	Detail (t)	1 &2G33-F001 1 &2G33-F004	Inside Outside	Yes Yes	N/A 5
M-31& M-32	NA (Note 45)	Containment High Rad Detector									
M-33	56	Combustible Gas Control Drywell Suction	Air/Vapor Mixture	4 4	Yes Yes	A(b) A(b)	Detail (g)	1HG001B 1HG002B	Outside Outside	Yes Yes	N/A 10
M-33	Spare (Unit 2)										
M-34	55	Standby Liquid Control	Sodium Pentaborate Solution	1 1/2 1 1/2 1 1/2	No No No	AC(b) C AD(b)	Detail (u)	1&2C41-F007 1&2C41-F006 1&2C41-F004A,B	Inside Outside Outside	No (Note 62) No No (Note 62)	N/A N/A 100
M-35	Spare										
M-36	55	Recirc. Loop Sampling	Reactor Water	3/4 3/4 3/4	No No No	A(b) A(b) A(b)	Detail (ae)	1&2B33-F019 1&2B33-F020 1&2B33-F395	Inside Outside Inside	Yes Yes Yes	N/A 10 Max N/A
M-37	56	Clean Condensate	Condensate	3 3	No No	A(b) A(b)	Detail (ai)	1&2MC033 1&2MC027	Outside Outside	No (Note 43) No (Note 43)	N/A 4
M-38	56	Service Air	Air	3 3	No No	A(b) A(b)	Detail (v)	1&2SA046 1&2SA042	Outside Outside	No (Note 43) No (Note 43)	N/A 4
M-39	Spare										
M-40A,B,C,D	55 (Note 24)	CRD Insert	Condensate	1	No	A	Note (24)	1&2C11-D001-120 1&2C11-D001-123	Outside Outside	No No	45 Max
M-41A,B,C,D	55 (Note 24)	CRD Withdrawal	Condensate	3/4	No	A	Note (24)	1&2C11-D001-121 1&2C11-D001-122	Outside Outside	No No	45 Max
M-42 to M-46	54	TIP Drive	NA	3/8	No	NA	Note (18)	1&2C51-J004	Outside	Yes Note (18)	2
M-47	54	Air Supply	Air	3/4	No	A(b)		1&2IN031	Outside	Yes	
M-48	Spare										

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CODE CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
M-29	No Slam-Check No Slam-Check MO Gate MO Globe	1 1 1 1	Process Process Auto Auto	NA NA RM RM	C C C C	C C C C	C C C C	NA NA As is As is	Rev. Flow Rev. Flow RM (Note 31) A,D,U,RM(Note 31)	Instantaneous Instantaneous 15 Sec Standard	ESS 1 ESS 1 ESS 1 ESS 1	Note (3) Note (3) Note (51)
M-30	MO Gate MO Gate	1 1	Auto Auto	RM RM	O O	O O	C C	As is As is	B,J,RM B,J,RM	≤ 10 sec ≤ 10 sec	ESS 2 ESS 1	Note (61)
M-31 & M-32												
M-33	MO Gate MO Globe	2 2	RM RM	M M	C C	C C	O O	As is As is	RM(Note 37) RM(Note 37)	Standard Standard	Note (23) Note (23)	Note (20,54)
M-33												
M-34	No Slam-Check No Slam-Check Explosive	1 1 1	Process Process RM	NA NA NA	C C C	C C C	C C C	NA NA	Rev. Flow Rev. Flow NA	-- -- NA	NA NA	
M-35												
M-36	AO Globe Check AO Globe	2 2 2	Auto Process Auto	RM N/A RM	O C O	O C O	C C C	Closed N/A Closed	B,C,RM Reverse Flow B,C,RM	Standard Instantaneous Standard	ESS 2 N/A ESS 1	Note (9,42) Note (9,42)
M-37	Gate Gate	2 2	M M	NA NA	C C	C C	C C	NA NA	NA NA	NA NA	NA NA	Note (43) Note (43)
M-38	Gate Gate	2 2	M M	NA NA	C C	C C	C C	NA NA	NA NA	NA MA	NA NA	Note (43) Note (43)
M-39												
M-40 A, B, C, D	SO Gate SO Gate	Note (27) Note (27)	Auto Auto	RM RM	C C	C C	C C	As is As is	A,RM A,RM	Instantaneous Instantaneous		Typical of 185 Typical of 185
M-41 A, B, C, D	SO Gate SO Gate	Note (27) Note (27)	Auto Auto	RM RM	C C	C C	C C	As is As is	A,RM A,RM	Instantaneous Instantaneous		Typical of 185 Typical of 185
M-42 to M-46	Solenoid Ball	2	Auto	RM	C	C	C	C	A,F,RM (note 31)	NA	NA	
M-47	SO Globe	2	Auto	RM	O	O	C	C	B,F,RM	5 sec	ESS 2	
M-48	Spare											

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14,15)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
M-49 & M-50	56	Recric. Flow Control Valve Hydraulic Piping	Hydraulic Fluid (Fyrquel)	3/4 3/4 1/2 1/2 1/2 1/2 3/4 3/4	No No No No No No No No	Note (19) Note (19) Note (19) Note (19) Note (19) Note (19) Note (19) Note (19)	Detail (c) Detail (c) Detail (c) Detail (c) Detail (c) Detail (c) Detail (c) Detail (c)	1&2B33-F338A,B 1&2B33-F339A,B 1&2B33-F340A,B 1&2B33-F341A,B 1&2B33-F342A,B 1&2B33-F343A,B 1&2B33-F344A,B 1&2B33-F345A,B	Inside Outside Inside Outside Inside Outside Inside Outside	No (Note 35) No (Note 35) No (Note 35) No (Note 35) No (Note 35) No (Note 35) No (Note 35) No (Note 35)	N/A N/A N/A N/A
M-51	Spare										
M-52	55 (Note 33)	RPV Level	Reactor Water	3/4	Yes	C	Detail (AB)	2B21-F570	Outside	No (Note 33)	10 Max
M-53	56	Combustible Gas Control Drywell Suction	Air/Vapor Mixture	4 4	Yes Yes	A(b) A(b)	Detail (g)	1&21HG001A 1&21HG002A	Outside Outside	Yes Yes	N/A 10
M-54 (Unit 1)	Spare										
M-54 (Unit 2)	56	Air Dryer Blowdown	Air	3 3	No No	A(b) A(b)	Detail (g)	2IN074 2IN075	Outside Outside	Yes Yes	
	56	Drywell Pneumatic Comp Discharge	Air	2 2	No No	AC(b) A(b)	Detail (AL)	2IN018 2IN017	Outside Outside	Yes Yes	N/A 5
	56	Drywell Pneumatic Comp Suction	Air	2 1/2 2 1/2	No No	A(b) A(b)	Detail (g)	2IN001A 2IN001B	Outside Outside	Yes Yes	N/A 5

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CODE CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION(6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
M-49 & M-50	SO Globe	2	Auto	RME	O	O	C	C	B,F,RME	Instantan.	ESS 2	Note (35)
	SO Globe	2	Auto	RME	O	O	C	C	B,F,RME	Instantan.	ESS 1	Note (35)
	SO Globe	2	Auto	RME	O	O	C	C	B,F,RME	Instantan.	ESS 2	Note (35)
	SO Globe	2	Auto	RME	O	O	C	C	B,F,RME	Instantan.	ESS 1	Note (35)
	SO Globe	2	Auto	RME	O	O	C	C	B,F,RME	Instantan.	ESS 2	Note (35)
	SO Globe	2	Auto	RME	O	O	C	C	B,F,RME	Instantan.	ESS 1	Note (35)
	SO Globe	2	Auto	RME	O	O	C	C	B,F,RME	Instantan.	ESS 2	Note (35)
	SO Globe	2	Auto	RME	O	O	C	C	B,F,RME	Instantan.	ESS 1	Note (35)
M-51												
M-52	EFCV	2	Process	NA	O	O	O	NA	Flow	Instantan.	NA	
M-53	MO Gate	2	RM	M	C	C	O	As is	RM (Note 37)	Standard	Note (23)	Note (20,54)
	MO Globe	2	RM	M	C	C	O	As is	RM (Note 37)	Standard	Note (23)	
M-54 (Unit 1)												
M-54 (Unit 2)	AO Globe	2	Auto	M	O	O	C	C	F,H,RM	Standard	ESS 2	
	AO Globe	2	Auto	M	O	O	C	C	F,H,RM	Standard	ESS 1	
	No Slam-Check	2	Process	NA	O	O	C	NA	NA	Instantan.		
	AO Globe	2	Auto	M	O	O	C	C	F,H,RM	Standard	ESS 2	Note (28)
	AO Globe	2	Auto	RM	O	O	C	C	F,H,RM	Standard	ESS 2	Note (20)
	AO Globe	2	Auto	RM	O	O	C	C	F,H,RM	Standard	ESS 1	

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14,15)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
M-55	57	ADS Pneumatic Supply	Nitrogen or Air	1	Yes	B	Detail (j)	1 & 2IN100	Outside	No (Note 38)	5
M-56	55 (Note 33)	Reactor Water Level	Reactor Water	3/4	Yes	C	Detail (w)	1 &2B21-F372	Outside	No (Note 33)	10 Max
M-57	Spare										
M-58	Deleted										
M-59	56 (Note 58)	Clean Condensate to Refueling Bellows	Condensate	2 2	No No	A(b) A(b)	Detail (v)	1&2FC113 1&2FC114	Outside Outside	Yes Yes	N/A 5
M-59	55 (Note 33)	RPV Level and Pressure	Reactor Water	3/4	Yes	C	Detail (AB)	1B21-F570	Outside	No	10 Max
M-60 (Unit 1)	56	Drywell Pneumatic Compressor Discharge	Air	2 2 3 3	No No No No	AC(b) A(b) A(b) A(b)	Detail (AL) Detail (g)	1IN018 1IN017 1IN074 1IN075	Outside Outside Outside Outside	Yes Yes Yes Yes	N/A 5
M-60 (Unit 2)	57	ADS Pneumatic Supply	Nitrogen or Air	1	Yes	B	Detail (j)	2IN101	Outside	No (Note 38)	5
M-61 (Unit 1)	57	ADS Pneumatic Supply	Nitrogen or Air	1	Yes	B	Detail (j)	1IN101	Outside	No (Note 38)	5
M-61 (Unit 2)	Spare										
M-62 (Unit 1)	56	Drywell Pneumatic Comp Discharge	Air	2 1/2 2 1/2	No No	A(b) A(b)	Detail (g)	1IN001A 1IN001B	Outside Outside	Yes Yes	N/A 5
M-62 (Unit 2)	Spare										
M-63 & M-64	55	Recirc. Pump Seal Injection Supply	Condensate	3/4 3/4	No No	A(a) A(a)	Detail (h) Note (25)	1&2B33-F013A,B 1&2B33-F017A,B	Inside Outside	Yes (Note 25) Yes (Note 25)	 N/A
M-65	56 (Note 58)	Reactor Well Bulkhead Drain	Water	10 10	No No	A(b) A(b)	Detail (V) (Unit 1 only) Detail (AD) (Unit 2 only)	1&2FC115 1&2FC086	Outside Outside	Yes Yes	N/A 5
M-65 (Unit 2)	55 (Note 33)	RPV Level	Reactor Water	3/4	Yes	C	Detail (AB)	2B21-F571	Outside	No (Note 33)	10 max

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
M-55	SO Globe	2	RM	M	O	O	O	O	NA	Instantaneous	ESS 2	
M-56	Excess Flow check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
M-57												
M-58												
M-59	Globe Globe	2 2	M M	NA NA	L.C. L.C.	C C	C C	NA NA	NA NA	NA NA	NA NA	Note (20,54) Note (20)
M-59	EFCV	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	Note(23,33)
M-60 (Unit 1)	Check AO Globe AO Globe AO Globe	2 2 2 2	Process Auto Auto Auto	NA M M M	O O O O	O O O O	C C C C	NA C C C	NA B,F,RM B,F,RM B,F,RM	Instantaneous Standard Standard Standard	 ESS 2 ESS 2 ESS 1	Note (28) Note (28)
M-60 (Unit 2)	SO Globe	2	RM	M	O	O	FO	FO	NA	Instantaneous	ESS 2	
M-61 (Unit 2)	SO Globe	2	RM	M	O	O	FO	FO	NA	Instantaneous	ESS 2	
M-61 (Unit 2)												
M-62 (Unit 1)	AO Globe AO Globe	2 2	Auto Auto	RM RM	O O	O O	C C	C C	B,F,RM B,F,RM	Standard Standard	ESS 2 ESS 1	Note (20)
M-62 (Unit 2)												
M-63 & M-64	No Slam-Check No Slam-Check	2 2	Process Process	NA NA	O O	O O	C C	NA NA	Reverse Flow Reverse Flow	Instantaneous Instantaneous	NA NA	
M-65	Gate Gate	2 2	M M	NA NA	C C	C C	C C	NA NA	NA NA	NA NA	NA NA	Note (20 ,54) (Note 20 Unit 1 only)
M-65 (Unit 2)	EFCV	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14, 15)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
M-66	56	Suppression Chamber Purge Line	Air	26 26 1 1/2 1 1/2 8	No No No No No	A (b) A (b) A (b) A (b) A (b)	Detail (s) Detail (s) Detail (s) Detail (s)	1&2VQ027 1&2VQ026 1&2VQ050 1&2VQ051 1&2VQ043	Outside Outside Outside Outside Outside	Yes Yes Yes Yes Yes	N/A 8 7 Max.
M-67	56	Suppression Chamber Vent Line	Air	26 26 2	No No No	A (b) A (b) A (b)	Detail (h)	1&2VQ031 1&2VQ040 1&2VQ032	Outside Outside Outside	Yes Yes Yes	N/A 17 N/A
M-68	56 (Note 28)	LPCS Suction from Suppression Pool	Suppression Pool Water	24	Yes	B	Detail (m)	1&2E21-F001	Outside	No (Note 39)	2
M-69	56 (Note 28)	HPCS Suction from Suppression Pool	Suppression Pool Water	24	Yes	B	Detail (m)	1&2E22-F015	Outside	No (Note 39)	5
M-70	56 (Note 28) 56 (Note 32)	RHR (LPCI) Suction From Supp. Pool Supp. Pool Water Level	Suppression Pool Water Supp. Pool /water	24 3/4	Yes No	B C	Detail (m) Detail (w)	1&2E12-F004A 1&2CM002	Outside Outside	No (Note 39) No (Note 32)	2 10 Max.
M-71	56 (Note 28) 56 (Note 32)	RHR (LPCI) Suction From Supp. Pool Supp. Pool Water Level	Suppression Pool Water Supp. Pool Water	24 3/4	Yes No	B C	Detail (m) Detail (w)	1&2E12-F004C 1&2CM010	Outside Outside	No (Note 39) No (Note 32)	2 10 Max.

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWERFAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
M-66	AO Butterfly AO Butterfly MO Globe MO Globe AO Butterfly	2 2 2 2 2	Auto Auto Auto Auto Auto	RM RM RM RM RM	C C O O C	C C C C O	C C C C C	C C As is As is C	F,B,Y,Z,RM F,B,Y,Z,RM F,B,Y,Z,RM F,B,Y,Z,RM F,B,Y,Z,RM	10 sec. 10 sec. 23 sec. 23 sec. 10 sec.	ESS 2 ESS 1 ESS 1 ESS 1 ESS 1	Note(8,20,46,54) Note(8,46) Note(20, 54) Note (46)
M-67	AO Butterfly AO Butterfly MO Globe	2 2 2	Auto Auto Auto	RM RM RM	C C C	C C C	C C C	C C As is	F,B,Y,Z,RM F,B,Y,Z,RM F,B,Y,Z,RM	10 sec. 10 sec. Standard	ESS 2 ESS 1 ESS 2	Note (8,20,41,46, 54) Note (8, 46) Note (8,20)
M-68	MO Gate	2	RM	M	O	O	O	As is	RM (Note 36)	Standard	ESS 1	Note (20)
M-69	MO Gate	2	Auto	RM	O	O	O	As is	RM (Note 36)	Standard	ESS 3	Note (20)
M-70	MO Gate EFCV	2 2	RM Process	M NA	O O	O O	O O	As is NA	RM (Note 36) Flow	Standard Instantan.	Note (22) NA	Note (20)
M-71	MO Gate EFCV.	2 2	RM Process	M NA	O O	O O	O O	As is NA	RM (Note 36) Flow	Standard Instantan.	Note (22) Na	Note (20)

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14,15)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
M-72	56 (Note 28)	RHR (LPCI) Suction From Supp. Pool	Suppression Pool Water	24	Yes	B	Detail (m)	1&2E12-F004B	Outside	No (Note 39)	2
M-73 & M-74	56	RHR to Suppression Pool Spray Header	Suppression Pool Water	4	No	B	Detail (z)	1&2E12-F027A,B	Outside	No (Note 29)	23
M-75	56 (Note 28)	RCIC Pump Suction From Suppression Pool	Suppression Pool Water	8	Yes	B	Detail (m)	1&2E51-F031	Outside	No (Note 39)	2
M-76	56 (Note 28)	RCIC Turbine Exhaust	Steam	10	Yes Yes	A (b) A (b)	Detail (o)	1&2E51-F068 1&2E51-F040	Outside Outside	Yes Yes	3 N/A
M-77	56 (Note 28) 56 (Note 28)	LPCS Test Line LPCS Min. Flow Line RHR Suction RV RCIC Full Flow Test Return to Supp. Pool	Suppression Pool Water Suppression Pool Water	14 4 2 4	Yes Yes Yes Yes	B B B B	Detail (AA)	1&2E21-F012 1&2E21-F011 1&2E12-F088A 1(2)E51-F362 1(2)E51-F363 1(2)E51-F022 1(2)E51-F059	Outside Outside Outside Outside Outside Outside Outside	No (Note 29) No (Note 29) No (Note 29) Yes (Note 49) Yes (Note 49) Yes (Note 49) Yes (Note 49)	225 max. 215 max. 230 max.
M-78	Spare										
M-79 & M-84	56 (Note 28)	RHR Min. Flow Line RHR Test Line	Supp. Pool Water	18 18 14 8 4 2	Yes Yes Yes Yes Yes Yes	B B B B B C	Detail (q),(AG)	1&2E12-F024A,B 1&2E12-F021 1&2E12-F302 1&2E12-F064A,B,C 1&2E12-F011A,B 1&2E12-F088B	Outside Outside Outside Outside Outside Outside	No (Note 29) No (Note 29) No (Note 29) No (Note 29) No (Note 29) No (Note 29)	300 Max.
M-80	56 (Note 28)	RCIC Pump Min. Flow Line	Condensate	2	Yes	B	Detail (r)	1&2E51-F019	Outside	No (Note 29)	40
M-81	56 (Note 28)	RCIC Vacuum Pump Discharge	Condensate	1 1/4 1 1/4	No No	A (b) A (b)	Detail (r)	1&2E51-F069 1&2E51-F028	Outside Outside	Yes Yes	3 N/A
M-82	56 (Note 28)	HPCS Test Line HPCS Min Flow Line	Condensate	14 4	Yes Yes	B B	Detail (l)	1&2E22-F023 1&2E22-F012	Outside Outside	No (Note 29) No (Note 29)	29 Max.
M-83 & M-93	56 (Note 28)	LPCS Safety/Relief Valve Discharge	Suppression Pool	4 2	Yes Yes	C C	Detail (AK)	1&2E21-F018 1&2E21-F031	Outside Outside	No (Note 29) No (Note 29)	125 Max.
M-85 M-86 M-87 M-90 M-91 M-99	56 (Note 28)	RHR Safety/Relief Valve Discharge	Suppression Pool Water	2 2 2 2 2	Yes Yes Yes Yes Yes	C C C C C	Detail (AK)	1&2E12-F025A 1&2E12-F025B 1&2E12-F025C 1&2E12-F088C 1&2E12-F030 1&2E12-F005	Outside Outside Outside Outside Outside Outside	No (Note 29) No (Note 29) No (Note 29) No (Note 29) No (Note 29) No (Note 29)	69 Max.

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
M-72	MO Gate	2	RM	M	O	O	O	As is	RM (Note 36)	Standard	Note (22)	Note (20)
M-73 & M-74	MO Gate	2	Auto	RM	C	C	C	As is	G, RM	30 sec	Note (22)	Note (2, 20,56)
M-75	MO Gate	2	Auto	RM	C	C	C	As is	RM (Note 36)	Note (59)	ESS 1 (DC)	Note (20,57)
M-76	MO Gate	2	Auto	RM	O	O	O	As is	RM (Note 36)	Note (59)	ESS 1	Note (20,54))
	Check	2	Process	NA	C	C	C	As is	Reverse Flow	Instantan.		
M-77	MO Globe	2	RM	M	C	C	C	As is	Rm(Notes 31,36)	Note (47)	ESS 1	Note (20)
	MO Gate	2	RM	M	O	O	C	As is	Rm(Notes 31,36)	Standard	ESS 1	Note (20)
	Relief	2	Process	NA	C	C	C	NA		---	--	Note (20)
	Gate	2	Manual	NA	C	C	C	NA		---	--	--
	Gate	2	Manual	NA	C	C	C	NA		---	--	Note (20,54)
	MO Globe	2	Process	RM	C	C	C	As is	RM(Notes 31,36)	Note (59)	ESS 1	
	MO Globe	2	Process	RM	C	C	C	As is	RM(Notes 31,36)	Note (59)	ESS 1	--
M-78												
M-79 & M-84	MO Globe	2	Auto	RM	C	C	C	As is	G,RM	Standard	Note (22)	Note (2 20)
	MO Globe	2	Auto	RM	C	C	C	As is	G,RM	Standard	ESS 2	Note (20)
	Gate	2	M	NA	C	C	C	NA		--	--	Note (20)
	MO Gate	2	RM	M	O	C	C	As is	RM(Notes 31,36)	Standard Note	Note (22)	Note (20)
	MO Gate	2	RM	M	C	C	C	As is	GRM(Notes31,3 6)	(50) 22 sec	ESS 1	Note (20)
	Relief	2	Process	NA	C	C	C	NA		--	--	Note (20)
M-80	MO Globe	2	RM	M	C	C	C	As is	RM(Notes 31,36)	7 sec	ESS 1 (DC)	Note (20)
M-81	MO Globe	2	RM	M	O	O	O	As is	RM(Notes 31,36)	Note (59)	ESS 1	Note (20,54)
	No Slam Check	2	Process	NA	C	C	C	NA	Reverse Flow	Instantan.	NA	
M-82	MO Globe	2	Auto	M	C	C	C	As is	G,RM	Standard	ESS 3	Note (20)
	MO Gate	2	Auto	M	C	C	C	As is	G,RM	Standard	ESS 3	Note (20,56)
M-83 & M-93	Relief	2	Process	NA	C	C	C	NA	Process	NA	NA	Note (20)
	Relief	2	Process	NA	C	C	C	NA	Process	NA	NA	Note (20)
M-85	Relief	2	Process	NA	C	C	C	NA	Process	NA	NA	Note (20)
M-86	Relief	2	Process	NA	C	C	C	NA	Process	NA	NA	Note (20)
M-87	Relief	2	Process	NA	C	C	C	NA	Process	NA	NA	Note (20)
M-90	Relief	2	Process	NA	C	C	C	NA	Process	NA	NA	Note (20)
M-91	Relief	2	Process	NA	C	C	C	NA	Process	NA	NA	Note (20)
M-99	Relief	2	Process	NA	C	C	C	NA	Process	NA	NA	Note (20)

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
M-88 & M-89	56 (Note 28)	RHR Safety/Relief Valve Discharge and H_x Vent Line	Steam	3/4 3/4 6 2	Yes Yes Yes Yes	B B C C	Detail (p)	1&2E12-F073A,B 1&2E12-F074A,B 1&2E12-F055A,B 1&2E12-F311A,B	Outside Outside Outside Outside	No (Note 29) No (Note 29) No (Note 29) No (Note 29)	N/A 56 Max.
M-92	56 (Note 28)	RCIC Safety/Relief Valve Discharge	Condensate	4	No	C	Detail (AK)	1&2E12-F036B	Outside	No (Note 29)	5
M-94	56 (Note 28)	HPCS Safety/Relief Valve Discharge	Condensate	2	Yes	C	Detail (AK)	1&2E22-F014	Outside	No (Note 29)	27
M-95	Spare										
M-96	56	Drywell Equip. Drains	Water	4 4	No No	A (b) A (b)	Detail (g)	1&2RE025 1&2RE024	Outside Outside	Yes Yes	10 N/A
M-97	56	Drywell Equip. Drain Cooling	Water	2 2	No No	A (b) A (b)	Detail (g)	1&2RE029 1&2RE026	Outside Outside	Yes Yes	10 N/A
M-98	56	Drywell Floor Drains	Water	4 4	No No	A (b) A (b)	Detail (g)	1&2RF012 1&2RF013	Outside Outside	Yes Yes	N/A 10
M-100	56 (Note 28)	SUPR CHBR	N_2/O_2	1/2	No	A (b)	Detail (g)	1CM019A 1CM020A	Outside Outside	Yes Yes	60 60

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
M-88 & M-89	MO Globe MO Glove Relief Relief	2 2 2 2	RM RM Process Process	M M NA NA	C C C C	C C C C	C C C C	As is As is NA NA	RM (Note 36) RM (Note 36) Process Process	Standard Standard NA NA	ESS 1 ESS 1 NA NA	Note (20) Note (20) Note (20) Note (20)
M-92	Relief	2	Process	NA	C	C	C	NA	Process	NA	NA	Note (20)
M-94	Relief	2	Process	NA	C	C	C	NA	Process	NA	NA	Note (20)
M-95												
M-96	AO Globe AO Globe	2 2	Auto Auto	RM RM	C C	C C	C C	C C	B,F,RM B,F,RM	Standard Standard	ESS 1 ESS 2	Note (20)
M-97	AO Globe AO Globe	2 2	Auto Auto	RM RM	C C	C C	C C	C C	B,F,RM B,F,RM	Standard Standard	ESS 1 ESS 2	Note (20,42,54)
M-98	AO Glove AO Glove	2 2	Auto Auto	RM RM	C C	C C	C C	C C	B,F,RM B,F,RM	Standard Standard	ESS 2 ESS 1	Note (20,42)
M-100	SOL Globe SOL Globe	2 2	Auto Auto	RM RM	O O	O O	C C	C C	B, F, RM B, F, RM	5 sec 5 sec	ESS 1 ESS 2	Note 20

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in.)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
M-101	56 56 (Note 28)	RCIC Turbine Exhaust Breaker Line RCIC Safety/Relief Valve Discharge	Air Condensate	2 2 4	Yes Yes No	A (b) A (b) C	Detail (o) Detail (AK)	1&2E51-F080 1&2E51-F086 1&2E12-F036A	Outside Outside Outside	Yes Yes No (Note 29)	17 NA 5
M-102	Spare										
M-103	NA	Vacuum Breaker	Air	24	Yes	Exempt	Detail (y)	1&2PC003C	Outside	No	4
M-104	56 (Note 32) 56 NA	Supp. Pool Water Level Combustible Gas Control Return Vacuum Breaker	Supp. Pool Water Air Vapor Mixture Air	3/4 6 6 24	No Yes Yes Yes	C A (b) A (b) Exempt	Detail (w) Detail (g) Detail (y)	1&2CM012 1&2HG005A 1&2HG006A 1&2PC003A	Outside Outside Outside Outside	No (Note 32) Yes Yes No	10 Max. NA 4
M-105	56 (Note 32) NA	Supp. Pool Water Level Vacuum Breaker	Supp. Pool Water Air	3/4 24	No Yes	C Exempt	Detail (w) Detail (y)	1&2CM004 1&2PC003D	Outside Outside	No (Note 32) No	10 Max. 4
M-106	NA 56	Vacuum Breaker Combustible Gas Control Return	Air Air Vapor Mixture	24 6 6	Yes Yes Yes	Exempt A (b) A (b)	Detail (y) Detail (g)	1&2PC003B 1&2HG005B 1&2HG006B	Outside Outside Outside	No Yes Yes	4 N/A
M-107	NA NA	Vacuum Breaker Vacuum Breaker	Air Air	24 24	Yes Yes	Exempt C	Detail (y) Detail (y)	1&2PC002C 1&2PC001C	Outside Outside	No No	2
M-108	NA NA	Vacuum Breaker Vacuum Breaker	Air Air	24 24	Yes Yes	Exempt C	Detail (y) Detail (y)	1&2PC002A 1&2PC001A	Outside Outside	No No	2
M-109	NA NA	Vacuum Breaker Vacuum Breaker	Air Air	24 24	Yes Yes	Exempt C	Detail (y) Detail (y)	1&2PC002D 1&2PC001D	Outside Outside	No No	2
M-110	NA NA	Vacuum Breaker Vacuum Breaker	Air Air	24 24	Yes Yes	Exempt C	Detail (y) Detail (y)	1&2PC002B 1&2PC001B	Outside Outside	No No	2

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CODE CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
M-101	MO Globe MO Globe Relief	2 2 2	RM RM Process	M M NA	O O C	O O C	C C C	As is As is NA	F,RM (Note 36) F,RM (Note 36) Process	Note (59) Standard NA	ESS 1 ESS 2 NA	 Note (20) Note (20)
M-102												
M-103	Butterfly	2	M	NA	O	O	O	NA	NA	NA	NA	Note (4, 55)
M-104	EFCV MO Gate MO Gate Butterfly	2 2 2 2	Process RM RM M	NA M M NA	O C C O	O C C O	O O O O	NA As is As is NA	Flow RM (Note 37) RM (Note 37) NA	Instantan. Standard Standard NA	 Note (23) Note (23) NA	NA Note (20,54) Note (4,55)
M-105	EFCV Butterfly	2 2	Process M	NA NA	O O	O O	O O	NA NA	Flow NA	Instantan. NA	 NA	NA Note (4,55)
M-106	Butterfly MO Gate MO Gate	2 2 2	M RM RM	NA M M	O C C	O C C	O O O	NA As is As is	NA RM (Note 37) RM (Note 37)	NA Standard Standard	NA Note (23) Note (23)	Note (4,55) Note (20,54)
M-107	Butterfly Vacuum Breaker	2 2	M Process	N/A N/A	O C	O C	O C/O	NA NA	NA Pressure Differential	NA NA	NA ESS1 ESS2	Note (4,55) Note (4)
M-108	Butterfly Vacuum Breaker	2 2	M Process	NA NA	O C	O C	O C/O	NA NA	NA Pressure Differential	NA NA	NA ESS1 ESS2	Note (4,55) Note (4)
M-109	Butterfly Vacuum Breaker	2 2	M Process	NA NA	O C	O C	O C/O	NA NA	NA Pressure Differential	NA NA	NA ESS1 ESS2	Note (4,55) Note (4)
M-110	Butterfly Vacuum Breaker	2 2	M Process	NA NA	O C	O C	O C/O	NA NA	NA Pressure Differential	NA NA	NA ESS1 ESS2	Note (4,55) Note (4)

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
I-1A, B, C, D, E, F	---	---	---	---	---	---	---	---	---	---	---
I-2	55 (Note 26)	RPV Level and Pressure	Reactor Water	3/4	Yes	C	Detail (w)	1&2B21-F374	Outside	No (Note 33)	10 max.
I-3	---	---	---	---	---	---	---	---	---	---	10 max.
I-4A	55 (Note 26) 55 (Note 33)	RPV Level and Pressure Backfill	Reactor Water Reactor Water	3/4 1/2	Yes No	C C(b)	Detail (w) Detail (ac)	1&2B21-F376 1&2C11-F423G/ 1&2C11-F422G	Outside Outside	No (Note 33) Yes (Note 33)	10 max. 10 max
I-4B, C, D, E	---	---	---	---	---	---	---	---	---	---	10 max.
I-4F	56	SUPR CHBR/DW Oxygen Monitor (Unit 1) or Drywell Humidity Monitor (Unit 2)	Air	3/4 3/4	No No	A (b) A (b)	Detail (g)	1&2CM017A 1&2CM018A	Outside Outside	Yes Yes	10 max. 10 max.
I-5A	55 (Note 26) 55 (Note 33)	RPV Level and Pressure Backfill	Reactor Water Reactor Water	3/4 1/2	Yes No	C C (b)	Detail (w) Detail (ac)	1&2B21-F359 1&2C11-F423B/ 1&2C11-F422B	Outside Outside	No (Note 33) Yes (Note 33)	10 max. 18 max.
I-5B, C, D, E	---	---	---	---	---	---	---	---	---	---	10 max.
I-5F	56	Drywell Tritium Grab Sample (Unit 1) or Drywell Humidity Monitor (Unit 2)	Air	3/4 3/4	No No	A (b) A (b)	Detail (g)	1&2CM017B 1&2CM018B	Outside Outside	Yes Yes	10 max. 10 max
I-6	55 (Note 26)	RPV Level and Pressure	Reactor Water	3/4	Yes	C	Detail (w)	1&2B21-F355	Outside	No (Note 33)	10 max.
I-7	55 (Note 26) 55 (Note 33)	RPV Level and Pressure Backfill	Reactor Water Reactor Water	3/4 1/2	Yes No	C C (b)	Detail (w) Detail (ac)	1&2B21-F361 1&2C11-F423D/ 1&2C11-F422D	Outside Outside	No (Note 33) Yes (Note 33)	10 max. 13 max
I-8A	55 (Note 26) 55 (Note 33)	RPV Level and Pressure Backfill	Reactor Water Reactor Water	3/4 1/2	Yes No	C C (b)	Detail (w) Detail (ac)	1&2B21-F378 1&2C11-F423F/ 1&2C11-F422F	Outside Outside	No (Note 33) Yes (Note 33)	10 max. 54 max.
I-8B, C, F	---	---	---	---	---	---	---	---	---	---	---
I-8D	56	Drywell Pressure	Air	3/4	No	C	Detail (w)	1&2VQ061	Outside	No (Note 32)	10 max.

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
I-1A,B,C,D,E,F	--	--	--	--	--	--	--	--	--	--	--	Spare
I-2	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-3	--	--	--	--	--	--	--	--	--	--	--	Spare
I-4A	Excess Flow Check Checks	2 2	Process Process	NA NA	O O	O C	O C	NA NA	Flow Flow	Instantaneous Instantaneous	NA NA	 Note (33)
I-4B,C,D,E	--	--	--	--	--	--	--	--	--	--	--	Spare
I-4F	SO Globe SO Globe	2 2	Auto Auto	RM RM	O O	O O	C C	C C	B,F,RM B,F,RM	5 sec. 5 sec.	ESS 2 ESS 1	Note (20)
I-5A	Excess Flow Check Checks	2 2	Process Process	NA NA	O O	O C	O C	NA NA	Flow Flow	Instantaneous Instantaneous	NA NA	 Note (33)
I-5B,C,D,E	--	--	--	--	--	--	--	--	--	--	--	Spare
I-5F	SO Globe SO Globe	2 2	Auto Auto	RM RM	O O	O O	C C	C C	B,F,RM B,F,RM	5 sec. 5 sec.	ESS 2 ESS 1	Note (20)
I-6	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-7	Excess Flow Check Checks	2 2	Process Process	NA NA	O O	O C	O C	NA NA	Flow Flow	Instantaneous Instantaneous	NA NA	 Note (33)
I-8A	Excess Flow Chk Checks	2 2	Process Process	NA NA	O O	O C	O C	NA NA	Flow Flow	Instantaneous Instantaneous	NA NA	 Note (33)
I-8B,C,F	--	--	--	--	--	--	--	--	--	--	--	Spare
I-8D	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14, 15)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
I-8E	57 (Note 44)	RPV Head Seal Leak Detection	Air	3/4	No	---	Detail (j)	1&2E31-F303	Outside	No	10 max.
I-9a	55 (Note 26)	RPV Level and Pressure	Reactor Water	3/4	Yes	C	Detail (w)	1&2B21-F370	Outside	No (Note 33)	10 max.
I-9B, C	---	---	---	---	---	---	---	---	---	---	10 max.
I-9D, E, F	57 (Note 44)	ADS Accumulator Pressure	Air	3/4	Yes	B	Detail (j)	1&2B21-F342D, V, S	Outside	No	10 max.
I-10A & B	55 (Note 26)	RPV Level and Pressure	Reactor Water	3/4 3/4	Yes Yes	C C	Detail (w) Detail (w)	1&2B21-F363 1&2B21-F353	Outside Outside	No (Note 33) No (Note 33)	10 max. 10 max.
I-10C & D	55 (Note 26)	RCIC Steam Flow		3/4 3/4	Yes Yes	C C	Detail (w) Detail (w)	1&2B21-F415B 1&2B21-F415A	Outside Outside	No (Note 33) No (Note 33)	10 max. 10 max
I-10E & F	---	---	---	---	---	---	---	---	---	---	10 max.
I-11A	56	Primary Cont. Air Sample	Air Air	1/2 1/2	No No	A (b) A (b)	Detail (g)	1&2CM031 1&2CM032	Outside Outside	Yes Yes	10 max. 10 max.
I-11B	56 (Note 28)	Post LOCA Containment Monitoring	Air	1/2 1/2 1/2	Yes No No	B A (b) A (b)	Detail (k) Detail (g) Detail (g)	1&2CM022A 1&2CM029 1&2CM030	Outside Outside Outside	No (Note 40) Yes Yes	10 max. NA 10 max.
I-12A	55	RPV Level and Pressure	Reactor Water	3/4	Yes	---	Detail (w)	1&2B21-F357	Outside	No (Note 33)	10 max.
I-12B, C, E, F	57 (Note 44)	ADS Accumulator Pressure	Air	3/4	Yes	B	Detail (j)	1&2B21-E342E, R, U, C	Outside	No	10 max.
I-12D	---	---	---	---	---	---	---	---	---	---	---
I-13	56 (Note 32)	Drywell Pressure	Air	3/4	Yes	C	Detail (w)	1&2B21-F382	Outside	No (Note 32)	10 max.
I-14A, B, C, D, E, F	---	---	---	---	---	---	---	---	---	---	10 max.
I-15A, B, C, D	55 (Note 26)	Steam Flow	Steam	3/4 3/4 3/4 3/4	Yes Yes Yes Yes	C C C C	Detail (w) Detail (w) Detail (w) Detail (w)	1&2B21-F328B 1&2B21-F327B 1&2B21-F327A 1&2B21-F328A	Outside Outside Outside Outside	No (Note 33)	10 max. 10 max. 10 max. 10 max.
I-15 E & F	55 (Note 26)	RWCU Flow	Reactor Water	3/4 3/4	No No	C C	Detail (w) Detail (w)	1&2G33-F312A 1&2G33-F312B	Outside Outside	No (Note 33) No (Note 33)	10 max. 10 max.
I-16A	55 (Note 26)	RHR Line Integrity	Reactor Water	3/4	Yes	C	Detail (w)	1&2E12-F315	Outside	No (Note 33)	10 max.
I-16B & C	---	---	---	---	---	---	---	---	---	---	10 max.

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
I-8E	Globe	2	Manual	NA	O	O	O	NA	--	--	NA	
I-9A	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-9B,C	--	--	--	--	--	--	--	--	--	--	--	Spare
I-9D,E,F	Manual	2	Manual	NA	O	O	O	NA	--	--	--	
I-10A & B	Excess Flow Chk Excess Flow Chk	2 2	Process Process	NA NA	O O	O O	O O	NA NA	Flow Flow	Instantaneous Instantaneous	NA NA	
I-10C & D	Excess Flow Chk Excess FlowChk	2 2	Process Process	NA NA	O O	O O	O O	NA NA	Flow Flow	Instantaneous Instantaneous	NA NA	
I-10E & F	--	--	--	--	--	--	--	--	--	--	--	Spare
I-11A	SO Globe SO Globe	2 2	Auto Auto	RM RM	O O	O O	C C	C C	B,F,RM B,F,RM	5 sec. 5 sec.	ESS 2 ESS 1	Note (20)
I-11B	SO Globe SO Globe SO Globe	2 2 2	Auto Auto Auto	RM RM RM	C/O O O	C O O	O C C	O C C	RM (Note 37) B,F,RM B,F,RM	5 sec. 5 sec. 5 sec.	ESS 1 ESS 2 ESS 1	Note (20) Note (20)
I-12A	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-12B,C,E,F	Manual	2	Manual	NA	O	O	O	NA	--	--	--	
I-12D	--	--	--	--	--	--	--	--	--	--	--	Spare
I-13	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-14A,B,C,D,E	--	--	--	--	--	--	--	--	--	--	--	Spare
I-15A,B,C,D	Excess Flow Chk Excess Flow Chk Excess Flow Chk Excess Flow Chk	2 2 2 2	Process Process Process Process	NA NA NA NA	O O O O	O O O O	O O O O	NA NA NA NA	Flow Flow Flow Flow	Instantaneous Instantaneous Instantaneous Instantaneous	NA NA NA NA	
I-15E & F	Excess Flow Chk Excess Flow Chk	2 2	Process Process	NA NA	O O	O O	O O	NA NA	Flow Flow	Instantaneous Instantaneous	NA NA	
I-16A	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-16B & C	--	--	--	--	--	--	--	--	--	--	--	Spare

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in.)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14)	VALVE ARRANGEMENT FIGURE 6.2-32	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
I-16D & E	55 (Note 26)	RCIC Steam Flow	Steam	3/4 3/4	Yes Yes	C C	Detail (w)	1&2B21-F413B 1&2B21-F413A	Outside Outside	No (Note 33) No (Note 33)	10 Max. 10 Max.
I-16F	55 (Note 26)	LPCS/LPCI ΔP	Reactor Water	3/4	Yes	C	Detail (w)	1&2E21-F304	Outside	No (Note 33)	10 Max.
I-17A	55 (Note 26)	Jet Pump Pressure	Reactor Water	3/4	No	C	Detail (w)	1&2B21-F344	Outside	No (Note 33)	10 Max.
I-17B,C,D,E,F	---	---	---	--	--	--	--	--	--	---	10 Max.
I-18	56 (Note 32)	Drywell Pressure	Air	3/4	Yes	--	Detail (w)	1&2B21-F365	Outside	No (Note 32)	10 Max.
I-19A I-19B I-19C I-19D I-19E I-19F	55 (Note 26)	Jet Pump Flow	Reactor Water	3/4 3/4 3/4 3/4 3/4 3/4	No No No No No No	C C C C C C	Detail (w) Detail (w) Detail (w) Detail (w) Detail (w) Detail (w)	1&2B21-F443 1&2B21-F439 1&2B21-F437 1&2B21-F441 1&2B21-F445A 1&2B21-F447	Outside Outside Outside Outside Outside Outside	No (Note 33) No (Note 33) No (Note 33) No (Note 33) No (Note 33) No (Note 33)	10 Max. 10 Max. 10 Max. 10 Max. 10 Max. 10 Max.
I-20A I-20B I-20C I-20D I-20E I-20F	55 (Note 26)	Jet Pump Flow	Reactor Water	3/4 3/4 3/4 3/4 3/4 3/4	No No No No No No	C C C C C C	Detail (w) Detail (w) Detail (w) Detail (w) Detail (w) Detail (w)	1&2B21-F455A 1&2B21-F451 1&2B21-F449 1&2B21-F453 1&2B21-F445B 1&2B21-F455B	Outside Outside Outside Outside Outside Outside	No (Note 33) No (Note 33) No (Note 33) No (Note 33) No (Note 33) No (Note 33)	10 Max. 10 Max. 10 Max. 10 Max. 10 Max. 10 Max.
I-21A,B,C,D,E,F	---	---	---	---	--	-	---	---	---	---	10 Max.
I-22A & D	55 (Note 26)	Recirc. Pump Seal Press.	Reactor Water	3/4 3/4	No No	C C	Detail (w) Detail (w)	1&2B33-F319A 1&2B33-F317A	Outside Outside	No (Note 33) No (Note 33)	10 Max. 10 Max.
I-22B & C	55 (Note 26)	Recirc. Pump Flow	Reactor Water	3/4 3/4 3/4 3/4	No No No No	C C C C	Detail (x) Detail (x) Detail (x) Detail (x)	1&2B33-F313C 1&2B33-F313D 1&2B33-F311C 1&2B33-F311D	Outside Outside Outside Outside	No (Note 33) No (Note 33) No (Note 33) No (Note 33)	10 Max. 10 Max. 10 Max. 10 Max.

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CODE CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
I-16D & E	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-16F	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-17A	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-17B,C,D,E,F	---	--	---	---					---	---		Spare
I-18	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-19A	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-19B	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-19C	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-19D	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-19E	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-19F	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-20A	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-20B	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-20C	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-20D	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-20E	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-20F	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-21A,B,C,D,E,F	---		---	--	--	--	--	--	---	---	--	Spare
I-22A & D	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-22B & C	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in.)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14)	VALVE ARRANGEMENT FIGURE 6.2-32	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
I-22E & F	55 (Note 26)	Recirc. Pump ΔP	Reactor Water	3/4 3/4	No No	C C	Detail (w) Detail (w)	1&2B33-F315A 1&2B33-F315B	Outside Outside	No (Note 33) No (Note 33)	10 Max. 10 Max.
I-23A	---	---	---	---	--	-	---	---	---	---	10 Max.
I-23B	55 (Note 26)	Recirc. Pump Suction Press.	Reactor Water	3/4	No	C	Detail (w)	1&2B33-F301A	Outside	No (Note 33)	10 Max.
I-23C & D	55 (Note 26)	Recirc. Pump Flow	Reactor Water	3/4 3/4 3/4 3/4	No No No No	C C C C	Detail (x) Detail (x)	1&2B33-F307C 1&2B33-F307D 1&2B33-F305C 1&2B33-F305D	Outside Outside Outside Outside	No (Note 33) No (Note 33) No (Note 33) No (Note 33)	10 Max. 10 Max. 10 Max. 10 Max.
I-23E & F	55 (Note 26)	RHR Shutdown Flow	Reactor Water	3/4 3/4	Yes Yes	C C	Detail (w) Detail (w)	1&2E12-F359B 1&2E12-F359A	Outside Outside	No (Note 33) No (Note 33)	10 Max. 10 Max.
I-24A,B,C,D,E,F	--	---	---	---	--	--	--	---	---	---	10 Max.
I-25A & B	55 (Note 26)	RHR Line Integrity	Reactor Water	3/4 3/4	Yes Yes	C C	Detail (w) Detail (w)	1&2E12-F319 1&2E12-F317	Outside Outside	No (Note 33) No (Note 33)	10 Max. 10 Max.
I-25C, D, E, F	---	---	---	---	---	-	--	---	---	---	10 Max.
I-26	56 (Note 32)	Drywell Press.	Air	3/4	Yes	C	Detail (w)	1&2B21-F367	Outside	No (Note 33)	10 Max.
I-27A & D	55 (Note 26)	Recirc. Pump Flow	Reactor Water	3/4 3/4 3/4 3/4	No	C C C C	Detail (x) Detail (x)	1&2B33-F307A 1&2B33-F307B 1&2B33-F305A 1&2B33-F305B	Outside Outside Outside Outside	No (Note 33) No (Note 33) No (Note 33) No (Note 33)	10 Max. 10 Max. 10 Max. 10 Max.

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CODE CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
I-22E & F	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-23A	---	-	---	--	-	-	-	--	----	---	--	Spare
I-23B	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-23C & D	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-23E & F	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-24A,B,C,D,E,F	---	-	---	---	-	-	-	--	----	---	--	Spare
I-25A & B	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-25C, D, E, F	---	-	---	--	-	-	-	--	--	---	--	Spare
I-26	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-27A & D	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous		
	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Pressure	Instantaneous		

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14,15)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
I-27B & C	55 (Note 26)	RHR Shutdown Flow	Reactor Water	3/4 3/4	Yes	C C	Detail (w) Detail (w)	1&2E12-F360A 1&2E12-F360B	Outside Outside	No (Note 33) No (Note 33)	10 Max. 10 Max.
I-27E&F	55 (Note 26)	Recirc. Pump Seal Press.	Reactor Water	3/4 3/4	No No	C C	Detail (w)	1&2B33-F317B 1&2B33-F319B	Outside Outside	No (Note 33) No (Note 33)	10 Max. 10 Max.
I-28A	55 (Note 26)	Recirc. Pump Suction Press.	Reactor Water	3/4	No	C	Detail (w)	1&2B33-F301B	Outside	No (Note 33)	10 Max.
I-28B & C	55 (Note 26)	Recirc. Pump P	Reactor Water	3/4 3/4	No No	C C	Detail (w) Detail (w)	1&2B33-F315D 1&2B33-F315C	Outside Outside	No (Note 33) No (Note 33)	10 Max. 10 Max.
I-28D & E	55 (Note 25)	Recirc. Pump Flow	Reactor Water	3/4 3/4 3/4 3/4	No No No No	C C C C	Detail (x) Detail (x)	1&2B33-F313A 1&2B33-F313B 1&2B33-F311A 1&2B33-F311B	Outside Outside Outside Outside	No (Note 33) No (Note 33) No (Note 33) No (Note 33)	10 Max. 10 Max. 10 Max. 10 Max.
I-28F	55 (Note 26)	RPV Drain Flow	Reactor Water	3/4	No	C	Detail(w)	1&2G33-F309	Outside	No (Note 33)	10 Max.
I-29A, D, E, F	55 (Note 26)	Steam Flow	Steam	3/4 3/4 3/4 3/4	No No No No	C C C C	Detail(w) Detail(w) Detail(w) Detail(w)	1&2B21-F326D 1&2B21-F325D 1&2B21-F325C 1&2B21-F326C	Outside Outside Outside Outside	No (Note 33) No (Note 33) No (Note 33) No (Note 33)	10 Max. 10 Max. 10 Max. 10 Max.
I-29B	55 (Note 26)	Core ΔP	Reactor Water	3/4	Yes	C	Detail(w)	1&2B21-F350	Outside	No (Note 33)	10 Max.
I-29C	55 (Note 26)	RPV Bottom Head Drain Flow	Reactor Water	3/4	No	C	Detail(w)	1&2B21-F346	Outside	No (Note 33)	10 Max.
I-30A & B	55 (Note 26)	RPV/HPCS ΔP	Reactor Water	3/4 3/4	No No	C C	Detail(w) Detail(w)	1&2B21-F348 1&2E22-F304	Outside Outside	No (Note 33) No (Note 33)	10 Max. 10 Max.
I-30C, D, E, F	57 (Note 44)	MSIV Accumulator Pressure	Air	3/4	No	B	Detail(j)	1&2B21-F329A,B,C,D	Outside	No	10 Max.
I-31A I-31B I-31C I-31D I-31E I-31F	55 (Note 26)	Jet Pump Flow	Reactor Water	3/4 3/4 3/4 3/4 3/4 3/4	No No No No No No	C C C C C C	Detail(w) Detail(w) Detail(w) Detail(w) Detail(w) Detail(w)	1&2B21-F471 1&2B21-F469 1&2B21-F473 1&2B21-F465B 1&2B21-F475B 1&2B21-F475A	Outside Outside Outside Outside Outside Outside	No (Note 33) No (Note 33) No (Note 33) No (Note 33) No (Note 33) No (Note 33)	10 Max. 10 Max. 10 Max. 10 Max. 10 Max. 10 Max

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
I-27B & C	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-27E & F	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC		Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-28A	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-28B & C	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-28D & E	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-28F	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-29A,D,E,F	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-29B	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-29C	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-30A & B	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-30C,D,E,F	Manual	2	Manual	NA	O	O	O	NA	--	--	--	
I-31A	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-31B	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-31C	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-31D	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-31E	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-31F	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	

EFC = Excess Flow Check

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14,15)	VALVE ARRANGEMENT FIGURE 6.2-31	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
I-32A I-32B I-32C I-32D I-32E I-32F	55 (Note 26)	Jet Pump Flow	Reactor Water	3/4 3/4 3/4 3/4 3/4 3/4	No No No No No No	C C C C C C	Detail (w) Detail (w) Detail (w) Detail (w) Detail (w) Detail (w)	1&2B21-F465A 1&2B21-F467 1&2B21-F463 1&2B21-F459 1&2B21-F457 1&2B21-F461	Outside Outside Outside Outside Outside Outside	No (Note 33) No (Note 33) No (Note 33) No (Note 33) No (Note 33) No (Note 33)	10 Max. 10 Max. 10 Max. 10 Max. 10 Max. 10 Max.
I-33	56 (Note 32)	Drywell Pressure	Air	3/4	Yes	C	Detail (w)	1&2B21-F380	Outside	No (Note 33)	10 Max.
I-34A, D, E, F	55 (Note 26)	Steam Flow	Steam	3/4 3/4 3/4 3/4	Yes Yes Yes Yes	C C C C	Detail (w) Detail (w) Detail (w) Detail (w)	1&2B21-F328D 1&2B21-F328C 1&2B21-F327C 1&2B21-F327D	Outside Outside Outside Outside	No (Note 33) No (Note 33) No (Note 33) No (Note 33)	10 Max. 10 Max. 10 Max. 10 Max.
I-34B & C	---	---	---	---	---	-	---	---	---	---	---
I-35	56 (Note 28) 56	Post LOCA Containment Monitoring HRSS Sampling	Air Air	1/2 1/2	Yes No	B A(b) A(b)	Detail (k) Detail (g) Detail (g)	1&2CM023B 1&2CM085 1&2CM086	Outside Outside Outside	No (Note 40) Yes Yes	10 Max. 10 Max. 10 Max.
I-36	56 (Note 28)	Post LOCA Containment Monitoring	Air	1/2 1/2 1/2	Yes No No	B A (b) A (b)	Detail (k) Detail (g) Detail (g)	1&2CM024A 1&2CM027 1&2CM028	Outside Outside Outside	No (Note 40) Yes Yes	10 Max. Not Applicable 10 Max.
I-37A, B, C, D	55 (Note 26)	Steam Flow	Steam	3/4 3/4 3/4 3/4	Yes Yes Yes Yes	C C C C	Detail (w) Detail (w) Detail (w) Detail (w)	1&2B21-F325A 1&2B21-F326A 1&2B21-F325B 1&2B21-F326B	Outside Outside Outside Outside	No (Note 33) No (Note 33) No (Note 33) No (Note 33)	10 Max. 10 Max. 10 Max. 10 Max.
I-37E & F	---	---	---	---	---	---	---	---	---	---	10 Max.
I-38 & 39	NA	Supp. Chamber	Air	1 1/4	No	--- ---	--- ---	--- ---	--- ---	--- ---	10 Max. 10 Max.

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
I-32A	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-32B	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-32C	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-32D	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-32E	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-32F	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-33	EFC	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-34A,D,E,F	EFC	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Pressure	Instantaneous	NA	
I-34B,C	--	--	--	--	--	--	--	--	--	--	--	Spare
I-35	SO Globe	2	RM	N/A	C/O	C	O	O	RM	5 sec.	ESS 2	
	SO Globe	2	Manual	N/A	C	C	C/O	C	---	---	N/A	
	SO Globe	2	Manual	N/A	C	C	C/O	C	---	---	N/A	
I-36	SO Globe	2	RM	N/A	C/O	C	O	O	RM	5 sec.	ESS 1	Note (20)
	SO Globe	2	Auto	RM	O	O	C	C	B,F,RM	5 sec.	ESS 2	
	SO Globe	2	Auto	RM	O	O	C	C	B,F,RM	5 sec.	ESS 1	
I-37A,B,C,D	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	EFC	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-37E&F	--	--	--	--	--	--	--	--	--	--	--	Spare
I-38 & 39	--	--	--	--	--	--	--	--	--	--	--	RTDs are provided through these connections
	--	--	--	--	--	--	--	--	--	--	--	

EFC = Excess Flow Check

CONTAINMENT PENETRATION NUMBER	NRC GDC	LINE ISOLATED	FLUID CONTAINED	LINE SIZE (in.)	ESF SYSTEM (NOTE 21)	THROUGH LINE LEAKAGE CLASSIFICATION (NOTE 14)	VALVE ARRANGEMENT FIGURE 6.2-32	VALVE NUMBER	LOCATION WITH RESPECT TO CONTAINMENT	TYPE C TEST	LENGTH OF PIPE FROM CONTAINMENT TO OUTERMOST VALVE (ft)
I-40,41, 42,43	56 (Note 32)	Supp. Pool Water Level	Supp. Pool Water	3/4 3/4 3/4 3/4 3/4 3/4 3/4 3/4	No No No No No No No No	Exempt Exempt Exempt Exempt Exempt Exempt Exempt Exempt	Detail (v) Detail (v) Detail (v) Detail (v) Detail (v) Detail (v) Detail (v) Detail (v)	1&2CM039 1&2CM040 1&2CM041 1&2CM042 1&2CM043 1&2CM044 1&2CM045 1&2CM046	Outside Outside Outside Outside Outside Outside Outside Outside	No (Note 32) No (Note 32) No (Note 32) No (Note 32) No (Note 32) No (Note 32) No (Note 32) No (Note 32)	10 Max. 10 Max. 10 Max. 10 Max. 10 Max. 10 Max. 10 Max. 10 Max.
I-44 & 46	--	Supp. Pool Water Temp.	--	1 1/4 1 1/4	--	--	--				10 Max. 10 Max.
I-45	56 (Note 28)	Drywell Air Sampling Post LOCA Cont. Mont. Drywell Humidity Sampling	Air	1	No No Yes No No No No	A (b) A (b) B A(b) A(b) A(b) A(b)	Detail (g) Detail (k) Detail (g) Detail (g) 	1&2CM034 1&2CM033 1&2CM025A 2CM020A 2CM019A 1&2CM020B 1&2CM019B	Outside Outside Outside Outside Outside Outside Outside	Yes Yes No (Note 40) Yes Yes Yes Yes	10 Max. 10 Max. 10 Max. 10 Max. 10 Max. 10 Max. 10 Max.
I-47	56(Note 28)	Post LOCA Containment Monitoring	Air	1 1/4	Yes	B	Detail (w)	1&2CM026B	Outside	No(Note 40)	10 Max
	56	HRSS Sampling	Air	1/2	No	A(b) A(b)	Detail (g) Detail (g)	1&2CM089 1&2CM090	Outside Outside	Yes Yes	10 Max. 10 Max..
I-48 & 49	56 (Note 32)	Supp. Pool Water Level	Supp. Pool Water	1 1/4 1 1/4	No No	C C	Detail (w) Detail (w)	1&2E22-F341 1&2E22-F342	Outside Outside	No(Note 32) No(Note 32)	10 Max. 10 Max.
I-50	56 (Note 28)	Post LOCA Containment Monitoring	Air	1/2	Yes	B	Detail (k)	1&2CM021B	Outside	No (Note 40)	10 Max.
	56	HRSS Sampling	Air	1/2	No	A(b) A(b)	Detail (g) Detail (g)	1&2CM085 1&2CM086	Outside Outside	Yes Yes	10 Max. 10 Max.

CONTAINMENT PENETRATION NUMBER	VALVE TYPE	ASME SECTION III CODE CLASS	PRIMARY METHOD OF ACTUATION	SECONDARY METHOD OF ACTUATION	NORMAL VALVE POSITION	SHUTDOWN VALVE POSITION	POST ACCIDENT POSITION	POWER FAILURE VALVE POSITION (6)	ISOLATION SIGNAL	VALVE CLOSURE TIME (7)	POWER SOURCE	REMARKS
I-40,41, 42,43	Globe	2	Manual	N/A	C	C	C	NA	Flow	---	NA	
	Globe	2	Manual	N/A	C	C	C	NA	Flow	---	NA	
	Globe	2	Manual	N/A	C	C	C	NA	Flow	---	NA	
	Globe	2	Manual	N/A	C	C	C	NA	Flow	---	NA	
	Globe	2	Manual	N/A	C	C	C	NA	---	---	NA	
	Globe	2	Manual	N/A	C	C	C	NA	---	---	NA	
	Globe	2	Manual	N/A	C	C	C	NA	---	---	NA	
	Globe	2	Manual	N/A	C	C	C	NA	---	---	NA	
I-44 & 46												RTDs are provided through these connecti
I-45	SO Globe	2	Auto	RM	O	O	C	C	B,F,RM	5 sec.	ESS 2	(Note 20)
	SO Globe	2	Auto	RM	O	O	C	C	B,F,RM	5 sec.	ESS 1	
	SO Globe	2	Auto	RM	C/O	C	O	O	RM (Note 37)	5 sec.	ESS 1	
	SO Globe	2	Auto	RM	O	O	C	C	B,F,RM	5 sec.	ESS 2	(Note 20)
	SO Globe	2	Auto	RM	O	O	C	C	B,F,RM	5 sec.	ESS 1	
	SO Globe	2	Auto	RM	O	O	C	C	B,F,RM	5 sec.	ESS 2	(Note 20)
	SO Globe	2	Auto	RM	O	O	C	C	B,F,RM	5 sec.	ESS 1	
I-47	SO Globe	2	Auto	RM	C/O	C	O	O	RM(Note37)	5 sec.	ESS 2	
	SO GLOBE	2	Manual	N/A	C	C	C/O	C	---	---	N/A	
	SO GLOBE	2	Manual	N/A	C	C	C/O	C	---	---	N/A	
I-48 & 49	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
	Excess Flow Check	2	Process	NA	O	O	O	NA	Flow	Instantaneous	NA	
I-50	SO Globe	2	Auto	RM	C/O	C	O	O	RM (Note37)	5 sec.	ESS 2	
	SO Globe	2	Manual	N/A	C	C	C/O	C	---	---	N/A	
	SO Globe	2	Manual	N/A	C	C	C/O	C	---	---	N/A	

SIGNAL	DESCRIPTION
A	Reactor vessel low water level level 3 - (A scram occurs at this level also. This is the higher of the two low water level signals.)
B	Reactor vessel low low water level level 2 - (The RCIC and HPCS systems are initiated at this level also. (This is the lower of the two low water level signals.)
C	High radiation - Main steam
D	Line break - High area temperature or very high system flow.
E	Main condenser low vacuum.
F	High drywell pressure.
G	Reactor vessel low low low water level (Level 1) or high drywell pressure (Emergency Core Cooling System are started).
H	Reactor vessel low low low water level (Level 1)
J	Line break in cleanup system - high space temperature.
M	Line break in RHR shutdown and head cooling (high space temberature).
P	Low main steamline pressure at inlet turbine (RUN mode only).
U	High reactor vessel pressure - close RHR shutdown cooling valves and head cooling valves.
Y	High radiation, fuel pool ventilation exhaust.
Z	High radiaion, reactor building ventilation exhaust.
RM	Remote manual switch from control room. (All regular Class A and Class B isolation valves are capable of remote manual operation from the control room.)
RME	Remote manual switch from Auxiliary Electric Equipment Room. Note - position indication also available in Control Room in group summary position indicator lights.

These notes are keyed by number to correspond to numbers in parenthesis in Table 6.2-21.

1. Main steam isolation valves require that both solenoid pilots be de-energized to close valves. Accumulator air pressure plus spring force together close valves when both pilots are de-energized. Voltage failure at only one pilot does not cause valve closure. The valves are designed to fully close in less than 5 seconds.

2. Suppression pool spray (1(2)E12-F027A/B) and suppression pool cooling valves (1(2)E12-F024A/B) have interlocks that allow them to be manually reopened after automatic closure. This setup permits suppression pool spray, for high drywell pressure conditions, and/or suppression pool water cooling. The drywell spray valves (1(2)E12-F016A/B, 1(2)E12-F017A/B), do not receive any automatic closure signals.

3. Testable check valves are provided with an air operator for remote opening with zero differential pressure across the valve seat. These valves will close on reverse flow even though the test switches may be positioned for open. The valves open when pump pressure exceeds reactor pressure even though the test switch may be closed. The testable feature has been eliminated from the Division 1, 2, and 3, ECCS testable check valves.

4. In the normal configuration the lines are considered to be an extension of primary containment. If a vacuum breaker valve is inoperable, the butterfly valve will be closed to prevent bypass leakage. If a vacuum breaker valve is subsequently removed, a blind flange will be added, and the flange and butterfly valve will form the containment boundary. The vacuum breaker valves will be leakage tested as part of the periodic low pressure suppression bypass leakage test. The acceptance limits are based on the allowable suppression bypass capability of the containment.

5. A-c motor-operated valves required for isolation functions are powered from the a-c standby power buses. D-c operated isolation valves are powered from the station batteries.

6. All motor-operated isolation valves remain in the last position upon failure of valve power. All air-operated valves close on motive air failure except the VQ Butterfly valves which require their solenoid valves to be deenergized.

7. The standard operating times for power actuated valves based on actual stem travel shall be less than or equal to 110% of the nominal values below:

	Motor-operated	Air-Operated
Gate valves	12 in./min	Not applicable
Globe valves	4 in./min	4 in./min
Butterfly valves	30 - 90 seconds	0 - 10 seconds

8. Reactor building vent exhaust high radiation signal “z” and fuel pool ventilation exhaust high radiation signal "Y" are generated by two trip units; this requires one unit at high trip or both units at downscale (instrument failure trip), in order to initiate isolation.

9. Valves can be opened or closed by remote manual switch for operating convenience during any mode of reactor operation except when an automatic signal is present.

10. Normal status position of valve (open or closed) is the position during normal power operation of the reactor (see "Normal Status" column).

11. Deleted.

12. Deleted.

13. Deleted.

14. Categories indicated are in accordance with ASME Section XI Article IWV-2000. The types of leakage tests are as follows: (a) water test and (b) air test. Exempt valves are those used for testing, draining, venting, maintenance or operational convenience.

15. The leakage criteria for these valves is specified in 10 CFR 50 Appendix J and the LaSalle Primary Containment Leak Rate Testing Program.

16. Deleted.

17. The outboard check valves on the feedwater return lines are provided with an air operator for testing the valves to ensure that the disks are not frozen in the open position. The actuator moves the disk partially into the flow stream, but is not capable of completely closing the valve against flow. The feedwater valve actuator is used to apply seating force to the valve for ensuring leaktightness at low differential pressures. The actuator will be exercised to assure operability prior to leak testing.

18. The TIP drive guide tubes provide a sealed path for the flexible drive cable of the TIP probes. The TIP tubing seals the TIP system from the reactor coolant and forms a leak tight boundary designed for reactor coolant pressure boundary conditions. The shear valve is provided to cut the cable in the event that the drive cable cannot be withdrawn, and the ball provides the guide tubes with shut-off capability.

The LaSalle TIP system design specifications require that the maximum leakage rate of the ball and shear valves shall be in accordance with the Manufacturers Standardization Society (Hydrostatic Testing of Valves). The ball valves are 100% leak tested to the following criteria by the manufacturer:

Pressure	0 - 62 psig
Temperature	340°F
Leak Rate	10^{-3} cm^3 /s

A statistically chosen sample of the shear valves is tested by the manufacturer to the following criteria:

Pressure	0 - 125 psig
Temperature	340°F
Leak Rate	10^{-3} cm^3 /sec STP.

The shear valves have explosive squibs and require testing to destruction. They cannot therefore be 100% tested nor can they be tested in accordance with 10 CFR 50 Appendix J requirements after installation.

Isolation is accomplished by a seismically qualified solenoid-operated ball valve, which is normally closed. Ball valve position is indicated in the control room. The ball valve is periodically leak tested in accordance with the LaSalle 10 CFR 50 Appendix J Program and the acceptable leakage limits for these valves are in accordance with the Appendix J program.

When the TIP system cable is inserted, the ball valve of the selected tube opens automatically so that the probe and cable may advance. A maximum of four valves may be opened at any one time to conduct calibration, and any one guide tube is used, at most, a few hours per year.

If closure of the line is required during calibration, a signal causes the cable to be retracted and the ball valve to close automatically after completion of cable withdrawal. If a TIP cable fails to withdraw or a ball valve fails to close, each line is equipped with an explosive shear valve.

If a failure occurs, the shear valve would be manually actuated from the Main Control Room to shear the TIP cable and isolate the penetration. Because the TIP shear valve requires testing to destruction, it is not tested in accordance with 10 CFR 50 Appendix J, but instead is tested as specified in Technical Specification. The Technical Specification verifies continuity of the explosive charge and batch sampling testing of the explosive squib charges, with replacement of the explosive squib before expiration of the shelf-life and operating life. A statistical sample of the shear valves are leak tested in the manufacturers shop to ensure that the leakage limits conform to the design specification limits of 10^{-3} cm^3/sec.

19. The hydraulic lines are sealed pipe designed for 2000 psig operating pressure.

20. Test pressure is not in the same direction as the pressure existing when the valve is required to perform the safety function as required by Appendix J to 10 CFR 50. Either manufacturers' test data, site test results or justification (e.g., reverse test pressure tending to lift disk from seat) will be available on site to verify that testing in the reverse direction will provide either equivalent or more conservative results.

21. Although the valves listed may be included in the containment isolation system which is an ESF system, a "yes" designation is given only for those valves in systems where the parent system containing the valve is an ESF system.

22. The valves associated with RHR "A" loop are powered from ESS1 sources. The valves associated with RHR "B" and "C" loops are supplied from ESS2 power sources.

23. The power source for the valves associated with penetrations M-23 (Unit 2), M-33 (Unit l) and M-106 is ESS1. The power source for the valves associated with penetrations M-53 and M-104 is ESS2. This arrangement was used to maintain redundancy of function for the combustible gas control system. The valves are closed during normal plant operation, and are open only for periodic testing and following a LOCA.

24. Criterion 55 concerns those lines of the reactor coolant pressure boundary penetrating the primary reactor containment. The control rod drive (CRD) insert and withdraw lines are not part of the reactor coolant pressure boundary. The basis to which the CRD lines are designed is commensurate with the safety importance of isolating these lines. Since these lines are vital to the scram function, their operability is of utmost concern.

    In the design of this system, it has been accepted practice to omit automatic valves for isolation purposes, as this introduces a possible failure mechanism. As a means of providing positive actuation, manual shutoff valves (1&2C11D001-101 and –102) are used. The charging water, drive water and cooling water headers are provided with a check valve (1&2C11D001-115, -137 and -138) within the hydraulic control unit (HCU), a Seismic Category I module, and the normally closed solenoid valves (1&2C11D001-120, -121, -122 and -123). These valves will prevent any direct flow away from containment. These valves are shown on Sheet 3 of Drawing M-100 (Unit 1) and M-146 (Unit 2).

    If an insert line fails, a ball check valve provided in each drive is designed to seal off the broken line by using reactor pressure to shift the ball check valve to the upper seat. This feature also prevents any direct flow away from the primary containment.

When the HCU's are pressurized, leaks resulting from degraded piping integrity would be observed by the Operators on their daily rounds. In addition, several indicators in the control room, such as temperature and pressure of CRD cooling water or drywell sump pump operation, indicates whether leakage is excessive. The maximum leakage expected at this penetration is 3 gpm when the RPV is still pressurized (about 1000 psi). This leakage also assumes a single active failure of a check valve inside the HCU. After the reactor vessel is depressurized, the CRD leakage will decrease to about 0.5 gpm. It may also be said that leakage monitoring of the CRD insert and withdraw lines is provided by the overall type A leakage rate test. Since the RPV and nonseismic portions of the CRD system are vented during the performance of the Type A test, any leakage from these lines would be included in the total Type A test leakage.

The flowout of the CRD is restricted through the HCU performance test requirements to ensure that HCU leakage does not exceed 0.2 gpm. The maximum leakage expected for these penetrations is 0.2 gpm per HCU. If a single failure is assumed, the maximum leakage would be 3 gpm. Seismic tests have demonstrated the seal integrity of the CRD system. Maximum leakage following these tests did not exceed 3 gpm.

The system design criteria are as follows:

	Seismic Category	Quality Group Classification	Quality Assurance Classification
Valves; insert and withdraw	I	B	I
Insert and withdraw line piping	I	B	I

The CRD insert and withdraw lines are compatible with the criteria intended by 10 CFR 50, Appendix J for Type C testing, since the acceptance criterion for Type C testing allows demonstration of fluid leakage rates by associated bases. The maximum leakage expected has been factored in with the total allowable containment penetration leakage and determined to be acceptabe.

25. The recirculation pump seal water line extends from the recirculation pump through the drywell and connects to the CRD supply line outside the primary containment. The seal water line forms a part of the reactor coolant pressure boundary; therefore, the consequences of failing this line have been evaluated. This evaluation shows that the consequences of breaking this line are less severe than failing an instrument line. Therefore, the two check valves in series provide sufficient isolation capability for postulated failure of this line.

    These lines are high-pressure lines coming from the discharge of the CRD pumps to the recirculation pump seals. They are provided with a check valve inside the containment and a check valve outside the containment.

    The inside and outside check will receive a Type C local leak test with water as the testing mechanism during refueling outages.

26. See Note 33.

27. The Hydraulic Control Unit (HCU) is a factory-assembled engineered module of valves, tubing, piping, and stored water which controls a single control rod drive by the application of precisely timed sequences of pressures and flows to accomplish slow insertion or withdrawal of the control rods for power control, and rapid insertion for reactor scram.

    Although the hydraulic control unit, as a unit, is field installed and connected to process piping, many of its internal parts differ markedly from process piping components because of the more complex functions they must provide.

    Thus, although the codes and standards invoked by Groups A, B, C and D pressure integrity quality levels clearly apply at all levels to the interfaces between the HCU and the connecting conventional piping components (e.g., pipe nipples, fittings, simple hand valves, etc.), it is considered that they do not apply to the specialty parts (e.g., solenoid valves, pneumatic components, and instruments). The HCU shutoff (isolation) valves are Quality Group B.

    The design and construction specifications for the HCU do invoke such codes and standards as can be reasonably applied to individual parts in developing required quality levels, but these codes and standards are supplemented with additional requirements for these parts and for the remaining parts and details. For example, 1) all welds are penetrant tested (PT), 2) all socket welds are inspected for gaps between pipe and socket bottom, 3) all welding is performed by qualified welders, and 4) all work is done per written procedures. Quality Group D is generally applicable because the codes and standards involked by that group contain clauses which permit the use of manufacturer's standards and proven design techniques which are not explicitly defined within the codes of Quality Group A, B, or C. This is supplemented by the QC techniques.

28. These lines have been evaluated to an acceptable alternative design basis other than that specifically listed in GDC 55 and 56. This alternate basis is found in SRP 6.2.4.II.6, and the

evaluation to the criteria specified therein is as follows:

a. All lines are in engineered safety feature or engineered safety featured-related systems.

b. System reliability can readily be seen to be greater when only a single valve is provided, since the addition of another valve in series provides an additional potential point of failure, and, in the case of relief valve discharge lines, the installation of an additional valve is actually prohibited by the ASME Code.

c. The systems are closed outside containment.

d. A single active failure of these ESF systems can be accommodated.

e. The systems outside containment are protected from missiles consistent with their classification as ESF systems.

f. The systems are designed to Seismic Category I standards.

g. The systems are classified as Safety Class 2.

h. The design ratings of these systems meet or exceed those specified for the primary containment.

i. The leaktightness of these systems is assured by normal surveillance, inservice testing and leak detection monitoring.

j. The single valve on these lines is located outside containment.

29. These lines are always filled with water on the outboard side of the containment thereby forming a water seal. They are maintained at a pressure that is always higher than primary containment pressure by water leg pumps; thus, precluding any outleakage from primary containment. However, even if outleakage did occur it would be into an ESF system which forms a closed loop outside primary containment. Thus, any leakage from primary containment would return to primary containment through this closed loop.

These valves are under continuous leakage test because they are always subjected to a differential pressure acting across the seat. Leakage through these valves is continuously monitored by the pressure switches in the pump discharge lines, which have a low alarm setpoint in the main control room.

Even though a special leakage test is not merited on these valves for the reasons discussed above, a system leakage test will be performed and compared to an acceptance limit based on site boundary dose considerations.

30. The leakages through the Main Steamline valves will not be included in establishing the acceptance limits for the combined leakage in accordance with the 10 CFR 50, Appendix J, Type B and C tests. The NRC granted exemption to 10 CFR 50, Appendix J, for not including MSIV leakage in the Type A, B, or C acceptance criteria. This exemption is based on the use of the MSIV Isolated Condenser Leakage Treatment Method discussed in Section 6.8, and associated analyses.

31. Although only one isolation valve signal is indicated for these valves, the valves also receive automatic signals from various system operational parameters. For example, the ECCS pump minimum flow valves close automatically when adequate flow is achieved in the system; the ECCS test lines close automatically on receipt of an accident signal. Although these signals are not considered isolation signals; and are therefore, excluded from this table, there are other system operation signals that control these valves to ensure their proper position for safe shutdown. Reference to the logic diagrams for these valves indicates which other signals close these valves.

32. To satisfy the requirements of General Design Criterion 56 and to perform their function, these instrument lines have been designed to meet the requirements of Regulatory Guide 1.11 (Safety Guide 11).

    These lines are Seismic Category I and terminate in instruments that are Seismic Category I. They are provided with manual isolation valves and excess flow check valves.

The integrity of these lines is to be tested during the Type “A” Test. These lines and their associated instruments are to be pressurized to P_a. Surveillance inspections are performed to ensure that the leaktight integrity of these lines and their associated instruments. Additional inservice inspection is included in the Technical Specifications. This inservice inspection verifies the function of the excess flow check valves.

Isolation is provided by the excess flow check valve. In the event of a line rupture downstream of the check valve and a containment pressure above 2 psig this valve would close to limit the amount of leakage.

33. To perform their function and to satisfy the requirements of General Design Criterion 55, these instrument lines have been designed to meet the requirements of Regulatory Guide 1.11 (Safety Guide 11).

These lines are Seismic Category I and terminate in instruments that are Seismic Category I. They-are provided with flow-restricting orifices, manual isolation valves, and excess flow check valves.

The flow-restricting orifice is sized to assure that in the event of a postulated failure of the piping or component, the potential offsite exposure would be substantially below the guidelines of 10 CFR 100.

Isolation is provided by the excess flow check valve. In the event of a line rupture downstream of the check valves, this valve would close to limit the amount of leakage.

The integrity of these lines are tested during the Type "A" Test. Surveillance inspections are performed to ensure the leaktight integrity of these lines and their associated instruments. Additional inservice testing is included in the Technical Specifications. This inservice inspection verifies the function of the excess flow check valves.

For Unit 1 Penetrations M-21 and M-59, and Unit 2 Penetrations M-52 and M-65 reference leg backfill lines have been installed to comply with NRC Bulletin 93-03. These lines tap into the reference legs outboard of the excess flow check valves. Two safety related, Seismic Category I, check valves provide the boundary between the non-safety related CRD system and the safety related reference leg. These two check valves also form part of the boundary that will be checked by surveillance inspections in accordance with Check Valve Monitoring and Preventative Maintenance Program.

For Penetrations I-4A, I-5A, I-7 and I-8A, reference leg backfill lines have been installed to comply with NRC Bulletin 93-03. These lines tap into reference lines 1(2)NB10A-3/4”, 1(2)NB12A-3/4", 1(2)NB23A-3/4" and 1(2)NB25A-3/4" between the containment penetration and the manual isolation valve/excess flow check valve combination. This makes these lines part of the reactor coolant pressure boundary. This location was chosen to prevent the mispositioning of the manual isolation valve (while the injection line is functioning) from over pressurizing all the instruments on the instrument panel. Two safety related, Seismic Category I, check valves in series act as the outboard containment isolation valves. These two valves also provide the boundary between the non-safety related CRD system and the safety related reference leg as well as form part of the boundary that will be checked by surveillance inspections in accordance with Check Valve Monitoring and Preventative Maintenance Program.

34. These valves are provided for long-term leaktightness only. Feedwater check valves in each line provide immediate isolation. These MO valves are remote manually closed from the control room upon indication of loss of feedwater flow. Therefore, no additional isolation signals are required.

35. Penetrations M-49 and M-50 contain lines for the hydraulic control of the reactor recirculation flow control valves. The hydraulic fluid in these lines is used to position the flow control valves.

    Three of four lines of each penetration in this system are under a constant pressure test during normal plant operations due to its high operating pressure of 1800 psig. The fourth line of each penetration in this system is a seal leakage return line back to the HPU Reservoir. Any leakage from this system would be limited to hydraulic fluid which fills these lines and is independent of the containment atmosphere.

    In order to perform Type C leakage tests on the isolation valves associated with this system, the system would have to be disabled and the hydraulic fluid drained. This is detrimental to the proper operation of the system in that possible damage could occur in establishing the test condition or restoring the system to normal.

    Therefore, these hydraulic isolation valves are exempted from Type C testing.

36. The feedback information available to the plant operator which enables him to determine when the valves with only a "Remote Manual (RM)" closure should be closed is summarized as follows:

    a. Leak detection information, as described in Subsection 7.6.2.2 is available to enable the operator to determine the location of a leak or line failure, and close the isolation valve associated with that line.

    b. RPV level information is available to the operator to ascertain whether the flow is actually reaching the RPV.

    c. Suppression pool water level information would also identify the occurrence of a line failure or leakage.

37. These valves are required to open on signals B and F during the post-LOCA conditions. They remain closed during all other plant operating states, except cold shutdown. Therefore, there is no reason to provide them with any isolation signal other than remote manual.

38. The ADS supply lines are maintained at a minimum pressure of 160 psig at all times. Leakage in these lines is monitored by pressure instrumentation which alarms in the main control room on low pressure. Therefore, these lines are always under a continuous leak test, and a specific local leak rate test (Type C) will not be performed. The intent of the requirement is satisfied however, by the system design itself.

39. The ECCS and RCIC suction lines are normally filled with water on both the inboard and outboard side of containment, thereby forming a water seal to the containment environment. The valves are open during post-LOCA conditions to supply a water source for the ECCS pumps. Since a break in an ECCS line need not be considered in conjunction with a DBA, the only possible situation requiring one of these valves to be closed during a DBA is an unacceptable leakage in an ECCS. However, because these ECCS systems are constantly monitored for excessive leakage, this is not a credible event for design.

40. These valves are required to open and remain open following a LOCA to allow the containment air to be sampled. They are part of a system which constitutes a closed loop outside of the containment and will be open during Type A testing. Therefore there is no reason to perform a Type C test on these valves.

41. The inboard flange of these butterfly valves has been provided with a double O-ring type gasket with a leakoff test connection provided between the O-rings. This permits the performance of a Type B leak rate test on this non-welded containment boundary, in addition to the Type C leak test on the valve seats.

42. These valves are capable of being manually overrided by applying jumpers to the isolation logic when a containment isolation signal is present, in order to obtain reactor coolant sample at the High Radiation Sample System Panels under post-accident conditions.

43. These penetrations are provided with removable spools outboard of the outboard isolation valve. During operation these lines will be blind flanged using a double O-ring and Type B leak tested. In addition, the packing of these isolation valves will be soap-bubble tested to ensure insignificant or no leakage at containment test pressure.

44. These lines have been evaluated to an acceptable alternate design basis other than that specifically listed in GDC 57. This alternate basis is found in SRP 6.2.4.II.6.a.

45. High Radiation Detectors (1&2 RE-CM011 and 1&2 RE-CM017) have been installed in Containment Penetrations M-31 & M-32. These detectors are mounted in steel sleeves which protrude into the Primary Containment at diverse locations, so as to view a larger segment of the containment atmosphere, maintain accessibility for maintenance and calibration, and to minimize exposure during maintenance and calibration. The Containment Penetration is Seal Welded on the inside of the containment and Blind Flanged on the outside of the Containment.

46. These valves are provided with plugged Tees between the solenoid valve and the air cylinder for applying air pressure to the air cylinder using an air bellows hand pump for opening the valve, if instrument air is not available.

47. These valves have different closure time.

1E21-F012	Closure time - less than or equal to 40 seconds
2E21-F012	Closure time - slower than standard (see below)

48. These valves have a slower than standard stem speed, but operate faster than the Tech Spec requirement. The valves' stroke time has been evaluated and is acceptable.

49. In Test Mode 1 the RCIC System is aligned to take suction from the Condensate Storage Tank (CST) and the full flow test return line is aligned to the CST. Valves E51-F362 and E51-F363 will become primary containment isolation valves. In Test Mode 2 the RCIC System is aligned to take suction from the Suppression Pool (SP). Valves E51-F362 and E51-F363 will no longer be containment isolation valves. Valves E51-F022, and E51-F059 will become containment isolation valves and spectacle flange E51-D316 (blind side) will be a containment isolation boundary.

50. General Electric Specification 22A2817AK Rev. 6 states that the maximum operating time for valves 1(2)E12-F064 A/B/C is eight seconds. The intent is to insure that RHR pump minimum flow requirements are met. The downstream orifice becomes the limiting device before the valve fully opens. An evaluation (NTS 373-201-98-CAQ05833.00) concluded as long as the minimum flow valves pass the required minimum flow in 8 seconds or less, the GE specification requirements are met.

51. These valves are subject to bonnet pressure locking. The reactor side valve discs have vent holes drilled in them to prevent pressure accumulation in the bonnet.

52. Exempt Change DCPs 9500254, 255, 256, and 257 change the Valve Closure time for the 1E12-F017B, 17A, 16B, and 16A valves from approximately 75 seconds to approximately 95 seconds. Exempt Change E01-2-94-934A, B, C and D change the Valve Closure time for the 2E12-F016A, B and 2E12-F017A, B valves from approximately 75 seconds to approximately 95 seconds. These are no longer in the standard operating time range for a motor operated gate valve.

53. Exempt Changes E01-1-94-433 and E01-2-94-939-E changed the valve closure times for the 1G33-F040 and 2G33-F040 valves, respectively, from approximately 21 seconds to 39 seconds. This is no longer in the standard operating time range for a motor operated gate valve.

54. The stem packing of these inboard primary containment isolation valves (located outside primary containment) is not tested for leakage during Type C Local Leak Rate Testing. The packing itself is either local leak rate tested via test port or subjected to pressure and subsequently soap bubble tested during primary containment pressurization on a periodic basis in accordance with 10 CFR 50 Appendix J and the LaSalle Station Leak Rate Test Program.

55. The Vacuum Breaker line manual isolation valves have a double-gasketed flange on the inboard or containment side provided with test connections for leak testing. The outboard flanges on the manual isolation valves are leak tested by pressurizing the entire vacuum breaker line and performing a soap bubble test on the outboard flange. The stem seal or packing of these valves will be tested either locally or by primary containment pressurization and subsequent soap bubble inspection.

56. This valve is subject to bonnet pressure locking. The non-containment side valve disc has a vent hole drilled in it to prevent pressure accumulation in the bonnet.

57. This valve is subject to bonnet pressure locking. The bonnet of this valve has a hole drilled in it discharging through piping and isolation valves to allow manual venting of the bonnet.

58. These lines have been evaluated to an acceptable alternative design basis other than that specifically listed in GDC 56 and SRP 6.2.4.II. NRC approval of this design is found in the LaSalle Safety Evaluation Report (SER), NUREG 0519 Section 22.2.II.E.4.2.

59. These valves are monitored by the IST/MOV program as implemented by Subsection ISTC of ASME OM Code 2001 Edition through 2003 Addenda, and Code Case OMN-1 "Alternative Rules for Pressure and Inservice Testing of Certain Electric Motor Operated Valve Assemblies in Light Water Reactor Power Plants".

60. Valves 1(2)E51-F064 have been replaced by spectacle flanges 1(2)E51-D324.

61. In response to Generic Letter 96-06, a hole exists in the inboard disc at the inboard containment isolation valve to prevent thermal over-pressurization of the penetration.

62. Penetration M-34 contains the Standby Liquid Control System Injection line.

The Standby Liquid Control System (SBLC) Line enters the reactor vessel below the core plate. Under post LOCA conditions, the reflooding capability of the jet pumps will always assure the core to be two-thirds covered. This provides assurance that the SBLC line will always be water filled post-LOCA. Thus, the SBLC line is not a potential primary containment atmospheric pathway either during or following a Design Basis Accident (DBA).

Type C testing is not required on boundaries that do not constitute potential primary containment atmospheric pathways during and following a DBA. Thus, it is not required to Type C test any of the containment isolation valves in that pathway.

The SBLC line including valves 1&2C41-F007 and 1&2C41-F004A,B will be hydrostatically tested on a periodic basis to insure their leak tight integrity and evaluated against the leakage requirements of Technical Specifications SR 3.6.1.3.11.

TABLE 6.2-22
(SHEET 1 OF 2)

PARAMETERS USED TO DETERMINE HYDROGEN CONCENTRATION

1.	Reactor power	3,559 MWt
2.	Number of assemblies	764
3.	Total Zr mass in active clad/assembly	101 lb
4.	Zirconium clad mass	77,187 lb
5.	Fraction of Zr clad reacted	0.945%
6.	Drywell free volume	229,538 ft^3
7.	Suppression chamber volume	165,100 ft^3
8.	Drywell initial temperature	135° F
9.	Drywell initial pressure	0.75 psig
10.	Drywell initial relative humidity	20%
11.	Suppression chamber initial temperature	105° F**
12.	Suppression chamber initial pressure	0.75 psig
13.	Suppression chamber initial relative humidity	100%
14.	Thermal recombiner capacity	125 scfm

TABLE 6.2-22
(SHEET 2 OF 2)

15. The guidelines as set forth in Regulatory Guide 1.7 were followed:

a) 50% of the halogens and 1% of the solids present in the core are intimately mixed with the coolant water.

b) 25% of the halogens plate out on surfaces in the containment.

c) All noble gases and 25% of the halogens are released from the core to the containment atmosphere.

d) All other fission products remain in the fuel rods.

e) $G(H_2)$*is 0.5 molecules/100eV

f) $G(O_2)$*is 0.25 molecules/100eV

g) The following percentage of fission product radiation energy is absorbed by the coolant:

Percentage	Radiation Type	Location of Source
0%	Beta	Fuel Rods
100%	Beta	Coolant
10%	Gamma	Fuel Rods
100%	Gamma	Coolant

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* For water, borated water, and borated alkaline solutions.

** As discussed in Section 6.2.1.8 supplementary evaluations have been satisfactorily completed with a 105°F initial suppression pool temperature. (Reference 14)

TABLE 6.2-23

CONTAINMENT LEAKAGE TESTING

TYPE OF TEST PER APPENDIX J OF 10 CFR 50	DESCRIPTION OF TEST	CALCULATED PEAK PRESSURE Pa (psig)	LEAK RATES at Pa (%/24 hours) MAXIMUM ALLOWABLE (La)	DESIGN (Ld)	TEST PRESSURE Pt (psig)
A	Integrated Leak Rate	39.9	0.635(3)	0.5	(6)
B	Local Penetration Leakage Rate	39.9	(1)	(1)	(6)
C	Local Containment Isolation Valve Leakage Rate	39.9	(1)(2)	0.1 SCFH per inch of nominal valve size at 50 psig	(6)
-	MSIV Leakage Rate	39.9	(5)	100 scfh	25(4)

(1) The combined leakage rate of all penetrations and valves exclusive of MSIV leakage subject to Type B and C tests shall be less than 0.60 La, as specified in Appendix J to 10 CFR 50.

(2) See Table 6.2-21, Note 15.

(3) Exclusive of the MSIV leakage rates.

(4) Exemption of 10 CFR 50, as stated in III C.3 of Appendix J.

(5) The sum of all four main steam lines shall be less than 400 SCFH. Any MSIV exceeding the proposed limit will be repaired and retested to meet a leakage rate of less than 25 SCFH.

(6) Test pressure shall be, as a minimum, equal to Pa. Variance in test pressure shall be in accordance with ANSI/ANS 56.8-1994.

TABLE 6.2-24
(SHEET 1 OF 2)

SUBCOMPARTMENT VENT PATH DESCRIPTION
RECIRCULATION OUTLET LINE BREAK WITH SHIELDING DOORS

VENT PATH NO.	FROM VOL. NODE NO.	TO VOL. NODE NO.	DESCRIPTION OF VENT PATH FLOW	AREA* (ft^2)	LENGTH (ft)	Σ (L/A) (ft^{-1})	HYDRAULIC DIAMETER (ft)	HEAD LOSS, K			
								FRICTION LOSS, K_f	TURNIN G LOSS, K_{bl}	EXPANSION AND CONTRACTION, K_g	TOTAL
1	1	2	unchoked	14.86	5.98	0.40	4.05	-	0.10	0.14	0.24
2	2	3	unchoked	14.86	5.98	0.40	4.05	-	0.10	0.14	0.24
3	3	4	unchoked	14.86	7.48	0.50	4.05	-	0.12	0.28	0.40
4	4	5	unchoked	14.86	8.97	0.60	4.05	-	0.14	0.28	0.42
5	6	7	choked	20.19	6.04	0.30	4.40	-	0.06	0.16	0.22
6	7	8	choked	20.19	6.04	0.30	4.40	-	0.06	0.16	0.22
7	8	9	choked	20.19	7.55	0.38	4.40	-	0.07	0.32	0.39
8	9	10	unchoked	20.19	9.06	0.45	4.40	-	0.09	0.32	0.41
9	35	34	choked	7.04	2.50	0.30	2.42	-	0.85	0.00	0.85
10	34	11	choked	10.02	3.19	0.32	2.95	-	0.03	0.32	0.35
11	11	12	choked	7.47	4.78	0.64	2.70	-	0.56	0.00	0.56
12	12	13	choked	7.09	6.37	0.90	2.70	-	0.52	0.32	0.84
13	13	14	unchoked	7.09	7.96	1.13	2.70	-	0.53	0.32	0.85
14	14	15	unchoked	7.09	9.55	1.35	2.70	-	1.00	0.64	1.64
15	11	17	choked	2.11	4.78	2.26	2.70	-	0.05	0.00	0.05
16	16	17	choked	3.87	6.37	1.46	2.20	-	0.07	0.31	0.38
17	17	18	unchoked	6.79	6.37	0.94	2.70	-	0.52	0.31	0.83
18	18	19	unchoked	6.79	7.96	1.17	2.70	-	0.54	0.31	0.85
19	19	20	unchoked	6.79	9.55	1.41	2.70	-	1.01	0.62	1.63
20	21	22	unchoked	9.83	6.35	0.65	3.00	-	0.06	0.30	0.36
21	22	23	choked	9.83	6.35	0.65	3.00	-	0.06	0.30	0.36
22	23	24	unchoked	9.83	7.93	0.81	3.00	-	0.07	0.60	0.67
23	24	25	unchoked	9.83	9.52	0.97	3.00	-	0.08	0.60	0.68
24	26	27	unchoked	14.68	9.52	0.65	3.25	-	0.98	0.30	1.28
25	27	28	unchoked	14.68	9.52	0.65	3.25	-	0.08	0.60	0.68
26	28	29	unchoked	14.68	9.52	0.65	3.25	-	0.98	0.30	1.28
27	30	31	unchoked	13.49	9.52	0.71	3.20	-	0.97	0.30	1.27
28	31	32	unchoked	13.49	9.52	0.71	3.20	-	0.53	0.60	1.13
29	32	33	unchoked	13.49	9.52	0.71	3.20	-	0.97	0.30	1.27
30	6	1	unchoked	18.40	6.27	0.33	5.80	0.03	0.00	0.00	0.03, 0.03**
31	7	2	unchoked	18.40	6.27	0.33	5.80	0.03	0.00	0.00	0.03, 0.03**
32	8	3	unchoked	18.40	6.27	0.33	5.80	0.03	0.00	0.00	0.03, 0.03**
33	9	4	unchoked	23.36	6.27	0.22	5.80	0.03	0.00	0.00	0.03, 0.03**
34	10	5	unchoked	23.36	6.27	0.22	5.80	0.03	0.00	0.00	0.03, 0.03**
35	34	6	choked	3.61	7.20	1.40	3.70	0.01	0.00	1.12	1.13, 0.90**
36	11	6	choked	3.61	7.20	1.40	3.70	0.01	0.00	1.12	1.13, 0.90**
37	12	7	unchoked	7.22	6.19	0.62	3.70	0.01	0.00	1.12	1.13, 0.90**
38	13	8	unchoked	7.22	6.19	0.62	3.70	0.01	0.27	1.12	1.40, 1.17**
39	14	9	unchoked	10.84	6.19	0.41	3.70	0.01	0.00	1.12	1.13, 0.90**
40	15	10	unchoked	10.84	6.19	0.41	3.70	0.01	0.00	1.12	1.13, 0.90**
41	12	17	unchoked	8.56	4.80	0.56	3.70	0.01	0.45	0.00	0.46
42	13	18	unchoked	8.56	4.80	0.56	3.70	0.01	0.45	0.00	0.46

TABLE 6.2-24
(SHEET 2 OF 2)

VENT PATH NO.	FROM VOL. NODE NO.	TO VOL. NODE NO.	DESCRIPTION OF VENT PATH FLOW	AREA* (ft^2)	LENGTH (ft)	Σ (L/A) (ft^{-1})	HYDRAULIC DIAMETER (ft)	HEAD LOSS, K: FRICTION LOSS, K_f	HEAD LOSS, K: TURNING LOSS, K_{bl}	HEAD LOSS, K: EXPANSION AND CONTRACTION, K_g	HEAD LOSS, K: TOTAL
43	14	19	unchoked	12.84	4.80	0.37	3.70	0.01	0.45	0.00	0.46
44	15	20	unchoked	11.65	4.80	0.41	3.70	0.01	0.43	0.00	0.44
45	34	16	choked	5.94	4.80	0.94	3.70	0.03	0.00	0.00	0.03
46	11	16	unchoked	5.94	4.80	0.94	3.70	0.03	0.85	0.00	0.88
47	16	21	choked	7.72	4.54	0.44	3.70	0.01	0.00	0.66	0.67
48	17	22	choked	7.72	5.55	0.59	3.70	0.02	0.00	0.66	0.68
49	18	23	unchoked	7.72	5.55	0.59	3.70	0.02	0.00	0.66	0.68
50	19	24	unchoked	11.57	5.55	0.40	3.70	0.02	0.00	0.66	0.68
51	20	25	unchoked	11.57	5.50	0.40	3.70	0.02	0.00	0.66	0.68
52	21	26	choked	7.72	8.00	0.80	3.90	0.03	0.27	0.66	0.96
53	22	26	choked	3.86	8.00	1.60	3.90	0.03	0.35	0.66	1.04
54	22	27	choked	3.86	8.00	1.60	3.90	0.03	0.35	0.66	1.04
55	23	27	choked	7.72	8.00	0.80	3.90	0.03	0.00	0.66	0.69
56	24	28	unchoked	11.57	8.00	0.54	3.90	0.03	0.27	0.66	0.96
57	25	29	unchoked	11.57	8.00	0.54	3.90	0.03	0.28	0.66	0.97
58	26	30	choked	11.57	9.20	0.60	3.90	0.03	0.31	0.66	1.00
59	27	31	choked	11.57	9.20	0.60	3.90	0.03	0.35	0.66	1.04
60	28	32	choked	11.57	9.20	0.60	3.90	0.03	0.28	0.66	0.97
61	29	33	choked	11.57	9.20	0.60	3.90	0.03	0.31	0.66	1.00
62	30	36	choked	9.27	-	1.05	-	0.01	0.00	0.74	0.75
63	31	36	choked	13.90	-	0.70	-	0.02	0.00	1.67	1.69
64	32	36	choked	13.90	-	0.70	-	0.02	0.00	1.67	1.69
65	33	36	choked	9.27	-	1.05	-	0.01	0.00	0.74	0.75
66	33	36	choked	2.04	-	1.05	-	-	-	-	1.72
67	32	36	choked	0.68	-	3.39	-	-	-	-	1.71
68	31	36	choked	2.10	-	1.11	-	-	-	-	1.71
69	30	36	choked	1.77	-	1.25	-	-	-	-	1.72
70	36	37	unchoked	400.	-	0.06	-	-	-	-	0.05
71	29	37	choked	1.39	-	1.50	-	-	-	-	1.73
72	28	37	choked	0.71	-	3.30	-	-	-	-	1.71
73	27	37	choked	0.71	-	3.30	-	-	-	-	1.71
74	26	37	choked	1.39	-	1.50	-	-	-	-	1.71
75	37	38	unchoked	965.	-	0.03	-	-	-	-	0.05
76	20	38	choked	1.25	-	1.97	-	-	-	-	1.71
77	19	38	choked	1.07	-	2.20	-	-	-	-	1.71
78	18	38	choked	0.71	-	3.30	-	-	-	-	1.71
79	17	38	choked	0.71	-	3.30	-	-	-	-	1.71
80	15	38	choked	1.25	-	1.97	-	-	-	-	1.71
81	14	38	choked	1.07	-	2.20	-	-	-	-	1.71
82	13	38	choked	1.47	-	1.50	-	-	-	-	1.71
83	12	38	choked	0.71	-	3.30	-	-	-	-	1.71
84	11	38	choked	0.71	-	3.30	-	-	-	-	1.71
85	35	38	choked	1.08	-	2.43	-	-	-	-	1.71
86	0	35	choked	1.00	-	0.00	-	-	-	-	0.00

* Minimum cross-sectional area.

**Loss coefficient for reverse flow.

TABLE 6.2-25
(SHEET 1 OF 2)

SUBCOMPARTMENT VENT PATH DESCRIPTION
FEEDWATER LINE BREAK WITH SHIELDING DOORS

								HEAD LOSS, K			
VENT PATH NO.	FROM VOL. NODE NO.	TO VOL. NODE NO.	DESCRIPTION OF VENT PATH FLOW	AREA* (ft^2)	LENGTH (ft)	Σ (L/A) (ft^{-1})	HYDRAULIC DIAMETER (ft)	FRICTION LOSS, K_f	TURNING LOSS, K_{bl}	EXPANSION AND CONTRACTION, K_E	TOTAL
1	1	2	unchoked	14.86	8.97	0.60	4.05	-	0.15	0.14	0.29
2	2	3	unchoked	14.86	8.97	0.60	4.05	-	0.15	0.28	0.43
3	3	4	unchoked	14.86	8.97	0.60	4.05	-	0.15	0.14	0.29
4	5	6	unchoked	20.19	9.06	0.45	4.40	-	0.09	0.16	0.25
5	6	7	unchoked	20.19	9.06	0.45	4.40	-	0.09	0.32	0.41
6	7	8	unchoked	20.19	9.06	0.45	4.40	-	0.09	0.16	0.25
7	9	10	unchoked	13.88	9.55	0.69	3.10	-	1.00	0.31	1.31
8	10	11	unchoked	13.88	9.55	0.69	3.10	-	0.65	0.62	1.27
9	11	12	unchoked	13.88	9.55	0.69	3.10	-	1.00	0.31	1.31
10	13	14	unchoked	9.83	6.35	0.65	3.00	-	0.06	0.45	0.51
11	14	15	unchoked	9.83	6.35	0.65	3.00	-	0.06	0.45	0.51
12	15	16	unchoked	9.83	7.80	0.81	3.00	-	0.08	0.30	0.38
13	16	17	unchoked	9.83	9.52	0.97	3.00	-	0.09	0.30	0.39
14	18	19	unchoked	14.68	6.35	0.44	3.25	-	0.49	0.30	0.79
15	19	20	unchoked	14.68	6.35	0.44	3.25	-	0.53	0.30	0.83
16	20	21	unchoked	14.68	6.35	0.54	3.25	-	0.51	0.00	0.51
17	21	22	unchoked	14.68	6.35	0.65	3.25	-	0.55	0.30	0.85
18	29	23	choked	5.42	2.50	0.40	2.52	-	0.85	0.00	0.85
19	23	24	choked	16.19	3.17	0.20	3.20	-	0.03	0.30	0.33
20	24	25	choked	16.19	4.76	0.30	3.20	-	0.05	0.00	0.05
21	25	26	unchoked	16.19	6.35	0.40	3.20	-	0.73	0.60	1.33
22	26	27	unchoked	16.19	7.93	0.50	3.20	-	0.74	0.60	1.34
23	27	28	unchoked	16.19	9.52	0.60	3.20	-	0.09	0.30	0.39
24	5	1	unchoked	23.80	6.27	0.26	5.80	-	0.00	0.00	0.03
25	6	2	unchoked	23.80	6.27	0.26	5.80	-	0.00	0.00	0.03
26	7	3	unchoked	23.80	6.27	0.26	5.80	0.03	0.00	0.00	0.03
27	8	4	unchoked	23.80	6.27	0.26	5.80	0.03	0.00	0.00	0.03
28	9	5	unchoked	10.84	8.53	0.54	3.70	0.02	0.26	0.85	1.13, 1.28**
29	10	6	unchoked	10.84	8.53	0.54	3.70	0.02	0.26	0.85	1.13, 1.28**
30	11	7	unchoked	10.84	8.53	0.54	3.70	0.02	0.26	0.85	1.13, 1.28**
31	12	8	unchoked	10.84	8.53	0.54	3.70	0.02	0.26	0.85	1.13, 1.28**

TABLE 6.2-25
(SHEET 2 OF 2)

								HEAD LOSS, K			
VENT PATH NO.	FROM VOL. NODE NO.	TO VOL. NODE NO.	DESCRIPTION OF VENT PATH FLOW	AREA* (ft^2)	LENGTH (ft)	Σ (L/A) (ft^{-1})	HYDRAULIC DIAMETER (ft)	FRICTION LOSS, K_f	TURNING LOSS, K_{bl}	EXPANSION AND CONTRACTION, K_E	TOTAL
32	13	9	unchoked	7.22	8.00	0.83	3.70	0.02	0.31	0.63	0.96
33	14	9	unchoked	3.61	8.00	1.66	3.70	0.02	0.31	0.63	0.96
34	14	10	unchoked	3.61	8.00	1.66	3.70	0.02	0.31	0.63	0.96
35	15	10	unchoked	7.22	8.00	0.83	3.70	0.02	0.31	0.63	0.96
36	16	11	unchoked	10.84	8.00	0.56	3.70	0.02	0.31	0.63	0.96
37	17	12	unchoked	10.84	8.00	0.56	3.70	0.02	0.36	0.63	1.01
38	18	13	choked	7.71	8.00	0.80	3.90	0.02	0.00	0.66	0.68
39	19	14	choked	7.71	8.00	0.80	3.90	0.02	0.35	0.66	1.03
40	20	15	unchoked	7.71	8.00	0.80	3.90	0.02	0.28	0.66	0.96
41	21	16	unchoked	11.57	8.00	0.54	3.90	0.02	0.29	0.66	0.97
42	22	17	unchoked	11.57	8.00	0.54	3.90	0.02	0.28	0.66	0.96
43	23	18	choked	3.86	10.08	1.94	3.90	0.04	0.00	0.66	0.70
44	24	18	choked	3.96	10.08	1.94	3.90	0.04	0.00	0.66	0.70
45	25	19	choked	7.71	10.08	0.97	3.90	0.04	0.28	0.66	0.98
46	26	20	choked	7.71	10.08	0.97	3.90	0.04	0.30	0.66	1.00
47	27	21	unchoked	11.57	10.08	0.65	3.90	0.04	0.29	0.66	0.99
48	28	22	unchoked	11.57	10.08	0.65	3.90	0.04	0.27	0.66	0.97
49	23	30	choked	1.54	-	3.60	-	0.01	0.00	1.60	1.61
50	24	30	choked	3.86	-	1.30	-	0.02	0.00	1.05	1.07
51	25	30	choked	7.71	-	1.06	-	0.02	0.00	1.97	1.99
52	26	30	choked	7.71	-	1.06	-	0.02	0.00	1.97	1.99
53	27	30	unchoked	9.27	-	0.79	-	0.01	0.00	2.39	2.40
54	28	30	unchoked	11.57	-	0.65	-	0.02	0.00	1.80	1.82
55	29	30	choked	0.68	-	3.96	-	-	-	-	1.71
56	28	30	choked	0.68	-	3.96	-	-	-	-	1.71
57	27	30	unchoked	1.36	-	1.98	-	-	-	-	1.71
58	26	30	unchoked	1.36	-	1.70	-	-	-	-	1.73
59	25	30	unchoked	0.68	-	3.96	-	-	-	-	1.71
60	30	31	unchoked	400.	-	0.06	-	-	-	-	0.05
61	22	31	choked	0.71	-	3.86	-	-	-	-	1.71
62	21	31	unchoked	1.39	-	1.70	-	-	-	-	1.73
63	20	31	unchoked	0.68	-	2.98	-	-	-	-	1.74
64	19	31	unchoked	1.42	-	1.93	-	-	-	-	1.71
65	31	32	unchoked	965.	-	0.03	-	-	-	-	0.05
66	12	32	choked	2.89	-	0.90	-	-	-	-	1.71
67	11	32	choked	2.50	-	1.17	-	-	-	-	1.71
68	10	32	unchoked	2.50	-	1.17	-	-	-	-	1.71
69	9	32	unchoked	2.14	-	1.29	-	-	-	-	1.71
70	0	32	choked	1.0	-	0.0	-	-	-	-	0.0

* Minimum cross-sectional area.
** Loss coefficient for reverse flow.

TABLE 6.2-26

MASS AND ENERGY RELEASE RATE DATA

RECIRCULATION OUTLET LINE BREAK

(For Biological Shield Pressurization Analysis)

BREAK AREA ≅ 2.753 ft^2

TIME (sec)	LIQUID MASS FLOW RATE (lb_m/sec)	STEAM MASS FLOW RATE (lb_m/sec)	LIQUID ENTHALPY (Btu/lb_m)	STEAM ENTHALPY (Btu/lb_m)	TOTAL MASS RELEASE RATE (lb_m/sec)	TOTAL ENERGY RELEASE RATE (Btu/sec)
0.0	0.	0.	527.4	1195.9	0.	0.
0.0020	742.	0.	527.4	1195.9	742.	3.92×10^5
0.0040	2388.	0.	527.4	1195.9	2388.	1.26×10^6
0.0060	4958.	0.	527.4	1195.9	4958.	2.62×10^6
0.0080	8926.	0.	527.4	1195.9	8926.	4.71×10^6
0.0100	14162.	0.	527.4	1195.9	14162.	7.47×10^6
0.0173	36184.	0.	527.4	1195.9	36184.	1.91×10^6
0.0194	36184.	0.	527.4	1195.9	36184.	1.91×10^7
0.0194	18324.	0.	527.4	1195.9	18324.	9.67×10^6
0.0220	21146.	0.	527.4	1195.9	21146.	1.12×10^7
0.0240	22890.	0.	527.4	1195.9	22890.	1.21×10^7
0.0260	24294.	0.	527.4	1195.9	24294.	1.28×10^7
0.0280	25222.	0.	527.4	1195.9	25222.	1.33×10^7
0.0300	25730.	0.	527.4	1195.9	25730.	1.36×10^7
0.0310	25770.	0.	527.4	1195.9	25770.	1.36×10^7
5.0	25770.	0.	527.4	1195.9	25770.	1.36×10^7

TABLE 6.2-27

MASS AND ENERGY RELEASE RATE DATA

FEEDWATER LINE BREAK

(For biological shield pressurization analysis)

BREAK AREA ≅ 1.538 ft						
TIME (sec)	LIQUID MASS FLOW RATE (lb_m/sec)	STEAM MASS FLOW RATE (lb_m/sec)	LIQUID ENTHALPY (Btu/lb_m)	STEAM ENTHALPY (Btu/lb_m)	TOTAL MASS RELEASE RATE (lb_m/sec)	TOTAL ENERGY RELEASE RATE (Btu/sec)
0.0	14,197.	0.	397.8	1190.	14,197.	5.65×10^6
0.00105	14,197.	0.	397.8	1190.	14,197.	5.65×10^6
0.00106	21,599.	0.	397.8	1190.	21,599.	8.60×10^6
1.0	21,599.	0.	397.8	1190.	21,599.	8.60×10^6

TABLE 6.2-28
(SHEET 1 OF 8)
PRIMARY CONTAINMENT ISOLATION VALVES

VALVE FUNCTION AND NUMBER		VALVE GROUP[a]	MAXIMUM ISOLATION TIME (Seconds)
A.	AUTOMATIC ISOLATION VALVES		
1.	Main Steam Isolation Valves 1(2)B21-F022A, B, C, D 1(2)B21-F028A, B, C, D	1	5*
2.	Main Steam Line Drain Valves 1(2)B21-F016 1(2)B21-F019 1(2)B21-F067A, B, C, D	1	 ≤ 15 ≤ 15 ≤ 23
3.	Reactor Coolant System Sample Line Valves [b] 1(2)B33-F019 1(2)B33-F020	3	≤ 5
4.	Drywell Equipment Drain Valves 1(2)RE024 1(2)RE025 1(2)RE026 1(2)RE029	2	 ≤ 20 ≤ 20 ≤ 15 ≤ 15
5.	Drywell Floor Drain Valves 1(2)RF012 1(2)RF013	2	≤ 20
6.	Reactor Water Cleanup Suction Valves 1(2)G33-F001[c] 1(2)G33-F004	5	≤ 10
7.	RCIC Steam Line Valves 1(2)E51-F008[d] 1(2)E51-F063 1(2)E51-F076	8	 ≤ 20 ≤ 15 ≤ 15
8.	Containment Vent and Purge Valves 1(2)VQ026 1(2)VQ027 1(2)VQ029 1(2)VQ030 1(2)VQ031 1(2)VQ032 1(2)VQ034 1(2)VQ035 1(2)VQ036 1(2)VQ040 1(2)VQ042 1(2)VQ043 1(2)VQ047 1(2)VQ048 1(2)VQ050 1(2)VQ051 1(2)VQ068	4	≤ 10 ≤ 10 ≤ 10 ≤ 10 ≤ 10 ≤ 5 ≤ 10 ≤ 5 ≤ 10 ≤ 10 ≤ 10 ≤ 10 ≤ 5 ≤ 5 ≤ 5 ≤ 5 ≤ 5
9.	RCIC Turbine Exhaust Vacuum Breaker Line Valves 1(2)E51-F080 1(2)E51-F086	9	N/A

TABLE 6.2-28
(SHEET 2 OF 8)
PRIMARY CONTAINMENT ISOLATION VALVES

VALVE FUNCTION AND NUMBER		VALVE GROUP[a]	MAXIMUM ISOLATION TIME (Seconds)
A. AUTOMATIC ISOLATION VALVES (CONTINUED)			
10.	Containment Monitoring Valves 1(2)CM017A,B 1(2)CM0l8A,B 1(2)CM019A,B 1(2)CM020A,B 1(2)CM021B [f] 1(2)CM022A[f] 1(2)CM025A[f] 1(2)CM026B[f] 1(2)CM027 1(2)CM028 1(2)CM029 1(2)CM030 1(2)CM031 1(2)CM032 1(2)CM033 1(2)CM034	2	≤5
11.	Drywell Pneumatic Valves 1(2)IN001A and B 1(2)IN017 1(2)IN074 1(2)IN075 1(2)IN031	 10 10 10 10 2	 ≤ 30 ≤ 22 ≤ 22 ≤ 22 ≤ 5
12.	RHR Shutdown Cooling Mode Valves 1(2)E12-F008 1(2)E12-F009 1(2)E12-F023 1(2)E12-F053A and B	6	 ≤40 ≤ 40 ≤ 90 ≤ 29
13.	Tip Guide Tube Ball Valves (Five Valves) 1(2)C51-J004	7	N/A
14.	Reactor Building Closed Cooling Water System Valves 1(2)WR029 1(2)WR040 1(2)WR179 1(2)WR180	2	≤ 30
15.	Primary Containment Chilled Water Inlet Valves 1(2)VP113A and B 1(2)VP063A and B	2	 ≤ 90 ≤ 40
16.	Primary Containment Chilled Water Outlet Valves 1(2)VP053A and B 1(2)VP114A and B	2	 ≤ 40 ≤ 90

TABLE 6.2-28
(SHEET 3 OF 8)
PRIMARY CONTAINMENT ISOLATION VALVES

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VALVE FUNCTION AND NUMBER	VALVE GROUP[(a)]	MAXIMUM ISOLATION TIME (Seconds)
A. AUTOMATIC ISOLATION VALVES (CONTINUED)		
17. Recirc. Hydraulic Flow Control Line Valves 1(2)B33-F338 A and B 1(2)B33-F339 A and B 1(2)B33-F340 A and B 1(2)B33-F341 A and B 1(2)B33-F342 A and B 1(2)B33-F343 A and B 1(2)B33-F344 A and B 1(2)B33-F345 A and B	2	≤ 5
18. Feedwater Testable Check Valves 1(2)B21-F032 A and B	2	N/A
B. MANUAL ISOLATION VALVES		
1. 1(2)FC086		N/A
2. 1(2)FC113		N/A
3. 1(2)FC114		N/A
4. 1(2)FC115		N/A
5. 1(2)MC027 [(h)]		N/A
6. 1(2)MC033 [(h)]		N/A
7. 1(2)SA042 [(h)]		N/A
8. 1(2)SA046 [(h)]		N/A
9. 1(2)CM039		N/A
10. 1(2)CM040		N/A
11. 1(2)CM041		N/A
12. 1(2)CM042		N/A
13. 1(2)CM043		N/A
14. 1(2)CM044		N/A
15. 1(2)CM045		N/A
16. 1(2)CM046		N/A
17. 1(2)CM085		N/A
18. 1(2)CM086		N/A
19. 1(2)CM089		N/A
20. 1(2)CM090		N/A
C. EXCESS FLOW CHECK VALVES		
1. 1(2)B21-F374		
2. 1(2)B21-F376		
3. 1(2)B21-F359		
4. 1(2)B21-F355		
5. 1(2)B21-F361		
6. 1(2)B21-F378		
7. 1(2)B21-F372		
8. 1(2)B21-F370		
9. 1(2)B21-F363		
10. 1(2)B21-F353		
11. 1(2)B21-F415A, B		
12. 1(2)B21-F357		

TABLE 6.2-28
(SHEET 4 OF 8)
PRIMARY CONTAINMENT ISOLATION VALVES

VALVE FUNCTION AND NUMBER		VALVE GROUP[(a)]	MAXIMUM ISOLATION TIME (Seconds)
C. EXCESS FLOW CHECK VALVES (CONTINUED)			
13.	1(2)B21-F382		
14.	1(2)B21-F328A, B, C, D		
15.	1(2)B21-F327A, B, C, D		
16.	1(2)B21-F413A, B		
17.	1(2)B21-F344		
18.	1(2)B21-F365		
19.	1(2)B21-F443		
20.	1(2)B21-F439		
21.	1(2)B21-F437		
22.	1(2)B21-F441		
23.	1(2)B21-F445A, B		
24.	1(2)B21-F453		
25.	1(2)B21-F447		
26.	1(2)B21-F455A, B		
27.	1(2)B21-F451		
28.	1(2)B21-F449		
29.	1(2)B21-F367		
30.	1(2)B21-F326A, B, C, D		
31.	1(2)B21-F325A, B, C, D		
32.	1(2)B21-F350		
33.	1(2)B21-F346		
34.	1(2)B21-F348		
35.	1(2)B21-F471		
36.	1(2)B21-F473		
37.	1(2)B21-F469		
38.	1(2)B21-F475A, B		
39.	1(2)B21-F465A, B		
40.	1(2)B21-F467		
41.	1(2)B21-F463		
42.	1(2)B21-F380		
43.	1(2)G33-F312A, B		
44.	1(2)G33-F309		
45.	1(2)E12-F315		
46.	1(2)E12-F359A, B		
47.	1(2)E12-F319		
48.	1(2)E12-F317		
49.	1(2)E12-F360A, B		
50.	1(2)E21-F304		
51.	1(2)E22-F304		
52.	1(2)E22-F341		

TABLE 6.2-28
(SHEET 5 OF 8)
PRIMARY CONTAINMENT ISOLATION VALVES

VALVE FUNCTION AND NUMBER		VALVE GROUP[a]	MAXIMUM ISOLATION TIME (Seconds)
C. EXCESS FLOW CHECK VALVES (CONTINUED)			
53.	1(2)E22-F342		
54.	1(2)B33-F319A, B		
55.	1(2)B33-F317A, B		
56.	1(2)B33-F313A, B, C, D		
57.	1(2)B33-F311A, B, C, D		
58.	1(2)B33-F315A, B, C, D		
59.	1(2)B33-F301A, B		
60.	1(2)B33-F307A, B, C, D		
61.	1(2)B33-F305A, B, C, D		
62.	1(2)CM004		
63.	1(2)CM002		
64.	1(2)CM012		
65.	1(2)CM010		
66.	1(2)VQ061		
67.	1(2)B21-F457		
68.	1(2)B21-F459		
69.	1(2)B21-F461		
70.	1(2)CM102		
71.	1(2)B21-F570		
72.	1(2)B21-F571		
D. OTHER ISOLATION VALVES			
1.	Deleted		
2.	Reactor Feedwater and RWCU System Return 1(2)B21-F010A, B 1(2)B21-F065A, B 1(2)G33-F040		
3.	Residual Heat Removal/Low Pressure Coolant Injection System 1(2)E12-F042A, B, C 1(2)E12-F016A, B 1(2)E12-F017A, B 1(2)E12-F004A, B, C 1(2)E12-F027A, B 1(2)E12-F024A, B 1(2)E12-F021 1(2)E12-F302 1(2)E12-F064A, B, C 1(2)E12-F011A, B 1(2)E12-F088A, B, C 1(2)E12-F025A, B, C 1(2)E12-F030 1(2)E12-F005		

TABLE 6.2-28
(SHEET 6 OF 8)
PRIMARY CONTAINMENT ISOLATION VALVES

VALVE FUNCTION AND NUMBER	VALVE GROUP[a]	MAXIMUM ISOLATION TIME (Seconds)
D. OTHER ISOLATION VALVES (CONTINUED)		
3. Residual Heat Removal/Low Pressure Coolant Injection System (Continued) 1(2)E12-F073A, B 1(2)E12-F074A, B 1(2)E12-F055A, B 1(2)E12-F036A, B 1(2)E12-F311A, B		
4. Low Pressure Core Spray System 1(2)E21-F005 1(2)E21-F001 1(2)E21-F012 1(2)E21-F011 1(2)E21-F018 1(2)E21-F031		
5. High Pressure Core Spray System 1(2)E22-F004 1(2)E22-F015 1(2)E22-F023 1(2)E22-F012 1(2)E22-F014		
6. Reactor Core Isolation Cooling System 1(2)E51-F013 1(2)E51-F069 1(2)E51-F028 1(2)E51-F068 1(2)E51-F040 1(2)E51-F031 1(2)E51-F019 1(2)E51-F059(i) 1(2)E51-F022(i) 1(2)E51-F362(j) 1(2)E51-F363(j)		
7. Post LOCA Hydrogen Control 1(2)HG001A, B 1(2)HG002A, B 1(2)HG005A, B 1(2)HG006A, B		

TABLE 6.2-28
(SHEET 7 OF 8)
PRIMARY CONTAINMENT ISOLATION VALVES

VALVE FUNCTION AND NUMBER	VALVE GROUP[(a)]	MAXIMUM ISOLATION TIME (Seconds)
D. OTHER ISOLATION VALVES (CONTINUED)		
8. Standby Liquid Control System 1(2)C41-F004A, B 1(2)C41-F006 1(2)C41-F007		
9. Reactor Recirculation Seal Injection 1(2)B33-F013A, B 1(2)B33-F017A, B		
10. Drywell Pneumatic System 1(2)IN018 1(2)IN100 1(2)IN101		
11. Reference Leg Backfill 1(2)C11-F422B 1(2)C11-F422D 1(2)C11-F422F 1(2)C11-F422G 1(2)C11-F423B 1(2)C11-F423D 1(2)C11-F423F 1(2)C11-F423G		
12. Control Rod Drive Insert Lines 1(2)C11-D001-120 1(2)C11-D001-123		
13. Control Rod Drive Withdrawal Lines 1(2)C11-D001-121 1(2)C11-D001-122		
14. RHR Shutdown Cooling 1(2)E12-F460		
15. Reactor Coolant System Sample Line Valve 1(2)B33-F395		
16. Reactor Building Closed Cooling Water 1(2)WR225/226		
17. Primary Containment Chilled Water Inlet Valve 1(2)VP198A/B		
18. Primary Containment Chilled Water Outlet Valve 1(2)VP197A/B		
19. Containment Monitoring System 1(2)CM023B 1(2)CM024A		

* But ≥ 3 seconds.
a) See Technical Specification for isolation signal(s) that operates each valve group.
b) May be opened on an intermittent basis under administrative control.
c) Not closed by SLCS actuation.
d) Deleted.

TABLE 6.2-28
(SHEET 8 OF 8)
PRIMARY CONTAINMENT ISOLATION VALVES

e) Not closed by Trip Functions 4a, c, d, e or f of Technical Specification 3.3.2, Table 3.3.2-1.
f) Opens on an isolation signal.
g) Also closed by drywell pressure-high signal
h) These penetrations are provided with removable spools outboard of the outboard isolation valve. During operation, these lines will be blind flanged using a double O-ring.
i) If valves 1(2)E51-F362 and 1(2)E51-F363 are locked closed and acceptably leak rate tested, then valves 1(2)E51-F059 and 1(2)E51-F022 are not considered to be primary containment isolation valves and are not required to be leak rate tested.
j) Either the 1(2)E51-F362 or the 1(2)E51-F363 valve may be open when the RCIC system is in the standby mode of operation, and both valves may be open during operation of the RCIC system in the full flow test mode, providing that:

    (1) valve 1(2)E51-F022 is acceptably leak rate tested, and

    (2) valve 1(2)E51-F059 is deactivated, locked closed and acceptably leak rate tested, and

    (3) the spectacle flange, installed immediately downstream of the 1(2)E51-F059 valve, is closed and acceptably leak rate tested.

6.3 EMERGENCY CORE COOLING SYSTEMS

6.3.1 Design Bases

The objective of the emergency core cooling systems (ECCS), in conjunction with the containment, is to limit the release of radioactive materials following a loss-of-coolant accident so that resulting radiation exposures are within the guideline values given in published regulations.

Safety design bases for the emergency core cooling systems are given in the following subsections.

6.3.1.1 Summary Description of the Emergency Core Cooling System

The emergency core cooling system (ECCS) consists of a high-pressure core spray (HPCS) system, a low-pressure core spray (LPCS) system, a low-pressure coolant injection (LPCI) system, and an automatic depressurization system (ADS).

The HPCS consists of a single, motor-driven pump and associated piping, valves, controls and instrumentation. The system is designed to pump water over the entire range of operating pressures, and thus can spray water into the reactor vessel even if the reactor pressure remains near normal operating levels. For small breaks which do not result in rapid vessel depressurization, the HPCS maintains the proper reactor water level and depressurizes the vessel.

The HPCS sprays the top surface of the core until sufficient water accumulates in the vessel to reflood the core. Water is injected into the vessel through nozzles in a circular sparger above and around the periphery of the core.

The LPCS is a loop similar to, but independent of, the HPCS. The low pressure system is designed to provide protection in case of larger breaks which would rapidly depressurize the reactor vessel. Like the HPCS, water from the LPCS enters the vessel through nozzles in a circular sparger located above and around the core periphery. The LPCS limits the maximum cladding temperature and cools it to saturation upon flooding the core. This system acts to protect the core for intermediate and large breaks, and is assisted by the HPCS and ADS for small breaks.

The LPCI is capable of delivering a large flood of water into the core to refill the vessel once it depressurizes. It consists of three residual heat removal subsystem pumps, each of which injects water into the vessel through its own separate piping and penetrations. The function of this system is to cool the core by flooding, thereby cooling the cladding to saturation after a LOCA. The LPCI acts to protect the core for intermediate or large breaks, and is assisted by the HPCS and ADS for small breaks.

Because the spraying and flooding systems can draw water from the suppression pool, they have a continuous supply of water. Water and steam from the vessel which would be lost through a postulated pipe break are collected in the suppression pool. Likewise, water pumped by the ECCS and lost through a break would also accumulate in the suppression pool.

The ADS utilizes 7 of the 13 safety/relief valves (Unit 2 has a total of 13 valves). These are activated as a backup to the HPCS to reduce vessel pressure in case of breaks for which depressurization is required, so that flow from the LPCI and LPCS can enter the vessel in time to cool the core and limit cladding temperature.

6.3.1.1.1 Range of Coolant Ruptures and Leaks

The emergency core cooling systems provide adequate core cooling in the event of any size break or leak in the nuclear system process barrier up to and including the design-basis break and the double-ended recirculation line break.

6.3.1.1.2 Fission Product Decay Heat

In the event of a loss-of-coolant accident, the emergency core cooling systems remove both residual stored heat and radioactive decay heat from the reactor core at a rate that limits the maximum fuel cladding temperature to a value less than the 10 CFR 50 limit of acceptability of 2200° F. The amount of heat to be removed is discussed in Section 6.2.

6.3.1.1.3 Reactivity Required for Cold Shutdown

The reactor is designed to be in the cold shutdown condition with the control rod of highest reactivity worth fully withdrawn and all other control rods fully inserted. Refer to Subsection 4.3.2 for a complete discussion.

6.3.1.2 Functional Requirement Design Bases

a. Emergency core cooling systems are provided with sufficient capacity, diversity, reliability, and redundancy to cool the reactor core under all design-basis accident conditions.

b. Emergency core cooling systems are initiated automatically by conditions that sense the potential inadequacy of the normal core cooling.

c. The emergency core cooling systems are capable of startup and operation regardless of the availability of offsite power supplies and the normal generating system of the plant.

d. Action taken to effect containment integrity does not negate the ability to achieve core cooling. All ECCS pumps are designed to operate without benefit of containment back pressure.

e. The components of the emergency core cooling systems within the reactor vessel are designed to withstand the transient mechanical loadings during a loss-of-coolant accident so that the required core cooling flow is not restricted.

f. The equipment of the emergency core cooling systems can withstand the physical effects of a loss-of-coolant accident so that the core can be effectively cooled. Such effects considered are missiles, fluid jets, pipe whip, high temperature, pressure, humidity, and seismic acceleration.

g. To provide a reliable supply of water for the emergency core cooling systems, the prime source of liquid for cooling the reactor core after a loss-of-coolant accident is a stored source located within the containment. The source is located so that a closed cooling water path is established during emergency core cooling systems operation.

6.3.1.3 Reliability Requirements Design Bases

The flow rate and sensing networks of each emergency core cooling system are testable during reactor shutdown. All active components are testable during normal operation of the nuclear system.

6.3.2 System Design

The ECCS, containing four separate subsystems, is designed to satisfy the following performance objectives:

a. to prevent fuel cladding fragmentation for any mechanical failure of the nuclear boiler system up to, and including, a break equivalent to the largest nuclear boiler system pipe;

b. to provide this protection by at least two independent, automatically actuated cooling systems;

c. to function with or without external (offsite) power sources; and

d. to permit testing of all ECCS by acceptable methods including, wherever practical, testing during power plant operations.

The aggregate of these emergency core cooling systems is designed to protect the reactor core against fuel cladding damage (fragmentation) across the entire spectrum of line break accidents.

The power for operation of the ECCS is from regular a-c power sources. Upon loss of the regular power, operation is from onsite standby a-c power sources. Standby sources have sufficient diversity and capacity so that all ECCS requirements are satisfied. The HPCS is powered from one a-c supply bus. The LPCS and one LPCI are powered from a second a-c supply bus and the two remaining LPCI are powered from a third and separate a-c supply bus. The HPCS has its own diesel generator as its alternate power supply. The LPCS and one LPCI loops switch to one site backup power supply and the other two LPCI loops switch to a second site backup power supply.

All systems start automatically. The starting signal comes from at least two independent and redundant sensors of drywell pressure and low reactor vessel water level. Refer to Subsection 7.3.1.2 for a complete discussion of the ECCS instrumentation and starting and control logic.

Further discussion of the integrated performance of the ECCS is presented in Subsection 6.3.3.7. The bounds within which system parameters must be maintained and the acceptable inoperable components are discussed in the Technical Specifications.

6.3.2.1 Schematic Piping and Instrumentation Diagrams

Piping and instrumentation diagrams for the subsystems and components which constitute the ECCS are provided and are referenced under the discussion of that subsystem or component.

6.3.2.2 Equipment and Component Descriptions

6.3.2.2.1 High-Pressure Core Spray (HPCS) System

The high-pressure core spray (HPCS) system consists of a single motor-driven pump located outside the primary containment and associated system piping, valves, controls and instrumentation. The system is designed to operate from normal offsite auxiliary power or from a standby diesel-generator supply if offsite power is not available. The piping and instrumentation diagram (P&ID) for the HPCS is shown in Drawing Nos. M-95 and M-141. The HPCS system process diagram is shown in Figure 6.3-1.

The principal HPCS equipment is located outside the primary containment. Suction piping is provided from the suppression pool. The suppression pool water source assures a closed cooling water supply for extended operation of the HPCS system. After the HPCS injection piping enters the vessel, it divides and enters the shroud at two points near the top of the shroud. A semicircular sparger is attached to each outlet. Nozzles are spaced around the spargers to spray the water radially over the core and into the fuel assemblies. The HPCS injection piping is provided with an isolation valve on each side of the containment barrier. Remote controls for operating the valves and diesel generator are provided in the plant control room. The controls and instrumentation of the HPCS system are described, illustrated, and evaluated in detail in Chapter 7.0.

The HPCS system is designed to cool the reactor core sufficiently to prevent fuel cladding temperatures from exceeding the 10 CFR 50 limit of 2200° F following any break in the nuclear system piping. The system is designed to pump water into the reactor vessel over a wide range of pressures. For small breaks that do not result in rapid reactor depressurization, the system maintains reactor water level and depressurizes the vessel. For large breaks the HPCS system cools the core by a spray.

If a loss-of-coolant accident should occur, a low water level signal or a high drywell pressure signal initiates a reactor scram, the HPCS and its support equipment. The HPCS flow automatically stops when a high water level in the reactor vessel is signaled. The HPCS system also serves as a backup to the RCIC system in the event the reactor becomes isolated from the main condenser during operation and feedwater flow is lost.

If normal auxiliary power is not available, the HPCS pump motor is driven by its own onsite power source. The HPCS standby power source is discussed in Section 8.3.

The HPCS system vessel pressure versus flow characteristic assumed in LOCA analyses is shown in Figure 6.3-2. Figure 6.3-10 shows the minimum required pump head for HPCS system in order to meet the LOCA analyses assumptions. When the system is started, initial flow rate is established by primary system pressure. As vessel pressure decreases, flow will increase. When vessel pressure reaches 200 psid (differential pressure between the reactor vessel and the suction source) the system reaches rated core spray flow. The HPCS motor size is based on peak horsepower requirements.

The elevation of the HPCS pump is below the water level of the suppression pool. This assures a flooded pump suction. Pump NPSH requirements are met even with the containment at atmospheric pressure by providing adequate suction head and suction line size. The HPCS pump characteristics, head, flow, horsepower, and required NPSH are shown in Figure 6.3-3.

If the HPCS line should break outside the containment, a check valve in the line inside the drywell will prevent loss of reactor water outside the containment. The HPCS pump and piping are positioned to avoid damage from the physical effects of design-basis accidents, such as pipe whip, missiles, high temperature, pressure, and humidity.

To assure continuous core cooling, signals to isolate the containment do not operate any HPCS valves which could affect flow to the reactor pressure vessel.

The HPCS equipment and support structures are designed in accordance with Seismic Category I criteria (Chapter 3.0). The system is assumed to be filled with water for seismic analysis.

6.3.2.2.2 Automatic Depressurization System (ADS)

If the RCIC and HPCS cannot maintain the reactor water level, the automatic depressurization system, which is independent of any other ECCS, reduces the reactor pressure so that flow from LPCI and LPCS systems enters the reactor vessel in time to cool the core and limit fuel cladding temperature.

The automatic depressurization system employs nuclear system pressure relief valves to relieve high-pressure steam to the suppression pool. The design, number, location, description, and evaluation of the pressure relief valves are discussed in detail in Subsection 5.2.2.4.1. The operation of the ADS is discussed in Subsection 7.3.1.2.2. The piping and instrument diagram (P&ID) for the ADS is shown in Drawings M-55 and M-116.

6.3.2.2.3 Low-Pressure Core Spray (LPCS) System

The low-pressure core spray system consists of a centrifugal pump that can be powered by normal auxiliary power or the standby a-c power system; a spray sparger in the reactor vessel above the core (separate from the HPCS sparger); piping and valves to convey water from the suppression pool to the sparger; and associated controls and instrumentation. Drawing Nos. M-94 and M-140 show the P&ID for the low-pressure core spray system, and Figure 6.3-4 shows the process diagram for the low-pressure core spray system.

When low water level in the reactor vessel or high pressure in the drywell is sensed, with reactor vessel pressure low enough, the low-pressure core spray system automatically sprays water into the top of the fuel assemblies to cool the core. This action is initiated in conjunction with other ECCS subsystems soon enough, and at a sufficient flow rate to maintain the fuel cladding temperature below 2200° F. (The low-pressure coolant injection system starts from the same signals and operates independently to achieve the same objective by flooding the reactor vessel.)

The low-pressure core spray system protects the core in the event of a large break in the nuclear system and when the HPCS is unable to maintain reactor vessel water level. Such protection extends to a small break in which the ADS or HPCS has operated to lower the reactor vessel pressure to the operating range of the LPCS. The system vessel pressure versus flow characteristic assumed for LOCA analyses is shown in Figure 6.3-5. Figure 6.3-11 shows the minimum required pump head for the LPCS system in order to meet the LOCA analyses assumption.

The LPCS pump receives power from an a-c power bus having standby power source backup supply. The pump motor and associated automatic motor-operated valves for the LPCS and one LPCI loop receive a-c power from the same bus, while another bus provides a-c power for equipment on the other two LPCI loops (Section 8.3).

The low-pressure core spray pump and all motor-operated valves can be operated individually by manual switches located in the control room. Operating indication is provided in the control room by a flowmeter and valve indicator lights.

To assure continuity of core cooling, signals to isolate the containment do not operate any low-pressure core spray system valves which could affect flow to the reactor pressure vessel.

The LPCS injection check valve is the only low-pressure core spray equipment in the containment required during a loss-of-coolant accident that requires consideration for the high temperature and humidity environment in the drywell resulting from the accident. The valve actuates on flow through the pipeline, independent of any external signal. The actuator is provided only for local repositioning. Thus, neither the normal nor accident environment in the drywell affects the operability of the low-pressure core spray equipment for the accident.

The LPCS system piping and support structures are designed in accordance with Seismic Category I criteria (Chapter 3.0). The system is assumed to be filled with water for seismic analysis.

LPCS flow passes through a motor-operated pump suction valve that is normally open. This valve can be closed by a remote manual switch (located in the control room) to isolate the LPCS system from the suppression pool should a leak develop in that system. This valve is located in the core spray pump suction line as close to the suppression pool penetration as practical. Because the LPCS conveys water from the suppression pool, a closed loop is established for the spray water escaping from the break.

The LPCS pump is located in the reactor building below the water level in the suppression pool to assure positive pump suction. Pump NPSH requirements are met with the containment at atmospheric pressure. A pressure gauge is provided to indicate the suction head. The LPCS pump characteristics are shown in Figure 6.3-6.

6.3.2.2.4 Low-Pressure Coolant Injection (LPCI) Subsystem

The low-pressure coolant injection subsystem is one of the independent operating subsystems of the RHR system. The LPCI subsystem is actuated by low water level in the reactor or high pressure in the drywell. The subsystem, in conjunction with other ECC subsystems, is required to flood the core before fuel cladding temperature reaches 2200° F and then to maintain water level.

LPCI operation provides protection to the core for a large break in the nuclear system in addition to the LPCS and HPCS. Protection provided by LPCI also extends to a small break in which the ADS or HPCS have reduced the reactor vessel pressure to the LPCI operating range. The vessel pressure versus flow characteristic assumed in the LOCA analyses for the LPCI pumps is shown in Figure 6.3-7. Figure 6.3-12 shows the minimum required pump head for the LPCI system in order to meet the LOCA analyses assumptions.

Figure 6.3-8 shows the schematic process diagram (and process data) of the RHR system. The LPCI subsystem uses the three RHR motor-driven centrifugal pumps to convey water from the suppression pool to the reactor vessel through three separate nozzles. The RHR pumps receive power from a-c power buses having standby power source backup supply. Two RHR pump motors and the associated automatic motor-operated valves receive a-c power from one bus, while the LPCS pump and the other RHR pump motor and valves receive power from another bus (Section 8.3).

The pump, piping, control and instrumentation of the LPCI loops are separated and protected so that any single physical event, or missiles generated by rupture of any pipe in any system within the drywell, cannot make all loops inoperable.

To assure continuity of core cooling, signals to isolate the primary containment do not operate any RHR system valves which interfere with the LPCI mode of operation.

The LPCI injection check valves on each LPCI line are the only LPCI components in the drywell required to actuate during a loss-of-coolant accident that require consideration for the high temperature and humidity environment in the drywell resulting from the accident. The valves actuate on flow through the pipeline, independent of any external signal. The actuator is provided only for local repositioning. Thus, neither the normal nor accident environment in the containment affects the operability of the low-pressure coolant injection equipment for the accident.

Using the suppression pool as the source of water for LPCI establishes a closed loop for recirculation of LPCI water escaping from the break. LPCI pumps and equipment are described in detail in Subsection 5.4.7, which also describes the other functions served by the same pumps if not needed for the LPCI function. The portions of the RHR required for accident protection are designed in accordance with Seismic Category I criteria (Chapter 3.0). The piping and instrument diagram (P&ID) for the LPCI is shown in Drawings M-96 and M-142.

6.3.2.2.5 ECCS Discharge Line Fill System

One design requirement of any core cooling system is that cooling water flow to the reactor vessel be initiated rapidly when the system is called on to perform its function. This quick start system characteristic is provided by quick opening valves, quick start pumps, and standby a-c power source. The lag between the signal pump start and the initiation of flow into the RPV can be minimized by always keeping the core cooling pump discharge lines full. If these lines were empty when the systems were called for, the large momentum forces associated with accelerating fluid into a dry pipe could cause physical damage to the piping. The ECCS discharge line fill system maintains the pump discharge lines in a filled condition.

Since the ECCS discharge lines are elevated above the suppression pool, check valves are provided near the pumps to prevent back flow from emptying the lines into the suppression pool. Past experience has shown that these valves will leak slightly, producing a small back flow that will eventually empty the discharge piping. To ensure that this leakage from the discharge lines is replaced and the lines are always kept filled, a water leg pump is provided for each ECCS division. The power supply to these pumps is classified as essential when the main ECCS pumps are deactivated. Indication is provided in the control room as to whether these pumps are operating, and ESF system status lights indicate low discharge lines pressure. The piping and instrument diagram (P&ID) for the ECCS is shown on the P&IDs for HPCS, LPCS, and LPCI.

6.3.2.2.6 ECCS Pumps NPSH

The ECCS pump specifications are such that the NPSH requirements for HPCS, LPCS and LPCI are met with the containment at atmospheric pressure and the suppression pool at saturation temperature. Calculations were performed to evaluate ECCS NPSH requirements post DBA-LOCA. The calculations used the following conservative inputs:

1. Maximum ECCS pump flow - unthrottled system, reactor pressure at 0 psid, maximizing suction friction losses and NPSH required.

   LPCI pump - 8100 gpm
   LPCS pump - 8100 gpm
   HPCS pump - 7000 gpm

2. Increased clean, commercial steel piping friction losses to account for potential aging effects, thus maximizing suction losses. An absolute roughness of 0.0005 ft was used (vs. 0.00015 ft. for clean pipe), resulting in an increase in calculated head loss of about 22 percent.

3. To account for strainer plugging, the head loss across the debris bed formed on the stacked disk replacement strainers installed at the suction of the ECCS pumps due to accumulation of insulation debris and miscellaneous fibrous and particulate matter debris produced as a result of a LOCA is determined. This head loss is added to the head loss associated with a clean strainer.

4. Containment conditions used in the analysis are containment at atmospheric pressure and the suppression pool at saturation temperature (212F).

5. A minimum suppression pool elevation of 695' 11-1/2" is used. This includes a worst-case post-LOCA drawdown of 43 inches.

6. NPSH Required values for the ECCS pumps are taken from the vendor pump curves. With respect to the pump suction inlet centerline, the NPSH Required is:

   LPCI pump - 14.0 ft. @8100 gpm
   LPCS pump - 2.0 ft. @8100 gpm
   HPCS pump - 5.0 ft. @7000 gpm

The calculations determined that adequate NPSH exists to meet ECCS pump requirements post LOCA for all ECCS pumps. Additionally, adequate margin exists to ensure that flashing does not occur in any of the ECCS pump suction lines post-LOCA.

ECCS PUMP NPSH AND FLASHING MARGINS FOR LIMITING SUPPRESSION POOL CONDITIONS

Pump	Pump Flow Rate (gpm)	Strainer Margin for NPSH (ft.)	Strainer Margin for Flashing (ft.)	Clean Strainer Head Loss[1] (ft.)	Head Loss due to post-LOCA debris[2] (ft.)	NPSH Margin (ft.)
RHR/LPCI	8100	5.4	12.4	0.71	3.6	1.1
LPCS	8100	17.6	12.6	0.71	3.6	8.3
HPCS	7000	14.0	11.6	0.53	3.6	7.4

[1] 0.76 feet @8400 gpm
[2] Maximum value (@8100 gpm, Unit 2)

6.3.2.2.7 Design Pressures and Temperatures

The design pressures and temperatures at various points in the system, during each of the several modes of operation of the ECC subsystems, can be obtained from the miscellaneous information blocks on the following process diagrams: Figure 6.3-1 for the HPCS, Figure 6.3-4 for the LPCS, and Figure 6.3-8 for the LPCI.
The operational characteristics of the ADS valves are presented in Subsection 5.2.2.

6.3.2.2.8 Coolant Quantity

With reference to the Mark II containment at LaSalle County Station Units 1 and 2, the HPCS system normally takes suction from the suppression pool which contains a minimum of 128,800 cubic feet of water. The LPCS and LPCI systems also take suction from the suppression pool for their source of water.

The CSCS equipment cooling water system source (cooling lake) which provides the ultimate heat sink for cooling the suppression pool during the recovery from a DBA has sufficient capacity to accept heat from the suppression pool and prevent it from exceeding 200° F.

6.3.2.2.9 Pump Characteristics

Pump characteristic curves and the pump power requirements for all ECCS pump are shown in Figures 6.3-3, 6.3-6, and 6.3-9. Pump power requirements are given in Chapter 8.0.

6.3.2.2.10 Heat Exchanger Characteristics

There are no heat exchangers in the closed cooling water path associated with the emergency core cooling subsystems. The heat exchangers in the RHR system are discussed in Section 6.2.

6.3.2.2.11 ECCS Flow Diagrams

A schematic diagram and the flow rates and pressures of the various ECCS subsystems can be obtained from the following process diagrams: Figure 6.3-1, High-Pressure Core Spray System; Figure 6.3-4, Low-Pressure Core Spray System; and Figure 6.3-8, Residual Heat Removal System. (The RHR process diagrams show the low-pressure coolant injection system.) These parameters are presented for several modes of operation, including loss-of-coolant accident and test conditions.

6.3.2.2.12 Relief Valves and Vents

The ECC subsystems contain relief valves to protect the components and piping from inadvertent overpressure conditions.

The HPCS system has one relief valve on the discharge side of the pump downstream of the check valve to relieve thermally expanded fluid:

Nominal relief setting: 1500 psig.

HPCS suction side relief valve:

Nominal relief setting: 100 psig

Capacity: > 10 gpm, 10% Accumulation.

The LPCS system pump discharge relief valve:

Nominal relief setting: 550 psig

Capacity: 100 gpm, 10% Accumulation.

LPCS suction side relief valve:

Nominal relief setting: 100 psig

Capacity: > 10 gpm, 10% Accumulation.

The LPCI system pump discharge relief valve (one for each of three pumps):

Nominal relief setting: 500 psig.

6.3.2.2.13 Motor-Operated Valves and Controls (General)

Motor-operated valves are used in the RHR, HPCS, and LPCS emergency core cooling (ECC) systems; they are also used in the RCIC, feedwater, recirculation, reactor water cleanup (RWCU), standby gas treatment, standby liquid control, main steam, and hydrogen recombiner systems. In addition, motor-operated valves are installed on various primary and secondary containment isolation lines, certain sample lines for containment sampling in the post-LOCA condition, and other lines as indicated in Table 6.3-9.

Valve motor operators in these safety systems are provided with thermal overload protection devices. To ensure that the thermal overloads will not prevent the motor-operated valves from performing their safety-related functions under emergency conditions, the thermal overload protection devices are either bypassed under accident conditions or have sufficiently high trip setpoints to prevent inadvertent trips during valve operation per Regulatory Guide 1.106, Rev. 1. Thermal overload bypass circuits are normally installed on the safety-related motor-operated valves that are required to operate during or immediately following an accident such as the primary containment automatic isolation, emergency core cooling, and RCIC system valves. Thermal overload bypass circuits are not installed on the hydrogen recombiner valves since these valves are not required to be operated until several hours after the accident has occurred. In addition, these valves are normally closed and are provided with only a remote manual control system.

For the valves equipped with thermal overload bypass circuits, the thermal overload protection is either (1) normally in the circuit but automatically bypassed whenever any safety-related use of the valve is initiated, or (2) continuously bypassed and temporarily placed in the circuit via a test switch when the motors are undergoing periodic surveillance or maintenance testing.

To prevent the valve motors from being damaged during normal operation or surveillance testing when the thermal overloads are not bypassed, the thermal overloads are set to trip the valve motor operators during locked rotor conditions. A schematic or typical thermal overload bypass arrangement is shown in Figure 6.3-47 and a list of motor-operated valves which have their thermal overload protection bypassed during an accident condition is given in Table 6.3-9.

For the hydrogen recombiner motor-operated valves, the thermal overloads are always in the circuit. However, setting calculations based on IEEE-741-1990 demonstrate that the thermal overloads for these valves will not inadvertently trip during required valve operation. The trip setpoints of these thermal overloads have been verified to account for the uncertainties due to the ambient temperature at the location of the overload device following an accident and the inaccuracies in the device trip characteristics.

Further information on motor-operated valves and controls is provided in Subsection 6.2.4.

6.3.2.2.14 Process Instrumentation

Multiple instrumentation is available to the operator in the control room to assist him in assessing the post-LOCA conditions.

Basically, these indications are two varieties: those which indicate the pressures, temperatures and level in the reactor vessel and in the containment; and those that provide indication of operation of the ECCS, position of valves and circuit breakers and flows of ECCS systems.

The most significant instruments in the first category would be:

a. reactor vessel level,

b. reactor vessel pressure,

c. containment pressure,

d. containment temperature,

e. suppression pool level, and

f. suppression pool temperature,

and in the category of ECCS:

a. LPCI flow,

b. LPCS flow, and

c. HPCS flow,

Other available instrumentation is listed in the P&ID included with the description of the above system in Chapters 5.0 and 6.0. Discussion of instrumentation also appears in some detail in Chapter 7.0.

6.3.2.2.15 Scram Discharge System Pipe Break

In August 1981, the U. S. Nuclear Regulatory Commission published NUREG-0803, "Generic Safety Evaluation Report regarding integrity of BWR Scram System Piping". This document addressed the possibility of Scram System pipe breaks outside the primary containment. Specifically, a generic BWR probabilistic risk assessment in that document indicated that the postulated Scram Discharge Volume (SDV) event is not a dominant contributor to the probability of core damage. However, NRC guidance in Chapter 5 of NUREG-0803 required that certain plant specific issues be addressed by BWR owners. These plant specific issues included (1) Piping Integrity, (2) Mitigation Capability, and (3) Environmental Qualification.

LaSalle Station has addressed the plant-specific recommendations of NUREG-0803 in the response to NRC per Reference 34. The plant-specific evaluation established that even with the postulated break in the Scram Discharge System piping, the LaSalle leak detection equipment and the Station Operating Procedures will guide the Reactor Operators to prompt and successful mitigation of the event with equipment that is qualified for safe shutdown, adequate core cooling, and capable of maintaining secondary containment integrity.

6.3.2.3 Applicable Codes and Classification

All piping systems and components (pumps, valves, etc.) for the ECCS comply with the applicable codes, addenda, code cases, and errata in effect at the time the equipment is procured. See Tables 3.2-1, 3.2-2, 3.2-3 and 3.2-4 for code requirements pertaining to components and systems. Tables 3.2-1, 3.2-2, and 3.2-3 list code editions in effect at the time of original equipment procurement.

The piping and components of the ECCS subsystems within the containment and out to and including the pressure retaining injection valve are Class I. All other piping and components are Class 2, 3, or non-Code as indicated on the system P&ID. Subsection NA, NB, NC and ND of the Code apply to the ECCS.

The equipment and piping of the ECCS, in order to meet specified seismic capabilities, are designed to the requirements of Seismic Category I. This class includes all structures and equipments essential to the safe shutdown and isolation of the reactor, or the failure or damage of which could result in undue risk to the health and safety of the public.

6.3.2.4 Materials Specifications and Compatibility

Refer to Table 5.2-7, Reactor Coolant Pressure Boundary Materials (Section 5.2) for a presentation of the specifications which generally apply to the selection of materials used in the emergency core cooling system. Nonmetallic materials such as lubricants, seals, packings, paints and primers, insulation, as well as metallic materials, etc., are selected as a result of an engineering review and evaluation for compatibility with other materials in the system and the surroundings with concern for chemical, radiolytic, mechanical, and nuclear effects.

Materials used in or on the emergency core cooling system are reviewed and evaluated with regard to radiolytic and pyrolytic composition and attendant effects on safe operation of the ECCS. For example, guidance on the use of fluoro carbon plastic (Teflon) is provided to address IGSCC and FME concerns associated with use of Teflon. Only inorganic thermal insulation, which does not decompose due to radiation or temperature, is used in these environments. All paints used are suitable for the temperature conditions anticipated for their service. Additional information is presented in Section 6.1.

6.3.2.5 System Reliability

As applied to the ECCS, availability is defined as the probability that the system is operable when required. The ECCS availability is a function of the component system test intervals and the failure rates of the component parts used in the systems. The component parts used in the ECCS have low failure rates, as evidenced by historical field operating experience. The ECCS availability required to assure adequate plant safety is established as a system design requirement. System availability is evaluated to assure adherence to the availability design requirement, the periodic surveillance test intervals, and allowable repair times for inoperable systems. When applicable, analyses are performed by the methods outlined in Reference 1. The levels of redundancy, diversity, and surveillance requirements combine to yield a high order of system availability.

ECCS analyses to determine peak core temperatures are based on the most limiting single failures, assuming no offsite power is available. The analyses demonstrate that the ECCS function is sufficient to meet the Appendix K criteria. The analyses do not consider various minimum combinations of the remaining systems, following a postulated single failure, which are sufficient to meet the Appendix K criteria.

6.3.2.6 Protection Provisions

The emergency core cooling system piping and components are protected against damage from movement, from thermal stresses, from the effects of the LOCA and the safe shutdown earthquake.

The component supports which protect against damage from movement and from seismic events are discussed in Subsection 5.4.14. The methods used to provide assurance that thermal stresses do not cause damage to the ECCS are described in Subsection 3.9.1.

The ECCS are protected against the effects of pipe whip, which might result from piping failures up to and including the LOCA. This protection is provided by separation, pipe whip restraints, or energy absorbing materials if required. One of these three methods will be applied to provide protection against damage to piping and components of the ECCS which otherwise could result in a reduction of ECCS effectiveness to an unacceptable level.

The ECCS piping and components located outside the reactor building are protected from internally and externally generated missiles by the reinforced concrete structure of the ECCS pump rooms. In addition, the watertight construction of the ECCS pump rooms, when required, protects against mass flooding.

6.3.2.7 Provisions for Performance Testing

High-Pressure Core Spray System

a. A full flow test line is provided to route water from and to the suppression pool without entering the reactor pressure vessel.

b. Instrumentation is provided to indicate system performance during normal test operations.

c. All motor-operated valves are capable of manual operation either local or remote for test purposes with the exception of valves E22-F010 and E22-F011. Valves E22-F001, E22-F010, and E22-F011 are no longer considered part of the design basis for the HPCS System.

d. System relief valves are removable for bench testing during plant shutdown.

e. Drains are provided to leak test the major system valves.

Low-Pressure Core Spray System

a. A full flow test line is provided to route water from and to the suppression pool without entering the reactor pressure vessel.

b. A provision exists to crosstie to the RHR Shutdown Cooling suction line to utilize reactor quality water when testing the pump discharge into the reactor pressure vessel during normal plant shutdown. Utilization of this crosstie is optional as testing can be performed with suction from the Suppression Pool.

c. Instrumentation is provided to indicate system performance during normal and test operations.

d. All motor-operated valves and check valves are capable of operation for test purposes.

e. Relief valves are removable for bench testing during plant shutdown.

Low-Pressure Coolant Injection System

a. A discharge test line is provided for each of the three pump loops to route suppression pool water back to the suppression pool without entering the reactor pressure vessel.

b. A suction test line supplying reactor grade water, is provided to test loop "C" discharge into the reactor pressure vessel during normal plant shutdown.

c. Instrumentation is provided to indicate system performance during normal and test operations.

d. All motor-operated valves, air-operated valves, and check valves are capable of manual operation for test purposes.

e. Shutdown lines taking suction from the reactor system water are provided for loops "A" and "B" to test pump discharge into the reactor pressure vessel during normal plant shutdown and to provide for shutdown cooling.

f. All relief valves are removable for bench testing during plant shutdown.

6.3.2.8 Manual Actions

The initiation of the ECCS is completely automatic. No operator action is assumed for at least 10 minutes after initiation. As shown elsewhere in this section, something less than 4 minutes is required to reflood the core following the design-basis accident. The length of time required is a function of the size and location of the break and the location of the postulated single failure, if any. A time sequence of events for these operations is given in Table 6.3-3.

The design evaluations are all based on these rather long operator delays, and indicate considerable safety margin is still available.

6.3.3 ECCS Performance Evaluation

The performance of the ECCS is evaluated through application of the 10 CFR 50 Appendix K evaluation models and then showing conformance to the acceptance criteria of 10 CFR 50.46 (References 1, 19, 20, 40 and 41 for GE fuel and References 11, 12, 13, 14, 15 and 46 for FANP fuel) provide a complete description of the methods used to perform the calculations. These methods are summarized herein. A summary description of the loss-of-coolant accident results are also provided herein. LOCA Analysis for Power Uprate to 3489 MWt was performed in References 18, 20, 33, and 42 for GE fuel and References 16 and 47 for FANP fuels.

The information provided herein is applicable to the current licensing basis LOCA analyses from References 18, 33, 16, 42 and 47.

The information provided herein is applicable to the initial LOCA analysis, unless otherwise noted.

The ECCS performance is evaluated for the entire spectrum of break sizes for postulated LOCA's. The accidents, as listed in Chapter 15.0, for which ECCS operation is required are:

a. 15.2.8 feedwater piping break;

b. 15.6.4 spectrum of BWR steam system piping failures outside of containment; and

c. 15.6.5 loss-of-coolant accidents.

Chapter 15.0 provides the radiological consequences of the above listed events.

6.3.3.1 ECCS Bases for Technical Specifications

The maximum average planar linear heat generation rates calculated in this performance analysis provide the basis for technical specifications designed to ensure conformance with the acceptance criteria of 10 CFR 50.46. Minimum ECCS functional requirements are specified in Subsections 6.3.3.4 and 6.3.3.5, and testing requirements are discussed in Subsection 6.3.4. Limits on minimum suppression pool water level are discussed in Section 6.2.

6.3.3.2 Acceptance Criteria for ECCS Performance

The applicable acceptance criteria, extracted from 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water-Cooled Nuclear Power Reactors," are listed, and for each criterion applicable parts of Subsection 6.3.3, where conformance is demonstrated, are indicated. A detailed description of the methods used to show compliance are shown in References 11, 19, 20 and 46.

Criterion 1; Peak Cladding Temperature

"The calculated maximum fuel element cladding temperature shall not exceed 2200°F." Conformance to Criterion 1 is shown in Tables 6.3-6a, 6.3-6i and 6.3-8. Compliance with criterion 1 for GE fuels is demonstrated in References 18, 33 and 42.

Criterion 2: Maximum Cladding Oxidation

"The calculated total local oxidation of the cladding shall nowhere exceed 0.17 times the total cladding thickness before oxidation." Conformance to Criterion 2 is shown in Tables 6.3-6a, 6.3-6i and 6.3-8. Compliance with criterion 2 for GE fuels is demonstrated in References 18,33 and 42.

Criterion 3: Maximum Hydrogen Generation

"The calculated total amount of hydrogen generated from the chemical reaction of the cladding with water or steam shall not exceed 0.01 times the hypothetical amount that would be generated if all the metal in the cladding cylinder surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react." Conformance to Criterion 3 is shown in Tables 6.3-6a, 6.3-6i, and 6.3-8. Compliance with criterion 3 for GE fuels is demonstrated in References 18,33 and 42.

Criterion 4: Coolable Geometry

"Calculated changes in core geometry shall be such that the core remains amenable to cooling." As described in Reference 1, Section III, conformance to Criterion 4 is demonstrated by conformance to Criteria 1 and 2. Compliance with criterion 4 for GE fuels is demonstrated in References 18,33 and 42.

Criterion 5: Long-Term Cooling

"After any calculated successful initial operation of the ECCS, the calculated core temperature shall be maintained at an acceptably low value; and decay heat shall be removed for the extended period of time required by the long-lived radioactivity remaining in the core." Conformance to Criterion 5 is demonstrated generically for General Electric BWR's in Reference 20, Section III.A. Briefly summarized, when the core refloods shortly following the postulated LOCA, the fuel rods will return quickly to saturation temperature over their entire length. For large pipe breaks the heat flux in the core will eventually be inadequate to maintain a two-phase water flow over the entire length of the core. The static water level inside the core shroud is approximately that of the jet pump suctions.

When at least one spray system is available long-term, the upper third of the core will remain wetted by the core spray water as in non-jet pump BWRs, and there will be no further perforation or metal-water reaction.

6.3.3.3 Single-Failure Considerations

The functional consequences of potential operator errors and single failures, (including those which might cause any manually controlled electrically operated valve in the ECCS to move to a position which could adversely affect the ECCS) and the potential for submergence of valve motors in the ECCS are discussed in Subsection 6.3.2.5 and Tables 6.3-5, 6.3-6. Table 6.3-6 shows that all potential single failures can be identified as no more severe than one of the following failures:

a. Low-pressure coolant injection (LPCI), emergency diesel-generator, which powers two LPCI pumps. For example, failure of one LPCI pump or one LPCI injection valve is less severe than the diesel-generator failure which disables two LPCI pumps.

b. Low-pressure core spray (LPCS) emergency diesel-generator, which powers one LPCI pump and one LPCS pump.

c. High-pressure core spray (HPCS).

d. One automatic depressurization system (ADS) valve.

It is, therefore, only necessary to consider each of the above single failures in the emergency core cooling system performance analyses. For large breaks, failure of one of the diesel generators is, in general, the most severe failure. For small breaks, the HPCS is the most severe failure. The systems of the ECCS which remain operational after these failures are shown in Table 6.3-6.

For the LOCA evaluation model which covers the entire spectrum of break sizes (large breaks to small breaks), failure of the HPCS ECCS subsystem in Division 3 due to failure of its associated diesel generator is, in general, the most severe failure. The remaining operable ECCS subsystems, which include one spray subsystem, provide the capability to adequately cool the core, under near-term and long-term conditions, and prevent excessive fuel damage. For all LOCA analyses, only six ADS valves are assumed to function. An additional analysis has been performed which assumes five ADS valves function, however, in this analysis all low pressure and high pressure ECCS subsystems are also assumed to be available.

A single failure in the ADS (one ADS valve) has no effect in large breaks. Only six of the seven available ADS valves were assumed operable in the LOCA analyses to support one safety/relief valve out-of-service operation. One ADS valve from the 6 valves modeled in the LOCA analyses was assumed to fail for the single failure evaluation as shown in Table 6.3-6.

6.3.3.4 System Performance During the Accident

In general, the system response to an accident can be described as follows:

a. receiving an initiation signal;

b. a small lag time (to open all valves and have the pumps up to rated speed); and

c. finally, the ECCS flow entering the vessel.

Key ECCS actuation setpoints and time delays for all the emergency core cooling systems are provided in Table 6.3-2 for the GE LOCA analysis and in Table 6.3-2a for the FANP LOCA analysis.

The flow delivery rates analyzed in Subsection 6.3.4 can be determined from the head-flow curves and the pressure versus time plots discussed in Subsection 6.3.3.7. Simplified piping and instrumentation and functional control diagrams for the

ECCS are provided in Subsection 6.3.2. The operational sequence of ECCS for the DBA is shown in Table 6.3-3 for the GE LOCA analysis. Table 6.3-7a shows the operational sequence of ECCS for the Reference 17 ATRIUM-9B DBA analysis. Table 6.3-7b shows the operational sequence for the limiting recirculation break from the FANP ATRIUM- 9B LOCA analysis.

Operator action is not required for ECCS operation, except as a monitoring function, during the short-term cooling period following the LOCA. During the short-term cooling period, the operator will take action as specified in Subsection 6.2.2.3 to place the containment cooling system into operation.

6.3.3.5 Use of Dual Function Components for ECCS

With the exception of the LPCI system, the systems of the ECCS are designed to accomplish only one function: to cool the reactor core following a loss of reactor coolant. To this extent, components or portions of these systems (except for pressure relief) are not required for operation of other systems which have emergency core cooling functions, or vice versa. Because either the ADS initiating signal or the overpressure signal opens the safety-relief valve, no conflict exists.

The LPCI subsystem is configured from the RHR pumps and some of the RHR valves and piping. When the reactor water level is low, the LPCI subsystem (line up) has priority through the valve control logic over the other RHR subsystems for containment cooling. Immediately following a LOCA, the RHR system is directed to the LPCI mode. When the RHR shutdown cooling mode is utilized, the transfer to the LPCI mode must be remote manually initiated.

6.3.3.6 Limits on ECC System Parameters

The limits on the ECC system parameters are identified in Subsections 6.3.3.2, 6.3.3.7.3 and 6.3.3.7.4.

Any number of components in any given system may be out of service, up to and including the entire system. The maximum allowable out-of-service time is a function of the level of redundance and the specified test intervals.

6.3.3.7 ECCS Analysis for LOCA

6.3.3.7.1 GE LOCA Analysis Procedures and Input Variables

The procedures approved for LOCA analysis conformance calculations are described in detail in References 1, 19 and 40. These procedures were used in the calculations enumerated in Subsection 6.3.3. For convenience, the four computer codes are briefly described below. The interfaces between the codes are shown schematically in Figures II-2a, II-2b, and II-2c in the "Documentation of Evaluation Models," Section II.A of Reference 1. The major interfaces are briefly noted below.

Short-Term Thermal-Hydraulic Model (LAMB)

The LAMB code is a model which is used to analyze the short-term thermodynamic and thermal-hydraulic behavior of the coolant in the vessel during a postulated LOCA. In particular, LAMB predicts the core flow, core inlet enthalpy and core pressure during the early stages of the reactor vessel blowdown. For a detailed description of the model and a discussion regarding sources of input to the model, refer to the "LAMB Code Documentation," Section II.A.3 of Reference 1.

Transient Critical Power Model (SCAT)

The SCAT code is used to evaluate the short-term thermal-hydraulic response of the coolant in the core during a postulated LOCA. SCAT receives input from LAMB and analyzes the convective heat transfer process in the thermally limited fuel bundle. For a detailed description of the model and a discussion regarding sources of input to the model, refer to the "SCAT Code Documentation," Section II.A.4 of Reference 1.

Long-Term Thermal-Hydraulic Model and Refill/Reflood Model (SAFE/REFLOOD)

The SAFE/REFLOOD code is a model which is used to analyze the long-term thermodynamic behavior of the coolant in the vessel. The SAFE/REFLOOD code calculates the uncovery and reflooding of the core and the duration of spray cooling and (for small breaks) the peak cladding temperature.

For a detailed description of the model and a discussion regarding sources of input to the model, refer to the "SAFE code and REFLOOD code documentation," Sections II.A.1 and II.A.2 of Reference 1.

Core Heatup Model (CHASTE)

The CHASTE code solves the transient heat transfer equations for specific axial planes of each fuel bundle type for large breaks. CHASTE receives input from SCAT, SAFE and REFLOOD and calculates cladding temperatures and local cladding oxidation during the entire LOCA transient. For a detailed description of the CHASTE model and a discussion regarding sources of input, refer to the "CHASTE code documentation," Section II.A.5 of Reference 1.

The significant input variables used by the Initial LOCA codes are listed in Table 6.3-2.

Core Heatup Model (GESTR-LOCA)

The GESTR-LOCA code is used to initialize the fuel stored energy and fuel rod fission gas inventory at the onset of a postulated LOCA for input to SAFER. GESTR-LOCA also initializes the transient pellet-cladding gap conductance for input to both SAFER and SCAT.

Long-term System Response (SAFER)

This code is used to calculate the long-term system response of the reactor for reactor transients over a complete spectrum of hypothetical break sizes and locations. SAFER is compatible with the GESTR-LOCA fuel rod model for gap conductance and fission gas release. SAFER tracks, as a function of time, the core water level, system pressure response, ECCS performance, and other primary thermal-hydraulic phenomena occurring in the reactor. SAFER realistically models all regimes of heat transfer which occur inside the core during the event, and it provides the outputs as a function of time for heat transfer coefficients and PCT.

The significant input variables used by GESTR-LOCA and SAFER are presented in Table 4-1 and Figure 3-1 in Reference 8.

SAFER/GESTR LOCA Model Code Descriptions

Results of extensive LOCA experimental programs since 1974 have clearly demonstrated the large conservatisms that the SAFE/RELOAD LOCA models have with respect to modeling the vessel inventory, inventory distribution and core heat transfer. A new thermal-hydraulic model (SAFER) and a new fuel rod thermal-mechanical model (GESTR-LOCA) have been developed to provide more realistic calculations for LOCA analyses. The SAFER and GESTR-LOCA models are summarized below and discussed in detail in References 19, 40, 43 and 44. As with the SAFE/REFLOOD LOCA models (described above for initial core), SAFER/GESTR-LOCA is applicable to prepressurized fuel. Non-pressurized fuel calculations results in conservative limits with respect to pressured fuel.

Realistic Thermal-Hydraulics Model (SAFER)

SAFER replaces the combination of the SAFE and REFLOOD ECCS performance evaluation models discussed above for initial cores.

The SAFER code employs a heatup model with a simplified radiation heat transfer correlation to calculate PCT and local maximum oxidation, which CHASTE heatup calculation discussed above. The PCT and local maximum oxidation fraction from SAFER can be used directly.

Best Estimate fuel Rod Thermal Mechanical Model (GESTR-LOCA)

The GESTR-LOCA model has been developed to provide best-estimate predictions of the thermal performance of GE nuclear fuel rods experiencing variable power histories. For ECCS analyses, the GESTR-LOCA model is used to initialize the fuel stored energy and fuel rod fission gas inventory at the onset of a postulated LOCA. Details of the GESTR-LOCA models are provided in Reference 19.

Transition Boiling Transition Model (TASC)

TASC replaces the SCAT boiling transition model discussed above. The TASC model is used to evaluate the short-term thermal-hydraulic response of the coolant in the core during a postulated loss-of-coolant accident. In particular, the convective heat transfer response in the thermally limiting fuel bundle is analyzed during the transient. For a detailed description of the model and a discussion regarding sources of input to the model refer to Reference 45.

SAFER/GESTR-LOCA Model Application Methodology

Using the SAFER/GESTR-LOCA models, the LOCA events are analyzed with nominal values of inputs and correlations. A calculation is performed in conformance to Appendix K and checked for consistency with generic statistical upper bound analyses that encompass modeling uncertainties in SAFER/GESTR-LOCA and uncertainties related to plant parameters.

6.3.3.7.1.2 FANP LOCA Analysis Procedures and Input Variables

The procedures approved for LOCA analysis conformance calculations are described in detail in References 11 and 46. These procedures were used in the calculations enumerated in Section 6.3.3. The EXEM BWR as described in Reference 11 employs four major computer codes to evaluate the system and fuel response during all phases of a LOCA. For convenience these four computer codes are briefly described below. The interface between the codes are shown schematically in References 11 and 46. The major interfaces are briefly noted below.

Blowdown Analysis (RELAX)

The RELAX code is a model which is used to calculate the system thermal-hydraulic response during the blowdown phase of the LOCA. In RELAX the core is represented by an average core channel to determine the properties of the coolant in the vessel. In particular, RELAX predicts the upper and lower plenum boundary conditions for the hot channel analysis along with the core average conditions at the time of rated spray for initialization of the FLEX analysis. For a detailed discussion regarding sources of input to the model refer to the References 12 and 46.

Refill/Reflood Analysis (FLEX) (Reference 16, ATRIUM-9B and Reference 37 ATRIUM-10 Analysis)

The FLEX code is a model used to analyze the system hydraulic response during a postulated LOCA from the time of rated spray to the time of hot node reflood. The principal result of FLEX is the prediction of time for hot node reflood. FLEX also provides a prediction of reactor vessel coolant inventory during the ECCS injection period. FLEX provides the time of hot node reflood and the time of bypass reflood to the HUXY analysis. For a detailed description of the model and a discussion regarding sources of input to the model, refer to Reference 12.

Heatup Analysis (HUXY)

The HUXY code is a model used to perform the heatup calculations for the entire postulated LOCA accident. HUXY predicts the thermal response of each fuel rod in one axial plane of the hot channel assembly. Until time of rated spray HUXY uses RELAX calculated hot channel heat transfer coefficients. After the time of rated spray and prior to hot node reflood, HUXY uses Appendix K spray heat transfer coefficients for the fuel rods and the water canister. After the time of hot node reflood, HUXY uses Appendix K reflood heat transfer coefficients. The principal results of the HUXY heatup analysis are the peak clad temperature and the percent local oxidation of the fuel cladding. For a detailed description of the model and a discussion regarding sources of input to the model, refer to References 13 and 14.

Fuel Parameters (RODEX2)

The RODEX2 code is a model which predicts fuel parameters used as input to the blowdown and heatup analysis both for the system and hot channel analyses. RODEX2 predicts the fuel stored energy, the pellet-clad gap, the pellet-clad gap heat transfer coefficient, and fission gas inventory. These calculations are based on the initial conditions of the system at the onset of a postulated LOCA event. For a detailed description of the model and a discussion regarding sources of input to the model, refer to Reference 15.

6.3.3.7.2 <u>Accident Description</u>

A detailed description of the Initial LOCA calculation methodology is provided in References 1, 19 and 40. The SAFER/GESTR LOCA analysis is summarized in Reference 18, 33, 35 and 42. The FANP LOCA analysis is summarized in Reference 16, 17, 37, 47 and 48. For convenience, a short description of the major events during a design-basis accident (DBA) is included here.

Immediately after the postulated double-ended recirculation line break, vessel pressure and core flow begin to decrease. The initial pressure response is governed by the closure of the main steam isolation valves and the relative values of energy added to the system by decay heat and energy removed from the system by the initial blowdown of fluid from the downcomer. The initial core flow decrease is rapid because the recirculation pump in the broken loop ceases to pump almost immediately because it has lost suction. The pump in the intact loop coasts down relatively slow. This pump coastdown governs the core flow response for the next several seconds. When the jet pump suctions uncover, calculated core flow decreases to near zero. When the recirculation pump suction nozzle uncovers, the energy release rate from the break increases significantly and the pressure begins to decay more rapidly. As a result of the increased rate of vessel pressure loss, the initially subcooled water in the lower plenum saturates and flashes up through the core, increasing the core flow. This low plenum flashing continues at a reduced rate for the next several seconds.

Heat transfer rates on the fuel cladding (Figure 6.3-20) during the early stages of the blowdown are governed primarily by the core flow response. Nucleate boiling continues in the high power plane until shortly after jet pump uncovery. Boiling transition follows shortly after the core flow loss that results from jet pump uncovery. Film boiling heat transfer rates then apply, with increasing heat transfer resulting from the core flow increase during the lower plenum flashing period. Heat transfer then slowly decreases until the high power axial plane uncovers. At that time, convective heat transfer is assumed to cease.

Water level inside the shroud (Figure 6.3-17) remains high during the early stages of the blowdown because of flashing of the water in the core. After a short time, the level inside the shroud has decreased to uncover the core. Several seconds later the ECCS is actuated. As a result the vessel water level begins to increase. Some time later, the lower plenum is filled, and the core is subsequently rapidly recovered.

The cladding temperature at the high power plane (Figure 6.3-29) increases initially because nucleate boiling is not maintained even though, the heat input decreases and the sink temperature decreases. A rapid, short duration cladding heatup follows the time of boiling transition when film boiling occurs and the cladding temperature approaches that of the fuel. The subsequent heatup is slower, being governed by decay heat and core spray heat transfer. Finally, the heatup is terminated when the core is recovered by the accumulation of ECCS water.

6.3.3.7.3 Break Spectrum Calculations

A complete spectrum of postulated break sizes and location is considered in the evaluation of ECCS performance. The general analytical procedures for conducting break spectrum calculations are discussed in References 11 and 46 for the FANP fuel and Reference 19 for GE fuel. For ease of reference, a summary of all figures and tables presented in subsection 6.3.3 is shown in Table 6.3-4. All figures and tables for the LaSalle specific SAFER/GESTR-LOCA analysis are presented in References 18, 33 and 42. All figures and tables for the LaSalle specific FANP-LOCA analysis are presented in References 17, 36 and 48.

A complete break spectrum for GE fuel was evaluated in Reference 8. However, with the relaxation of certain ECCS parameters (i.e. HPCS injection valve stroke time increased from 14 to 28 seconds; LPCI and LPCS injection valve stroke time increased from 20 to 40 seconds), parts of the break spectrum calculations were repeated in Reference 18 to confirm the limiting case. The LOCA analysis for Power Uprate to 3489 MWt was performed in Reference 35. A summary of the current SAFER/GESTR-LOCA results of the break spectrum calculations is shown in tabular form in Table 6.3-8. A summary of the FANP LOCA results for the break spectrum calculations for ATRIUM-9B fuel is shown in tabular form in Tables 6.3-8a and 6.3-8b. Results for ATRIUM-10 fuel are given in References 36 and 48. Conformance to the acceptance criteria (PCT < 2200°F, local clad oxidation < 17% and a core wide metal water reaction < 1%) is demonstrated. Details of calculations for specific breaks are included in subsequent paragraphs. The LOCA analysis for GE14 fuel was performed in Reference 42.

6.3.3.7.4 Large Recirculation Line Break Calculations

6.3.3.7.4.1 GE Fuel LOCA Analysis Large Recirculation Line Break Calculations

Important results from the GE LOCA analyses of the DBA (double ended guillotine break of the recirculation suction line with a single failure of the HPCS diesel generator) are shown in Figures C-3a, C-3b, C-3c, and C-3d of Reference 18. These figures are not included in this section because GE considers this information proprietary and will not release them for use in a public domain document. The following results are shown in Reference 18 for the DBA LOCA:

For the GE LOCA analyses:

a) Water level as a function of time from SAFER. (Figure C-3a)

b) Reactor vessel pressure as a function of time from SAFER. (Figure C-3b)

c) Fuel rod convective heat transfer coefficient as a function of time from SAFER. (Figure C-3d)

d) Peak cladding temperature as a function of time from SAFER. (Figure C-3c)

This case is the limiting break from the break spectrum calculations and defines the licensing basis PCT for the GE 8x8 NB fuel.

The maximum local oxidation and peak cladding temperature from the GE LOCA (SAFER/GESTR) analysis of the DBA as well as other break sizes, single failures and break locations are shown in Table 6.3-8. Figures identified above are shown in Reference 18 (3323 MWs), they are not shown in the UFSAR because GE considers this information proprietary and will not release them for use in a public domain document. Power uprate results are shown in Reference 33 and the GE 14 Results are shown in Reference 42.

A "Unit Status Sheet", which tracks the changes in PCT after each 10CFR50.46 submittal is maintained by Nuclear Fuels.FANP Fuel LOCA Analysis Large Recirculation Line Break Calculations

FANP performed LOCA break spectrum analyses for ATRIUM-9B and ATRIUM-10 fuel types (References 17 and 36). In addition, the Reference 48 ATRIUM-10 analysis is being applied to both Unit 1 and Unit 2. The limiting large break for ATRIUM-9B fuel is the 1.0 double-ended guillotine break of the recirculation suction piping with a single failure of the LPCS diesel generator. The limiting large break for the ATRIUM-10 fuel analysis of Reference 36 is the 2.0 square feet split break of the recirculation suction piping with a single failure of the LPCS diesel generator. For the Reference 48, EXEM BWR-2000 analysis for ATRIUM-10, the limiting case is the double-ended guillotine break with 0.8 discharge co-efficient with the LPCI diesel generator single failure.

Important results from the FANP fuel LOCA analyses of the limiting large break (1.0 double ended guillotine break of the recirculation suction piping with a single failure of the LPCS diesel generator) for ATRIUM-9B fuel are shown in Figures 6.3-13 through 6.3-29. Similar plots for ATRIUM-10 fuel can be found in References 36 and 48. These results from Reference 17 are:

a) Upper plenum pressure as a function of time during blowdown from RELAX.

b) Total Break Flow as a function of time during blowdown from RELAX.

c) Core inlet flow as a function of time during blowdown from RELAX.

d) Core outlet flow as a function of time during blowdown from RELAX.

e) Lower downcomer mixture level as a function of time during blowdown from RELAX.

f) Lower plenum liquid mass as a function of time during blowdown from RELAX.

g) Hot channel high power node quality as a function of time during blowdown from RELAX.

h) Hot channel high power node heat transfer coefficient as a function of time during blowdown from RELAX.

i) System pressure as a function of time from FLEX.

j) Lower plenum mixture level as a function of time during refill/reflood from FLEX.

k) Relative entrainment as a function of time during refill/reflood from FLEX.

l) Core entrained liquid flow as a function of time during refill/reflood from FLEX.

m) ADS flow as a function of time during blowdown from RELAX.

n) LPCI flow as a function of time during blowdown from RELAX.

o) LPCS flow as a function of time during blowdown from RELAX.

p) HPCS flow as a function of time during blowdown from RELAX.

q) Peak cladding temperature as a function of time from HUXY.

The limiting large break for FANP ATRIUM-9B fuel is not the overall limiting break from the break spectrum analysis. The small break case as described in Section 6.3.3.7.6.2 is the limiting case for the licensing basis for FANP ATRIUM-9B fuel. Therefore, the large break results are not the basis for the ATRIUM-9B MAPLHGR limits. The ATRIUM-9B MAPLHGR limits are determined from small break analysis and they are given in Section 6.3.3.7.6.2.

The MAPLHGR limits currently in the LaSalle Station's COLR for ATRIUM-9B fuel remain valid because they were the bounding MAPLHGR values used in the SPC LOCA analysis and are conservative. The bundle specific, exposure dependent MAPLHGR limits for LaSalle Station's current fuel cycle are presented in the COLR. (Reference 21)

6.3.3.7.5 Deleted.

6.3.3.7.6 Small Recirculation Line Break Calculations

6.3.3.7.6.1 GE Fuel LOCA Analysis Small Recirculation Line Break Calculations

Important results from the GE LOCA analysis of the small break (0.08 recirculation piping suction break with a single failure of the HPCS diesel generator) are shown in Figures B-1, B-2, B-3, and B-4 of Reference 42, for GE 14 fuel. These figures are not included in this section because GE considers this information proprietary and will not release them for use in a public domain document. The following results are shown in Reference 42 for the 0.08 small break LOCA:

For the GE LOCA analyses:

a) Water level as a function of time from SAFER. (Figure B-1)

b) Reactor vessel pressure as a function of time from SAFER. (Figure B-2)

c) Fuel rod convective heat transfer coefficient as a function of time from SAFER. (Figure B-4)

d) Peak cladding temperature as a function of time from SAFER. (Figure B-3)

The limiting large break GE 14 fuel is not the overall limiting break from the break spectrum analysis. The small break case is described in Section 6.3.3.7.6.1 is the limiting case for the licensing Basis for GE 14 fuel.

6.3.3.7.6.2 FANP Fuel LOCA Analysis Small Recirculation Line Break Calculations

FANP performed LOCA break spectrum analyses for ATRIUM-9B and ATRIUM-10 fuel types (References 17, 36 and 48). The limiting small break for ATRIUM-9B fuel is the 1.1 square feet break of the recirculation discharge piping with a single failure of the HPCS diesel generator. The limiting small break for the Reference 36 ATRIUM-10 fuel analysis is the 1.0 square feet break of the recirculation suction piping with a single failure of the HPCS diesel generator.

The PCT for the limiting small break for each fuel type bounds the PCT for the large breaks for the Reference 17 analysis of ATRIUM-9B and the Reference 36 analysis of ATRIUM-10. Therefore, the MAPLHGR limits were determined from the limiting small break analysis. The MAPLHGR limits for each fuel type were determined in References 16 and 37 and are given in Tables 6.3-6a and 6.3-6i. For the Reference 48 EXEM BWR-2000 break spectrum analysis for ATRIUM-10 fuel, the small break results are less limiting than those of the large break case identified in Section 6.3.3.7.4.2. For the limiting large break/single failure combination, the ATRIUM-10 EXEM BWR-2000 heatup analysis (Reference 47) yielded lower PCT and oxidation faction results than the ATRIUM-10 results of Reference 37. Table 6.3-6j summarizes the licensing basis results from the Reference 47 ATRIUM-10 analysis, which is being applied to both Unit 1 and Unit 2. The bundle specific, exposure dependent MAPLHGR limits for LaSalle Station's current fuel cycle are presented in the COLR (Reference 21).

Important results from the FANP LOCA analysis of the small break yielding the highest cladding temperature for ATRIUM-9B fuel are shown in Figures 6.3-30 through 6.3-46. Similar plots for ATRIUM-10 fuel can be found in References 37 and 48. These results from Reference 16 are as follows:

a) Upper plenum pressure as a function of time during blowdown from RELAX.

b) Total Break Flow as a function of time during blowdown from RELAX.

c) Core inlet flow as a function of time during blowdown from RELAX.

d) Core outlet flow as a function of time during blowdown from RELAX.

e) Lower downcomer mixture level as a function of time during blowdown from RELAX.

f) Lower downcomer liquid mass as a function of time during blowdown from RELAX.

g) Hot channel high power node quality as a function of time during blowdown from RELAX.

h) Hot channel high power node heat transfer coefficient as a function of time during blowdown from RELAX.

i) System pressure as a function of time from FLEX.

j) Lower plenum mixture level as a function of time during refill/reflood from FLEX.

k) Relative entrainment as a function of time during refill/reflood from FLEX.

l) Core entrained liquid flow as a function of time during refill/reflood from FLEX.

m) ADS flow as a function of time during blowdown from RELAX.

n) LPCI flow as a function of time during blowdown from RELAX.

o) LPCS flow as a function of time during blowdown from RELAX.

p) HPCS flow as a function of time during blowdown from RELAX.

q) Peak cladding temperature as a function of time from HUXY.

6.3.3.7.7 Calculations For Other Break Locations

6.3.3.7.7.1 GE Fuel LOCA Analysis Calculations for Other Break Locations

GE analyzed four non-recirculation break locations to determine the limiting non-recirculation line break and whether or not the results of this break were bound by the limiting recirculation line break. These breaks are the HPCS line break, the feedline break, the main steamline break inside containment, and the steamline break outside of containment. The main steamline break outside containment (see Section 6.3.3.7.8.1) was determined to be the limiting non-recirculation line break in Reference 8. Reference 8 also shows that the HPCS line break, the feedline break, and the main steamline break inside containment result in no cladding heatup beyond the initial cladding temperature. For these reasons no other non-recirculation line breaks needed to be examined in References 18, 33, and 42.

6.3.3.7.7.2 FANP Fuel LOCA Analysis Calculations for Other Break Locations

FANP also analyzed non-recirculation line breaks in References 17 and 36. These included breaks in HPCS and LPCI. Additional breaks (main steamline, feedwater line, reactor water cleanup line and shutdown cooling lines) were dispositioned in References 17 and 36 as non-limiting. References 17 and 36 show that breaks inside containment are less limiting than breaks outside containment. The most limiting non-recirculation line breaks are the HPCS and the LPCI line breaks, of which the HPCS line break with a single failure of the LPCI diesel generator is the most limiting. See Table 6.3-8b for a summary of the non-recirculation line break results for ATRIUM-9B fuel. Results for ATRIUM-10 fuel are given in Reference 36.

For the Reference 48 EXEM BWR-2000 break spectrum analysis for ATRIUM-10 fuel, the limiting case of the HPCS line break was analyzed. The worst single failure for this case is the LPCS diesel generator. The ECCS line breaks are nonlimiting.

6.3.3.7.8 Steamline Break Outside Containment

Any break outside the primary containment in a line which connects directly to the reactor pressure vessel will initiate ADS action if conditions as described in subsection 7.3.1.2.2.3 are met. Therefore, given the LOCA assumptions of no feedwater or RCIC, and assuming the failure of HPCS if the main steamline isolation valves (MSIV) close and the break becomes isolated or is too small to depressurize the vessel to below the shutoff head of the low-pressure ECC systems, then actuation of the ADS is necessary to reduce the vessel pressure so that the low-pressure ECC systems can terminate the transient. This will occur automatically after the time delay bypass of high drywell pressure.

The outside steamline break is a representative analysis of this class of breaks, since a large amount of vessel inventory is lost through the broken steamline before the MSIV's can isolate the break. All these types of breaks have the same characteristic sequence of events once the MSIV's close culminating in automatic ADS actuation and subsequent vessel reflooding by the low-pressure ECC systems.

6.3.3.7.8.1 GE Fuel Steamline Break Outside Containment Analysis

A GE outside steamline break analysis was investigated assuming automatic ADS action 12 minutes after RPV level reaches level 1. A complete set of results using the small-break method is provided in Figures D-5a through D-5d of Reference 18. These figures are not included in this section because GE considers this information proprietary and will not release them for use in a public domain document. The steamline break outside containment analysis for Power Uprate to 3489 MWt was performed in Reference 33. The peak cladding temperature predicted is far below the 2200° F limit. Table 6.3.7 lists the sequence of events associated with this break.

6.3.3.7.8.2 FANP Fuel Steamline Break Outside Containment Analysis

Main Steam Line Breaks outside containment are inherently less challenging to fuel limits than MSLB inside containment. For MSLB outside containment, isolation valve closure will terminate break flow prior to the loss of significant inventory and the core will remain covered. The FANP analysis (References 17, 36 and 48) dispositions the steamline break inside containment by showing that the consequences of the steamline break on the core are bound by the recirculation line break analyses. The consequences of the steamline break are far from limiting with respect to 10 CFR 50.46 acceptance criteria. The accident does not result in a significant challenge to the fuel limits. The high heat transfer during blowdown period and the rapid initiation of the low pressure ECCS lead to the predicted PCT hundreds of degrees less than the limiting recirculation line break. In many cases there is no heatup of the fuel during a steamline break. Although a steamline break may be limiting with respect to reactor vessel, containment, or radiological limits, these analyses are not significantly impacted by fuel or core design characteristics.

6.3.3.8 LOCA Analysis Conclusions

6.3.3.8.1 Errors and Changes Affecting The LOCA Analyses

A new LOCA analysis (Reference 42) was performed for GE Fuel to support the introduction of GE 14 fuel for LaSalle Units 1 and 2 . There is no other type of GE fuel in the LaSalle Unit 1 and 2 core. The GE LOCA analysis in support of GE 14 fuel incorporated all known errors and the licensing basis PCT for the GE 14 fuel is 1460 °F. All known errors and issues have been incorporated in the GE LOCA analysis (Reference 42).

The analysis of record for FANP ATRIUM-9B fuel (Reference 16) was performed in March 1999 to support the introduction of ATRIUM-9B fuel into the Unit 2 Cycle 8 core. The PCT is 1807 °F and it was reported in the May 1999 10 CFR50.46 letter. The subsequent letter in February 2002 reported changes to PCT due to code errors, which increased PCT by 18 °F. The June 2000 10CFR50.46 annual letter reported no assessments due to errors or plant changes. The June 2001 10CFR 50.46 annual letter reported assessments due to FANP code errors, Unit 2 Cycle 9 reload fuel and Unit 2 LPCS riser leakage. The June 2002 10CFR 50.46 annual letter reported assessments due to incorrect pellet dish volume terms in RDX2LSE fuel swelling calculation, reconciliation of RODEX2-2A numerical iteration scheme, incorrect HUXY gadolinia conductivity model, incorrect calculation start time for the BULGEX code, incorrect constant used in the rupture temperature calculation, incorrect Zircaloy heat of reaction, Unit 1 Cycle 10 reload fuel and the ATRIUM-9B exposure extension. These assessments resulted in a net PTC change of 2 °F. The June 2003 10CFR 50.46 annual letter reported assessments due to incorrect calculation of inertia terms for recirculation pump discharge break junctions, Unit 2 Cycle 10 reload fuel, Unit 2 jet pump riser leakage and Unit 1 mid-cycle reload that resulted in a net PCT increase of 5 °F. For the March 2004 10CFR 50.46 report several assessment and error were reported but there was no net change in the PCT. Therefore, the PCT for ATRIUM-9B is 1832 °F. For the March 2006 10CFR 50.46 annual report there was no assessment nor any error reported for the GE14 and ATRIUM-9B or ATRIUM-10 fuel and hence there was no impact on the PCT.

Reference 37 shows that the PCT for ATRIUM-10 fuel is 1807 F. The ATRIUM-10 fuel LOCA analysis were reanalyzed in Reference 47. The Reference 47 analysis is applicable to all ATRIUM-10 fuel in both Unit 1 and 2, and thus the licensing basis PCT is 1729 F. For Unit 1 Cycle 12, there will be no ATRIUM-9B fuel, and the Reference 47 analysis for ATRIUM-10 fuel is being applied. That analysis shows the PCT to be 1729°F, which is therefore the licensing basis PCT for FANP fuel in Unit 1.

A "Unit Status Sheet", which tracks the changes in PCT after each 10CFR50.46 submittal is maintained by Nuclear Fuels.

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6.3.3.9.1 GE Fuel LOCA Analysis Conclusions

Having shown compliance with the applicable acceptance criteria of Subsection 6.3.3.2, it is concluded that the ECCS equipment will perform its function in an acceptable manner and meet all of the 10 CFR 50.46 acceptance criteria, given operation at or below the maximum average planar linear heat generation rates for GE fuels given in the COLR. The licensing basis PCT is in the most recent 10CFR50.46 report on each unit's NRC docket. As stated in Reference 42, the licensing basis PCT for the GE 14 fuel is 1460 °F.

A “Unit Status Sheet”, which tracks the errors or changes which affect any of the LOCA analyses and the current licensing basis PCT is maintained by Nuclear Fuels.

6.3.3.9.2 AREVA Fuel LOCA Analysis Conclusions

Having shown compliance with the applicable acceptance criteria of Subsection 6.3.3.2, it is concluded that the ECCS equipment will perform its function in an acceptable manner and meet all of the 10 CFR 50.46 acceptance criteria, given operation at or below the maximum average planar linear heat generation rates for AREVA fuels given in the COLR, Reference 21. The licensing basis PCT for AREVA ATRIUM-9B fuel is 1832 °F. This number is based upon the ATRIUM-9B LOCA analysis (Reference 16) plus the arithmetic sum of all PCT changes due to errors or changes to the ATRIUM-9B LOCA analysis. Further details on the PCT changes due to errors or changes to the ATRIUM-9B LOCA analysis may be found in section 6.3.3.8.1.

The licensing basis PCT for AREVA ATRIUM-10 fuel from Reference 37 is 1807 F. The Reference 47 analysis being applied to the Unit 1 Cycle 12 shows the ATRIUM-10 fuel licensing bases PCT is 1729°F. Further details on the PCT changes due to errors or changes to the ATRIUM-10 LOCA analysis may be found in section 6.3.3.8.1. The ATRIUM-10 fuel LOCA analysis were reanalyzed in Reference 47. The licensing basis PCT for AREVA ATRIUM-10 fuel from Reference 47 is 1729 F.

Since there is no ATRIUM-9B fuel in either Unit 1 or Unit 2, the current licensing basis PCT is 1729 F, and is applicable to both Unit 1 and Unit 2.

A “Unit Status Sheet”, which tracks the errors or changes which affect any of the LOCA analyses and the current licensing basis PCT, is maintained by Nuclear Fuels.

6.3.3.10 MSIV Closure Change from Reactor Water Level 2 to Level 1

By letter dated March 6, 1987 (Reference 7), CECo submitted a LOCA safety evaluation to justify changing the MSIV water level isolation setpoint. Previously, the most limiting LOCA, the one that results in the highest peak cladding temperature and determines the maximum average planar linear heat generation rate (MAPLHGR) limit, was the recirculation suction line break DBA. ECCS calculations were performed using the NRC staff approved codes, SAFE, REFLOOD and CHASTE. The effects of the proposed lower setpoint for large, intermediate and small break LOCAs were considered.

CECo stated that large and intermediate LOCA events would not be affected by the setpoint change. For these events, there would be a rapid depressurization and inventory loss within the reactor vessel resulting in a fast actuation of the MSIVs. It was concluded that the lower MSIV setpoint would not significantly increase the reactor core inventory loss, the total core uncovery time or subsequent fuel heatup, or the radiation release to the environment. Thus, the setpoint change would not affect the consequences of design basis accidents. The NRC Staff accepted the findings.

For a small break LOCA there is a potential of initiation of MSIV closure at the proposed lower level setpoint which results in raising the peak cladding temperature (PCT). This event was analyzed. The results show that increase in PCT is less than 30°F. The highest small break LOCA PCT would be substantially less than 2200°F limit. The results of the LOCA analyses show that the DBA remains unchanged. Therefore, the MAPLHGR will not be changed. The NRC found this acceptable.

6.3.4 Tests and Inspections

Each active component of the emergency core cooling systems that is provided to operate in a design-basis accident is designed to be tested during normal operation of the nuclear system.

The HPCS, ADS, LPCI, and LPCS loops are tested periodically to assure that the emergency core cooling systems will operate.

Preoperational tests of the emergency core cooling systems were conducted during the final stages of plant construction prior to initial startup (Chapter 14.0 of the FSAR). These tests assure correct functioning of all controls, instrumentation, pumps, piping, and valves. System reference characteristics, such as pressure differentials and flow rates, are documented following the preoperational tests and are used to establish the limits of acceptability for measurements obtained in subsequent operational tests.

During plant operations, the pumps valves, piping, instrumentation, wiring, and other components outside the drywell can be inspected visually at any time. Components inside the drywell can be inspected when the drywell is open for access. When the reactor vessel is open, the spargers and other internals can be inspected. Testing frequencies of most ECCS components are correlated with testing frequencies of the associated controls and instrumentation. When a pump or valve control is tested, the operability of that pump or valve and its associated instrumentation is tested by the same action. The portions of the emergency core cooling systems requiring primary system pressure integrity are designed to specifications for in-service inspection.

A design flow functional test of the HPCS over the operating pressure and flow range is performed during normal plant operation by pumping water from the suppression pool and back through the full flow test return line to the suppression pool. The suction valve from the suppression pool is normally open and the discharge valve to the reactor remains closed.

The HPCS test conditions are tabulated on the HPCS process flow diagram, Figure 6.3-1. If an initiation signal occurs while the HPCS is being tested, the system returns to the operating mode.

The HPCS can be tested at full flow with suppression pool water at any time except when the reactor vessel water level is low.

Each LPCI loop can be tested during reactor operation. The test conditions are tabulated in Figure 6.3-8. This test does not inject cold water into the reactor because the injection line valves are closed.

To test an LPCI pump at rated flow, the test line valve to the suppression pool is opened, the pump suction valve from the suppression pool is opened (this valve is normally open), and the pumps are started using the remote/manual switches in the control room. Correct operation is determined by observing the instruments in the control room.

The LPCI injection check valve inside the drywell is tested by monitoring flow into the reactor vessel during surveillance testing.

If an initiation signal occurs during the test, the LPCI system returns to the operating mode. The valves in the test bypass lines are closed automatically to assure that the LPCI pump discharge is correctly routed to the reactor vessel.

Similarly, the LPCS pump and valves are tested periodically during reactor operations. With the injection valve closed and the return line open to the suppression pool, full flowing pump capability is demonstrated. The injection valve and the LPCS injection check valve are tested in a manner similar to that previously discussed for the LPCI valves. The system test conditions during reactor shutdown are shown on the LPCS system process diagram, Figure 6.3-4. The portion of the LPCS outside the drywell is inspected for leaks during tests. Controls and instrumentation tests are described in Subsection 7.3.1.2.3.

6.3.5 Instrumentation Requirements

Design details, including redundancy and logic, of the instrumentation of the ECCS are discussed in Subsection 7.3.1.

6.3.5.1 HPCS Actuation Instrumentation

The HPCS is automatically actuated by the following sensed variables: reactor vessel low water level, or drywell high pressure.

In addition, the HPCS can be manually actuated from the control room.

6.3.5.2 ADS Actuation Instrumentation

The ADS is automatically actuated by the following sensed variables: reactor vessel low water level and drywell high pressures. The drywell high pressure signal is not required for auto initiation if the drywell pressure bypass timer (DPBT) times out. Another time delay allows the logic to reset or the operator to bypass automatic blowdown if conditions have corrected themselves or the signals are erroneous. A manual switch may be used to inhibit ADS action if necessary. For further discussion see subsection 7.3.1.2.2.3.

In addition, the ADS can be manually actuated from the control room.

6.3.5.3 LPCS Actuation Instrumentation

The LPCS is automatically actuated by the following sensed variables: reactor vessel low water level, or drywell high pressure.

In addition the LPCS can be manually actuated from the control room.

6.3.5.4 LPCI Actuation Instrumentation

The LPCI is automatically actuated by the following sensed variables: reactor vessel low water level, or drywell high pressure. Reactor vessel low water level or drywell high pressure also stops other modes of RHR system operation so that LPCI is not inhibited.

In addition, the LPCI can be manually actuated from the control room. Subsection 7.3.1.3.2.3 discusses conformance to IEEE-279 and other applicable regulatory requirements for the ECCS instrumentation and controls.

6.3.6 References

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TABLE 6.3-2
(SHEET 1 of 5)

Significant Input Variables Used In the GE
Loss-Of-Coolant Accident Analyses

A. Plant Parameters

	Units	Nominal	Analysis Value
Core Thermal Power	MWt	3722	3797
% of Rated Core Thermal Power	%	106.7	108.8
Core Flow	lbm/hr	108.5×10^6	108.5×10^6
Vessel Steam Dome Pressure	psia	1050	1053

Source of Information: Reference 42.
*Based on licensed power of 3489 Mwt.

TABLE 6.3-2
(SHEET 2 of 5)

Significant Input Variables Used In the GE
Loss-Of-Coolant Accident Analyses

B. Emergency Core Cooling System Parameters

Low Pressure Coolant Injection System

Initiating Signals	Units	Analysis Value
Vessel pressure at which flow may commence	psid (vessel to drywell)	200
Minimum rated flow at vessel pressure	gpm (3 pumps, 2 pumps, 1 pump) psid (vessel to drywell)	17961, 11974, 5987 20
System Head-flow Delivery characteristics (3 pumps)	psid/gpm	200/0 20/17961
Low water level or High drywell pressure	Inches referenced to instrument zero psig	-161.5 (Level 1)* 2.5
Maximum allowable time delay from initiating signal to pump capable of speed and injection valve full open (assuming vessel pressure permissive is satisfied)	sec	60.0
Maximum Allowable Injection Valve Stroke Time **	sec	40.0
Pressure at which injection valve may open	psig	435.0

Source of Information: Reference 36 and used only in that analysis. See Reference 42 for GE14 LOCA analysis

* Analytical Setpoint is approximately equal to top of active fuel

** No flow is assumed until the injection valve is full open

TABLE 6.3-2
(SHEET 3 of 5)

Significant Input Variables Used In the GE
Loss-Of-Coolant Accident Analyses

Low Pressure Core Spray System

Vessel pressure at which flow may commence	psid (vessel to drywell)	255
Minimum rated flow at vessel pressure	gpm psid (vessel to drywell)	5600 122
System Head-flow Delivery characteristics	psid/gpm	255/0 122/5600 0/7000

Initiating Signals	Units	Analysis Value
Low water level or High drywell pressure	Inches referenced to instrument zero psig	-161.5 (Level 1)* 2.5
Maximum allowed (runout) flow	gpm	7000
Maximum allowable time delay from initiating signal to pump capable of speed and injection valve full open (assuming vessel pressure permissive is satisfied)	sec	60.0
Maximum Allowable Injection Valve Stroke Time **	sec	40.0
Pressure at which injection valve may open	psig	435.0

Source of Information: Reference 33 and used only in that analysis. See Reference 42 for GE14 LOCA analysis

* Analytical Setpoint is approximately equal to top of active fuel
** No flow is assumed until the injection valve is full open

TABLE 6.3-2
(SHEET 4 of 5)

Significant Input Variables Used In the GE
Loss-Of-Coolant Accident Analyses

High Pressure Core Spray System

Vessel pressure at which flow may commence	psid (vessel drywell)	1160
Minimum flow at vessel pressure	gpm psid (vessel drywell)	750 @ 1130 5400 @ 200
System Head-flow Delivery characteristics	psid/gpm	1160/0 1130/750 200/5400 0/5400

Initiating Signals	Units	Analysis Value
Low water level or High drywell pressure	Inches referenced to instrument zero psig	-97.9 (Level 2)* 2.5
Maximum Allowable Injection Valve Stroke Time **	sec	28.0
Maximum allowable time delay from initiating signal to rated flow available and injection valve full open**	sec	41

Source of Information: Reference 33 and used only in that analysis. See Reference 42 for GE14 LOCA analysis

* Analytical Setpoint is approximately equal to 5.3 feet above top of active fuel
** No flow is assumed until the injection valve is full open

TABLE 6.3-2
(SHEET 5 of 5)

Significant Input Variables Used In the GE
Loss-Of-Coolant Accident Analyses

Automatic Depressurization System

Total Number of valves installed		7
Number of valves used in analysis		6
Minimum flow capacity of any six valves at vessel pressure	lb/hr psig (at vessel pressure)	5.17×10^6 1146

Initiating Signals	Units	Analysis Value
Low water level and High drywell pressure	Inches referenced to instrument zero psig	-161.5 (Level 1)* 2.5
Delay time from all initiating signals completed to the time valves are open	sec	120
Low water level and Maximum Time Delay	Inches referenced to instrument zero sec	-161.5 (Level 1)* 720

Source of Information: Reference 33, and used only in that analysis. See Reference 42 for GE14 LOCA analysis

C. Fuel Parameters

Fuel Type	GE14	GE8x8NB (GE9B)
Fuel Bundle Geometry	10x10	8 x 8
Number of Fuel Rods	92	60

Source of Information: Reference 33 and 42

* Analytical Setpoint is approximately equal to top of active fuel

TABLE 6.3-2a
(SHEET 1 of 5)

Significant Input Variables Used In the
FANP Loss-Of-Coolant Accident Analyses

A. Plant Parameters

	Units	Analysis Value
Core Thermal Power	MWt	3796.44
% of Rated Core Thermal Power	%	102*
Vessel Steam Output	LBm/hr	16.57×10^6
Corresponding Percent of Rated Steam Flow	percent	102*
Core Flow	lbm/hr	113.9×10^6
Corresponding Percent of Rated Core Flow	percent	105
Vessel Steam Dome Pressure	psia	1050
Maximum Recirculation Line Break Area for DEG	ft^2	5.072

Source of Information: References 28, 16, 37 and 47

* Based on an uprated power of 112%

TABLE 6.3-2a
(SHEET 2 of 5)

Significant Input Variables Used In the
FANP Loss-Of-Coolant Accident Analyses

B. Emergency Core Cooling System Parameters

Low Pressure Coolant Injection System

Vessel pressure at which flow may commence	psid (vessel to drywell)	200
Minimum rated flow at vessel pressure	gpm (3 pumps, 2 pumps, 1 pump) psid (vessel to drywell)	17961, 11974, 5987 20
System Head-flow Delivery characteristics (3 pumps)	psid/gpm	200/0 20/17961

Initiating Signals	Units	Analysis Value
Low-Low-Low water level or High drywell pressure	Inches referenced to instrument zero psig	-161.5 (Level 1)** 2.5
Low Pressure System response time from detection of LOOP	sec	60.0
Maximum Allowable Injection Valve Stroke Time ***	sec	40.0
Pressure at which injection valve may open	psig	435.0
Minimum Flow Valve Opening Time Closing Time Max Bypass Line Flow per Pump Closure Setpoint	 sec sec gpm gpm	 15.0 15.0 870.0 2463.0

Source of Information: References 28

** Analytical Setpoint is approximately equal to top of active fuel
*** Flow is assumed to increase linearly over the entire valve stroke

TABLE 6.3-2a
(SHEET 3 of 5)

Significant Input Variables Used In the
FANP Loss-Of-Coolant Accident Analyses

Low Pressure Core Spray System

Vessel pressure at which flow may commence	psid (vessel to drywell)	255
Minimum rated flow at vessel pressure	gpm psid (vessel to drywell)	5600 122
System Head-flow Delivery characteristics	psid/gpm	255/0 122/5600 0/7000

Initiating Signals	Units	Analysis Value
Low-Low-Low water level or High drywell pressure	Inches referenced to instrument zero psig	-161.5 (Level 1)** 2.5
Maximum (runout) flow	gpm	7000
Low Pressure System response time from detection of LOOP	sec	60.0
Maximum Allowable Injection Valve Stroke Time ***	sec	40.0
Pressure at which injection valve may open	psig	435.0
Minimum Flow Valve		
Opening Time	sec	7.0****
Closing Time	sec	7.0****
Max Bypass Line Flow per Pump	gpm	950.0
Closure Setpoint	gpm	2121.0

Source of Information: References 28

** Analytical Setpoint is approximately equal to top of active fuel
*** Flow is assumed to increase linearly over the entire valve stroke
**** For Unit 2 Minimum Flow Valve opening and closing time. For Unit 1 there is no requirement

TABLE 6.3-2a
(SHEET 4 of 5)

Significant Input Variables Used In the
FANP Loss-Of-Coolant Accident Analyses

High Pressure Core Spray System

Vessel pressure at which flow may commence	psid (vessel to pump suction)	1160
Minimum rated flow at vessel pressure	gpm psid (vessel to pump suction)	750 @ 1130 5400 @ 200
System Head-flow Delivery characteristics	psid/gpm	1160/0 1130/750 200/5400 0/5400

Initiating Signals	Units	Analysis Value
Low water level or High drywell pressure	Inches referenced to instrument zero psig	-97.9 (Level 2)** 2.5
Maximum Allowable Injection Valve Stroke Time ***	sec	28.0
Maximum allowable time delay from LOOP to pumps capable of rated flow available and injection valve full open	sec	46
Minimum Flow Valve Max Bypass Line Flow per Pump Closing Setpoint	 gpm gpm	 1350.0 1948.0

Source of Information: References 28

** Analytical Setpoint is approximately equal to 5.3 feet above top of active fuel
*** Flow is assumed to increase linearly over the entire valve stroke

TABLE 6.3-2a
(SHEET 5 of 5)

Significant Input Variables Used In the
FANP Loss-Of-Coolant Accident Analyses

Automatic Depressurization System

Total Number of valves installed		7
Number of valves used in analysis		6
Minimum flow capacity of any six valves at vessel pressure	lb/hr psig (vessel pressure)	5.17×10^6 1150

Initiating Signals	Units	Analysis Value
Low-Low-Low water level and High drywell pressure	Inches referenced to instrument zero psig	-161.5 (Level 1)** 2.5
Delay time from all initiating signals completed to the time valves are open	sec	120
Low-Low-Low water level and Maximum Time Delay	ft above Top of Active Fuel sec	-161.5 (Level 1)** 720

C. Fuel Parameters

Fuel Type		ATRIUM-9B
Fuel Bundle Geometry		9 x 9
Number of Fuel Rods		72

Fuel Type		ATRIUM-10
Fuel Bundle Geometry		10 x 10
Number of Fuel Rods		83 full length rods 8 part length rods

Source of Information: References 28, 16 and 37

** Analytical Setpoint is approximately equal to top of active fuel

TABLE 6.3-3
(SHEET 1 of 2)

OPERATIONAL SEQUENCE OF EMERGENCY CORE COOLING

SYSTEMS FOR DESIGN-BASIS ACCIDENT ANALYSIS[1]

(The information in this table is historical; please refer to Appendix A of Reference 33 and Reference 42 for GE14 Fuel.) The sequence of events for the limiting small break is provided in Appendix B of Reference 42.

TIME(sec)	EVENTS
0	Design-basis loss-of-coolant accident assumed to start; normal auxiliary power assumed to be lost.
~ 0	Drywell high pressure[2] and reactor low water level reached. All diesel generators signaled to start; scram; HPCS, LPCS, LPCI signaled to start on high drywell pressure.
$t_1 \rightarrow 6$	Reactor low-low water level reached. HPCS receives second signal to start.
$t_2 \rightarrow 7$	Reactor low-low-low water level reached. Main steam isolation valve close. Second signal to start LPCI and LPCS; auto-depressurization sequence begins.
(t_1+13)	HPCS diesel generators ready to load; energize HPCS pump motor, open HPCS injection valve.
(t_2+13)	Division 1 and 2 diesel generators ready to load; start to close containment isolation valves.
(t_1+41)	HPCS injection valve open and pump at design flow, which completes HPCS startup; LPCS and LPCI (RHR "C") pumps at rated speed.
$t_3 \rightarrow 28$	Low pressure permissive for LPCS & LPCI injection valve
$(t_3+40) \rightarrow 68$	LPCI and LPCS pumps at rated flow, LPCS and LPCI injection valves open, which completes the LPCI and LPCS startups.
~150	Core effectively reflooded assuming worst single failure; heatup terminated.
>10 min.	Operator shifts to containment cooling.

TABLE 6.3-3
(SHEET 2 of 2)

NOTES:

1. For the purpose of all but the next to last entry on this table, all ECCS equipment is assumed to function as designed. Performance analysis calculations consider the effects of single equipment failures. (See Subsections 6.3.2.5 and 6.3.3.3.) The recirculation suction line break DBA with limiting HPCS EDG failure case, using Appendix K assumptions, is used.

2. Credit is taken in LOCA analyses for ECCS start on high drywell pressure signal.

Source of information: Reference 33 analysis results from GE.

TABLE 6.3-4
(SHEET 1 of 2)

KEY TO FIGURES AND TABLES IN SECTION 6.3

Figures Applicable to Specific Breaks	Large Recirculation Line Breaks		Small Recirculation Line Breaks		Other Break Locations
	GE 1.0 DEG Suction SF-HPCS/DG 6.3.3.7.4.1	AREVA 1.0 DEG Suction SF-LPCS/DG 6.3.3.7.4.2	GE 0.08 ft² Suction SF-HPCS/DG 6.3.3.7.6.1	AREVA 1.1 ft² Discharge SF-HPCS/DG 6.3.3.7.6.2	GE MSLB Outside Containment 6.3.3.7.7
Reactor Vessel Pressure	C-3b*	N/A	B-2	N/A	D-5b*
Water Level	C-3a*	N/A	B-1	N/A	D-5a*
Heat Transfer Coefficient	C-3d*	N/A	B-4	N/A	D-5d*
Peak Cladding Temperature	C-3c*	6.3-29	B-3	6.3-46	D-5c*
Upper Plenum Pressure	N/A	6.3-13	N/A	6.3-30	N/A
Total Break Flow	N/A	6.3-14	N/A	6.3-31	
Core Inlet Flow	N/A	6.3-15	N/A	6.3-32	N/A
Core Outlet Flow	N/A	6.3-16	N/A	6.3-33	N/A
Lower Downcomer Mixture Level	N/A	6.3-17	N/A	6.3-34	N/A
Lower Downcomer Liquid Mass	N/A	6.3-18	N/A	6.3-35	N/A
Hot Channel High Power Node Quality	N/A	6.3-19	N/A	6.3-36	N/A
Hot Channel High Power Node Heat Transfer Coefficient	N/A	6.3-20	N/A	6.3-37	N/A
System Pressure	N/A	6.3-21	N/A	6.3-38	N/A
Lower Plenum Mixture Level	N/A	6.3-22	N/A	6.3-39	N/A
Relative Entrainment	N/A	6.3-23	N/A	6.3-40	N/A
Core Entrained Liquid Flow	N/A	6.3-24	N/A	6.3-41	N/A
ADS Flow	N/A	6.3-25	N/A	6.3-42	N/A
LPCI Flow	N/A	6.3-26	N/A	6.3-43	N/A
LPCS Flow	N/A	6.3-27	N/A	6.3-44	N/A
HPCS Flow	N/A	6.3-28	N/A	6.3-45	N/A

TABLE 6.3-4
(SHEET 2 of 2)

KEY TO FIGURES AND TABLES IN SECTION 6.3

* These figures are shown in Reference 18 (3323 MWs), they are not shown in the UFSAR because GE considers this information proprietary and will not release them for use in a public domain document. Power uprate results are shown in Reference 33 and the GE14 results in Reference 42.

Input Variables – Tables 6.3-2 and 6.3-2a
Operation Sequence of ECCS for GE DBA – Table 6.3-3
Peak Cladding Temperature, Maximum Local Oxidation, and MAPLHGR vs. Exposure for FANP fuel – Table 6.3-6a, Table 6.3-6i and Table 6.3-6j
Summary of GE LOCA Analysis Results – Table 6.3-8
Summary of SPC LOCA Analysis Results – Table 6.3-8a and Table 6.3-8b
Single Failure Analysis – Table 6.3-1

TABLE 6.3-5
(SHEET 1 of 6)

ECCS SINGLE VALVE FAILURE ANALYSIS

SYSTEM	VALVE	POSITION FOR NORMAL PLANT OPERATION CLOSED	POSITION FOR NORMAL PLANT OPERATION OPEN	CONSEQUENCES OF VALVE FAILURE ASSUMED TOGETHER WITH DESIGN-BASIS (DBA) LOCA	REMAINING ECCS COOLANT DELIVERY SYSTEMS
High-pressure core spray (HPCS)	Suppression pool suction E22-F015		X	If MO valve fails to remain open during system operation, HPCS will no longer function.	LPCS + 3 LPC1 loops
	Drains and pressure test connections on suction line			If these manual valves are placed in the incorrect open position, part of the flow could be diverted to locations other than the RPV. However, since all connections, except that for E22-F019, have two valves that must be left open before flow is diverted, and the leak detection system would alarm, three failures would be required for this improper position to result and go undetected. In the case of E22-F019, two failures would be required.	LPCS + 3 LPCI loops + partial HPCS
	E22-F019	X			
	E22-F017/E22-F308	X			
	E22-F339/E22-F340	X			
	Minimum flow			If MO valve fails to open, HPCS pump may overheat and fail.	LPCS + 3 LPCI loops
	E22-F012	X		If valve fails to reclose, approximately 10% of system flow returns to suppression pool	90% HPCS + LPCS +3 LPCI loops
	Condensate tank suction to HP Core Spray			Valves are isolated from HPCS System by means of blind flange. Failure will have no effect on HPCS operation.	HPCS + LPCS + 3 LPCI loops
	E22-F001 (MO)	X			
	E22-F302 (Manual)	X			
	E22-F030/E22-F309 (Pressure test connection)	X			
	Test return to suppression pool			If MO valve is open on start of LOCA, auto close signal recloses valve.	HPCS + LPCS + 3 LPCI loops.
	E22-F023	X		If valve fails to remain closed during system operation, approximately 90% of HPCS flow returns to suppression poo1. HPCS will no longer function.	LPCS + 3 LPCI loops
	Abandoned test return to condensate tank			If these valves are placed in the incorrect open position, part of flow could be diverted to other locations than RPV. However, valves are closed and handwheels are removed.	LPCS +3 LPCI loops + partial HPCS
	E22-F010	X			
	E22-F011	X			

TABLE 6.3-5
(SHEET 2 of 6)

SYSTEM	VALVE	POSITION FOR NORMAL PLANT OPERATION CLOSED	OPEN	CONSEQUENCES OF VALVE FAILURE ASSUMED TOGETHER WITH DESIGN-BASIS (DBA) LOCA	REMAINING ECCS COOLANT DELIVERY SYSTEMS
	Injection valve E22-F004	X		If MO valve fails to remain open, HPCS will no longer function.	LPCS + 3 LPCI loops
	Maintenance valve E22-F038		X	This manual valve is located in the discharge line inside the drywell, and if closed, would result in blocking system injection. Since the valve has position (open/closed) indication in the control room, two error/failures would be required for blockage of system flow to result (i.e., valve is placed in wrong position and operator fails to take corrective action, or position indicating lights do not properly function.	LPCS + 3 LPCI loops
	Water leg valves			These manual valves must be in the position shown to ensure that the discharge line remain filled, thus avoiding water hammer on pump start. Improper positioning would result in a pressure switch/alarm indicating the discharge line is not filled. Therefore, two failures (valve in improper position and switch/alarm failure) must occur before the error goes undetected.	LPCS + 3 LPCI loops
	E22-F026	X			
	E22-F034		X		
	E22-F006		X		
	E22-F033		X		
	Drains, vents and pressure test connections on discharge lines			These manual valves are normally closed, connected in series, and located on the pump discharge line. Both valves in each group must be open before water is diverted from the normal discharge path. Also, as in the case of valves F030 and F033 above, improper position would be detected by the Leak Detection System(i.e., 3 failures required for improper position to result and go undetected.	LPCS + 3 LPCI loops + partial HPCS
	E22-F003/E22-F031	X			
	E22-F021/E22-F022	X			
	E22-F348/E22-F347	X			
	E22-F349/E22-F350	X			
Low-pressure core spray (LPCS)	Suppression pool suction E21-F001		X	If valve fails to remain open during system operation, LPCS will no longer function.	HPCS + LPCS + 3LPCI loops. HPCS + 3 LPCI loops

TABLE 6.3-5
(SHEET 3 of 6)

SYSTEM	VALVE	POSITION FOR NORMAL PLANT OPERATION CLOSED	OPEN	CONSEQUENCES OF VALVE FAILURE ASSUMED TOGETHER WITH DESIGN-BASIS (DBA) LOCA	REMAINING ECCS COOLANT DELIVERY SYSTEMS
	Drains, vents and pressure test connections on suction line			If these manual valves are incorrectly placed in the open position, the leak detection system would alarm. In addition, all connections except E21-F008 require that two valves in series be left in an incorrect position before suction flow is affected. Thus, three failures would be required for the improper valve positions to result in flow loss, except in the case of E21-F008 which requires two failures.	HPCS + 3 LPCI loops + partial LPCS
	E21-F008	X			
	E21-F327/E21-F328	X			
	E21-F334/E21-F335	X			
	E21-F329/E21-F330	X			
	E21-F331/E21-F332	X			
	Test return line E21-F012	X		If MO valve is open on start of LOCA, auto close signal recloses valve.	HPCS + LPCS + LPCI loops.
				If valve fails to remain closed during system operation, approximately 90% of LPCS flow returns to suppression pool. LPCS will no longer function.	HPCS + 3 LPCI loops
	Injection valve E21-F005	X		If MO valve fails to remain open, LPCS will no longer function.	HPCS + 3 LPCI loops
	Maintenance Valve E21-F051		X	Since this manual valve has position indication in the control room, the valve would have to be in the wrong position (closed) and the position indication fail in order for injection blockage to occur; a malfunction requires 2 failures.	HPCS + 3 LPCI loops
	Minimum flow			If valves are not open, LPCS pump may overheat and fail. If valve E21-F011 fails to close approximately 10% of system flow returns to suppression pool.	HPCS + 3 LPCI loops For E21-F011 failure to close, HPCS + 90% LPCS + 3 LPCI loops.
	E21-F011 (MO)		X		
	E21-F052 (Manual)		X		
	Drain, vent and pressure test connections on discharge line			Incorrect position could degrade injection flow. Since both manual valves are in the same drain line, both valves would have to be in the wrong position in order for injection flow to degrade; a malfunction requires 2 failures.	HPCS + 3 LPCI loops + partial LPCS
	E21-F325/E21-F326	X			
	E21-F025/E21-F305	X			
	E21-F013/E21-F014	X			
	E21-F321/E21-F322	X			

TABLE 6.3-5
(SHEET 4 of 6)

SYSTEM	VALVE	POSITION FOR NORMAL PLANT OPERATION CLOSED	OPEN	CONSEQUENCES OF VALVE FAILURE ASSUMED TOGETHER WITH DESIGN-BASIS (DBA) LOCA	REMAINING ECCS COOLANT DELIVERY SYSTEMS
	Water leg Valves E21-F004 E21-F032 E21-F034 E21-F035	 X	 X X X	These manual valves must be in the indicated position to ensure discharge line remains filled. Since a low pressure alarm indicates a fill system failure, both sensor and valve position would have to be incorrect in order for the failure to go undetected. Two failures would be required	HPCS + 3 LPCI loops
Low-pressure coolant injection (LPCI)					
LPCI loop A	Suppression pool suction E12-F004A		X	If valve fails to remain open during system operation, LPCI loop will no longer function	HPCS + LPCS + 3 LPCI loops. HPCS + LPCS + 2 LPCI loops.
	Minimum flow E12-F064A (MO) E12-F018A (Manual)		 X X	If valves are not open, LPCI pump may overheat and fail. If valves E12-F064A fails to close approximately 10% of loop, flow returns to suppression pool	HPCS + LPCS + 2 LPCI loops. HPCS + LPCS + 2 For E12-F064A failure to close. LPCI loops + 90% LPCI loop.
	Test return line E12-F024A	 X		If MO valve is open on start of LOCA, auto close signal recloses valve. If valve fails to remain closed during system operation approximately 90% of loop flow returns to suppression pool. LPCI loop will no longer function.	HPCS + LPCS + 3 LPCI loops. HPCS + LPCS + 2 LPCI loops.
	Drain, vent and pressure test connections on the suction line E12-F370A/E12-F369A E12-F397/E12-F398 E12-F356A/E12-F379A E12-F071A/E12-F070	 X X X X		If these manual valves are in the incorrect position, part of the flow could be diverted. However, all connections are provided with two valves in series, and the leak detection system would alarm. Thus, three failures must be postulated for the incorrect condition to go undetected.	HPCS + LPCS + 2 LPCI loops + partial LPCIA

TABLE 6.3-5
(SHEET 5 of 6)

SYSTEM	VALVE	POSITION FOR NORMAL PLANT OPERATION CLOSED	OPEN	CONSEQUENCES OF VALVE FAILURE ASSUMED TOGETHER WITH DESIGN-BASIS (DBA) LOCA	REMAINING ECCS COOLANT DELIVERY SYSTEMS
Low-pressure coolant injection (LPCI) (cont'd) LPCI loop A					
	Heat exchanger bypass E12-F048A		X	No effect. LPCI flow will be through heat exchanger. Heat exchanger pressure drop will not degrade loop flow.	HPCS + LPCS + 3 LPCI loops.
	Injection valve(s) E12-F042A	X		If MO valve fails to remain open, LPCI loop will no longer function.	HPCS + LPCS + 2 LPCI loops.
	Maintenance valve E12-F092A (Manual) E12-F098A (Manual)		 X X	The valve E12-F092A with position indication in the main control room. Therefore, for this valve to be incorrectly positioned (closed), a failure of this indication as well as incorrect valve positioning (two failures) must be assumed. Valve E12-F098A could block LPCI flow if left in the incorrect (closed) position.	HPCS + LPCS + 2 LPCI loops.
	Water leg valves E12-F085A		 X	This manual valve must be open to ensure a filled discharge line. Incorrect positioning would be detected and alarmed in the control room by a pressure switch signal on low pressure. Thus, two failures would be required in order for valve to be incorrectly positioned.	HPCS + LPCS + 2 LPCI
	Drains, vents and pressure test connections on discharge line E12-F361A/E12-F362A E12-F363A/E12-F364A E12-F385A/E12-F386A E12-F080A/E12-F081A E12-F060A/E12-F075A E12-F367/E12-F368 E12-F372A/E12-F371A E12-F056A/E12-F057A E12-F321A/E12-F322A E12-F086/E12-F389 E12-F063A/E12-F388A	 X X X X X X X X X X X		All connections are double valved; therefore, two valves in series would have to be in an incorrect position before any flow would be diverted. In addition, the low pressure alarm would be sounded in the control room since the water leg pump would not maintain the line filled, and leak detection alarms would also be triggered by leakage into the areas. Therefore, four failures must be postulated before any adverse effects on the system could go undetected.	HPCS + LPCS + 2 LPCI + Partial LPCI A

TABLE 6.3-5
(SHEET 6 of 6)

SYSTEM	VALVE	POSITION FOR NORMAL PLANT OPERATION CLOSED	OPEN	CONSEQUENCES OF VALVE FAILURE ASSUMED TOGETHER WITH DESIGN-BASIS (DBA) LOCA	REMAINING ECCS COOLANT DELIVERY SYSTEMS
LPCI (Cont'd)	Combustible gas control cooling water supply E12-F312A	X		This MO valve, if left in the incorrect position, could divert flow away from LPCI. However, position indication is provided in the main control room.	HPCS + LPCS + 2 LPCI + partial LPCI A
LPCI Loop A	Head spray E12-F023	X		This MO valve in an incorrect position (open) would be closed by an isolation signal if LPCI were activated. In addition, position indication is provided in the main control room, and the flow diverted would be sprayed into the RPV head.	HPCS + LPCS + 2 LPCI + partial LPCI A
Loops B and C are identical to Loop A except for the following instances: 1) No heat exchanger bypass valve (E12-F048) exists for Loop C; however, it is provided for Loop B. 2) No combustible gas control cooling water cross-tie exists for Loop C. 3) No head spray line exists for either Loop B or C. 4) The following additional connections and valves exist on Loop C and not on Loops A or B					
	Suppression pool cleanup suction lines E12-F303 E12-F402	 X X		These manual valves located in branch lines off the LPCI suction are also provided with a normally blind flanged connection. A spool piece can be added during plant shutdown to clean-up the suppression pool. Therefore, both the valve and blind flange would have to be incorrect before flow could be diverted.	HPCS + LPCS + LPCI A&B
	Water leg valves E12-F082 E12-F380		 X X	Pressure switches are provided to alarm at low pressure if the water leg pumps are not maintaining the proper fill in the lines.	HPCS + LPCS + LPCI A

TABLE 6.3-6

SINGLE FAILURES CONSIDERED

FOR ECCS ANALYSIS

Assumed Failure (1)	Remaining ECCS (2)
HPCS D/G	LPCS + 3 LPCI + ADS(3)
LPCS D/G	HPCS + 2 LPCI + ADS(3)
LPCI D/G	HPCS + LPCS + LPCI + ADS(3)
ADS	HPCS + LPCS + 3 LPCI + 5 ADS valves

(1) Other postulated failures are not specifically considered because they result in at least as much ECCS capacity as one of the above assumed failures.

(2) Systems remaining, as identified in this table, are applicable to all non-ECCS line breaks. For a LOCA from an ECCS line break, the remaining systems are those listed for the recirculation line break, less the ECCS in which the break is assumed.

(3) The analysis was performed assuming only 6 of the 7 ADS Valves were functional. This was done to support operation with one SRV out-of-service. In the case of a single failure of the ADS, only 5 ADS valves were assumed.

TABLE 6.3-6a

ATRIUM-9B MAPLHGR Analysis Results

Average Planar Exposure (GWd/MTU)	MAPLHGR (kW/ft)	PCT (F)[1]	Local Cladding Oxidation (%)[2]
0	13.5	1807	0.68
5	13.5	1792	0.63
10	13.5	1758	0.55
15	13.5	1709	0.47
20	13.5	1726	0.72
25	13.0	1686	0.59
30	12.5	1652	0.45
35	12.0	1640	0.45
40	11.5	1592	0.31
45	11.0	1557	0.24
50	10.5	1520	0.19
55	10.0	1474	0.15
60	9.5	1412	0.11
61.1[3]	9.39	1396	0.10
64.3	9.07	--	--
65	9.0	1384	0.16

Core average metal-water reaction is <0.16% at all exposures.

Source: EMF-2175(P) (Reference 16)

Footnotes:

1 All LOCA PCT evaluations are tracked by Nuclear Fuels and reported to the NRC.

2 Reference 32 documents that the peak local cladding oxidation is changed to 0.79% due to limiting PCT change.

3 The exposure limit has been extended to 64.3 GWd/MTU with a MAPLHGR limit of 9.07 kW/ft (Reference 38). Note that the analyses that support the ATRIUM-9B exposure extension were actually performed for 65 GWd/MTU. However, the ATRIUM-9B fuel cannot be operated past 64.3 GWd/MTU (Reference 39).

TABLE 6.3-6i

ATRIUM-10 MAPLHGR Analysis Results

Average Planar Exposure (GWd/MTU)	MAPLHGR (kW/ft)	PCT (F)	Local Cladding Oxidation (%)
0	12.5	1729	0.48
5	12.5	1648	0.33
10	12.5	1567	0.21
15	12.5	1578	0.22
20	12.1	1546	0.19
25	11.7	1519	0.16
30	11.2	1493	0.14
35	10.8	1464	0.11
40	10.4	1428	0.09
45	9.9	1399	0.08
50	9.5	1365	0.07
55	9.1	1327	0.05
60	8.3	1243	0.03
65	7.4	1163	0.02
67	7.1	1130	0.02

Core average metal-water reaction is <<0.16% at all exposures.

Source: EMF-3231(P) (Reference 47)

Note:
1. ALL LOCA PCT evaluations are tracked by Nuclear Fuel Management and reported to the NRC.

TABLE 6.3-6j

Limiting ATRIUM-10 LOCA Analysis Break Characteristics and Results (Applied to Unit 1 and Unit 2)	
Location	Recirculation suction pipe
Type / size	Double-ended guillotine / 0.8 discharge coefficient
Single failure	Low-pressure coolant injection diesel generator
Maximum MAPLHGR (kW/ft)	12.5
Peak cladding temperature (°F)	1729
Local cladding oxidation (max %)	0.48
Total hydrogen generated (% of total hydrogen possible)	<<0.16*

Source: EMF-3231(P) (Reference 47)

* Planar average MWR for the peak power plane is ≤ 16% which indicates a CMWR significantly less than 0.16%.

TABLE 6.3-7

SEQUENCE OF EVENTS FOR STEAMLINE BREAK OUTSIDE CONTAINMENT

(The information in this table is historical; please refer to Appendix A from GE proprietary document GE-NE-208-21-1093, "Engineering Evaluation Requirements for the LaSalle County Station Units 1 and 2 SAFER-GESTR Loss of Coolant Accident Analysis with ECCS Relaxations," dated November 1993.)

TIME (sec)	EVENT
0	Guillotine break of one main steamline outside primary containment.
~0.5	High steamline flow signal initiates closure of main steamline isolation valve.
<1.0	Reactor begins scram.
≤5.5	Main steamline isolation valves fully closed.
~60	RCIC and HPCS would initiate on low water level (RCIC considered unavailable, HPCS assumed single failure, and therefore, may not be available).
~6	Safety relief valves open high vessel pressure. The valves open and close to maintain vessel pressure at approximately 1100 psi.
~300	Reactor water level above core begins to drop slowly due to loss of steam through the safety valves. Reactor pressure still at approximately 1100 psi.
~1150	ADS auto initiates after 10 minute drywell pressure bypass timer plus the existing 2 minute initiation delay. Vessel depressurizes rapidly.
~1350	Low-pressure ECC systems initiated. Reactor fuel uncovered partially.
~1400	Core effectively reflooded and cladding temperature heatup terminated. No fuel rod failure.

TABLE 6.3-7a

Event Times for FANP Limiting Large Break LOCA
1.0 DEG Pump Suction SF-LPCS/DG
for ATRIUM-9B Fuel

Event	Time (Seconds)
Initiate Break	0.0
Initiate Scram	0.6
Feedwater Flow Stops	0.5
MSIV Fully Closed	5.0
Low-Low Water Level	8.3
Low-Low-Low Water Level	9.5
Jet Pump Uncovers	10.8
Recirculation Suction Uncovers	14.7
Lower Plenum Flashes	17.1
HPCS Valve Starts to Open	13.0
HPCS Pump at Rated Speed	41.0
HPCS Flow Starts	41.0
LPCS Valve Starts to Open	NA
LPCS Pump at Rated Speed	NA
LPCS Flow Starts	NA
LPCI Valve Starts to Open	46.6
LPCI Pump at Rated Speed	60.0
LPCI Flow Starts	63.5
End of Blowdown (Rated Spray)	80.4
ADS Valve Opens	129.5
Start of Reflood	116.6
Core Reflood	125.2
Depressurization Ends	>150.0
Peak Cladding Temperature Occurs	125.2

Source: EMF-2174(P)

TABLE 6.3-7b

Event Times for FANP Limiting LOCA
1.1 ft^2 Pump Discharge SF-HPCS/DG
for ATRIUM-9B Fuel

Event	Time (Seconds)
Initiate Break	0.0
Initiate Scram	0.6
Feedwater Flow Stops	0.5
MSIV Fully Closed	5.0
Low-Low Water Level	13.0
Low-Low-Low Water Level	15.4
Jet Pump Uncovers	18.4
Recirculation Suction Uncovers	28.9
Lower Plenum Flashes	34.3
HPCS Valve Starts to Open	NA
HPCS Pump at Rated Speed	NA
HPCS Flow Starts	NA
LPCS Valve Starts to Open	97.9
LPCS Pump at Rated Speed	65.0
LPCS Flow Starts	133.6
LPCS MFV Closed	147.2
LPCI Valve Starts to Open	97.9
LPCI Pump at Rated Speed	65.0
LPCI Flow Starts	144.0
LPCI MFV Closed (End of RELAX Calculation)	183.5
End of Blowdown (Rated Spray)	160.5
ADS Valve Opens	135.4
Start of Reflood	196.2
Core Reflood	203.1
Depressurization Ends	>250.0
Peak Cladding Temperature Occurs	203.1

Source: EMF-2175(P)

SUMMARY OF RESULTS OF SAFER/GESTR-LOCA ANALYSIS (10CFR50 Appendix K)

LASALLE 1 & 2 SPECIFIC BREAK SPECTRUM

Fuel Type: GE14

Break Size	Break Location	Single Failure	1st PCT	2nd PCT
DBA	Suction	HPCS/DG	1019 / 1009	1258 / 1394
	Suction	LPCS/DG	1019 / 1009	1210 / 1301
	Suction	LPCI/DG	1019 / 1009	1214 / 1231
0.08 ft^2	Suction	HPCS/DG	1032	993
0.1 ft^2	Suction	HPCS/DG	N/A	1446
MSLB	Outside Containment	HPCS/DG	N/A	659

Limiting Break	0.08ft^2 Recirculation Suction Line Break
Limiting ECCS Failure	HPCS Diesel Generator Failure
Peak Cladding Temperature (Licensing Basis)	1460°F
Maximum Local Oxidation	< 1.0%
Core-Wide Metal-Water Reaction	<0.1%

Notes: (1) First PCT is the PCT due to early boiling transition and lowering of water level before lower plenum flashing, and the second PCT is the PCT after ECC systems inject.

(2) Deleted

(3) Core-Wide Metal-Water Reaction <0.1% for all cases.

(4) There is no early boiling transition for break areas less than 1.0 ft^2. Therefore, N/A is used for the first PCT and the value in the second PCT column is the peak PCT for the entire transient.

(5) Based on Reference 42 for GE14 Fuel

(6) The licensing basis PCT is in the most recent 10 CFR 50.46 report on each unit's NRC docket.

Summary of Results of FANP Fuel (HUXY) LOCA Analysis*

(Sheet 1 of 2)

LaSalle 1 & 2 Specific Break Spectrum
(Recirculation Line Break)

Fuel Type: ATRIUM-9B

Break Size	Break Location	Break Type **	Single Failure	PCT (°F)*
DBA	Suction	DEG	LPCS/DG	1669
	Suction	DEG	LPCI/DG	1661
	Suction	DEG	HPCS/DG	1648
	Discharge	DEG	LPCS/DG	1494
	Discharge	DEG	LPCI/DG	1452
	Discharge	DEG	HPCS/DG	1567
	Suction	DES	LPCS/DG	1644
	Suction	DES	LPCI/DG	1643
	Suction	DES	HPCS/DG	1625
	Discharge	DES	LPCS/DG	1505
	Discharge	DES	LPCI/DG	1466
	Discharge	DES	HPCS/DG	1567
80% DBA	Suction	DEG	HPCS/DG	1636
	Suction	DES	HPCS/DG	1621
	Discharge	DEG	HPCS/DG	1565
	Discharge	DES	HPCS/DG	1567
60% DBA	Suction	DEG	LPCS/DG	1580
	Suction	DEG	HPCS/DG	1582
	Discharge	DEG	LPCS/DG	1474
	Discharge	DEG	HPCS/DG	1562
	Suction	DES	LPCS/DG	1625
	Suction	DES	HPCS/DG	1615
	Discharge	DES	LPCS/DG	1490
	Discharge	DES	HPCS/DG	1564

* Source EMF-2174(P)(Reference 17)

** For DEG breaks, the discharge coefficient and full break area are used in the analyses. For split breaks (DES), size is the fraction of twice pipe cross-section area.

The licensing basis PCT is in the most recent 10CFR 50.46 report on each unit's NRC docket.

Summary of Results of FANP Fuel (HUXY) LOCA Analysis*

(Sheet 2 of 2)

LaSalle 1 & 2 Specific Break Spectrum
(Recirculation Line Break)

Break Size	Break Location	Break Type **	Single Failure	PCT (°F)*
40% DBA	Suction	DEG	HPCS/DG	1561
	Suction	DES	HPCS/DG	1475
	Discharge	DEG	HPCS/DG	1563
	Discharge	DES	HPCS/DG	1567
1.6 ft^2	Suction	N/A	LPCS/DG	1491
	Suction	N/A	HPCS/DG	1479
	Discharge	N/A	LPCS/DG	1461
	Discharge	N/A	HPCS/DG	1573
1.0 ft^2	Suction	N/A	LPCS/DG	1396
	Suction	N/A	LPCI/DG	1431
	Suction	N/A	HPCS/DG	1594
	Discharge	N/A	LPCS/DG	1404
	Discharge	N/A	LPCI/DG	1432
	Discharge	N/A	HPCS/DG	1728
1.1 ft^2	Discharge	N/A	HPCS/DG	1737
1.2 ft^2	Discharge	N/A	HPCS/DG	1717
0.4 ft^2	Suction	N/A	LPCS/DG	1251
	Suction	N/A	HPCS/DG	1387
	Discharge	N/A	LPCS/DG	1363
	Discharge	N/A	HPCS/DG	1611
0.1 ft^2	Suction	N/A	LPCS/DG	716
	Suction	N/A	HPCS/DG	1317
	Discharge	N/A	LPCS/DG	1035
	Discharge	N/A	HPCS/DG	1429

* Source EMF-2174(P)(Reference 17)

** For DEG breaks, the discharge coefficient and full break area are used in the analyses. For split breaks (DES), size is the fraction of twice pipe cross-section area.

The licensing basis PCT is in the most recent 10CFR 50.46 report on each unit's NRC docket.

TABLE 6.3-8b

Summary of Results of FANP Fuel (HUXY) LOCA Analysis*

LaSalle 1 & 2 Specific Break Spectrum
(Non-Recirculation Line Break)

ATRIUM-9B

Break Location	Single Failure	PCT (°F)	Maximum Local Metal Water Reaction (%)	Core Average Metal Water Reaction (%)
HPCS Line	LPCS DG	1386	0.06	<1.0
HPCS Line	ADS Valve	1019	0.00	<1.0
LPCI Line	HPCS DG	1263	0.03	<1.0
LPCI Line	LPCS DG	1188	0.02	<1.0

* Source EMF-2174(P) (Reference 17)

The licensing basis PCT is in the most recent 10CFR 50.46 report on each unit's NRC docket.

TABLE 6.3-9
(Sheet 1 of 4)

MOTOR-OPERATED VALVES THERMAL OVERLOAD PROTECTION

	VALVE NUMBER	BYPASS DEVICE (Continuous, Accident Conditions, or None)	SYSTEM(S) AFFECTED
a.	1VG001	Accident Conditions	SBGTS
	1VG003	Accident Conditions	
	2VG001	Accident Conditions	
	2VG003	Accident Conditions	
b.	1(2)VP113A	Accident Conditions	Primary containment chilled water coolers
	1(2)VP113B	Accident Conditions	
	1(2)VP114A	Accident Conditions	
	1(2)VP114B	Accident Conditions	
	1(2)VP053A	Accident Conditions	
	1(2)VP053B	Accident Conditions	
	1(2)VP063A	Accident Conditions	
	1(2)VP063B	Accident Conditions	
c.	1VQ038*	Accident Conditions	Primary containment vent and purge system
	1(2)VQ032	Accident Conditions	
	1(2)VQ035	Accident Conditions	
	1(2)VQ047	Accident Conditions	
	1(2)VQ048	Accident Conditions	
	1(2)VQ050	Accident Conditions	
	1(2)VQ051	Accident Conditions	
	1(2)VQ068	Accident Conditions	
	1VQ037*	Accident Conditions	
	2VQ037*	Accident Conditions	
	2VQ038*	Accident Conditions	
d.	1(2)WR179	Accident Conditions	RBCCW system
	1(2)WR180	Accident Conditions	
	1(2)WR040	Accident Conditions	
	1(2)WR029	Accident Conditions	
e.	1(2)B21 - F067A	Accident Conditions	Main steam system
	1(2)B21 - F067B	Accident Conditions	
	1(2)B21 - F067C	Accident Conditions	
	1(2)B21 - F067D	Accident Conditions	
	1(2)B21 - F019	Accident Conditions	
	1(2)B21 - F016	Accident Conditions	
	1(2)B21 - F020	Continuous	
	1(2)B21 - F068	Continuous	
	1(2)B21 - F070	Continuous	
	1(2)B21 - F069	Continuous	
	1(2)B21 - F071	Continuous	
	1(2)B21 - F072	Continuous	
	1(2)B21 - F073	Continuous	
	1(2)B21 - F418A	Continuous	
	1(2)B21 - F418B	Continuous	

* These valves have thermal overload bypass for accident conditions from both Unit 1 and Unit 2

TABLE 6.3-9
(Sheet 2 of 4)

	VALVE NUMBER	BYPASS DEVICE (Continuous, Accident Conditions, or None)	SYSTEM(S) AFFECTED
f.	1(2)B21 - F065A	Continuous	Main feedwater system
	1(2)B21 - F065B	Continuous	
g.	1(2)E21 - F001	Continuous	LPCS system
	1(2)E21 - F005	Accident Conditions	
	1(2)E21 - F011	Accident Conditions	
	1(2)E21 - F012	Accident Conditions	
h.	1(2)C41 - F001A	Accident Conditions	SBLCS
	1(2)C41 - F001B	Accident Conditions	
i.	1(2)G33 - F001	Accident Conditions	RWCU
	1(2)G33 - F004	Accident Conditions	
	1(2)G33 - F040	Continuous	
j.	1(2)E12 - F052A	Accident Conditions	RHR system
	1(2)E12 - F064A	Accident Conditions	
	1(2)E12 - F087A	Accident Conditions	
	1(2)E12 - F004A	Continuous	
	1(2)E12 - F047A	Continuous	
	1(2)E12 - F048A	Accident Conditions	
	1(2)E12 - F003A	Continuous	
	1(2)E12 - F026A	Accident Conditions	
	1(2)E12 - F068A	Continuous	
	1(2)E12 - F073A	Continuous	
	1(2)E12 - F074A	Continuous	
	1(2)E12 - F011A	Accident Conditions	
	1(2)E12 - F024A	Accident Conditions	
	1(2)E12 - F016A	Accident Conditions	
	1(2)E12 - F017A	Accident Conditions	
	1(2)E12 - F027A	Accident Conditions	
	1(2)E12 - F004B	Continuous	
	1(2)E12 - F047B	Continuous	
	1(2)E12 - F048B	Accident Conditions	
	1(2)E12 - F003B	Continuous	
	1(2)E12 - F068B	Continuous	
	1(2)E12 - F073B	Continuous	
	1(2)E12 - F074B	Continuous	
	1(2)E12 - F026B	Accident Conditions	
	1(2)E12 - F011B	Accident Conditions	
	1(2)E12 - F024B	Accident Conditions	
	1(2)E12 - F006B	Continuous	
	1(2)E12 - F016B	Accident Conditions	
	1(2)E12 - F017B	Accident Conditions	
	1(2)E12 - F042B	Accident Conditions	
	1(2)E12 - F064B	Accident Conditions	
	1(2)E12 - F093	Continuous	
	1(2)E12 - F021	Accident Conditions	
	1(2)E12 - F004C	Continuous	

TABLE 6.3-9
(Sheet 3 of 4)

	VALVE NUMBER	BYPASS DEVICE (Continuous, Accident Conditions, or None)	SYSTEM(S) AFFECTED
j. (cont'd)	1(2)E12 - F052B	Accident Conditions	RHR system
	1(2)E12 - F087B	Accident Conditions	
	1(2)E12 - F099B	Accident Conditions	
	1(2)E12 - F099A	Accident Conditions	
	1(2)E12 - F008	Accident Conditions	
	1(2)E12 - F009	Accident Conditions	
	1(2)E12 - F040A	Accident Conditions	
	1(2)E12 - F040B	Accident Conditions	
	1(2)E12 - F049A	Accident Conditions	
	1(2)E12 - F049B	Accident Conditions	
	1(2)E12 - F053A	Accident Conditions	
	1(2)E12 - F053B	Accident Conditions	
	1(2)E12 - F006A	Continuous	
	1(2)E12 - F023	Accident Conditions	
	1(2)E12 - F027B	Accident Conditions	
	1(2)E12 - F042A	Accident Conditions	
	1(2)E12 - F042C	Accident Conditions	
	1(2)E12 - F064C	Accident Conditions	
	1(2)E12 - F094	Continuous	
k.	1(2)E51 - F086	Accident Conditions	RCIC system
	1(2)E51 - F022	Accident Conditions	
	1(2)E51 - F068	Continuous	
	1(2)E51 - F069	Continuous	
	1(2)E51 - F080	Accident Conditions	
	1(2)E51 - F046	Accident Conditions	
	1(2)E51 - F059	Accident Conditions	
	1(2)E51 - F063	Accident Conditions	
	1(2)E51 - F019	Accident Conditions	
	1(2)E51 - F031	Continuous	
	1(2)E51 - F045	Accident Conditions	
	1(2)E51 - F008	Accident Conditions	
	1(2)E51 - F010	Accident Conditions	
	1(2)E51 - F013	Accident Conditions	
	1(2)E51 - F076	Accident Conditions	
	1(2)E51 - F360	Accident Conditions	
l.	1(2)E22 - F004	Accident Conditions	HPCS system
	1(2)E22 - F012	Accident Conditions	
	1(2)E22 - F015	Continuous	
	1(2)E22 - F023	Accident Conditions	

TABLE 6.3-9
(Sheet 4 of 4)

	VALVE NUMBER	BYPASS DEVICE (Continuous, Accident Conditions, or None)	SYSTEM(S) AFFECTED
m.	1(2)HG001A	None	Hydrogen recombiner system
	1(2)HG001B	None	
	1(2)HG002A	None	
	1(2)HG002B	None	
	1(2)HG005A	None	
	1(2)HG005B	None	
	1(2)HG006A	None	
	1(2)HG006B	None	
	1(2)HG003	None	
	2(1)HG009	None	
	2(1)HG018	None	
	1(2)HG025	None	
	1(2)HG026	None	
	1(2)HG027	None	
	1(2)E12-F312A	None	
	1(2)E12-F312B	None	

6.4 HABITABILITY SYSTEMS

Habitability systems are designed to ensure habitability inside the control and the auxiliary electric equipment (AEE) rooms for both Units 1 and 2 during all normal and abnormal station operating conditions including the post-LOCA requirements, in compliance with Criterion 19 of 10 CFR 50, Appendix A. The habitability systems cover all the equipment, supplies, and procedures related to the control and auxiliary electric equipment so that control room operators are safe against postulated releases of radioactive materials, noxious gases, smoke, and steam. Adequate sanitary facilities and medical supplies are provided to meet the requirements of operating personnel during and after the accident. Adequate food and water storage in the control room are also provided for operators during the accident. In addition, the environment of the control and auxiliary electric equipment rooms is maintained in order to ensure the integrity of the contained safety-related controls and equipment, during all the station operating conditions.

6.4.1 Design Bases

The design bases of the habitability systems upon which the functional design is established, are summarized as follows:

a. Independent HVAC systems are provided for the control room envelope and the auxiliary electric equipment room envelope which contains the remote shutdown panels and consists of auxiliary electric equipment room Unit 1 and Unit 2.

b. The control and auxiliary electric equipment rooms are occupied continuously on a year-round basis. The occupancy of the operating personnel is assured for a minimum period of 30 days, after a design-basis accident (DBA).

c. The habitability systems are designed to support a minimum of 5 people during normal and abnormal station operating conditions. The control room is supplied by three separate and independent breathing air subsystems which are each comprised of three 300 cubic foot air cylinders with appropriate pressure regulators, low pressure alarms and face masks. Two of these subsystems are for the Unit 1 and Unit 2 control room operators, while the third system supplies a manifold in the control room which can support the senior reactor operator, the control room technical adviser, and a third user as deemed necessary. All three subsystems are designed to provide a minimum of 6 hours of breathing air for each user.

d. Sanitary facilities and medical supplies for minor injuries are provided for the control room. In addition, food and bottled water for a day (at least three meals) are stored in the control room for a minimum of 10 people. This food is for use in accident conditions when access to the control room with food and water would be limited by dose rates.

e. The radiological effects on the control and auxiliary electric equipment rooms that could exist as a consequence of any accident described in Chapter 15.0 are considered in the design of the habitability system.

f. The design includes provisions to preclude the effect of noxious gas and smoke from inside or outside the plant.

g. In addition to the subsystems mentioned in (c) above, carts containing self-contained breathing air systems, e.g., Air-Paks, are located immediately outside the control room. These portable carts are intended for emergency use.

   Each Air-Pak has a nominal 1/2 hour air breathing bottle which is rechargeable. These carts contain adequate spares to provide necessary replacement bottles. A self-contained recharging system is provided for refilling expended air bottles on a timely basis to assure an adequate air supply to emergency personnel.

   At least ten total air paks are dedicated for fire brigade use and are located where brigade members can readily obtain them. These air packs are also rechargeable to assure adequate air supply to the fire brigade.

h. The habitability systems are designed to operate effectively during and after a DBA such as a LOCA with the simultaneous loss of offsite power, design-basis earthquake, or failure of any one of the HVAC system components.

i. Radiation monitors, ammonia, and ionization detectors continuously monitor the air supply from the control room and AEE room outside air inlets (see Figure 6.4-2). The detection of high radiation, ammonia, or smoke is alarmed in the control room. Related protection functions are simultaneously initiated for high radiation or smoke. Pressure differential indicators are provided in the control room and AEE room to monitor the pressure differential between control/AEE room and surrounding areas respectively.

   Outdoor air and individual room temperature indicators are provided for the control room HVAC system and the AEE room HVAC system.

j. Each control room and AEER HVAC subsystem has a supply air filter unit that contains a charcoal filter unit, called the recirculation filter. Each filter unit consists of a pre-filter and a normally bypassed charcoal filter. Upon detection of smoke in the return ductwork, the charcoal filter is automatically placed in service. After validation of a high ammonia concentration in the air intake, the charcoal filter will be manually placed on line. Upon detection of high radiation, the Operator must manually place the charcoal filter on-line within 4 hours of detection to maintain the control room and AEER doses to within GDC 19 limits.

6.4.2 System Design

6.4.2.1 Definition of Control Room Envelope

Habitability systems on LaSalle County Station consist of the control room envelope and the AEE room envelope. A ventilation barrier is provided between the two envelopes by supplying independent HVAC systems as described in Subsection 9.4.1.

6.4.2.2 Ventilation System Design

The detailed ventilation system design is presented in Subsection 9.4.1.

All the components are designed to perform their function during and after the design basis earthquake except for the electric heating equipment, which is supported to stay in position, but may not function.

All components are protected from internally and externally generated missiles. A layout diagram of the control and AEE rooms, showing doors, corridors, stairways, shield walls and the equipment layout is given in Figure 6.4-1.

The description of controls, instruments, radiation, smoke, and ammonia monitors for the control/AEE room HVAC systems is included in Subsections 7.2. and 7.3.4.3. The locations of outside air intakes and potential sources of radioactive and toxic gas releases are indicated in Figure 6.4-2.

A detailed description of the emergency makeup air filter trains is presented in Subsection 6.5.1.

6.4.2.3 Leaktightness

The control room ductwork was leak tested during start-up and the leakage through the isolation dampers was determined from vendor data. All cable pans and duct penetrations are sealed. Approximately 1500 cfm of outside air is introduced in the control room envelope to maintain approximately 1/8 in. H_20 positive pressure with respect to adjacent areas and approximately 2500 cfm of outside air is introduced in the AEE room envelope to maintain approximately 1/8 in. H_20 positive pressure. During isolation of the control room or AEE room, due to the presence of toxic gases in the intake stream, the outside air dampers are shut.

6.4.2.4 Interaction with Other Zones and Pressure-Containing Equipment

The control room envelope is surrounded by the auxiliary building offices (elevation 768 feet). These offices are served by an independent HVAC system as described in Subsection 9.4.3. There is a ventilation barrier between the control room and auxiliary building office HVAC systems through concrete wall construction and leaktight doors.

The control room envelope is isolated from the turbine building through leaktight double doors.

6.4.2.5 Shielding Design

The shielding for the control and AEE rooms is designed so that the doses experienced by control room personnel during normal operation and during design-basis accidents are as low as reasonably achievable (ALARA). However, the main function of the shielding is to protect occupants from the radiation associated with a LOCA.

During normal operation the control and AEE rooms are shielded from radiation sources in reactor water, steam processing equipment, station vent stack, and in the calibration facility. The sources, shielding, areas affected, and the dose rates are given in Table 6.4-1.

The design-basis accident which requires excessive radiation protection for the control and AEE rooms is the LOCA. The radiation sources due to a LOCA are distributed throughout the containment and the environment surrounding the control and AEE rooms as specified in Chapter 15.0. The shielding design and doses are based on airborne, cloud, and plate out sources given in Table 6.4-2. The location of the sources is shown in Figure 6.4-3.

The shielding reduces the radiation dose rates inside the control room (from outside sources) to levels where the accumulated dose is a small fraction of the limit specified in Criterion 19 of 10 CFR 50 Appendix A.

The shielding arrangement for the control and AEE rooms is presented in Figure 6.4-1, the sources and accident doses are given in Table 6.4-2, and the LOCA shielding model is shown in Figure 6.4-3. Exposure of control room personnel due to airborne radiation inside the control room is discussed in Chapter 15.0.

The shielding which protects the control and AEE rooms during normal operation is directly associated with the radiation sources, i.e is not part of the control and AEE rooms shielding, which provides additional radiation protection. Table 6.4-1 lists the sources, total shielding thickness, and calculated dose rates during normal operation.

6.4.3 System Operational Procedures

During normal plant operation, the mixture of recirculated air and outside air for the control room HVAC system is filtered by high-efficiency, water and fire resistant glass fiber filters. The control room HVAC system is started through a remote control switch located in the control room. The sequence of operation is given in Chapter 7.0.

To remove any noxious gases, odors, and smoke from the control room environs, a bank of charcoal absorber beds is provided with each control room air handling equipment train. These charcoal beds, located downstream of high-efficiency filters, are normally bypassed. If noxious gases are detected in the control room environs (outside air intake), the control room HVAC system is manually put in the recirculation mode, by which the outside air intake dampers are closed and the recirculation air from the control room system is routed through the charcoal absorber banks by operation of the handswitch controls provided on the main control board.

On the smoke detection signal in the return duct, the supply air to the control room HVAC system is automatically routed through the charcoal absorber and annunciated on the main control board. The operator may continue to route the system supply air through the charcoal absorber for smoke removal, or depending on the condition of the outside air, may manually bypass the charcoal absorber and purge the system with outside air. Prior to manually placing the HVAC systems in purge, e.g., maximum outside and exhaust air, the operator shall align the supply air through the charcoal absorber.

In the event of high radiation detection from the outside air intake of the control room HVAC system, the radiation monitoring system automatically shuts off normal and maximum outside air supply, and maximum exhaust air to the system. The minimum outside air requirement is routed through the emergency makeup air filter train and fan (for removal of radioactive particulates and iodine), before being supplied to the system.

Two emergency makeup air filter trains and fans are provided, each capable of handling minimum requirements of outside air for the system. In the event of high radiation levels, each train is sized to process 4000 cfm of outside air, providing 1500 cfm to the control room HVAC system and 2500 cfm to the auxiliary electric equipment room HVAC system. Each train contains a supply air filter, which must be placed on-line within the first four hours of an accident to maintain CR doses within GDC 19 values. The emergency makeup air filter units are described in detail in Subsection 6.5.1.

6.4.4 Design Evaluation

The control room HVAC system is designed to maintain a habitable environment and to ensure the operability of all the components in the control room under all the station operating conditions. The system is provided with redundant equipment to meet the single failure criteria. The redundant equipment is supplied with separate essential power sources and is operable during loss of offsite power. The power supply and control and instrumentation meet IEEE-279 and IEEE-308 criteria. All the HVAC equipment except heating are designed for Seismic Category I.

The likelihood of an equipment fire affecting control room habitability is minimized because early ionization detection is assured, fire fighting apparatus is available, and filtration and purging capability are provided.

The following provisions are made to minimize fire and smoke hazards inside the control room and damage to nuclear safety- related circuits:

a. Most electrical wiring and equipment are surrounded by, or mounted in metal enclosures.

b. The nuclear safety-related circuits for redundant divisions (including wiring) are physically segregated by space or fire partitions to allow only isolated damage to electrical equipment.

c. Cables used throughout the control room are flame retardant.

d. Structural and finish materials (including furniture) for the control room and interconnecting areas have been selected on the basis of fire resistant characteristics. Structural floors and interior walls are of reinforced concrete. Interior partitions incorporate metal, masonry, or gypsum dry walls on metal joists. The control room ceiling, door frames, and doors are metallic. Wood trim is not used.

The air distribution in the control room is designed to supply air into the occupied area and exhaust through the control panels. In the event of smoke or products of combustion in the control panels, the ionization detection system alerts the operator and automatically positions dampers to pass all the supply air delivered to the conditioned spaces through a normally bypassed absorber for smoke and odor absorption. A manual override is also provided for this function as well as the ability to introduce 100% outside air to purge the control room as may be necessary.

Two redundant ammonia detectors are provided at each outside air intake duct to the control room HVAC system. Upon detection of ammonia in the outside air, a control room annunciator alarms. The intake dampers can be manually closed, and the control room HVAC system operated in 100% recirculation mode, thus routing the recirculating air through its charcoal absorbers.

Four radiation monitor channels (A, B, C, and D) are provided to detect high radiation at each outside air intake to the control room HVAC system. These monitor channels alarm the control room upon detection of high radiation. The emergency makeup air filter trains, designed to remove radioactive particulates and absorb radioactive iodine from the minimum quantity of outside air, are automatically started upon high radiation signals from two-out-of-four radiation monitor channels. The four monitor channels are divided into two trip systems. High radiation signals from Monitor channels A and B or C and D will start the emergency makeup filter train for each intake.

The emergency makeup air filter trains, recirculation filters, and control room shielding are designed to limit the occupational dose below levels required by Criterion 19 of 10 CFR 50 Appendix A.

The introduction of the minimum quantity of outside air to maintain the control room and other areas served by the control room HVAC system at a positive pressure with respect to surrounding potentially contaminated areas, at all the station operating conditions except when the system is in recirculation mode, precludes infiltration of unfiltered air into the control room.

The physical location of two redundant outside air intakes provides the option of drawing makeup air to the control room HYAC system from either of them depending upon the lesser contamination level, during and after a LOCA. It is possible that due to outside wind direction after a LOCA, one of the air intakes may not have any contaminants, while the other intake may have contaminants. The former may be utilized for makeup air in the control room. This provides additional security towards maintaining the habitability of the control room. The radiological consequences due to radioactivity drawn into the control room or AEER are provided in section 15.6.5.5.

6.4.5 Testing and Inspection

The control room HVAC system and its components are thoroughly tested in a program consisting of the following:

a. factory and component qualification tests,

b. onsite preoperational testing, and

c. onsite subsequent periodic testing.

Written test procedures establish minimum acceptable values for all tests. Test results are recorded as a matter of performance record, thus enabling early detection of faulty performance.

All equipment is factory inspected and tested in accordance with the applicable equipment specifications, codes, and quality assurance requirements. System ductwork and erection of equipment is inspected during various construction stages for quality assurance. Construction tests are performed on all mechanical components and the system is balanced for the design airflows and system operating pressures. Controls, interlocks, and safety devices on each system are cold checked, adjusted, and tested to ensure the proper sequence of operation.

The inplace HEPA and Charcoal filter testing acceptance criteria, and the decontamination efficiency for the emergency makeup unit comply with the values listed in Reg. Guide 1.52, Revision 2.

6.4.6 Instrumentation Requirements

All the instruments and controls for the control room HVAC system are electric or pneumatic.

a. Each redundant control room HVAC system has a local control panel and each is independently controlled. Important operating functions are controlled and monitored from the main control room.

b. Instrumentation is provided to monitor important variables associated with normal operation. Instruments to alarm abnormal conditions are provided in the control room.

c. A radiation detection system (instrument range 0.10 to 10,000 mr/hr.) is provided to monitor the radiation levels at the system outside air intakes and inside the control room. A high radiation signal is alarmed on the main control board.

d. The ammonia detection system is provided to detect the presence of ammonia at outside air intakes. Ammonia detection is annunciated locally and in the main control room.

e. The ionization detection is provided in the outside and return air path from associated areas. Ionization detection is annunciated locally and on the main control board via the fire detection control panel.

f. The control room HVAC system is designed for automatic environmental control with the manual starting of fans. The refrigeration equipment has a manual auto switch.

g. A fire protection water spray system is provided to each charcoal adsorber / absorber bed.

h. The various instruments of the control system are described in detail in Chapter 7.0.

i. The emergency makeup air filter train airflow rate and upstream HEPA filter differential pressure is transmitted to the main control board, recorded, and alarmed.

TABLE 6.4-1

DOSE RATES IN THE CONTROL AND AUXILIARY ELECTRIC EQUIPMENT (AEE) ROOMS DURING NORMAL OPERATIONS

COMPONENT	SOURCE	RADIATION	AREAS AFFECTED	TOTAL SHIELD THICKNESS (INCHES)*	CALCULATED DOSE RATE (mr/hr)
RWCU pump	Reactor water	Direct gamma	Control room	56	<0.1
			AEE room	42	<0.2
Skyshine	Reactor steam	Scattered gamma	Control room	30	<0.1
			Computer room	12	<0.5
Main steam tunnel	Reactor steam	Direct gamma	Control room	56	<0.5
			AEE room	56	<0.5
Station vent stack	Off-gas	Direct gamma	Control room	40	<0.1
Feedwater pump	Reactor steam	Direct gamma	Computer room	48	<0.1
Calibration facility	Cs-137	Direct gamma	AEE room	24	<0.1

* Thickness is given in inches of ordinary concrete with density of 140 pounds per cubic foot

TABLE 6.4-2

SHINE DOSE EXPERIENCED BY CONTROL ROOM PERSONNEL FOLLOWING LOSS-OF-COOLANT ACCIDENT*

SOURCE	SOURCE DISTRIBUTION **	SHIELD MODEL***	ACTUAL SHIELD***	MAXIMUM DOSE RATE (R/hr)	ACCUMULATED** DOSE (rem)
1. Primary Containment	100% Nobles, 50% Halogens, 1% Particulates evenly distributed	72 in. R.B. + 56 in. wall	72 in. R.B. + 56 in. wall		
a. Airborne	100% on west side†			$.6 \times 10^{-7}$	4×10^{-6}
b. Plate out				4×10^{-1}	2×10^{-8}
2. Reactor Building	0.5% per day from 1 above	56 in. wall, 36 in. ceiling	56 in. wall, 48 in. ceiling		
a. Airborne	evenly distributed			2×10^{-5}	2.2×10^{-3}
b. Plate out A	87% on west side†			1×10^{-5}	$<1 \times 10^{-2}$
c. Refueling floor plate out B	13% on west side†			1.2×10^{-3}	7.3×10^{-1}
3. SGTS Filter Unit	100% Halogens, particulates from 2a	36 in. R.B. + 56 in. wall	124 in. R.B. + 56 in. wall	2×10^{-9}	8×10^{-6}
4. Exhaust Clouds	Exhaust from 3, 100% Nobles, 10% Halogens				
a. External to stations		40 in. wall	40 in. wall	2×10^{-4}	8×10^{-3}
b. Airborne adjacent to control room		24 in. wall	24 in. wall	$<1 \times 10^{-7}$	$<1 \times 10^{-5}$
5. Control Room Air Intake Filter Unit	Exhaust from 3 100% Nobles, 10% Halogens	24 in. ceiling	36 in. ceiling	2×10^{-2}	1.5×10^{-1}
			Total(rem):	$<9.4 \times 10^{-1}$ leak rate of a 0.005/day <1 2 leak rate of 0.00635/day	

* Due to sources outside the control room an average χ/Q was used to calculate the sources on the control room intake filter; more than 2/3 of this value is due to fumigation.

** For calculation purposes, the duration of the LOCA was chosen to be 30 days. No credit was taken for containment spray or mixing in the secondary containment. The filter efficiency for the SGTS filter units is 99% for halogens and 99.95%, including filter bank bypass for particulates.

*** Thickness of ordinary concrete with density of 140 pounds per cubic foot.

† 50% of the available halogens particulates are plated out as indicated.

Note 1: The doses due to radioactivity drawn into the Control Room and Auxiliary Electric Equipment Room are given in section 15.6.5.5.

Note 2: This table was developed based upon the original source term used in the DBA LOCA analysis. The source term has been revised, but this table is conservative; and the resultant dose is negligible compared to the GDC 19 limits.

6.5 FISSION PRODUCT REMOVAL AND CONTROL SYSTEMS

6.5.1 Engineered Safety Feature (ESF) Filter Systems

The following filtration systems which are required to perform safety-related functions are provided:

a. Standby gas treatment system: This system is utilized to reduce halogen and particulate concentrations in gases leaking from the primary containment and which are potentially present in the secondary containment (reactor building) following the accident.

b. Control room and Auxiliary Electric Equipment Room (AEE Room) HVAC emergency makeup air filter units and recirculation filters: These systems are utilized to clean the outside air of halogen and particulates, which are potentially present in outside air following an accident, before introducing air into the control room or AEER HVAC system.

6.5.1.1 Design Bases

6.5.1.1.1 Standby Gas Treatment System

a. The standby gas treatment system is designed to automatically start in response to any one of the following signals:

    1. high pressure in Unit 1 or Unit 2 drywell,

    2. low-water level in Unit 1 or Unit 2 reactor,

    3. high radiation in exhaust air from over the fuel handling pools in the reactor building for either Unit 1 or Unit 2,

    4. high radiation in the ventilation exhaust plenum for reactor building for either Unit 1 or Unit 2, and

    5. manual activation from the main control room.

b. The radioactive gases leaking from the primary containment and which are potentially present in the secondary containment after a LOCA are treated in order to remove particulate and radioactive and nonradioactive forms of iodine to limit the offsite dose to the guidelines of 10 CFR 100.

c. The capability of one SGTS train to draw down the pressure in the secondary containment to -0.25 in. H_2O, and to maintain that secondary containment pressure, is verified on a staggered basis in accordance with Technical Specifications.

d. Any primary containment leakage (except that which is treated by the MSIV-ICLTM) will be contained within the secondary containment free air volume and will only reach the outside after passing through the SGTS. The secondary containment inleakage is determined by utilizing published leakage data for applicable building construction and incorporating known leakage values for piping, electrical, and duct penetrations at pressure control boundaries. The SGTS flow rate is approximately equal to the total free air volume of the reactor buildings for both Units 1 and 2 evacuated at a rate of one per day. The design flow rate through the SGTS also accounts for volumetric expansion of both reactor building air volumes due to temperature rises as equipment residual heat is released after ventilation and process system shutdown.

e. The secondary containment leakage is calculated in the following manner:

1. Assume laminar flow through small cracks, thus

$$Q = K \ \Delta P$$

where:

ΔP is the pressure differential across the secondary containment boundary; Q is the airflow rate (leakage); and K is the loss coefficient.

2. Take a secondary containment leak rate of 4000 ft^3/min at still wind conditions with -0.25 inch (H_2O) differential pressure between the outdoor ambient condition and the in-containment pressure.

3. Assume the manufacturer's certified leak test results on the siding for the reactor building.

4. Accept the air leakage test results contained in "Conventional Building for Reactor Containment," NAA-SR-10100.

f. Two full-capacity standby gas treatment system equipment trains and associated dampers, ducts, instruments, and controls are provided.

g. Each train is sized and specified for the worst conditions, treating incoming air-steam mixtures saturated at 150° F containing fission products and incoming particulates released from primary containment at the Tech. Spec. leakage rate as determined in accordance with Regulatory Guide 1.3 and T1D-14844. The design nominal volume rate for each train was established at 4000 cfm.

h. Each equipment train contains the amount of charcoal required to absorb the inventory of fission products leaking from the primary containment, based on a one unit LOCA.

i. Each train is designed with the proper air heaters, demister, and prefilters needed to assure the optimum gas conditions entering the high-efficiency particulate air (HEPA) and charcoal filters. The air heater is sized to reduce air entering at 150° F, 100% relative humidity to a maximum 70% relative humidity. The demister is specified to remove any entrained moisture in the airstream.

j. A standby cooling air fan is provided for each equipment train to remove heat generated by fission product decay on the HEPA filters and charcoal adsorbers after shutdown of the train.

The standby cooling air fan is conservatively sized to remove approximately 7700 Btu/hr of heat (generated by instantaneous deposition of iodine, on a HEPA filter bank and charcoal adsorbers) with less than a 50° F rise in cooling air temperature. This will limit the air temperature in the SGTS to 200° F maximum to prevent possible desorption and fire. Charcoal desorption temperature is given in ORNL-NSIC-65. No credit is taken for equipment or environment heat sink. Reactor building cooling air is routed through the shutdown train and exhausted to the atmosphere via the plant vent stack.

k. The SGTS exhibits a removal efficiency of no less than 99% on radioactive and nonradioactive forms of iodine and no less than 99.95%, including filter bank bypass on all particulate matter 0.3 micron and larger in size. The particulate removal efficiency is predicated on the use of 99% particulate removal efficiency. The physical property of new charcoal purchased shall meet requirements specified in Table 5-1 of ANSI/ASME N509-1980. Performance requirement shall be as specified in Table 5-1 of ANSI/ASME N509-1980 with penetration less than 0.5% as tested per ASTM D3803-1989. The charcoal is contained in gasketless, all welded construction adsorbers to preclude bypass of the charcoal and to ensure the highest removal efficiencies on methyl iodine.

   The exhaust air from each SGTS is routed through a seismically supported duct and is an elevated release at an elevation of 1080 feet above mean sea level, approximately 186 feet 8 inches above the highest structure. The discharge air velocity from the SGTS vent exhaust pipe is approximately 1270 fpm. This high point release provides effluent dispersion ratios sufficient to meet this requirement of 10 CFR 100.

l. The SGTS is designed with redundancy to meet single failure criteria.

m. The power supplies meet IEEE 308 criteria and ensure uninterrupted operation in the event of loss of normal a-c power. The controls meet IEEE 279.

n. The SGTS is designed to Seismic Category I requirements.

o. The SGTS is designed to permit periodic testing and inspection of the principal system components described in the following subsections.

6.5.1.1.2 Emergency Makeup Air Filter Units:

a. The emergency makeup air filter unit is designed to start automatically and provide outside air to the control room and auxiliary electric equipment room HVAC systems in response to any one of the following signals:

   1. high radiation signal from the radiation monitors installed in outside air intake louvers for the control room and auxiliary electric equipment room HVAC systems; and

   2. manual activation from the main control room.

b. The T1D-14844 source model in conjunction with approved methods is used to calculate the quantity of activity released as a result of an accident and to determine inlet concentrations to the emergency makeup air filter train. See section 15.6.5.5 for additional details.

c. The capacity of the emergency makeup air filter units is based on the air quantity required to maintain the rooms served by the control room HVAC and auxiliary electric equipment room HVAC systems at a minimum of 1/8 inch H2O positive pressure with respect to adjacent areas.

d. Two full capacity emergency makeup air filter units and associated dampers, ducts, and controls are provided.

e. Each unit is designed with the proper air heaters, demister, and prefilters needed to assure the optimum air conditions entering the high-efficiency particulate air (HEPA) and charcoal filters.

f. The emergency makeup air filter unit exhibits a removal efficiency of no less than 95% on radioactive and nonradioactive forms of iodine and no less than 99.95%, including filter bank bypass on all particulate matter 0.3 micron and larger in size.

g. The emergency makeup air filter unit is designed to meet single failure criteria.

h. The power supplies meet IEEE 308 criteria and ensure uninterrupted operation in the event of loss of normal a-c power. The controls meet IEEE 279.

i. The emergency makeup air filter units are designed to Seismic Category I requirements.

j. The emergency makeup air filter units are designed to permit periodic testing and inspection of principal system components described in the following subsections.

k. Each control room and AEER HVAC subsystem has a supply air filter unit that contains a charcoal filter unit, called the recirculation filter. Each filter unit consists of a pre-filter and a normally bypassed charcoal filter. Upon detection of smoke in the return ductwork, the charcoal filter is automatically placed in service. After validation of a high ammonia concentration in the air intake, the charcoal filter will be manually placed on line. Upon detection of high radiation, the Operator must manually place the charcoal filter on-line within 4 hours of detection to maintain the control room and AEER doses to within GDC 19 limits.

6.5.1.2 System Design

6.5.1.2.1 Standby Gas Treatment System

a. The schematic design of the SGTS is shown in Drawing No. M-89. Nominal size of principal system components are listed in the Table 6.5-1.

b. The SGTS is automatically or manually started to treat air exhausted from either reactor building. Two completely redundant parallel process systems are provided, each having a nominal capacity of 4000 ft3/min (at 150° F).

   As indicated on the schematic in Drawing No. M-89, each process system may be considered as an installed spare. The process systems have separate equipment trains, isolation valves, power feeds, controls, and instrumentation. Two full capacity redundant standby gas treatment system equipment trains are provided. One equipment train is located in the Unit 1 reactor building and the other equipment train is located in the Unit 2 reactor building. The suction and discharge side of both trains are headered together so that either of the trains can treat the air from both reactor buildings. Each SGTS equipment train and damper on the suction and discharge side of corresponding trains are powered by electrical essential Division 2 of the related unit. Either secondary containment isolation power signal starts both equipment trains and activates both alarms in the main control room. The operator then shuts down one of the standby gas treatment system equipment trains after ensuring that at least one of the two redundant trains is operating. The intake connections used for the standby gas treatment system are located on reactor building Units 1 and 2 floor elevation 820 feet 0 in. No redundant duct system component is located within 20 feet of its counterpart in areas where credible internal missiles or pipe whips might compromise redundancy.

c. Each SGTS has the following components:

   1. A primary fan for inducing the air from the spaces listed previously and discharging it through the filter train and common discharge pipe for elevated release to atmosphere. The fan performance and motor selection are based on the worst environmental conditions inside the reactor building. The flow and pressures are listed in Table 6.5-1.

2. A standby cooling air fan is sized to dissipate heat generated by fission product decay on the filters. The 200 ft^3/min flow capacity limits the maximum temperature in the train to 200° F for 150° F entering air temperature. The fan is used only after train shutdown and when the electric heater and primary fan are not operating.

3. A demister which removes any entrained water droplets and moisture to minimize water loading on the prefilter. The

demister meets qualification requirements similar to those in MSAR 71-45 and is in UL Class I.

4. A single stage electric heater is sized to reduce the humidity of the airstream to at least 70% relative humidity for the worst inlet conditions. An analysis of heater capabilities for various entering saturated air conditions ranging from 65° F to 150° F yields a peak heating requirement of 47,000 Btu/hr at 95° F entering air temperature. A 23-kW heater is provided.

5. A prefilter, UL listed, all-glass media, exhibiting no less than 85% efficiency based on ASHRAE atmospheric dust spot test.

6. A high-efficiency particulate air (HEPA) filter, water resistant, capable of removing 99.95% minimum of particulate matter which is 0.3 micron or larger in size. The filter is designed to be fire resistant. Four, 1000-ft /min elements are provided. All elements are fabricated in accordance with Military Specification MIL-F-51068, MIL-F-51079 and UL-586. The elements are size 5 with IIB element frame material. Gasket material will be SCE 43 per ASTM D1056. Testing of the HEPA filter banks is described in Subsection 6.5.1.4.

7. A charcoal adsorber capable of removing not less than 99% of radioactive and nonradioactive forms of iodine. The charcoal adsorber is a gasketless, welded seam type, filled with impregnated coconut shell charcoal. The bank holds a total of approximately 5800 pounds of charcoal.

   The charcoal specification requires an ignition temperature test and a methyl iodide test on each batch of charcoal supplied. In addition, model tests or previous qualification test data were required to demonstrate the effectiveness of the bed design before construction of the actual beds. Test data proving uniform packing density of charcoal in beds was also required.

   Ten test canisters are provided for each adsorber. These canisters contain the same depth of the same charcoal as is in the adsorber. The canisters are mounted, so that a parallel flow path is created between each canister and the adsorber. Periodically one of the canisters is removed and laboratory tested to reverify the adsorbent efficiency. Two deluge valves in parallel connected to the station fire protection system are mounted outside of the charcoal adsorber. The charcoal bed is provided with a high temperature detector. The detector sensing high adsorber temperature will actuate an alarm in the main control room. High temperature alarms are nominally set at 310 °F. Manual charcoal deluge valves are operated locally and then solenoid operated valves are operated from the control room. The normally manual closed isolation valves upstream of the deluge valve in all cases require local actions to initiate water flow.

8. A high efficiency particulate filter identical to the one described in item 6 previously is provided to trap charcoal fines which may be entrained by the airstream.

d. Flow control valves are utilized upstream to regulate flow through the train. The train upstream static pressure will fluctuate between +1 and -1 inches water gauge.

e. Full-size access doors to each filter compartment are provided in the equipment train housing. Access doors are provided with transparent portholes to allow inspection of components without violating the train integrity.

f. The housing is of all welded construction, heavily reinforced.

g. Interior lights with external light switches, are provided between all train components to facilitate inspection, testing, and replacement of components.

h. Filter frames are in accordance with recommendations of Section 4.3 of ORNL-NSIC-65.

i. The height of release of the standby gas treatment system vent to the atmosphere is at elevation 1080 feet (186 feet 8 inches above the highest structure on the station).

6.5.1.2.2 <u>Emergency Makeup Air Filter Units</u>

a. The emergency makeup air filter units work in conjunction with the control room and auxiliary electric equipment room HVAC system as described in Subsection 9.4.1. The nominal size of principal system components is listed in Table 9.4-1.

b. In the event of high radiation detection in the outside air intakes of the control room HVAC system, the radiation monitoring system automatically shuts off normal outside air supply to the system and routes the outside air through the emergency makeup air filter train and fan (for removal of radioactive particulates and iodine), before being supplied to the control room and auxiliary electric equipment room HVAC systems.

c. Two emergency makeup air filter trains and fans are provided, each capable of handling 4000 cfm nominal of outside air, providing approximately 1500 cfm to the control room HVAC system and approximately 2500 cfm to the auxiliary electric equipment room HVAC system.

d. Each emergency makeup air filter unit is comprised of the following components in sequence:

    1. A demister which removes any entrained water droplets and moisture to minimize water droplets and water loading of the prefilter. The demister will meet qualification requirements similar to those in Mine Safety Appliance Research (MSAR) report 71-45 and will be UL Class I.

    2. A single stage electric heater, sized to reduce the humidity of the airstream to at least 70% relative humidity for the worst inlet conditions. An analysis of heater capacities for various entering saturated air conditions ranging from - 10° F to 95° F yields a peak heating requirement of 60,000 Btu/hr at 95° F. A 20-kW heater is provided.

    3. A prefilter, UL listed, all glass media, exhibiting no less than 85% efficiency based on ASHRAE Standard 52.2 method of testing.

    4. A high-efficiency particulate (HEPA) filter, water resistant, capable of removing 99.97% minimum of particulate matter which is 0.3 micron or larger in size. The filter is designed to be fire resistant, as may be required after consideration of heat generation from postulated deposit of fission products. Four 1000 cfm elements are provided. All elements are fabricated in accordance with Military Specification MIL-F-51068, MIL-F-51079, and UL-586.

5. A charcoal adsorber capable of removing not less than 95% of radioactive forms of iodine is provided. The charcoal absorber is an all welded gasketless type filled with impregnated coconut shell charcoal. The charcoal adsorber beds hold approximately 650 pounds of charcoal.

   The bed dimensions are so designed that the air has at least 0.25 seconds of residence time through the charcoal. The physical property of new charcoal purchased shall meet requirements specified in Table 5-1 of ANSI/ASME N509-1980. Performance requirement shall be as specified in Table 5-1 of ANSI/ASME N509-1980 with penetration less than 0.5% as tested per ASTM D3803-1989.

   The charcoal specification requires an ignition temperature test and a methyl iodine test on each batch of charcoal supplied.

   Ten test canisters are provided for the charcoal adsorber. These canisters contain the same depth of the same charcoal as in the charcoal adsorber. The canisters are so mounted that a parallel flow path is created between each canister and the charcoal adsorber. Thus, the charcoal in the canisters is subjected to the same contaminants as the charcoal in the bed. Periodically, one of the canisters is removed and laboratory tested to reverify the absorbent efficiency.

   Two deluge valves connected to the station fire water system are mounted adjacent to each charcoal adsorber. Manual charcoal deluge valves are operated locally. The normally closed manual isolation valves upstream of the solenoid deluge valve, in all cases, require local actions to initiate water flow. The deluge system will spray the adsorber compartment and thereby precluding the chance of an adsorber fire.

6. A high-efficiency particulate filter identical to the one described in item 4 is provided to trap charcoal fines which are entrained by the airstream.

7. A fan induces the air from the intake louvers and the makeup air filter train and discharges it to the suction side of the control room air handling equipment train. The fan performance is based on the maximum density and worst pressure condition, when it is inducing -10° F air from the outdoors and the makeup air filter train, containing filters which operate at no less than

twice their clean pressure drop.

8. Full size access doors adjacent to each filter are provided in the equipment train housing. Access doors are provided with transparent portholes to allow inspection and maintenance of components without violating the train integrity. Spacing between filter sections is based on ease of maintenance considerations.

9. The housing is an all welded construction, heavily reinforced, and built to tight leakage requirements.

10. Interior lights with external light switches are provided between all train components to facilitate inspection, testing, and replacement of components.

6.5.1.2.3 Supply Air Filter Unit Recirculation Filter

Each control room and AEER HVAC subsystem has a supply air filter unit that contains a charcoal filter unit, called the recirculation filter. Each filter unit consists of a pre-filter and a normally bypassed charcoal filter. Upon detection of smoke in the return ductwork, the charcoal filter is automatically placed in service. After validation of a high ammonia concentration in the air intake, the charcoal filter will be manually placed on line. Upon detection of high radiation, the Operator must manually place the charcoal filter on-line within 4 hours of detection to maintain the control room and AEER doses to within GDC 19 limits.

6.5.1.3 Design Evaluation

6.5.1.3.1 Standby Gas Treatment System

The Standby Gas Treatment System (SGTS) is designed to preclude direct exfiltration of contaminated air from either reactor building following an accident or abnormal occurrence which could result in abnormally high airborne radiation in the secondary containment. Equipment is powered from essential buses and all power circuits will meet IEEE 279 and IEEE 308. Redundant components are provided where necessary to ensure that a single failure will not impair or preclude system operation. A standby gas treatment system failure analysis is presented in Table 6.5-2.

An analysis was performed to determine the SGTS equipment capacity, based on the total inleakages to the secondary containment for both Units 1 and 2, while all the areas in the secondary containment are maintained at 0.25-inch water gauge negative. The secondary containment air pressure will begin to increase and approach 0 in. H_2O (i.e., rises from initial -0.25 in. H_2O to 0 in. H_2O) due to inleakage into the secondary containment during post-LOCA and at times when SGTS is started. The secondary containment air pressure begins to decrease exponentially at the time the SGTS reaches its full capacity. As required by the Technical Specifications, within 300 seconds the secondary containment pressure will be reduced to -0.25 in. H_2O with the SGTS at full capacity (see Figure 6.3-80). During this time period, the pressure difference is always negative (assuming 0 wind speed); therefore, only inleakage from the outside atmosphere can occur.

6.5.1.3.2 Emergency Makeup Air Filter Units

The emergency makeup air filter units work in conjunction with the control room and auxiliary electric equipment room HVAC systems to maintain habitability in the control room and auxiliary equipment rooms. The design evaluation is given in Subsection 6.4.4.

6.5.1.4 Tests and Inspections

6.5.1.4.1 Standby Gas Treatment System

a. The SGTS and its components are thoroughly tested in a program consisting of the following:

   1. factory and component qualification tests,

   2. onsite preoperational testing, and

   3. onsite periodic testing.

   Written test procedures establish minimum acceptable values for all tests. Test results are recorded as a matter of performance record, thus enabling early detection of depleted performance.

b. The factory and component qualification tests consist of the following:

   1. equipment train housing - a leak test ±2.0 psig internal pressure, and magnetic particle or liquid penetrant testing per Section III of ASME Boiler and Pressure Vessel Code of all welds which could cause bypass leakage around HEPA filters or adsorber beds;

   2. demister - qualification test or objective evidence to demonstrate compliance with specified design criteria;

   3. HEPA filters - elements tested individually by applicable inspection and testing methods;

   4. HEPA filter frames - liquid penetrant test per ASME B&PV Code Section III of all welds which could cause bypass leakage around HEPA filters.

   5. adsorbent beds - model test of bed or objective evidence to demonstrate flow pressure characteristics, channeling effects;

6. adsorbent - qualification tests for ignition temperature and methyl iodine removal efficiency test;

7. fans - tested in accordance with the latest revision of AMCA Standard 210 "Air Moving and Conditioning Association Test Code for Air Moving Devices," to establish characteristic curves, etc.;

8. heater - uniform temperature test, high temperature cutout test, and adjacent equipment temperature test;

9. prefilter - objective evidence or certification that ASHRAE efficiency specified is attained; and

10. valves - shop tests demonstrating leaktightness, closure times.

c. The onsite preoperational tests are discussed in Section 14.1 of the FSAR.

d. Onsite periodic testing - Operating personnel are trained and required to make surveillance checks. These checks shall include visual inspection and periodically running the equipment trains for performance testing as outlined in the Technical Specifications.

6.5.1.4.2 Emergency Makeup Air Filter Units

a. The emergency makeup air filter unit and its components were thoroughly tested in a program consisting of the following:

1. factory and component qualification tests,

2. onsite preoperational testing, and

3. onsite subsequent periodic testing.

Written test procedures establish minimum acceptable values for all tests. Test results are recorded as a matter of performance record, thus enabling early detection of faulty performance.

b. The factory and component qualification tests consisted of the following:

1. Filter Train Housing

a) leak test at design internal pressure, and

b) magnetic particle or liquid penetrant testing per Section III of ASME Boiler and Pressure Vessel Code of all welds which could cause bypass leakage around HEPA filters or absorber bed.

2. Demister

qualification test or objective evidence to demonstrate compliance with specified design criteria.

3. Prefilter

objective evidence or certification that ASHRAE efficiency specified were attained.

4. HEPA Filters

elements tested individually in accordance with applicable inspection and testing methods.

5. HEPA Filter Frames

liquid penetrant testing per ASME B&PV Code Section III of all welds which could cause bypass leakage around HEPA filters or adsorber bed.

6. Adsorbent Beds

model test of bed or objective evidence to demonstrate flow pressure characteristics, channeling effects.

7. Adsorbent

qualification tests for ignition temperature and methyl iodine removal efficiency test.

8. Fans were tested in accordance with the latest revision of AMCA Standard 210 "Air Moving and Conditioning Association Test Code for Air Moving Devices," to establish characteristic curves, etc.

9. Heater

   a) uniform temperature test,

   b) high-temperature cutout test, and

   c) adjacent equipment temperature test.

10. The onsite preoperational testing as described in Chapter 14.0 of the FSAR.

11. Onsite subsequent periodic testing as described in the Technical Specifications.

6.5.1.5 Instrumentation Requirements

a. Differential pressure indicators are provided to measure the pressure drop across each filter. Pressure differential across the upstream HEPA filter is transmitted to the main control board, recorded, and alarmed on high-pressure differential.

b. Each adsorber bed is provided with high-temperature detectors. The temperature detector actuates an alarm in the control room when the increase in adsorber temperature is beyond a preset value.

c. Manual charcoal deluge valves are operated locally. The normally closed manual isolation valves upstream of the solenoid deluge valve, in all cases, require local actions to initiate water flow. The deluge system will spray the adsorber compartment and thereby precluding the chance of an adsorber fire.

d. All power-operated isolation valves are supplied with position switches to provide positive indication on the main control board.

e. High-temperature cutouts are provided as an integral part of the single stage electric heaters. Local temperature indication is provided upstream and downstream of the electric heaters.

f. Flow signals are transmitted to the main control board for indication recording and are used as an input to a flow control valve provided upstream of each equipment train.

g. Remote manual operation is provided on the main control board for each fan, and each deluge valve.

6.5.1.6 Materials

a. All component material is capable of a service life of 40 years normal operation plus 6 months post-LOCA at the maximum cumulative radiation exposure without any adverse effects on service, performance, or operation. All materials of construction are compatible with the radiation exposure set forth. This includes but is not limited to all metal components, seals, gaskets, lubricants, and finishes, such as paints, etc. The integrated dose following the once-in-a-lifetime post-LOCA, uses the values given in UFSAR Section 3.11.

b. Care is taken to avoid the use of any compounds or other chemicals during fabrication or production that contain chlorides or other constituents capable of inducing stress corrosion in stainless steels which are used in the adsorber bed.

c. Pressure and temperature - All components, including the housings, shall be designed in accordance with the applicable pressure and temperature conditions.

d. All filter unit gaskets and seal pads are closed-cell, ozone resistant, oil-resistant neoprene or silicone-rubber sponge, Grade SCE-43 in accordance with ASTM D1056.

e. Only adhesives as listed and approved under AEC Health and Safety Bulletin 306, dated March 31, 1971, covering Military Specification MIL-F-51068C, dated June 8, 1970, and all the latest amendments and modifications are used.

f. The organic compounds included in the filter train are as follows:

    1. charcoal;

    2. the binder in the HEPA filter media (the total weight of media per filter element is approximately 4 pounds, or a total of 32 pounds per equipment train);

    3. adhesive used in HEPA filters - approximately 1 liquid quart of fire-retardant neoprene adhesive is used to manufacture each HEPA filter;

    4. neoprene gaskets used on HEPA filters and o-rings are used on the charcoal filter sample canisters; and

5. the binder in the glass pads used in the demister section (this is a phenolic compound).

6.5.2 Containment Spray Systems

The containment spray systems are described in Section 6.3. The containment spray systems are not required for fissions product removal.

6.5.3 Fission Product Control System

The standby gas treatment system (SGTS) is used to control the cleanup of fission products from the containment following an accident and is described in detail in Subsection 6.5.1.

6.5.4 Ice Condenser as a Fission Product Cleanup System

Not applicable.

TABLE 6.5-1
(SHEET 1 OF 4)

STANDBY GAS TREATMENT SYSTEM COMPONENTS

NAME OF EQUIPMENT	TYPE, QUANTITY AND NOMINAL CAPACITY (per component)
A. Filter Unit	
1. Equipment Numbers	1VG01S, 2VG01S
2. Type	Package
3. Quantity	2
4. Components of Each Unit	
a. Fan	
Type	Centrifugal
Quantity	1
Drive	Direct
Capacity (ft^3/min)	4000 (nominal)
Static Pressure (in. H_2O)	14.8
b. Demister	
Type	Impingement
Quantity	1 Bank with 4 elements
Static resistance	
clean (in. H_2O)	0.95
dirty (in. H_2O)	1.7
c. Heater	
Type	Electric, sheathed, single stage

TABLE 6.5-1
(SHEET 2 OF 4)

NAME OF EQUIPMENT	TYPE, QUANTITY AND NOMINAL CAPACITY (per component)
Quantity	1
Capacity (kW)	23
Accessories	Overload cutout
d. Prefilter	
Type	High Efficiency
Quantity	1 Bank With 4 Elements
Efficiency (per ASHRAE) Dust Spot Test)	90%
Static resistance	
clean (in. H_2O)	0.35
dirty (in. H_2O)	1
e. HEPA Filters	
Type	Absolute High Efficiency
Quantity	4 Elements per Bank. Two Banks per Train
Media	Glass Fiber, Waterproof, Fire Resistant
Bank Efficiency (% with 0.3 micron particles)	99.97 (Purchased) 99.95 (Operational Requirement)
Static Resistance	
clean (in. H_2O)	0.7
dirty (in. H_2O)	2

TABLE 6.5-1
(SHEET 3 OF 4)

NAME OF EQUIPMENT	TYPE, QUANTITY AND NOMINAL CAPACITY (per component)
f. Charcoal Adsorber Bed	
Type	Vertical gasketless
Quantity	8 - 8 in. thick
Media	Impregnated Charcoal
Iodine Removal Efficiency (%)	99 (Operational Requirement) 99 (Operational Requirement)
Quantity of Media (lb)	5800
Depth of Bed (in.)	8
Residence Time for 8 in. bed (sec)	2.0
Static Resistance (in. H_2O)	4.6
g. Standby Cooling Air Fan	
Type	Centrifugal
Quantity	1
Drive	Direct
Capacity (ft^3/min)	200
Static Pressure (in. H_2O)	5

TABLE 6.5-1
(SHEET 4 OF 4)

NAME OF EQUIPMENT	TYPE, QUANTITY AND NOMINAL CAPACITY (per component)
B. Secondary Containment Isolation Dampers	
1. Equipment Numbers	1VQ037, 1VQ038 2VQ037, 2VQ038 1VR04YA&B, 1VR05YA&B 2VR04YA&B, 2VR05YA&B
2. Type	Special
3. Quantity	8
4. Operator	Air Cylinder
5. Diameter (in.)	72

TABLE 6.5-2

STANDBY GAS TREATMENT SYSTEM EQU1PMENT FAILURE ANALYSIS

COMPONENT	FAILURE	FAILURE DETECTED BY	ACTION
Primary Fan	Motor Burnout, Drive Shaft Break, etc.	Flow Monitor - Low-Flow Switch	Main Control Board Alarm. Redundant train started after its isolation valves are positioned properly. Operating train is then shut down.
Electric Heating Coil	Element Overheat	High Temperature Protection Circuit on Coil	Main Control Board Indication. Redundant train started after its isolation valves are positioned properly. Operating train is then shut down.
Standby Cooling Fan	No Startup Results In High Charcoal Adsorber Temperature	Temperature Switch	If temperature switch trips, then alarm sounds in main control room (Station operator manually actuates deluge valves). Redundant train started after its isolation valves are positioned properly. Operating train is then shut down.
Flow Control Valve	Fails Open	Flow Monitor - High-Flow Switch	Main Control Board Alarm. Redundant train started after its isolation valves are positioned properly. Operating train is then shut down.
Flow Control Valve	Fails Shut	Flow Monitor - Low-Flow Switch	Main Control Board Alarm. Redundant train started after its isolation valves are positioned properly. Operating train is then shut down.
Isolation Valve	Fails Open		None - Redundant valves or backflow dampers provided as required.
	Fails Shut	Flow Monitor - Low-Pressure Switch	Main Control Board Alarm. Redundant train started after its isolation valves are positioned properly. Operating train is then shut down.
HEPA Filter	High Particulate Loading	High ΔP Alarms	Main Control Board Alarm. Redundant train started after its isolation valves are positioned properly. Operating train is then shut down.
Duct	Destruction by Equipment Missile or Flailing Pipe	Flow Monitor - High-Flow Switch	Main Control Board Alarm. Redundant train started after its isolation valves are positioned properly. Operating train is then shut down.
Deluge Valve	Fails Closed	No Detection	None required, two valves provided to flood bed.

6.6 INSERVICE INSPECTION OF ASME CODE CLASS 2 AND 3 COMPONENTS

6.6.1 Components Subject to Examination

All ASME Class 2 components (pressure vessels, piping, pumps, and valves) are inservice inspected according to ASME, B&PVC, Section XI, Subsection IWC, with appropriate addendum(s). The main steamlines (four) are inspected from the first outside containment isolation valve to the turbine stop valves. Inspection requirements are the same as for ASME Class 2 components.

All ASME Class 3 components (pressure vessels, piping, and valves) are inservice inspected according to ASME, B&PVC, Section XI, Subsection IWD, with appropriate addendum(s).

6.6.2 Accessibility

The design and arrangement of the ASME Class 2 and ASME Class 3 piping, pump, and valve components have been made accessible for inspection and examination as follows:

Pipe and Equipment Welds

Location and clearance envelopes have been established for inspection and examination. Contours and surface finish are acceptable for inspection and examination.

Insulation Removal

Piping or components to be inspected according to the Section XI code which are insulated, have been designed with removable numbered insulation panels.

Shielding

Piping or components to be inspected according to the Section XI code and are radiologically shielded have been designed with removable or accessible shields.

6.6.3 Examination Techniques and Procedures

Inservice inspection will be in accordance with ASME, B&PV Section XI.

6.6.4 Inspection Intervals

The initial 10-year inspection program for LaSalle units 1 and 2 was submitted to the NRC on July 13, 1982 and December 21, 1982, respectively. The inservice inspection program for both units 1 and 2 are based on the requirements of the ASME, Section XI 1980 edition including addenda through winter 1980. The inservice examinations conducted during the second 120 month Inspection Interval will comply with the 1989 Edition of ASME Section XI, except in cases where relief has been granted by the NRC. The inservice examinations conducted during the third 120 month Inspection Interval will comply with the 2001 Edition through the 2003 addenda, including the December of 2003 Erratum of ASME Section XI, except in cases where relief has been granted by the NRC.

6.6.5 Examination Categories and Requirements

The inservice inspection categories and requirements for Class 2, and Class 3 components are in agreement with ASME Section XI.

Specific written requests for relief from ASME code requirements determined to be impractical were contained in the initial inservice inspection program. Relief from those requirements was granted by the NRC, detailed evaluation is included in Appendix C of NUREG-0519, Supplement No. 5, Safety Evaluation Report related to the operation of LaSalle County Station, Units 1 and 2.

6.6.6 Evaluation of Examination Results

The evaluation of Class 2 components examination results will comply with the requirements of Section XI.

The repair procedures for Class 2 and 3 components comply with the requirements of Section XI.

6.6.7 System Pressure Tests

All Class 2 system pressure testing complies with the criteria of Code Section XI, Article IWC-5000. All Class 3 system pressure tests comply with the criteria of Article IWD-5000.

6.6.8 Augmented Inservice Inspection to Protect Against Postulated Piping Failures

This inspection has been adequately covered by the requirements of Section XI already adhered to previously.

6.7 MAIN STEAM ISOLATION VALVE LEAKAGE CONTROL SYSTEM (MSIV-LCS) Unit 2 deleted, Unit 1 abandoned in place

The Main Steam Isolation Valve Leakage Control System provided originally has been deleted. The valve leakages are processed by the Isolated Condenser Leakage Treatment Method as discussed in Section 6.8.

6.8 Main Steam Isolation Valve - Isolated Condenser Leakage Treatment Method

The Main Steam Isolation Valve - Isolated Condenser Leakage Treatment Method (MSIV - ICLTM) (Also called the MSIV Alternate Treatments Leakage Paths) controls and minimizes the release of fission products which could leak through the closed main steam isolation valves (MSIV's) after a LOCA. The system provides this control by processing valve leakage through the main steamlines, main steamline drains, and the main condenser.

6.8.1 Design Bases

6.8.1.1 Safety Criteria

The following general and specific design criteria represent system design, safety, and performance requirements imposed upon the MSIV-ICLTM:

a. The safety function of the main steamlines and main steamline drains are described in LSCS-UFSAR Section 10.3.

b. The safety function of the main condenser is described in LSCS-UFSAR Section 10.4.1.

6.8.1.2 Regulatory Acceptance Criteria

The classification of the components and piping of the main steam supply system is listed in Table 3.2-1. All components and piping for the main steam supply system are designed in accordance with the codes and standards listed in Table 3.2-2 for the applicable classification.

The classification of the main condenser is described in LSCS-UFSAR Section 10.4.1.3.

6.8.1.3 Leakage Rate Requirements

The MSIV-ICLTM has been incorporated as an integral part of the BWR plant design. The design features employed with this systems are established to reduce the leakage rate of radioactive materials to the environment during a postulated LOCA. Leakage control requirements are imposed upon the MSIV-ICLTM in order to:

a. eliminate the possibility of secondary containment bypass leakage of accident induced radioactive releases,

b. allow for higher MSIV leakage limits, and

c. assure reasonable leakage verification test frequencies (once per fuel cycle).

The design and operational requirements imposed upon the MSIV-ICLTM relative to the foregoing criteria are established to:

a. allow MSIV leakage rates up to a total of 400 scfh for all MSIV valves,

b. allow a MSIV leakage rate verification testing frequency compatible with the requirements of plant operating technical specifications, and

c. assure and restrict total plant dose impacts below 10 CFR 100 guidelines.

6.8.2 System Description

6.8.2.1 General Description

The system provides this control by processing valve leakage through the main steamlines, main steamline drains, and the main condenser.

6.8.2.2 System Operation (U2 MSIV LCS delete, U1 Abandon-in-place)

With the deletion of the MSIV-LCS, MSIV leakage will pass from the outboard MSIV, through the main steamlines, main steamline drains and into the condenser. The large wetted volume in the main condenser plates out inorganic iodine and holds up other fission products that escape through the MSIVs, limiting release to the environment. This alternate pathway is more reliable than the MSIV-LCS since less equipment is employed. The alternate pathway also has a much higher capacity for processing leakage than does the MSIV-LCS, with a capacity of only 100 scfh. In addition, the MSIV-LCS will only operate at less than 35 psig reactor vessel steam dome pressure, whereas the alternate pathway is independent of reactor pressure.

To properly align the pathway, in addition to closing the MSIVs and the containment isolation valves, operators will close valves to isolate the leakage pathway from the auxiliary steam supplies. The operating drains will also be closed and the shutdown drains will be opened. All of the remote manually operated valves that need to be moved are powered from Class 1E power supplies. Although these valves and their power supplies (with the exception of the MSIVs) are not maintained as safety-related, design control for all of these valves is maintained with respect to their importance to safety. Appropriate changes to station procedures have been made to reflect deletion of the MSIV-LCS and use of the alternate leakage treatment method.

6.8.2.3 Equipment Required

The following equipment components are provided to facilitate system operation:

a. piping - process piping is carbon steel throughout;

b. valves - motor-operated, standard closing speeds;

c. main condenser

6.8.3 System Evaluation

An evaluation of the capability of the MSIV-ICLTM to prevent or control the release of radioactivity from the main steamlines during and following a LOCA has been conducted. The results of this evaluation are presented in LaSalle County Nuclear Power Stations Units 1 and 2 Application for Amendment of Facility Operating Licenses NPF-11 and NPF-18, Appendix A, Technical Specifications, and Exemption to Appendix J of 10CFR50 Regarding Elimination of MSIV Leakage Control System and Increased MSIV Leakage Limits, NRC Docket Nos. 50-373 and 50-374.

Additionally, Sargent & Lundy performed an evaluation on the piping, condenser and turbine building, to assure they would remain functional during a seismic event to mitigate the radiologically consequences of MSIV leakage (Reference Sargent & Lundy Calculation 068078 (EMD), Rev. 2, dated 8/9/95 for Unit 1 and 067927 (EMD), Rev. 2 dated 8/10/95 for Unit 2).

See Section 15.6.5.5 for more information in the dose analysis and dose consequences.

6.8.4 Instrumentation Requirements

The instrumentation necessary for control and status indication of the MSIV-ICLTM is designed to function under Seismic Category I and environmental loading conditions appropriate to its installation with the control circuits designed to satisfy separation criteria. MSIV closed indication is powered from Class 1E power and is maintained as safety-related.

6.8.5 Inspection and Testing

Preoperational tests for the main steamlines, main steamline drains, and the main condenser are discussed in LSCS-UFSAR Sections 10.3.4 and 10.4.1.4. No additional testing is required to support this operating mode.

TABLE 6.8-1

DOSE CONSEQUENCES OF MSIV LEAKAGE

LEAKAGE 30 DAYS FOLLOWING LOCA-UNIT 1

(100 SCFH per line)

	WHOLE BODY DOSE (rem)	THYROID DOSE (rem)
Exclusion Area (509 meters)	1.451E-3	3.14E-2
Low Population Zone (6400 meters)	3.3E-2	10.47

ATTACHMENT 6.A

ANNULUS PRESSURIZATION

ATTACHMENT 6.A

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6.A ANNULUS PRESSURIZATION

6.A.1 INTRODUCTION

Annulus pressurization refers to the loading on the shield wall and reactor vessel caused by a postulated pipe rupture at the reactor pressure vessel nozzle safe-end to pipe weld. The pipe break assumed is an instantaneous guillotine rupture which allows mass/energy release into the drywell and annular region between the biological shield wall and the reactor pressure vessel (RPV).

The mass and energy released during the postulated pipe rupture cause:

a. A rapid asymmetric decompression acoustic loading of the annular region between the vessel and shroud from the pipe break at or beyond the vessel nozzle safe-end weld.

b. A transient asymmetric differential pressure within the annular region between the biological shield wall and the reactor pressure vessel (annulus pressurization).

c. A jet-stream release of the reactor pressure vessel inventory and the impact of the ruptured pipe against the whip restraint attached to the biological shield wall.

The results of the mass and energy release evaluation are then used to produce a dynamic structural analysis (force-time history) of the RPV and shield wall. The force time history output from the dynamic analysis is subsequently used to compute loads on the reactor components. The following is a more detailed description of the annulus pressurization calculation performed for the LaSalle County Station.

6.A.2 SHORT-TERM MASS ENERGY RELEASE

The postulated pipe rupture at the weld between recirculation or feedwater piping and the reactor nozzle safe end leads to a high rate of water and steam mixture into the annulus between the RPV and the shield wall. Figure 6.A-1 illustrates the location of this break. Calculation of the mass/energy release is performed using the generic method for short-term mass releases. This method and a sample calculation are described below. Figure 6.A-2 illustrates a typical mass flux vs. time for a feedwater line break.

The purpose of this procedure is to document the method by which short-term mass release rates are calculated. The flow rates which could be produced by a primary system line break for the first 5 seconds include the effects of inventory and subcooling. Optionally, credit may be taken for a finite break opening time.

ASSUMPTIONS

The assumptions are as follows:

a. The initial velocity of the fluid in the pipe is zero. When considering both sides of the break, the effects of initial velocities would tend to cancel out.

b. Constant reservoir pressure.

c. Initial fluid conditions inside the pipe on both sides of the break are similar.

d. Wall thickness of the pipe is small compared to the diameter.

e. Subcompartment pressure $\simeq$ 0.

f. Mass flux is calculated using the Moody steady slip flow model with subcooling.

g. For steamline breaks, level swell occurs at 1 second after the break with a quality of 7%.

NOMENCLATURE (See Figure 6.A-3)

A_{BR} - Break area.

A_L - Minimum cross-sectional area between the vessel and the break. This can be the sum of the areas of parallel flow paths.

C - Sonic velocity (see Figure 6.A-4).

D - Pipe inside diameter at the break location.

F_I - Inventory flow multiplier.

F_I = 0.75 for saturated steam.

FI = 0.50 for liquid and saturated steam-liquid mixtures.

g_c - Proportionality constant (=32.17 [2] lbm-ft/lbf-sec^2).

G - Mass flux.

G_C - Maximum mass flux (see Figure 6.A-5).

h_O - Reservoir or vessel enthalpy.

h_P - Initial enthalpy of the fluid in the pipe.

h_7 - Enthalpy at P_O and a quality of 7%.

L_I - Inventory length. The distance between the break and the nearest area increase of A_L whichever is less.

$\dot{M}$ - Mass flow rate.

$\dot{M}_I$ - Mass flow rate during the inventory period.

P_O - Reservoir or vessel pressure.

P_{SAT} - Saturation pressure for liquid with an enthalpy of h_P.

t - Time.

t_I - Length of the inventory period.

v - Specific volume of the fluid initially in the pipe.

V_I - Volume of the pipe between the break and A_L .

X - Separation distance of the break.

6.A.2.1 Instantaneous Guillotine Break

The following method should be applied to each side of the break and the results summed to determine the total flow.

Inventory Period

Prior to a pipe break, the fluid in the pipe is moving at a relatively low velocity. After the break occurs, a finite time is required to accelerate the fluid to steady-state velocities. The length of this time period is conservatively estimated as follows:

a. If $A_L / A_{BR} > F_I$,

$$t_I = \frac{2 L_I}{c} \tag{6.A-1}$$

b. If $A_L / A_{BR} < F_I$,

$$t_I = \frac{V_I}{A_{BR}\ G\ F_I\ v} \tag{6.A-2}$$

where G is calculated as shown in Subsection 6.A.2.4 for a large separation distance and $t < t_I$.

During this time period, the mass flow rate is calculated as

$$\dot{M}_I = G\ A_{BR}\ F_I \tag{6.A-3}$$

Steady-State Period

Following the inventory period, the flow is assumed to be choked at the limiting cross-sectional flow area.

For $t_I < t < 5.0$ seconds, (6.A-4)

$$\dot{M} = A_L\ G$$

6.A.2.2 Break Opening Flow Rate

See Table 6.A-1 for the pipe displacement time history for postulated recirculation suction pipe rupture and Figure 6.A-7 for the nomenclature used.

Inventory Period

The inventory period is determined as described in Subsection 6.A.2.1. The flow rate as a function of pipe separation distance is given by

$$\dot{M} = G\ \pi\ D\ X \tag{6.A-5}$$

where G is obtained by using the methods of Subsection 6.A.2.4 (a or b).

Determining Flow Rate

Following the inventory period, equation 6.A-5 is used to deter mine the flow rate where the mass flux, G, is determined from Subsection 6.A.2.4 (a, c, or d).

6.A.2.3 Combined Break Flow

To determine the total flow rate released from the break, the results of Subsections 6.A.2.1 and 6.A.2.2 are compared and whichever produces the smallest flow rate at any time is used (see Figure 6.A-6). Both methods produce maximum flow rates based on different limiting areas. The transfer from one curve to the other represents a change in the point where the flow is choked.

6.A.2.4 Determination of the Mass Flux, G

Depending on the time period, fluid conditions, and break separation distance, the mass flux is determined as follows:

$$X_B = \sqrt{1-(P_{SAT}/P_o)} \quad (D/2) \qquad (6.A\text{-}6)$$

a. If $X < X_B$,

$$G = \sqrt{2g_c P_o / v}$$

b. If $X > X_B$ and $t < t_I$
$G = G_c(P_o, h_p)$ from Figure 6.A-5

c. If $X > X_B$ and $t > t_I$
$G = G_c(P_o, h_o)$ from Figure 6.A-5

d. If the break is a steamline and
T > 1.0, level swell occurs.
$G = G_c(P_o, h_7)$ from Figure 6.A-5

Note that for complete break separation (Subsection 6.A.2.1), X is always greater than X_B, and for saturated water, X_B is equal to zero.

6.A.2.5 Biological Shield Wall

For the purpose of analyzing the biological shield wall pressurization, credit may be taken for flow which escapes through the wall penetration. If the initial break location is in the annulus region between the wall and the vessel, no flow is assumed to escape through the penetration. If, however, it is located within the penetration itself, some of the flow may be assumed to escape. It is recommended that the fraction of the flow which escapes be calculated based on the ratio of the minimum annular flow area between the penetration and pipe surface and between the penetration and pipe surface and between the penetration and the safe-end nozzle.

6.A.2.6 Comparison of the GE model with the Henry/Fauske Correlation

The GE methodology for calculating the mass energy release from a recirculation line break which results in an annulus pressurization event was provided the NRC's Mr. Denwood F. Ross, Assistant Director for Reactor Safety, via GE letter dated May 2, 1978, from Mr. E. D. Fuller of BWR Licensing. This methodology was used in the adequacy assessment made for LSCS.

The definition of the annulus pressurization is given in the introduction (Subsection 6.A.1). A description of the time aspects of the calculated mass and energy flow rates followed by a description of the modeling for the feedwater line and separately for the recirculation line is provided below. A comparison is then made between GE's analytical method and the method used in RELAP4/MOD5. Finally, both graphical and numerical results of this comparison are provided to substantiate the conclusion that the resulting break flows using the GE methods are much more conservative than those predicted by the use of RELAP for the LaSalle plant.

Timing Aspects of Mass and Energy Flow Rates

The GE method for calculating the short-term mass/energy release assumes that the overall time for mass release may be divided into two periods, the inventory period and the quasi-steady period. The inventory period is defined as the time required to accelerate the pipe fluid to steady-state velocities, at which time the flow is assumed to choke at minimum flow cross sections. During this time, the mass flux is based on initial thermodynamic conditions existing within the pipe. In the quasi-steady period, during which the flow is choked, the mass flux is based on thermodynamic conditions upstream from the choke points. For both time periods the mass flux is determined from a graph of critical mass flux versus enthalpy, as calculated by the Moody Slip Flow Method. Each side of the break is analyzed separately and the results summed to give the total mass release rate.

Method for Feedwater Line Modeling

The feedwater system for LaSalle County Station consists of the pumps, heaters, valves, and piping necessary for the transmission of hotwell condensate to the reactor vessel as part of the closed cycle cooling loop. LSCS has three feedwater pumps, two steam- driven and one electric-driven. During normal operation, the electric pump is in standby. The flow passes through a complex series of pipes and components from the feedwater pumps to the reactor vessel.

The break location for the feedwater line break is the safe-end to the pipe weld housed within the vessel to shield wall subcompartment. For the feedwater line break, instantaneous break opening is assumed. Flow for the vessel side passes through the feedwater nozzles of the broken line and out the break. Flow from the system side passes through the feedwater piping network and out the break.

The nodalization of the feedwater system is shown in Figures 6.A-8 and 6.A-9. A series of 24 modes was selected after sensitivity studies were completed which demonstrated that a 24-node model was conservative relative to higher-noded systems.

The broken feedwater leg to be analyzed was chosen by multiple RELAP runs to determine the limiting break location. The critical assumptions in the analysis are as follows:

a. The feedwater pumps are simulated as (constant) mass flow sources.

b. The reactor pressure vessel (RPV) is an infinite reservoir at constant temperature and pressure.

c. The temperature of the pump-side hydraulic network remains constant.

d. Appropriate sections of the hydraulic network are combined by means of "Ohm's Law" expressions for series and parallel circuits, assuming constant fanning friction actions.

e. The RPV thermodynamics state is subcooled at the prevailing temperature in the lower plenum (532° F).

The break is modeled as an instantaneous guillotine pipe break with complete pipe offset. Before the break occurs, a fully open valve connects, Volumes 18 and 19. Closed valves connect those volumes to Volume 1, an infinite sink at constant pressure and temperature (atmospheric conditions). The break is initiated at time zero by closure of the valve between Volumes 18 and 19 simultaneous opening of the valves to Volume 1.

Method of Recirculation Line Modeling

The recirculation system for LaSalle County Station is similar to the recirculation system of other BWR's. Flow is taken from the lower jet pump diffuser region, passed through 21-inch lines to a constant-speed pump, and then through a flow control valve to a header which feeds flow to five risers which provide flow to two jet pump nozzles each.

The nodalization for the recirculation line leak is shown in Figure 6.A-10. The system has been modeled using 21 nodes. The break is located at the vessel nozzle safe-end to pipe weld on the recirculation pump suction side. The type of break considered here has a finite break opening time. For this case the break opening is complete after 30 milliseconds, at which time the pipe offset longitudinal distance is 5.8 inches. The break area is modeled as the surface area of an imaginary volume having a length of 5.8 inches and a diameter equal to that of the recirculation pipe ID. This volume (#18) is connected by a valve (Type 3) to an infinite reservoir (volume #19), and also by valves (Type 2) to the vessel side volume (#27) and pump side volume (#21). Both valves (Type 1) also connect Volumes 17 and 21. It is normally open before the break, and at the initiation of the break, closes at the same rate as the other valves open. The sum of the areas of the Type 2 valves equals the pipe area.

This network of valves best represents the break with finite opening time. Valves of Type 2 are opened at the same rate as Type 3 to ensure that choking occurs at Junctions 21 and/or 22. Junction 23 (having valve Type 3) is in reality a fluid surface, and choking cannot physically occur there. Choking must at least occur at Junctions 21 and/or 22, where the fluid is constrained by the pipe diameter.

Other assumptions in the analysis include:

a. Negligible effects of core reactor kinetics on rated heat transfer to the core volume (Volume 2).

b. Constant flow of steam from the steam dome (Volume 5) at rated conditions.

c. Constant flow of feedwater at rated conditions.

d. Recirculation pumps trip at the time zero and are modeled via pump characteristic curves for coastdown.

e. Jet pump hydraulics were modeled as one equivalent pump per recirculation loop.

Comparison of General Electric Analysis to RELAP4/MOD5

For the annulus pressurization event, the NRC has questioned General Electric's method for computing mass and energy flow rates following a postulated LOCA from long lines containing subcooled fluid. A program was developed to expedite the licensing of the LaSalle County Station to perform RELAP analyses using appropriate assumptions and to compare the results with those obtained using General Electric's method.

RELAP4/MOD5 is a general computer program which can be used to analyze the thermal hydraulic transient behavior of a water- cooled nuclear reactor subjected to postulated accidents such as loss-of-coolant accidents. The program simultaneously solves the fluid flow, heat transfer, the reactor kinetics equations describing the behavior of the reactor.

Numerical input data is utilized to describe the initial conditions and geometry of the system being analyzed. This data includes fluid volume, geometry, pump characteristics, power generation, heat exchanger properties, and nodalization of fluid flow paths. Once the system has been described with initial flow, pressure, temperature, and power level boundary conditions, transients such as loss-of-coolant accident can be simulated by control action inputs. RELAP then computes fluid conditions such as flow, pressure, mass inventory and quality as a function of time.

For the brief transients considered here ($t \leq 0.5$ seconds), appreciable simplification of the overall thermal-hydraulic system, including the reactor pressure vessel, is justified owing to the relatively longer time constants which apply for heat transfer. Brief summaries of the modeling approaches for feedwater and recirculation line breaks are given below.

The assumptions applied to these analyses are as follows:

a. Feedwater line:

   1. LaSalle RELAP deck as basis.

   2. Henry-Fauske-Moody flow model is used.

   3. Instant break opening.

   4. Mass flux terms between vessel and break (short side) are eliminated.

b. Recirculation line:

   1. LaSalle RELAP deck as basis.

   2. Finite break opening time is allowed for.

   3. Henry-Fauske-Moody flow model is used.

   4. Momentum flux terms in RELAP between vessel and break (short side) are eliminated.

<u>Results of the Analysis</u>

The resulting break flows using the GE methods are much more conservative than those obtained by the use of RELAP. This is indicated graphically in Figures 6.A-11 through 6.A-13.

Conclusions

The mass release result for the GE mass energy release method and the RELAP4/Mod 5 calculations are compared in Figures 6.A-11 through 6.A-13 for the postulated feedwater line break and recirculation line break respectively. The analyses show that the GE method is conservative relative to RELAP 4/Mod 5 for both cases. The ration (r) of the GE method flow rates to those from RELAP/MOD5 is as follows:

Break Location	r(t = 0.1 sec)	r(t = 0.5 sec)
Feedwater (Leg EA)	2.300	1.70
Feedwater (Leg EB)	2.200	1.60
Recirculation Line	1.065	1.21

6.A.3 LOAD DETERMINATION

6.A.3.1 Acoustic Loads

Because the boiling water reactor (BWR) is a two-phase system that operates at or close to saturation pressure (1000 psi), the differential pressure across the reactor shroud is of short duration, and the BWR system is not subjected to a significant shock-type load with respect to structural supports. This short- duration acoustic load is confined to a bending moment and shear force on the reactor pressure vessel and reactor shroud support. Typical results of the integrated force acting on the reactor pressure vessel shroud are given in Table 6.A-2.

6.A.3.2 Pressure Loads

The pressure responses of the RPV-shield wall annulus for a recirculation suction line and a feedwater line were investigated using the RELAP4 computer code. An asymmetric model using several nodes and flow paths was developed for the analysis of the recirculation and feedwater line breaks. Further description of these analytical models and detailed discussion of the analyses may be found in Section 6.2.

The pressure histories generated by the RELAP4 code were in turn used to calculate the loads on the sacrificial wall and the reactor pressure vessel. The annulus was divided into seven zones and an eighth-order Fourier fit to the output pressure histories made for each zone to produce the Fourier coefficients required for the structural analysis of the shield wall. The specific loading data consisted of the time-pressure (psia) histories for each node within the annulus. Time-force histories representing the resultant loads on the RPV for each node through its geometric center were generated by taking the product of the node pressure and its "effective" surface area.

A sample pressure-to-force calculation is shown in Subsection 6.A.4. Subsection 6.A.5 shows the nodalization schemes and pressure areas used in this calculation. The time-force histories (forcing functions) calculated at each nodal point for both a recirculation and a feedwater line break are shown in Subsection 6.A.7. The nodal points are illustrated in Figure 6.A-14.

6.A.3.3 Jet Loads

To address structural loads on the vessel and internals completely, jet thrust, jet impingement, and pipe whip restraint loads must be considered in conjunction with the above mentioned pressure loads. Jet thrust refers to the vessel reaction force with results as the jet stream of liquid is released from the break. Jet impingement refers to the jet stream force which leaves the broken pipe and impacts the vessel. The pipe whip restraint load is the force which results when the energy-absorbing pipe whip restraint restricts the pipe separation to less than one full pipe diameter. This restricted separation is accounted for as a finite break opening time in the mass/energy release calculation. These jet loads are calculated as described in ANSI 176 (draft), "Design Basis For Protection Of Nuclear Power Plants Against Effects Of Postulated Pipe Ruptures", January 1977.

The jet load forces used in this analysis are shown in Subsection 6.A.6. Although these values have been calculated for a recirculation line break only, they are also conservatively used for the feedwater load evaluation. This is conservative because the calculation of these jet effects depends largely on the area of the break, and the recirculation line is about 2.5 times larger in area. Figure 6.A-15 illustrates the location of the pressure loads and jet loads with respect to the RPV and shield wall.

The pressure loads and jet loads described above are then combined to perform a structural dynamic analysis. Both of these loads are appropriately distributed along a horizontal beam model, which is shown in Figure 6.A-14. The vessel coordinates of these nodal points are described in Table 6.A-3.

The force time histories are then applied to a composite lumped- mass model of the pedestal, shield wall, and a detailed representation of the reactor pressure vessel and internals. The DYSEA01 computer program is used for this analysis. This computer program is described in Subsection 6.A.3.4. The analysis produces acceleration time histories at all nodes for use in evaluating the reactor pressure vessel and internal components. Response spectra at all nodes are also computed.

The peak loading on the major components used to establish the adequacy of the component design is shown in Tables 6.A-4 and 6.A-5.

6.A.3.4 Dynamic and Seismic Analysis (DYSEA) Computer Program

The DYSEA (Dynamic and Seismic Analysis) program is a GE proprietary program developed specifically for seismic and dynamic analysis of RPV and internals/building systems. It calculates the dynamic response of linear structural systems by either temporal modal superposition or response spectrum method. Fluid- structure interaction effect in the RPV is taken into account by way of hydrodynamic mass.

The DYSEA program was based on the program SAP-IV with added capability to handle the hydrodynamic mass effect. Structural stiffness and mass matrices are formulated similar to SAP-IV. Solution is obtained in the time domain by calculating the dynamic response mode by mode. Time integration is performed by using Newmark's β-method. Response spectrum solution is also available as an option.

Program Version and Computer

The DYSEA version now operating on the Honeywell 6000 computer of GE, Nuclear Energy Systems Division, was developed at GE by modifying the SAP-IV program. Capability was added to handle the hydrodynamic mass effect due to fluid-structure interaction in the reactor. The program can handle three-dimensional dynamic problems with beam, trusses, and springs. Both acceleration time histories and response spectra may be used as input.

History of Use

The DYSEA program was developed in the summer of 1976. It has been adopted as a standard production program since 1977 and it has been used extensively in all dynamic and seismic analysis of the RPV and internals/building systems.

Extent of Application

The current version of DYSEA has been used in all dynamic and seismic analysis since its development. Results from test problems were found to be in close agreement with those obtained from either verified programs or analytic solutions.

<u>Test Problems</u>

<u>Problem 1:</u>

The first test problem involves finding the eigenvalues and eigenvectors from the following characteristic equation:

$$(\omega^2 [M]-[K]) \{x\} = 0$$

where ω is the circular frequency, x is the eigenvector, and [K] and [M] are the stiffness and the mass matrices given by:

$$[M] = \begin{bmatrix} 1 - \frac{4}{\pi^2} & \frac{4}{\pi^2} & - \frac{4}{q\pi^2} \\ & 1 - \frac{4}{q\pi^2} & \frac{4}{\dot{\pi}^2} \\ \text{Symmetric} & & 1 - \frac{4}{25\pi^2} \end{bmatrix} \tag{6.A-7}$$

$$[K] = \begin{bmatrix} 1 + \frac{\pi^2}{4} & 3 & \frac{5}{q} \\ & 1 + \frac{g\pi^2}{4} & 15 \\ \text{Symmetric} & & 1 + \frac{25\pi^2}{4} \end{bmatrix} \tag{6.A-8}$$

The analytical solution and the solution from DYSEA are:

a) Eigenvalues ω_i:

<u>i</u>	DYSEA SOLUTION	ANALYTIC SOLUTION
1	5.7835	5.7837
2	30.4889	30.4878
3	75.0493	75.0751

b) Eigenvectors ϕ_i:

1. DYSEA SOLUTION / ANALYTIC SOLUTION

$$0.0319 \quad \begin{bmatrix} 1.000 & 1.000 & 1.000 \\ -0.0319 & -1.5536 & -1.2105 \\ -0.0072 & -0.0666 & 2.0271 \end{bmatrix} \qquad \begin{bmatrix} 1.000 & 1.000 & 1.000 \\ -0.0319 & -1.554 & -1.211 \\ -0.0072 & -0.0666 & 2.027 \end{bmatrix}$$

Problem 2:

The second test problem compares the dynamic responses of the reactor pressure vessel, internals and reactor building subjected to earthquake ground motion.

The mathematical model of the reactor pressure vessel, internals and reactor building is given in Figure B-1. The inputs in the form of ground spectra are applied at the basement level. Response spectrum analysis was used in the analysis.

Natural frequencies of the system and the maximum responses at key locations have been calculated by both DYSEA and SAMIS. Result comparison are given in B-1 and B-2. It can be seen that the results calculated by DYSEA agree closely with those obtained by SAMIS.

6.A.4 PRESSURE TO FORCE CONVERSION

The RELAP4 pressure distribution output is converted to equivalent forces which are input into the DYSEA01 computer program. Each pressure is represented by a force acting normal to the RPV or shield wall at the center of the given pressure surface area. These forces are then converted into resulting forces (x component) acting on the respective DYSEA01 RPV beam nodal points. Mathematically, this is described as:

$$F_R = PA \cos \theta$$

where:

F_R = resultant force (lb),

P = RELAP4 node pressure (psia),

A = RELAP4 node surface area (in^2), and

θ = Component angle.

The results of these calculations are summarized in Table 6.A-4.

As an example, the pressure to force conversion at DYSEA01 node points 31 and 32 is shown below:

Time = 0.0800 seconds

NODE	ELEV (inches)	PRESSURE (lb/in^2)	AREA* (in^2)	ANGLE (degrees)	FORCE (lb)
6	1089.14	43.61	5828.44	15	245516
7	1089.14	35.34	5828.44	45	145660
8	1089.14	39.24	5828.44	75	59188
9	1089.14	41.40	8617.79	112.5	-136539
10	1089.14	39.99	8617.79	157.5	-318367
					- 4543

*See Table 6.A-8

For 360°, the resultant force is 2 times 4543 lb or an inward (positive) force of 9086 lb.

Since DYSEA nodal points 31 and 32 are at Elevations 1065.2 inches and 1125.7 inches respectively, the RELAP4 pressure/force at Elevation 1089.14 inches is distributed accordingly.
Consequently:

$$F_{31} = \frac{1125.7 - 1089.14}{1125.7 - 1065.2} (9086) = 5491 \text{ lb, and}$$

$$F_{32} = \frac{1065.2 - 1089.14}{1065.2 - 1125.7} (9086) = 3595 \text{ lb.}$$

These values can be compared to the computer-calculated DYSEA01 results, which are 5832.6 lb and 3252.7 lb respectively.

In the matrix displacement method of structural analysis, externally applied nodal forces and moments are required to produce nodal displacements equivalent to those that would be produced by forces or pressures applied between nodes. GE considers the external moment effects for LaSalle AP to be negligible because of the close nodal spacing of the LaSalle RPV mathematical model.

6.A.5 SACRIFICIAL SHIELD, ANNULUS PRESSURIZATION, AND RPV LOADING DATA

This subsection provides a brief description of the analyses performed and the nodalization schemes, force constants, and load centers for the recirculation and feedwater line breaks. These data are used as input to the pressure to force conversion calculation.

The pressure responses of the RPV-sacrificial shield wall annulus to postulated pipe breaks at the RPV nozzle safe-end to pipe weld in a recirculation outlet line and a feedwater line were investigated using the RELAP4 computer code. Throughout the analyses the following assumptions were made:

a. RPV thermal insulation displaces to the shield wall while retaining its original volume and leaving its support structure in place.

b. Insulation above the shield wall yields to elevated pressures and blows out into the drywell allowing venting of annulus at the summit of the shield wall.

c. sacrificial shield penetration doors remain closed, allowing for limited venting of the annulus through all nozzle penetrations.

The nodalization schemes for both studies remain consistent with the guidelines cited above, with the exception of the region directly above the break, where it was anticipated that a finer mesh would be necessary to properly account for the highly localized pressure gradients expected there (see Figures 6.A-16 and 6.A-17). The final nodalization was determined on the basis of available sensitivity studies for similar analyses.

The mass and energy release rates were derived with the methods outlined in Subsection 6.A.2. The blowdown rates for the recirculation outlet line break analysis account for actual pipe displacement, while those for the feedwater line reflect an assumption of instantaneous pipe displacement (see RELAP4 input listings, Tables 6.A-6 and 6.A-7).

The specific loading data compiled for the NSSS adequacy evaluation for postulated pipe breaks within the annulus consists of the time-pressure history (psia) and two time-force (lbf) histories for each node within the annulus. The latter two histories represent integrated forces acting through the center of each node on the RPV and the sacrificial shield wall respectively. The time-force histories were generated by taking the product of the node pressure and a predetermined constant, or η_{ss}, which accounts for the curved surface of the RPV and the sacrificial shield respectively (see Tables 6.A-8 and 6.A-9). The two loading histories, one for the RPV and one for the shield wall, are defined below.

$$F_{v_i} = \int_{-\Delta\theta/2}^{+\Delta\theta/2} P_i \ \ell_i \ R_V \cos 0 d\theta - \xi \sum_j P_i \left\{ \frac{\pi D_{p_j}^2}{4} \right\} \qquad (6.A\text{-}9)$$

$$= P_i \, 2 \ell_i \, R_V \sin(\Delta\theta/2) - P_i \ \xi \sum_j \left\{ \frac{\pi D_{p_j}^2}{4} \right\}$$

$$= P_i \ \eta_v$$

Where:

F_{v_i} ≡ nodal resultant force on RPV (lbf),

P_i ≡ node absolute pressure (psia),

ℓ_i node height (inches),

R_V ≡ RPV radius (inches),

$\Delta\theta$ ≡ azimuthal width of node (degrees), and

D_{p_j} ≡ pipe OD (in.).

(6.A-10)

$$F_{ss_i} = \int_{-\Delta\theta/2}^{+\Delta\theta/2} P_i \ \ell_i \ R_{ss} \cos \theta \, d\theta - \xi \sum_j P_i \left\{ \frac{\pi D^2_{ss_j}}{4} \right\}$$

$$= P_i \ 2\ell_i \ R_{ss} \ \sin \left(\Delta\theta/2\right) - P_{i_u} \ \xi \sum_j \left\{ \frac{\pi D^2_{ss_j}}{4} \right\}$$

$$= P_i \ \eta_{ss}$$

Where:

F_{ss_i} ≡ nodal resultant force on shield wall (lbf),

P_i ≡ node absolute pressure (psia),

ℓ_i ≡ node height (inches),

R_{ss} ≡ shield wall inner radius (inches),

$\Delta\theta$ ≡ azimuthal width of node (degrees),

D_{ss_j} ≡ penetration ID (inches), and

ξ ≡ proportionality factor $= \dfrac{\sin \dfrac{(\Delta\theta)}{2}}{\dfrac{\Delta\theta}{2}} \left\{ \dfrac{360}{2\pi} \right\}$

6.A.6 JET LOAD FORCES

This subsection provides the jet load forces which result from pipe separation during the postulated accident. The pipe whip schematic is shown in Figure 6.A-7, and the resulting loads are listed in Table 6.A-1.

These loads are applied to the appropriate nodal points for input to the DYSEA01 computer program. The DYSEA01 program input is provided in Table 6.A-10.

6.A.7 RECIRCULATION AND FEEDWATER LINE BREAK FORCING FUNCTION

The time force histories provided in Tables 6.A-11 and 6.A-12 are those values converted from the time-pressure histories which were calculated with the RELAP4 computer program. These time forces histories are used as input to the DYSEA01 computer program.

TABLE 6.A-1
(SHEET 1 OF 5)

TIME HISTORY FOR POSTULATED RECIRCULATION

SUCTION PIPE RUPTURE*, **

Time (sec)	Pipe Displ. At Restraint (in.)	Pipe Velocity At Restraint (ft/sec)	Pipe Acceler. At Restraint (ft/sec^2)	Rel. Displ. Of End (in.)	Total Displ. Of End (in.)	Restr. Load Comp. PD1 (lb)	Restr. Load Comp. PD2 (lb)	Blowdown Force (lb)
0.00153	4.147E-02	3.547E 00	1.679E 03	0.	4.648E-02	0.	0.	346919.
0.00233	8.294E-02	4.889E 00	1.655E 03	0.	9.295E-02	0.	0.	346919.
0.00297	1.244E-01	5.932E 00	1.645E 03	0.	1.394E-01	0.	0.	346919.
0.00351	1.659E-01	6.816E 00	1.640E 03	0.	1.859E-01	0.	0.	346919.
0.00398	2.074E-01	7.597E 00	1.635E 03	0.	2.324E-01	0.	0.	346919.
0.00441	2.488E-01	8.304E 00	1.632E 03	0.	2.789E-01	0.	0.	346919.
0.00481	2.903E-01	8.955E 00	1.630E 03	0.	3.253E-01	0.	0.	346919.
0.00519	3.318E-01	9.561E 00	1.628E 03	0.	3.718E-01	0.	0.	346919.
0.00554	3.732E-01	1.013E 01	1.626E 03	0.	4.183E-01	0.	0.	346919.
0.00587	4.147E-01	1.067E 01	1.624E 03	0.	4.648E-01	0.	0.	346919.
0.00687	5.427E-01	1.077E 01	3.194E 02	2.689E-02	6.351E-01	50588.	0.	346919.
0.00787	6.742E-01	1.117E 01	4.350E 02	9.147E-02	8.471E-01	108204.	0.	346919.
0.00887	8.108E-01	1.159E 01	3.863E 02	1.808E-01	1.089E 00	168037.	0.	346919.
0.00987	9.519E-01	1.190E 01	2.419E 02	2.875E-01	1.354E 00	229892.	0.	346919.
0.01087	1.096E 00	1.203E 01	3.532E 01	4.076E-01	1.636E 00	293042.	0.	346919.
0.01187	1.240E 00	1.194E 01	-2.099E 02	5.388E-01	1.928E 00	356421.	0.	346919.

* Output parameters are listed at the end of this table.

** Except for the restraint load components PD1 and PD2, all variables below are in a direction parallel to the blowdown force.

TABLE 6.A-1
(SHEET 2 OF 5)

Time (sec)	Pipe Displ. At Restraint (in.)	Pipe Velocity At Restraint (ft/sec)	Pipe Acceler. At Restraint (ft/sec^2)	Rel. Displ. Of End (in.)	Total Displ. Of End (in.)	Restr. Load Comp. PD1 (lb)	Restr. Load Comp. PD2 (lb)	Blowdown Force (lb)
0.01287	1.381E 00	1.158E 01	-4.744E 02	6.802E-01	2.228E 00	418752.	0.	346919.
0.01387	1.517E 00	1.096E 01	-7.414E 02	8.316E-01	2.531E 00	478650.	0.	346919.
0.01487	1.643E 00	1.007E 01	-1.027E 03	9.934E-01	2.835E 00	538908.	0.	346919.
0.01587	1.757E 00	8.948E 00	-1.197E 03	1.166E 00	3.136E 00	581800.	0.	346919.
0.01687	1.857E 00	7.672E 00	-1.335E 03	1.350E 00	3.431E 00	618871.	0.	346919.
0.01787	1.941E 00	6.278E 00	-1.438E 03	1.543E 00	3.719E 00	649762.	0.	346919.
0.01887	2.008E 00	4.801E 00	-1.504E 03	1.746E 00	3.996E 00	674226.	0.	346919.
0.01987	2.056E 00	3.279E 00	-1.531E 03	1.956E 00	4.261E 00	692131.	0.	346919.
0.02087	2.086E 00	1.751E 00	-1.519E 03	2.172E 00	4.510E 00	703465.	0.	346919.
0.02187	2.098E 00	2.567E-01	-1.469E 03	2.392E 00	4.744E 00	708338.	0.	346919.
0.02222	2.098E 00	0.	0.	2.470E 00	4.822E 00	708572.	0.	346919.
0.02242	2.098E 00	0.	0.	2.513E 00	4.865E 00	708572.	0.	346919.
0.02262	2.098E 00	0.	0.	2.555E 00	4.907E 00	708572.	0.	346919.
0.02283	2.098E 00	0.	0.	2.598E 00	4.950E 00	708572.	0.	346919.
0.02304	2.098E 00	0.	0.	2.640E 00	4.992E 00	708572.	0.	346919.
0.02325	2.098E 00	0.	0.	2.683E 00	5.035E 00	708572.	0.	346919.
0.02347	2.098E 00	0.	0.	2.725E 00	5.077E 00	708572.	0.	346919.
0.02370	2.098E 00	0.	0.	2.768E 00	5.120E 00	708572.	0.	346919.
0.02393	2.098E 00	0.	0.	2.810E 00	5.162E 00	708572.	0.	346919.

TABLE 6.A-1
(SHEET 3 OF 5)

Time (sec)	Pipe Displ. At Restraint (in.)	Pipe Velocity At Restraint (ft/sec)	Pipe Acceler. At Restraint (ft/sec^2)	Rel. Displ. Of End (in.)	Total Displ. Of End (in.)	Restr. Load Comp. PD1 (lb)	Restr. Load Comp. PD2 (lb)	Blowdown Force (lb)
0.02417	2.098E 00	0.	0.	2.853E 00	5.2O5E 00	708572.	0.	346919.
0.02442	2.098E 00	0.	0.	2.895E 00	5.247E 00	708572.	0.	346919.
0.02467	2.098E 00	0.	0.	2.938E 00	5.290E 00	708572.	0.	346919.
0.02494	2.098E 00	0.	0.	2.980E 00	5.332E 00	708572.	0.	346919.
0.02522	2.098E 00	0.	0.	3.023E 00	5.375E 00	708572.	0.	346919.
0.02551	2.098E 00	0.	0.	3.065E 00	5.417E 00	708572.	0.	346919.
0.02582	2.098E 00	0.	0.	3.108E 00	5.460E 00	708572.	0.	346919.
0.02614	2.098E 00	0.	0.	3.150E 00	5.502E 00	708572.	0.	3469l9.
0.02649	2.098E 00	0.	0.	3.193E 00	5.545E 00	708572.	0.	346919.
0.02687	2.098E 00	0.	0.	3.235E 00	5.587E 00	708572.	0.	346919.
0.02728	2.098E 00	0.	0.	3.278E 00	5.630E 00	708572.	0.	346919.
0.02774	2.098E 00	0.	0.	3.320E 00	5.672E 00	708572.	0.	346919.
0.02827	2.098E 00	0.	0.	3.363E 00	5.715E 00	708572.	0.	346919.
0.02893	2.098E 00	0.	0.	3.405E 00	5.757E 00	708572.	0.	346919.
0.02992	2.098E 00	0.	0.	3.448E 00	5.800E 00	708572.	0.	346919.

TABLE 6.A-1
(SHEET 4 OF 5)

Output Parameters Summary

Effective clearance (inches)	Length from restraint to break (ft)	Restraint loading direction
0.415	3.542	0 degrees

Pipe bending strain limit (in/in)	Pipe rotation stability limit (degr.)	Max. allowable bending moment (ft-lbs)
9.054E-02	7.7815	1417307

Impact Velocity = 10.67 ft/sec   Impact Time = 0.0059 seconds

Number of bars composing the restraint	Defl. of struc. in direction of thrust (in.)	Defl. of restr. in direction of thrust (in.)
2	0.7086	0.9754

Force on restr. in direction of thrust (lb)	Force on struc. in direction of thrust (lb)	Time at peak dynamic load (seconds)
708572	708572	0.0221

Total energy absorbed by the restraint (ft-lb)	`Energy absorbed by the structure (ft-lb)	Energy absorbed by the bottom hinge (ft-lb)
30522	20920	1956

Energy absorbed by the top top hinge (ft-lb)	Restraint load (peak) components (lb)		Restraint load (static) components (lb)	
	PD1	PD2	PS1	PS2
0.	708572	0.	138258	0.

TABLE 6.A-1
(SHEET 5 OF 5)

Relative defl. of pipe end in the direction of the thrust (in.)		Total defl. of the pipe end	
3.4649		5.8168	
Defl. time for pipe end (seconds after impact)		Total time of movement	
0.0250		0 0309	
Energy absorbed by the restraint hinge (ft-lb)		Total absorbed energy (ft-lb)	
115445		168843	
Pipe defl. at restraint components (in.)		Pipe defl. at the break components (in.)	
XR1	XR2	XP1	XP2
2.0986	0.	5.8168	0.

TABLE 6.A-2

ACOUSTIC LOADING ON REACTOR PRESSURE VESSEL SHROUD

TIME (msec)	ACOUSTIC LOAD (kips)
0	0
1.2	0
1.6	150
2.0	320
2.5	650
2.8	250
3.0	100
3.2	0

TABLE 6.A-3
(SHEET 1 OF 2)

RPV COORDINATES OF NODAL POINTS

NODE NUMBER	NODAL COORDINATES X-ORDINATE	Y- ORDINATE	Z-ORDINATE
1	-912.000	774.000	1563.000
2	-912.000	774.000	1556.000
3	-912.000	774.000	981.200
4	-912.000	774.000	740.000
5	-912.000	774.000	1356.000
6	-912.000	774.000	1316.000
7	-912.000	774.000	1279.200
8	-912.000	774.000	1240.400
9	-912.000	774.000	1201.600
10	-912.000	774.000	1163.600
11	-912.000	774.000	1141.700
12	-912.000	774.000	1125.700
13	-912.000	774.000	1065.200
14	-912.000	774.000	1035.200
15	-912.000	774.000	1021.300
16	-912.000	774.000	994.200
17	-912.000	774.000	1601.700
18	-912.000	774.000	1559.700
19	-912.000	774.000	1499.700
20	-912.000	774.000	1436.900
21	-912.000	774.000	1398.500
22	-912.000	774.000	1318.000
23	-912.000	774.000	1279.200
24	-912.000	774.000	1240.400
25	-912.000	774.000	1201.600
26	-912.000	774.000	1163.600
27	-912.000	774.000	1141.700
28	-912.000	774.000	1125.700
29	-912.000	774.000	1021.300
30	-912.000	774.000	1035.200
31	-912.000	774.000	1065.200
32	-912.000	774.000	1125.700
33	-912.000	774.000	1141.700
34	-912.000	774.000	1163.600
35	-912.000	774.000	1201.600
36	-912.000	774.000	1240.400
37	-912.000	774.000	1279.200
38	-912.000	774.000	1318.000
39	-912.000	774.000	1356.600
40	-912.000	774.000	1398.500
41	-912.000	774.000	1436.900
42	-912.000	774.000	1499.700
43	-912.000	774.000	1559.700
44	-912.000	774.000	1563.600

TABLE 6.A-3
(SHEET 2 OF 2)

NODAL COORDINATES

NODE NUMBER	X-ORDINATE	Y- ORDINATE	Z-ORDINATE
45	-912.000	774.000	1601.700
46	-912.000	774.000	1619.800
47	-912.000	774.000	1724.200
48	-912.000	774.000	1743.600
49	-912.000	774.000	1768.200
50	-912.000	774.000	1817.100
51	-912.000	774.000	1866.000
52	-912.000	774.000	1563.000
53	300.000	774.000	886.000
54	-912.000	774.000	446.000
55	-912.000	774.000	318.000
56	-912.000	774.000	0.
57	-912.000	774.000	740.000

TABLE 6.A-4
MAXIMUM MEMBER FORCES DUE TO ANNULUS PRESSURIZATION

COMPONENT DESCRIPTION	ELEMENT NUMBER	FEEDWATER	RECIRC.	JET REACTION
Top guide (L)*	4	22.20	38.00	29.0
Core plate (L)	7	20.80	42.00	30.0
Fuel support (L)	8	19.00	69.00	74.0
CRD housing (L)		9.10	22.00	70.0
CRD housing (M)		.24	.56	1.9
Shroud head (L)	19	59.80	78.00	133.0
Shroud head (M)	19	6.40	5.90	6.1
Shroud support (L)	26	184.00	296.00	246.0
Shroud support (M)	26	19.80	40.00	22.0
Vessel skirt (L)	50	1220.00	3204.00	1858.0
Vessel skirt (M)	50	216.00	221.00	130.0
Pedestal cont. (L)	3	486.00	2325.00	859.0
Pedestal cont. (M)	3	326.00	680.00	206.0
Stabilizer (L)	III	1722.00	1949.00	746.0
CRD support beam (L)		4.50	27.00	50.0

* *(L) Load - 10^3 x lb
(M) Moment - 10^6 x in. x lb
All loads incorporate appropriate factor to account for shell behavior

TABLE 6.A-5

MAXIMUM ACCELERATION* DUE TO ANNULUS PRESSURIZATION

(in./sec^2)

COMPONENT DESCRIPTION	NODE NUMBER	FEEDWATER	RECIRC. LINE BREAK	JET LOAD
–P line	9	80	283	675
CRD guide tube	11	86	298	309
Separators	17	155	306	342
Head spray	51	178	416	898
Steam dryer	46	118	200	451
Feedwater sparger	43	109	157	538
Jet pump	38	133	362	406
RPV	30	62	253	514
RPV (bottom)	16	61	254	598
Shield wall	2	282	398	229
Top of shield wall	1	190	326	254
Fuel	5	74	198	394
Fuel	7	27	51	77
Fuel	9	80	283	675

- *All accelerations incorporate a factor to account for shell behavior.

TABLE 6.A-6
(SHEET 1 OF 3)

RELAP 4 INPUT DATA, RECIRCULATION LINE OUTLET BREAK

```
= LASALLE RPV-SHIELD ANNULUS PRESSURIZATION STUDY – NSLD CALC NO 3C7-0976-001
* PROJECT NO 4266-00  R.M. HOGAN – D.L. ROBINSON – NUCLEAR ANALYSTS
* RECIRCULATION OUTLET LINE BREAK
  *
* CASE "A" BASE LISTING 12/27/76
  *
*2345678901234567890123457890123457890123457890123457890123457890123457890
* PROBLEM DIMENSIONS
* CARD  LDMP-NEDI-NTC—NTRP-NVOL-NBUB-NTDV-NJUN-NONE-NFLL-NONE
 010001 -2  0    3    6    38    0    0    86    0    4    0    1    0    0  0  0  0
  *
 *PROBLEM CONSTANTS
 010002    0.0    1.0
  *
* TIME STEPS
  030010    1    1    10    0    0.0001    1E-06    0.025
  030020    1    1    5     0    0.001     1E-06    0.2
  030030    1    1    1     0    0.01      1E-06    1.0
 *
 * TRIP CONTROLS
  040010    1    1    0     0     0.2    0.0    *END PROBLEM ON ELAPSED TIME
  040020    2    1    0     0     0.0    0.0    * ACTION #2 ON ELAPSED TIME (FILL)
  040030    3    4    30    36    3.0    0.0    * ACTION #3 ON DP (OPEN VALVE)
  040040    4    4    31    36    3.0    0.0    * ACTION #4 ON DP (OPEN VALVE)
  040050    5    4    32    36    3.0    0.0    * ACTION #5 ON DP (OPEN VALVE)
 040060     6    4    33    36    3.0    0.0    * ACTION #6 ON DP (OPEN VALVE)
 *
 * BEGIN VOLUME DATA
* 2345678901234567890123456789012345678901234567890123456789012345678901234567890
VOLUME   B  R  PRESS   TEMP  QUAL   VOLUME   MT    MIX   TP  FLOWA  DIAMV  ELEV
050011   0  0  15.45   -1.   0.946  100.6    5.07  5.07  0   18.40  0.0    755.29
050021   0  0  15.45   -1.   0.946  100.6    5.07  5.07  0   18.40  0.0    755.29
050031   0  0  15.45   -1.   0.946  100.6    5.07  5.07  0   18.40  0.0    755.29
050041   0  0  15.45   -1.   0.946  150.9    5.07  5.07  0   23.36  0.0    755.29
050051   0  0  15.45   -1.   0.946  150.9    5.07  5.07  0   23.36  0.0    755.29
050061   0  0  15.45   -1.   0.946  121.0    7.47  7.47  0   20.98  0.0    760.36
050071   0  0  15.45   -1.   0.946  121.0    7.47  7.47  0   20.98  0.0    760.36
050081   0  0  15.45   -1.   0.946  121.0    7.47  7.47  0   20.98  0.0    760.36
050091   0  0  15.45   -1.   0.946  181.5    7.47  7.47  0   25.64  0.0    760.36
050101   0  0  15.45   -1.   0.946  181.5    7.47  7.47  0   25.64  0.0    760.36
050111   0  0  15.45   -1.   0.946  39.87    6.92  6.92  0   10.02  0.0    767.83
050121   0  0  15.45   -1.   0.946  54.28    4.90  4.90  0   10.50  0.0    767.83
050131   0  0  15.45   -1.   0.946  61.94    4.90  4.90  0   10.50  0.0    767.83
050141   0  0  15.45   -1.   0.946  81.43    4.90  4.90  0   13.47  0.0    767.83
050151   0  0  15.45   -1.   0.946  80.54    4.90  4.90  0   13.47  0.0    767.83
050161   0  0  15.45   -1.   0.946  26.77    2.67  2.67  0   8.43   0.0    774.75
050171   0  0  15.45   -1.   0.946  52.18    4.69  4.69  0   10.30  0.0    772.73
050181   0  0  15.45   -1.   0.946  52.18    4.69  4.69  0   10.30  0.0    772.73
050191   0  0  15.45   -1.   0.946  78.28    4.69  4.69  0   13.27  0.0    772.73
050201   0  0  15.45   -1.   0.946  77.39    4.69  4.69  0   13.27  0.0    773.73
050211   0  0  15.45   -1.   0.946  67.48    6.41  6.41  0   12.44  0.0    777.42
050221   0  0  15.45   -1.   0.946  67.48    6.41  6.41  0   12.44  0.0    777.42
050231   0  0  15.45   -1.   0.946  67.48    6.41  6.41  0   12.44  0.0    777.42
050241   0  0  15.45   -1.   0.946  101.2    6.41  6.41  0   15.52  0.0    777.42
050251   0  0  15.45   -1.   0.946  101.2    6.41  6.41  0   15.52  0.0    777.42
050261   0  0  15.45   -1.   0.946  171.1    9.59  9.59  0   18.61  0.0    783.83
050271   0  0  15.45   -1.   0.946  155.8    9.59  9.59  0   18.61  0.0    783.83
050281   0  0  15.45   -1.   0.946  155.8    9.59  9.59  0   18.61  0.0    783.83
050291   0  0  15.45   -1.   0.946  171.1    9.59  9.59  0   18.61  0.0    783.83
050301   0  0  15.45   -1.   0.946  155.8    8.81  8.81  0   17.86  0.0    793.42
050311   0  0  15.45   -1.   0.946  153.4    8.81  8.81  0   17.86  0.0    793.42
050321   0  0  15.45   -1.   0.946  143.9    8.81  8.81  0   17.86  0.0    793.42
050331   0  0  15.45   -1.   0.946  164.1    8.81  8.81  0   17.86  0.0    793.42
050341   0  0  15.45   -1.   0.946  19.76    6.92  6.92  0   10.02  0.0    767.83
050351   0  0  15.45   -1.   0.946  19.52    4.92  4.92  0   7.04   0.0    769.56
050361   0  0  15.45   -1.   0.557  16315.   41.0  41.0  0   400.   0.0    793.42
050371   0  0  15.45   -1.   0.557  11665.   12.1  12.1  0   965.   0.0    781.32
050381   0  0  15.45   -1.   0.557  82775.   44.7  44.7  0   1850.  0.0    736.62
VOLUME   B  R  PRESS   TEMP  QUAL   VOLUME   MT    MIX   TP  FLOWA  DIAMV  ELEV
* 2345678901234567890123456789012345678901234567890123456789012345678901234567890
* END VOLUME DATA
*
* BEGIN HORIZONTAL FLOW PATHS WITHIN S.S. ANNULUS
* 2345678901234567890123456789012345678901234567890123456789012345678901234567890
```

TABLE 6.A-6
(SHEET 2 OF 3)

RELAP 4 INPUT DATA, RECIRCULATION LINE OUTLET BREAK

JUNCT	IN	OT	P	V	FLO	AJUN	ZJUN	IN	FJUF	FJUR	V	C	1	EQ	DM	CC	C	E
080011	1	2	0	0	0.0	14.86	757.82	0.40	0.24	0.00	0	0	0	0	0.0	0.6	1	0
080021	2	3	0	0	0.0	14.86	757.82	0.40	0.24	0.00	0	0	0	0	0.0	0.6	1	0
080031	3	4	0	0	0.0	14.86	757.82	0.50	0.40	0.00	0	0	0	0	0.0	0.6	1	0
080041	4	5	0	0	0.0	14.86	757.82	0.60	0.42	0.00	0	0	0	0	0.0	0.6	1	0
080051	6	7	0	0	0.0	20.19	764.10	0.30	0.22	0.00	0	0	0	0	0.0	0.6	1	0
080061	7	8	0	0	0.0	20.19	764.10	0.30	0.22	0.00	0	0	0	0	0.0	0.6	1	0
080071	8	9	0	0	0.0	20.19	764.10	0.38	0.39	0.00	0	0	0	0	0.0	0.6	1	0
080081	9	10	0	0	0.0	20.19	764.10	0.45	0.41	0.00	0	0	0	3	0.0	0.6	1	0
080091	35	34	0	0	0.0	7.04	772.02	0.30	0.85	0.00	0	0	0	0	0.0	0.6	1	0
080101	34	11	0	0	0.0	10.02	771.29	0.32	0.35	0.00	0	0	0	0	0.0	0.6	1	0
080111	11	12	0	0	0.0	7.47	770.28	0.64	0.56	0.00	0	0	0	3	0.0	0.6	1	0
080121	12	13	0	0	0.0	7.09	770.28	0.90	0.84	0.00	0	0	0	0	0.0	0.6	1	0
080131	13	14	0	0	0.0	7.09	770.28	1.13	0.85	0.00	0	0	0	3	0.0	0.6	1	0
080141	14	15	0	0	0.0	7.09	770.28	1.35	1.64	0.00	0	0	0	3	0.0	0.6	1	0
080151	11	17	0	0	0.0	2.11	773.74	2.26	0.05	0.00	0	0	0	0	0.0	0.6	1	0
080161	16	17	0	0	0.0	3.87	776.09	1.46	0.38	0.00	0	0	0	3	0.0	0.6	1	0
080171	17	18	0	0	0.0	6.79	775.07	0.94	0.83	0.00	0	0	0	3	0.0	0.6	1	0
080181	18	19	0	0	0.0	6.79	775.07	1.17	0.85	0.00	0	0	0	3	0.0	0.6	1	0
080191	19	20	0	0	0.0	6.79	775.07	1.41	1.63	0.00	0	0	0	3	0.0	0.6	1	0
080201	21	22	0	0	0.0	9.83	780.62	0.65	0.36	0.00	0	0	0	3	0.0	0.6	1	0
080211	22	23	0	0	0.0	9.83	780.62	0.65	0.36	0.00	0	0	0	3	0.0	0.6	1	0
080221	23	24	0	0	0.0	9.83	780.62	0.81	0.67	0.00	0	0	0	3	0.0	0.6	1	0
080231	24	25	0	0	0.0	9.83	780.62	0.97	0.68	0.00	0	0	0	3	0.0	0.6	1	0
080241	26	27	0	0	0.0	14.68	788.62	0.65	1.28	0.00	0	0	0	3	0.0	0.6	1	0
080251	27	28	0	0	0.0	14.68	788.62	0.65	0.68	0.00	0	0	0	3	0.0	0.6	1	0
080261	28	29	0	0	0.0	14.68	788.62	0.65	1.28	0.00	0	0	0	3	0.0	0.6	1	0
080271	30	31	0	0	0.0	13.49	797.83	0.71	1.27	0.00	0	0	0	3	0.0	0.6	1	0
080281	31	32	0	0	0.0	13.49	797.83	0.71	1.13	0.00	0	0	0	3	0.0	0.6	1	0
080291	32	33	0	0	0.0	13.49	797.83	0.71	1.27	0.00	0	0	0	3	0.0	0.6	1	0
JUNCT	IN	OT	P	V	FLO	AJUN	ZJUN	IN	FJUF	FJUR	V	C	1	EQ	DM	CC	C	E

* 234567890123456789012345678901234567890123456789012345678901234567890123456789 0

* END HORIZONTAL FLOW PATHS WITHIN 5.5. ANNULUS

*

* BEGIN VERTICAL FLOW PATHS WITHIN S.S. ANNULUS

* 2345678901234567890123456789012345678901234567890123456789012345678901234567890

JUNCT	IN	OT	P	V	FLO	AJUN	ZJUN	IN	FJUF	FJUR	V	C	I	EQ	DM	CC	C	E
080301	6	1	0	0	0.0	18.40	760.36	0.33	0.03	0.03	1	0	0	3	0.0	0.6	1	0
080311	7	2	0	0	0.0	18.40	760.36	0.33	0.03	0.03	1	0	0	3	0.0	0.6	1	0
080321	8	3	0	0	0.0	18.40	760.36	0.33	0.03	0.03	1	0	0	3	0.0	0.6	1	0
080331	9	4	0	0	0.0	23.36	760.36	0.22	0.03	0.03	1	0	0	3	0.0	0.6	1	0
080341	10	5	0	0	0.0	23.36	760.36	0.22	0.03	0.03	1	0	0	0	0.0	0.6	1	0
080351	34	6	0	0	0.0	3.61	767.83	1.40	1.13	0.90	1	0	0	3	0.0	0.6	1	0
080361	11	6	0	0	0.0	3.61	767.83	1.40	1.13	0.90	1	0	0	3	0.0	0.6	1	0
080371	12	7	0	0	0.0	7.22	767.83	0.62	1.13	0.90	1	0	0	3	0.0	0.6	1	0
080381	13	8	0	0	0.0	7.22	767.83	0.62	1.40	1.17	1	0	0	3	0.0	0.6	1	0
080391	14	9	0	0	0.0	10.84	767.83	0.41	1.13	0.90	1	0	0	0	0.0	0.6	1	0
080401	15	10	0	0	0.0	10.84	767.83	0.41	1.13	0.90	1	0	0	0	0.0	0.6	1	0
080411	12	17	0	0	0.0	8.56	772.73	0.56	0.46	0.00	1	0	0	3	0.0	0.6	1	0
080421	13	18	0	0	0.0	8.56	772.73	0.56	0.46	0.00	1	0	0	0	0.0	0.6	1	0
080431	14	19	0	0	0.0	14.50	772.73	0.33	0.59	0.00	1	0	0	0	0.0	0.6	1	0
080441	15	20	0	0	0.0	14.50	772.73	0.33	0.68	0.00	1	0	0	0	0.0	0.6	1	0
080451	34	16	0	0	0.0	5.94	774.75	0.94	0.03	0.00	1	0	0	3	0.0	0.6	1	0
080461	11	16	0	0	0.0	5.94	774.75	0.94	0.88	0.00	1	0	0	3	0.0	0.6	1	0
080471	16	21	0	0	0.0	7.72	777.42	0.44	0.67	0.00	1	0	0	0	0.0	0.6	1	0
080481	17	22	0	0	0.0	7.72	777.42	0.59	0.68	0.00	1	0	0	0	0.0	0.6	1	0
080491	18	23	0	0	0.0	7.72	777.42	0.59	0.68	0.00	1	0	0	0	0.0	0.6	1	0
080501	19	24	0	0	0.0	11.57	777.42	0.40	0.68	0.00	1	0	0	0	0.0	0.6	1	0
080511	20	25	0	0	0.0	11.57	777.42	0.40	0.68	0.00	1	0	0	0	0.0	0.6	1	0
080521	21	26	0	0	0.0	7.72	783.83	0.80	0.96	0.00	1	0	0	0	0.0	0.6	1	0
080531	22	26	0	0	0.0	3.86	783.83	1.60	1.04	0.00	1	0	0	3	0.0	0.6	1	0
080541	22	27	0	0	0.0	3.86	783.83	1.60	1.04	0.00	1	0	0	0	0.0	0.6	1	0
080551	23	27	0	0	0.0	7.72	783.83	0.80	0.69	0.00	1	0	0	3	0.0	0.6	1	0
080561	24	28	0	0	0.0	11.57	783.83	0.54	0.96	0.00	1	0	0	0	0.0	0.6	1	0
080571	25	29	0	0	0.0	11.57	783.83	0.54	0.97	0.00	1	0	0	0	0.0	0.6	1	0
080581	26	30	0	0	0.0	11.57	793.42	0.60	1.00	0.00	1	0	0	0	0.0	0.6	1	0
080591	27	31	0	0	0.0	11.57	793.42	0.60	1.04	0.00	1	0	0	0	0.0	0.6	1	0
080601	28	32	0	0	0.0	11.57	793.42	0.60	0.97	0.00	1	0	0	0	0.0	0.6	1	0
080611	29	33	0	0	0.0	11.57	793.42	0.60	1.00	0.00	1	0	0	0	0.0	0.6	1	0
JUNCT	IN	OT	P	V	FLO	AJUN	ZJUN	IN	FJUF	FJUR	V	C	I	EQ	DM	CC	C	E

*234567890123456789012345678901234567890123456789012345678901234567890123456789 0

*END VERTICAL FLOW PATHS WITHIN S.S. ANNULUS

*

* BEGIN FLOW PATHS TO CONTAINMENT – PENETRATIONS WITH SHIELDING DOORS

*2345678901234567890123456789012345678901234567890123456789012345678901234567890

JUNCT	IN	OT	P	V	FLO	AJUN	ZJUN	IN	FJUF	FJUR	V	C	I	EQ	DM	CC	C	E
080621	30	36	0	1	0.0	9.27	797.83	1.05	0.75	0.00	0	0	0	0	0.0	0.6	1	0
080631	31	36	0	2	0.0	13.90	797.83	0.70	1.69	0.00	0	0	0	0	0.0	0.6	1	0

TABLE 6.A-6
(SHEET 3 OF 3)

RELAP 4 INPUT DATA, RECIRCULATION LINE OUTLET BREAK

```
080641  32  36  0  3  0.0  13.90  797.83  0.70  1.69  0.00  0  0  0  0   0.0  0.6  1  0
080651  33  36  0  4  0.0  9.27   797.83  1.05  0.75  0.00  0  0  0  0   0.0  0.6  1  0
080661  33  36  0  0  0.0  2.04   797.83  1.05  1.72  0.00  0  0  0  3   0.0  0.6  1  0
080671  32  36  0  0  0.0  0.68   797.83  3.39  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080681  31  36  0  0  0.0  2.10   797.83  1.11  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080691  30  36  0  0  0.0  1.77   797.83  1.25  1.72  0.00  0  0  0  3   0.0  0.6  1  0
080701  36  37  0  0  0.0  400.   793.42  0.06  0.05  0.00  1  0  0  3   0.0  0.6  1  0
080711  29  37  0  0  0.0  1.39   788.62  1.50  1.73  0.00  0  0  0  3   0.0  0.6  1  0
080721  28  37  0  0  0.0  0.71   788.62  3.30  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080731  27  37  0  0  0.0  0.71   788.62  3.30  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080741  26  37  0  0  0.0  1.39   788.62  1.50  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080751  37  38  0  0  0.0  965.   781.32  0.03  0.05  0.00  1  0  0  3   0.0  0.6  1  0
080761  20  38  0  0  0.0  1.25   775.07  1.97  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080771  19  38  0  0  0.0  1.07   775.07  2.20  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080781  18  38  0  0  0.0  0.71   775.07  3.30  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080791  17  38  0  0  0.0  0.71   775.07  3.30  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080801  15  38  0  0  0.0  1.25   770.28  1.97  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080811  14  38  0  0  0.0  1.07   770.28  2.20  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080821  13  38  0  0  0.0  1.47   770.28  1.50  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080831  12  38  0  0  0.0  0.71   770.28  3.30  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080841  11  38  0  0  0.0  0.71   772.02  3.30  1.71  0.00  0  0  0  3   0.0  0.6  1  0
080851  35  38  0  0  0.0  1.08   772.02  2.43  1.71  0.00  0  0  0  0   0.0  0.6  1  0
JUNCT   IN  OT  P  V  FLO  AJUN   ZJUN    IN    FJUF  FJUR  V  C  I  EQ  DM   CC   C  E
*234567890123456789012345678901234567890123456789012345678901234567890123456789 0
*END FLOW PATHS TO CONTAINMENT – PENETRATIONS WITH SHIELDING DOORS
*
*BEGIN FILL PATH
*2345678901234567890123456789012345678901234567890123456789012345678901234567890
JUNCT   IN  OT  P  V  FLO  AJUN   ZJUN    IN    FJUF  FJUR  V  C  I  EQ  DM   CC   C  E
080861  0   35  1  0  0.0  1.00   772.02  0.00  0.00  0.00  0  0  0  3   0.0  1.0  1  0
JUNCT   IN  OT  P  V  FLO  AJUN   ZJUN    IN    FJUF  FJUR  V  C  I  EQ  DM   CC   C  E
*2345678901234567890123456789012345678901234567890123456789012345678901234567890
* END FILL PATH
*
* VALVE DATA CARDS
 110010  -3   0.0   0.0   0.0
 110020  -4   0.0   0.0   0.0
 110030  -5   0.0   0.0   0.0
 110040  -6   0.0   0.0   0.0
*
* FILL TABLE  DATA CARDS
* FILL CONTROL
 130100  16   2   0   0   1060.   533.
* CARD    TIME     FLOW     TIME       FLOW     TIME       FLOW
130101    0.0      0.0      0.002      371.     0.004      1194.
130102    0.006    2476.    0.008      4463.    0.010      7081.
130103    0.0173   18092.   0.019395   18092.   0.019405   9162.
130104    0.022    10573.   0.024      11445.   0.026      12147.
130105    0.028    12611.   0.030      12865.   0.031      12885.
130106    5.0      12885.
*
*2345678901234567890123456789012345678901234567890123456789012345678901234567890
*******************************************************************************
* MODEL REVISIONS
*******************************************************************************
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TABLE 6.A-7
(SHEET 1 OF 3)

RELAP 4 INPUT DATA, FEEDWATER LINE BREAK

```
= LASALLE RPV-SHIELD ANNULUS PRESSURIZATION STUDY – NSLD CALC NO 3C7-0976-001
* PROJECT NO 4266-00  R.M. HOGAN – D.L. ROBINSON – NUCLEAR ANALYSTS
* FEEDWATER LINE BREAK
  *
* CASE "C"  BASE LISTING 1/3/77
  *
*2345678901234567890123457890123457890123457890123457890123457890123457890123457890
* PROBLEM DIMENSIONS
* CARD  LDMP----NEDI---------NTS--------NTRP---------NVOL------NBUB--------NTDV-------NJUN-------NONE--------NFLL---------NONE
  010001   -2      0      3      8      32      0      0      70      060      1      00000
  *
 *PROBLEM CONSTANTS
  010002          0.0      1.0
  *
* TIME STEPS
  030010          1      1      50      0      0.0001      1E-06      0.025
  030020          1      1      25      0      0.001       1E-06      0.2
  030030          1      1      1       0      0.01        1E-06      1.0
 *
 * TRIP CONTROLS
  040010          1      1      0       0      0.2      0.0      *END PROBLEM ON ELAPSED TIME
  040020          2      1      0       0      0.0      0.0      * ACTION #2 ON ELAPSED TIME (FILL)
  040030          3      4      23      30     3.0      0.0      * ACTION #3 ON DP (OPEN VALVE)
  040040          4      4      24      30     3.0      0.0      * ACTION #4 ON DP (OPEN VALVE)
  040050          5      4      25      30     3.0      0.0      * ACTION #5 ON DP (OPEN VALVE)
 040060           6      4      26      30     3.0      0.0      * ACTION #6 ON DP (OPEN VALVE)
040070       7      4      27      30      3.0      0.0      *ACTION #7 ON DP (OPEN VALVE)
040080       8      4      28      30      3.0      0.0      * ACTION #8 ON DP (OPEN VALVE)
*
* BEGIN VOLUME DATA
* 2345678901234567890123457890123457890123457890123457890123457890123457890123457890
     VOLUME    B    R    PRESS    TEMP    QUAL     VOLUME    HT      MIX     TP    FLOWA    DIAMV    ELEV
     050011    0    0    15.45    -1.     0.946    150.9     5.07    5.07    0     23.36    0.0      755.29
     050021    0    0    15.45    -1.     0.946    150.9     5.07    5.07    0     23.36    0.0      755.29
     050031    0    0    15.45    -1.     0.946    150.9     5.07    5.07    0     23.36    0.0      755.29
     050041    0    0    15.45    -1.     0.946    150.9     5.07    5.07    0     23.36    0.0      755.29
     050051    0    0    15.45    -1.     0.946    181.5     7.47    7.47    0     23.80    0.0      760.36
     050061    0    0    15.45    -1.     0.946    181.5     7.47    7.47    0     23.80    0.0      760.36
     050071    0    0    15.45    -1.     0.946    181.5     7.47    7.47    0     23.80    0.0      760.36
     050081    0    0    15.45    -1.     0.946    181.5     7.47    7.47    0     23.80    0.0      760.36
     050091    0    0    15.45    -1.     0.946    159.7     9.59    9.59    0     17.83    0.0      767.83
     050101    0    0    15.45    -1.     0.946    157.9     9.59    9.59    0     17.83    0.0      767.83
     050111    0    0    15.45    -1.     0.946    157.9     9.59    9.59    0     17.83    0.0      767.83
     050121    0    0    15.45    -1.     0.946    167.4     9.59    9.59    0     17.83    0.0      767.83
     050131    0    0    15.45    -1.     0.946    67.48     6.41    6.41    0     12.44    0.0      777.42
     050141    0    0    15.45    -1.     0.946    67.48     6.41    6.41    0     12.44    0.0      777.42
     050151    0    0    15.45    -1.     0.946    67.48     6.41    6.41    0     12.44    0.0      777.42
     050161    0    0    15.45    -1.     0.946    101.2     6.41    6.41    0     15.79    0.0      777.42
     050171    0    0    15.45    -1.     0.946    101.2     6.41    6.41    0     15.79    0.0      777.42
     050181    0    0    15.45    -1.     0.946    100.8     9.59    9.59    0     15.52    0.0      783.83
     050191    0    0    15.45    -1.     0.946    110.0     9.59    9.59    0     15.52    0.0      783.83
     050201    0    0    15.45    -1.     0.946    116.1     9.59    9.59    0     15.52    0.0      783.83
     050211    0    0    15.45    -1.     0.946    171.1     9.59    9.59    0     18.61    0.0      783.83
     050221    0    0    15.45    -1.     0.946    155.8     9.59    9.59    0     18.61    0.0      783.83
     050231    0    0    15.45    -1.     0.946    45.22     10.58   10.58   0     13.39    0.0      793.42
     050241    0    0    15.45    -1.     0.946    55.63     10.58   10.58   0     13.39    0.0      793.42
     050251    0    0    15.45    -1.     0.946    116.2     10.58   10.58   0     16.48    0.0      793.42
     050261    0    0    15.45    -1.     0.946    131.5     10.58   10.58   0     16.48    0.0      793.42
     050271    0    0    15.45    -1.     0.946    176.7     10.58   10.58   0     19.57    0.0      793.42
     050281    0    0    15.45    -1.     0.946    171.8     10.58   10.58   0     19.57    0.0      793.42
     050291    0    0    15.45    -1.     0.946    16.12     4.00    4.00    0     5.42     0.0      796.75
     050301    0    0    15.45    -1.     0.557    16315.    41.00   41.00   0     400.     0.0      793.42
     050311    0    0    15.45    -1.     0.557    11665.    12.10   12.10   0     965.     00       781.32
     050321    0    0    15.45    -1.     0.557    82775.    44.70   44.70   0     1850.    00       736.62
     VOLUME    B    R    PRESS    TEMP    QUAL     VOLUME    HT      MIX     TP    FLOWA    DIAMV    ELEV
  *2345678901234567890123457890123457890123457890123457890123457890123457890123457890
  * END VOLUME DATA
  *
  * BEGIN HORIZONTAL FLOW PATHS WITHIN S.S. ANNULUS
   *  2345678901234567890123457890123457890123457890123457890123457890123457890123457890
  *      JUNCT----IN———-----0T——------—P------------V--------------FLO---------AJUN--------ZJUN---------IN-----------FJUF———--FJUR—-----V –C-I-EQ---DM----------CC------------C-E
         080011   1    2    0    0    0.0    14.86    757.82    0.60    0.29    0.00    0 0 0 0    0.0    0.6    1 0
         080021   2    3    0    0    0.0    14.86    757.82    0.60    0.43    0.00    0 0 0 0    0.0    0.6    1 0
         080031   3    4    0    0    0.0    14.86    757.82    0.60    0.29    0.00    0 0 0 0    0.0    0.6    1 0
         080041   5    6    0    0    0.0    20.19    764.10    0.45    0.25    0.00    0 0 0 0    0.0    0.6    1 0
```

TABLE 6.A-7
(SHEET 2 OF 3)

RELAP 4 INPUT DATA, FEEDWATER LINE BREAK

```
080051  6   7   0  0  0.0  20.19  764.10  0.45  0.41  0.00  0 0 0 0  0.0  0.6  1 0
080061  7   8   0  0  0.0  20.19  764.10  0.45  0.25  0.00  0 0 0 0  0.0  0.6  1 0
080071  9   10  0  0  0.0  13.88  772.63  0.69  1.31  0.00  0 0 0 0  0.0  0.6  1 0
080081  10  11  0  0  0.0  13.88  772.63  0.69  1.27  0.00  0 0 0 3  0.0  0.6  1 0
080091  11  12  0  0  0.0  13.88  772.63  0.69  1.31  0.00  0 0 0 3  0.0  0.6  1 0
080101  13  14  0  0  0.0  9.83   780.62  0.65  0.51  0.00  0 0 0 0  0.0  0.6  1 0
080111  14  15  0  0  0.0  9.83   780.62  0.65  0.51  0.00  0 0 0 3  0.0  0.6  1 0
080121  15  16  0  0  0.0  9.83   780.62  0.81  0.38  0.00  0 0 0 3  0.0  0.6  1 0
080131  16  17  0  0  0.0  9.83   780.62  0.97  0.39  0.00  0 0 0 3  0.0  0.6  1 0
080141  18  19  0  0  0.0  14.68  788.62  0.44  0.79  0.00  0 0 0 3  0.0  0.6  1 0
080151  19  20  0  0  0.0  14.68  788.62  0.44  0.83  0.00  0 0 0 3  0.0  0.6  1 0
080161  20  21  0  0  0.0  14.68  788.62  0.54  0.51  0.00  0 0 0 3  0.0  0.6  1 0
080171  21  22  0  0  0.0  14.68  788.62  0.65  0.85  0.00  0 0 0 3  0.0  0.6  1 0
080181  29  23  0  0  0.0  5.42   798.75  0.40  0.85  0.00  0 0 0 0  0.0  0.6  1 0
080191  23  24  0  0  0.0  16.19  798.75  0.20  0.33  0.00  0 0 0 3  0.0  0.6  1 0
080201  24  25  0  0  0.0  16.19  798.75  0.30  0.05  0.00  0 0 0 3  0.0  0.6  1 0
080211  25  26  0  0  0.0  16.19  798.75  0.40  1.33  0.00  0 0 0 3  0.0  0.6  1 0
080221  26  27  0  0  0.0  16.19  798.75  0.50  1.34  0.00  0 0 0 3  0.0  0.6  1 0
080231  27  28  0  0  0.0  16.19  798.75  0.60  0.39  0.00  0 0 0 3  0.0  0.6  1 0
* JUNCT----IN—---------0T—----------P-------------V--------------FLO---------AJUN--------ZJUN---------IN-----------FJUF—------FJUR—-----V C-I-EQ---DM----------CC----------C-E
*23456789012345678901234567890123456789001234567890123456789001234567890123456789012345678901234567890
* END HORIZONTAL FLOW PATHS WITHIN 5*5* ANNULUS
*
* BEGIN VERTICAL FLOW PATHS WITHIN S*S* ANNULUS
*01234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
* JUNCT----IN—---------0T—----------P-------------V--------------FLO---------AJUN--------ZJUN---------IN-----------FJUF—------FJUR—-----V –C-I-EQ---DM----------CC----------C-E
080241  5   1   0  0  0.0  23.80  760.36  0.26  0.03  0.00  1 0 0 3  0.0  0.6  1 0
080251  6   2   0  0  0.0  23.80  760.36  0.26  0.03  0.00  1 0 0 3  0.0  0.6  1 0
080261  7   3   0  0  0.0  23.80  760.36  0.26  0.03  0.00  1 0 0 3  0.0  0.6  1 0
080271  8   4   0  0  0.0  23.80  760.36  0.26  0.03  0.00  1 0 0 0  0.0  0.6  1 0
080281  9   5   0  0  0.0  10.84  767.83  0.54  1.13  1.28  1 0 0 0  0.0  0.6  1 0
080291  10  6   0  0  0.0  10.84  767.83  0.54  1.13  1.28  1 0 0 3  0.0  0.6  1 0
080301  11  7   0  0  0.0  10.84  767.83  0.54  1.13  1.28  1 0 0 0  0.0  0.6  1 0
080311  12  8   0  0  0.0  10.84  767.83  .054  1.13  1.28  1 0 0 0  0.0  0.6  1 0
080321  13  9   0  0  0.0  7.22   777.42  0.83  0.96  0.00  1 0 0 3  0.0  0.6  1 0
080331  14  9   0  0  0.0  3.61   777.42  1.66  0.96  0.00  1 0 0 3  0.0  0.6  1 0
080341  14  10  0  0  0.0  3.61   777.42  1.66  0.96  0.00  1 0 0 3  0.0  0.6  1 0
080351  15  10  0  0  0.0  7.22   777.42  0.83  0.96  0.00  1 0 0 0  0.0  0.6  1 0
080361  16  11  0  0  0.0  10.84  777.42  0.56  0.96  0.00  1 0 0 0  0.0  0.6  1 0
080371  17  12  0  0  0.0  10.84  777.42  0.56  1.01  0.00  1 0 0 0  0.0  0.6  1 0
080381  18  13  0  0  0.0  7.71   783.83  0.80  0.68  0.00  1 0 0 0  0.0  0.6  1 0
080391  19  14  0  0  0.0  7.71   783.83  0.80  1.03  0.00  1 0 0 0  0.0  0.6  1 0
080401  20  15  0  0  0.0  7.71   783.83  0.80  0.96  0.00  1 0 0 0  0.0  0.6  1 0
080411  21  16  0  0  0.0  11.57  783.83  0.54  0.97  0.00  1 0 0 0  0.0  0.6  1 0
080421  22  17  0  0  0.0  11.57  783.83  0.54  0.96  0.00  1 0 0 0  0.0  0.6  1 0
080431  23  18  0  0  0.0  3.86   793.42  1.94  0.70  0.00  1 0 0 3  0.0  0.6  1 0
080441  24  18  0  0  0.0  3.86   793.42  1.94  0.70  0.00  1 0 0 0  0.0  0.6  1 0
080451  25  19  0  0  0.0  7.71   793.42  0.97  0.98  0.00  1 0 0 0  0.0  0.6  1 0
080461  26  20  0  0  0.0  7.71   793.42  0.97  1.00  0.00  1 0 0 0  0.0  0.6  1 0
080471  27  21  0  0  0.0  11.57  793.42  0.65  0.99  0.00  1 0 0 0  0.0  0.6  1 0
080481  28  22  0  0  0.0  11.57  793.42  0.65  0.97  0.00  1 0 0 0  0.0  0.6  1 0
* JUNCT----IN—---------0T—----------P-------------V--------------FLO---------AJUN--------ZJUN---------IN-----------FJUF—------FJUR—-----V –C-I-EQ---DM----------CC----------C-E
*234577890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
* END VERTICAL FLOW PATHS WITHIN S*S*ANNULUS
*
* BEGIN FLOW PATHS TO CONTAINMENT – PENETRATIONS WITH SHIELDING DOORS
* 234577890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
* JUNCT----IN—---------0T—----------P-------------V--------------FLO---------AJUN--------ZJUN---------IN-----------FJUF—------FJUR—-----V –C-I-EQ---DM----------CC----------C-E
080491  23  30  0  1  0.0  1.54   798.75  3.60  1.61  0.00  0 0 0 0  0.0  0.6  1 0
080501  24  30  0  2  0.0  3.86   798.75  1.30  1.07  0.00  0 0 0 0  0.0  0.6  1 0
080511  25  30  0  3  0.0  7.71   798.75  1.06  1.99  0.00  0 0 0 0  0.0  0.6  1 0
080521  26  30  0  4  0.0  7.71   798.75  1.06  1.99  0.00  0 0 0 0  0.0  0.6  1. 0
080531  27  30  0  5  0.0  9.27   798.75  0.79  2.40  0.00  0 0 0 0  0.0  0.6  1 .0
080541  28  30  0  6  0.0  11.57  798.75  0.65  1.82  0.00  0 0 0 0  0.0  0.6  1 0
080551  29  30  0  0  0.0  0.68   798.75  3.96  1.71  0.00  0 0 0 0  0.0  0.6  1 0
080561  28  30  0  0  0.0  0.68   798.75  3.96  1.71  0.00  0 0 0 3  0.0  0.6  1 0
080571  27  30  0  0  0.0  1.36   798.75  1.98  1.71  0.00  0 0 0 3  0.0  0.6  1 0
080581  26  30  0  0  0.0  1.36   798.75  1.70  1.73  0.00  0 0 0 3  0.0  0.6  1 0
080591  25  30  0  0  0.0  0.68   798.75  3.96  1.71  0.00  0 0 0 3  0.0  0.6  1 0
080601  30  31  0  0  0.0  400.   793.42  0.06  0.05  0.00  1 0 0 3  0.0  0.6  1 0
080611  22  31  0  0  0.0  0.71   788.62  3.86  1.71  0.00  0 0 0 3  0.0  0.6  1 0
080621  21  31  0  0  0.0  1.39   788.62  1.70  1.73  0.00  0 0 0 3  0.0  0.6  1 0
080631  20  31  0  0  0.0  0.68   788.62  2.98  1.74  0.00  0 0 0 3  0.0  0.6  1 0
080641  19  31  0  0  0.0  1.42   788.62  1.93  1.71  0.00  0 0 0 3  0.0  0.6  1 0
080651  31  32  0  0  0.0  965.   781.32  0.03  0.05  0.00  1 0 0 3  0.0  0.6  1 0
080661  12  32  0  0  0.0  2.89   772.63  0.90  1.71  0.00  0 0 0 3  0.0  0.6  1 0
080671  11  32  0  0  0.0  2.50   772.63  1.17  1.71  0.00  0 0 0 3  0.0  0.6  1 0
```

TABLE 6.A-7
(SHEET 3 OF 3)

RELAP 4 INPUT DATA, FEEDWATER LINE BREAK

```
080681   10   32   0   0   0.0   2.50   772.63   1.17   1.71   0.00   0 0 0 3   0.0   0.6   1 0
080691   9    32   0   0   0.0   2.14   772.63   1.29   1.71   0.00   0 0 0 3   0.0   0.6   1 0
* JUNCT----IN—---------0T—----------P------------V-------------FLO---------AJUN--------ZJUN---------IN-----------FJUF—------FJUR——-----V –C-I-EQ---DM----------CC-----—C-E
* 2345778901234567890123456789012345678901234567890123456789012345678901234567890
* END FLOW PATHS TO CONTAINMENT – PENETRATIONS WITH SHIELDING DOORS
*
* BEGIN FILL PATH
* 2345778901234567890123456789012345678901234567890123456789012345678901234567890
 * JUNCT----IN—---------0T—----------P------------V-------------FLO---------AJUN--------ZJUN---------IN-----------FJUF—------FJUR——-----V –C-I-EQ---DM----------CC---------—C-E
080701   0    29   1   0   0.0   1.0    789.75   0.0    0.0    0.0    0 0 0 3   0.0   1.0   1 0
* JUNCT----IN—---------0T—----------P------------V-------------FLO---------AJUN--------ZJUN---------IN-----------FJUF—------FJUR——-----V –C-I-EQ---DM----------CC-----—C-E
* 2345778901234567890123456789012345678901234567890123456789012345678901234567890
* END FILL PATH
*
* VALVE  DATA CARDS
110010   -3   0.0   0.0   0.0   0.0
110020   -4   0.0   0.0   0.0   0.0
110030   -5   0.0   0.0   0.0   0.0
110040   -6   0.0   0.0   0.0   0.0
110050   -7   0.0   0.0   0.0   0.0
110060   -8   0.0   0.0   0.0   0.0
*
* FILL TABLE  DATA CARDS
* FILL CONTROL
130100    4          2         0          0         1045.   420.
* CARD    TIME       FLOW      TIME       FLOW
1030101   0.0        14200.    0.001050   14200.
1030102   0.001060   21600.    1.00       21600.
*
* 2345778901234567890123456789012345678901234567890123456789012345678901234567890
*********************************************************************************************************************************M
* MODEL REVISIONS
130101    0.0        7100.     0.001050   7100.
130102    0.001060   10800.    1.00       10800.
CARD ABOVE  IS REPLACEMENT CARD.

********************************************************************************************************************************M
*
```

TABLE 6.A-8
(SHEET 1 OF 2)

FORCE CONSTANTS AND LOAD CENTERS
FOR RECIRCULATION LINE OUTLET BREAK

NODE	O_v	O_{ss}	ELEVATION	Π
1	3696.03	4948.35	757.82	15.0°, 345.0°
2	3696.03	4948.35	757.825	45.0°, 315.0°
3	3696.03	4948.35	757.825	75.0°, 285.0°
4	5464.86	7316.51	757.825	112.5°, 247.5°
5	5464.86	7316.51	757.825	157.5°, 202.5°
6	5828.44	7290.77	764.095	15.0°, 345.0°
7	5828.44	7290.77	764.095	45.0°, 315.0°
8	5828.44	7290.77	764.095	75.0°, 285.0°
9	8617.79	10779.95	764.095	112.5°, 247.5°
10	8617.79	10779.95	764.095	157.5°, 202.5°
11	2857.42	2503.87	771.290	22.5°, 337.5°
12	4038.29	3887.97	770.280	45.0°, 315.0°
13	4022.57	2990.40	770.280	75.0°, 285.0°
14	5970.91	5748.63	770.280	112.5°, 247.5°
15	5891.80	5523.42	770.280	157.5°, 202.5°
16	2234.85	2605.94	776.085	15.0°, 345.0°
17	3862.52	3683.01	775.075	45.0°, 315.0°
18	3862.52	3683.01	775.075	75.0, 285.0
19	5711.02	5445.58	775.075	112.5°, 247.5°
20	5631.91	5220.37	775.075	157.5°, 202.5°
21	5325.49	6256.20	780.625	15.0°, 345.0°
22	5325.49	6256.20	780.625	45.0°, 315.0°

TABLE 6.A-8
(SHEET 2 OF 2)

NODE	O_v	O_{ss}	ELEVATION	Π
23	5325.49	6256.20	780.625	75.0°, 285.0°
24	7874.13	9250.27	780.625	112.5°, 247.5°
25	7874.13	9250.27	780.625	157.5°, 202.5°
26	11713.96	11338.09	788.625	22.5°, 337.5°
27	11713.28	12957.61	788.625	67.5°, 297.5°
28	11713.28	12957.61	788.625	112.5°, 247.5°
29	11713.96	11338.09	788.625	157.5°, 202.5°
30	12864.45	12694.81	798.710	22.5°, 337.5°
31	12809.98	12622.87	798.710	67.5°, 297.5°
32	12934.41	14386.28	798.710	112.5°, 247.5°
33	12867.88	11885.05	798.710	157.5°, 202.5°
34	1557.92	2042.96	771.290	7.5°, 352.5°
35	1140.80	0.00	772.020	0.0°, 360.0°

TABLE 6.A-9
(SHEET 1 OF 2)

FORCE CONSTANTS AND LOAD CENTERS
FOR FEEDWATER LINE BREAK

NODE	O_v	O_{ss}	ELEVATION	Π
1	5464.86	7316.51	757.825	22.5°, 337.5°
2	5464.86	7316.51	757.825	67.5°, 292.5°
3	5464.86	7316.51	757.825	112.5°, 147.50
4	5464.86	7316.51	757.825	157.5°, 202.5°
5	8617.79	10779.95	764.095	22.5°, 337.5°
6	8617.79	10779.95	764.095	67.5°, 292.5°
7	8617.79	10779.95	764.095	112.5°, 247.5°
8	8617.79	10779.95	764.095	157.5°, 202.5°
9	11681.94	11194.20	772.625	22.5°, 337.5°
10	11523.72	10743.78	772.625	67.5°, 292.5°
11	11523.72	10743.78	772.625	112.5°, 247.5°
12	11666.44	10309.43	772.625	157.5, 202.5
13	5325.49	6256.20	780.625	15.0°, 345.0°
14	5325.49	6256.20	780.625	45.0°, 315.0°
15	5325.49	6256.20	780.625	75.0°, 285.0°
16	7874.13	9250.27	780.625	112.5°, 247.5°
17	7874.13	9250.27	780.625	157.5°, 202.5°
18	7967.46	9359.90	788.625	15.0°, 345.0°
19	7841.24	7570.97	788.625	45.0°, 315.0°
20	7963.08	7716.94	788.625	75.0°, 285.0°
21	11713.96	11338.09	788.625	112.5°, 247.5°
22	11718.28	12957.61	788.625	157.5°, 202.5°
23	3530.66	4305.38	798.710	7.5°, 352.5°

TABLE 6.A-9
(SHEET 2 OF 2)

NODE	O_v	O_{ss}	ELEVATION	Π
24	4432.90	5207.63	798.710	22.5°, 337.5°
25	8726.85	9431.69	798.710	45.0°, 315.0°
26	8722.47	7788.73	798.710	75.0°, 285.0°
27	12872.20	13504.58	798.710	112.5°, 247.5°
28	12934.41	14386.28	798.710	157.5°, 202.5°
29	840.94	0.00	798.710	0.0°, 360.0°

TABLE 6.A-10
(SHEET 1 OF 2)
DYSEA01 PROGRAM INPUT FOR JET LOAD FORCES

TIME FUNCTION NUMBER = (1)

FUNCTION DESCRIPTION = (RESTRAINT LOAD AT NODE 2)

NUMBER OF ABSCISSAE = (51)
FUNCTION SCALE FACTOR = (3.8880E-01)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.00163	0.	0.00233	0.	0.00297	0.	0.00351	0.	0.00398	0.
0.00441	0.	0.00481	0.	0.00519	0.	0.00554	0.	0.00667	0.
0.00887	5.0588E 04	0.00787	1.0820E 05	0.00887	1.6604E 05	0.00987	2.2989E 05	0.01087	2.9304E 05
0.01187	3.5842E 05	0.01287	4.1875E 05	0.01387	4.7365E 05	0.01487	5.3891E 05	0.01587	5.8180E 05
0.01687	6.1887E 05	0.01787	6.4976E 05	0.01887	6.7423E 05	0.01987	6.9213E 05	0.02087	7.0347E 05
0.02187	7.0834E 05	0.02222	7.0857E 05	0.02242	7.0857E 05	0.02262	7.0857E 05	0.02283	7.0857E 05
0.02304	7.0857E 05	0.02325	7.0857E 05	0.02347	7.0857E 05	0.02370	7.0857E 05	0.02393	7.0857E 05
0.02417	7.0857E 05	0.02442	7.0857E 05	0.02467	7.0857E 05	0.02494	7.0857E 05	0.02522	7.0857E 05
0.02551	7.0857E 05	0.02582	7.0857E 05	0.02614	7.0857E 05	0.02649	7.0857E 05	0.02687	7.0858E 05
0.02728	7.0857E 05	0.02774	7.0857E 05	0.02827	7.0857E 05	0.02893	7.0857E 05	0.02992	7.0858E 05
0.19740	7.0857E 05								

TIME FUNCTION NUMBER = (2)

FUNCTION DESCRIPTION = (RESTRAINT LOAD AT NODE 3)

NUMBER OF ABSCISSAE = (51)
FUNCTION SCALE FACTOR = (6.1120E-01)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.00153	0.	0.00233	0.	0.00297	0.	0.00351	0.	0.00398	0.
0.00441	0.	0.00481	0.	0.00519	0.	0.00554	0.	0.00587	0.
0.00687	5.0588E 04	0.00787	1.0820E 05	0.00887	1.6604E 05	0.00987	2.2989E 05	0.01087	2.9304E 05
0.01187	3.5642E 05	0.01287	4.1875E 05	0.01387	4.7365E 05	0.01487	5.3891E 05	0.01587	5.8180E 05
0.01687	6.1887E 05	0.01787	8.4976E 05	0.01887	6.7423E 05	0.01987	6.9213E 05	0.02087	7.0347E 05
0.02187	7.0834E 05	0.02222	7.0857E 05	0.02242	7.0857E 05	0.02202	7.0857E 05	0.02283	7.0857E 05
0.02304	7.0857E 05	0.02325	7.0857E 05	0.02347	7.0857E 05	0.02370	7.0857E 05	0.02393	7.0857E 05
0.02417	7.0857E 05	0.02442	7.0857E 05	0.02467	7.0857E 05	0.02494	7.0857E 05	0.02522	7.0857E 05
0.02551	7.0857E 05	0.02582	7.0857E 05	0.02614	7.0857E 05	0.02649	7.0857E 05	0.02687	7.0858E 05
0.02728	7.0857E 05	0.02774	7.0857E 05	0.02827	7.0857E 05	0.02893	7.0857E 05	0.02992	7.0858E 05
0.19740	7.0857E 05								

TABLE 6.A-10
(SHEET 2 OF 2)
DYSEA01 PROGRAM INPUT FOR JET LOAD FORCES

TIME FUNCTION NUMBER = (3)

FUNCTION DESCRIPTION = (BLOWDOWN LOAD AT NODE 34 & JET LOAD)

NUMBER OF ABSCISSAE = (51)
FUNCTION SCALE FACTOR = (-2.4270E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.00153	2.8666E 05	0.00233	2.8666E 05	0.00297	2.8666E 05	0.00351	2.8666E 05	0.00398	2.8666E 05
0.00441	2.8666E 05	0.00481	2.8666E 05	0.00519	2.8666E 05	0.00554	2.8666E 05	0.00587	2.8666E 05
0.00887	2.8666E 05	0.00787	2.8666E 05	0.00887	2.8666E 05	0.00987	2.8666E 05	0.01087	2.8666E 05
0.01187	2.8666E 05	0.01287	2.8666E 05	0.01387	2.8666E 05	0.01487	2.8666E 05	0.01587	2.8666E 05
0.01687	2.8666E 05	0.01787	2.8666E 05	0.01887	2.8666E 05	0.01987	2.8666E 05	0.02087	2.8666E 05
0.02187	2.8666E 05	0.02222	2.8666E 05	0.02242	2.8666E 05	0.02262	2.8666E 05	0.02283	2.8666E 05
0.02304	2.8666E 05	0.02325	2.8666E 05	0.02347	2.8666E 05	0.02370	2.8666E 05	0.02390	2.8666E 05
0.02417	2.8666E 05	0.02442	2.8666E 05	0.02467	2.8666E 05	0.02494	2.8666E 05	0.02522	2.8666E 05
0.02551	2.8666E 05	0.02582	2.8666E 05	0.02614	2.8666E 05	0.02649	2.8666E 05	0.02687	2.8666E 05
0.02728	2.8666E 05	0.02774	2.8666E 05	0.02827	2.8666E 05	0.02893	2.8666E 05	0.02992	2.8666E 05
0.19740	2.8666E 05								

TIME FUNCTION NUMBER = (4)

FUNCTION DESCRIPTION = (BLOWDOWN LOAD AT NODE 35 & JET LOAD)

NUMBER OF ABSCISSAE = (51)
FUNCTION SCALE FACTOR = (-2.4270E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.00163	6.0254E 04	0.00233	6.0254E 04	0.00297	6.0254E 04	0.00351	6.0254E 04	0.00398	6.0254E 04
0.00441	6.0254E 04	0.00481	6.0254E 04	0.00519	6.0254E 04	0.00554	6.0254E 04	0.00587	6.0254E 04
0.00887	6.0254E 04	0.00787	6.0254E 04	0.00887	6.0254E 04	0.00987	6.0254E 04	0.01087	6.0254E 04
0.01187	6.0254E 04	0.01287	6.0254E 04	0.01387	6.0254E 04	0.01487	6.0254E 04	0.01587	6.0254E 04
0.01687	6.0254E 04	0.01787	6.0254E 04	0.01887	6.0254E 04	0.01987	6.0254E 04	0.02087	6.0254E 04
0.02187	6.0254E 04	0.02222	6.0254E 04	0.02242	6.0254E 04	0.02262	6.0254E 04	0.02283	6.0254E 04
0.02304	6.0254E 04	0.02325	6.0254E 04	0.02347	6.0254E 04	0.02370	6.0254E 04	0.02390	6.0254E 04
0.02417	6.0254E 04	0.02442	6.0254E 04	0.02467	6.0254E 04	0.02494	6.0254E 04	0.02522	6.0254E 04
0.02551	6.0254E 04	0.02582	6.0254E 04	0.02614	6.0254E 04	0.02649	6.0254E 04	0.02687	6.0254E 04
0.02726	6.0254E 04	0.02774	6.0254E 04	0.02827	6.0254E 04	0.02893	6.0254E 04	0.02992	6.0254E 04
0.19740	6.0254E 04								

TABLE 6.A-11
(SHEET 1 OF 32)

TIME FORCE HISTORIES - RECIRCULATION LINE BREAK

TIME FUNCTION NUMBER = (1)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 30 00>02% 0. -0.7)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-7.0000E-01	0.00010	-7.0000E-01	0.00020	-7.0000E-01	0.00030	-7.0000E-01	0.00040	-7.0000E-01
0.00050	-7.0000E-01	0.00060	-7.0000E-01	0.00070	-7.0000E-01	0.00080	-7.0000E-01	0.00090	-7.0000E-01
0.00100	-7.0000E-01	0.00110	8.0000E-01	0.00120	8.0000E-01	0.00130	8.0000E-01	0.00140	8.0000E-01
0.00150	8.0000E-01	0.00160	8.0000E-01	0.00170	8.0000E-01	0.00180	8.0000E-01	0.00190	8.0000E-01
0.00200	-3.0000E-01	0.00210	-1.4000E 00	0.00220	1.0000E-01	0.00230	1.0000E-01	0.00240	1.0000E-01
0.00250	1.0000E-01	0.00260	1.0000E-01	0.00270	1.0000E-01	0.00280	1.0000E-01	0.00290	-1.0000E 00
0.00300	5.0000E-01	0.00310	5.0000E-01	0.00320	-6.0000E-01	0.00330	-6.0000E-01	0.00340	-1.7000E 00
0.00350	-1.7000E 00	0.00360	-2.0000E-01	0.00370	-1.3000E 00	0.00380	-1.5000E 00	0.00390	-2.4000E 00
0.00400	-3.5000E 00	0.00410	-3.1000E 00	0.00420	-4.2000E 00	0.00430	-5.3000E 00	0.00440	-6.4000E 00
0.00450	-7.4000E 00	0.00460	-9.3000E 00	0.00470	-1.0000E 01	0.00480	-1.1400E 01	0.00490	-1.3600E 01
0.00500	-1.5800E 01	0.00510	-1.9600E 01	0.00520	-2.0500E 01	0.00530	-2.3800E 01	0.00540	-2.7100E 01
0.00550	-3.1400E 01	0.00560	-3.5600E 01	0.00570	-3.9400E 01	0.00580	-4.4900E 01	0.00590	-4.9200E 01
0.00600	-5.6600E 01	0.00610	-6.1300E 01	0.00620	-6.8200E 01	0.00630	-7.6600E 01	0.00640	-8.5000E 01
0.00650	-9.3700E 01	0.00660	-1.0280E 02	0.00670	-1.1230E 02	0.00680	-1.2430E 02	0.00690	-1.3680E 02
0.00700	-1.4950E 02	0.00710	-1.6370E 02	0.00720	-1.7660E 02	0.00730	-1.9370E 02	0.00740	-2.0940E 02
0.00750	-2.2730E 02	0.00760	-2.4630E 02	0.00770	-2.6470E 02	0.00780	-2.8690E 02	0.00790	-3.0890E 02
0.00800	-3.3310E 02	0.00810	-3.5830E 02	0.00820	-3.8390E 02	0.00830	-4.1110E 02	0.00840	-4.3060E 02
0.00850	-4.6970E 02	0.00860	-5.0310E 02	0.00870	-5.3650E 02	0.00880	-5.7170E 02	0.00890	-6.0090E 02
0.00900	-6.4620E 02	0.00910	-6.8660E 02	0.00920	-7.2810E 02	0.00930	-7.7290E 02	0.00940	-8.1810E 02
0.00950	-8.6620E 02	0.00960	-9.1550E 02	0.00970	-9.6600E 02	0.00980	-1.0201E 03	0.00990	-1.0760E 03
0.01000	-1.1345E 03	0.01010	-1.1942E 03	0.01020	-1.2557E 03	0.01030	-1.3202E 03	0.01040	-1.3877E 03
0.01050	-1.4570E 03	0.01060	-1.5278E 03	0.01070	-1.6023E 03	0.01080	-1.6786E 03	0.01090	-1.7569E 03
0.01100	-1.8377E 03	0.01110	-1.9219E 03	0.01120	-2.0080E 03	0.01130	-2.0970E 03	0.01140	-2.1890E 03
0.01150	-2.2840E 03	0.01160	-2.3808E 03	0.01170	-2.4817E 03	0.01180	-2.5841E 03	0.01190	-2.6899E 03
0.01200	-2.7986E 03	0.01210	-2.9103E 03	0.01220	-3.0246E 03	0.01230	-3.1411E 03	0.01240	-3.2614E 03
0.01250	-3.3861E 03	0.01260	-3.5123E 03	0.01270	-3.6415E 03	0.01280	-3.7747E 03	0.01290	-3.9105E 03
0.01300	-4.0496E 03	0.01310	-4.1918E 03	0.01320	-4.3357E 03	0.01330	-4.4857E 03	0.01340	-4.6377E 03
0.01350	-4.7924E 03	0.01360	-4.9504E 03	0.01370	-5.1121E 03	0.01380	-5.2771E 03	0.01390	-5.4457E 03
0.01400	-5.6173E 03	0.01410	-5.7918E 03	0.01420	-5.9711E 03	0.01430	-6.1522E 03	0.01440	-6.3382E 03
0.01450	-6.5270E 03	0.01460	-6.7180E 03	0.01470	-6.9131E 03	0.01480	-7.1120E 03	0.01490	-7.3150E 03
0.01500	-7.5213E 03	0.01510	-7.7294E 03	0.01520	-7.9418E 03	0.01530	-8.1593E 03	0.01540	-8.3769E 03
0.01550	-8.6015E 03	0.01560	-8.8283E 03	0.01570	-9.0581E 03	0.01580	-9.2921E 03	0.01590	-9.5304E 03
0.01600	-9.7706E 03	0.01610	-1.0014E 04	0.01620	-1.0263E 04	0.01630	-1.0513E 04	0.01640	-1.0769E 04
0.01650	-1.1026E 04	0.01660	-1.1288E 04	0.01670	-1.1553E 04	0.01680	-1.1822E 04	0.01690	-1.2094E 04
0.01700	-1.2370E 04	0.01710	-1.2650E 04	0.01720	-1.2932E 04	0.01730	-1.3218E 04	0.01740	-1.3509E 04
0.01750	-1.3801E 04	0.01760	-1.4099E 04	0.01770	-1.4399E 04	0.01780	-1.4703E 04	0.01790	-1.5010E 04
0.01800	-1.5322E 04	0.01810	-1.5634E 04	0.01820	-1.5953E 04	0.01830	-1.6273E 04	0.01840	-1.6599E 04
0.01850	-1.6927E 04	0.01860	-1.7259E 04	0.01870	-1.7593E 04	0.01880	-1.7932E 04	0.01890	-1.8274E 04
0.01900	-1.8619E 04	0.01910	-1.8968E 04	0.01920	-1.9321E 04	0.01930	-1.9675E 04	0.01940	-2.0034E 04
0.01950	-2.0396E 04	0.01960	-2.0762E 04	0.01970	-2.1132E 04	0.01980	-2.1504E 04	0.01990	-2.1881E 04
0.02000	-2.2260E 04	0.02010	-2.2643E 04	0.02020	-2.3031E 04	0.02030	-2.3421E 04	0.02040	-2.3814E 04
0.02050	-2.4210E 04	0.02060	-2.4612E 04	0.02070	-2.5017E 04	0.02080	-2.5424E 04	0.02090	-2.5835E 04
0.02100	-2.6249E 04	0.02110	-2.6668E 04	0.02120	-2.7089E 04	0.02130	-2.7514E 04	0.02140	-2.7942E 04
0.02150	-2.8375E 04	0.02160	-2.8811E 04	0.02170	-2.9247E 04	0.02180	-2.9686E 04	0.02190	-3.0130E 04
0.02200	-3.0576E 04	0.02210	-3.1025E 04	0.02220	-3.1476E 04	0.02230	-3.1928E 04	0.02240	-3.2384E 04
0.02250	-3.2842E 04	0.02260	-3.3302E 04	0.02270	-3.3764E 04	0.02280	-3.4231E 04	0.02290	-3.4700E 04
0.02300	-3.5170E 04	0.02310	-3.5642E 04	0.02320	-3.6116E 04	0.02330	-3.6591E 04	0.02340	-3.7069E 04
0.02350	-3.7547E 04	0.02360	-3.8025E 04	0.02370	-3.8500E 04	0.02380	-3.8989E 04	0.02390	-3.9471E 04
0.02400	-3.9954E 04	0.02410	-4.0440E 04	0.02420	-4.0927E 04	0.02430	-4.1413E 04	0.02440	-4.1903E 04
0.02450	-4.2392E 04	0.02460	-4.2881E 04	0.02470	-4.3372E 04	0.02480	-4.3863E 04	0.02490	-4.4353E 04
0.02500	-4.4844E 04	0.02600	-4.9743E 04	0.02700	-5.4525E 04	0.02800	-5.9050E 04	0.02900	-6.3150E 04
0.03000	-6.6656E 04	0.03100	-6.9403E 04	0.03200	-7.1250E 04	0.03300	-7.2097E 04	0.03400	-7.1884E 04
0.03500	-7.0605E 04	0.03600	-6.8320E 04	0.03700	-6.5130E 04	0.03800	-6.1191E 04	0.03900	-5.6687E 04

TABLE 6.A-11
(SHEET 2 OF 32)

0.04000	-5.1820E 04	0.04100	-4.6802E 04	0.04200	-4.1822E 04	0.04300	-3.7061E 04	0.04400	-3.2660E 04
0.04500	-2.8715E 04	0.04600	-2.8251E 04	0.04700	-2.2262E 04	0.04800	-1.9721E 04	0.04900	-1.7604E 04
0.05000	-1.5857E 04	0.05100	-1.4412E 04	0.05200	-1.3205E 04	0.05300	-1.2173E 04	0.05400	-1.1269E 04
0.05500	-1.0462E 04	0.05600	-9.7343E 03	0.05700	-9.0809E 03	0.05800	-8.5027E 03	0.05900	-8.0047E 03
0.06000	-7.5888E 03	0.06100	-7.2478E 03	0.06200	-6.5521E 03	0.06300	-6.6065E 03	0.06400	[illegible]
0.06500	-6.0060E 03	0.06600	-5.5609E 03	0.06700	-4.9959E 03	0.06800	-4.2781E 03	0.06900	-3.3735E 03
0.07000	-2.2803E 03	0.07100	-1.0139E 03	0.07200	3.9270E 02	0.07300	1.8980E 03	0.07400	3.4499E 03
0.07500	4.9830E 03	0.07600	6.4342E 03	0.07700	7.7441E 03	0.07800	8.8624E 03	0.07900	9.7545E 03
0.08000	1.0395E 04	0.08100	1.0780E 04	0.08200	1.0915E 04	0.08300	1.0807E 04	0.08400	1.0618E 04
0.08500	1.0090E 04	0.08600	9.5719E 03	0.08700	9.0235E 03	0.08800	8.4997E 03	0.08900	8.0534E 03
0.09000	7.7262E 03	0.09100	7.5560E 03	0.09200	7.5665E 03	0.09300	7.7810E 03	0.09400	8.1043E 03
0.09500	8.8120E 03	0.09600	9.5945E 03	0.09700	1.0516E 04	0.09800	1.1542E 04	0.09900	1.2631E 04
0.10000	1.3756E 04	0.10100	1.4872E 04	0.10200	1.5948E 04	0.10300	1.6944E 04	0.10400	1.7814E 04
0.10500	1.8534E 04	0.10600	1.9050E 04	0.10700	1.9403E 04	0.10800	1.9528E 04	0.10900	1.9426E 04
0.11000	1.9103E 04	0.11100	1.8565E 04	0.11200	1.7826E 04	0.11300	1.6911E 04	0.11400	1.5838E 04
0.11500	1.4644E 04	0.11600	1.3356E 04	0.11700	1.2009E 04	0.11800	1.0046E 04	0.11900	9.2999E 03
0.12000	8.0006E 03	0.12100	6.7834E 03	0.12200	5.6784E 03	0.12300	4.7125E 03	0.12400	3.9093E 03
0.12500	3.2704E 03	0.12600	2.8282E 03	0.12700	2.5675E 03	0.12800	2.4858E 03	0.12900	2.5756E 03
0.13000	2.8404E 03	0.13100	3.2196E 03	0.13200	3.5922E 03	0.13300	4.2211E 03	0.13400	[illegible]
0.13500	5.3956E 03	0.13600	5.9901E 03	0.13700	6.5598E 03	0.13800	7.0357E 03	0.13900	7.5502E 03
0.14000	7.9364E 03	0.14100	8.2325E 03	0.14200	8.4436E 03	0.14300	8.5655E 03	0.14400	8.6008E 03
0.14500	8.5754E 03	0.14600	8.4815E 03	0.14700	8.3707E 03	0.14800	8.1761E 03	0.14900	8.0070E 03
0.15000	7.8562E 03	0.15100	7.7411E 03	0.15200	7.6726E 03	0.15300	7.6613E 03	0.15400	7.7098E 03
0.15500	7.8210E 03	0.15600	7.9898E 03	0.15700	8.2102E 03	0.15800	8.4604E 03	0.15900	8.7533E 03
0.16000	9.0442E 03	0.16100	9.3275E 03	0.16200	9.5867E 03	0.16300	9.8129E 03	0.16400	9.9905E 03
0.16500	1.0113E 04	0.16600	1.0173E 04	0.16700	1.0164E 04	0.16800	1.0076E 04	0.16900	9.9314E 03
0.17000	9.7369E 03	0.17100	9.4993E 03	0.17200	9.2277E 03	0.17300	8.9304E 03	0.17400	8.6180E 03
0.17500	8.2946E 03	0.17600	7.9701E 03	0.17700	7.6489E 03	0.17800	7.3326E 03	0.17900	7.0272E 03
0.18000	6.7330E 03	0.18100	6.4521E 03	0.18200	6.1873E 03	0.18300	5.9370E 03	0.18400	5.7045E 03
0.18500	5.4870E 03	0.18600	5.2872E 03	0.18700	5.1044E 03	0.18800	4.9413E 03	0.18900	4.7962E 03
0.19000	4.6753E 03	0.19100	4.5763E 03	0.19200	4.4993E 03	0.19300	4.4476E 03	0.19400	4.4182E 03
0.19500	4.4120E 03	0.19600	4.4279E 03	0.19700	4.4663E 03	0.19800	4.5240E 03	0.19900	4.5963E 03
0.20000	4.6769E 03	0.20200	4.8597E 03	0.20400	5.0244E 03	0.20600	5.1403E 03	0.20800	5.1825E 03
0.21000	5.1410E 03	0.21200	5.0242E 03	0.21400	4.5501E 03	0.21600	4.6546E 03	0.21800	4.4776E 03
0.22000	4.3596E 03	0.22200	4.3353E 03	0.22400	4.4270E 03	0.22600	4.6387E 03	0.22800	4.9600E 03
0.23000	5.3623E 03	0.23200	5.8013E 03	0.23400	6.2319E 03	0.23600	6.6010E 03	0.23800	6.8676E 03
0.24000	6.9944E 03	0.24200	6.9680E 03	0.24400	6.7848E 03	0.24600	6.4615E 03	0.24800	6.0296E 03
0.25000	5.5251E 03	0.25200	4.9933E 03	0.25400	4.4796E 03	0.25600	4.0178E 03	0.25800	3.6389E 03
0.26000	3.3605E 03	0.26200	3.1886E 03	0.26400	3.1184E 03	0.26600	3.1389E 03	0.26800	3.2320E 03
0.27000	3.3762E 03	0.27200	3.5485E 03	0.27400	3.7266E 03	0.27600	3.8904E 03	0.27800	4.0220E 03
0.28000	4.1116E 03	0.28200	4.1483E 03	0.28400	4.1353E 03	0.28600	4.0712E 03	0.28800	3.9650E 03
0.29000	3.8299E 03	0.29200	3.6756E 03	0.29400	3.5156E 03	0.29600	3.3637E 03	0.29800	3.2316E 03
0.30000	3.1261E 03	0.30200	3.0479E 03	0.30400	3.0009E 03	0.30600	2.9787E 03	0.30800	2.9769E 03
0.31000	2.9839E 03	0.31200	2.9937E 03	0.31400	2.9962E 03	0.31600	2.9865E 03	0.31800	2.9556E 03
0.32000	2.9050E 03	0.32200	2.8345E 03	0.32400	2.7478E 03	0.32600	2.6498E 03	0.32800	2.5524E 03
0.33000	2.4595E 03	0.33200	2.3845E 03	0.33400	2.3323E 03	0.33600	2.3094E 03	0.33800	2.3175E 03
0.34000	2.3596E 03	0.34200	2.4285E 03	0.34400	2.5249E 03	0.34600	2.6376E 03	0.34800	2.7584E 03
0.35000	2.8770E 03	0.35200	2.9845E 03	0.35400	3.0733E 03	0.35600	3.1360E 03	0.35800	3.1671E 03
0.36000	3.1668E 03	0.36200	3.1333E 03	0.36400	3.0711E 03	0.36600	2.9854E 03	0.36800	2.8856E 03
0.37000	2.7734E 03	0.37200	2.6547E 03	0.37400	2.5362E 03	0.37600	2.4180E 03	0.37800	2.3175E 03
0.38000	2.2326E 03	0.38200	2.1589E 03	0.38400	2.0921E 03	0.38600	2.0218E 03	0.38800	1.8434E 03
0.39000	1.8441E 03	0.39200	1.7348E 03	0.39400	1.6154E 03	0.39600	1.4970E 03	0.39800	1.3793E 03
0.40000	1.2729E 03	0.40200	1.1799E 03	0.40400	1.0966E 03	0.40600	9.6870E 02	0.40800	8.2960E 02
0.41000	6.7660E 02	0.41200	4.8160E 02	0.41400	3.0090E 02	0.41600	1.3320E 02	0.41800	-6.8800E 01
0.42000	-2.4670E 02	0.42200	-3.9630E 02	0.42400	-3.1560E 02	0.42600	-5.9970E 02	0.42800	-6.4940E 02
0.43000	-6.6350E 02	0.43200	-6.4080E 02	0.43400	-5.8310E 02	0.43600	-4.9280E 02	0.43800	-3.7600E 02
0.44000	-2.3970E 02	0.44200	-9.1600E 01	0.44400	5.8200E 01	0.44600	1.9990E 02	0.44800	3.2430E 02
0.45000	4.2070E 02	0.45200	4.8790E 02	0.45400	5.2140E 02	0.45600	5.2540E 02	0.45800	-5.0470E 02
0.46000	4.6690E 02	0.46200	4.2370E 02	0.46400	3.3680E 02	0.46600	3.6510E 02	0.46800	3.7010E 02
0.47000	4.0370E 02	0.47200	4.7140E 02	0.47400	5.6770E 02	0.47600	6.8540E 02	0.47800	8.1120E 02
0.48000	9.3670E 02	0.48200	1.0458E 03	0.48400	1.1266E 03	0.48600	1.1724E 03	0.48800	1.1763E 03
0.49000	1.1394E 03	0.49200	1.0636E 03	0.49400	9.5950E 02	0.49600	8.3500E 02	0.49800	7.0270E 02
0.50000	5.7330E 02	0.50110	5.0690E 02						

TIME FUNCTION NUMBER = (2)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 31 00>::$ 0. 1.6)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	1.6000E 00	0.00010	1.6000E 00	0.00020	1.6000E 00	0.00030	1.6000E 00	0.00040	1.6000E 00
0.00050	1.6000E 00	0.00060	1.6000E 00	0.00070	1.6000E 00	0.00080	1.6000E 00	0.00090	1.6000E 00
0.00100	1.6000E 00	0.00110	4.0000E-01	0.00120	4.0000E-01	0.00130	4.0000E-01	0.00140	4.0000E-01
0.00150	4.0000E-01	0.00160	-2.5000E 00	0.00170	-2.5000E 00	0.00180	-3.0000E 00	0.00190	-5.0000E 00
0.00200	-6.3000E 00	0.00210	-7.5000E 00	0.00220	-1.0000E 01	0.00230	-1.2700E 01	0.00240	-1.7400E 01
0.00250	-2.1200E 01	0.00260	-2.6100E 01	0.00270	-3.2300E 01	0.00280	-3.9800E 01	0.00290	-4.8400E 01
0.00300	-5.9300E 01	0.00310	-7.2100E 01	0.00320	-8.5700E 01	0.00330	-1.0060E 02	0.00340	-1.1890E 02
0.00350	-1.3870E 02	0.00360	-1.6110E 02	0.00370	-1.8680E 02	0.00380	-2.1410E 02	0.00390	-2.4470E 02
0.00400	-2.7820E 02	0.00410	-3.1510E 02	0.00420	-3.5740E 02	0.00430	-4.0170E 02	0.00440	-4.4540E 02
0.00450	-4.9990E 02	0.00460	-5.5510E 02	0.00470	-6.1390E 02	0.00480	-6.7620E 02	0.00490	-7.4250E 02
0.00500	-8.1220E 02	0.00510	-8.8650E 02	0.00520	-9.6580E 02	0.00530	-1.0475E 03	0.00540	-1.1339E 03
0.00550	-1.2245E 03	0.00560	-1.3180E 03	0.00570	-1.4174E 03	0.00580	-1.5182E 03	0.00590	-1.6257E 03
0.00600	-1.7347E 03	0.00610	-1.8492E 03	0.00620	-1.9686E 03	0.00630	-2.0902E 03	0.00640	-2.2161E 03
0.00650	-2.3470E 03	0.00660	-2.4816E 03	0.00670	-2.6189E 03	0.00680	-2.7603E 03	0.00690	-2.9090E 03
0.00700	-3.0601E 03	0.00710	-3.2160E 03	0.00720	-3.3748E 03	0.00730	-3.5371E 03	0.00740	-3.7053E 03
0.00750	-3.8777E 03	0.00760	-4.0544E 03	0.00770	-4.2354E 03	0.00780	-4.4202E 03	0.00790	-4.6101E 03
0.00800	-4.8035E 03	0.00810	-5.0015E 03	0.00820	-5.2038E 03	0.00830	-5.4121E 03	0.00840	-5.6252E 03
0.00850	-5.8415E 03	0.00860	-6.0639E 03	0.00870	-6.2898E 03	0.00880	-6.5224E 03	0.00890	-6.7592E 03
0.00900	-7.0018E 03	0.00910	-7.2489E 03	0.00920	-7.5020E 03	0.00930	-7.7611E 03	0.00940	-8.0228E 03
0.00950	-8.2921E 03	0.00960	-8.5673E 03	0.00970	-8.8472E 03	0.00980	-9.1341E 03	0.00990	-9.4277E 03
0.01000	-9.7266E 03	0.01010	-1.0032E 04	0.01020	-1.0342E 04	0.01030	-1.0659E 04	0.01040	-1.0984E 04
0.01050	-1.1316E 04	0.01060	-1.1654E 04	0.01070	-1.1999E 04	0.01080	-1.2353E 04	0.01090	-1.2710E 04
0.01100	-1.3077E 04	0.01110	-1.3453E 04	0.01120	-1.3833E 04	0.01130	-1.4220E 04	0.01140	-1.4616E 04
0.01150	-1.5017E 04	0.01160	-1.5426E 04	0.01170	-1.5841E 04	0.01180	-1.6264E 04	0.01190	-1.6694E 04
0.01200	-1.7128E 04	0.01210	-1.7574E 04	0.01220	-1.8024E 04	0.01230	-1.8481E 04	0.01240	-1.8948E 04
0.01250	-1.9422E 04	0.01260	-1.9903E 04	0.01270	-2.0393E 04	0.01280	-2.0888E 04	0.01290	-2.1397E 04
0.01300	-2.1910E 04	0.01310	-2.2433E 04	0.01320	-2.2965E 04	0.01330	-2.3504E 04	0.01340	-2.4054E 04
0.01350	-2.4612E 04	0.01360	-2.5178E 04	0.01370	-2.5755E 04	0.01380	-2.6340E 04	0.01390	-2.6936E 04
0.01400	-2.7541E 04	0.01410	-2.8154E 04	0.01420	-2.8779E 04	0.01430	-2.9412E 04	0.01440	-3.0056E 04
0.01450	-3.0709E 04	0.01460	-3.1373E 04	0.01470	-3.2048E 04	0.01480	-3.2732E 04	0.01490	-3.3427E 04
0.01500	-3.4132E 04	0.01510	-3.4848E 04	0.01520	-3.5577E 04	0.01530	-3.6314E 04	0.01540	-3.7063E 04
0.01550	-3.7823E 04	0.01560	-3.8594E 04	0.01570	-3.9377E 04	0.01580	-4.0171E 04	0.01590	-4.0978E 04
0.01600	-4.1795E 04	0.01610	-4.2624E 04	0.01620	-4.3466E 04	0.01630	-4.4318E 04	0.01640	-4.5185E 04
0.01650	-4.6061E 04	0.01660	-4.6951E 04	0.01670	-4.7854E 04	0.01680	-4.8769E 04	0.01690	-4.9696E 04
0.01700	-5.0637E 04	0.01710	-5.1589E 04	0.01720	-5.2554E 04	0.01730	-5.3535E 04	0.01740	-5.4527E 04
0.01750	-5.5532E 04	0.01760	-5.6552E 04	0.01770	-5.7582E 04	0.01780	-5.8627E 04	0.01790	-5.9685E 04
0.01800	-6.0755E 04	0.01810	-6.1840E 04	0.01820	-6.2937E 04	0.01830	-6.4048E 04	0.01840	-6.5173E 04
0.01850	-6.6312E 04	0.01860	-6.7464E 04	0.01870	-6.8628E 04	0.01880	-6.9807E 04	0.01890	-7.0998E 04
0.01900	-7.2204E 04	0.01910	-7.3424E 04	0.01920	-7.4654E 04	0.01930	-7.5900E 04	0.01940	-7.7158E 04
0.01950	-7.8419E 04	0.01960	-7.9698E 04	0.01970	-8.0990E 04	0.01980	-8.2296E 04	0.01990	-8.3611E 04
0.02000	-8.4937E 04	0.02010	-8.6274E 04	0.02020	-8.7621E 04	0.02030	-8.8979E 04	0.02040	-9.0346E 04
0.02050	-9.1708E 04	0.02060	-9.3070E 04	0.02070	-9.4425E 04	0.02080	-9.5777E 04	0.02090	-9.7118E 04
0.02100	-9.8456E 04	0.02110	-9.9784E 04	0.02120	-1.0111E 05	0.02130	-1.0242E 05	0.02140	-1.0372E 05
0.02150	-1.0501E 05	0.02160	-1.0235E 05	0.02170	-1.0354E 05	0.02180	-1.0472E 05	0.02190	-1.0589E 05
0.02200	-1.0704E 05	0.02210	-1.0817E 05	0.02220	-1.0929E 05	0.02230	-1.1039E 05	0.02240	-1.1147E 05
0.02250	-1.1254E 05	0.02260	-1.1359E 05	0.02270	-1.1462E 05	0.02280	-1.1562E 05	0.02290	-1.1661E 05
0.02300	-1.1759E 05	0.02310	-1.1854E 05	0.02320	-1.1947E 05	0.02330	-1.2039E 05	0.02340	-1.2129E 05
0.02350	-1.2216E 05	0.02360	-1.2302E 05	0.02370	-1.2386E 05	0.02380	-1.2468E 05	0.02390	-1.2549E 05
0.02400	-1.2626E 05	0.02410	-1.2701E 05	0.02420	-1.2773E 05	0.02430	-1.2842E 05	0.02440	-1.2909E 05
0.02450	-1.2973E 05	0.02460	-1.3035E 05	0.02470	-1.3093E 05	0.02480	-1.3149E 05	0.02490	-1.3203E 05
0.02500	-1.3253E 05	0.02600	-1.3671E 05	0.02700	-1.3894E 05	0.02800	-1.3909E 05	0.02900	-1.3727E 05
0.03000	-1.3391E 05	0.03100	-1.2963E 05	0.03200	-1.2476E 05	0.03300	-1.1962E 05	0.03400	-1.1445E 05
0.03500	-1.0959E 05	0.03600	-1.0508E 05	0.03700	-1.0102E 05	0.03800	-9.7482E 04	0.03900	-9.4409E 04

TABLE 6.A-11
(SHEET 4 OF 32)

0.04000	-9.1518E 04	0.04100	-8.8633E 04	0.04200	-8.5604E 04	0.04300	-8.2244E 04	0.04400	-7.8471E 04
0.04500	-7.4297E 04	0.04600	-6.9790E 04	0.04700	-6.5040E 04	0.04800	-6.0160E 04	0.04900	-5.5200E 04
0.05000	-5.0133E 04	0.05100	-4.4970E 04	0.05200	-3.9849E 04	0.05300	-3.5013E 04	0.05400	-3.0453E 04
0.05500	-2.6184E 04	0.05600	-2.2191E 04	0.05700	-1.8409E 04	0.05800	-1.4874E 04	0.05900	-1.1809E 04
0.06000	-9.1597E 03	0.06100	-3.2319E 03	0.06200	-1.4060E 02	0.06300	2.7473E 03	0.06400	5.3519E 03
0.06500	7.6890E 03	0.06600	9.6464E 03	0.06700	1.1216E 04	0.06800	1.2336E 04	0.06900	1.2975E 04
0.07000	1.3140E 04	0.07100	1.2816E 04	0.07200	1.2088E 04	0.07300	1.1050E 04	0.07400	9.8062E 03
0.07500	8.5158E 03	0.07600	7.3118E 03	0.07700	6.3317E 03	0.07800	5.6937E 03	0.07900	5.5033E 03
0.08000	5.6326E 03	0.08100	6.7222E 03	0.08200	8.6611E 03	0.08300	9.2270E 03	0.08400	1.1506E 04
0.08500	1.4150E 04	0.08600	1.6966E 04	0.08700	1.9654E 04	0.08800	2.2724E 04	0.08900	2.5519E 04
0.09000	2.8169E 04	0.09100	3.0594E 04	0.09200	3.2748E 04	0.09300	3.4479E 04	0.09400	3.5806E 04
0.09500	3.6665E 04	0.09600	3.7147E 04	0.09700	3.7220E 04	0.09800	3.6916E 04	0.09900	3.6314E 04
0.10000	3.5278E 04	0.10100	3.4079E 04	0.10200	3.2651E 04	0.10300	3.1067E 04	0.10400	2.9443E 04
0.10500	2.7636E 04	0.10600	2.6305E 04	0.10700	2.4912E 04	0.10800	2.3702E 04	0.10900	2.2713E 04
0.11000	2.1972E 04	0.11100	2.1484E 04	0.11200	2.1228E 04	0.11300	2.1171E 04	0.11400	2.1264E 04
0.11500	2.1442E 04	0.11600	2.1768E 04	0.11700	2.2181E 04	0.11800	2.2577E 04	0.11900	2.2900E 04
0.12000	2.3142E 04	0.12100	2.3250E 04	0.12200	2.3206E 04	0.12300	2.2000E 04	0.12400	2.2023E 04
0.12500	2.2098E 04	0.12600	2.1398E 04	0.12700	2.0568E 04	0.12800	1.9627E 04	0.12900	1.8593E 04
0.13000	1.7497E 04	0.13100	1.6395E 04	0.13200	1.5311E 04	0.13300	1.4266E 04	0.13400	1.3282E 04
0.13500	1.2388E 04	0.13600	1.1577E 04	0.13700	1.0865E 04	0.13800	1.0263E 04	0.13900	9.7561E 03
0.14000	9.4610E 03	0.14100	9.3147E 03	0.14200	9.3567E 03	0.14300	9.6087E 03	0.14400	1.0858E 04
0.14500	1.0727E 04	0.14600	1.1592E 04	0.14700	1.2628E 04	0.14800	1.3777E 04	0.14900	1.4306E 04
0.15000	1.6192E 04	0.15100	1.7538E 04	0.15200	1.8370E 04	0.15300	1.9256E 04	0.15400	1.9959E 04
0.15500	2.0457E 04	0.15600	2.0739E 04	0.15700	2.0808E 04	0.15800	2.0674E 04	0.15900	2.0358E 04
0.16000	1.9895E 04	0.16100	1.9321E 04	0.16200	1.8681E 04	0.16300	1.8010E 04	0.16400	1.7341E 04
0.16500	1.6706E 04	0.16600	1.6128E 04	0.16700	1.5627E 04	0.16800	1.5226E 04	0.16900	1.4909E 04
0.17000	1.4657E 04	0.17100	1.4467E 04	0.17200	1.4322E 04	0.17300	1.4205E 04	0.17400	1.4106E 04
0.17500	1.4013E 04	0.17600	1.3915E 04	0.17700	1.3804E 04	0.17800	1.3681E 04	0.17900	1.3540E 04
0.18000	1.3385E 04	0.18100	1.3219E 04	0.18200	1.3046E 04	0.18300	1.2872E 04	0.18400	1.2700E 04
0.18500	1.2535E 04	0.18600	1.2376E 04	0.18700	1.2223E 04	0.18800	1.2075E 04	0.18900	1.1929E 04
0.19000	1.1781E 04	0.19100	1.1623E 04	0.19200	1.1450E 04	0.19300	1.1258E 04	0.19400	1.1039E 04
0.19500	1.0798E 04	0.19600	1.0526E 04	0.19700	1.0223E 04	0.19800	9.8874E 03	0.19900	9.5314E 03
0.20000	9.1613E 03	0.20200	8.4093E 03	0.20400	7.7301E 03	0.20600	7.2051E 03	0.2080	6.9036E 03
0.21000	6.8671E 03	0.21200	7.0993E 03	0.21400	7.5759E 03	0.21600	8.2404E 03	0.21800	9.0164E 03
0.22000	9.8130E 03	0.22200	1.0543E 04	0.22400	1.1125E 04	0.22600	1.1499E 04	0.22800	1.1640E 04
0.23000	1.1551E 04	0.23200	1.1267E 04	0.23400	1.0845E 04	0.23600	1.0355E 04	0.23800	9.8610E 03
0.24000	9.4222E 03	0.24200	9.0750E 03	0.24400	8.8367E 03	0.24600	8.7040E 03	0.24800	8.6502E 03
0.25000	8.6323E 03	0.25200	8.6045E 03	0.25400	8.5264E 03	0.25600	8.3747E 03	0.25800	8.1410E 03
0.26000	7.8366E 03	0.26200	7.4855E 03	0.26400	7.1168E 03	0.26600	6.7597E 03	0.26800	6.4364E 03
0.27000	6.1651E 03	0.27200	5.9538E 03	0.27400	5.7960E 03	0.27600	5.6908E 03	0.27800	5.6289E 03
0.28000	5.5951E 03	0.28200	5.5830E 03	0.28400	5.5611E 03	0.28600	5.5794E 03	0.28800	5.5710E 03
0.29000	5.5483E 03	0.29200	5.5070E 03	0.29400	5.4462E 03	0.29600	5.3640E 03	0.29800	5.2090E 03
0.30000	5.1319E 03	0.30200	4.9860E 03	0.30400	4.8238E 03	0.30600	4.6476E 03	0.30800	4.4527E 03
0.31000	4.2688E 03	0.31200	4.0736E 03	0.31400	3.8812E 03	0.31600	3.7012E 03	0.31800	3.5463E 03
0.32000	3.3969E 03	0.32200	3.2828E 03	0.32400	3.1980E 03	0.32600	3.1441E 03	0.32800	3.1228E 03
0.33000	3.1271E 03	0.33200	3.1555E 03	0.33400	3.2030E 03	0.33600	3.2638E 03	0.33800	3.3331E 03
0.34000	3.4026E 03	0.34200	3.4696E 03	0.34400	3.5274E 03	0.34600	3.5712E 03	0.34800	3.6018E 03
0.35000	3.6161E 03	0.35200	3.6119E 03	0.35400	3.5911E 03	0.35600	3.5590E 03	0.35800	3.5134E 03
0.36000	3.4547E 03	0.36200	3.3754E 03	0.36400	3.2715E 03	0.36600	3.2449E 03	0.36800	3.2073E 03
0.37000	3.0217E 03	0.37200	2.8604E 03	0.37400	2.6359E 03	0.37600	2.9171E 03	0.37800	2.5401E 03
0.38000	2.4208E 03	0.38200	2.1384E 03	0.38400	1.7712E 03	0.38600	1.3832E 03	0.38800	1.0451E 03
0.39000	7.9260E 02	0.39200	6.3350E 02	0.39400	5.4190E 02	0.39600	4.6180E 02	0.39800	4.1730E 02
0.40000	2.8170E 02	0.40200	5.0600E 01	0.40400	-1.7140E 02	0.40600	-5.7320E 02	0.40800	-9.1890E 02
0.41000	-1.1892E 03	0.41200	-1.6081E 03	0.41400	-1.9639E 03	0.41600	-2.2295E 03	0.41800	-2.5996E 03
0.42000	-2.8237E 03	0.42200	-3.0174E 03	0.42400	-3.1568E 03	0.42600	-3.2364E 03	0.42800	-3.2570E 03
0.43000	-3.2254E 03	0.43200	-3.1509E 03	0.43400	-3.0540E 03	0.43600	-2.9483E 03	0.43800	-2.8511E 03
0.44000	-2.7736E 03	0.44200	-2.7187E 03	0.44400	-2.6885E 03	0.44600	-2.6729E 03	0.44800	-2.6675E 03
0.45000	-2.6596E 03	0.45200	-2.6377E 03	0.45400	-2.5902E 03	0.45600	-2.5054E 03	0.45800	-2.3800E 03
0.46000	-2.2105E 03	0.46200	-2.0067E 03	0.46400	-1.7780E 03	0.46600	-1.5416E 03	0.46800	-1.3199E 03
0.47000	-1.1272E 03	0.47200	-9.8460E 02	0.47400	-9.0060E 02	0.47600	-0.7880E 02	0.47800	-9.1380E 02
0.48000	-9.9070E 02	0.48200	-1.0958E 03	0.48400	-1.2094E 03	0.48600	-1.3161E 03	0.48800	-1.4002E 03
0.49000	-1.4575E 03	0.49200	-1.4865E 03	0.49400	-1.4910E 03	0.49600	-1.4772E 03	0.49800	-1.4614E 03

0.50000	-1.4549E 03	0.50110	-1.4595E 03

TABLE 6.A-11
(SHEET 5 OF 32)

TIME FUNCTION NUMBER = (3)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 32 00>02$ 0. 0.9)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	9.0000E-01	0.00010	9.0000E-01	0.00020	9.0000E-01	0.00030	9.0000E-01	0.00040	9.0000E-01
0.00050	9.0000E-01	0.00060	9.0000E-01	0.00070	9.0000E-01	0.00080	9.0000E-01	0.00090	9.0000E-01
0.00100	9.0000E-01	0.00110	2.0000E-01	0.00120	2.0000E-01	0.00130	2.0000E-01	0.00140	2.0000E-01
0.00150	2.0000E-01	0.00160	-1.4000E 00	0.00170	-1.4000E 00	0.00180	-2.1000E 00	0.00190	-2.6000E 00
0.00200	-3.5000E 00	0.00210	-4.2000E 00	0.00220	-5.6000E 00	0.00230	-7.[illegible]000E 00	0.00240	-9.7000E 00
0.00250	-1.1800E 01	0.00260	-1.4600E 01	0.00270	-1.8000E 01	0.00280	-2.2200E 01	0.00290	-2.7000E 01
0.00300	-3.3100E 01	0.00310	-4.0200E 01	0.00320	-4.7800E 01	0.00330	-5.6[illegible]00E 01	0.00340	-6.6300E 01
0.00350	-7.7400E 01	0.00360	-8.9800E 01	0.00370	-1.0420E 02	0.00380	-1.1940E 02	0.00390	-1.39[illegible]0E 02
0.00400	-1.5520E 02	0.00410	-1.7570E 02	0.00420	-1.9930E 02	0.00430	-2.24[illegible]0E 02	0.00440	-2.5060E 02
0.00450	-2.7880E 02	0.00460	-3.0950E 02	0.00470	-3.4240E 02	0.00480	-3.7710E 02	0.00490	-4.1410E 02
0.00500	-4.5290E 02	0.00510	-4.9440E 02	0.00520	-5.3860E 02	0.00530	-5.84[illegible]0E 02	0.00540	-6.3230E 02
0.00550	-6.8290E 02	0.00560	-7.3500E 02	0.00570	-7.9040E 02	0.00580	-8.4720E 02	0.00590	-9.0660E 02
0.00600	-9.6740E 02	0.00610	-1.0312E 03	0.00620	-1.0973E 03	0.00630	-1.1657E 03	0.00640	-1.2359E 03
0.00650	-1.3089E 03	0.00660	-1.3839E 03	0.00670	-1.4605E 03	0.00680	-1.5[illegible]10E 03	0.00690	-1.6222E 03
0.00700	-1.7066E 03	0.00710	-1.7935E 03	0.00720	-1.8821E 03	0.00730	-1.9726E 03	0.00740	-2.0663E 03
0.00750	-2.1625E 03	0.00760	-2.2610E 03	0.00770	-2.3620E 03	0.00780	-2.4650E 03	0.00790	-2.5709E 03
0.00800	-2.6788E 03	0.00810	-2.7892E 03	0.00820	-2.9020E 03	0.00830	-3.0182E 03	0.00840	-3.1370E 03
0.00850	-3.2577E 03	0.00860	-3.3817E 03	0.00870	-3.5076E 03	0.00880	-3.6374E 03	0.00890	-3.7694E 03
0.00900	-3.9047E 03	0.00910	-4.0425E 03	0.00920	-4.1836E 03	0.00930	-4.3261E 03	0.00940	-4.4741E 03
0.00950	-4.6243E 03	0.00960	-4.7777E 03	0.00970	-4.9338E 03	0.00980	-5.0939E 03	0.00990	-5.2576E 03
0.01000	-5.4243E 03	0.01010	-5.5943E 03	0.01020	-5.7675E 03	0.01030	-5.9441E 03	0.01040	-6.1256E 03
0.01050	-6.3104E 03	0.01060	-6.4992E 03	0.01070	-6.6917E 03	0.01080	-6.8887E 03	0.01090	-7.0882E 03
0.01100	-7.2927E 03	0.01110	-7.5022E 03	0.01120	-7.7143E 03	0.01130	-7.9301E 03	0.01140	-8.1507E 03
0.01150	-8.3746E 03	0.01160	-8.6028E 03	0.01170	-8.8340E 03	0.01180	-9.0697E 03	0.01190	-9.3099E 03
0.01200	-9.5519E 03	0.01210	-9.8004E 03	0.01220	-1.0052E 04	0.01230	-1.0306E 04	0.01240	-1.0567E 04
0.01250	-1.0831E 04	0.01260	-1.1099E 04	0.01270	-1.1372E 04	0.01280	-1.1649E 04	0.01290	-1.1932E 04
0.01300	-1.2219E 04	0.01310	-1.2511E 04	0.01320	-1.2807E 04	0.01330	-1.3107E 04	0.01340	-1.3414E 04
0.01350	-1.3726E 04	0.01360	-1.4041E 04	0.01370	-1.4363E 04	0.01380	-1.4689E 04	0.01390	-1.5021E 04
0.01400	-1.5359E 04	0.01410	-1.5701E 04	0.01420	-1.6049E 04	0.01430	-1.6403E 04	0.01440	-1.6762E 04
0.01450	-1.7126E 04	0.01460	-1.7496E 04	0.01470	-1.7872E 04	0.01480	-1.8254E 04	0.01490	-1.8641E 04
0.01500	-1.9035E 04	0.01510	-1.9434E 04	0.01520	-1.9840E 04	0.01530	-2.0251E 04	0.01540	-2.0669E 04
0.01550	-2.1093E 04	0.01560	-2.1523E 04	0.01570	-2.1960E 04	0.01580	-2.2403E 04	0.01590	-2.2852E 04
0.01600	-2.3308E 04	0.01610	-2.3770E 04	0.01620	-2.4240E 04	0.01630	-2.4715E 04	0.01640	-2.5198E 04
0.01650	-2.5687E 04	0.01660	-2.6183E 04	0.01670	-2.6687E 04	0.01680	-2.7197E 04	0.01690	-2.7714E 04
0.01700	-2.8239E 04	0.01710	-2.8770E 04	0.01720	-2.9308E 04	0.01730	-2.9855E 04	0.01740	-3.0408E 04
0.01750	-3.0969E 04	0.01760	-3.1537E 04	0.01770	-3.2112E 04	0.01780	-3.2695E 04	0.01790	-3.3285E 04
0.01800	-3.3881E 04	0.01810	-3.4486E 04	0.01820	-3.5098E 04	0.01830	-3.5718E 04	0.01840	-3.6345E 04
0.01850	-3.6980E 04	0.01860	-3.7623E 04	0.01870	-3.8272E 04	0.01880	-3.8930E 04	0.01890	-3.9594E 04
0.01900	-4.0266E 04	0.01910	-4.0947E 04	0.01920	-4.1633E 04	0.01930	-4.2327E 04	0.01940	-4.3029E 04
0.01950	-4.3732E 04	0.01960	-4.4446E 04	0.01970	-4.5166E 04	0.01980	-4.5894E 04	0.01990	-4.6628E 04
0.02000	-4.7367E 04	0.02010	-4.8113E 04	0.02020	-4.8864E 04	0.02030	-4.9621E 04	0.02040	-5.0383E 04
0.02050	-5.1143E 04	0.02060	-5.1903E 04	0.02070	-5.2668E 04	0.02080	-5.3412E 04	0.02090	-5.4160E 04
0.02100	-5.4906E 04	0.02110	-5.5647E 04	0.02120	-5.6384E 04	0.02130	-5.7116E 04	0.02140	-5.7843E 04
0.02150	-5.8564E 04	0.02160	-5.7077E 04	0.02170	-5.7743E 04	0.02180	-5.8402E 04	0.02190	-5.9053E 04
0.02200	-5.9694E 04	0.02210	-6.0325E 04	0.02220	-6.0949E 04	0.02230	-6.1563E 04	0.02240	-6.2166E 04
0.02250	-6.2760E 04	0.02260	-6.3344E 04	0.02270	-6.3918E 04	0.02280	-6.4480E 04	0.02290	-6.5033E 04
0.02300	-6.5575E 04	0.02310	-6.6106E 04	0.02320	-6.6627E 04	0.02330	-6.7139E 04	0.02340	-6.7638E 04
0.02350	-6.8128E 04	0.02360	-6.8602E 04	0.02370	-6.9073E 04	0.02380	-6.9533E 04	0.02390	-6.9982E 04
0.02400	-7.0411E 04	0.02410	-7.0829E 04	0.02420	-7.1231E 04	0.02430	-7.1619E 04	0.02440	-7.1991E 04
0.02450	-7.2349E 04	0.02460	-7.2692E 04	0.02470	-7.3019E 04	0.02480	-7.3331E 01	0.02490	-7.3628E 04
0.02500	-7.3909E 04	0.02600	-7.6240E 04	0.02700	-7.7482E 04	0.02800	-7.7565E 04	0.02900	-7.6552E 04
0.03000	-7.4676E 04	0.03100	-7.2291E 04	0.03200	-6.9578E 04	0.03300	-6.6711E 04	0.03400	-6.3825E 04
0.03500	-6.1116E 04	0.03600	-5.8600E 04	0.03700	-5.6338E 04	0.03800	-5.4363E 04	0.03900	-5.2649E 04

TABLE 6.A-11
(SHEET 6 OF 32)

0.04000	-5.1037E 04	0.04100	-4.9428E 04	0.04200	-4.7739E 04	0.04300	-4.5665E 04	0.04400	-4.3761E 04
0.04500	-4.1433E 04	0.04600	-3.8920E 04	0.04700	-3.6271E 04	0.04800	-3.3549E 04	0.04900	-3.0764E 04
0.05000	-2.7958E 04	0.05100	-2.5078E 04	0.05200	-2.2223E 04	0.05300	-1.9526E 04	0.05400	-1.6904E 04
0.05500	-1.4602E 04	0.05600	-1.2375E 04	0.05700	-1.0266E 04	0.05800	-8.2948E 03	0.05900	-6.6360E 03
0.06000	-5.1081E 03	0.06100	-1,8023E 03	0.06200	-7.8400E 01	0.06300	1.5321E 03	0.06400	3.0013E 03
0.06500	4.2679E 03	0.06600	5.3795E 03	0.06700	6.2549E 03	0.06800	6.6792E 03	0.06900	7.2379E 03
0.07000	7.3277E 03	0.07100	7.1469E 03	0.07200	6.7412E 03	0.07300	6.1623E 03	0.07400	5.4687E 03
0.07500	4.7490E 03	0.07600	4.0776E 03	0.07700	3.5310E 03	0.07800	3.1752E 03	0.07900	3.0690E 03
0.08000	3.2527E 03	0.08100	3.7488E 03	0.08200	2.0417E 03	0.08300	5.1456E 03	0.08400	6.4165E 03
0.08500	7.8910E 03	0.08600	9.4616E 03	0.08700	1.1072E 04	0.08800	1.2673E 04	0.08900	1.4231E 04
0.09000	1.5709E 04	0.09100	1.7062E 04	0.09200	1.8263E 04	0.09300	1.9228E 04	0.09400	1.9905E 04
0.09500	2.0447E 04	0.09600	2.0716E 04	0.09700	2.0757E 04	0.09800	2.0586E 04	0.09900	2.0251E 04
0.10000	1.9674E 04	0.10100	1.9005E 04	0.10200	1.6208E 04	0.10300	1.7336E 04	0.10400	1.6423E 04
0.10500	1.5524E 04	0.10600	1.4670E 04	0.10700	1.3893E 04	0.10800	1.5218E 04	0.10900	1.2663E 04
0.11000	1.2253E 04	0.11100	1.1981E 04	0.11200	1.1738E 04	0.11300	1.1806E 04	0.11400	1.1858E 04
0.11500	1.1958E 04	0.11600	1.2139E 04	0.11700	1.2370E 04	0.11800	1.2520E 04	0.11900	1.2775E 04
0.12000	1.2906E 04	0.12100	1.2966E 04	0.12200	1.2941E 04	0.12300	1.2826E 04	0.12400	1.2610E 04
0.12500	1.2323E 04	0.12600	1.1933E 04	0.12700	1.1470E 04	0.12800	1.0845E 04	0.12900	1.0371E 04
0.13000	9.7577E 03	0.13100	9.1429E 03	0.13200	8.5384E 03	0.13300	7.9559E 03	0.13400	7.4068E 03
0.13500	6.9083E 03	0.13600	6.4563E 03	0.13700	6.0588E 03	0.13800	5.7234E 03	0.13900	5.4586E 03
0.14000	5.2762E 03	0.14100	5.1946E 03	0.14200	5.2179E 03	0.14300	5.3557E 03	0.14400	5.6091E 03
0.14500	5.9822E 03	0.14600	6.4643E 03	0.14700	7.0421E 03	0.14800	7.6830E 03	0.14900	8.3567E 03
0.15000	9.0300E 03	0.15100	9.6687E 03	0.15200	1.0244E 04	0.15300	1.0739E 04	0.15400	1.1130E 04
0.15500	1.1408E 04	0.15600	1.1566E 04	0.15700	1.1604E 04	0.15800	1.1529E 04	0.15900	1.1353E 04
0.16000	1.1095E 04	0.16100	1.0775E 04	0.16200	1.0418E 04	0.16300	1.0043E 04	0.16400	9.6703E 03
0.16500	9.3167E 03	0.16600	8.9940E 03	0.16700	8.7145E 03	0.16800	8.4921E 03	0.16900	8.3141E 03
0.17000	8.1739E 03	0.17100	8.0680E 03	0.17200	7.9872E 03	0.17300	7.9221E 03	0.17400	7.8665E 03
0.17500	7.8146E 03	0.17600	7.7599E 03	0.17700	7.6982E 03	0.17800	7.6296E 03	0.17900	7.5509E 03
0.18000	7.4646E 03	0.18100	7.3718E 03	0.18200	7.2751E 03	0.18300	7.1786E 03	0.18400	7.0827E 03
0.18500	6.9902E 03	0.18600	6.9015E 03	0.18700	6.8164E 03	0.18800	6.7339E 03	0.18900	6.6525E 03
0.19000	6.5698E 03	0.19100	6.4817E 03	0.19200	6.3851E 03	0.19300	6.2780E 03	0.19400	6.1559E 03
0.19500	6.0218E 03	0.19600	5.8702E 03	0.19700	5.7008E 03	0.19800	5.5139E 03	0.19900	5.3164E 03
0.20000	5.1090E 03	0.20200	4.6896E 03	0.20400	4.3109E 03	0.20600	4.0181E 03	0.20800	3.8499E 03
0.21000	3.8296E 03	0.21200	3.9591E 03	0.21400	4.2248E 03	0.21600	4.5954E 03	0.21800	5.0282E 03
0.22000	5.4725E 03	0.22200	5.8797E 03	0.22400	6.2041E 03	0.22600	6.4126E 03	0.22800	6.4915E 03
0.23000	6.4416E 03	0.23200	6.2835E 03	0.23400	6.0481E 03	0.23600	5.7744E 03	0.23800	5.4992E 03
0.24000	5.2545E 03	0.24200	5.0609E 03	0.24400	4.9280E 03	0.24600	4.8540E 03	0.24800	4.8240E 03
0.25000	4.8140E 03	0.25200	4.7985E 03	0.25400	4.7549E 03	0.25600	4.6703E 03	0.25800	4.5400E 03
0.26000	4.3703E 03	0.26200	4.1745E 03	0.26400	3.9639E 03	0.26600	3.7697E 03	0.26800	3.5894E 03
0.27000	3.4381E 03	0.27200	3.3203E 03	0.27400	3.2323E 03	0.27600	3.1736E 03	0.27600	3.1391E 03
0.28000	3.1202E 03	0.28200	3.1135E 03	0.28400	3.1124E 03	0.28600	3.1115E 03	0.28800	3.1068E 03
0.29000	3.0941E 03	0.29200	3.0711E 03	0.29400	3.0372E 03	0.29600	2.9518E 03	0.29800	2.9328E 03
0.30000	2.8619E 03	0.30200	2.7806E 03	0.30400	2.6901E 03	0.30600	2.5920E 03	0.30800	2.4887E 03
0.31000	2.3806E 03	0.31200	2.2717E 03	0.31400	2.1645E 03	0.31600	2.0640E 03	0.31800	1.9732E 03
0.32000	1.8944E 03	0.32200	1.8307E 03	0.32400	1.7834E 03	0.32600	1.7534E 03	0.32800	1.7415E 03
0.33000	1.7439E 03	0.33200	1.7597E 03	0.33400	1.7862E 03	0.33600	1.8202E 03	0.33800	1.8588E 03
0.34000	1.8975E 03	0.34200	1.9349E 03	0.34400	1.9671E 03	0.34600	1.9915E 03	0.34800	2.0086E 03
0.35000	2.0166E 03	0.35200	2.0142E 03	0.35400	2.0027E 03	0.35600	1.9847E 03	0.35800	1.9593E 03
0.36000	1.9266E 03	0.36200	1.8824E 03	0.36400	1.8245E 03	0.36600	1.8096E 03	0.36800	1.7886E 03
0.37000	1.6851E 03	0.37200	1.5952E 03	0.37400	1.4700E 03	0.37600	1.6268E 03	0.37800	1.4166E 03
0.38000	1.3500E 03	0.38200	1.1925E 03	0.38400	9.8770E 02	0.38600	7.7140E 02	0.38800	5.8280E 02
0.39000	4.4200E 02	0.39200	3.5330E 02	0.39400	3.0220E 02	0.39600	2.5750E 02	0.39800	2.3270E 02
0.40000	1.5710E 02	0.40200	2.8200E 01	0.40400	-9.5600E 01	0.40600	-3.1960E 02	0.40800	-5.1300E 02
0.41000	-6.6320E 02	0.41200	-8.9680E 02	0.41400	-1.0952E 03	0.41600	-1.2433E 03	0.41800	-1.4497E 03
0.42000	-1.5747E 03	0.42200	-1.6827E 03	0.42400	-1.7605E 03	0.42600	-1.8048E 03	0.42800	-1.8163E 03
0.43000	-1.7987E 03	0.43200	-1.7572E 03	0.43400	-1.7031E 03	0.43600	-1.6442E 03	0.43800	-1.5900E 03
0.44000	-1.5468E 03	0.44200	-1.5162E 03	0.44400	-1.4993E 03	0.44600	-1.4906E 03	0.44800	-1,4876E 03
0.45000	-1.4832E 03	0.45200	-1.4710E 03	0.45400	-1.4445E 03	0.45600	-1.3972E 03	0.45800	-1.3272E 03
0.46000	-1.2327E 03	0.46200	-1.1191E 03	0.46400	-9.9150E 02	0.46600	-8.5970E 02	0.46800	-7.3610E 02
0.47000	-6.2860E 02	0.47200	-5.4910E 02	0.47400	-5.0220E 02	0.47600	-4.9010E 02	0.47800	-5.0960E 02
0.48000	-5.5250E 02	0.48200	-6.1110E 02	0.48400	-6.7440E 02	0.48600	-7.3400E 02	0.48800	-7.8090E 02
0.49000	-8.1280E 02	0.49200	-8.2900E 02	0.49400	-8.3150E 02	0.49600	-8.2380E 02	0.49800	-8.1500E 02
0.50000	-8.1130E 02	0.50110	-8.1390E 02						

TABLE 6.A-11
(SHEET 7 OF 32)

TIME FUNCTION NUMBER = (4)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 33 00>02$ 0. 13623.8)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	1.3624E 04	0.00010	1.3624E 04	0.00020	1.3624E 04	0.00030	1.3624E 04	0.00040	1.3624E 04
0.00050	1.3624E 04	0.00060	1.3624E 04	0.00070	1.3624E 04	0.00080	1.3624E 04	0.00090	1.3624E 04
0.00100	1.3624E 04	0.00110	1.3624E 04	0.00120	1.3624E 04	0.00130	1.3624E 04	0.00140	1.3624E 04
0.00150	1.3624E 04	0.00160	1.3624E 04	0.00170	1.3624E 04	0.00180	1.3624E 04	0.00190	1.3624E 04
0.00200	1.3624E 04	0.00210	1.3624E 04	0.00220	1.3624E 04	0.00230	1.3624E 04	0.00240	1.362[illegible]E 04
0.00250	1.3624E 04	0.00260	1.3624E 04	0.00270	1.3623E 04	0.00280	1.36[illegible]E 04	0.00290	1.3623E 04
0.00300	1.3623E 04	0.00310	1.3623E 04	0.00320	1.3622E 04	0.00330	1.3622E 04	0.00340	1.3622E 04
0.00350	1.3621E 04	0.00360	1.3621E 04	0.00370	1.3620E 04	0.00380	1.3619E 04	0.00390	1.3618E 04
0.00400	1.3617E 04	0.00410	1.3616E 04	0.00420	1.3614E 04	0.00430	1.3612E 04	0.00440	1.3610E 04
0.00450	1.3608E 04	0.00460	1.3605E 04	0.00470	1.3602E 04	0.00480	1.359[illegible]E 04	0.00490	1.359[illegible]E 04
0.00500	1.3591E 04	0.00510	1.3587E 04	0.00520	1.3581E 04	0.00530	1.3576E 04	0.00540	1.35[illegible]E 04
0.00550	1.3563E 04	0.00560	1.3555E 04	0.00570	1.3547E 04	0.00580	1.3538E 04	0.00590	1.3529E 04
0.00600	1.3518E 04	0.00610	1.3508E 04	0.00620	1.3496E 04	0.00630	1.3483E 04	0.00640	1.3470E 04
0.00650	1.3456E 04	0.00660	1.3441E 04	0.00670	1.3425E 04	0.00680	1.3408E 04	0.00690	1.3390E 04
0.00700	1.3372E 04	0.00710	1.3353E 04	0.00720	1.3333E 04	0.00730	1.3312E 04	0.00740	1.3291E 04
0.00750	1.3268E 04	0.00760	1.3245E 04	0.00770	1.3221E 04	0.00780	1.3197E 04	0.00790	1.3172E 04
0.00800	1.3146E 04	0.00810	1.3119E 04	0.00820	1.3092E 04	0.00830	1.3066E 04	0.00840	1.3037E 04
0.00850	1.3008E 04	0.00860	1.2979E 04	0.00870	1.2950E 04	0.00880	1.2920E 04	0.00890	1.2890E 04
0.00900	1.2860E 04	0.00910	1.2829E 04	0.00920	1.2798E 04	0.00930	1.2767E 04	0.00940	1.2736E 04
0.00950	1.2705E 04	0.00960	1.2674E 04	0.00970	1.2643E 04	0.00980	1.2612E 04	0.00990	1.2581E 04
0.01000	1.2550E 04	0.01010	1.2519E 04	0.01020	1.2489E 04	0.01030	1.2458E 04	0.01040	1.2428E 04
0.01050	1.2398E 04	0.01060	1.2368E 04	0.01070	1.2338E 04	0.01080	1.2309E 04	0.01090	1.2280E 04
0.01100	1.2251E 04	0.01110	1.2222E 04	0.01120	1.2193E 04	0.01130	1.2165E 04	0.01140	1.2137E 04
0.01150	1.2109E 04	0.01160	1.2081E 04	0.01170	1.2054E 04	0.01180	1.2027E 04	0.01190	1.2000E 04
0.01200	1.1973E 04	0.01210	1.1946E 04	0.01220	1.1919E 04	0.01230	1.1892E 04	0.01240	1.1865E 04
0.01250	1.1838E 04	0.01260	1.1810E 04	0.01270	1.1782E 04	0.01280	1.1753E 04	0.01290	1.1724E 04
0.01300	1.1694E 04	0.01310	1.1664E 04	0.01320	1.1633E 04	0.01330	1.1601E 04	0.01340	1.1569E 04
0.01350	1.1534E 04	0.01360	1.1500E 04	0.01370	1.1464E 04	0.01380	1.1427E 04	0.01390	1.136[illegible] 04
0.01400	1.1351E 04	0.01410	1.1311E 04	0.01420	1.1269E 04	0.01430	1.1227E 04	0.01440	1.1162E 04
0.01450	1.1137E 04	0.01460	1.1090E 04	0.01470	1.1042E 04	0.01480	1.0992E 04	0.01490	1.0941E 04
0.01500	1.0886E 04	0.01510	1.0833E 04	0.01520	1.0777E 04	0.01530	1.0720E 04	0.01540	1.06[illegible] 04
0.01550	1.0599E 04	0.01560	1.0536E 04	0.01570	1.0472E 04	0.01580	1.0405E 04	0.01590	1.0337E 04
0.01600	1.0268E 04	0.01610	1.0197E 04	0.01620	1.0123E 04	0.01630	1.00[illegible]8E 04	0.01640	9.971[illegible]E 03
0.01650	9.8932E 03	0.01660	9.8126E 03	0.01670	9.7307E 03	0.01680	9.6468E 03	0.01690	9.5611E 03
0.01700	9.4738E 03	0.01710	9.3844E 03	0.01720	9.2935E 03	0.01730	9.200[illegible]E 03	0.01740	9.1064E 03
0.01750	9.0103E 03	0.01760	8.9122E 03	0.01770	8.8126E 03	0.01780	8.7114E 03	0.01790	8.6086E 03
0.01800	8.5038E 03	0.01810	8.3975E 03	0.01820	8.2896E 03	0.01830	8.1798E 03	0.01840	8.0687E 03
0.01850	7.9559E 03	0.01860	7.8416E 03	0.01870	7.7256E 03	0.01880	7.6082E 03	0.01890	7.4893E 03
0.01900	7.3688E 03	0.01910	7.2468E 03	0.01920	7.1234E 03	0.01930	6.9986E 03	0.01940	6.8725E 03
0.01950	6.7569E 03	0.01960	6.6295E 03	0.01970	6.5016E 03	0.01980	6.3733E 03	0.01990	6.2440E 03
0.02000	6.1140E 03	0.02010	5.9836E 03	0.02020	5.8521E 03	0.02030	5.7203E 03	0.02040	5.5880E 03
0.02050	5.4550E 03	0.02060	5.3216E 03	0.02070	5.1873E 03	0.02080	5.0529E 03	0.02090	4.9181E 03
0.02100	4.7829E 03	0.02110	4.6471E 03	0.02120	4.5113E 03	0.02130	4.3749E 03	0.02140	4.2364E 03
0.02150	4.1014E 03	0.02160	3.9645E 03	0.02170	3.8271E 03	0.02180	3.6[illegible]8E 03	0.02190	3.5514E 03
0.02200	3.4155E 03	0.02210	3.2815E 03	0.02220	3.1492E 03	0.02230	3.0188E 03	0.02240	2.8900E 03
0.02250	2.7630E 03	0.02260	2.6382E 03	0.02270	2.5151E 03	0.02280	2.3919E 03	0.02290	2.2742E 03
0.02300	2.1587E 03	0.02310	2.0457E 03	0.02320	1.9350E 03	0.02330	1.8273E 03	0.02340	1.7230E 03
0.02350	1.6222E 03	0.02360	2.2991E 03	0.02370	2.2153E 03	0.02380	2.1358E 03	0.02390	2.0583E 03
0.02400	1.9875E 03	0.02410	1.9195E 03	0.02420	1.8553E 03	0.02430	1.7948E 03	0.02440	1.7381E 03
0.02450	1.6852E 03	0.02460	1.6361E 03	0.02470	1.5905E 03	0.02480	1.54[illegible]E 03	0.02490	1.5105E 03
0.02500	1.4758E 03	0.02600	1.0969E 03	0.02700	8.1770E 02	0.02800	6.0730E 02	0.02900	4.6260E 02
0.03000	3.6960E 02	0.03100	3.3840E 02	0.03200	3.6680E 02	0.03300	5.2660E 02	0.03400	7.7840E 02
0.03500	1.1462E 03	0.03600	1.6426E 03	0.03700	2.2595E 03	0.03800	2.9833E 03	0.03900	3.7968E 03

TABLE 6.A-11
(SHEET 8 OF 32)

0.04000	4.6807E 03	0.04100	5.6288E 03	0.04200	6.6280E 03	0.04300	7.6594E 03	0.04400	8.7099E 03
0.04500	9.7708E 03	0.04600	1.0838E 04	0.04700	1.1909E 04	0.04800	1.2979E 04	0.01900	1.4045E 04
0.05000	1.5098E 04	0.05100	1.6128E 04	0.05200	1.7123E 04	0.05300	1.8073E 04	0.05400	1.8968E 04
0.05500	1.9793E 04	0.05600	2.0546E 04	0.05700	2.1220E 04	0.05800	2.1816E 04	0.05900	2.2343E 04
0.06000	2.2806E 04	0.06100	2.3218E 04	0.06200	2.3600E 04	0.06300	[illegible]	[illegible]	[illegible]
0.06500	2.4592E 04	0.06600	2.4904E 04	0.06700	2.5224E 04	0.06800	2.5557E 04	0.06900	2.5909E 04
0.07000	2.6282E 04	0.07100	2.6679E 04	0.07200	2.7097E 04	0.07300	[illegible]	0.07400	[illegible]
0.07500	2.8441E 04	0.07600	2.8892E 04	0.07700	2.9334E 04	0.07800	2.9754E 04	[illegible]	3.0151E 04
0.08000	3.0516E 04	0.08100	3.0845E 04	0.08200	3.1137E 04	0.08300	3.1367E 04	[illegible]	3.1604E 04
0.08500	3.1790E 04	0.08600	3.1939E 04	0.08700	3.2056E 04	0.08800	[illegible]	[illegible]	[illegible]
0.09000	3.2311E 04	0.09100	3.2392E 04	0.09200	3.2485E 04	0.09300	[illegible]	[illegible]	[illegible]
0.09500	3.2916E 04	0.09600	3.3128E 04	0.09700	3.3379E 04	[illegible]	[illegible]	[illegible]	[illegible]
0.10000	3.4424E 04	0.10100	3.4821E 04	0.10200	3.5241E 04	0.10300	[illegible]	[illegible]	[illegible]
0.10500	3.6513E 04	0.10600	3.6923E 04	0.10700	3.7318E 04	0.10800	[illegible]	[illegible]	[illegible]
0.11000	3.8384E 04	0.11100	3.8701E 04	0.11200	3.9001E 04	0.11300	[illegible]	0.11400	3.9567E 04
0.11500	3.9838E 04	0.11600	4.0104E 04	0.11700	4.0366E 04	0.11800	4.0622E [illegible]	[illegible]	4.0872E 04
0.12000	4.1127E 04	0.12100	4.1422E 04	0.12200	4.1748E 04	0.12300	4.2112E 04	[illegible]	4.2483E 04
0.12500	4.2840E 04	0.12600	4.3183E 04	0.12700	4.3485E 04	0.12800	[illegible]	[illegible]	[illegible]
0.13000	4.4095E 04	0.13100	4.4191E 04	0.13200	4.4247E 04	0.13300	4.4262E 04	[illegible]	4.4236E 04
0.13500	4.4134E 04	0.13600	4.4019E 04	0.13700	4.3880E 04	0.13800	4.3795E 04	0.13900	4.3869E 04
0.14000	4.4075E 04	0.14100	4.4371E 04	0.14200	4.4738E 04	0.14300	4.5102E 04	0.14400	4.5433E 04
0.14500	4.5701E 04	0.14600	4.5894E 04	0.14700	4.6002E 04	0.14800	4.6031E 04	[illegible]	4.5993E 04
0.15000	4.5903E 04	0.15100	4.5783E 04	0.15200	4.5654E 04	0.15300	4.5531E 04	0.15400	4.5428E 04
0.15500	4.5357E 04	0.15600	4.5321E 04	0.15700	4.5336E 04	0.15800	4.5420E 04	0.15900	4.5604E 04
0.16000	4.5873E 04	0.16100	4.6206E 04	0.16200	4.6581E 04	0.16300	4.6976E 04	0.16400	4.7380E 04
0.16500	4.7772E 04	0.16600	4.8142E 04	0.16700	4.8477E 04	0.16800	[illegible]	0.16900	4.9024E 04
0.17000	4.9247E 04	0.17100	4.9440E 04	0.17200	4.9607E 04	0.17300	4.9753E 04	0.17400	4.9882E 04
0.17500	4.9999E 04	0.17600	5.0106E 04	0.17700	5.0207E 04	0.17600	5.0303E 04	0.17900	5.0394E 04
0.18000	5.0481E 04	0.18100	5.0563E 04	0.18200	5.0639E 04	0.18300	5.0705E 04	[illegible]	[illegible]
0.18500	5.0819E 04	0.18600	5.0860E 04	0.18700	5.0889E 04	0.18800	5.0908E 04	[illegible]	5.0918E 04
0.19000	5.0921E 04	0.19100	5.0919E 04	0.19200	5.0916E 04	0.19300	5.0914E 04	0.19400	5.0916E 04
0.19500	5.0924E 04	0.19600	5.0940E 04	0.19700	5.0970E 04	0.19600	5.1017E 04	0.19900	5.1083E 04
0.20000	5.1171E 04	0.20200	5.1391E 04	0.20400	5.1651E 04	0.20600	5.1913E 04	[illegible]	5.2154E 04
0.21000	5.2362E 04	0.21200	5.2536E 04	0.21400	5.2686E 04	0.21600	5.2816E 04	[illegible]	5.2931E 04
0.22000	5.3041E 04	0.22200	5.3132E 04	0.22400	5.3201E 04	0.22600	5.3259E 04	[illegible]	5.3307E 04
0.23000	5.3361E 04	0.23200	5.3419E 04	0.23400	5.3483E 04	0.23600	5.3551E 04	[illegible]	[illegible]
0.24000	5.3736E 04	0.24200	5.3835E 04	0.24400	5.3949E 04	0.24600	5.4056E 04	[illegible]	5.4165E 04
0.25000	5.4269E 04	0.25200	5.4384E 04	0.25400	5.4517E 04	0.25600	5.4670E 04	0.25800	[illegible]
0.26000	5.5011E 04	0.26200	5.5172E 04	0.26400	5.5308E 04	0.26600	5.5409E 04	[illegible]	[illegible]
0.27000	5.5491E 04	0.27200	5.5483E 04	0.27400	5.5453E 04	0.27600	5.5423E 04	[illegible]	[illegible]
0.28000	5.5386E 04	0.28200	5.5396E 04	0.28400	5.5433E 04	0.28600	5.5497E 04	[illegible]	5.5587E 04
0.29000	5.5700E 04	0.29200	5.5830E 04	0.29400	5.5969E 04	0.29600	5.6106E 04	[illegible]	5.6239E 04
0.30000	5.6353E 04	0.30200	5.6443E 04	0.30400	5.6508E 04	0.30600	5.6551E 04	[illegible]	5.6569E 04
0.31000	5.6569E 04	0.31200	5.6571E 04	0.31400	5.6574E 04	0.31600	5.6579E 04	0.31800	5.6591E 04
0.32000	5.6620E 04	0.32200	5.6672E 04	0.32400	5.6746E 04	0.32600	5.6838E 04	0.32600	5.6946E 04
0.33000	5.7066E 04	0.33200	5.7193E 04	0.33400	5.7320E [illegible]	0.33500	[illegible]	0.33500	5.7546E 04
0.34000	5.7631E 04	0.34200	5.7691E 04	0.34400	5.7724E 04	0.34600	5.7734E 04	0.34600	5.7724E 04
0.35000	5.7700E 04	0.35200	5.7672E 04	0.35400	5.7644E 04	0.35600	5.7622E 04	0.35800	5.7607E 04
0.36000	5.7600E 04	0.36200	5.7607E 04	0.36400	5.7618E 04	0.36600	[illegible]	0.36600	5.7664E 04
0.37000	5.7712E 04	0.37200	5.7780E 04	0.37400	5.7860E 04	0.37600	5.7967E 04	0.37800	5.8072E 04
0.38000	5.8228E 04	0.38200	5.8421E 04	0.38400	5.8626E 04	0.38600	5.8814E 04	0.36800	5.8959E 04
0.39000	5.9041E 04	0.39200	5.9054E 04	0.39400	5.9002E 04	0.39600	[illegible]	[illegible]	5.9781E 04
0.40000	5.8662E 04	0.40200	5.8559E 04	0.40400	5.8484E 04	0.40600	5.8424E 04	0.40800	5.8391E 04
0.41000	5.8384E 04	0.41200	5.8397E 04	0.41400	5.8441E 04	0.41600	5.8512E 04	0.41800	5.8590E 04
0.42000	5.8680E 04	0.42200	5.8770E 04	0.42400	5.8852E 04	0.42600	5.8917E 04	0.42600	5.8960E 04
0.43000	5.8983E 04	0.43200	5.8988E 04	0.43400	5.8981E 04	0.43600	5.8969E 04	0.43800	5.8958E 04
0.44000	5.8948E 04	0.44200	5.8943E 04	0.44400	5.8943E 04	0.44600	5.8951E 04	0.44600	5.8972E 04
0.45000	5.9008E 04	0.45200	5.9062E 04	0.45400	5.9132E 04	0.45600	5.9214E 04	0.45600	5.9302E 04
0.46000	5.9386E 04	0.46200	5.9459E 04	0.46400	5.9516E 04	0.46600	5.9553E 04	0.46800	5.9570E 04
0.47000	5.9570E 04	0.47200	5.9558E 04	0.47400	5.9541E 04	0.47600	5.9522E 04	0.47800	5.9508E 04
0.48000	5.9500E 04	0.48200	5.9501E 04	0.48400	5.9512E 04	0.48600	5.9532E 04	0.48800	5.9561E 04
0.49000	5.9594E 04	0.49200	5.9631E 04	0.49400	5.9669E 04	0.49600	5.9705E 04	0.49800	5.9737E 04
0.50000	5.9765E 04	0.50110	5.9778E 04						

TIME FUNCTION NUMBER = (5)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 34 00>02$ 0. -10080.4)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-1.0080E 04	0.00010	-1.0099E 04	0.00020	-1.0134E 04	0.00030	-1.0168E 04	0.00040	-1.0262E 04
0.00050	-1.0351E 04	0.00060	-1.0461E 04	0.00070	-1.0595E 04	0.00080	-1.0731E 04	0.00090	-1.0897E 04
0.00100	-1.1079E 04	0.00110	-1.1228E 04	0.00120	-1.1442E 04	0.00130	-1.1677E 04	0.00140	-1.1936E 04
0.00150	-1.2218E 04	0.00160	-1.2526E 04	0.00170	-1.2857E 04	0.00180	-1.3214E 04	0.00190	-1.3591E 04
0.00200	-1.4004E 04	0.00210	-1.4430E 04	0.00220	-1.4901E 04	0.00230	-1.5417E 04	0.00240	-1.5979E 04
0.00250	-1.6585E 04	0.00260	-1.7241E 04	0.00270	-1.7946E 04	0.00280	-1.8695E 04	0.00290	-1.9491E 04
0.00300	-2.0338E 04	0.00310	-2.1232E 04	0.00320	-2.2171E 04	0.00330	-2.3156E 04	0.00340	-2.4185E 04
0.00350	-2.5259E 04	0.00360	-2.6379E 04	0.00370	-2.7546E 04	0.00380	-2.8769E 04	0.00390	-3.0003E 04
0.00400	-3.1261E 04	0.00410	-3.2506E 04	0.00420	-3.3601E 04	0.00430	-3.5139E 04	0.00440	-3.6517E 04
0.00450	-3.7923E 04	0.00460	-3.9380E 04	0.00470	-4.0874E 04	0.00480	-4.2408E 04	0.00490	-4.3982E 04
0.00500	-4.5597E 04	0.00510	-4.7252E 04	0.00520	-4.8950E 04	0.00530	-5.0682E 04	0.00540	-5.2464E 04
0.00550	-5.4284E 04	0.00560	-5.6148E 04	0.00570	-5.8056E 04	0.00580	-6.0003E 04	0.00590	-6.1992E 04
0.00600	-6.4023E 04	0.00610	-6.6055E 04	0.00620	-6.8159E 04	0.00630	-7.0335E 04	0.00640	-7.2581E 04
0.00650	-7.4895E 04	0.00660	-7.7281E 04	0.00670	-7.9735E 04	0.00680	-8.2256E 04	0.00690	-8.4849E 04
0.00700	-8.7506E 04	0.00710	-9.0229E 04	0.00720	-9.3020E 04	0.00730	-9.5874E 04	0.00740	-9.8788E 04
0.00750	-1.0177E 05	0.00760	-1.0481E 05	0.00770	-1.0792E 05	0.00780	-1.1110E 05	0.00790	-1.1434E 05
0.00800	-1.1765E 05	0.00810	-1.2098E 05	0.00820	-1.2441E 05	0.00830	-1.2792E 05	0.00840	-1.3153E 05
0.00850	-1.3522E 05	0.00860	-1.3898E 05	0.00870	-1.4283E 05	0.00880	-1.4676E 05	0.00890	-1.5077E 05
0.00900	-1.5486E 05	0.00910	-1.5903E 05	0.00920	-1.6328E 05	0.00930	-1.6761E 05	0.00940	-1.7201E 05
0.00950	-1.7647E 05	0.00960	-1.8102E 05	0.00970	-1.8564E 05	0.00980	-1.9032E 05	0.00990	-1.9507E 05
0.01000	-1.9990E 05	0.01010	-2.0477E 05	0.01020	-2.0972E 05	0.01030	-2.1475E 05	0.01040	-2.1964E 05
0.01050	-2.2502E 05	0.01060	-2.3031E 05	0.01070	-2.3563E 05	0.01080	-2.4102E 05	0.01090	-2.4647E 05
0.01100	-2.5199E 05	0.01110	-2.5757E 05	0.01120	-2.5635E 05	0.01130	-2.6373E 05	0.01140	-2.6917E 05
0.01150	-2.7465E 05	0.01160	-2.8016E 05	0.01170	-2.8572E 05	0.01180	-2.9135E 05	0.01190	-2.9726E 05
0.01200	-3.0323E 05	0.01210	-3.0926E 05	0.01220	-3.1530E 05	0.01230	-3.2147E 05	0.01240	-3.2765E 05
0.01250	-3.3389E 05	0.01260	-3.4017E 05	0.01270	-3.4651E 05	0.01280	-3.5299E 05	0.01290	-3.5942E 05
0.01300	-3.6587E 05	0.01310	-3.7237E 05	0.01320	-3.7893E 05	0.01330	-3.8551E 05	0.01340	-3.9211E 05
0.01350	-3.9878E 05	0.01360	-4.0545E 05	0.01370	-4.1218E 05	0.01380	-4.1892E 05	0.01390	-4.2569E 05
0.01400	-4.3251E 05	0.01410	-4.3934E 05	0.01420	-4.4622E 05	0.01430	-4.5310E 05	0.01440	-4.6003E 05
0.01450	-4.6696E 05	0.01460	-4.7391E 05	0.01470	-4.8067E 05	0.01480	-4.8789E 05	0.01490	-4.9492E 05
0.01500	-5.0200E 05	0.01510	-5.0911E 05	0.01520	-5.1625E 05	0.01530	-5.2342E 05	0.01540	-5.3063E 05
0.01550	-5.3787E 05	0.01560	-5.4513E 05	0.01570	-5.5243E 05	0.01580	-5.5975E 05	0.01590	-5.6710E 05
0.01600	-5.7449E 05	0.01610	-5.8187E 05	0.01620	-5.8929E 05	0.01630	-5.9674E 05	0.01640	-6.0420E 05
0.01650	-6.1169E 05	0.01660	-6.1919E 05	0.01670	-6.2671E 05	0.01680	-6.3425E 05	0.01690	-6.4180E 05
0.01700	-6.4937E 05	0.01710	-6.5695E 05	0.01720	-6.6470E 05	0.01730	-6.7233E 05	0.01740	-6.8003E 05
0.01750	-6.8769E 05	0.01760	-6.9527E 05	0.01770	-7.0284E 05	0.01780	-7.1036E 05	0.01790	-7.1779E 05
0.01800	-7.2520E 05	0.01810	-7.3256E 05	0.01820	-7.3983E 05	0.01830	-7.4707E 05	0.01840	-7.5426E 05
0.01850	-7.6136E 05	0.01860	-7.6843E 05	0.01870	-7.7545E 05	0.01880	-7.8240E 05	0.01890	-7.8925E 05
0.01900	-7.9606E 05	0.01910	-8.0281E 05	0.01920	-8.0936E 05	0.01930	-8.1603E 05	0.01940	-8.2464E 05
0.01950	-8.1789E 05	0.01960	-8.2117E 05	0.01970	-8.2436E 05	0.01980	-8.2745E 05	0.01990	-8.3043E 05
0.02000	-8.3330E 05	0.02010	-8.3607E 05	0.02020	-8.3670E 05	0.02030	-8.4125E 05	0.02040	-8.4373E 05
0.02050	-8.4614E 05	0.02060	-8.4841E 05	0.02070	-8.5065E 05	0.02080	-8.5201E 05	0.02090	-8.5486E 05
0.02100	-8.5687E 05	0.02110	-8.5881E 05	0.02120	-8.6069E 05	0.02130	-8.6243E 05	0.02140	-8.6416E 05
0.02150	-8.6583E 05	0.02160	-8.6744E 05	0.02170	-8.6894E 05	0.02180	-8.7051E 05	0.02190	-8.7209E 05
0.02200	-8.7365E 05	0.02210	-8.7515E 05	0.02220	-8.7665E 05	0.02230	-8.7813E 05	0.02240	-8.7958E 05
0.02250	-8.8099E 05	0.02260	-8.8239E 05	0.02270	-8.8377E 05	0.02280	-8.8515E 05	0.02290	-8.8637E 05
0.02300	-8.8765E 05	0.02310	-8.8892E 05	0.02320	-8.9016E 05	0.02330	-8.9138E 05	0.02340	-8.9257E 05
0.02350	-8.9374E 05	0.02360	-8.8893E 05	0.02370	-8.8999E 05	0.02380	-8.9103E 05	0.02390	-8.9204E 05
0.02400	-8.9302E 05	0.02410	-8.9399E 05	0.02420	-8.9494E 05	0.02430	-8.9587E 05	0.02440	-8.9676E 05
0.02450	-8.9764E 05	0.02460	-8.9850E 05	0.02470	-8.9935E 05	0.02480	-9.0017E 05	0.02490	-9.0095E 05
0.02500	-9.0174E 05	0.02600	-9.1046E 05	0.02700	-9.1922E 05	0.02800	-9.2827E 05	0.02900	-9.3723E 05
0.03000	-9.4609E 05	0.03100	-9.5461E 05	0.03200	-9.6219E 05	0.03300	-9.6870E 05	0.03400	-9.7380E 05
0.03500	-9.7767E 05	0.03600	-9.8005E 05	0.03700	-9.8105E 05	0.03800	-9.8078E 05	0.03900	-9.7939E 05

TABLE 6.A-11
(SHEET 10 OF 32)

0.04000 -9.7704E 05	0.04100 -9.7380E 05	0.04200 -9.6978E 05	0.04300 -9.6519E 05	0.04400 -9.6009E 05
0.04500 -9.5462E 05	0.04600 -9.4894E 05	0.04700 -9.4296E 05	0.04800 -9.3675E 05	0.04900 -9.3039E 05
0.05000 -9.2394E 05	0.05100 -9.1751E 05	0.05200 -9.1121E 05	0.05300 -9.0511E 05	0.05400 -8.9931E 05
0.05500 -8.9397E 05	0.05600 -8.8907E 05	0.05700 -8.8468E 05	0.05800 -8.8002E 05	0.05900 -8.7743E 05
0.06000 -8.7446E 05	0.06100 -8.7184E 05	0.06200 -8.6941E 05	0.06300 -8.6715E 05	0.06400 -8.6504E 05
0.06500 -8.6300E 05	0.06600 -8.6094E 05	0.06700 -8.5678E 05	0.06800 -8.50[illegible]1E 05	0.06900 -8.5406E 05
0.07000 -8.5142E 05	0.07100 -8.4858E 05	0.07200 -8.4555E 05	0.07300 -8.4237E 05	0.07400 -8.3908E 05
0.07500 -8.3571E 05	0.07600 -8.3237E 05	0.07700 -8.2909E 05	0.07800 -8.2596E 05	0.07900 -8.2301E 05
0.08000 -8.2028E 05	0.08100 -8.1784E 05	0.08200 -8.1565E 05	0.08300 -8.1379E 05	0.08400 -8.1218E 05
0.08500 -8.1080E 05	0.08600 -8.0971E 05	0.08700 -8.0884E 05	0.08800 -8.0616E 05	0.08900 -8.0756E 05
0.09000 -8.0700E 05	0.09100 -8.0641E 05	0.09200 -8.0572E 05	0.09300 -8.0[illegible]8E 05	0.09400 -8.0381E 05
0.09500 -8.0249E 05	0.09600 -8.0087E 05	0.09700 -7.9897E 05	0.09800 -7.905[illegible]E 05	0.09900 -7.9[illegible]5E 05
0.10000 -7.9095E 05	0.10100 -7.8789E 05	0.10200 -7.8469E 05	0.10300 -7.8140E 05	0.10400 -7.7616E 05
0.10500 -7.7493E 05	0.10600 -7.7178E 05	0.10700 -7.6874E 05	0.10800 -7.6505E 05	0.10900 -7.6314E 05
0.11000 -7.6058E 05	0.11100 -7.5815E 05	0.11200 -7.5584E 05	0.11300 -7.5364E 05	0.11400 -7.5151E 05
0.11500 -7.4943E 05	0.11600 -7.4738E 05	0.11700 -7.4537E 05	0.11800 -7.4340E 05	0.11900 -7.4148E 05
0.12000 -7.3952E 05	0.12100 -7.3725E 05	0.12200 -7.3474E 05	0.12300 -7.3194E 05	0.12400 -7.2908E 05
0.12500 -7.2630E 05	0.12600 -7.2370E 05	0.12700 -7.2133E 05	0.12800 -7.1939E 05	0.12900 -7.1780E 05
0.13000 -7.1670E 05	0.13100 -7.1597E 05	0.13200 -7.1552E 05	0.13300 -7.1540E 05	0.13400 -7.1560E 05
0.13500 -7.1640E 05	0.13600 -7.1728E 05	0.13700 -7.1835E 05	0.13800 -7.1901E 05	0.13900 -7.1844E 05
0.14000 -7.1686E 05	0.14100 -7.1460E 05	0.14200 -7.1177E 05	0.14300 -7.0697E 05	0.14400 -7.0643E 05
0.14500 -7.0437E 05	0.14600 -7.0288E 05	0.14700 -7.0204E 05	0.14800 -7.0182E 05	0.14900 -7.0211E 05
0.15000 -7.0281E 05	0.15100 -7.0374E 05	0.15200 -7.0473E 05	0.15300 -7.0508E 05	0.15400 -7.0646E 05
0.15500 -7.0700E 05	0.15600 -7.0727E 05	0.15700 -7.0716E 05	0.15800 -7.0651E 05	0.15900 -7.0509E 05
0.16000 -7.0302E 05	0.16100 -7.0046E 05	0.16200 -6.9758E 05	0.16300 -6.9452E 05	0.16400 -6.9143E 05
0.16500 -6.8841E 05	0.16600 -6.8556E 05	0.16700 -6.8296E 05	0.16800 -6.8074E 05	0.16900 -6.7878E 05
0.17000 -6.7706E 05	0.17100 -6.7558E 05	0.17200 -6.7430E 05	0.17300 -6.7318E 05	0.17400 -6.7219E 05
0.17500 -6.7126E 05	0.17600 -6.7043E 05	0.17700 -6.6967E 05	0.17800 -6.680[illegible]E 05	0.17900 -6.6827E 05
0.18000 -6.6762E 05	0.18100 -6.6696E 05	0.18200 -6.6637E 05	0.18300 -6.6505E 05	0.18400 -6.6540E 05
0.18500 -6.6503E 05	0.18600 -6.6473E 05	0.18700 -6.6451E 05	0.18800 -6.6437E 05	0.18900 -6.6427E 05
0.19000 -6.6425E 05	0.19100 -6.6426E 05	0.19200 -6.6428E 05	0.19300 -6.6430E 05	0.19400 -6.6428E 05
0.19500 -6.6421E 05	0.19600 -6.6407E 05	0.19700 -6.6384E 05	0.19800 -6.6347E 05	0.19900 -6.6297E 05
0.20000 -6.6229E 05	0.20200 -6.6058E 05	0.20400 -6.5857E 05	0.20600 -6.5656E 05	0.20800 -6.5468E 05
0.21000 -6.5310E 05	0.21200 -6.5176E 05	0.21400 -6.5062E 05	0.21600 -6.4964E 05	0.21800 -6.4876E 05
0.22000 -6.4792E 05	0.22200 -6.4723E 05	0.22400 -6.4671E 05	0.22600 -6.4622E 05	0.22800 -6.4585E 05
0.23000 -6.4545E 05	0.23200 -6.4499E 05	0.23400 -6.4448E 05	0.23600 -6.4396E 05	0.23800 -6.4331E 05
0.24000 -6.4257E 05	0.24200 -6.4180E 05	0.24400 -6.4093E 05	0.24600 -6.4006E 05	0.24800 -6.3925E 05
0.25000 -6.3844E 05	0.25200 -6.3756E 05	0.25400 -6.3654E 05	0.25600 -6.3535E 05	0.25800 -6.3406E 05
0.26000 -6.3275E 05	0.26200 -6.3148E 05	0.26400 -6.3045E 05	0.26600 -6.2966E 05	0.26800 -6.2822E 05
0.27000 -6.2903E 05	0.27200 -6.2911E 05	0.27400 -6.2936E 05	0.27600 -6.2956E 05	0.27800 -6.2977E 05
0.28000 -6.2986E 05	0.28200 -6.2978E 05	0.28400 -6.2948E 05	0.28600 -6.2900E 05	0.28800 -6.2831E 05
0.29000 -6.2742E 05	0.29200 -6.2642E 05	0.29400 -6.2536E 05	0.29600 -6.2429E 05	0.29800 -6.2328E 05
0.30000 -6.2241E 05	0.30200 -6.2172E 05	0.30400 -6.2122E 05	0.30600 -6.20[illegible]0E 05	0.30800 -6.2075E 05
0.31000 -6.2076E 05	0.31200 -6.2073E 05	0.31400 -6.2071E 05	0.31600 -6.2006E 05	0.31800 -6.2056E 05
0.32000 -6.2034E 05	0.32200 -6.1995E 05	0.32400 -6.1938E 05	0.32600 -6.1865E 05	0.32800 -6.1782E 05
0.33000 -6.1691E 05	0.33200 -6.1593E 05	0.33400 -6.1495E 05	0.33600 -6.1403E 05	0.33800 -6.1323E 05
0.34000 -6.1257E 05	0.34200 -6.1211E 05	0.34400 -6.1185E 05	0.34600 -6.1178E 05	0.34800 -6.1186E 05
0.35000 -6.1203E 05	0.35200 -6.1225E 05	0.35400 -6.1246E 05	0.35600 -6.1264E 05	0.35800 -6.1277E 05
0.36000 -6.1285E 05	0.36200 -6.1283E 05	0.36400 -6.1276E 05	0.36600 -6.1268E 05	0.36800 -6.1250E 05
0.37000 -6.1217E 05	0.37200 -6.1169E 05	0.37400 -6.1112E 05	0.37600 -6.1037E 05	0.37800 -6.0960E 05
0.38000 -6.0846E 05	0.38200 -6.0703E 05	0.38400 -6.0552E 05	0.38600 -6.0412E 05	0.38800 -6.0307E 05
0.39000 -6.0251E 05	0.39200 -6.0244E 05	0.39400 -6.0289E 05	0.39600 -6.0371E 05	0.39800 -6.0467E 05
0.40000 -6.0563E 05	0.40200 -6.0646E 05	0.40400 -6.0708E 05	0.40600 -6.0756E 05	0.40800 -6.0786E 05
0.41000 -6.0795E 05	0.41200 -6.0787E 05	0.41400 -6.0756E 05	0.41600 -6.0707E 05	0.41800 -6.0652E 05
0.42000 -6.0587E 05	0.42200 -6.0523E 05	0.42400 -6.0465E 05	0.42600 -6.0422E 05	0.42800 -6.0393E 05
0.43000 -6.0380E 05	0.43200 -6.0382E 05	0.43400 -6.0393E 05	0.43600 -6.0406E 05	0.43800 -6.0418E 05
0.44000 -6.0431E 05	0.44200 -6.0440E 05	0.44400 -6.0444E 05	0.44600 -6.0438E 05	0.44800 -6.0426E 05
0.45000 -6.0403E 05	0.45200 -6.0365E 05	0.45400 -6.0313E 05	0.45600 -6.0253E 05	0.45800 -6.0189E 05
0.46000 -6.0127E 05	0.46200 -6.0072E 05	0.46400 -6.0030E 05	0.46600 -6.0002E 05	0.46800 -5.9991E 05
0.47000 -5.9993E 05	0.47200 -6.0002E 05	0.47400 -6.0017E 05	0.47600 -6.0034E 05	0.47800 -6.0047E 05
0.48000 -6.0054E 05	0.48200 -6.0055E 05	0.48400 -6.0050E 05	0.48600 -6.0034E 05	0.48800 -6.0015E 05
0.49000 -5.9992E 05	0.49200 -5.9968E 05	0.49400 -5.9940E 05	0.49600 -5.9915E 05	0.49800 -5.9893E 05

0.50000 -5.9873E 05	0.50110 -5.9864E 05

TIME FUNCTION NUMBER = (6)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 35 00>02$ 0. -2857.6)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-2.8576E 03	0.00010	-2.8750E 03	0.00020	-2.9079E 03	0.00030	-2.9577E 03	0.00040	-3.0244E 03
0.00050	-3.1065E 03	0.00060	-3.2052E 03	0.00070	-3.3208E 03	0.00080	-3.4465E 03	0.00090	-3.5611E 03
0.00100	-3.7499E 03	0.00110	-3.8743E 03	0.00120	-4.0521E 03	0.00130	-4.2421E 03	0.00140	-4.4439E 03
0.00150	-4.6570E 03	0.00160	-4.8814E 03	0.00170	-5.1152E 03	0.00180	-5.3597E 03	0.00190	-5.6128E 03
0.00200	-5.8763E 03	0.00210	-6.1439E 03	0.00220	-6.4364E 03	0.00230	-6.7533E 03	0.00240	-7.0947E 03
0.00250	-7.4579E 03	0.00260	-7.8428E 03	0.00270	-8.2502E 03	0.00280	-8.6759E 03	0.00290	-9.1215E 03
0.00300	-9.5849E 03	0.00310	-1.0068E 04	0.00320	-1.0567E 04	0.00330	-1.1081E 04	0.00340	-1.1611E 04
0.00350	-1.2154E 04	0.00360	-1.2713E 04	0.00370	-1.3304E 04	0.00380	-1.3930E 04	0.00390	-1.4583E 04
0.00400	-1.5264E 04	0.00410	-1.5940E 04	0.00420	-1.6666E 04	0.00430	-1.7437E 04	0.00440	-1.8246E 04
0.00450	-1.9092E 04	0.00460	-1.9983E 04	0.00470	-2.0913E 04	0.00480	-2.1880E 04	0.00490	-2.2882E 04
0.00500	-2.3921E 04	0.00510	-2.4996E 04	0.00520	-2.6107E 04	0.00530	-2.7247E 04	0.00540	-2.8430E 04
0.00550	-2.9643E 04	0.00560	-3.0889E 04	0.00570	-3.2171E 04	0.00580	-3.3403E 04	0.00590	-3.4827E 04
0.00600	-3.6202E 04	0.00610	-3.7570E 04	0.00620	-3.8996E 04	0.00630	-4.0478E 04	0.00640	-4.2014E 04
0.00650	-4.3603E 04	0.00660	-4.5246E 04	0.00670	-4.6938E 04	0.00680	-4.8603E 04	0.00690	-5.0173E 04
0.00700	-5.2313E 04	0.00710	-5.4199E 04	0.00720	-5.6132E 04	0.00730	-5.8108E 04	0.00740	-6.0125E 04
0.00750	-6.2179E 04	0.00760	-6.4278E 04	0.00770	-6.6416E 04	0.00780	-6.8593E 04	0.00790	-7.0806E 04
0.00800	-7.3060E 04	0.00810	-7.5317E 04	0.00820	-7.7639E 04	0.00830	-8.0019E 04	0.00840	-8.2460E 04
0.00850	-8.4948E 04	0.00860	-8.7491E 04	0.00870	-9.0087E 04	0.00880	-9.2728E 04	0.00890	-9.5429E 04
0.00900	-9.8178E 04	0.00910	-1.0097E 05	0.00920	-1.0382E 05	0.00930	-1.0671E 05	0.00940	-1.0965E 05
0.00950	-1.1263E 05	0.00960	-1.1566E 05	0.00970	-1.1872E 05	0.00980	-1.2183E 05	0.00990	-1.2498E 05
0.01000	-1.2817E 05	0.01010	-1.3139E 05	0.01020	-1.3466E 05	0.01030	-1.3797E 05	0.01040	-1.4134E 05
0.01050	-1.4475E 05	0.01060	-1.4824E 05	0.01070	-1.5174E 05	0.01080	-1.5528E 05	0.01090	-1.5887E 05
0.01100	-1.6250E 05	0.01110	-1.6617E 05	0.01120	-1.6823E 05	0.01130	-1.7186E 05	0.01140	-1.7554E 05
0.01150	-1.7924E 05	0.01160	-1.8298E 05	0.01170	-1.8674E 05	0.01180	-1.9055E 05	0.01190	-1.9446E 05
0.01200	-1.9841E 05	0.01210	-2.0239E 05	0.01220	-2.0641E 05	0.01230	-2.1046E 05	0.01240	-2.1453E 05
0.01250	-2.1864E 05	0.01260	-2.2278E 05	0.01270	-2.2696E 05	0.01280	-2.3120E 05	0.01290	-2.3544E 05
0.01300	-2.3968E 05	0.01310	-2.4395E 05	0.01320	-2.4827E 05	0.01330	-2.5259E 05	0.01340	-2.5692E 05
0.01350	-2.6130E 05	0.01360	-2.6567E 05	0.01370	-2.7010E 05	0.01380	-2.7451E 05	0.01390	-2.7896E 05
0.01400	-2.8344E 05	0.01410	-2.8792E 05	0.01420	-2.9244E 05	0.01430	-2.9695E 05	0.01440	-3.0151E 05
0.01450	-3.0605E 05	0.01460	-3.1062E 05	0.01470	-3.1517E 05	0.01480	-3.1977E 05	0.01490	-3.2436E 05
0.01500	-3.2898E 05	0.01510	-3.3361E 05	0.01520	-3.3824E 05	0.01530	-3.4289E 05	0.01540	-3.4755E 05
0.01550	-3.5221E 05	0.01560	-3.5689E 05	0.01570	-3.6159E 05	0.01580	-3.6629E 05	0.01590	-3.7100E 05
0.01600	-3.7572E 05	0.01610	-3.8045E 05	0.01620	-3.8519E 05	0.01630	-3.8994E 05	0.01640	-3.9470E 05
0.01650	-3.9946E 05	0.01660	-4.0423E 05	0.01670	-4.0901E 05	0.01680	-4.1379E 05	0.01690	-4.1858E 05
0.01700	-4.2337E 05	0.01710	-4.2816E 05	0.01720	-4.3306E 05	0.01730	-4.3784E 05	0.01740	-4.4274E 05
0.01750	-4.4759E 05	0.01760	-4.5235E 05	0.01770	-4.5710E 05	0.01780	-4.6181E 05	0.01790	-4.6643E 05
0.01800	-4.7104E 05	0.01810	-4.7561E 05	0.01820	-4.8009E 05	0.01830	-4.8456E 05	0.01840	-4.8899E 05
0.01850	-4.9334E 05	0.01860	-4.9763E 05	0.01870	-5.0198E 05	0.01880	-5.0624E 05	0.01890	-5.1042E 05
0.01900	-5.1459E 05	0.01910	-5.1871E 05	0.01920	-5.2275E 05	0.01930	-5.2680E 05	0.01940	-5.3279E 05
0.01950	-5.3226E 05	0.01960	-5.3331E 05	0.01970	-5.3437E 05	0.01980	-5.3540E 05	0.01990	-5.3641E 05
0.02000	-5.3740E 05	0.02010	-5.3837E 05	0.02020	-5.3931E 05	0.02030	-5.4024E 05	0.02040	-5.4116E 05
0.02050	-5.4209E 05	0.02060	-5.4298E 05	0.02070	-5.4389E 05	0.02080	-5.4480E 05	0.02090	-5.4569E 05
0.02100	-5.4658E 05	0.02110	-5.4747E 05	0.02120	-5.4835E 05	0.02130	-5.4921E 05	0.02140	-5.5010E 05
0.02150	-5.5097E 05	0.02160	-5.5185E 05	0.02170	-5.5272E 05	0.02180	-5.5361E 05	0.02190	-5.5456E 05
0.02200	-5.5551E 05	0.02210	-5.5647E 05	0.02220	-5.5741E 05	0.02230	-5.5836E 05	0.02240	-5.5932E 05
0.02250	-5.6029E 05	0.02260	-5.6123E 05	0.02270	-5.6219E 05	0.02280	-5.6318E 05	0.02290	-5.6412E 05
0.02300	-5.6506E 05	0.02310	-5.6331E 05	0.02320	-5.6421E 05	0.02330	-5.6512E 05	0.02340	-5.6604E 05
0.02350	-5.6696E 05	0.02360	-5.6787E 05	0.02370	-5.6680E 05	0.02380	-5.6974E 05	0.02390	-5.7067E 05
0.02400	-5.7160E 05	0.02410	-5.7255E 05	0.02420	-5.7349E 05	0.02430	-5.7443E 05	0.02440	-5.7538E 05
0.02450	-5.7630E 05	0.02460	-5.7724E 05	0.02470	-5.7819E 05	0.02480	-5.7913E 05	0.02490	-5.8008E 05
0.02500	-5.8100E 05	0.02600	-5.9053E 05	0.02700	-5.9996E 05	0.02800	-6.0919E 05	0.02900	-6.1775E 05
0.03000	-6.2583E 05	0.03100	-6.2936E 05	0.03200	-6.3371E 05	0.03300	-6.3662E 05	0.03400	-6.3886E 05
0.03500	-6.4070E 05	0.03600	-6.4204E 05	0.03700	-6.4298E 05	0.03800	-6.4359E 05	0.03900	-6.4386E 05

TABLE 6.A-11
(SHEET 12 OF 32)

0.04000	-6.4382E 05	0.04100	-6.4346E 05	0.04200	-6.42[illegible]E 05	0.04300	-6.4183E 05	0.04400	-6.4053E 05
0.04500	-6.3909E 05	0.04600	-6.3745E 05	0.04700	-6.3562E 05	0.04800	-6.3368E 05	0.04900	-6.3167E 05
0.05000	-6.2959E 05	0.05100	-6.2742E 05	0.05200	-6.2517E 05	0.05300	-6.2279E 05	0.05400	-6.2031E 05
0.05500	-6.1787E 05	0.05600	-6.1524E 05	0.05700	-6.12[illegible]7E 05	0.05800	-6.1045E 05	0.05900	-6.0817E 05
0.06000	-6.0596E 05	0.06100	-6.0407E 05	0.06200	-6.0219E 05	0.06300	-6.0101E 05	0.06400	-5.9989E 05
0.06500	-5.9934E 05	0.06600	-5.9885E 05	0.06700	-5.9855E 05	0.06800	-5.9834E 05	0.06900	-5.9820E 05
0.07000	-5.9815E 05	0.07100	-5.9016E 05	0.07200	-5.9826E 05	0.07300	-5.9945E 05	0.07400	-5.9603E 05
0.07500	-5.9876E 05	0.07600	-5.9882E 05	0.07700	-5.9878E 05	0.07800	-5.9[illegible]64E 05	0.07900	-5.9635E 05
0.08000	-5.9791E 05	0.08100	-5.9731E 05	0.08200	-5.9655E 05	0.08300	-5.9564E 05	0.08400	-5.9461E 05
0.08500	-5.9332E 05	0.08600	-5.9183E 05	0.08700	-5.9013E 05	0.08800	-5.8829E 05	0.08900	-5.8637E 05
0.09000	-5.8445E 05	0.09100	-5.8257E 05	0.09200	-5.8076E 05	0.09300	-5.7906E 05	0.09400	-5.7750E 05
0.09500	-5.7607E 05	0.09600	-5.7476E 05	0.09700	-5.7409E 05	0.09800	-5.7280E 05	0.09900	-5.71[illegible]E 05
0.10000	-5.7126E 05	0.10100	-5.7050E 05	0.10200	-5.6960E 05	0.10300	-5.6874E 05	0.10400	-5.6773E 05
0.10500	-5.6660E 05	0.10600	-5.6543E 05	0.10700	-5.6407E 05	0.10800	-5.6270E 05	0.10900	-5.6123E 05
0.11000	-5.5971E 05	0.11100	-5.5797E 05	0.11200	-5.5620E 05	0.11300	-5.5439E 05	0.11400	-5.5258E 05
0.11500	-5.5078E 05	0.11600	-5.4901E 05	0.11700	-5.4724E 05	0.11800	-5.4556E 05	0.11900	-5.4402E 05
0.12000	-5.4276E 05	0.12100	-5.4158E 05	0.12200	-5.4113E 05	0.12300	-5.4021E 05	0.12400	-5.3986E 05
0.12500	-5.3953E 05	0.12600	-5.3917E 05	0.12700	-5.3870E 05	0.12800	-5.3805E 05	0.12900	-5.3716E 05
0.13000	-5.3595E 05	0.13100	-5.3480E 05	0.13200	-5.3309E 05	0.13300	-5.3278E 05	0.13400	-5.3144E 05
0.13500	-5.3015E 05	0.13600	-5.2895E 05	0.13700	-5.2793E 05	0.13800	-5.2813E 05	0.13900	-5.2901E 05
0.14000	-5.3094E 05	0.14100	-5.3408E 05	0.14200	-5.3676E 05	0.14300	-5.3986E 05	0.14400	-5.4270E 05
0.14500	-5.4520E 05	0.14600	-5.4720E 05	0.14700	-5.4860E 05	0.14800	-5.4907E 05	0.14900	-5.5011E 05
0.15000	-5.5024E 05	0.15100	-5.5010E 05	0.15200	-5.4968E 05	0.15300	-5.4915E 05	0.15400	-5.4855E 05
0.15500	-5.4795E 05	0.15600	-5.4735E 05	0.15700	-5.4667E 05	0.15800	-5.4667E 05	0.15900	-5.4678E 05
0.16000	-5.4717E 05	0.16100	-5.4766E 05	0.16200	-5.4012E 05	0.16300	-5.4825E 05	0.16400	-5.4305E 05
0.16500	-5.4728E 05	0.16600	-5.4653E 05	0.16700	-5.4564E 05	0.16800	-5.4409E 05	0.16900	-5.4250E 05
0.17000	-5.4081E 05	0.17100	-5.3909E 05	0.17200	-5.3742E 05	0.17300	-5.3584E 05	0.17400	-5.3433E 05
0.17500	-5.3298E 05	0.17600	-5.3177E 05	0.17700	-5.3073E 05	0.17800	-5.2965E 05	0.17900	-5.2913E 05
0.18000	-5.2856E 05	0.18100	-5.2811E 05	0.18200	-5.2781E 05	0.18300	-5.2762E 05	0.18400	-5.2751E 05
0.18500	-5.2740E 05	0.18600	-5.2733E 05	0.18700	-5.2719E 05	0.18800	-5.2705E 05	0.18900	-5.2682E 05
0.19000	-5.2655E 05	0.19100	-5.2616E 05	0.19200	-5.2672E 05	0.19300	-5.2481E 05	0.19400	-5.2390E 05
0.19500	-5.2289E 05	0.19600	-5.2181E 05	0.19700	-5.2081E 05	0.19800	-5.1983E 05	0.19900	-5.1937E 05
0.20000	-5.1891E 05	0.20200	-5.1807E 05	0.20400	-5.1712E 05	0.20600	-5.1597E 05	0.20800	-5.1459E 05
0.21000	-5.1300E 05	0.21200	-5.1148E 05	0.21400	-5.1031E 05	0.21600	-5.0966E 05	0.21800	-5.1020E 05
0.22000	-5.1075E 05	0.22200	-5.1112E 05	0.22400	-5.1179E 05	0.22600	-5.1199E 05	0.22800	-5.1244E 05
0.23000	-5.1277E 05	0.23200	-5.1282E 05	0.23400	-5.1236E 05	0.23600	-5.1214E 05	0.23800	-5.1142E 05
0.24000	-5.1029E 05	0.24200	-5.1026E 05	0.24400	-5.0963E 05	0.24600	-5.0843E 05	0.24800	-5.0672E 05
0.25000	-5.0482E 05	0.25200	-5.0284E 05	0.25400	-5.0109E 05	0.25600	-4.9974E 05	0.25800	-4.9885E 05
0.26000	-4.9841E 05	0.26200	-4.9834E 05	0.26400	-4.9864E 05	0.26600	-4.9902E 05	0.26800	-4.9951E 05
0.27000	-4.9997E 05	0.27200	-5.0009E 05	0.27400	-5.0082E 05	0.27600	-5.0101E 05	0.27800	-5.0094E 05
0.28000	-5.0065E 05	0.28200	-5.0017E 05	0.28400	-4.9951E 05	0.28600	-4.9865E 05	0.28800	-4.9768E 05
0.29000	-4.9672E 05	0.29200	-4.9589E 05	0.29400	-4.9523E 05	0.29600	-4.9479E 05	0.29800	-4.9454E 05
0.30000	-4.9447E 05	0.30200	-4.9456E 05	0.30400	-4.9507E 05	0.30600	-4.9529E 05	0.30800	-4.9522E 05
0.31000	-4.9543E 05	0.31200	-4.9586E 05	0.31400	-4.9578E 05	0.31600	-4.9511E 05	0.31800	-4.9436E 05
0.32000	-4.9358E 05	0.32200	-4.9256E 05	0.32400	-4.9140E 05	0.32600	-4.9015E 05	0.32800	-4.8895E 05
0.33000	-4.8790E 05	0.33200	-4.8709E 05	0.33400	-4.8654E 05	0.33600	-4.8629E 05	0.33800	-4.8626E 05
0.34000	-4.8640E 05	0.34200	-4.8668E 05	0.34400	-4.8703E 05	0.34600	-4.8741E 05	0.34800	-4.8777E 05
0.35000	-4.8818E 05	0.35200	-4.8871E 05	0.35400	-4.8909E 05	0.35600	-4.8934E 05	0.35800	-4.8961E 05
0.36000	-4.9063E 05	0.36200	-4.9090E 05	0.36400	-4.9088E 05	0.36600	-4.9016E 05	0.36800	-4.8979E 05
0.37000	-4.8887E 05	0.37200	-4.8747E 05	0.37400	-4.8569E 05	0.37600	-4.8363E 05	0.37800	-4.8219E 05
0.38000	-4.8098E 05	0.38200	-4.8027E 05	0.38400	-4.8005E 05	0.38600	-4.8024E 05	0.38800	-4.8068E 05
0.39000	-4.8126E 05	0.39200	-4.8187E 05	0.39400	-4.8251E 05	0.39600	-4.8313E 05	0.39800	-4.8365E 05
0.40000	-4.8398E 05	0.40200	-4.8475E 05	0.40400	-4.8504E 05	0.40600	-4.8512E 05	0.40800	-4.8491E 05
0.41000	-4.8439E 05	0.41200	-4.8371E 05	0.41400	-4.8300E 05	0.41600	-4.8232E 05	0.41800	-4.8179E 05
0.42000	-4.8142E 05	0.42200	-4.8121E 05	0.42400	-4.8112E 05	0.42600	-4.8114E 05	0.42800	-4.8123E 05
0.43000	-4.8137E 05	0.43200	-4.8155E 05	0.43400	-4.8180E 05	0.43600	-4.8227E 05	0.43800	-4.8265E 05
0.44000	-4.8313E 05	0.44200	-4.8322E 05	0.44400	-4.8306E 05	0.44600	-4.8261E 05	0.44800	-4.8198E 05
0.45000	-4.8114E 05	0.45200	-4.8038E 05	0.45400	-4.7971E 05	0.45600	-4.7922E 05	0.45800	-4.7887E 05
0.46000	-4.7869E 05	0.46200	-4.7865E 05	0.46400	-4.7870E 05	0.46600	-4.7881E 05	0.46800	-4.7895E 05
0.47000	-4.7909E 05	0.47200	-4.7920E 05	0.47400	-4.7926E 05	0.47600	-4.7926E 05	0.47800	-4.7918E 05
0.48000	-4.7903E 05	0.48200	-4.7882E 05	0.48400	-4.7860E 05	0.48600	-4.7836E 05	0.48800	-4.7814E 05
0.49000	-4.7795E 05	0.49200	-4.7780E 05	0.49400	-4.7766E 05	0.49600	-4.7761E 05	0.49800	-4.7758E 05
0.50000	-4.7756E 05	0.50110	-4.7756E 05						

TABLE 6.A-11
(SHEET 13 OF 32)

TIME FUNCTION NUMBER = (7)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 36 00>02$ 0. -515.9)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-5.1590E 02	0.00010	-5.1590E 02	0.00020	-5.1530E 02	0.00030	-5.1590E 02	0.00040	-5.1590E 02
0.00050	-5.1590E 02	0.00060	-5.1590E 02	0.00070	-5.1730E 02	0.00080	-5.1730E 02	0.00090	-5.1730E 02
0.00100	-5.1730E 02	0.00110	-5.1730E 02	0.00120	-5.1730E 02	0.00130	-5.1860E 02	0.00140	-5.1860E 02
0.00150	-5.2100E 02	0.00160	-5.2250E 02	0.00170	-5.2400E 02	0.00180	-5.2680E 02	0.00190	-5.3070E 02
0.00200	-5.3500E 02	0.00210	-5.4060E 02	0.00220	-5.4610E 02	0.00230	-5.5660E 02	0.00240	-5.6780E 02
0.00250	-5.8150E 02	0.00260	-5.9600E 02	0.00270	-6.1520E 02	0.00280	-6.3550E 02	0.00290	-6.6220E 02
0.00300	-6.8980E 02	0.00310	-7.2460E 02	0.00320	-7.6210E 02	0.00330	-8.0620E 02	0.00340	-6.5650E 02
0.00350	-9.1140E 02	0.00360	-9.7360E 02	0.00370	-1.0436E 03	0.00380	-1.1205E 03	0.00390	-1.2036E 03
0.00400	-1.2955E 03	0.00410	-1.3969E 03	0.00420	-1.5045E 03	0.00430	-1.6222E 03	0.00440	-1.7463E 03
0.00450	-1.8798E 03	0.00460	-2.0218E 03	0.00470	-2.1728E 03	0.00480	-2.3313E 03	0.00490	-2.4984E 03
0.00500	-2.6718E 03	0.00510	-2.8538E 03	0.00520	-3.0442E 03	0.00530	-3.2406E 03	0.00540	-3.4448E 03
0.00550	-3.6549E 03	0.00560	-3.8709E 03	0.00570	-4.0936E 03	0.00580	-4.3217E 03	0.00590	-4.5557E 03
0.00600	-4.7944E 03	0.00610	-5.0373E 03	0.00620	-5.2649E 03	0.00630	-5.5376E 03	0.00640	-5.7941E 03
0.00650	-6.0537E 03	0.00660	-6.3169E 03	0.00670	-6.5819E 03	0.00680	-6.8524E 03	0.00690	-7.1235E 03
0.00700	-7.3987E 03	0.00710	-7.6755E 03	0.00720	-7.9566E 03	0.00730	-8.2306E 03	0.00740	-8.5231E 03
0.00750	-8.8089E 03	0.00760	-9.1005E 03	0.00770	-9.3917E 03	0.00780	-9.6847E 03	0.00790	-9.9019E 03
0.00800	-1.0280E 04	0.00810	-1.0581E 04	0.00820	-1.0886E 04	0.00830	-1.1185E 04	0.00840	-1.1506E 04
0.00850	-1.1821E 04	0.00860	-1.2139E 04	0.00870	-1.2462E 04	0.00880	-1.2789E 04	0.00890	-1.3122E 04
0.00900	-1.3460E 04	0.00910	-1.3803E 04	0.00920	-1.4152E 04	0.00930	-1.4509E 04	0.00940	-1.4872E 04
0.00950	-1.5243E 04	0.00960	-1.5622E 04	0.00970	-1.6009E 04	0.00980	-1.6401E 04	0.00990	-1.6810E 04
0.01000	-1.7226E 04	0.01010	-1.7653E 04	0.01020	-1.8090E 04	0.01030	-1.8538E 04	0.01040	-1.8999E 04
0.01050	-1.9472E 04	0.01060	-1.9961E 04	0.01070	-2.0461E 04	0.01080	-2.0975E 04	0.01090	-2.1507E 04
0.01100	-2.2050E 04	0.01110	-2.2612E 04	0.01120	-2.3176E 04	0.01130	-2.3763E 04	0.01140	-2.4365E 04
0.01150	-2.4982E 04	0.01160	-2.5612E 04	0.01170	-2.6257E 04	0.01180	-2.6918E 04	0.01190	-2.7593E 04
0.01200	-2.8284E 04	0.01210	-2.8991E 04	0.01220	-2.9714E 04	0.01230	-3.0455E 04	0.01240	-3.1214E 04
0.01250	-3.1989E 04	0.01260	-3.2783E 04	0.01270	-3.3594E 04	0.01280	-3.4425E 04	0.01290	-3.5274E 04
0.01300	-3.6141E 04	0.01310	-3.7029E 04	0.01320	-3.7936E 04	0.01330	-3.8861E 04	0.01340	-3.9807E 04
0.01350	-4.0773E 04	0.01360	-4.1758E 04	0.01370	-4.2764E 04	0.01380	-4.3788E 04	0.01390	-4.4832E 04
0.01400	-4.5896E 04	0.01410	-4.6982E 04	0.01420	-4.8088E 04	0.01430	-4.9213E 04	0.01440	-5.0358E 04
0.01450	-5.1523E 04	0.01460	-5.2708E 04	0.01470	-5.3911E 04	0.01480	-5.5136E 04	0.01490	-5.6380E 04
0.01500	-5.7641E 04	0.01510	-5.8920E 04	0.01520	-6.0216E 04	0.01530	-6.1531E 04	0.01540	-6.2862E 04
0.01550	-6.4210E 04	0.01560	-6.5575E 04	0.01570	-6.6957E 04	0.01580	-6.8356E 04	0.01590	-6.9771E 04
0.01600	-7.1201E 04	0.01610	-7.2649E 04	0.01620	-7.4113E 04	0.01630	-7.5593E 04	0.01640	-7.7090E 04
0.01650	-7.8600E 04	0.01660	-8.0127E 04	0.01670	-8.1669E 04	0.01680	-8.3225E 04	0.01690	-8.4796E 04
0.01700	-8.6386E 04	0.01710	-8.7990E 04	0.01720	-8.9614E 04	0.01730	-9.1248E 04	0.01740	-9.2898E 04
0.01750	-9.4563E 04	0.01760	-9.6242E 04	0.01770	-9.7938E 04	0.01780	-9.9648E 04	0.01790	-1.0137E 05
0.01800	-1.0311E 05	0.01810	-1.0486E 05	0.01820	-1.0663E 05	0.01830	-1.0842E 05	0.01840	-1.1021E 05
0.01850	-1.1202E 05	0.01860	-1.1364E 05	0.01870	-1.1567E 05	0.01880	-1.1752E 05	0.01890	-1.1939E 05
0.01900	-1.2126E 05	0.01910	-1.2315E 05	0.01920	-1.2504E 05	0.01930	-1.2696E 05	0.01940	-1.2888E 05
0.01950	-1.3066E 05	0.01960	-1.3260E 05	0.01970	-1.3455E 05	0.01980	-1.3648E 05	0.01990	-1.3843E 05
0.02000	-1.4037E 05	0.02010	-1.4232E 05	0.02020	-1.4425E 05	0.02030	-1.4617E 05	0.02040	-1.4811E 05
0.02050	-1.5006E 05	0.02060	-1.5201E 05	0.02070	-1.5398E 05	0.02080	-1.5595E 05	0.02090	-1.5793E 05
0.02100	-1.5990E 05	0.02110	-1.6189E 05	0.02120	-1.6388E 05	0.02130	-1.6587E 05	0.02140	-1.6787E 05
0.02150	-1.6986E 05	0.02160	-1.7187E 05	0.02170	-1.7388E 05	0.02180	-1.7592E 05	0.02190	-1.7800E 05
0.02200	-1.8006E 05	0.02210	-1.8209E 05	0.02220	-1.8406E 05	0.02230	-1.8602E 05	0.02240	-1.8794E 05
0.02250	-1.8985E 05	0.02260	-1.9170E 05	0.02270	-1.9354E 05	0.02280	-1.9542E 05	0.02290	-1.9719E 05
0.02300	-1.9888E 05	0.02310	-1.9235E 05	0.02320	-1.9387E 05	0.02330	-1.9536E 05	0.02340	-1.9602E 05
0.02350	-1.9821E 05	0.02360	-1.9958E 05	0.02370	-2.0093E 05	0.02380	-2.0224E 05	0.02390	-2.0353E 05
0.02400	-2.0478E 05	0.02410	-2.0601E 05	0.02420	-2.0720E 05	0.02430	-2.0836E 05	0.02440	-2.0951E 05
0.02450	-2.1059E 05	0.02460	-2.1167E 05	0.02470	-2.1272E 05	0.02480	-2.1374E 05	0.02490	-2.1476E 05
0.02500	-2.1571E 05	0.02600	-2.2412E 05	0.02700	-2.3098E 05	0.02800	-2.3692E 05	0.02900	-2.4188E 05
0.03000	-2.4627E 05	0.03100	-2.4708E 05	0.03200	-2.4872E 05	0.03300	-2.4944E 05	0.03400	-2.4987E 05
0.03500	-2.5018E 05	0.03600	-2.5026E 05	0.03700	-2.5020E 05	0.03800	-2.5001E 05	0.03900	-2.4969E 05

TABLE 6.A-11
(SHEET 14 OF 32)

0.04000	-2.4922E 05	0.04100	-2.4861E 05	0.04200	-2.4785E 05	0.04300	-2.4690E 05	0.04400	-2.4577E 05
0.04500	-2.4457E 05	0.04600	-2.4325E 05	0.04700	-2.4181E 05	0.04800	-2.4031E 05	0.04900	-2.3877E 05
0.05000	-2.3720E 05	0.05100	-2.3557E 05	0.05200	-2.3388E 05	0.05300	-2.3210E 05	0.05400	-2.3024E 05
0.05500	-2.2841E 05	0.05600	-2.2644E 05	0.05700	-2.2457E 05	0.05800	-2.2282E 05	0.05900	-2.2110E 05
0.06000	-2.1943E 05	0.06100	-2.1801E 05	0.06200	-2.1658E 05	0.06300	-2.1569E 05	0.06400	-2.1484E 05
0.06500	-2.1445E 05	0.06600	-2.1409E 05	0.06700	-2.1385E 05	0.06800	-2.1373E 05	0.06900	-2.1363E 05
0.07000	-2.1360E 05	0.07100	-2.1362E 05	0.07200	-2.1372E 05	0.07300	-2.1386E 05	0.07400	-2.1401E 05
0.07500	-2.1412E 05	0.07600	-2.1417E 05	0.07700	-2.1416E 05	0.07800	-2.1403E 05	0.07900	-2.1381E 05
0.08000	-2.1347E 05	0.08100	-2.1301E 05	0.08200	-2.1242E 05	0.08300	-2.1171E 05	0.08400	-2.1091E 05
0.08500	-2.0990E 05	0.08600	-2.0874E 05	0.08700	-2.0741E 05	0.08800	-2.0597E 05	0.08900	-2.0447E 05
0.09000	-2.0297E 05	0.09100	-2.0160E 05	0.09200	-2.0009E 05	0.09300	-1.9877E 05	0.09400	-1.9754E 05
0.09500	-1.9643E 05	0.09600	-1.9540E 05	0.09700	-1.9460E 05	0.09800	-1.9388E 05	0.09900	-1.9325E 05
0.10000	-1.9268E 05	0.10100	-1.9209E 05	0.10200	-1.9144E 05	0.10300	-1.9072E 05	0.10400	-1.8993E 05
0.10500	-1.8906E 05	0.10600	-1.8814E 05	0.10700	-1.8706E 05	0.10800	-1.8601E 05	0.10900	-1.8487E 05
0.11000	-1.8368E 05	0.11100	-1.8232E 05	0.11200	-1.8093E 05	0.11300	-1.7953E 05	0.11400	-1.7811E 05
0.11500	-1.7670E 05	0.11600	-1.7532E 05	0.11700	-1.7393E 05	0.11800	-1.7262E 05	0.11900	-1.7141E 05
0.12000	-1.7043E 05	0.12100	-1.6951E 05	0.12200	-1.6916E 05	0.12300	-1.6844E 05	0.12400	-1.6816E 05
0.12500	-1.6790E 05	0.12600	-1.6762E 05	0.12700	-1.6726E 05	0.12800	-1.6675E 05	0.12900	-1.6606E 05
0.13000	-1.6512E 05	0.13100	-1.6423E 05	0.13200	-1.6339E 05	0.13300	-1.6268E 05	0.13400	-1.6162E 05
0.13500	-1.6062E 05	0.13600	-1.5968E 05	0.13700	-1.5667E 05	0.13800	-1.5902E 05	0.13900	-1.5970E 05
0.14000	-1.6120E 05	0.14100	-1.6365E 05	0.14200	-1.6574E 05	0.14300	-1.6817E 05	0.14400	-1.7038E 05
0.14500	-1.7232E 05	0.14600	-1.7389E 05	0.14700	-1.7503E 05	0.14800	-1.7582E 05	0.14900	-1.7616E 05
0.15000	-1.7626E 05	0.15100	-1.7615E 05	0.15200	-1.7582E 05	0.15300	-1.7541E 05	0.15400	-1.7494E 05
0.15500	-1.7448E 05	0.15600	-1.7400E 05	0.15700	-1.7347E 05	0.15800	-1.7340E 05	0.15900	-1.7356E 05
0.16000	-1.7387E 05	0.16100	-1.7425E 05	0.16200	-1.7461E 05	0.16300	-1.7471E 05	0.16400	-1.7456E 05
0.16500	-1.7395E 05	0.16600	-1.7337E 05	0.16700	-1.7268E 05	0.16800	-1.7148E 05	0.16900	-1.7031E 05
0.17000	-1.6893E 05	0.17100	-1.6760E 05	0.17200	-1.6631E 05	0.17300	-1.6509E 05	0.17400	-1.6392E 05
0.17500	-1.6288E 05	0.17600	-1.6194E 05	0.17700	-1.6112E 05	0.17800	-1.6042E 05	0.17900	-1.5985E 05
0.18000	-1.5939E 05	0.18100	-1.5904E 05	0.18200	-1.5879E 05	0.18300	-1.5863E 05	0.18400	-1.5853E 05
0.18500	-1.5843E 05	0.18600	-1.5836E 05	0.18700	-1.5824E 05	0.18800	-1.5812E 05	0.18900	-1.5794E 05
0.19000	-1.5773E 05	0.19100	-1.5742E 05	0.19200	-1.5708E 05	0.19300	-1.5636E 05	0.19400	-1.5566E 05
0.19500	-1.5488E 05	0.19600	-1.5404E 05	0.19700	-1.5326E 05	0.19800	-1.5249E 05	0.19900	-1.5214E 05
0.20000	-1.5179E 05	0.20200	-1.5114E 05	0.20400	-1.5042E 05	0.20600	-1.4953E 05	0.20800	-1.4847E 05
0.21000	-1.4722E 05	0.21200	-1.4603E 05	0.21400	-1.4512E 05	0.21600	-1.4452E 05	0.21800	-1.4501E 05
0.22000	-1.4544E 05	0.22200	-1.4573E 05	0.22400	-1.4625E 05	0.22600	-1.4641E 05	0.22800	-1.4676E 05
0.23000	-1.4701E 05	0.23200	-1.4705E 05	0.23400	-1.4669E 05	0.23600	-1.4651E 05	0.23800	-1.4594E 05
0.24000	-1.4506E 05	0.24200	-1.4504E 05	0.24400	-1.4454E 05	0.24600	-1.4361E 05	0.24800	-1.4228E 05
0.25000	-1.4080E 05	0.25200	-1.3925E 05	0.25400	-1.3789E 05	0.25600	-1.3684E 05	0.25800	-1.3614E 05
0.26000	-1.3579E 05	0.26200	-1.3574E 05	0.26400	-1.3598E 05	0.26600	-1.3626E 05	0.26800	-1.3664E 05
0.27000	-1.3700E 05	0.27200	-1.3710E 05	0.27400	-1.3766E 05	0.27600	-1.3782E 05	0.27800	-1.3775E 05
0.28000	-1.3752E 05	0.28200	-1.3714E 05	0.28400	-1.3663E 05	0.28600	-1.3596E 05	0.28800	-1.3520E 05
0.29000	-1.3445E 05	0.29200	-1.3382E 05	0.29400	-1.3329E 05	0.29600	-1.3296E 05	0.29800	-1.3276E 05
0.30000	-1.3272E 05	0.30200	-1.3277E 05	0.30400	-1.3316E 05	0.30600	-1.3335E 05	0.30800	-1.3330E 05
0.31000	-1.3345E 05	0.31200	-1.3380E 05	0.31400	-1.3372E 05	0.31600	-1.3320E 05	0.31800	-1.3262E 05
0.32000	-1.3200E 05	0.32200	-1.3119E 05	0.32400	-1.3029E 05	0.32600	-1.2932E 05	0.32800	-1.2838E 05
0.33000	-1.2757E 05	0.33200	-1.2693E 05	0.33400	-1.2650E 05	0.33600	-1.2631E 05	0.33800	-1.2628E 05
0.34000	-1.2639E 05	0.34200	-1.2663E 05	0.34400	-1.2688E 05	0.34600	-1.2719E 05	0.34800	-1.2747E 05
0.35000	-1.2779E 05	0.35200	-1.2819E 05	0.35400	-1.2851E 05	0.35600	-1.2860E 05	0.35800	-1.2890E 05
0.36000	-1.2968E 05	0.36200	-1.2990E 05	0.36400	-1.2987E 05	0.36600	-1.2954E 05	0.36800	-1.2901E 05
0.37000	-1.2831E 05	0.37200	-1.2720E 05	0.37400	-1.2583E 05	0.37600	-1.2437E 05	0.37800	-1.2310E 05
0.38000	-1.2216E 05	0.38200	-1.2162E 05	0.38400	-1.2144E 05	0.38600	-1.2161E 05	0.38800	-1.2196E 05
0.39000	-1.2243E 05	0.39200	-1.2292E 05	0.39400	-1.2343E 05	0.39600	-1.2393E 05	0.39800	-1.2435E 05
0.40000	-1.2462E 05	0.40200	-1.2524E 05	0.40400	-1.2547E 05	0.40600	-1.2556E 05	0.40800	-1.2539E 05
0.41000	-1.2501E 05	0.41200	-1.2448E 05	0.41400	-1.2394E 05	0.41600	-1.2340E 05	0.41800	-1.2301E 05
0.42000	-1.2271E 05	0.42200	-1.2256E 05	0.42400	-1.2249E 05	0.42600	-1.2252E 05	0.42800	-1.2259E 05
0.43000	-1.2273E 05	0.43200	-1.2286E 05	0.43400	-1.2308E 05	0.43600	-1.2345E 05	0.43800	-1.2377E 05
0.44000	-1.2415E 05	0.44200	-1.2422E 05	0.44400	-1.2410E 05	0.44600	-1.2377E 05	0.44800	-1.2325E 05
0.45000	-1.2265E 05	0.45200	-1.2207E 05	0.45400	-1.2167E 05	0.45600	-1.2119E 05	0.45800	-1.2093E 05
0.46000	-1.2080E 05	0.46200	-1.2078E 05	0.46400	-1.2065E 05	0.46600	-1.2093E 05	0.46800	-1.2104E 05
0.47000	-1.2115E 05	0.47200	-1.2125E 05	0.47400	-1.2130E 05	0.47600	-1.2130E 05	0.47800	-1.2123E 05
0.48000	-1.2113E 05	0.48200	-1.2096E 05	0.48400	-1.2079E 05	0.48600	-1.2061E 05	0.48800	-1.2044E 05
0.49000	-1.2029E 05	0.49200	-1.2017E 05	0.49400	-1.2009E 05	0.49600	-1.2004E 05	0.49800	-1.2002E 05
0.50000	-1.2001E 05	0.50110	-1.2001E 05						

TIME FUNCTION NUMBER = (8)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 37 00>023 0. -1.2)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-1.2000E 00	0.00010	-1.2000E 00	0.00020	-1.2000E 00	0.00030	-1.2000E 00	0.00040	-1.2000E 00
0.00050	-1.2000E 00	0.00060	-1.2000E 00	0.00070	-1.2000E 00	0.00080	-1.2000E 00	0.00090	-1.2000E 00
0.00100	-1.2000E 00	0.00110	-1.2000E 00	0.00120	-1.2000E 00	0.00130	-1.2000E 00	0.00140	-1.2000E 00
0.00150	-1.2000E 00	0.00160	-1.2000E 00	0.00170	-1.2000E 00	0.00180	-1.2000E 00	0.00190	-1.2000E 00
0.00200	-1.2000E 00	0.00210	-1.2000E 00	0.00220	-1.2000E 00	0.00230	-1.2000E 00	0.00240	-2.8000E 00
0.00250	-2.8000E 00	0.00260	-2.8000E 00	0.00270	-4.4000E 00	0.00280	-4.4000E 00	0.00290	-6.1000E 00
0.00300	-6.1000E 00	0.00310	-9.3000E 00	0.00320	-1.1000E 01	0.00330	-1.2600E 01	0.00340	-1.5800E 01
0.00350	-1.9100E 01	0.00360	-2.4000E 01	0.00370	-2.8900E 01	0.00380	-3.5400E 01	0.00390	-4.2000E 01
0.00400	-5.0100E 01	0.00410	-6.1100E 01	0.00420	-7.2500E 01	0.00430	-8.5600E 01	0.00440	-1.0030E 02
0.00450	-1.1630E 02	0.00460	-1.3740E 02	0.00470	-1.6020E 02	0.00480	-1.8550E 02	0.00490	-2.1370E 02
0.00500	-2.4420E 02	0.00510	-2.8130E 02	0.00520	-3.2010E 02	0.00530	-3.6270E 02	0.00540	-4.1310E 02
0.00550	-4.6520E 02	0.00560	-5.2630E 02	0.00570	-5.8910E 02	0.00580	-6.6020E 02	0.00590	-7.3500E 02
0.00600	-8.1920E 02	0.00610	-9.0760E 02	0.00620	-1.0054E 03	0.00630	-1.1093E 03	0.00640	-1.2214E 03
0.00650	-1.3412E 03	0.00660	-1.4691E 03	0.00670	-1.6003E 03	0.00680	-1.7544E 03	0.00690	-1.9[illegible]E 03
0.00700	-2.0722E 03	0.00710	-2.2474E 03	0.00720	-2.4298E 03	0.00730	-2.6882E 03	0.00740	-2.[illegible]E 03
0.00750	-3.0418E 03	0.00760	-3.2661E 03	0.00770	-3.5002E 03	0.00780	-3.7406E 03	0.00790	-4.0020E 03
0.00800	-4.2697E 03	0.00810	-4.5481E 03	0.00820	-4.8266E 03	0.00830	-5.1301E 03	0.00840	-5.4462E 03
0.00850	-5.7674E 03	0.00860	-6.0997E 03	0.00870	-6.4414E 03	0.00880	-6.7940E 03	0.00890	-7.1583E 03
0.00900	-7.5308E 03	0.00910	-7.9149E 03	0.00920	-8.3097E 03	0.00930	-8.7125E 03	0.00940	-9.1263E 03
0.00950	-9.5497E 03	0.00960	-9.9816E 03	0.00970	-1.0422E 04	0.00980	-1.0873E 04	0.00990	-1.1332E 04
0.01000	-1.1801E 04	0.01010	-1.2276E 04	0.01020	-1.2759E 04	0.01030	-1.3262E 04	0.01040	-1.3754E 04
0.01050	-1.4261E 04	0.01060	-1.4776E 04	0.01070	-1.5299E 04	0.01080	-1.5830E 04	0.01090	-1.6367E 04
0.01100	-1.6912E 04	0.01110	-1.7462E 04	0.01120	-1.8021E 04	0.01130	-1.8506E 04	0.01140	-1.9150E 04
0.01150	-1.9736E 04	0.01160	-2.0321E 04	0.01170	-2.0913E 04	0.01180	-2.1513E 04	0.01190	-2.2117E 04
0.01200	-2.2729E 04	0.01210	-2.3348E 04	0.01220	-2.3974E 04	0.01230	-2.4605E 04	0.01240	-2.5244E 04
0.01250	-2.5890E 04	0.01260	-2.6545E 04	0.01270	-2.7203E 04	0.01280	-2.7869E 04	0.01290	-2.8544E 04
0.01300	-2.9224E 04	0.01310	-2.9913E 04	0.01320	-3.0609E 04	0.01330	-3.1314E 04	0.01340	-3.2026E 04
0.01350	-3.2747E 04	0.01360	-3.3476E 04	0.01370	-3.4213E 04	0.01380	-3.4959E 04	0.01390	-3.5714E 04
0.01400	-3.6478E 04	0.01410	-3.7252E 04	0.01420	-3.8034E 04	0.01430	-3.8827E 04	0.01440	-3.9632E 04
0.01450	-4.0447E 04	0.01460	-4.1270E 04	0.01470	-4.2107E 04	0.01480	-4.2953E 04	0.01490	-4.3815E 04
0.01500	-4.4687E 04	0.01510	-4.5570E 04	0.01520	-4.6470E 04	0.01530	-4.7379E 04	0.01540	-4.8303E 04
0.01550	-4.9240E 04	0.01560	-5.0191E 04	0.01570	-5.1159E 04	0.01580	-5.2136E 04	0.01590	-5.3133E 04
0.01600	-5.4142E 04	0.01610	-5.5167E 04	0.01620	-5.6206E 04	0.01630	-5.7267E 04	0.01640	-5.8340E 04
0.01650	-5.9429E 04	0.01660	-6.0535E 04	0.01670	-6.1657E 04	0.01680	-6.2799E 04	0.01690	-6.3956E 04
0.01700	-6.5130E 04	0.01710	-6.6323E 04	0.01720	-6.7532E 04	0.01730	-6.8761E 04	0.01740	-7.0009E 04
0.01750	-7.1274E 04	0.01760	-7.2558E 04	0.01770	-7.3860E 04	0.01780	-7.5183E 04	0.01790	-7.6521E 04
0.01800	-7.7878E 04	0.01810	-7.9256E 04	0.01820	-8.0651E 04	0.01830	-8.2[illegible]E 04	0.01840	-8.3[illegible]E 04
0.01850	-8.4955E 04	0.01860	-8.6428E 04	0.01870	-8.7918E 04	0.01880	-8.9[illegible]E 04	0.01890	-9.0961E 04
0.01900	-9.2513E 04	0.01910	-9.4086E 04	0.01920	-9.5673E 04	0.01930	-9.7284E 04	0.01940	-9.8914E 04
0.01950	-1.0056E 05	0.01960	-1.0223E 05	0.01970	-1.0392E 05	0.01980	-1.0564E 05	0.01990	-1.0737E 05
0.02000	-1.0913E 05	0.02010	-1.1091E 05	0.02020	-1.1271E 05	0.02030	-1.1451E 05	0.02040	-1.1633E 05
0.02050	-1.1816E 05	0.02060	-1.2000E 05	0.02070	-1.2185E 05	0.02080	-1.2370E 05	0.02090	-1.2557E 05
0.02100	-1.2744E 05	0.02110	-1.2932E 05	0.02120	-1.3121E 05	0.02130	-1.3312E 05	0.02140	-1.3502E 05
0.02150	-1.3694E 05	0.02160	-1.3887E 05	0.02170	-1.4080E 05	0.02180	-1.4275E 05	0.02190	-1.4471E 05
0.02200	-1.4667E 05	0.02210	-1.4865E 05	0.02220	-1.5062E 05	0.02230	-1.5261E 05	0.02240	-1.5460E 05
0.02250	-1.5659E 05	0.02260	-1.5859E 05	0.02270	-1.6059E 05	0.02280	-1.6259E 05	0.02290	-1.6459E 05
0.02300	-1.6659E 05	0.02310	-1.6859E 05	0.02320	-1.7039E 05	0.02330	-1.7237E 05	0.02340	-1.7434E 05
0.02350	-1.7628E 05	0.02360	-1.7826E 05	0.02370	-1.8023E 05	0.02380	-1.8220E 05	0.02390	-1.8418E 05
0.02400	-1.8613E 05	0.02410	-1.8809E 05	0.02420	-1.9005E 05	0.02430	-1.9199E 05	0.02440	-1.9393E 05
0.02450	-1.9587E 05	0.02460	-1.9780E 05	0.02470	-1.9972E 05	0.02480	-2.0163E 05	0.02490	-2.0354E 05
0.02500	-2.0543E 05	0.02600	-2.2391E 05	0.02700	-2.4097E 05	0.02800	-2.4667E 05	0.02900	-2.6810E 05
0.03000	-2.6797E 05	0.03100	-2.7601E 05	0.03200	-2.8579E 05	0.03300	-2.9511E 05	0.03400	-3.0306E 05
0.03500	-3.0947E 05	0.03600	-3.1424E 05	0.03700	-3.1748E 05	0.03800	-3.1924E 05	0.03900	-3.1962E 05

0.04000	-3.1873E 05	0.04100	-3.1676E 05	0.04200	-3.1394E 05	0.04300	-3.1036E 05	0.04400	-3.0[illegible]E 05
0.04500	-3.0255E 05	0.04600	-2.9643E 05	0.04700	-2.9012E 05	0.04800	-2.[illegible]7E 05	0.04900	-2.7758E 05
0.05000	-2.7114E 05	0.05100	-2.6584E 05	0.05200	-2.573[illegible]E 05	0.05300	-2.5144E 05	0.05400	-2.5213E 05
0.05500	-2.3958E 05	0.05600	-2.3497E 05	0.05700	-2.2987E 05	0.05800	-2.2601E 05	0.05900	-2.2113E 05
0.06000	-2.1755E 05	0.06100	-2.1409E 05	0.06200	-2.101[illegible]E 05	0.06300	-2.1115E 05	0.06400	-2.[illegible]E 05
0.06500	-2.0753E 05	0.06600	-2.0776E 05	0.06700	-2.015[illegible]E 05	0.06800	-2.0271E 05	0.06900	-2.0026E 05
0.07000	-1.9901E 05	0.07100	-1.9724E 05	0.07200	-1.9556E 05	0.07300	-1.9374E 05	0.07400	-1.91[illegible]E 05
0.07500	-1.8918E 05	0.07600	-1.8657E 05	0.07700	-1.8346E 05	0.07800	-1.8032E 05	0.07900	-1.7706E 05
0.08000	-1.7355E 05	0.08100	-1.6988E 05	0.08200	-1.6621E 05	0.08300	-1.6227E 05	0.08400	-1.5029E 05
0.08500	-1.5497E 05	0.08600	-1.5114E 05	0.08700	-1.4750E 05	0.08800	-1.[illegible]400E 05	0.08900	-1.40[illegible]E 05
0.09000	-1.3695E 05	0.09100	-1.3336E 05	0.09200	-1.2964E 05	0.09300	-1.2600E 05	0.09400	-1.2181E 05
0.09500	-1.1799E 05	0.09600	-1.1409E 05	0.09700	-1.1042E 05	0.09800	-1.0676E 05	0.09900	-1.0[illegible]E 05
0.10000	-1.0019E 05	0.10100	-9.7674E 04	0.10200	-9.5415E 04	0.10300	-9.3402E 04	0.10400	-9.1786E 04
0.10500	-9.0595E 04	0.10600	-8.9408E 04	0.10700	-8.8414E 04	0.10800	-8.7[illegible]E 04	0.10900	-8.[illegible]E 04
0.11000	-8.7272E 04	0.11100	-8.5906E 04	0.11200	-8.5343E 04	0.11300	-8.4[illegible]E 04	0.11400	-8.4624E 04
0.11500	-8.3751E 04	0.11600	-8.3422E 04	0.11700	-8.2746E 04	0.11800	-8.2106E 04	0.11900	-8.[illegible]E 04
0.12000	-8.1778E 04	0.12100	-8.1717E 04	0.12200	-8.1334E 04	0.12300	-8.1043E 04	0.12400	-8.1[illegible]E 04
0.12500	-8.1387E 04	0.12600	-8.2233E 04	0.12700	-8.3997E 04	0.12800	-8.[illegible]E 04	0.12900	-8.[illegible]E 04
0.13000	-8.3176E 04	0.13100	-8.9882E 04	0.13200	-9.1890E 04	0.13300	-9.4[illegible]1E 04	0.13400	-8.7[illegible]E 04
0.13500	-8.7405E 04	0.13600	-9.8903E 04	0.13700	-9.9729E 04	0.13800	-1.0[illegible]6E 05	0.13900	-1.0[illegible]E 05
0.14000	-9.9733E 04	0.14100	-9.8648E 04	0.14200	-9.7006E 04	0.14300	-9.[illegible]E 04	0.14400	[illegible] 04
0.14500	-9.4201E 04	0.14600	-9.3790E 04	0.14700	-9.3034E 04	0.14800	-9.[illegible]E 04	0.14900	-9.2711E 04
0.15000	-9.2658E 04	0.15100	-9.2271E 04	0.15200	-9.2135E 04	0.15300	[illegible] 04	0.15400	-9.1[illegible]E 04
0.15500	-9.1623E 04	0.15600	-9.1789E 04	0.15700	-9.1365E 04	0.15800	-9.0104E 04	0.15900	-8.[illegible]E 04
0.16000	-8.7437E 04	0.16100	-8.5307E 04	0.16200	-8.4938E 04	0.16300	-8.41[illegible]E 04	0.16400	[illegible] 04
0.16500	-8.1354E 04	0.16600	-8.1868E 04	0.16700	-8.4439E 04	0.16800	-8.25[illegible] 04	0.16900	-8.[illegible]E 04
0.17000	-8.5506E 04	0.17100	-8.6631E 04	0.17200	-8.8186E 04	0.17300	-9.0129E 04	0.17400	-8.114[illegible] 04
0.17500	-9.2627E 04	0.17600	-9.3088E 04	0.17700	-9.3094E 04	0.17800	-9.2[illegible]7E 04	0.17900	-9.4[illegible] 04
0.18000	-9.3966E 04	0.18100	-9.2716E 04	0.18200	-9.1657E 04	0.18300	-8.[illegible]84E 04	0.18400	-8.[illegible]E 04
0.18500	-8.5266E 04	0.18600	-8.3325E 04	0.18700	-8.0443E 04	0.18800	-7.8622E 04	0.18900	-7.6102E 04
0.19000	-7.4954E 04	0.19100	-7.3264E 04	0.19200	-7.4324E 04	0.19300	-7.1641E 04	0.19400	-7.1619E 04
0.19500	-7.0880E 04	0.19600	-6.9093E 04	0.19700	-7.0036E 04	0.19800	-6.6005E 04	0.19900	-6.6652E 04
0.20000	-6.5337E 04	0.20200	-6.4466E 04	0.20400	-6.4073E 04	0.20600	-6.2435E 04	0.20800	-6.4418E 04
0.21000	-6.6928E 04	0.21200	-6.8962E 04	0.21400	-7.0187E 04	0.21600	-6.8762E 04	0.21800	-7.0044E 04
0.22000	-6.8883E 04	0.22200	-6.7237E 04	0.22400	-6.7154E 04	0.22600	-6.6367E 04	0.22800	-6.665[illegible] 04
0.23000	-6.2244E 04	0.23200	-6.2195E 04	0.23400	-6.2456E 04	0.23600	-6.1976E 04	0.23800	-6.21[illegible]E 04
0.24000	-5.9353E 04	0.24200	-6.0398E 04	0.24400	-6.0613E 04	0.24600	-6.0[illegible]4E 04	0.24800	-6.243[illegible]E 04
0.25000	-6.6062E 04	0.25200	-6.7204E 04	0.25400	-6.9724E 04	0.25600	-7.1[illegible]E 04	0.25800	-7.1062E 04
0.26000	-7.3765E 04	0.26200	-7.2348E 04	0.26400	-7.0234E 04	0.26600	-6.[illegible]1E 04	0.26800	-6.6[illegible]E 04
0.27000	-6.4241E 04	0.27200	-6.2754E 04	0.27400	-6.0234E 04	0.27600	-6.06[illegible]E 04	0.27800	-6.[illegible]E 04
0.28000	-5.8810E 04	0.28200	-5.8462E 04	0.28400	-5.8321E 04	0.28600	-6.1287E 04	0.28800	-6.[illegible]E 04
0.29000	-6.4015E 04	0.29200	-6.7879E 04	0.29400	-6.9064E 04	0.29600	-7.[illegible]E 04	0.29800	-7.1[illegible] 04
0.30000	-7.1831E 04	0.30200	-6.6207E 04	0.30400	-7.0062E 04	0.30600	-6.8101E 04	0.30800	-6.4970E 04
0.31000	-6.3795E 04	0.31200	-5.8857E 04	0.31400	-5.7239E 04	0.31600	-6.4[illegible]E 04	0.31800	-5.4[illegible] 04
0.32000	-5.5178E 04	0.32200	-5.5313E 04	0.32400	-5.6901E 04	0.32600	-5.9[illegible] 04	[illegible]	[illegible] 04
0.33000	-6.2383E 04	0.33200	-6.4701E 04	0.33400	-6.4062E 04	0.33600	-6.[illegible] 04	0.33800	-6.[illegible]E 04
0.34000	-6.6470E 04	0.34200	-6.7792E 04	0.34400	-6.4917E 04	0.34600	-6.[illegible]18E 04	0.34800	-6.2[illegible]19E 04
0.35000	-6.2999E 04	0.35200	-5.9860E 04	0.35400	-5.8341E 04	0.35600	-5.5442E 04	0.35800	-5.3[illegible]21E 04
0.36000	-4.9160E 04	0.36200	-4.9003E 04	0.36400	-4.5726E 04	0.36600	-4.5161E 04	0.36800	-4.4[illegible]7E 04
0.37000	-4.6562E 04	0.37200	-4.7596E 04	0.37400	-5.1166E 04	0.37600	-5.3771E 04	0.37800	-6.7748E 04
0.38000	-6.0456E 04	0.38200	-6.6245E 04	0.38400	-6.4502E 04	0.38600	-6.6469E 04	0.38800	-6.42[illegible]E 04
0.39000	-6.5477E 04	0.39200	-6.3707E 04	0.39400	-6.2941E 04	0.39600	-6.0810E 04	0.39800	-6.9811E 04
0.40000	-6.2629E 04	0.40200	-5.7484E 04	0.40400	-5.8107E 04	0.40600	-5.5334E 04	0.40800	-5.5427E 04
0.41000	-5.8534E 04	0.41200	-5.7888E 04	0.41400	-6.1645E 04	0.41600	-6.1197E 04	0.41800	-6.4174E 04
0.42000	-6.4163E 04	0.42200	-6.4935E 04	0.42400	-6.4381E 04	0.42600	-6.4518E 04	0.42800	-6.3256E 04
0.43000	-6.3800E 04	0.43200	-6.0695E 04	0.43400	-6.1329E 04	0.43600	-5.7909E 04	0.43800	-6.1141E 04
0.44000	-5.4808E 04	0.44200	-5.3135E 04	0.44400	-5.1181E 04	0.44600	-5.2057E 04	0.44800	-5.3075E 04
0.45000	-5.3681E 04	0.45200	-5.5620E 04	0.45400	-5.6497E 04	0.45600	-5.7942E 04	0.45800	-5.9159E 04
0.46000	-5.8997E 04	0.46200	-6.0227E 04	0.46400	-5.9217E 04	0.46600	-5.9663E 04	0.46800	-5.8105E 04
0.47000	-5.8226E 04	0.47200	-5.7947E 04	0.47400	-5.6931E 04	0.47600	-5.6382E 04	0.47800	-5.8652E 04
0.48000	-5.6240E 04	0.48200	-5.6068E 04	0.48400	-5.6878E 04	0.48600	-5.6844E 04	0.48800	-5.7699E 04
0.49000	-5.9089E 04	0.49200	-5.8423E 04	0.49400	-5.8897E 04	0.49600	-5.8029E 04	0.49800	-5.9023E 04
0.50000	-5.8111E 04	0.50110	-5.8430E 04						

TABLE 6.A-11
(SHEET 17 OF 32)

TIME FUNCTION NUMBER = (9)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 38 00>02$ 0. -0.2)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-2.0000E-01	0.00010	-2.0000E-01	0.00020	-2.0000E-01	0.00030	-2.0000E-01	0.00040	-2.0000E-01
0.00050	-2.0000E-01	0.00060	-2.0000E-01	0.00070	-2.0000E-01	0.00080	-2.0000E-01	0.00090	-2.0000E-01
0.00100	-2.0000E-01	0.00110	-2.0000E-01	0.00120	-2.0000E-01	0.00130	-2.0000E-01	0.00140	-2.0000E-01
0.00150	-2.0000E-01	0.00160	-2.0000E-01	0.00170	-2.0000E-01	0.00180	-2.0000E-01	0.00190	-2.0000E-01
0.00200	-2.0000E-01	0.00210	-2.0000E-01	0.00220	-2.0000E-01	0.00230	-2.0000E-01	0.00240	-5.0000E-01
0.00250	-5.0000E-01	0.00260	-5.0000E-01	0.00270	-5.0000E-01	0.00280	-5.0000E-01	0.00290	-1.1000E 00
0.00300	-1.1000E 00	0.00310	-1.7000E 00	0.00320	-2.0000E 00	0.00330	-2.3000E 00	0.00340	-2.9000E 00
0.00350	-3.5000E 00	0.00360	-4.4000E 00	0.00370	-5.3000E 00	0.00380	-6.5000E 00	0.00390	-7.7000E 00
0.00400	-9.2000E 00	0.00410	-1.1200E 01	0.00420	-1.3300E 01	0.00430	-1.57[illegible]E 01	0.00440	-1.8400E 01
0.00450	-2.1400E 01	0.00460	-2.5200E 01	0.00470	-2.9400E 01	0.00480	-3.4100E 01	0.00490	-3.9200E 01
0.00500	-4.4900E 01	0.00510	-5.1700E 01	0.00520	-5.8800E 01	0.00530	-6.[illegible]E 01	0.00540	-7.[illegible]00E 01
0.00550	-8.5400E 01	0.00560	-9.6700E 01	0.00570	-1.0820E 02	0.00580	-1.21[illegible]E 02	0.00590	-1.3520E 02
0.00600	-1.5040E 02	0.00610	-1.6670E 02	0.00620	-1.8460E 02	0.00630	-2.0[illegible]0E 02	0.00640	-2.2430E 02
0.00650	-2.4630E 02	0.00660	-2.6900E 02	0.00670	-2.9500E 02	0.00680	-3.2[illegible]E 02	0.00690	-3.50[illegible]0E 02
0.00700	-3.8660E 02	0.00710	-4.1270E 02	0.00720	-4.4620E 02	0.00730	-4.8100E 02	0.00740	-5.1[illegible]10E 02
0.00750	-5.5860E 02	0.00760	-5.9980E 02	0.00770	-6.4280E 02	0.00780	-6.[illegible]10E 02	0.00790	-7.[illegible]E 02
0.00800	-7.8410E 02	0.00810	-8.3530E 02	0.00820	-8.8820E 02	0.00830	-9.4320E 02	0.00840	-1.0002E 03
0.00850	-1.0592E 03	0.00860	-1.1202E 03	0.00870	-1.1829E 03	0.00880	-1.2479E 03	0.00890	-1.3146E 03
0.00900	-1.3830E 03	0.00910	-1.4536E 03	0.00920	-1.5261E 03	0.00930	-1.6000E 03	0.00940	-1.6760E 03
0.00950	-1.7538E 03	0.00960	-1.8331E 03	0.00970	-1.9140E 03	0.00980	-1.9967E 03	0.00990	-2.0811E 03
0.01000	-2.1673E 03	0.01010	-2.2544E 03	0.01020	-2.3432E 03	0.01030	-2.4330E 03	0.01040	-2.52[illegible]3E 03
0.01050	-2.6191E 03	0.01060	-2.7136E 03	0.01070	-2.8096E 03	0.01080	-2.9072E 03	0.01090	-3.0059E 03
0.01100	-3.1058E 03	0.01110	-3.2068E 03	0.01120	-3.3096E 03	0.01130	-3.4132E 03	0.01140	-3.5183E 03
0.01150	-3.6245E 03	0.01160	-3.7320E 03	0.01170	-3.8406E 03	0.01180	-3.9508E 03	0.01190	-4.0613E 03
0.01200	-4.1741E 03	0.01210	-4.2879E 03	0.01220	-4.4028E 03	0.01230	-4.5187E 03	0.01240	-4.6360E 03
0.01250	-4.7547E 03	0.01260	-4.8749E 03	0.01270	-4.9957E 03	0.01280	-5.1180E 03	0.01290	-5.2420E 03
0.01300	-5.3670E 03	0.01310	-5.4934E 03	0.01320	-5.6213E 03	0.01330	-5.7508E 03	0.01340	-5.[illegible]16E 03
0.01350	-6.0139E 03	0.01360	-6.1477E 03	0.01370	-6.2831E 03	0.01380	-6.4199E 03	0.01390	-6.5589E 03
0.01400	-6.6991E 03	0.01410	-6.8413E 03	0.01420	-6.9848E 03	0.01430	-7.1306E 03	0.01440	-7.2783E 03
0.01450	-7.4280E 03	0.01460	-7.5792E 03	0.01470	-7.7329E 03	0.01480	-7.[illegible]2E 03	0.01490	-8.0466E 03
0.01500	-8.2067E 03	0.01510	-8.3660E 03	0.01520	-8.5341E 03	0.01530	-8.7012E 03	0.01540	-8.8707E 03
0.01550	-9.0429E 03	0.01560	-9.2175E 03	0.01570	-9.3952E 03	0.01580	-9.5751E 03	0.01590	-9.7578E 03
0.01600	-9.9431E 03	0.01610	-1.0131E 04	0.01620	-1.0322E 04	0.01630	-1.0517E 04	0.01640	-1.0714E 04
0.01650	-1.0914E 04	0.01660	-1.1117E 04	0.01670	-1.1323E 04	0.01680	-1.15[illegible]E 04	0.01690	-1.1745E 04
0.01700	-1.1961E 04	0.01710	-1.2180E 04	0.01720	-1.2402E 04	0.01730	-1.2626E 04	0.01740	-1.2857E 04
0.01750	-1.3085E 04	0.01760	-1.3325E 04	0.01770	-1.3564E 04	0.01780	-1.3807E 04	0.01790	-1.4053E 04
0.01800	-1.4302E 04	0.01810	-1.4555E 04	0.01820	-1.4811E 04	0.01830	-1.5071E 04	0.01840	-1.5335E 04
0.01850	-1.5602E 04	0.01860	-1.5872E 04	0.01870	-1.6146E 04	0.01880	-1.6424E 04	0.01890	-1.6705E 04
0.01900	-1.6990E 04	0.01910	-1.7279E 04	0.01920	-1.7570E 04	0.01930	-1.7866E 04	0.01940	-1.8166E 04
0.01950	-1.8468E 04	0.01960	-1.8775E 04	0.01970	-1.9085E 04	0.01980	-1.9401E 04	0.01990	-1.9719E 04
0.02000	-2.0042E 04	0.02010	-2.0368E 04	0.02020	-2.0698E 04	0.02030	-2.1031E 04	0.02040	-2.1364E 04
0.02050	-2.1700E 04	0.02060	-2.2038E 04	0.02070	-2.2377E 04	0.02080	-2.2718E 04	0.02090	-2.3060E 04
0.02100	-2.3404E 04	0.02110	-2.3750E 04	0.02120	-2.4097E 04	0.02130	-2.4447E 04	0.02140	-2.4797E 04
0.02150	-2.5149E 04	0.02160	-2.5503E 04	0.02170	-2.5859E 04	0.02180	-2.6216E 04	0.02190	-2.6575E 04
0.02200	-2.6936E 04	0.02210	-2.7299E 04	0.02220	-2.7662E 04	0.02230	-2.8027E 04	0.02240	-2.8392E 04
0.02250	-2.8758E 04	0.02260	-2.9125E 04	0.02270	-2.9493E 04	0.02280	-2.9860E 04	0.02290	-3.0227E 04
0.02300	-3.0594E 04	0.02310	-3.0961E 04	0.02320	-3.1292E 04	0.02330	-3.1656E 04	0.02340	-3.2017E 04
0.02350	-3.2374E 04	0.02360	-3.2737E 04	0.02370	-3.3099E 04	0.02380	-3.3461E 04	0.02390	-3.3825E 04
0.02400	-3.4183E 04	0.02410	-3.4543E 04	0.02420	-3.4902E 04	0.02430	-3.5259E 04	0.02440	-3.5616E 04
0.02450	-3.5971E 04	0.02460	-3.6325E 04	0.02470	-3.6678E 04	0.02480	-3.7029E 04	0.02490	-3.7379E 04
0.02500	-3.7728E 04	0.02600	-4.1121E 04	0.02700	-4.4254E 04	0.02800	-4.5301E 04	0.02900	-4.7400E 04
0.03000	-4.9213E 04	0.03100	-5.0798E 04	0.03200	-5.2486E 04	0.03300	-5.4197E 04	0.03400	-5.5656E 04
0.03500	-5.6835E 04	0.03600	-5.7711E 04	0.03700	-5.8305E 04	0.03800	-5.8628E 04	0.03900	-5.8593E 04

TABLE 6.A-11
(SHEET 18 OF 32)

0.04000	-5.8535E 04	0.04100	-5.8173E 04	0.04200	-5.7654E 04	0.04300	-5.6360E 04	0.04400	-5.6170E 04
0.04500	-5.5563E 04	0.04600	-5.4440E 04	0.04700	-5.3280E 04	0.04800	-5.2096E 04	0.04900	-5.0931E 04
0.05000	-4.9795E 04	0.05100	-4.8821E 04	0.05200	-4.7262E 04	0.05300	-4.6178E 04	0.05400	-4.[illegible]94E 04
0.05500	-4.3999E 04	0.05600	-4.3151E 04	0.05700	-4.2215E 04	0.05800	-4.1323E 04	0.05900	-4.0609E 04
0.06000	-3.9952E 04	0.06100	-3.9318E 04	0.06200	-3.8601E 04	0.06300	-3.8778E 04	0.06400	-3.7761E 04
0.06500	-3.8167E 04	0.06600	-3.8155E 04	0.06700	-3.7007E 04	0.06800	-3.7228E 04	0.06900	-3.6776E 04
0.07000	-3.6540E 04	0.07100	-3.6222E 04	0.07200	-3.5919E 04	0.07300	-3.[illegible]E 04	0.07400	-3.5164E 04
0.07500	-3.4743E 04	0.07600	-3.4204E 04	0.07700	-3.3696E 04	0.07800	-3.3116E 04	0.07900	-3.2520E 04
0.08000	-3.1871E 04	0.08100	-3.1190E 04	0.08200	-3.0625E 04	0.08300	-2.[illegible]300E 04	0.08400	-2.9070E 04
0.08500	-2.8460E 04	0.08600	-2.7756E 04	0.08700	-2.7009E 04	0.08800	-2.6[illegible]45E 04	0.08900	-2.5017E 04
0.09000	-2.5151E 04	0.09100	-2.4491E 04	0.09200	-2.3790E 04	0.09300	-2.3104E 04	0.09400	-2.2370E 04
0.09500	-2.1666E 04	0.09600	-2.0953E 04	0.09700	-2.0276E 04	0.09800	-1.[illegible]E 0[illegible]	0.09900	-1.8975E 04
0.10000	-1.8399E 04	0.10100	-1.7938E 04	0.10200	-1.7523E 04	0.10300	-1.7164E 04	0.10400	-1.6856E 04
0.10500	-1.6656E 04	0.10600	-1.6434E 04	0.10700	-1.6257E 04	0.10800	-1.6104E 04	0.10900	-1.[illegible]49E 04
0.11000	-1.6027E 04	0.11100	-1.5773E 04	0.11200	-1.5674E 04	0.11300	-1.[illegible]99E 04	0.11400	-1.5623E 04
0.11500	-1.5321E 04	0.11600	-1.5320E 04	0.11700	-1.5196E 04	0.11800	-1.[illegible]E 04	0.11900	-1.[illegible]069E 04
0.12000	-1.5019E 04	0.12100	-1.5007E 04	0.12200	-1.4937E 04	0.12300	-1.4[illegible]4E 04	0.12400	-1.4932E 04
0.12500	-1.4947E 04	0.12600	-1.5102E 04	0.12700	-1.5426E 04	0.12800	-1.5637E 04	0.12900	-1.61[illegible]8E 04
0.13000	-1.7112E 04	0.13100	-1.6507E 04	0.13200	-1.6676E 04	0.13300	-1.7401E 04	0.13400	-1.784[illegible]E 04
0.13500	-1.7888E 04	0.13600	-1.8163E 04	0.13700	-1.8315E 04	0.13800	-1.[illegible]E 04	0.1[illegible]900	-1.8[illegible]75E 04
0.14000	-1.8316E 04	0.14100	-1.8117E 04	0.14200	-1.7815E 04	0.14300	-1.7640E 04	0.14400	-1.7404E 04
0.14500	-1.7301E 04	0.14600	-1.7224E 04	0.14700	-1.7086E 04	0.14800	-1.7123E 04	0.14900	-1.7026E 04
0.15000	-1.7017E 04	0.15100	-1.6946E 04	0.15200	-1.6926E 04	0.15300	-1.[illegible]E 04	0.15400	-1.6[illegible]50E 04
0.15500	-1.6826E 04	0.15600	-1.6857E 04	0.15700	-1.6777E 04	0.15800	-1.[illegible]E 04	0.15900	-1.[illegible]313E 04
0.16000	-1.6058E 04	0.16100	-1.5567E 04	0.16200	-1.5699E 04	0.16300	-1.64[illegible]6E 04	0.16400	-1.[illegible]718E 04
0.16500	-1.4941E 04	0.16600	-1.5035E 04	0.16700	-1.5507E 04	0.16800	-1.5215E 04	0.1[illegible]900	-1.6[illegible]21E 04
0.17000	-1.5703E 04	0.17100	-1.5910E 04	0.17200	-1.6195E 04	0.17300	-1.6[illegible]2E 04	0.17400	-1.6739E 04
0.17500	-1.7011E 04	0.17600	-1.7096E 04	0.17700	-1.7244E 04	0.17800	-1.72[illegible]3E 04	0.17900	-1.7264E 04
0.18000	-1.7257E 04	0.18100	-1.7027E 04	0.18200	-1.6033E 04	0.18300	-1.[illegible]406E 04	0.18400	-1.6164E 04
0.18500	-1.5659E 04	0.18600	-1.5302E 04	0.18700	-1.4773E 04	0.18800	-1.4429E 04	0.18900	-1.3987E 04
0.19000	-1.3765E 04	0.19100	-1.3458E 04	0.19200	-1.3649E 04	0.19300	-1.31[illegible]7E 04	0.19400	-1.3153E 04
0.19500	-1.3017E 04	0.19000	-1.2854E 04	0.19700	-1.2862E 04	0.19800	-1.2207E 04	0.19900	-1.2[illegible]00E 04
0.20000	-1.1999E 04	0.20200	-1.1839E 04	0.20400	-1.1767E 04	0.20600	-1.1466E 04	0.20800	-1.1[illegible]30E 04
0.21000	-1.2291E 04	0.21200	-1.2665E 04	0.21400	-1.2[illegible]15E 04	0.21600	-1.2812E 04	0.21800	-1.28[illegible]4E 04
0.22000	-1.2650E 04	0.22200	-1.2318E 04	0.22400	-1.2333E 04	0.22600	-1.2106E 04	0.22800	-1.2057E 04
0.23000	-1.1431E 04	0.23200	-1.1422E 04	0.23400	-1.1470E 04	0.23600	-1.1[illegible]E 04	0.2[illegible]0	-1.1121E 04
0.24000	-1.0900E 04	0.24200	-1.1092E 04	0.24400	-1.1132E 04	0.24600	-1.1072E 04	0.24[illegible]00	-1.1457E 04
0.25000	-1.2132E 04	0.25200	-1.2342E 04	0.25400	-1.2805E 04	0.25600	-1.3212E 04	0.25[illegible]00	-1.3196E 04
0.26000	-1.3547E 04	0.26200	-1.3267E 04	0.26400	-1.2698E 04	0.26600	-1.2639E 04	0.25600	-1.2211E 04
0.27000	-1.1798E 04	0.27200	-1.1525E 04	0.27400	-1.1052E 04	0.27600	-1.1137E 04	0.27600	-1.0752E 04
0.28000	-1.0800E 04	0.28200	-1.0736E 04	0.28400	-1.0521E 04	0.28600	-1.12[illegible]6E 04	0.2[illegible]00	-1.1723E 04
0.29000	-1.1756E 04	0.29200	-1.2466E 04	0.29400	-1.2684E 04	0.29600	-1.[illegible]02E 04	0.29[illegible]	-1.3037E 04
0.30000	-1.3192E 04	0.30200	-1.2526E 04	0.30400	-1.2867E 04	0.30600	-1.21[illegible]E 04	0.30[illegible]00	-1.1832E 04
0.31000	-1.1716E 04	0.31200	-1.0909E 04	0.31400	-1.0511E 04	0.31600	-1.00[illegible]E 04	0.31[illegible]00	-9.074[illegible]E 03
0.32000	-1.0133E 04	0.32200	-1.0158E 04	0.32400	-1.0461E 04	0.32600	-1.0[illegible]07E 04	0.3[illegible]00	-1.0931E 04
0.33000	-1.1457E 04	0.33200	-1.1882E 04	0.33400	-1.1765E 04	0.33600	-1.2268E 04	0.33[illegible]00	-1.2477E 04
0.34000	-1.2207E 04	0.34200	-1.2450E 04	0.34400	-1.1922E 04	0.34600	-1.2[illegible]27E 04	0.[illegible]4800	-1.148[illegible]E 04
0.35000	-1.1570E 04	0.35200	-1.0993E 04	0.35400	-1.0714E 04	0.35600	-1.01[illegible]2E 04	0.[illegible]800	-9.7373E 03
0.36000	-9.0282E 03	0.36200	-8.9994E 03	0.36400	-8.3576E 03	0.36600	-8.2974E 03	0.3[illegible]00	-8.1516E 03
0.37000	-8.5511E 03	0.37200	-8.7409E 03	0.37400	-9.3565E 03	0.37600	-9.8750E 03	0.37600	-1.0605E 04
0.38000	-1.1103E 04	0.38200	-1.1982E 04	0.38400	-1.1846E 04	0.38600	-1.2207E 04	0.3[illegible]00	-1.1602E 04
0.39000	-1.2025E 04	0.39200	-1.1700E 04	0.39400	-1.1559E 04	0.39500	-1.1168E 04	0.39[illegible]00	-1.0984E 04
0.40000	-1.1502E 04	0.40200	-1.0557E 04	0.40400	-1.0120E 04	0.40600	-1.01[illegible]9E 04	0.40[illegible]00	-1.0179E 04
0.41000	-1.0750E 04	0.41200	-1.0631E 04	0.41400	-1.1321E 04	0.41600	-1.12[illegible]9E 04	0.41[illegible]00	-1.1786E 04
0.42000	-1.1783E 04	0.42200	-1.1925E 04	0.42400	-1.1824E 04	0.42600	-1.1849E 04	0.42800	-1.1617E 04
0.43000	-1.1717E 04	0.43200	-1.1147E 04	0.43400	-1.1263E 04	0.43600	-1.0[illegible]35E 04	0.43800	-1.1229E 04
0.44000	-1.0065E 04	0.44200	-9.7581E 03	0.44400	-9.3994E 03	0.44600	-9.5[illegible]02E 03	0.44800	-9.7472E 03
0.45000	-9.8584E 03	0.45200	-1.0215E 04	0.45400	-1.0376E 04	0.45600	-1.0[illegible]11E 04	0.45800	-1.0920E 04
0.46000	-1.0835E 04	0.46200	-1.1061E 04	0.46400	-1.0875E 04	0.46600	-1.0955E 04	0.45800	-1.0671E 04
0.47000	-1.0693E 04	0.47200	-1.0642E 04	0.47400	-1.0453E 04	0.47600	-1.0364E 04	0.47600	-1.0220E 04
0.48000	-1.0328E 04	0.48200	-1.0297E 04	0.48400	-1.0446E 04	0.48600	-1.04[illegible]9E 04	0.48600	-1.0596E 04
0.49000	-1.0852E 04	0.49200	-1.0729E 04	0.49400	-1.0816E 04	0.49600	-1.06[illegible]7E 04	0.49800	-1.0839E 04
0.50000	-1.0672E 04	0.50110	-1.0731E 04						

TABLE 6.A-11
(SHEET 19 OF 32)

TIME FUNCTION NUMBER = (10)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 39 00>025 0. 0.3)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	3.0000E-01	0.00010	3.0000E-01	0.00020	3.0000E-01	0.00030	3.0000E-01	0.00040	3.0000E-01
0.00050	3.0000E-01	0.00060	3.0000E-01	0.00070	3.0000E-01	0.00080	[illegible]	[illegible]	[illegible]
0.00100	3.0000E-01	0.00110	3.0000E-01	0.00120	3.0000E-01	0.00130	3.0000E-01	0.00140	3.0000E-01
0.00150	3.0000E-01	0.00160	3.0000E-01	0.00170	3.0000E-01	0.00180	3.0000E-01	0.00190	[illegible]
0.00200	3.0000E-01	0.00210	3.0000E-01	0.00220	3.0000E-01	0.00230	3.0000E-01	0.00240	3.0000E-01
0.00250	3.0000E-01	0.00260	3.0000E-01	0.00270	3.0000E-01	0.00280	3.0000E-01	[illegible]	[illegible]
0.00300	3.0000E-01	0.00310	3.0000E-01	0.00320	3.0000E-01	0.00330	3.0000E-01	0.00340	[illegible]
0.00350	3.0000E-01	0.00360	3.0000E-01	0.00370	3.0000E-01	0.00380	3.0000E-01	0.00390	3.0000E-01
0.00400	3.0000E-01	0.00410	3.0000E-01	0.00420	-5.0000E-01	0.00430	-5.0000E-01	0.00440	-5.0000E-01
0.00450	-5.0000E-01	0.00460	-5.0000E-01	0.00470	-5.0000E-01	0.00480	-5.0000E-01	0.00490	-1.3000E 00
0.00500	-1.3000E 00	0.00510	-1.3000E 00	0.00520	-2.0000E 00	0.00530	-2.0000E 00	0.00540	-2.0000E 00
0.00550	-2.8000E 00	0.00560	-3.6000E 00	0.00570	-3.6000E 00	0.00580	-4.3000E 00	0.00590	-5.1000E 00
0.00600	-5.9000E 00	0.00610	-7.4000E 00	0.00620	-8.2000E 00	0.00630	-9.7000E 00	0.00640	-1.1600E 01
0.00650	-1.3100E 01	0.00660	-1.4600E 01	0.00670	-1.6800E 01	0.00680	-1.9600E 01	0.00690	-2.1000E 01
0.00700	-2.4300E 01	0.00710	-2.7900E 01	0.00720	-3.1000E 01	0.00730	[illegible]	0.00740	-3.6700E 01
0.00750	-4.3600E 01	0.00760	-4.8900E 01	0.00770	-5.4300E 01	0.00780	-6.1500E 01	0.00790	-6.7600E 01
0.00800	-7.5100E 01	0.00810	-8.2800E 01	0.00820	-9.1500E 01	0.00830	-1.0070E 02	0.00840	-1.1100E 02
0.00850	-1.2130E 02	0.00860	-1.3310E 02	0.00870	-1.4560E 02	0.00880	-1.5800E 02	0.00890	-1.7040E 02
0.00900	-1.8900E 02	0.00910	-2.0610E 02	0.00920	-2.2350E 02	0.00930	-2.4330E 02	0.00940	-2.6310E 02
0.00950	-2.8440E 02	0.00960	-3.0680E 02	0.00970	-3.3150E 02	0.00980	-3.5680E 02	0.00990	-3.8390E 02
0.01000	-4.1270E 02	0.01010	-4.4310E 02	0.01020	-4.7500E 02	0.01030	-5.0560E 02	0.01040	-5.4510E 02
0.01050	-5.8220E 02	0.01060	-6.2170E 02	0.01070	-6.6370E 02	0.01080	-7.0650E 02	0.01090	-7.5240E 02
0.01100	-7.9930E 02	0.01110	-8.5040E 02	0.01120	-9.0230E 02	0.01130	-9.5500E 02	0.01140	-1.0181E 03
0.01150	-1.0717E 03	0.01160	-1.1340E 03	0.01170	-1.1978E 03	0.01180	-1.2651E 03	0.01190	-1.3350E 03
0.01200	-1.4055E 03	0.01210	-1.4806E 03	0.01220	-1.5572E 03	0.01230	-1.6362E 03	0.01240	-1.7212E 03
0.01250	-1.8067E 03	0.01260	-1.8948E 03	0.01270	-1.9863E 03	0.01280	[illegible]	0.01290	[illegible]
0.01300	-2.2794E 03	0.01310	-2.3826E 03	0.01320	-2.4852E 03	0.01330	-2.5901E 03	0.01340	-2.7124E 03
0.01350	-2.8272E 03	0.01360	-2.9464E 03	0.01370	-3.0683E 03	0.01380	-3.1910E 03	0.01390	-3.3229E 03
0.01400	-3.4540E 03	0.01410	-3.5888E 03	0.01420	-3.7263E 03	0.01430	[illegible]	0.01440	-4.0131E 03
0.01450	-4.1601E 03	0.01460	-4.3114E 03	0.01470	-4.4645E 03	0.01480	-4.6214E 03	0.01490	-4.7834E 03
0.01500	-4.9461E 03	0.01510	-5.1132E 03	0.01520	-5.2824E 03	0.01530	[illegible]	0.01540	-5.6314E 03
0.01550	-5.8108E 03	0.01560	-5.9924E 03	0.01570	-6.1786E 03	0.01580	[illegible]	0.01590	-6.5600E 03
0.01600	-6.7522E 03	0.01610	-6.9494E 03	0.01620	-7.1491E 03	0.01630	-7.3528E 03	0.01640	-7.5586E 03
0.01650	-7.7677E 03	0.01660	-7.9800E 03	0.01670	-8.1946E 03	0.01680	-8.4115E 03	0.01690	-8.6310E 03
0.01700	-8.8548E 03	0.01710	-9.0797E 03	0.01720	-9.3089E 03	0.01730	-9.5396E 03	0.01740	-9.7742E 03
0.01750	-1.0010E 04	0.01760	-1.0249E 04	0.01770	-1.0491E 04	0.01780	-1.0735E 04	0.01790	-1.0981E 04
0.01800	-1.1229E 04	0.01810	-1.1481E 04	0.01820	-1.1734E 04	0.01830	-1.1991E 04	0.01840	-1.2249E 04
0.01850	-1.2510E 04	0.01860	-1.2772E 04	0.01870	-1.3037E 04	0.01880	-1.3305E 04	0.01890	-1.3574E 04
0.01900	-1.3846E 04	0.01910	-1.4120E 04	0.01920	-1.4395E 04	0.01930	-1.4673E 04	0.01940	-1.4953E 04
0.01950	-1.5234E 04	0.01960	-1.5519E 04	0.01970	-1.5804E 04	0.01980	-1.6093E 04	0.01990	-1.6383E 04
0.02000	-1.6674E 04	0.02010	-1.6969E 04	0.02020	-1.7264E 04	0.02030	-1.7561E 04	0.02040	-1.7860E 04
0.02050	-1.8162E 04	0.02060	-1.8464E 04	0.02070	-1.8768E 04	0.02080	-1.9075E 04	0.02090	-1.9383E 04
0.02100	-1.9692E 04	0.02110	-2.0004E 04	0.02120	-2.0318E 04	0.02130	-2.0631E 04	0.02140	-2.0947E 04
0.02150	-2.1266E 04	0.02160	-2.1585E 04	0.02170	-2.1904E 04	0.02180	-2.2227E 04	0.02190	-2.2550E 04
0.02200	-2.2875E 04	0.02210	-2.3201E 04	0.02220	-2.3529E 04	0.02230	-2.3857E 04	0.02240	-2.4188E 04
0.02250	-2.4519E 04	0.02260	-2.4852E 04	0.02270	-2.5186E 04	0.02280	-2.5520E 04	0.02290	-2.5857E 04
0.02300	-2.6195E 04	0.02310	-2.6534E 04	0.02320	-2.6873E 04	0.02330	-2.7214E 04	0.02340	-2.7556E 04
0.02350	-2.7898E 04	0.02360	-2.8241E 04	0.02370	-2.8584E 04	0.02380	-2.8928E 04	0.02390	-2.9272E 04
0.02400	-2.9620E 04	0.02410	-2.9966E 04	0.02420	-3.0314E 04	0.02430	-3.0663E 04	0.02440	-3.1011E 04
0.02450	-3.1361E 04	0.02460	-3.1711E 04	0.02470	-3.2062E 04	0.02480	-3.2413E 04	0.02490	-3.2764E 04
0.02500	-3.3116E 04	0.02600	-3.6634E 04	0.02700	-4.0095E 04	0.02800	-4.3705E 04	0.02900	-4.7591E 04
0.03000	-5.1022E 04	0.03100	-5.4003E 04	0.03200	-5.6582E 04	0.03300	-5.8821E 04	0.03400	-6.0767E 04
0.03500	-6.2475E 04	0.03600	-6.3943E 04	0.03700	-6.5177E 04	0.03800	-6.6166E 04	0.03900	-6.6874E 04

TABLE 6.A-11
(SHEET 20 OF 32)

0.04000	-6.7250E 04	0.04100	-6.7241E 04	0.04200	-[illegible].6798E 04	0.04300	-6.5693E 04	0.04400	-6.4508E 04
0.04500	-6.2709E 04	0.04600	-6.0549E 04	0.04700	-5.7959E 04	0.04800	-5.6130E 04	0.04900	-5.2116E 04
0.05000	-4.8960E 04	0.05100	-4.5810E 04	0.05200	-3.8762E 04	0.05300	-3.6500E 04	0.05400	-3.2147E 04
0.05500	-2.9529E 04	0.05600	-2.7519E 04	0.05700	-2.5449E 04	0.05800	-2.3975E 04	0.05900	-2.2093E 04
0.06000	-2.2065E 04	0.06100	-2.1612E 04	0.06200	-2.1658E 04	0.06300	-2.1220E 04	0.06400	-2.1201E 04
0.06500	-2.1061E 04	0.06600	-2.0724E 04	0.06700	-2.0296E 04	0.06800	-1.9119E 04	0.06900	-1.8601E 04
0.07000	-1.7728E 04	0.07100	-1.6718E 04	0.07200	-1.5626E 04	0.07300	-1.4957E 04	0.07400	-1.4361E 04
0.07500	-1.2979E 04	0.07600	-1.1736E 04	0.07700	-1.0937E 04	0.07800	-1.0121E 04	0.07900	-9.2813E 03
0.08000	-8.4144E 03	0.08100	-7.6645E 03	0.08200	-6.8162E 03	0.08300	-6.0529E 03	0.08400	-5.2510E 03
0.08500	-4.[illegible]603E 03	0.08600	-3.5264E 03	0.08700	-2.7031E 03	0.08800	-1.[illegible]E 03	0.08900	-8.1160E 02
0.09000	-7.1090E 02	0.09100	9.5460E 02	0.09200	1.7674E 03	0.09300	2.[illegible]E 03	0.09400	3.4[illegible]E 03
0.09500	4.2340E 03	0.09600	4.8028E 03	0.09700	5.[illegible]E 03	0.09800	[illegible]E 03	0.09900	6.[illegible]E 03
0.10000	7.6903E 03	0.10100	6.2501E 03	0.10200	8.3037E 03	0.10300	9.50[illegible]E 03	0.10400	8.976[illegible]E 03
0.10500	1.0574E 04	0.10600	1.0952E 04	0.10700	1.1365E 04	0.10800	1.0[illegible]E 04	0.10900	1.1151E 04
0.11000	1.1312E 04	0.11100	1.0181E 04	0.11200	1.1357E 04	0.11300	[illegible]	0.11400	1.0[illegible]E 04
0.11500	9.7100E 03	0.11600	9.8775E 03	0.11700	8.6[illegible]71E 03	0.11800	8.09[illegible]E [illegible]	0.11900	7.4[illegible]E 03
0.12000	6.0045E 03	0.12100	6.4330E 03	0.12200	6.2618E 03	0.12300	5.[illegible]E 03	0.12400	4.5[illegible]2E 03
0.12500	3.7604E 03	0.12600	3.4111E 03	0.12700	2.6661E 03	0.12800	2.40[illegible]E 03	0.12900	1.7681E 03
0.13000	1.1181E 03	0.13100	-1.3163E 03	0.13200	-2.5270E 02	0.13300	-1.[illegible]E 03	0.13400	-1.2[illegible]E [illegible]
0.13500	-2.7884E 03	0.13600	-4.1415E 03	0.13700	-7.1190E 03	0.13800	-5.6161E 03	0.13900	-8.4604E 03
0.14000	-1.1412E 04	0.14100	-8.2301E 03	0.14200	-9.2724E 03	0.14300	-1.0177E 04	0.14400	-1.096[illegible]E 04
0.14500	-1.1729E 04	0.14600	-1.2556E 04	0.14700	-1.3015E 04	0.14800	-1.4703E 04	0.14900	-1.459[illegible]E 04
0.15000	-1.6201E 04	0.15100	-1.7126E 04	0.15200	-2.0162E 04	0.15300	-1.[illegible]5E 04	0.15400	-1.8[illegible]E 04
0.15500	-2.0142E 04	0.15600	-2.0601E 04	0.15700	-2.1822E 04	0.15800	-2.264[illegible]E 04	0.15900	-2.1443E 04
0.16000	-2.3068E 04	0.16100	-2.2006E 04	0.16200	-2.3431E 04	0.16300	-2.4[illegible]6E 04	0.16400	-2.3165E 04
0.16500	-2.4607E 04	0.16600	-2.3586E 04	0.16700	-2.3037E 04	0.16800	-2.4[illegible]E 04	0.16900	-2.4529E 04
0.17000	-2.3060E 04	0.17100	-2.3907E 04	0.17200	-2.3173E 04	0.17300	-2.2420E 04	0.17400	-2.2424E 04
0.17500	-2.3338E 04	0.17600	-2.0356E 04	0.17700	-1.9345E 04	0.17800	-2.2129E 04	0.17900	-1.9444E 04
0.18000	-1.8709E 04	0.18100	-1.9450E 04	0.18200	-1.9155E 04	0.18300	-1.801[illegible]E 04	0.18400	-1.6772E 04
0.18500	-1.8544E 04	0.18600	-1.8155E 04	0.18700	-1.7690E 04	0.18800	-1.6[illegible]1E 04	0.18900	-1.6345E 04
0.19000	-1.4[illegible]99E 04	0.19100	-1.4687E 04	0.19200	-1.3745E 04	0.19300	-1.2799E 04	0.19400	-1.1872E 04
0.19500	-1.116[illegible]E 04	0.19600	-1.0434E 04	0.19700	-9.0220E 03	0.19800	-9.6144E 03	0.19900	-9.209[illegible]E 03
0.20000	-9.0240E 03	0.20200	-8.5255E 03	0.20400	-7.853[illegible]E 03	0.20600	-7.2037E 03	0.20800	-6.6340E 03
0.21000	-6.1896E 03	0.21200	-6.4204E 03	0.21400	-7.2142E 03	0.21600	-6.[illegible]E 03	0.21800	-1.0395E 04
0.22000	-1.6502E 04	0.22200	-1.5828E 04	0.22400	-1.8[illegible]E 04	0.22600	-2.[illegible]141E 04	0.22800	-2.[illegible]057E 04
0.23000	-2.3718E 04	0.23200	-2.4681E 04	0.23400	-2.6[illegible]E 04	0.23600	-2.59[illegible]4E 04	0.23800	-2.6520E 04
0.24000	-2.6789E 04	0.24200	-2.6013E 04	0.24400	-2.7249E 04	0.24600	-2.5[illegible]E 04	0.24800	-2.3[illegible]26E 04
0.25000	-2.1504E 04	0.25200	-1.8788E 04	0.25400	-1.6040E 04	0.25600	-1.[illegible]E 04	0.25800	-1.2160E 04
0.26000	-1.0517E 04	0.26200	-9.2285E 03	0.26400	-[illegible].4998E 03	0.26600	-7.6[illegible]E 03	0.26800	-7.5264E 03
0.27000	-7.6070E 03	0.27200	-7.5243E 03	0.27400	-9.2106E 03	0.27600	-9.70[illegible]9E 03	0.27800	-1.2261E 04
0.28000	-1.2951E 04	0.28200	-1.4897E 04	0.28400	-1.7710E 04	0.28600	-1.7203E 04	0.28800	-1.7861E 04
0.29000	-1.8530E 04	0.29200	-1.7875E 04	0.29400	-1.8[illegible]09E 04	0.29600	-1.[illegible]E 04	0.29800	-1.6169E 04
0.30000	-1.4404E 04	0.30200	-1.3768E 04	0.30400	-1.2177E 04	0.30600	-1.1529E 04	0.30800	-1.0089E 04
0.31000	-9.6121E 03	0.31200	-8.9242E 03	0.31400	-8.47[illegible]2E 03	0.31600	-6.5546E 03	0.31800	-7.8946E 03
0.32000	-7.9399E 03	0.32200	-8.5680E 03	0.32400	-8.4456E 03	0.32600	-9.0926E 03	0.32800	-1.0036E 04
0.33000	-1.0160E 04	0.33200	-1.1047E 04	0.33400	-1.2099E 04	0.33600	-1.19[illegible]E 04	0.33800	-1.2770E 04
0.34000	-1.3558E 04	0.34200	-1.3470E 04	0.34400	-1.4517E 04	0.34600	-1.4046E 04	0.34800	-1.4843E 04
0.35000	-1.4228E 04	0.35200	-1.4763E 04	0.35400	-1.4203E 04	0.35600	-1.4356E 04	0.35800	-1.3669E 04
0.36000	-1.4396E 04	0.36200	-1.3593E 04	0.36400	-1.4029E 04	0.36600	-1.3142E 04	0.36800	-1.3416E 04
0.37000	-1.2613E 04	0.37200	-1.2813E 04	0.37400	-1.1833E 04	0.37600	-1.2065E 04	0.37800	-1.1293E 04
0.38000	-1.1608E 04	0.38200	-1.1088E 04	0.38400	-1.1929E 04	0.38600	-1.1843E 04	0.38800	-1.2963E 04
0.39000	-1.2703E 04	0.39200	-1.3617E 04	0.39400	-1.3428E 04	0.39600	-1.3[illegible]90E 04	0.39800	-1.3730E 04
0.40000	-1.4003E 04	0.40200	-1.3470E 04	0.40400	-1.3791E 04	0.40600	-1.3007E 04	0.40800	-1.2999E 04
0.41000	-1.2060E 04	0.41200	-1.2148E 04	0.41400	-1.1154E 04	0.41600	-1.1590E 04	0.41800	-1.0946E 04
0.42000	-1.1562E 04	0.42200	-1.1306E 04	0.42400	-1.1930E 04	0.42600	-1.1907E 04	0.42800	-1.2647E 04
0.43000	-1.2470E 04	0.43200	-1.3310E 04	0.43400	-1.2890E 04	0.43600	-1.3032E 04	0.43800	-1.3407E 04
0.44000	-1.4083E 04	0.44200	-1.4407E 04	0.44400	-1.4667E 04	0.44600	-1.1370E 04	0.44800	-1.4067E 04
0.45000	-1.3686E 04	0.45200	-1.3035E 04	0.45400	-1.2802E 04	0.45600	-1.2200E 04	0.45800	-1.2099E 04
0.46000	-1.1909E 04	0.46200	-1.1718E 04	0.46400	-1.1801E 04	0.46600	-1.1810E 04	0.46800	-1.2057E 04
0.47000	-1.2117E 04	0.47200	-1.2206E 04	0.47400	-1.2366E 04	0.47600	-1.2409E 04	0.47800	-1.2628E 04
0.48000	-1.2407E 04	0.48200	-1.2502E 04	0.48400	-1.2252E 04	0.48600	-1.2314E 04	0.48800	-1.2107E 04
0.49000	-1.2078E 04	0.49200	-1.1899E 04	0.49400	-1.2128E 04	0.49600	-1.2173E 04	0.49800	-1.2077E 04
0.50000	-1.2180E 04	0.50110	-1.2417E 04						

TABLE 6.A-11
(SHEET 21 OF 32)

TIME FUNCTION NUMBER = (11)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 40 00>02$ 0. 0.4)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	4.0000E-01	0.00010	4.0000E-01	0.00020	4.0000E-01	0.00030	4.0000E-01	0.00040	4.0000E-01
0.00050	4.0000E-01	0.00060	4.0000E-01	0.00070	4.0000E-01	0.00080	4.0000E-01	0.00090	4.0000E-01
0.00100	4.0000E-01	0.00110	4.0000E-01	0.00120	4.0000E-01	0.00130	4.0000E-01	0.00140	4.0000E-01
0.00150	4.0000E-01	0.00160	4.0000E-01	0.00170	4.0000E-01	0.00180	4.0000E-01	0.00190	4.0000E-01
0.00200	4.0000E-01	0.00210	4.0000E-01	0.00220	4.0000E-01	0.00230	4.0000E-01	0.00240	4.0000E-01
0.00250	4.0000E-01	0.00260	4.0000E-01	0.00270	4.0000E-01	0.00280	4.0000E-01	0.00290	4.0000E-01
0.00300	4.0000E-01	0.00310	4.0000E-01	0.00320	4.0000E-01	0.00330	4.0000E-01	0.00340	4.0000E-01
0.00350	4.0000E-01	0.00360	4.0000E-01	0.00370	4.0000E-01	0.00380	4.0000E-01	0.00390	4.0000E-01
0.00400	4.0000E-01	0.00410	4.0000E-01	0.00420	-7.0000E-01	0.00430	-7.0000E-01	0.00440	-7.0000E-01
0.00450	-7.0000E-01	0.00460	-7.0000E-01	0.00470	-7.0000E-01	0.00480	-7.0000E-01	0.00490	-1.8000E 00
0.00500	-1.8000E 00	0.00510	-1.8000E 00	0.00520	-2.9000E 00	0.00530	-2.9000E 00	0.00540	-2.9000E 00
0.00550	-4.0000E 00	0.00560	-5.0000E 00	0.00570	-5.0000E 00	0.00580	-5.1000E 00	0.00590	-7.2000E 00
0.00600	-8.3000E 00	0.00610	-1.0400E 01	0.00620	-1.1500E 01	0.00630	-1.2700E 01	0.00640	-1.6300E 01
0.00650	-1.8500E 01	0.00660	-2.0600E 01	0.00670	-2.3000E 01	0.00680	-2.7600E 01	0.00690	-3.0800E 01
0.00700	-3.5200E 01	0.00710	-3.9300E 01	0.00720	-4.3800E 01	0.00730	-4.9200E 01	0.00740	-5.4000E 01
0.00750	-6.1500E 01	0.00760	-6.9100E 01	0.00770	-7.6700E 01	0.00780	-8.6300E 01	0.00790	-9.5600E 01
0.00800	-1.0620E 02	0.00810	-1.1700E 02	0.00820	-1.2940E 02	0.00830	-1.4240E 02	0.00840	-1.5690E 02
0.00850	-1.7140E 02	0.00860	-1.8810E 02	0.00870	-2.0580E 02	0.00880	-2.2470E 02	0.00890	-2.4500E 02
0.00900	-2.6710E 02	0.00910	-2.9120E 02	0.00920	-3.1590E 02	0.00930	-3.4380E 02	0.00940	-3.7180E 02
0.00950	-4.0190E 02	0.00960	-4.3360E 02	0.00970	-4.6040E 02	0.00980	-5.0440E 02	0.00990	-5.4250E 02
0.01000	-5.8330E 02	0.01010	-6.2620E 02	0.01020	-6.7130E 02	0.01030	-7.2000E 02	0.01040	-7.7050E 02
0.01050	-8.2280E 02	0.01060	-8.7850E 02	0.01070	-9.3790E 02	0.01080	-9.8840E 02	0.01090	-1.0532E 03
0.01100	-1.1296E 03	0.01110	-1.2018E 03	0.01120	-1.2751E 03	0.01130	-1.3510E 03	0.01140	-1.4316E 03
0.01150	-1.5145E 03	0.01160	-1.6025E 03	0.01170	-1.6928E 03	0.01180	-1.7878E 03	0.01190	-1.8849E 03
0.01200	-1.9863E 03	0.01210	-2.0923E 03	0.01220	-2.2006E 03	0.01230	-2.3162E 03	0.01240	-2.4323E 03
0.01250	-2.5532E 03	0.01260	-2.6778E 03	0.01270	-2.8071E 03	0.01280	[illegible]	0.01290	[illegible]
0.01300	-3.2212E 03	0.01310	-3.3673E 03	0.01320	-3.5177E 03	0.01330	-3.6717E 03	0.01340	-3.8330E 03
0.01350	-3.9954E 03	0.01360	-4.1639E 03	0.01370	-4.3350E 03	0.01380	-4.5148E 03	0.01390	-4.6960E 03
0.01400	-4.8812E 03	0.01410	-5.0717E 03	0.01420	-5.2659E 03	0.01430	-5.4673E 03	0.01440	-5.6714E 03
0.01450	-5.8791E 03	0.01460	-6.0929E 03	0.01470	-6.3093E 03	0.01480	-6.5310E 03	0.01490	-6.7599E 03
0.01500	-6.9898E 03	0.01510	-7.2259E 03	0.01520	-7.4650E 03	0.01530	-7.7099E 03	0.01540	-7.9533E 03
0.01550	-8.2119E 03	0.01560	-8.4685E 03	0.01570	-8.7318E 03	0.01580	-8.9970E 03	0.01590	-9.2677E 03
0.01600	-9.5422E 03	0.01610	-9.8209E 03	0.01620	-1.0103E 04	0.01630	-1.0391E 04	0.01640	-1.0682E 04
0.01650	-1.0977E 04	0.01660	-1.1277E 04	0.01670	-1.1581E 04	0.01680	-1.1867E 04	0.01690	-1.2198E 04
0.01700	-1.2514E 04	0.01710	-1.2831E 04	0.01720	-1.3155E 04	0.01730	-1.3481E 04	0.01740	-1.3818E 04
0.01750	-1.4146E 04	0.01760	-1.4484E 04	0.01770	-1.4826E 04	0.01780	-1.5170E 04	0.01790	-1.5519E 04
0.01800	-1.5869E 04	0.01810	-1.6225E 04	0.01820	-1.6583E 04	0.01830	-1.6945E 04	0.01840	-1.7310E 04
0.01850	-1.7679E 04	0.01860	-1.8050E 04	0.01870	-1.8424E 04	0.01880	-1.8803E 04	0.01890	-1.9183E 04
0.01900	-1.9567E 04	0.01910	-1.9954E 04	0.01920	-2.0343E 04	0.01930	-2.0736E 04	0.01940	-2.1132E 04
0.01950	-2.1529E 04	0.01960	-2.1931E 04	0.01970	-2.2335E 04	0.01980	-2.2743E 04	0.01990	-2.3152E 04
0.02000	-2.3564E 04	0.02010	-2.3980E 04	0.02020	-2.4397E 04	0.02030	-2.4817E 04	0.02040	-2.5239E 04
0.02050	-2.5666E 04	0.02060	-2.6093E 04	0.02070	-2.6525E 04	0.02080	-2.6956E 04	0.02090	-2.7392E 04
0.02100	-2.7829E 04	0.02110	-2.8270E 04	0.02120	-2.8713E 04	0.02130	-2.9156E 04	0.02140	-2.9603E 04
0.02150	-3.0053E 04	0.02160	-3.0503E 04	0.02170	-3.0955E 04	0.02180	-3.1411E 04	0.02190	-3.1867E 04
0.02200	-3.2326E 04	0.02210	-3.2788E 04	0.02220	-3.3251E 04	0.02230	-3.3714E 04	0.02240	-3.4182E 04
0.02250	-3.4650E 04	0.02260	-3.5120E 04	0.02270	-3.5592E 04	0.02280	-3.6068E 04	0.02290	-3.6540E 04
0.02300	-3.7019E 04	0.02310	-3.7497E 04	0.02320	-3.7977E 04	0.02330	-3.8459E 04	0.02340	-3.8941E 04
0.02350	-3.9425E 04	0.02360	-3.9910E 04	0.02370	-4.0395E 04	0.02380	-4.0881E 04	0.02390	-4.1367E 04
0.02400	-4.1858E 04	0.02410	-4.2348E 04	0.02420	-4.2839E 04	0.02430	-4.3302E 04	0.02440	-4.3826E 04
0.02450	-4.4320E 04	0.02460	-4.4814E 04	0.02470	-4.5310E 04	0.02480	-4.5808E 04	0.02490	-4.6301E 04
0.02500	-4.6800E 04	0.02600	-5.1771E 04	0.02700	-5.6662E 04	0.02800	-6.1850E 04	0.02900	-6.7255E 04
0.03000	-7.2104E 04	0.03100	-7.6316E 04	0.03200	-7.9961E 04	0.03300	-8.3125E 04	0.03400	-8.5875E 04
0.03500	-8.8290E 04	0.03600	-9.0364E 04	0.03700	-9.2108E 04	0.03800	-9.3506E 04	0.03900	-9.4505E 04

TABLE 6.A-11
(SHEET 22 OF 32)

0.04000	-9.5038E 04	0.04100	-9.5025E 04	0.04200	-9.[illegible]390E 04	0.04300	-8.3120E 04	0.04400	-9.1163E 04
0.04500	-8.5619E 04	0.04600	-8.5567E 04	0.04700	-8.1921E 04	0.04800	-7.7010E 04	0.04900	-7.36[illegible]E 04
0.05000	-6.9190E 04	0.05100	-6.4739E 04	0.05200	-5.4778E 04	0.05300	-4.8971E 04	0.05400	-4.5[illegible]E 04
0.05500	-4.1730E 04	0.05600	-3.8800E 04	0.05700	-3.6964E 04	0.05800	-3.[illegible]E 04	0.05900	-3.2362E 04
0.06000	-3.1183E 04	0.06100	-3.0541E 04	0.06200	-3.0507E 04	0.06300	[illegible]	0.06400	-2.[illegible]
0.06500	-2.9764E 04	0.06600	-2.9207E 04	0.06700	-2.8602E 04	0.06800	-2.[illegible]	[illegible]	[illegible]
0.07000	-2.5052E 04	0.07100	-2.3026E 04	0.07200	-2.2364E 04	0.07300	-2.1187E 04	[illegible]	-2.[illegible] 04
0.07500	-1.8341E 04	0.07600	-1.6505E 04	0.07700	-1.5456E 04	0.07800	-1.4[illegible]E 04	[illegible]	-1.31[illegible]E 04
0.08000	-1.1891E 04	0.08100	-1.0331E 04	0.08200	-9.6312E 03	0.08300	-8.5601E 03	0.08400	-7.42[illegible]E 03
0.08500	-6.2128E 03	0.08600	-4.2004E 03	0.08700	-3.8200E 03	0.08800	-2.57[illegible]	[illegible]	-1.[illegible]
0.09000	-1.0047E 03	0.09100	1.3491E 03	0.09200	2.5259E 03	0.09300	3.71[illegible] 03	0.09400	4.[illegible] 03
0.09500	5.9835E 03	0.09600	7.0417E 03	0.09700	7.9380E 03	0.09800	[illegible]	[illegible]	9.[illegible] 03
0.10000	1.0731E 04	0.10100	1.1659E 04	0.10200	1.2583E 04	0.10300	1.3[illegible]7E 04	[illegible]	1.[illegible]
0.10500	1.4543E 04	0.10600	1.5520E 04	0.10700	1.6046E 04	0.10800	1.5[illegible] 04	[illegible]	1.[illegible]
0.11000	1.5987E 04	0.11100	1.4397E 04	0.11200	1.6053E 04	0.11300	1.14[illegible]E 04	0.11400	1.[illegible]67E 04
0.11500	1.3723E 04	0.11600	1.3959E 04	0.11700	1.2107E 04	0.11800	1.1442E 04	0.11900	1.[illegible]96E 04
0.12000	9.7574E 03	0.12100	9.0911E 03	0.12200	8.5352E 03	0.12300	7.2684E 03	0.12400	6.4134E 03
0.12500	5.3142E 03	0.12600	4.8206E 03	0.12700	3.7678E 03	0.12800	3.[illegible]E 03	[illegible]	2.4[illegible]E 03
0.13000	1.5800E 03	0.13100	-1.8602E 03	0.13200	-3.7120E 02	0.13300	-1.[illegible]3E 03	[illegible]	-1.7314E 03
0.13500	-3.9405E 03	0.13600	-5.8527E 03	0.13700	-1.0061E 04	0.13800	-7.7804E 03	0.13900	-1.1312E 04
0.14000	-1.6127E 04	0.14100	-1.1631E 04	0.14200	-1.3104E 04	0.14300	-1.4382E 04	[illegible]	1.[illegible]02E 04
0.14500	-1.6575E 04	0.14600	-1.7460E 04	0.14700	-1.8393E 04	0.14800	-2.07[illegible]E 04	[illegible]	-2.6[illegible]26E 04
0.15000	-2.1483E 04	0.15100	-2.4203E 04	0.15200	-2.8493E 04	0.15300	-2.[illegible]E 04	[illegible]	-2.7[illegible]E 04
0.15500	-2.8164E 04	0.15600	-2.9114E 04	0.15700	-3.0839E 04	0.15800	-3.2004E 04	[illegible]	-3.0[illegible]E 04
0.16000	-3.2600E 04	0.16100	-3.1099E 04	0.16200	-3.3112E 04	0.16300	-3.4431E 04	[illegible]	-3.2[illegible] 04
0.16500	-3.4775E 04	0.16600	-3.3330E 04	0.16700	-3.2535E 04	0.16800	[illegible]	[illegible]	-3.[illegible] 04
0.17000	-3.2588E 04	0.17100	-3.3785E 04	0.17200	-3.2747E 04	0.17300	-3.16[illegible]E 04	[illegible]	-3.[illegible] 04
0.17500	-3.2981E 04	0.17600	-2.8766E 04	0.17700	-2.7338E 04	0.17800	-3.127[illegible] 04	0.17900	-2.747[illegible]E 04
0.18000	-2.6440E 04	0.18100	-2.7487E 04	0.18200	-2.7070E 04	0.18300	-2.[illegible]4E 04	[illegible]	-2.[illegible] 04
0.18500	-2.6206E 04	0.18600	-2.5657E 04	0.18700	-2.4399E 04	0.18800	-2.[illegible]E 04	[illegible]	-2.[illegible] 04
0.19000	-2.1197E 04	0.19100	-2.0756E 04	0.19200	-1.6424E 04	0.19300	-1.[illegible]	[illegible]	-1.[illegible] 04
0.19500	-1.5778E 04	0.19600	-1.4745E 04	0.19700	-1.1029E 04	0.19800	-1.[illegible]7E 04	[illegible]	1.[illegible] 04
0.20000	-1.2753E 04	0.20200	-1.2048E 04	0.20400	-1.1090E 04	0.20600	-1.0100E 04	[illegible]	[illegible] 03
0.21000	-8.7471E 03	0.21200	-9.0733E 03	0.21400	-1.0195E 04	0.21600	-1.[illegible]	[illegible]	-1.[illegible]
0.22000	-2.3038E 04	0.22200	-2.2367E 04	0.22400	-2.6031E 04	0.22600	-2.[illegible]E 04	[illegible]	-3.[illegible]
0.23000	-3.3518E 04	0.23200	-3.4879E 04	0.23400	-3.7525E 04	0.23600	-3.6070E 04	[illegible]	-3.717[illegible]E 04
0.24000	-4.0604E 04	0.24200	-3.9588E 04	0.24400	-3.9500E 04	0.24600	[illegible]	[illegible]	-3.[illegible] 04
0.25000	-3.0589E 04	0.25200	-2.6551E 04	0.25400	-2.2667E 04	0.25600	-1.9713E 04	[illegible]	-1.7184E 04
0.26000	-1.4863E 04	0.26200	-1.3042E 04	0.26400	-1.1990E 04	0.26600	-1.0210E 04	[illegible]	-1.[illegible]3[illegible]E 04
0.27000	-1.1033E 04	0.27200	-1.0633E 04	0.27400	-1.3010E 04	0.27600	-1.[illegible]2E 04	[illegible]	-1.7[illegible] 04
0.28000	-1.8303E 04	0.28200	-2.1053E 04	0.28400	-2.5027E 04	0.28600	-2.4311E 04	[illegible]	-2.5[illegible]41E 04
0.29000	-2.6186E 04	0.29200	-2.5260E 04	0.29400	-2.5967E 04	0.29600	-2.[illegible]2E 04	[illegible]	-2.[illegible]E 04
0.30000	-2.0356E 04	0.30200	-1.9457E 04	0.30400	-1.7208E 04	0.30600	-1.6293E 04	[illegible]	-1.4250E 04
0.31000	-1.3584E 04	0.31200	-1.2612E 04	0.31400	-1.1976E 04	0.31600	-1.1807E 04	[illegible]	-1.1157E 04
0.32000	-1.1221E 04	0.32200	-1.2108E 04	0.32400	-1.1937E 04	0.32600	-1.[illegible]E 04	[illegible]	-1.4132E 04
0.33000	-1.4359E 04	0.33200	-1.5612E 04	0.33400	-1.7098E 04	0.33600	-1.60[illegible]E 04	[illegible]	-1.[illegible]E 04
0.34000	-1.9158E 04	0.34200	-1.9036E 04	0.34400	-2.0516E 04	0.34600	-1.[illegible]052E 04	[illegible]	-2.0376E 04
0.35000	-2.0107E 04	0.35200	-2.0864E 04	0.35400	-2.0072E 04	0.35600	-2.02[illegible]E 04	[illegible]	-1.9316E 04
0.36000	-2.0344E 04	0.36200	-1.9210E 04	0.36400	-1.9325E 04	0.36600	-1.8573E 04	[illegible]	-1.[illegible]E 04
0.37000	-1.7824E 04	0.37200	-1.8107E 04	0.37400	-1.6723E 04	0.37600	-1.7051E 04	0.37600	-1.[illegible]9E 04
0.38000	-1.6404E 04	0.38200	-1.5670E 04	0.38400	-1.6858E 04	0.38600	-1.6730E 04	[illegible]	-1.8319E 04
0.39000	-1.7952E 04	0.39200	-1.9244E 04	0.39400	-1.8977E 04	0.39600	-1.[illegible]782E 04	[illegible]	-1.8[illegible]E 04
0.40000	-1.9789E 04	0.40200	-1.9036E 04	0.40400	-1.9490E 04	0.40600	-1.3467E 04	[illegible]	-1.8370E 04
0.41000	-1.7043E 04	0.41200	-1.7168E 04	0.41400	-1.5762E 04	0.41600	-1.6390E 04	0.41800	-1.5[illegible]9E 04
0.42000	-1.6340E 04	0.42200	-1.5976E 04	0.42400	-1.6858E 04	0.42600	-1.6827E 04	0.42800	-1.7[illegible]72E 04
0.43000	-1.7622E 04	0.43200	-1.8810E 04	0.43400	-1.8216E 04	0.43600	-1.8540E 04	0.43800	-1.6846E 04
0.44000	-1.9902E 04	0.44200	-2.0360E 04	0.44400	-2.0727E 04	0.44600	-2.0307E 04	[illegible]	-1.9965E 04
0.45000	-1.9340E 04	0.45200	-1.8420E 04	0.45400	-1.5091E 04	0.45600	-1.7369E 04	0.45800	-1.7098E 04
0.46000	-1.6830E 04	0.46200	-1.6559E 04	0.46400	-1.6678E 04	0.46600	-1.6690E 04	0.46800	-1.7039E 04
0.47000	-1.7124E 04	0.47200	-1.7250E 04	0.47400	-1.7475E 04	0.47600	-1.7649E 04	0.47800	-1.7046E 04
0.48000	-1.7534E 04	0.48200	-1.7668E 04	0.48400	-1.7315E 04	0.48600	-1.7450E 04	0.48800	-1.7110E 04
0.49000	-1.7069E 04	0.49200	-1.6957E 04	0.49400	-1.7139E 04	0.49600	-1.7203E 04	[illegible]	-1.7008E 04
0.50000	-1.7213E 04	0.50110	-1.7547E 04						

TIME FUNCTION NUMBER = (12)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 42 000000000000000000000000000)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	1.5039E 03	0.00010	1.5039E 03	0.00020	1.5039E 03	0.00030	1.5039E 03	0.00040	1.5039E 03
0.00050	1.5035E 03	0.00060	1.5039E 03	0.00070	1.5039E 03	0.00080	1.5035E 03	0.00090	1.5035E 03
0.00100	1.5032E 03	0.00110	1.5032E 03	0.00120	1.5032E 03	0.00130	1.5032E 03	0.00140	1.5032E 03
0.00150	1.5032E 03	0.00160	1.5032E 03	0.00170	1.5032E 03	0.00180	1.5032E 03	0.00190	1.5032E 03
0.00200	1.5032E 03	0.00210	1.5032E 03	0.00220	1.5025E 03	0.00230	1.5025E 03	0.00240	1.5025E 03
0.00250	1.5025E 03	0.00260	1.5043E 03	0.00270	1.5043E 03	0.00280	1.5043E 03	0.00290	1.5043E 03
0.00300	1.5035E 03	0.00310	1.5035E 03	0.00320	1.5035E 03	0.00330	1.5035E 03	0.00340	1.5035E 03
0.00350	1.5035E 03	0.00360	1.5028E 03	0.00370	1.5028E 03	0.00380	1.5028E 03	0.00390	1.5028E 03
0.00400	1.5028E 03	0.00410	1.5028E 03	0.00420	1.5021E 03	0.00430	1.5021E 03	0.00440	1.5021E 03
0.00450	1.5021E 03	0.00460	1.5021E 03	0.00470	1.5013E 03	0.00480	1.5013E 03	0.00490	1.5013E 03
0.00500	1.5031E 03	0.00510	1.5031E 03	0.00520	1.5031E 03	0.00530	1.5031E 03	0.00540	1.5013E 03
0.00550	1.5013E 03	0.00560	1.5013E 03	0.00570	1.5006E 03	0.00580	1.5006E 03	0.00590	1.5006E 03
0.00600	1.5006E 03	0.00610	1.4999E 03	0.00620	1.4999E 03	0.00630	1.4999E 03	0.00640	1.4999E 03
0.00650	1.4990E 03	0.00660	1.4991E 03	0.00670	1.4991E 03	0.00680	1.4991E 03	0.00690	1.4990E 03
0.00700	1.4991E 03	0.00710	1.4991E 03	0.00720	1.4991E 03	0.00730	1.4991E 03	0.00740	1.4991E 03
0.00750	1.4984E 03	0.00760	1.4984E 03	0.00770	1.4966E 03	0.00780	1.4959E 03	0.00790	1.4959E 03
0.00800	1.4959E 03	0.00810	1.4959E 03	0.00820	1.4960E 03	0.00830	1.4959E 03	0.00840	1.4941E 03
0.00850	1.4941E 03	0.00860	1.4941E 03	0.00870	1.4941E 03	0.00880	1.4922E 03	0.00890	1.4898E 03
0.00900	1.4898E 03	0.00910	1.4881E 03	0.00920	1.4853E 03	0.00930	1.4870E 03	0.00940	1.4845E 03
0.00950	1.4826E 03	0.00960	1.4826E 03	0.00970	1.4810E 03	0.00980	1.4742E 03	0.00990	1.4750E 03
0.01000	1.4714E 03	0.01010	1.4696E 03	0.01020	1.4601E 03	0.01030	1.4643E 03	0.01040	1.4608E 03
0.01050	1.4565E 03	0.01060	1.4530E 03	0.01070	1.4477E 03	0.01080	1.4424E 03	0.01090	1.4383E 03
0.01100	1.4335E 03	0.01110	1.4267E 03	0.01120	1.4214E 03	0.01130	1.4126E 03	0.01140	1.4055E 03
0.01150	1.3977E 03	0.01160	1.3906E 03	0.01170	1.3818E 03	0.01180	1.3722E 03	0.01190	1.3608E 03
0.01200	1.3495E 03	0.01210	1.3389E 03	0.01220	1.3250E 03	0.01230	1.3126E 03	0.01240	1.3002E 03
0.01250	1.2836E 03	0.01260	1.2687E 03	0.01270	1.2520E 03	0.01280	1.2336E 03	0.01290	1.2137E 03
0.01300	1.1935E 03	0.01310	1.1726E 03	0.01320	1.1506E 03	0.01330	1.1262E 03	0.01340	1.1017E 03
0.01350	1.0737E 03	0.01360	1.0474E 03	0.01370	1.0169E 03	0.01380	9.8640E 02	0.01390	9.5510E 02
0.01400	9.1900E 02	0.01410	8.8320E 02	0.01420	8.4740E 02	0.01430	8.0730E 02	0.01440	7.6370E 02
0.01450	7.2180E 02	0.01460	6.7570E 02	0.01470	6.2780E 02	0.01480	5.7710E 02	0.01490	5.2490E 02
0.01500	4.7100E 02	0.01510	4.1420E 02	0.01520	3.5250E 02	0.01530	2.9070E 02	0.01540	2.2540E 02
0.01550	1.5940E 02	0.01560	8.7000E 01	0.01570	1.3200E 01	0.01580	-6.2500E 01	0.01590	-1.4160E 02
0.01600	-2.2570E 02	0.01610	-3.1090E 02	0.01620	-3.9660E 02	0.01630	-4.9240E 02	0.01640	-5.8790E 02
0.01650	-6.8760E 02	0.01660	-7.8990E 02	0.01670	-8.9620E 02	0.01680	-1.0076E 03	0.01690	-1.1220E 03
0.01700	-1.2406E 03	0.01710	-1.3620E 03	0.01720	-1.4892E 03	0.01730	-1.6199E 03	0.01740	-1.7549E 03
0.01750	-1.8934E 03	0.01760	-2.0370E 03	0.01770	-2.1873E 03	0.01780	-2.3386E 03	0.01790	-2.4942E 03
0.01800	-2.6584E 03	0.01810	-2.8250E 03	0.01820	-2.9970E 03	0.01830	-3.1730E 03	0.01840	-3.3542E 03
0.01850	-3.5415E 03	0.01860	-3.7330E 03	0.01870	-3.9296E 03	0.01880	-4.1340E 03	0.01890	-4.3416E 03
0.01900	-4.5553E 03	0.01910	-4.7750E 03	0.01920	-4.9997E 03	0.01930	-5.2279E 03	0.01940	-5.4647E 03
0.01950	-5.7065E 03	0.01960	-5.9525E 03	0.01970	-6.2054E 03	0.01980	-6.4650E 03	0.01990	-6.7306E 03
0.02000	-7.0016E 03	0.02010	-7.2775E 03	0.02020	-7.5618E 03	0.02030	-7.8513E 03	0.02040	-8.1465E 03
0.02050	-8.4496E 03	0.02060	-8.7552E 03	0.02070	-9.0710E 03	0.02080	-9.3901E 03	0.02090	-9.7171E 03
0.02100	-1.0050E 04	0.02110	-1.0390E 04	0.02120	-1.0736E 04	0.02130	-1.1087E 04	0.02140	-1.1445E 04
0.02150	-1.1810E 04	0.02160	-1.2182E 04	0.02170	-1.2561E 04	0.02180	-1.2944E 04	0.02190	-1.3337E 04
0.02200	-1.3734E 04	0.02210	-1.4135E 04	0.02220	-1.4546E 04	0.02230	-1.4963E 04	0.02240	-1.5387E 04
0.02250	-1.5814E 04	0.02260	-1.6252E 04	0.02270	-1.6694E 04	0.02280	-1.7144E 04	0.02290	-1.7599E 04
0.02300	-1.8061E 04	0.02310	-1.8531E 04	0.02320	-1.9005E 04	0.02330	-1.9486E 04	0.02340	-1.9973E 04
0.02350	-2.0465E 04	0.02360	-2.0960E 04	0.02370	-2.1463E 04	0.02380	-2.1973E 04	0.02390	-2.2489E 04
0.02400	-2.3007E 04	0.02410	-2.3533E 04	0.02420	-2.4053E 04	0.02430	-2.4601E 04	0.02440	-2.5144E 04
0.02450	-2.5690E 04	0.02460	-2.6244E 04	0.02470	-2.6802E 04	0.02480	-2.7365E 04	0.02490	-2.7934E 04
0.02500	-2.8506E 04	0.02600	-3.4500E 04	0.02700	-4.0083E 04	0.02800	-4.7551E 04	0.02900	-5.4450E 04
0.03000	-6.1493E 04	0.03100	-6.8565E 04	0.03200	-7.5423E 04	0.03300	-8.1206E 04	0.03400	-8.5610E 04
0.03500	-8.8387E 04	0.03600	-8.9100E 04	0.03700	-8.7739E 04	0.03800	-8.4418E 04	0.03900	-7.9291E 04

TABLE 6.A-11
(SHEET 24 OF 32)

0.04000	-7.2798E 04	0.04100	-6.5643E 04	0.04200	-5.[illegible]091E 04	0.04300	-5.0394E 04	0.04400	-4.2723E 04
0.04500	-3.5399E 04	0.04600	-2.9140E 04	0.04700	-2.3967E 04	0.04800	-1.9762E 04	0.04900	-1.6434E 04
0.05000	-1.3817E 04	0.05100	-1.1324E 04	0.05200	-8.1252E 03	0.05300	-6.8471E 03	0.05400	-6.0264E 03
0.05500	-5.1653E 03	0.05600	-4.1301E 03	0.05700	-2.9624E 03	0.05800	-1.6543E 03	0.05900	-2.3320E 02
0.06000	2.6357E 03	0.06100	3.7992E 03	0.06200	6.7834E 03	0.06300	1.0[illegible]E 04	0.06400	1.4364E 04
0.06500	1.8316E 04	0.06600	2.1847E 04	0.06700	2.5011E 04	0.06800	2.77[illegible]E 04	0.06900	3.0172E 04
0.07000	3.2287E 04	0.07100	3.4088E 04	0.07200	3.5569E 04	0.07300	3.6722E 04	0.07400	3.7511E 04
0.07500	3.8031E 04	0.07600	3.8362E 04	0.07700	3.8701E 04	0.07800	3.6649E 04	0.07900	3.8416E 04
0.08000	3.8011E 04	0.08100	3.7443E 04	0.08200	3.6748E 04	0.08300	3.5959E 04	0.08400	3.5031E 04
0.08500	3.4059E 04	0.08600	3.2374E 04	0.08700	3.1608E 04	0.08800	3.0500E 04	0.08900	2.9211E 04
0.09000	2.7939E 04	0.09100	2.6712E 04	0.09200	2.5465E 04	0.09300	2.4172E 04	0.09400	2.2866E 04
0.09500	2.1580E 04	0.09600	2.0353E 04	0.09700	1.9186E 04	0.09800	1.8073E 04	0.09900	1.7027E 04
0.10000	1.6031E 04	0.10100	1.5056E 04	0.10200	1.4231E 04	0.10300	1.3478E 04	0.10400	1.2823E 04
0.10500	1.2260E 04	0.10600	1.1822E 04	0.10700	1.1382E 04	0.10800	1.1229E 04	0.10900	9.8225E 03
0.11000	1.0952E 04	0.11100	1.0985E 04	0.11200	1.1375E 04	0.11300	1.1685E 04	0.11400	1.2387E 04
0.11500	1.2952E 04	0.11600	1.3256E 04	0.11700	1.3523E 04	0.11800	1.3691E 04	0.11900	1.3526E 04
0.12000	1.3293E 04	0.12100	1.3048E 04	0.12200	1.2772E 04	0.12300	1.2336E 04	0.12400	1.1889E 04
0.12500	1.1446E 04	0.12600	1.1705E 04	0.12700	1.0604E 04	0.12800	1.0139E 04	0.12900	1.0541E 04
0.13000	8.8398E 03	0.13100	8.0098E 03	0.13200	5.8758E 03	0.13300	6.0071E 03	0.13400	4.6349E 03
0.13500	6.3630E 02	0.13600	4.0971E 03	0.13700	3.1912E 03	0.13800	-1.3491E 03	0.13900	-2.3115E 03
0.14000	-2.1761E 03	0.14100	-1.7140E 03	0.14200	-2.7719E 03	0.14300	-2.9557E 03	0.14400	-4.0549E 03
0.14500	-5.3645E 03	0.14600	-5.0294E 03	0.14700	-5.6007E 03	0.14800	-5.8311E 03	0.14900	-6.2276E 03
0.15000	-6.6126E 03	0.15100	-7.2252E 03	0.15200	-7.2537E 03	0.15300	-6.6226E 03	0.15400	-6.4013E 03
0.15500	-5.9605E 03	0.15600	-5.4065E 03	0.15700	-4.8108E 03	0.15800	-4.2257E 03	0.15900	-3.2873E 03
0.16000	-2.6762E 03	0.16100	-1.8681E 03	0.16200	-1.2641E 03	0.16300	-1.3491E 03	0.16400	-7.5370E 02
0.16500	-2.4760E 02	0.16600	3.1900E 02	0.16700	1.1082E 03	0.16800	2.9[illegible]E [illegible]	0.16900	1.2367E 03
0.17000	1.7316E 03	0.17100	1.0525E 03	0.17200	1.8431E 03	0.17300	1.7923E 03	0.17400	2.0307E 03
0.17500	2.3357E 03	0.17600	3.1252E 03	0.17700	3.3924E 03	0.17800	2.9531E 03	0.17900	3.1544E 03
0.18000	3.1326E 03	0.18100	2.7692E 03	0.18200	2.5632E 03	0.18300	2.7[illegible]E 03	0.18400	2.2710E 03
0.18500	1.9561E 03	0.18600	1.4166E 03	0.18700	5.9100E 02	0.18800	-5.9370E 02	0.18900	-2.2985E 03
0.19000	-6.2265E 03	0.19100	-6.5860E 03	0.19200	-5.6170E 03	0.19300	-7.6444E 03	0.19400	-9.2275E 03
0.19500	-1.1860E 04	0.19600	-1.1860E 04	0.19700	-1.3008E 04	0.19800	-2.0152E 04	0.19900	-2.0434E 04
0.20000	-2.2317E 04	0.20200	-2.0740E 04	0.20400	-2.0450E 04	0.20600	-2.0154E 04	0.20800	-1.7559E 04
0.21000	-1.6492E 04	0.21200	-1.3476E 04	0.21400	-1.3155E 04	0.21600	-9.1377E 03	0.21800	-2.1024E 03
0.22000	1.1360E 03	0.22200	9.4396E 03	0.22400	1.4136E 04	0.22600	1.[illegible]28E 04	0.22800	2.4442E 04
0.23000	2.3055E 04	0.23200	2.7920E 04	0.23400	2.3178E 04	0.23600	2.3112E 04	0.23800	2.7769E 04
0.24000	2.5846E 04	0.24200	2.3542E 04	0.24400	2.1442E 04	0.24600	1.8[illegible]0E 04	0.24800	1.1876E 04
0.25000	2.1548E 03	0.25200	-1.5119E 03	0.25400	-2.9390E 03	0.25600	-1.1452E 04	0.25800	-1.9004E 04
0.26000	-2.0713E 04	0.26200	-2.1202E 04	0.26400	-2.2747E 04	0.26600	-2.0169E 04	0.26800	-1.9500E 04
0.27000	-1.8497E 04	0.27200	-1.6106E 04	0.27400	-1.3928E 04	0.27600	-9.1325E 03	0.27800	-3.7441E 03
0.28000	3.7690E 02	0.28200	4.4619E 03	0.28400	8.3095E 03	0.28600	1.2190E 04	0.28800	1.5130E 04
0.29000	1.7202E 04	0.29200	1.7561E 04	0.29400	1.6460E 04	0.29600	1.4697E 04	0.29800	1.1942E 04
0.30000	8.6410E 03	0.30200	4.8762E 03	0.30400	9.5180E 02	0.30600	-2.[illegible]370E 03	0.30800	-6.5753E 03
0.31000	-9.7285E 03	0.31200	-1.2315E 04	0.31400	-1.4140E 04	0.31600	-1.5163E 04	0.31800	-1.5470E 04
0.32000	-1.5038E 04	0.32200	-1.3975E 04	0.32400	-1.2379E 04	0.32600	-1.0462E 04	0.32800	-8.2613E 03
0.33000	-5.9345E 03	0.33200	-3.7179E 03	0.33400	-1.6293E 03	0.33600	2.3070E 02	0.33800	1.6566E 03
0.34000	2.6194E 03	0.34200	3.0802E 03	0.34400	3.0364E 03	0.34600	2.6216E 03	0.34800	1.7746E 03
0.35000	6.5670E 02	0.35200	-7.2580E 02	0.35400	-2.2129E 03	0.35600	-3.7581E 03	0.35800	-5.2172E 03
0.36000	-6.5738E 03	0.36200	-7.7712E 03	0.36400	-8.7256E 03	0.36600	-9.3877E 03	0.36800	-9.7573E 03
0.37000	-9.7654E 03	0.37200	-9.4967E 03	0.37400	-8.8573E 03	0.37600	-7.[illegible]E 03	0.37800	-6.0128E 03
0.38000	-5.5450E 03	0.38200	-4.1672E 03	0.38400	-2.8324E 03	0.38600	-1.7185E 03	0.38800	-8.4140E 02
0.39000	-2.1640E 02	0.39200	6.0300E 01	0.39400	6.4900E 01	0.39600	-2.4040E 02	0.39800	-7.5560E 02
0.40000	-1.4580E 03	0.40200	-2.2389E 03	0.40400	-3.0842E 03	0.40600	-3.8[illegible]95E 03	0.40800	-4.5710E 03
0.41000	-5.0959E 03	0.41200	-5.4114E 03	0.41400	-5.5114E 03	0.41600	-5.4167E 03	0.41800	-5.1606E 03
0.42000	-4.8055E 03	0.42200	-4.3763E 03	0.42400	-3.9499E 03	0.42600	-3.5337E 03	0.42800	-3.2071E 03
0.43000	-2.9605E 03	0.43200	-2.8327E 03	0.43400	-2.7968E 03	0.43600	-2.8748E 03	0.43800	-3.0549E 03
0.44000	-3.3252E 03	0.44200	-3.6433E 03	0.44400	-3.9720E 03	0.44600	-4.3491E 03	0.44800	-4.6842E 03
0.45000	-5.0003E 03	0.45200	-5.2122E 03	0.45400	-5.3667E 03	0.45600	-5.3973E 03	0.45800	-5.3734E 03
0.46000	-5.2227E 03	0.46200	-5.0461E 03	0.46400	-4.7698E 03	0.46600	-4.5118E 03	0.46800	-4.2113E 03
0.47000	-3.9582E 03	0.47200	-3.6996E 03	0.47400	-3.4915E 03	0.47600	-3.3045E 03	0.47800	-3.1804E 03
0.48000	-3.0613E 03	0.48200	-2.9829E 03	0.48400	-2.8949E 03	0.48600	-2.8487E 03	0.48800	-2.7935E 03
0.49000	-2.7787E 03	0.49200	-2.7424E 03	0.49400	-2.7767E 03	0.49600	-2.8069E 03	0.49800	-2.8992E 03
0.50000	-2.9670E 03	0.50110	-3.0357E 03						

TABLE 6.A-11
(SHEET 25 OF 32)

TIME FUNCTION NUMBER = (13)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 43 00-025 0. 66.5)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	6.6500E 01	0.00010	6.6500E 01	0.00020	6.6500E 01	0.00030	[illegible]	[illegible]	6.65[illegible] 01
0.00050	6.6500E 01	0.00060	6.6500E 01	0.00070	6.6600E 01	0.00080	[illegible]	[illegible]	[illegible]
0.00100	6.6400E 01	0.00110	6.6400E 01	0.00120	6.6400E 01	0.00130	6.6400E 01	[illegible]	6.6400E 01
0.00150	6.6400E 01	0.00160	6.6400E 01	0.00170	6.6400E 01	0.00180	6.6400E 01	[illegible]	6.6400E 01
0.00200	6.6400E 01	0.00210	6.6400E 01	0.00220	6.6400E 01	0.00230	6.6400E 01	[illegible]	6.6400E 01
0.00250	6.6400E 01	0.00260	6.6500E 01	0.00270	6.6500E 01	0.00280	[illegible]	[illegible]	[illegible]
0.00300	6.6500E 01	0.00310	6.6500E 01	0.00320	6.6600E 01	0.00330	6.6500E 01	[illegible]	6.6[illegible] 01
0.00350	6.6500E 01	0.00360	6.6400E 01	0.00370	6.6400E 01	0.00380	6.6400E 01	[illegible]	6.6400E 01
0.00400	6.6400E 01	0.00410	6.6400E 01	0.00420	6.6400E 01	0.00430	6.6400E 01	[illegible]	6.6400E 01
0.00450	6.6400E 01	0.00460	6.6400E 01	0.00470	6.6400E 01	0.00480	6.6400E 01	[illegible]	6.6400E 01
0.00500	6.6400E 01	0.00510	6.6400E 01	0.00520	6.6400E 01	0.00530	6.6400E 01	[illegible]	6.6400E 01
0.00550	6.6400E 01	0.00560	6.6400E 01	0.00570	6.6300E 01	0.00580	6.6300E 01	[illegible]	6.6[illegible] 01
0.00600	6.6300E 01	0.00610	6.6300E 01	0.00620	6.6300E 01	0.00630	[illegible]	[illegible]	6.6300E 01
0.00650	6.6300E 01	0.00660	6.6300E 01	0.00670	6.6300E 01	0.00680	[illegible]	[illegible]	[illegible]
0.00700	6.6300E 01	0.00710	6.6300E 01	0.00720	6.6300E 01	0.00730	[illegible]	[illegible]	6.6[illegible] 01
0.00750	6.6200E 01	0.00760	6.6200E 01	0.00770	6.6200E 01	0.00780	6.6200E 01	[illegible]	6.6100E 01
0.00800	6.6100E 01	0.00810	6.6100E 01	0.00820	6.6200E 01	0.00830	[illegible]	[illegible]	6.60[illegible] 01
0.00850	6.6000E 01	0.00860	6.6000E 01	0.00870	6.6000E 01	0.00880	6.6000E 01	[illegible]	6.6[illegible] 01
0.00900	6.5900E 01	0.00910	6.5800E 01	0.00920	6.5700E 01	0.00930	6.5700E 01	[illegible]	6.[illegible]300E 01
0.00950	6.5500E 01	0.00960	6.5500E 01	0.00970	6.5500E 01	0.00980	[illegible]	[illegible]	6.5200E 01
0.01000	6.5000E 01	0.01010	6.5000E 01	0.01020	6.4600E 01	0.01030	[illegible]	[illegible]	6.4600E 01
0.01050	6.4400E 01	0.01060	6.4200E 01	0.01070	6.4000E 01	0.01080	6.3900E 01	[illegible]	6.3600E 01
0.01100	6.3100E 01	0.01110	6.3100E 01	0.01120	6.2800E 01	0.01130	6.2400E 01	[illegible]	6.2100E 01
0.01150	6.1800E 01	0.01160	6.1500E 01	0.01170	6.1100E 01	0.01180	6.0700E 01	[illegible]	6.0200E 01
0.01200	5.9700E 01	0.01210	5.9200E 01	0.01220	5.8600E 01	0.01230	5.8000E 01	[illegible]	5.7500E 01
0.01250	5.6700E 01	0.01260	5.6100E 01	0.01270	5.5300E 01	0.01280	5.4500E 01	[illegible]	5.3700E 01
0.01300	5.2800E 01	0.01310	5.1800E 01	0.01320	5.0900E 01	0.01330	4.9800E 01	0.01340	4.8700E 01
0.01350	4.7500E 01	0.01360	4.6300E 01	0.01370	4.5000E 01	0.01380	4.3600E 01	0.01390	4.2100E 01
0.01400	4.0600E 01	0.01410	3.9000E 01	0.01420	3.7600E 01	0.01430	3.6700E 01	0.01440	3.5300E 01
0.01450	3.1900E 01	0.01460	2.9900E 01	0.01470	2.7000E 01	0.01480	2.5500E 01	0.01490	2.3200E 01
0.01500	2.0800E 01	0.01510	1.8300E 01	0.01520	1.5600E 01	0.01530	1.2900E 01	0.01540	1.0000E 01
0.01550	7.0000E 00	0.01560	3.8000E 00	0.01570	6.0000E-01	0.01580	-2.8000E 00	0.01590	-6.3000E 00
0.01600	-1.0000E 01	0.01610	-1.3700E 01	0.01620	-1.7600E 01	0.01630	-2.1800E 01	0.01640	-2.6000E 01
0.01650	-3.0400E 01	0.01660	-3.4900E 01	0.01670	-3.9700E 01	0.01680	-4.4500E 01	0.01690	-4.9600E 01
0.01700	-5.4900E 01	0.01710	-6.0200E 01	0.01720	-6.5800E 01	0.01730	-7.1600E 01	0.01740	-7.7600E 01
0.01750	-8.3700E 01	0.01760	-9.0000E 01	0.01770	-9.6700E 01	0.01780	-1.0340E 02	0.01790	-1.1030E 02
0.01800	-1.1750E 02	0.01810	-1.2490E 02	0.01820	-1.3250E 02	0.01830	-1.40[illegible]	0.01840	-1.4530E 02
0.01850	-1.5060E 02	0.01860	-1.6510E 02	0.01870	-1.7370E 02	0.01880	-1.8270E 02	0.01890	-1.9190E 02
0.01900	-2.0110E 02	0.01910	-2.1110E 02	0.01920	-2.2100E 02	0.01930	-2.3110E 02	0.01940	-2.4160E 02
0.01950	-2.5230E 02	0.01960	-2.6310E 02	0.01970	-2.7430E 02	0.01980	-2.8540E 02	0.01990	-2.9760E 02
0.02000	-3.0950E 02	0.02010	-3.2170E 02	0.02020	-3.3430E 02	0.02030	-3.4710E 02	0.02040	-3.6010E 02
0.02050	-3.7350E 02	0.02060	-3.8700E 02	0.02070	-4.0100E 02	0.02080	-4.1510E 02	0.02090	-4.[illegible]60E 02
0.02100	-4.4420E 02	0.02110	-4.5930E 02	0.02120	-4.7460E 02	0.02130	-4.8010E 02	0.02140	-5.0600E 02
0.02150	-5.2210E 02	0.02160	-5.3850E 02	0.02170	-5.[illegible]020E 02	0.02180	-5.72[illegible]E 02	0.02190	-5.8950E 02
0.02200	-6.0710E 02	0.02210	-6.2480E 02	0.02220	-6.4300E 02	0.02230	-6.6150E 02	0.02240	-6.8020E 02
0.02250	-6.9910E 02	0.02260	-7.1840E 02	0.02270	-7.3600E 02	0.02280	-7.5780E 02	0.02290	-7.7800E 02
0.02300	-7.9840E 02	0.02310	-8.1920E 02	0.02320	-8.4010E 02	0.02330	-8.6140E 02	0.02340	-8.8290E 02
0.02350	-9.0470E 02	0.02360	-9.2650E 02	0.02370	-9.4880E 02	0.02380	-9.7130E 02	0.02390	-9.9410E 02
0.02400	-1.0170E 03	0.02410	-1.0403E 03	0.02420	-1.0637E 03	0.02430	-1.0875E 03	0.02440	-1.1116E 03
0.02450	-1.1356E 03	0.02460	-1.1601E 03	0.02470	-1.1848E 03	0.02480	-1.2097E 03	0.02490	-1.2348E 03
0.02500	-1.2601E 03	0.02600	-1.5251E 03	0.02700	-1.8072E 03	0.02800	-2.1020E 03	0.02900	-2.4070E 03
0.03000	-2.7183E 03	0.03100	-3.0309E 03	0.03200	-3.3340E 03	0.03300	-3.5697E 03	0.03400	-3.7844E 03
0.03500	-3.9071E 03	0.03600	-3.9386E 03	0.03700	-3.8785E 03	0.03800	-3.7317E 03	0.03900	-3.5050E 03

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TABLE 6.A-11
(SHEET 26 OF 32)

0.04000	-3.2180E 03	0.04100	-2.9017E 03	0.04200	-2.5679E 03	0.04300	-2.2276E 03	0.04400	-1.8086E 03
0.04500	-1.5647E 03	0.04600	-1.2881E 03	0.04700	-1.0595E 03	0.04800	-8.73[illegible]E 02	0.04900	-7.26[illegible]0E 02
0.05000	-6.1000E 02	0.05100	-5.0060E 02	0.05200	-3.5920E 02	0.05300	-[illegible]E 02	0.05400	-2.66[illegible]0E 02
0.05500	-2.2830E 02	0.05600	-1.8260E 02	0.05700	-1.[illegible]100E 02	0.05800	-7.3[illegible]E 01	0.05900	-1.03[illegible]0E 01
0.06000	1.1650E 02	0.06100	1.6790E 02	0.06200	2.9990E 02	0.06300	4.50[illegible]E 02	0.06400	6.3490E 02
0.06500	8.0360E 02	0.06600	9.6580E 02	0.06700	1.1056E 03	0.06800	1.2[illegible]E 03	0.06900	1.3[illegible]7E 03
0.07000	1.4272E 03	0.07100	1.5006E 03	0.07200	1.5723E 03	0.07300	1.[illegible]E 03	0.07400	1.660[illegible]E 03
0.07500	1.6812E 03	0.07600	1.7046E 03	0.07700	1.7108E 03	0.07800	1.7[illegible]5E 03	0.07900	1.6302E 03
0.08000	1.6803E 03	0.08100	1.6552E 03	0.08200	1.6244E 03	0.08300	1.[illegible]7E 03	0.08400	1.5485E 03
0.08500	1.5056E 03	0.08600	1.4576E 03	0.08700	1.4061E 03	0.08800	1.3406E 03	0.08900	1.2813E 03
0.09000	1.2351E 03	0.09100	1.1809E 03	0.09200	1.1252E 03	0.09300	1.0[illegible]3E 03	0.09400	1.0109E 03
0.09500	9.5[illegible]90E 02	0.09600	8.2970E 02	0.09700	8.4620E 02	0.09800	7.[illegible]E 02	0.09900	7.5270E 02
0.10000	7.0860E 02	0.10100	6.6730E 02	0.10200	6.2910E 02	0.10300	6.95[illegible]E 02	0.10400	5.[illegible]E 02
0.10500	5.4190E 02	0.10600	5.2260E 02	0.10700	5.0180E 02	0.10800	4.8640E 02	0.10900	4.2090E 02
0.11000	4.8410E 02	0.11100	4.8560E 02	0.11200	5.0280E 02	0.11300	5.1650E 02	0.11400	5.4760E 02
0.11500	5.7260E 02	0.11600	5.8600E 02	0.11700	5.9730E 02	0.11800	6.0520E 02	0.11900	5.9790E 02
0.12000	5.8760E 02	0.12100	5.7680E 02	0.12200	5.6460E 02	0.12300	5.4530E 02	0.12400	5.2550E 02
0.12500	5.0600E 02	0.12600	5.1740E 02	0.12700	4.6880E 02	0.12800	4.4320E 02	0.12900	4.6600E 02
0.13000	3.2080E 02	0.13100	3.5110E 02	0.13200	2.5970E 02	0.13300	2.65[illegible]0E 02	0.13400	2.0490E 02
0.13500	2.8100E 01	0.13600	1.8110E 02	0.13700	1.4110E 02	0.13800	-6.1[illegible]0E 01	0.13900	-1.0220E 02
0.14000	-9.6200E 01	0.14100	-7.5800E 01	0.14200	-1.2260E 02	0.14300	-1.3070E 02	0.14400	-1.7920E 02
0.14500	-2.3710E 02	0.14600	-2.2300E 02	0.14700	-2.4760E 02	0.14800	-2.67[illegible]0E 02	0.14900	-2.75[illegible]0E 02
0.15000	-2.9230E 02	0.15100	-3.1840E 02	0.15200	-3.2050E 02	0.15300	-2.62[illegible]0E 02	0.15400	-2.8300E 02
0.15500	-2.6350E 02	0.15600	-2.9600E 02	0.15700	-2.1270E 02	0.15800	-1.[illegible]E 02	0.15900	-1.4560E 02
0.16000	-1.1830E 02	0.16100	-8.2600E 01	0.16200	-5.5900E 01	0.16300	-5.[illegible]E 01	0.16400	-3.3300E 01
0.16500	-1.0900E 01	0.16600	1.4100E 01	0.16700	4.9000E 01	0.16800	1.29[illegible]E 02	0.16900	5.4700E 01
0.17000	7.6500E 01	0.17100	4.6500E 01	0.17200	8.1500E 01	0.17300	7.[illegible]E 01	0.17400	8.[illegible]E 01
0.17500	1.0320E 02	0.17600	1.3820E 02	0.17700	1.5000E 02	0.17800	1.[illegible]E 02	0.17900	1.3940E 02
0.18000	1.3650E 02	0.18100	1.2240E 02	0.18200	1.1330E 02	0.18300	1.20[illegible]E 02	0.18400	1.0040E 02
0.18500	8.6500E 01	0.18600	6.2600E 01	0.18700	2.6100E 01	0.18800	-[illegible]E 01	0.18900	-1.6160E 02
0.19000	-2.7520E 02	0.19100	-2.9110E 02	0.19200	-2.4830E 02	0.19300	-3.3790E 02	0.19400	-4.0790E 02
0.19500	-5.2430E 02	0.19600	-5.2430E 02	0.19700	-5.7500E 02	0.19800	-5.90[illegible]0E 02	0.19900	-9.0330E 02
0.20000	-9.8650E 02	0.20200	-9.1680E 02	0.20400	-9.0400E 02	0.20600	-6.[illegible]0E 02	0.20800	-7.7620E 02
0.21000	-7.2800E 02	0.21200	-5.9570E 02	0.21400	-5.8150E 02	0.21600	-4.0390E 02	0.21800	-9.2900E 01
0.22000	5.0200E 01	0.22200	4.1730E 02	0.22400	6.2480E 02	0.22600	6.1900E 02	0.22800	1.0805E 03
0.23000	1.0192E 03	0.23200	1.2342E 03	0.23400	1.0246E 03	0.23600	1.0216E 03	0.23800	1.2275E 03
0.24000	1.1425E 03	0.24200	1.0407E 03	0.24400	9.4780E 02	0.24600	6.2360E 02	0.24800	5.2280E 02
0.25000	9.5300E 01	0.25200	-6.6800E 01	0.25400	-1.2890E 02	0.25600	-5.0620E 02	0.25800	-8.4010E 02
0.26000	-9.1560E 02	0.26200	-9.5720E 02	0.26400	-1.0055E 03	0.26600	-8.9160E 02	0.26800	-8.6200E 02
0.27000	-8.1770E 02	0.27200	-7.1190E 02	0.27400	-6.1570E 02	0.27600	-4.0370E 02	0.27800	-1.6550E 02
0.28000	1.6700E 01	0.28200	1.9720E 02	0.28400	3.6730E 02	0.28600	5.3090E 02	0.28800	6.6800E 02
0.29000	7.6040E 02	0.29200	7.7630E 02	0.29400	7.2760E 02	0.29600	6.4370E 02	0.29800	5.2790E 02
0.30000	3.8200E 02	0.30200	2.1550E 02	0.30400	4.2100E 01	0.30600	-1.29[illegible]0E 02	0.30800	-2.9070E 02
0.31000	-4.3000E 02	0.31200	-5.4440E 02	0.31400	-6.2510E 02	0.31600	-6.7[illegible]0E 02	0.31800	-6.8390E 02
0.32000	-6.6470E 02	0.32200	-6.1780E 02	0.32400	-5.4720E 02	0.32600	-4.02[illegible]0E 02	0.32800	-3.6520E 02
0.33000	-2.6230E 02	0.33200	-1.6440E 02	0.33400	-7.2000E 01	0.33600	1.0300E 01	0.33800	7.3200E 01
0.34000	1.1580E 02	0.34200	1.3650E 02	0.34400	1.5420E 02	0.34600	1.1600E 02	0.34800	7.8400E 01
0.35000	2.9000E 01	0.35200	-3.2100E 01	0.35400	-9.7800E 01	0.35600	-1.6610E 02	0.35800	-2.3060E 02
0.36000	-2.9060E 02	0.36200	-3.4350E 02	0.36400	-3.8570E 02	0.36600	-4.1500E 02	0.36800	-4.3130E 02
0.37000	-4.3170E 02	0.37200	-4.1980E 02	0.37400	-3.8150E 02	0.37600	-3.52[illegible]0E 02	0.37800	-3.0120E 02
0.38000	-2.4510E 02	0.38200	-1.8420E 02	0.38400	-1.2740E 02	0.38600	-7.6000E 01	0.38800	-3.7200E 01
0.39000	-9.6000E 00	0.39200	2.7000E 00	0.39400	2.9000E 00	0.39600	-1.0500E 01	0.39800	-3.3400E 01
0.40000	-6.4500E 01	0.40200	-9.8000E 01	0.40400	-1.3630E 02	0.40600	-1.7150E 02	0.40800	-2.0210E 02
0.41000	-2.2530E 02	0.41200	-2.3920E 02	0.41400	-2.4360E 02	0.41600	-2.3340E 02	0.41800	-2.2810E 02
0.42000	-2.1240E 02	0.42200	-1.9350E 02	0.42400	-1.7460E 02	0.42600	-1.5620E 02	0.42800	-1.4180E 02
0.43000	-1.3090E 02	0.43200	-1.2520E 02	0.43400	-1.2360E 02	0.43600	-1.2710E 02	0.43800	-1.3500E 02
0.44000	-1.4700E 02	0.44200	-1.6110E 02	0.44400	-1.7560E 02	0.44600	-1.9230E 02	0.44800	-2.0710E 02
0.45000	-2.2100E 02	0.45200	-2.3040E 02	0.45400	-2.3720E 02	0.45600	-2.3860E 02	0.45800	-2.3750E 02
0.46000	-2.3090E 02	0.46200	-2.2310E 02	0.46400	-2.1060E 02	0.46600	-1.9940E 02	0.46800	-1.8620E 02
0.47000	-1.7500E 02	0.47200	-1.6350E 02	0.47400	-1.5430E 02	0.47600	-1.4610E 02	0.47800	-1.4060E 02
0.48000	-1.3530E 02	0.48200	-1.3190E 02	0.48400	-1.2800E 02	0.48600	-1.2590E 02	0.48800	-1.2350E 02
0.49000	-1.2280E 02	0.49200	-1.2120E 02	0.49400	-1.2270E 02	0.49600	-1.2410E 02	0.49800	-1.2820E 02
0.50000	-1.3120E 02	0.50110	-1.3420E 02						

TABLE 6.A-11
(SHEET 27 OF 32)

TIME FUNCTION NUMBER = (14)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 3 00>02$ 0. -7300.8)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-7.3008E 03	0.00010	-7.3008E 03	0.00020	-7.3008E 03	0.00030	-7.2[illegible]9E 03	0.00040	-7.2979E 03
0.00050	-7.2946E 03	0.00060	-7.2899E 03	0.00070	-7.2821E 03	0.00080	-7.2724E 03	0.00090	-7.2568E 03
0.00100	-7.2440E 03	0.00110	-7.2104E 03	0.00120	-7.1876E 03	0.00130	-7.1394E 03	0.00140	-7.0795E 03
0.00150	-7.0051E 03	0.00160	-6.9127E 03	0.00170	-6.8004E 03	0.00180	-6.6717E 03	0.00190	-6.5226E 03
0.00200	-6.35[illegible]E 03	0.00210	-6.1570E 03	0.00220	-5.9375E 03	0.00230	-5.6934E 03	0.00240	-5.4149E 03
0.00250	-5.1122E 03	0.00260	-4.7705E 03	0.00270	-4.3960E 03	0.00280	-3.9836E 03	0.00290	-3.5302E 03
0.00300	-3.0[illegible]E 03	0.00310	-2.5030E 03	0.00320	-1.9257E 03	0.00330	-1.3063E 03	0.00340	-6.4440E 02
0.00350	6.0700E 01	0.00360	8.1250E 02	0.00370	1.5979E 03	0.00380	2.3892E 03	0.00390	3.1735E 03
0.00400	3.9554E 03	0.00410	4.7371E 03	0.00420	5.5210E 03	0.00430	6.3011E 03	0.00440	7.0853E 03
0.00450	7.8711E 03	0.00460	8.6613E 03	0.00470	9.4561E 03	0.00480	1.0258E 04	0.00490	1.1072E 04
0.00500	1.1893E 04	0.00510	1.2731E 04	0.00520	1.3583E 04	0.00530	1.4417E 04	0.00540	1.5329E 04
0.00550	1.6226E 04	0.00560	1.7142E 04	0.00570	1.8077E 04	0.00580	1.9[illegible]E 04	0.00590	2.0010E 04
0.00600	2.1010E 04	0.00610	2.2036E 04	0.00620	2.3079E 04	0.00630	2.4153E 04	0.00640	2.5255E 04
0.00650	2.[illegible]367E 04	0.00660	2.7550E 04	0.00670	2.8746E 04	0.00680	2.9972E 04	0.00690	3.1228E 04
0.00700	3.2526E 04	0.00710	3.3860E 04	0.00720	3.5228E 04	0.00730	3.6624E 04	0.00740	3.8077E 04
0.00750	3.9563E 04	0.00760	4.1092E 04	0.00770	4.2672E 04	0.00780	4.4[illegible]34E 04	0.00790	4.5[illegible]E 04
0.00800	4.7[illegible]4E 04	0.00810	4.9450E 04	0.00820	5.1263E 04	0.00830	5.3127E 04	0.00840	5.5013E 04
0.00850	5.7011E 04	0.00860	5.9026E 04	0.00870	6.1093E 04	0.00880	6.3[illegible]16E 04	0.00890	6.53[illegible]E 04
0.00900	6.7616E 04	0.00910	6.9895E 04	0.00920	7.2230E 04	0.00930	7.4618E 04	0.00940	7.7064E 04
0.00950	7.9[illegible]E 04	0.00960	8.2110E 04	0.00970	8.4721E 04	0.00980	8.7376E 04	0.00990	9.0091E 04
0.01000	9.2850E 04	0.01010	9.5682E 04	0.01020	9.8550E 04	0.01030	1.0149E 05	0.01040	1.0447E 05
0.01050	1.0761E 05	0.01060	1.1062E 05	0.01070	1.1377E 05	0.01080	1.1698E 05	0.01090	1.2024E 05
0.01100	1.2356E 05	0.01110	1.2693E 05	0.01120	1.2616E 05	0.01130	1.2957E 05	0.01140	1.3257E 05
0.01150	1.3677E 05	0.01160	1.3896E 05	0.01170	1.4219E 05	0.01180	1.4542E 05	0.01190	1.4890E 05
0.01200	1.[illegible]E 05	0.01210	1.5595E 05	0.01220	1.5959E 05	0.01230	1.6323E 05	0.01240	1.6705E 05
0.01250	1.70[illegible]E 05	0.01260	1.7469E 05	0.01270	1.7861E 05	0.01280	1.8264E 05	0.01290	1.8666E 05
0.01300	1.9074E 05	0.01310	1.9497E 05	0.01320	1.9906E 05	0.01330	2.0329E 05	0.01340	2.0758E 05
0.01350	2.1193E 05	0.01360	2.1632E 05	0.01370	2.2077E 05	0.01380	2.2526E 05	0.01390	2.2980E 05
0.01400	2.3439E 05	0.01410	2.3904E 05	0.01420	2.4372E 05	0.01430,	2.4846E 05	0.01440	2.5325E 05
0.01450	2.5808E 05	0.01460	2.6296E 05	0.01470	2.6788E 05	0.01480	2.7286E 05	0.01490	2.7794E 05
0.01500	2.830[illegible]E 05	0.01510	2.8823E 05	0.01520	2.9347E 05	0.01530	2.9877E 05	0.01540	3.0413E 05
0.01550	3.0955E 05	0.01560	3.1502E 05	0.01570	3.2056E 05	0.01580	3.2613E 05	0.01590	3.3176E 05
0.01600	3.[illegible]746E 05	0.01610	3.4319E 05	0.01620	3.4898E 05	0.01630	3.5472E 05	0.01640	3.6071E 05
0.01650	3.6[illegible]E 05	0.01660	3.7264E 05	0.01670	3.7867E 05	0.01680	3.8476E 05	0.01690	3.9089E 05
0.01700	3.9707E 05	0.01710	4.0330E 05	0.01720	4.0971E 05	0.01730	4.1[illegible]E 05	0.01740	4.223[illegible]E 05
0.01750	[illegible]79E 05	0.01760	4.[illegible]4E 05	0.01770	4.4173E 05	0.01780	4.4[illegible]E 05	0.01790	4.5[illegible]E 05
0.01800	[illegible]43E 05	0.01810	4.[illegible]6E 05	0.01820	4.7473E 05	0.01830	4.[illegible]142E 05	0.01840	4.[illegible]312 05
0.01850	4.[illegible]407E 05	0.01860	5.0165E 05	0.01870	5.0841E 05	0.01880	5.1[illegible]E 05	0.01890	5.2[illegible]E 05
0.01900	5.2904E 05	0.01910	5.3567E 05	0.01920	5.4214E 05	0.01930	5.4[illegible]E 05	0.01940	5.56[illegible]E 05
0.01950	5.[illegible]E 05	0.01960	5.6212E 05	0.01970	5.6866E 05	0.01980	5.7[illegible]E 05	0.01990	5.[illegible]E 05
0.02000	5.[illegible]32E 05	0.02010	5.9490E 05	0.02020	6.0116E 05	0.02030	6.07[illegible]E 05	0.02040	6.1349E 05
0.02050	6.1956E 05	0.02060	6.2559E 05	0.02070	6.3140E 05	0.02080	6.3[illegible]E 05	0.02090	6.42[illegible]E 05
0.02100	6.4961E 05	0.02110	6.5426E 05	0.02120	6.5972E 05	0.02130	6.6[illegible]E 05	0.02140	6.70[illegible]E 05
0.02150	6.7560E 05	0.02160	6.7550E 05	0.02170	6.8053E 05	0.02180	6.8[illegible]E 05	0.02190	6.90[illegible]E 05
0.02200	6.9566E 05	0.02210	7.0059E 05	0.02220	7.0545E 05	0.02230	7.1026E 05	0.02240	7.1501E 05
0.02250	7.1970E 05	0.02260	7.2431E 05	0.02270	7.2888E 05	0.02280	7.3342E 05	0.02290	7.3780E 05
0.02300	7.421[illegible] 05	0.02310	7.4211E 05	0.02320	7.4621E 05	0.02330	7.5030E 05	0.02340	7.5431E 05
0.02350	7.5825E 05	0.02360	7.5871E 05	0.02370	7.6249E 05	0.02380	7.6620E 05	0.02390	7.6906E 05
0.02400	7.7341E 05	0.02410	7.7691E 05	0.02420	7.8034E 05	0.02430	7.8370E 05	0.02440	7.8698E 05
0.02450	7.9010E 05	0.02460	7.9332E 05	0.02470	7.9639E 05	0.02480	7.9[illegible]9E 05	0.02490	8.0232E 05
0.02500	8.0517E 05	0.02600	8.3203E 05	0.02700	8.5453E 05	0.02800	8.7024E 05	0.02900	8.8341E 05
0.03000	8.[illegible]202E 05	0.03100	8.9[illegible]2E 05	0.03200	8.9386E 05	0.03300	8.9318E 05	0.03400	8.9470E 05
0.03500	8.8900E 05	0.03600	8.8115E 05	0.03700	8.7138E 05	0.03800	8.6015E 05	0.03900	8.4774E 05

TABLE 6.A-11
(SHEET 28 OF 32)

0.04000	8.3416E 05	0.04100	8.1954E 05	0.04200	8.0406E 05	0.04300	7.8777E 05	0.04400	7.7084E 05
0.04500	7.5407E 05	0.04600	7.3657E 05	0.04700	7.1812E 05	0.04800	7.0114E 05	0.04900	6.8320E 05
0.05000	6.6820E 05	0.05100	6.5231E 05	0.05200	6.3663E 05	0.05300	6.2171E 05	[illegible]	6.0929E 05
0.05500	5.9113E 05	0.05600	5.8175E 05	0.05700	5.7004E 05	0.05800	5.5924E 05	0.05900	5.4989E 05
0.06000	5.4130E 05	0.06100	5.2883E 05	0.06200	5.2044E 05	0.06300	5.1414E 05	0.06400	5.0364E 05
0.06500	5.0175E 05	0.06600	4.9574E 05	0.06700	4.9059E 05	[illegible]	[illegible]	[illegible]	4.6220E 05
0.07000	4.7042E 05	0.07100	4.7486E 05	0.07200	4.7167E 05	0.07300	4.6862E 05	0.07400	4.6579E 05
0.07500	4.6266E 05	0.07600	4.1985E 05	0.07700	4.5659E 05	0.07800	4.5313E 05	0.07900	4.4937E 05
0.08000	4.4521E 05	0.08100	4.4066E 05	0.08200	4.4203E 05	0.08300	4.3173E 05	0.08400	4.2633E 05
0.08500	4.2077E 05	0.08600	4.1499E 05	0.08700	4.0920E 05	0.08800	4.0344E 05	0.08900	3.9772E 05
0.09000	3.9197E 05	0.09100	3.8654E 05	0.09200	3.3077E 05	0.09300	3.7561E 05	0.09400	3.7040E 05
0.09500	3.6567E 05	0.09600	3.6111E 05	0.09700	3.5722E 05	0.09300	3.5306E 05	0.08900	3.4946E 05
0.10000	3.4641E 05	0.10100	3.4365E 05	0.10200	3.4121E 05	0.10300	3.3906E 05	0.10400	3.3719E 05
0.10500	3.3560E 05	0.10600	3.3416E 05	0.10700	3.3272E 05	0.10800	3.3101E 05	0.10900	3.3032E 05
0.11000	3.2940E 05	0.11100	3.2804E 05	0.11200	3.2604E 05	0.11300	3.2508E 05	0.11400	3.2457E 05
0.11500	3.2347E 05	0.11600	3.2247E 05	0.11700	3.2135E 05	0.11800	3.2039E 05	0.11900	3.1976E 05
0.12000	3.1954E 05	0.12100	3.1990E 05	0.12200	3.1070E 05	0.12300	3.1624E 05	0.12400	3.1820E 05
0.12500	3.1818E 05	0.12600	3.1833E 05	0.12700	3.1878E 05	0.12800	3.1902E 05	0.12900	3.1967E 05
0.13000	3.2081E 05	0.13100	3.1982E 05	0.13200	3.2026E 05	0.13300	3.2106E 05	[illegible]	3.2164E 05
0.13500	3.2164E 05	0.13600	3.2192E 05	0.13700	3.2222E 05	0.13800	3.2314E 05	0.13900	3.2313E 05
0.14000	3.2305E 05	0.14100	3.2317E 05	0.14200	3.2243E 05	0.14300	3.2119E 05	0.14400	3.2120E 05
0.14500	3.2082E 05	0.14600	3.1903E 05	0.14700	3.1681E 05	0.14800	3.1700E 05	0.14900	3.1301E 05
0.15000	3.1676E 05	0.15100	3.1461E 05	0.15200	[illegible]	0.15300	3.1241E 05	0.15400	3.1104E 05
0.15500	3.1033E 05	0.15600	3.0947E 05	0.15700	3.0642E 05	0.15800	[illegible]	0.15900	3.0685E 05
0.16000	3.0637E 05	0.16100	3.0406E 05	0.16200	3.0216E 05	0.16300	3.0112E 05	0.16400	3.0112E 05
0.16500	2.9952E 05	0.16600	2.9734E 05	0.16700	2.9276E 05	0.16800	[illegible]	0.16900	2.9836E 05
0.17000	2.9273E 05	0.17100	2.9177E 05	0.17200	2.9104E 05	0.17300	[illegible]	0.17400	2.8996E 05
0.17500	2.8860E 05	0.17600	2.8913E 05	0.17700	2.8808E 05	0.17800	2.8857E 05	0.17900	2.8839E 05
0.18000	2.8029E 05	0.18100	2.8793E 05	0.18200	2.8773E 05	0.18300	2.8786E 05	0.18400	2.8713E 05
0.18500	2.8562E 05	[illegible]	2.8606E 05	0.18700	2.8681E 05	[illegible]	2.8603E 05	[illegible]	2.8606E 05
0.19000	2.8490E 05	0.19100	2.8454E 05	0.19200	2.8487E 05	0.19300	2.8390E 05	0.19400	2.8367E 05
0.19500	2.8303E 05	0.19600	2.8243E 05	0.19700	2.8203E 05	0.19800	2.9076E 05	0.19900	2.8104E 05
0.20000	2.7989E 05	0.20200	2.7938E 05	0.20400	2.7790E 05	0.20600	2.7623E 05	0.20800	2.7523E 05
0.21000	2.7416E 05	0.21200	2.7288E 05	0.21400	2.7143E 05	0.21600	2.6958E 05	0.21800	2.6870E 05
[illegible]	[illegible]	[illegible]	[illegible]	0.22400	2.6420E 05	0.22600	2.6361E 05	[illegible]	2.6202E 05
0.23000	2.6142E 05	0.23200	2.6095E 05	0.23400	2.6043E 05	0.23600	2.6003E 05	0.23800	2.5959E 05
0.24000	2.5016E 05	0.24200	2.6431E 05	0.24400	2.5120E 05	0.24600	[illegible]	0.24800	2.5737E 05
[illegible]	2.5746E 05	0.25200	2.5302E 05	0.25400	2.5667E 05	0.25600	2.5613E 05	[illegible]	2.5618E 05
0.26000	2.5649E 05	0.26200	2.5600E 05	0.26400	2.5572E 05	0.26600	2.1560E 05	[illegible]	2.5531E 05
[illegible]	[illegible]	0.27200	2.5181E 05	0.27400	2.5460E 05	[illegible]	[illegible]	[illegible]	2.5452E 05
[illegible]	[illegible]	0.28200	2.5371E 05	0.28400	2.5230E 05	0.28600	[illegible]	[illegible]	2.5511E 05
[illegible]	[illegible]	0.29200	2.5255E 05	0.29400	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0.30200	2.5074E 05	0.30400	2.5155E 05	[illegible]	[illegible]	[illegible]	[illegible]
0.31000	[illegible]	0.31200	2.4970E 05	0.31400	2.4031E 05	0.31600	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0.32200	2.4765E 05	0.32400	2.4731E 05	0.32600	[illegible]	[illegible]	2.4601E 05
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0.34200	2.4327E 05	0.34400	[illegible]	0.34600	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0.35200	2.4141E 05	0.35400	2.4127E 05	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0.36200	2.4029E 05	0.36400	2.3850E 05	0.36600	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0.37200	2.3903E 05	0.37400	2.3857E 05	0.37600	[illegible]	[illegible]	2.3777E 05
0.38000	2.3730E 05	0.38200	2.3705E 05	0.38400	2.3736E 05	0.38600	2.3765E 05	[illegible]	2.3752E 05
[illegible]	[illegible]	0.39200	2.3050E 05	0.39400	2.3820E 05	0.39600	2.3952E 05	[illegible]	2.4062E 05
0.40000	2.4246E 05	0.40200	2.4249E 05	0.40400	2.4279E 05	0.40600	2.4397E 05	0.40600	2.4465E 05
0.41000	2.4586E 05	0.41200	2.4607E 05	0.41400	2.4723E 05	0.41600	2.4703E 05	0.41800	2.4806E 05
0.42000	2.4708E 05	0.42200	2.4815E 05	0.42400	2.4738E 05	0.42600	2.4801E 05	0.42800	2.4765E 05
0.43000	2.1780E 05	0.43200	2.4691E 05	0.43400	2.4711E 05	0.43600	2.4627E 05	0.43800	2.4716E 05
0.44000	2.4561E 05	0.44200	2.4487E 05	0.44400	2.4402E 05	0.44600	2.4374E 05	0.44800	2.4335E 05
0.45000	2.4276E 05	0.45200	2.4249E 05	0.45400	2.4190E 05	0.45600	2.4162E 05	0.45800	2.4121E 05
0.46000	2.4045E 05	0.46200	[illegible]	0.46400	2.3947E 05	0.46600	2.3920E 05	0.46800	2.3847E 05
0.47000	2.3827E 05	0.47200	2.3802E 05	0.47400	2.3760E 05	0.47600	2.3724E 05	0.47600	2.3702E 05
0.48000	2.3707E 05	0.48200	2.3683E 05	0.48400	2.3690E 05	0.48600	2.3683E 05	0.48800	2.3693E 05
0.49000	2.3718E 05	0.49200	2.3663E 05	0.49400	2.3699E 05	0.49600	2.3673E 05	0.49800	2.3702E 05
0.50000	2.3682E 05	0.50110	2.3695E 05						

TABLE 6.A-11
(SHEET 29 OF 32)

TIME FUNCTION NUMBER = (18)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 2 [illegible]028 0. -469.9)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-4.6990E 02	0.00010	-4.6990E 02	0.00020	-4.6990E 02	0.00030	-4.6890E 02	0.00040	-4.6690E 02
0.00050	-4.6410E 02	0.00060	-4.5900E 02	0.00070	-4.5100E 02	0.00080	-4.4090E 02	0.00090	-4.2670E 02
0.00100	-4.0860E 02	0.00110	-3.8510E 02	0.00120	-3.5150E 02	0.00130	-3.0480E 02	0.00140	-2.4210E 02
0.00150	-1.6390E 02	0.00160	-6.8300E 01	0.00170	4.8700E 01	0.00180	1.8390E 02	0.00190	3.4080E 02
0.00200	5.2180E 02	0.00210	7.2470E 02	0.00220	9.5320E 02	0.00230	1.2067E 03	0.00240	1.4956E 03
0.00250	1.8154E 03	0.00260	2.1742E 03	0.00270	2.5662E 03	0.00280	2.9992E 03	0.00290	3.4748E 03
0.00300	3.9928E 03	0.00310	4.5553E 03	0.00320	5.1616E 03	0.00330	5.8129E 03	0.00340	6.5114E 03
0.00350	7.2575E 03	0.00360	8.0499E 03	0.00370	8.8817E 03	0.00380	9.7172E 03	0.00390	1.0552E 04
0.00400	1.1382E 04	0.00410	1.2214E 04	0.00420	1.3053E 04	0.00430	1.3893E 04	0.00440	1.4736E 04
0.00450	1.5581E 04	0.00460	1.6436E 04	0.00470	1.7297E 04	0.00480	1.8167E 04	0.00490	1.9052E 04
0.00500	1.9954E 04	0.00510	2.0866E 04	0.00520	2.1798E 04	0.00530	2.2748E 04	0.00540	2.3718E 04
0.00550	2.4709E 04	0.00560	2.5721E 04	0.00570	2.6756E 04	0.00580	2.7816E 04	0.00590	2.8904E 04
0.00600	3.0018E 04	0.00610	3.1161E 04	0.00620	3.2330E 04	0.00630	3.3530E 04	0.00640	3.4765E 04
0.00650	3.6035E 04	0.00660	3.7341E 04	0.00670	3.8685E 04	0.00680	4.0066E 04	0.00690	4.1487E 04
0.00700	4.2950E 04	0.00710	4.4453E 04	0.00720	4.6001E 04	0.00730	4.7592E 04	0.00740	4.9230E 04
0.00750	5.0913E 04	0.00760	5.2648E 04	0.00770	5.4438E 04	0.00780	5.6201E 04	0.00790	5.8179E 04
0.00800	6.0133E 04	0.00810	6.2141E 04	0.00820	6.4205E 04	0.00830	6.6327E 04	0.00840	6.8513E 04
0.00850	7.0748E 04	0.00860	7.3044E 04	0.00870	7.5405E 04	0.00880	7.7827E 04	0.00890	8.0305E 04
0.00900	8.2850E 04	0.00910	8.5453E 04	0.00920	8.8126E 04	0.00930	9.0857E 04	0.00940	9.3650E 04
0.00950	9.6506E 04	0.00960	9.9427E 04	0.00970	1.0241E 05	0.00980	1.0546E 05	0.00990	1.0857E 05
0.01000	1.1175E 05	0.01010	1.1498E 05	0.01020	1.1828E 05	0.01030	1.2165E 05	0.01040	1.2508E 05
0.01050	1.2857E 05	0.01060	1.3215E 05	0.01070	1.3577E 05	0.01080	1.3947E 05	0.01090	1.4322E 05
0.01100	1.4704E 05	0.01110	1.5093E 05	0.01120	1.5054E 05	0.01130	1.5425E 05	0.01140	1.5799E 05
0.01150	1.6173E 05	0.01160	1.6549E 05	0.01170	1.6925E 05	0.01180	1.7306E 05	0.01190	1.7709E 05
0.01200	1.8120E 05	0.01210	1.8538E 05	0.01220	1.8963E 05	0.01230	1.9395E 05	0.01240	1.9834E 05
0.01250	2.0280E 05	0.01260	2.0733E 05	0.01270	2.1192E 05	0.01280	2.1665E 05	0.01290	2.2137E 05
0.01300	2.2616E 05	0.01310	2.3102E 05	0.01320	2.3595E 05	0.01330	2.4094E 05	0.01340	2.4600E 05
0.01350	2.5112E 05	0.01360	2.5630E 05	0.01370	2.6155E 05	0.01380	2.6686E 05	0.01390	2.7224E 05
0.01400	2.7767E 05	0.01410	2.8317E 05	0.01420	2.8873E 05	0.01430	2.9435E 05	0.01440	3.0004E 05
0.01450	3.0578E 05	0.01460	3.1157E 05	0.01470	3.1744E 05	0.01480	3.2339E 05	0.01490	3.2941E 05
0.01500	3.3551E 05	0.01510	3.4169E 05	0.01520	3.4794E 05	0.01530	3.5426E 05	0.01540	3.6066E 05
0.01550	3.6713E 05	0.01560	3.7367E 05	0.01570	3.8027E 05	0.01580	3.8695E 05	0.01590	3.9369E 05
0.01600	4.0051E 05	0.01610	4.0738E 05	0.01620	4.1432E 05	0.01630	4.2133E 05	0.01640	4.2840E 05
0.01650	4.3553E 05	0.01660	4.4273E 05	0.01670	4.4998E 05	0.01680	4.5730E 05	0.01690	4.6469E 05
0.01700	4.7213E 05	0.01710	4.7964E 05	0.01720	4.8735E 05	0.01730	4.9497E 05	0.01740	5.0265E 05
0.01750	5.1039E 05	0.01760	5.1819E 05	0.01770	5.2605E 05	0.01780	5.3397E 05	0.01790	5.4193E 05
0.01800	5.4993E 05	0.01810	5.5798E 05	0.01820	5.6608E 05	0.01830	5.7422E 05	0.01840	5.8239E 05
0.01850	5.9060E 05	0.01860	5.9885E 05	0.01870	6.0713E 05	0.01880	6.1543E 05	0.01890	6.2377E 05
0.01900	6.3212E 05	0.01910	6.4050E 05	0.01920	6.4882E 05	0.01930	6.5730E 05	0.01940	6.6569E 05
0.01950	6.6605E 05	0.01960	6.7450E 05	0.01970	6.8286E 05	0.01980	6.9112E 05	0.01990	6.9930E 05
0.02000	7.0739E 05	0.02010	7.1541E 05	0.02020	7.2331E 05	0.02030	7.3113E 05	0.02040	7.3889E 05
0.02050	7.4661E 05	0.02060	7.5421E 05	0.02070	7.6179E 05	0.02080	7.6930E 05	0.02090	7.7674E 05
0.02100	7.8411E 05	0.02110	7.9144E 05	0.02120	7.9871E 05	0.02130	8.0587E 05	0.02140	8.1302E 05
0.02150	8.2011E 05	0.02160	8.2500E 05	0.02170	8.3193E 05	0.02180	8.3892E 05	0.02190	8.4596E 05
0.02200	8.5295E 05	0.02210	8.5989E 05	0.02220	8.6674E 05	0.02230	8.7355E 05	0.02240	8.8031E 05
0.02250	8.8701E 05	0.02260	8.9364E 05	0.02270	9.0023E 05	0.02280	9.0683E 05	0.02290	9.1323E 05
0.02300	9.1957E 05	0.02310	9.1743E 05	0.02320	9.2331E 05	0.02330	9.2934E 05	0.02340	9.3529E 05
0.02350	9.4110E 05	0.02360	9.4380E 05	0.02370	9.4953E 05	0.02380	9.5518E 05	0.02390	9.6079E 05
0.02400	9.6628E 05	0.02410	9.7174E 05	0.02420	9.7713E 05	0.02430	9.8246E 05	0.02440	9.8772E 05
0.02450	9.9289E 05	0.02460	9.9802E 05	0.02470	1.0031E 06	0.02480	1.0081E 06	0.02490	1.0130E 06
0.02500	1.0179E 06	0.02600	1.0646E 06	0.02700	1.1068E 06	0.02800	1.1347E 06	0.02900	1.1670E 06
0.03000	1.1952E 06	0.03100	1.2155E 06	0.03200	1.2359E 06	0.03300	1.2535E 06	0.03400	1.2673E 06
0.03500	1.2777E 06	0.03600	1.2842E 06	0.03700	1.2870E 06	0.03800	1.2864E 06	0.03900	1.2826E 06

TABLE 6.A-11
(SHEET 30 OF 32)

0.04000	1.2756E 06	0.04100	1.2658E 06	0.04200	1.2534E 06	0.04300	1.2383E 06	0.04400	1.2208E 06
0.04500	1.2034E 06	0.04600	1.1820E 06	0.04700	1.1595E 06	0.04800	1.1365E 06	0.04900	1.1133E 06
0.05000	1.0902E 06	0.05100	1.0681E 06	0.05200	1.0343E 06	0.05300	1.0116E 06	0.05400	9.9704E 05
0.05500	9.6936E 05	0.05600	9.5207E 05	0.05700	9.3449E 05	0.05800	9.1900E 05	0.05900	9.0599E 05
0.06000	8.9385E 05	0.06100	8.8192E 05	0.06200	8.7173E 05	0.06300	8.6657E 05	0.06400	8.5556E 05
0.06500	8.5315E 05	0.06600	8.4841E 05	0.06700	8.3098E 05	0.06800	8.3329E 05	0.06900	8.2587E 05
0.07000	8.2010E 05	0.07100	8.1367E 05	0.07200	8.0795E 05	0.07300	8.0232E 05	0.07400	7.9716E 05
0.07500	7.8990E 05	0.07600	7.8265E 05	0.07700	7.7568E 05	0.07800	7.6890E 05	0.07900	7.6158E 05
0.08000	7.5368E 05	0.08100	7.4571E 05	0.08200	7.3974E 05	0.08300	7.2909E 05	0.08400	7.2014E 05
0.08500	7.1155E 05	0.08600	7.0226E 05	0.08700	6.[illegible]319E 05	0.08800	6.8412E 05	0.08900	6.7517E 05
0.09000	6.6756E 05	0.09100	6.5672E 05	0.09200	6.4775E 05	0.09300	6.3908E 05	0.09400	6.3041E 05
0.09500	6.2218E 05	0.09600	6.1408E 05	0.09700	6.0709E 05	0.09800	5.9935E 05	0.09900	5.9251E 05
0.10000	5.8610E 05	0.10100	5.8026E 05	0.10200	5.7466E 05	0.10300	5.6940E 05	0.10400	5.6704E 05
0.10500	5.6016E 05	0.10600	5.5587E 05	0.10700	5.5162E 05	0.10800	5.4958E 05	0.10900	5.4532E 05
0.11000	5.4314E 05	0.11100	5.4104E 05	0.11200	5.3500E 05	0.11300	5.3830E 05	0.11400	5.2995E 05
0.11500	5.2748E 05	0.11600	5.2357E 05	0.11700	5.2278E 05	0.11800	5.2022E 05	0.11900	5.1890E 05
0.12000	5.1780E 05	0.12100	5.1656E 05	0.12200	5.1501E 05	0.12300	5.1521E 05	0.12400	5.1555E 05
0.12500	5.1616E 05	0.12600	5.1649E 05	0.12700	5.1932E 05	0.12800	5.2006E 05	0.12900	5.2329E 05
0.13000	5.2974E 05	0.13100	5.3001E 05	0.13200	5.3015E 05	0.13300	5.3508E 05	0.13400	5.3742E 05
0.13500	5.4109E 05	0.13600	5.4374E 05	0.13700	5.5129E 05	0.13800	5.5171E 05	0.13900	5.5801E 05
0.14000	5.6485E 05	0.14100	5.5880E 05	0.14200	5.6087E 05	0.14300	5.6351E 05	0.14400	5.6559E 05
0.14500	5.6825E 05	0.14600	5.6995E 05	0.14700	5.7130E 05	0.14800	5.7582E 05	0.14900	5.7494E 05
0.15000	5.7618E 05	0.15100	5.7971E 05	0.15200	5.6564E 05	0.15300	5.7789E 05	0.15400	5.8232E 05
0.15500	5.8261E 05	0.15600	5.8288E 05	0.15700	5.8387E 05	0.15800	5.8379E 05	0.15900	5.7908E 05
0.16000	5.8014E 05	0.16100	5.7468E 05	0.16200	5.7627E 05	0.16300	5.7628E 05	0.16400	5.7366E 05
0.16500	5.6998E 05	0.16600	5.6590E 05	0.16700	5.6517E 05	0.16800	5.6425E 05	0.16900	5.6989E 05
0.17000	5.5847E 05	0.17100	5.6002E 05	0.17200	5.5733E 05	0.17300	5.5571E 05	0.17400	5.5487E 05
0.17500	5.5661E 05	0.17600	5.4906E 05	0.17700	5.4625E 05	0.17800	5.5135E 05	0.17900	5.4478E 05
0.18000	5.4233E 05	0.18100	5.4195E 05	0.18200	5.3977E 05	0.18300	5.3691E 05	0.18400	5.3453E 05
0.18500	5.3095E 05	0.18600	5.2806E 05	0.18700	5.2403E 05	0.18800	5.2051E 05	0.18900	5.1705E 05
0.19000	5.1390E 05	0.19100	5.1113E 05	0.19200	5.0964E 05	0.19300	5.0429E 05	0.19400	5.0208E 05
0.19500	4.9960E 05	0.19600	4.9596E 05	0.19700	4.9427E 05	0.19800	4.9127E 05	0.19900	4.9190E 05
0.20000	4.8777E 05	0.20200	4.8388E 05	0.20400	4.8018E 05	0.20600	4.7477E 05	0.20800	4.7275E 05
0.21000	4.7170E 05	0.21200	4.7111E 05	0.21400	4.7231E 05	0.21600	4.7160E 05	0.21800	4.7459E 05
0.22000	4.8333E 05	0.22200	4.7777E 05	0.22400	4.8188E 05	0.22600	4.8314E 05	0.22800	4.9107E 05
0.23000	4.8506E 05	0.23200	4.8556E 05	0.23400	4.9052E 05	0.23600	4.8848E 05	0.23800	4.8768E 05
0.24000	4.8837E 05	0.24200	4.8827E 05	0.24400	4.8655E 05	0.24600	4.8278E 05	0.24800	4.8081E 05
0.25000	4.8048E 05	0.25200	4.7472E 05	0.25400	4.6976E 05	0.25600	4.6873E 05	0.25800	4.6577E 05
0.26000	4.6392E 05	0.26200	4.5937E 05	0.26400	4.5595E 05	0.26600	4.5185E 05	0.26800	4.4920E 05
0.27000	4.4753E 05	0.27200	4.4486E 05	0.27400	4.4597E 05	0.27600	4.4655E 05	0.27800	4.4784E 05
0.28000	4.4822E 05	0.28200	4.5024E 05	0.28400	4.5453E 05	0.28600	4.5395E 05	0.28800	4.5599E 05
0.29000	4.5550E 05	0.29200	4.5694E 05	0.29400	4.5840E 05	0.29600	4.5568E 05	0.29800	4.5578E 05
0.30000	4.5324E 05	0.30200	4.4874E 05	0.30400	4.[illegible]900E 05	0.30600	4.4460E 05	0.30800	4.4132E 05
0.31000	4.4026E 05	0.31200	4.3474E 05	0.31400	4.3258E 05	0.31600	4.2913E 05	0.31800	4.2733E 05
0.32000	4.2743E 05	0.32200	4.2738E 05	0.32400	4.2703E 05	0.32600	4.2872E 05	0.32800	4.2857E 05
0.33000	4.2976E 05	0.33200	4.3212E 05	0.33400	4.3184E 05	0.33600	4.3319E 05	0.33800	4.3532E 05
0.34000	4.3481E 05	0.34200	4.3605E 05	0.34400	4.3525E 05	0.34600	4.3844E 05	0.34800	4.3440E 05
0.35000	4.3451E 05	0.35200	4.3317E 05	0.35400	4.3132E 05	0.35600	4.2917E 05	0.35800	4.2585E 05
0.36000	4.2459E 05	0.36200	4.2338E 05	0.36400	4.2094E 05	0.36600	4.1818E 05	0.36800	4.1718E 05
0.37000	4.1690E 05	0.37200	4.1674E 05	0.37400	4.1650E 05	0.37600	4.1717E 05	0.37800	4.1784E 05
0.38000	4.1933E 05	0.38200	4.2194E 05	0.38400	4.2[illegible]69E 05	0.38600	4.2314E 05	0.38800	4.2289E 05
0.39000	4.2397E 05	0.39200	4.2449E 05	0.39400	4.2420E 05	0.39600	4.2415E 05	0.39800	4.2376E 05
0.40000	4.2858E 05	0.40200	4.2330E 05	0.40400	4.2234E 05	0.40600	4.2220E 05	0.40800	4.2228E 05
0.41000	4.2373E 05	0.41200	4.2283E 05	0.41400	4.2434E 05	0.41600	4.2401E 05	0.41800	4.2532E 05
0.42000	4.2591E 05	0.42200	4.2573E 05	0.42400	4.2594E 05	0.42600	4.2580E 05	0.42800	4.2574E 05
0.43000	4.2600E 05	0.43200	4.2437E 05	0.43400	4.2442E 05	0.43600	4.2310E 05	0.43800	4.2629E 05
0.44000	4.2118E 05	0.44200	4.2018E 05	0.44400	4.1851E 05	0.44600	4.1845E 05	0.44800	4.1827E 05
0.45000	4.1734E 05	0.45200	4.1718E 05	0.45400	4.1678E 05	0.45600	4.1645E 05	0.45800	4.1700E 05
0.46000	4.1546E 05	0.46200	4.1591E 05	0.46400	4.1462E 05	0.46600	4.1489E 05	0.46800	4.1359E 05
0.47000	4.1378E 05	0.47200	4.1367E 05	0.47400	4.1286E 05	0.47600	4.1252E 05	0.47800	4.1195E 05
0.48000	4.1197E 05	0.48200	4.1180E 05	0.48400	4.1189E 05	0.48600	4.1181E 05	0.48800	4.1191E 05
0.49000	4.1311E 05	0.49200	4.1193E 05	0.49400	4.1253E 05	0.49600	4.1151E 05	0.49800	4.1229E 05
0.50000	4.1145E 05	0.50110	4.1226E 05						

TABLE 6.A-11
(SHEET 31 OF 32)

TIME FUNCTION NUMBER = (16)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 1 [illegible]>02S 0. 1588.4)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	1.5884E 03	0.00010	1.5884E 03	0.00020	1.5884E 03	0.00030	1.5884E 03	0.00040	1.5884E 03
0.00050	1.5884E 03	0.00060	1.5884E 03	0.00070	1.5884E 03	0.00080	1.5884E 03	0.00090	1.5884E 03
0.00100	1.5884E 03	0.00110	1.5884E 03	0.00120	1.5884E 03	0.00130	1.5884E 03	0.00140	1.5884E 03
0.00150	1.5889E 03	0.00160	1.5889E 03	0.00170	1.5889E 03	0.00180	1.5889E 03	0.00190	1.5889E 03
0.00200	1.5889E 03	0.00210	1.5889E 03	0.00220	1.5889E 03	0.00230	1.5887E 03	0.00240	1.5892E 03
0.00250	1.5894E 03	0.00260	1.5894E 03	0.00270	1.5894E 03	0.00280	1.5881E 03	0.00290	1.5881E 03
0.00300	1.5881E 03	0.00310	1.5887E 03	0.00320	1.5887E 03	0.00330	1.5887E 03	0.00340	1.5887E 03
0.00350	1.5887E 03	0.00360	1.5887E 03	0.00370	1.5892E 03	0.00380	1.5892E 03	0.00390	1.5892E 03
0.00400	1.5892E 03	0.00410	1.5892E 03	0.00420	1.5900E 03	0.00430	1.5900E 03	0.00440	1.5900E 03
0.00450	1.5900E 03	0.00460	1.5905E 03	0.00470	1.5905E 03	0.00480	1.5905E 03	0.00490	1.5905E 03
0.00500	1.5907E 03	0.00510	1.5913E 03	0.00520	1.5900E 03	0.00530	1.5902E 03	0.00540	1.5902E 03
0.00550	1.5904E 03	0.00560	1.5904E 03	0.00570	1.5906E 03	0.00580	1.5908E 03	0.00590	1.5915E 03
0.00600	1.5918E 03	0.00610	1.5920E 03	0.00620	1.5925E 03	0.00630	1.5932E 03	0.00640	1.5949E 03
0.00650	1.5953E 03	0.00660	1.5958E 03	0.00670	1.5969E 03	0.00680	1.5975E 03	0.00690	1.5983E 03
0.00700	1.5989E 03	0.00710	1.6003E 03	0.00720	1.6008E 03	0.00730	1.6016E 03	0.00740	1.6031E 03
0.00750	1.6047E 03	0.00760	1.6062E 03	0.00770	1.6075E 03	0.00780	1.6093E 03	0.00790	1.6109E 03
0.00800	1.6134E 03	0.00810	1.6155E 03	0.00820	1.6190E 03	0.00830	1.6216E 03	0.00840	1.6255E 03
0.00850	1.6283E 03	0.00860	1.6313E 03	0.00870	1.6347E 03	0.00880	1.6401E 03	0.00890	1.6440E 03
0.00900	1.6493E 03	0.00910	1.6537E 03	0.00920	1.6599E 03	0.00930	1.6655E 03	0.00940	1.6733E 03
0.00950	1.6802E 03	0.00960	1.6858E 03	0.00970	1.6940E 03	0.00980	1.7021E 03	0.00990	1.7106E 03
0.01000	1.7209E 03	0.01010	1.7303E 03	0.01020	1.7404E 03	0.01030	1.7536E 03	0.01040	1.7656E 03
0.01050	1.7782E 03	0.01060	1.7911E 03	0.01070	1.8053E 03	0.01080	1.8194E 03	0.01090	1.8359E 03
0.01100	1.8525E 03	0.01110	1.8710E 03	0.01120	1.8887E 03	0.01130	1.9077E 03	0.01140	1.9279E 03
0.01150	1.9493E 03	0.01160	1.9722E 03	0.01170	1.9944E 03	0.01180	2.0206E 03	0.01190	2.0457E 03
0.01200	2.0734E 03	0.01210	2.1012E 03	0.01220	2.1313E 03	0.01230	2.1625E 03	0.01240	2.1948E 03
0.01250	2.2287E 03	0.01260	2.2631E 03	0.01270	2.2996E 03	0.01280	2.3377E 03	0.01290	2.3772E 03
0.01300	2.4189E 03	0.01310	2.4626E 03	0.01320	2.5071E 03	0.01330	2.5529E 03	0.01340	2.6013E 03
0.01350	2.6526E 03	0.01360	2.7036E 03	0.01370	2.7586E 03	0.01380	2.8139E 03	0.01390	2.8704E 03
0.01400	2.9316E 03	0.01410	2.9941E 03	0.01420	3.0578E 03	0.01430	3.1238E 03	0.01440	3.1945E 03
0.01450	3.2648E 03	0.01460	3.3385E 03	0.01470	3.4130E 03	0.01480	3.4914E 03	0.01490	3.5739E 03
0.01500	3.6571E 03	0.01510	3.7426E 03	0.01520	3.8309E 03	0.01530	3.9234E 03	0.01540	4.0173E 03
0.01550	4.1132E 03	0.01560	4.2138E 03	0.01570	4.3171E 03	0.01580	4.4227E 03	0.01590	4.5315E 03
0.01600	4.6435E 03	0.01610	4.7591E 03	0.01620	4.8774E 03	0.01630	4.9989E 03	0.01640	5.1232E 03
0.01650	5.2515E 03	0.01660	5.3844E 03	0.01670	5.5184E 03	0.01680	5.6559E 03	0.01690	5.7979E 03
0.01700	5.9445E 03	0.01710	6.0935E 03	0.01720	6.2467E 03	0.01730	6.4031E 03	0.01740	6.5654E 03
0.01750	6.7288E 03	0.01760	6.8966E 03	0.01770	7.0688E 03	0.01780	7.2448E 03	0.01790	7.4261E 03
0.01800	7.6094E 03	0.01810	7.7976E 03	0.01820	7.9913E 03	0.01830	8.1873E 03	0.01840	8.3875E 03
0.01850	8.5931E 03	0.01860	8.8046E 03	0.01870	9.0185E 03	0.01880	9.2369E 03	0.01890	9.4599E 03
0.01900	9.6868E 03	0.01910	9.9190E 03	0.01920	1.0156E 04	0.01930	1.0397E 04	0.01940	1.0643E 04
0.01950	1.0893E 04	0.01960	1.1148E 04	0.01970	1.1407E 04	0.01980	1.1673E 04	0.01990	1.1943E 04
0.02000	1.2217E 04	0.02010	1.2497E 04	0.02020	1.2780E 04	0.02030	1.3069E 04	0.02040	1.3365E 04
0.02050	1.3662E 04	0.02060	1.3967E 04	0.02070	1.4275E 04	0.02080	1.4588E 04	0.02090	1.4907E 04
0.02100	1.5232E 04	0.02110	1.5560E 04	0.02120	1.5893E 04	0.02130	1.6230E 04	0.02140	1.6575E 04
0.02150	1.6924E 04	0.02160	1.7277E 04	0.02170	1.7637E 04	0.02180	1.7999E 04	0.02190	1.8368E 04
0.02200	1.8742E 04	0.02210	1.9121E 04	0.02220	1.9503E 04	0.02230	1.9893E 04	0.02240	2.0286E 04
0.02250	2.0685E 04	0.02260	2.1087E 04	0.02270	2.1495E 04	0.02280	2.1908E 04	0.02290	2.2326E 04
0.02300	2.2750E 04	0.02310	2.3178E 04	0.02320	2.3609E 04	0.02330	2.4047E 04	0.02340	2.4488E 04
0.02350	2.4933E 04	0.02360	2.5380E 04	0.02370	2.5834E 04	0.02380	2.6291E 04	0.02390	2.6752E 04
0.02400	2.7220E 04	0.02410	2.7689E 04	0.02420	2.8163E 04	0.02430	2.8641E 04	0.02440	2.9124E 04
0.02450	2.9610E 04	0.02460	3.0100E 04	0.02470	3.0592E 04	0.02480	3.1090E 04	0.02490	3.1592E 04
0.02500	3.2095E 04	0.02600	3.7322E 04	0.02700	4.2799E 04	0.02800	4.8521E 04	0.02900	5.4441E 04
0.03000	6.0349E 04	0.03100	6.6148E 04	0.03200	7.1685E 04	0.03300	7.6359E 04	0.03400	7.9967E 04
0.03500	8.2348E 04	0.03600	8.3199E 04	0.03700	8.2510E 04	0.03800	8.0371E 04	0.03900	7.6886E 04

TABLE 6.A-11
(SHEET 32 OF 32)

0.04000	7.2378E 04	0.04100	6.7382E 04	0.04200	6.[illegible]69E 04	0.04300	5.6603E 04	0.04400	5.1079E 04
0.04500	4.5723E 04	0.04600	4.1012E 04	0.04700	3.6925E 04	0.04800	3.3404E 04	0.04900	3.0392E 04
0.05000	2.7780E 04	0.05100	2.5146E 04	0.05200	2.0822E 04	0.05300	1.8984E 04	0.05400	1.7378E 04
0.05500	1.5887E 04	0.05600	1.4440E 04	0.05700	1.2877E 04	0.05800	1.1415E 04	0.05900	9.9911E 03
0.06000	7.6917E 03	0.06100	6.6785E 03	0.06200	4.5991E 03	0.06300	1.9611E 03	0.06400	-7.7600E 02
0.06500	-3.5337E 03	0.06600	-6.0550E 03	0.06700	-8.3501E 03	0.06800	-1.0454E 04	0.06900	-1.2407E 04
0.07000	-1.4127E 04	0.07100	-1.5688E 04	0.07200	-1.7005E 04	0.07300	-1.8094E 04	0.07400	-1.8853E 04
0.07500	-1.9664E 04	0.07600	-2.0448E 04	0.07700	-2.0820E 04	0.07800	-2.1056E 04	0.07900	-2.1164E 04
0.08000	-2.1148E 04	0.08100	-2.0968E 04	0.08200	-2.0714E 04	0.08300	-2.0337E 04	0.08400	-1.9895E 04
0.08500	-1.9406E 04	0.08600	-1.8828E 04	0.08700	-1.8165E 04	0.08800	-1.7413E 04	0.08900	-1.6651E 04
0.09000	-1.5709E 04	0.09100	-1.5229E 04	0.09200	-1.4477E 04	0.09300	-1.3713E 04	0.09400	-1.2929E 04
0.09500	-1.2165E 04	0.09600	-1.1443E 04	0.09700	-1.0753E 04	0.09800	-1.0116E 04	0.09900	-9.5191E 03
0.10000	-8.9781E 03	0.10100	-8.5005E 03	0.10200	-8.0822E 03	0.10300	-7.7423E 03	0.10400	-7.1377E 03
0.10500	-7.2434E 03	0.10600	-7.0866E 03	0.10700	-6.8923E 03	0.10800	-6.7007E 03	0.10900	-5.6726E 03
0.11000	-6.6856E 03	0.11100	-6.4322E 03	0.11200	-7.0285E 03	0.11300	-6.3813E 03	0.11400	-7.4746E 03
0.11500	-7.6691E 03	0.11600	-7.9223E 03	0.11700	-7.6939E 03	0.11800	-7.6582E 03	0.11900	-7.3113E 03
0.12000	-6.9182E 03	0.12100	-6.5576E 03	0.12200	-6.2634E 03	0.12300	-5.5680E 03	0.12400	-5.0124E 03
0.12500	-4.4183E 03	0.12600	-4.5262E 03	0.12700	-3.4112E 03	0.12800	-2.9706E 03	0.12900	-3.1315E 03
0.13000	-1.5994E 03	0.13100	-3.6120E 02	0.13200	1.0507E 03	0.13300	1.2205E 03	0.13400	2.1731E 03
0.13500	5.4583E 03	0.13600	3.3410E 03	0.13700	4.8382E 03	0.13800	7.6696E 03	0.13900	9.1317E 03
0.14000	9.8346E 03	0.14100	8.6587E 03	0.14200	9.7136E 03	0.14300	1.0096E 04	0.14400	1.1109E 04
0.14500	1.2264E 04	0.14600	1.2196E 04	0.14700	1.2792E 04	0.14800	1.3452E 04	0.14900	1.3690E 04
0.15000	1.4142E 04	0.15100	1.5105E 04	0.15200	1.5972E 04	0.15300	1.4642E 04	0.15400	1.5183E 04
0.15500	1.5039E 04	0.15600	1.4766E 04	0.15700	1.4664E 04	0.15800	1.4458E 04	0.15900	1.3490E 04
0.16000	1.3458E 04	0.16100	1.2580E 04	0.16200	1.2497E 04	0.16300	1.2855E 04	0.16400	1.2104E 04
0.16500	1.2155E 04	0.16600	1.1420E 04	0.16700	1.0628E 04	0.16800	9.6509E 03	0.16900	1.0940E 04
0.17000	1.0076E 04	0.17100	1.0943E 04	0.17200	1.0153E 04	0.17300	9.9486E 03	0.17400	9.7884E 03
0.17500	9.8373E 03	0.17600	8.5045E 03	0.17700	8.0714E 03	0.17800	9.2419E 03	0.17900	8.4467E 03
0.18000	8.3024E 03	0.18100	8.8020E 03	0.18200	8.9036E 03	0.18300	8.7472E 03	0.18400	9.0677E 03
0.18500	9.2691E 03	0.18600	9.5891E 03	0.18700	1.0106E 04	0.18800	1.0779E 04	0.18900	1.1922E 04
0.19000	1.4442E 04	0.19100	1.4661E 04	0.19200	1.3729E 04	0.19300	1.4957E 04	0.19400	1.5905E 04
0.19500	1.7647E 04	0.19600	1.7475E 04	0.19700	1.8189E 04	0.19800	2.3287E 04	0.19900	2.3397E 04
0.20000	2.4712E 04	0.20200	2.3435E 04	0.20400	2.3021E 04	0.20600	2.2452E 04	0.20800	2.0561E 04
0.21000	1.9581E 04	0.21200	1.7438E 04	0.21400	1.7258E 04	0.21600	1.4705E 04	0.21800	1.0043E 04
0.22000	9.3348E 03	0.22200	3.1665E 03	0.22400	6.2070E 02	0.22600	-2.0504E 03	0.22800	-4.6979E 03
0.23000	-4.1004E 03	0.23200	-7.0452E 03	0.23400	-3.1965E 03	0.23600	-3.2022E 03	0.23800	-6.1139E 03
0.24000	-4.1478E 03	0.24200	-2.0039E 03	0.24400	-1.5656E 03	0.24600	2.7000E 00	0.24800	4.4413E 03
0.25000	1.0847E 04	0.25200	1.2724E 04	0.25400	1.2729E 04	0.25600	1.8518E 04	0.25800	2.3466E 04
0.26000	2.3972E 04	0.26200	2.4225E 04	0.26400	2.5143E 04	0.26600	2.2880E 04	0.26800	2.2295E 04
0.27000	2.1759E 04	0.27200	2.0023E 04	0.27400	1.9070E 04	0.27600	1.5736E 04	0.27800	1.2467E 04
0.28000	9.7892E 03	0.28200	7.4295E 03	0.28400	5.4261E 03	0.28600	2.5227E 03	0.28800	5.8790E 02
0.29000	-7.2580E 02	0.29200	-1.1655E 03	0.29400	-2.4680E 02	0.29600	5.6320E 02	0.29800	2.3815E 03
0.30000	4.2673E 03	0.30200	6.7833E 03	0.30400	9.1571E 03	0.30600	1.1757E 04	0.30800	1.3978E 04
0.31000	1.6107E 04	0.31200	1.7789E 04	0.31400	1.8992E 04	0.31600	1.9720E 04	0.31800	1.9863E 04
0.32000	1.9609E 04	0.32200	1.9066E 04	0.32400	1.7937E 04	0.32600	1.6772E 04	0.32800	1.5475E 04
0.33000	1.3860E 04	0.33200	1.2504E 04	0.33400	1.1278E 04	0.33600	9.8803E 03	0.33800	9.0499E 03
0.34000	8.5382E 03	0.34200	8.1551E 03	0.34400	8.4514E 03	0.34600	8.6128E 03	0.34800	9.4352E 03
0.35000	1.0083E 04	0.35200	1.1231E 04	0.35400	1.2178E 04	0.35600	1.3350E 04	0.35800	1.4244E 04
0.36000	1.5437E 04	0.36200	1.6093E 04	0.36400	1.6908E 04	0.36600	1.7147E 04	0.36800	1.7478E 04
0.37000	1.7258E 04	0.37200	1.7097E 04	0.37400	1.6362E 04	0.37600	1.5779E 04	0.37800	1.4732E 04
0.38000	1.3901E 04	0.38200	1.2787E 04	0.38400	1.2109E 04	0.38600	1.1285E 04	0.38800	1.0988E 04
0.39000	1.0501E 04	0.39200	1.0573E 04	0.39400	1.0544E 04	0.39600	1.0923E 04	0.39800	1.1235E 04
0.40000	1.1805E 04	0.40200	1.2212E 04	0.40400	1.2890E 04	0.40600	1.3257E 04	0.40800	1.3717E 04
0.41000	1.3633E 04	0.41200	1.4081E 04	0.41400	1.3887E 04	0.41600	1.3950E 04	0.41800	1.3604E 04
0.42000	1.3529E 04	0.42200	1.3171E 04	0.42400	1.3040E 04	0.42600	1.2750E 04	0.42800	1.2714E 04
0.43000	1.2492E 04	0.43200	1.2620E 04	0.43400	1.2473E 04	0.43600	1.2775E 04	0.43800	1.2781E 04
0.44000	1.3146E 04	0.44200	1.3460E 04	0.44400	1.3769E 04	0.44600	1.3960E 04	0.44800	1.4129E 04
0.45000	1.4275E 04	0.45200	1.4269E 04	0.45400	1.4343E 04	0.45600	1.4246E 04	0.45800	1.4197E 04
0.46000	1.4054E 04	0.46200	1.3876E 04	0.46400	1.3708E 04	0.46600	1.3520E 04	0.46800	1.3372E 04
0.47000	1.3196E 04	0.47200	1.3024E 04	0.47400	1.2908E 04	0.47600	1.2802E 04	0.47800	1.2748E 04
0.48000	1.2594E 04	0.48200	1.2564E 04	0.48400	1.2432E 04	0.48600	1.2434E 04	0.48800	1.2325E 04
0.49000	1.2316E 04	0.49200	1.2273E 04	0.49400	1.2343E 04	0.49600	1.2387E 04	0.49800	1.2428E 04
0.50000	1.2513E 04	0.50110	1.2636E 04						

TABLE 6.A-12
(SHEET 1 OF 28)

TIME FORCE HISTORIES - FEEDWATER LINE BREAK

LASALLE
FEED WATER LINE BREAK

TIME FUNCTION NUMBER = (1)
FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 30 00>02$ 0. 0.2)
NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	2.0000E-01	0.00010	2.0000E-01	0.00020	2.0000E-01	0.00030	2.0000E-01	0.00040	2.0000E-01
0.00050	2.0000E-01	0.00060	2.0000E-01	0.00070	2.0000E-01	0.00080	2.0000E-01	0.00090	2.0000E-01
0.00100	2.0000E-01	0.00110	2.0000E-01	0.00120	2.0000E-01	0.00130	2.0000E-01	0.00140	2.0000E-01
0.00150	2.0000E-01	0.00160	2.0000E-01	0.00170	2.0000E-01	0.00180	2.0000E-01	0.00190	2.0000E-01
0.00200	2.0000E-01	0.00210	2.0000E-01	0.00220	2.0000E-01	0.00230	2.0000E-01	0.00240	2.0000E-01
0.00250	2.0000E-01	0.00260	2.0000E-01	0.00270	2.0000E-01	0.00280	2.0000E-01	0.00290	2.0000E-01
0.00300	2.0000E-01	0.00310	2.0000E-01	0.00320	2.0000E-01	0.00330	2.0000E-01	0.00340	2.0000E-01
0.00350	2.0000E-01	0.00360	2.0000E-01	0.00370	2.0000E-01	0.00380	2.0000E-01	0.00390	2.0000E-01
0.00400	2.0000E-01	0.00410	2.0000E-01	0.00420	2.0000E-01	0.00430	2.0000E-01	0.00440	2.0000E-01
0.00450	2.0000E-01	0.00460	2.0000E-01	0.00470	2.0000E-01	0.00480	2.0000E-01	0.00490	2.0000E-01
0.00500	2.0000E-01	0.00510	2.0000E-01	0.00520	2.0000E-01	0.00530	2.0000E-01	0.00540	2.0000E-01
0.00550	2.0000E-01	0.00560	2.0000E-01	0.00570	2.0000E-01	0.00580	2.0000E-01	0.00590	2.0000E-01
0.00600	2.0000E-01	0.00610	2.0000E-01	0.00620	2.0000E-01	0.00630	2.0000E-01	0.00640	2.0000E-01
0.00650	2.0000E-01	0.00660	2.0000E-01	0.00670	2.0000E-01	0.00680	2.0000E-01	0.00690	2.0000E-01
0.00700	2.0000E-01	0.00710	2.0000E-01	0.00720	2.0000E-01	0.00730	2.0000E-01	0.00740	2.0000E-01
0.00750	2.0000E-01	0.00760	2.0000E-01	0.00770	2.0000E-01	0.00780	2.0000E-01	0.00790	2.0000E-01
0.00800	2.0000E-01	0.00810	-9.0000E-01	0.00820	2.0000E-01	0.00830	2.0000E-01	0.00840	2.0000E-01
0.00850	2.0000E-01	0.00860	2.0000E-01	0.00870	2.0000E-01	0.00880	2.0000E-01	0.00890	2.0000E-01
0.00900	2.0000E-01	0.00910	2.0000E-01	0.00920	2.0000E-01	0.00930	2.0000E-01	0.00940	2.0000E-01
0.00950	2.0000E-01	0.00960	2.0000E-01	0.00970	2.0000E-01	0.00980	2.0000E-01	0.00990	-9.0000E-01
0.01000	2.0000E-01	0.01010	2.0000E-01	0.01020	2.0000E-01	0.01030	2.0000E-01	0.01040	2.0000E-01
0.01050	2.0000E-01	0.01060	-9.0000E-01	0.01070	-9.0000E-01	0.01080	2.0000E-01	0.01090	2.0000E-01
0.01100	2.0000E-01	0.01110	2.0000E-01	0.01120	2.0000E-01	0.01130	2.0000E-01	0.01140	-9.0000E-01
0.01150	-9.0000E-01	0.01160	-1.3000E 00	0.01170	-9.0000E-01	0.01180	-9.0000E-01	0.01190	2.0000E-01
0.01200	2.0000E-01	0.01210	2.0000E-01	0.01220	2.0000E-01	0.01230	2.0000E-01	0.01240	-9.0000E-01
0.01250	-9.0000E-01	0.01260	-9.0000E-01	0.01270	-9.0000E-01	0.01280	-9.0000E-01	0.01290	-1.3000E 00
0.01300	-1.3000E 00	0.01310	-1.3000E 00	0.01320	-9.0000E-01	0.01330	-1.9000E 00	0.01340	-1.9000E 00
0.01350	-1.9000E 00	0.01360	-1.9000E 00	0.01370	-1.9000E 00	0.01380	-1.9000E 00	0.01390	-1.9000E 00
0.01400	-1.9000E 00	0.01410	-3.0000E 00	0.01420	-3.0000E 00	0.01430	-3.0000E 00	0.01440	-1.9000E 00
0.01450	-1.9000E 00	0.01460	-1.9000E 00	0.01470	-1.9000E 00	0.01480	-3.0000E 00	0.01490	-4.0000E 00
0.01500	-4.4000E 00	0.01510	-4.4000E 00	0.01520	-5.5000E 00	0.01530	-5.5000E 00	0.01540	-5.5000E 00
0.01550	-5.5000E 00	0.01560	-6.5000E 00	0.01570	-6.5000E 00	0.01580	-6.5000E 00	0.01590	-7.5000E 00
0.01600	-7.5000E 00	0.01610	-7.5000E 00	0.01620	-8.6000E 00	0.01630	-8.6000E 00	0.01640	-9.6000E 00
0.01650	-1.0100E 01	0.01660	-1.1100E 01	0.01670	-1.1100E 01	0.01680	-1.2100E 01	0.01690	-1.2100E 01
0.01700	-1.3200E 01	0.01710	-1.4200E 01	0.01720	-1.4200E 01	0.01730	-1.5700E 01	0.01740	-1.6700E 01
0.01750	-1.7800E 01	0.01760	-1.8800E 01	0.01770	-1.8800E 01	0.01780	-2.0300E 01	0.01790	-2.1300E 01
0.01800	-2.2400E 01	0.01810	-2.4500E 01	0.01820	-2.5900E 01	0.01830	-2.7000E 01	0.01840	-2.8000E 01
0.01850	-2.9500E 01	0.01860	-3.1600E 01	0.01870	-3.3000E 01	0.01880	-3.5100E 01	0.01890	-3.6600E 01
0.01900	-3.9700E 01	0.01910	-4.2200E 01	0.01920	-4.4300E 01	0.01930	-4.6800E 01	0.01940	-4.8900E 01
0.01950	-5.1400E 01	0.01960	-5.3900E 01	0.01970	-5.6000E 01	0.01980	-5.8500E 01	0.01990	-6.1600E 01
0.02000	-6.5200E 01	0.02010	-6.7700E 01	0.02020	-7.1300E 01	0.02030	-7.4800E 01	0.02040	-7.8400E 01
0.02050	-8.1900E 01	0.02060	-8.5500E 01	0.02070	-9.0100E 01	0.02080	-9.3600E 01	0.02090	-9.8200E 01
0.02100	-1.0330E 02	0.02110	-1.0780E 02	0.02120	-1.1240E 02	0.02130	-1.1700E 02	0.02140	-1.2210E 02
0.02150	-1.2710E 02	0.02160	-1.3170E 02	0.02170	-1.3770E 02	0.02180	-1.4380E 02	0.02190	-1.5050E 02
0.02200	-1.5660E 02	0.02210	-1.6370E 02	0.02220	-1.6970E 02	0.02230	-1.7730E 02	0.02240	-1.8540E 02
0.02250	-1.9250E 02	0.02260	-1.9960E 02	0.02270	-2.0780E 02	0.02280	-2.1680E 02	0.02290	-2.2600E 02
0.02300	-2.3460E 02	0.02310	-2.4310E 02	0.02320	-2.5280E 02	0.02330	-2.6240E 02	0.02340	-2.7240E 02
0.02350	-2.8310E 02	0.02360	-2.9380E 02	0.02370	-3.0490E 02	0.02380	-3.1660E 02	0.02390	-3.2660E 02
0.02400	-3.3870E 02	0.02410	-3.5240E 02	0.02420	-3.6410E 02	0.02430	-3.7770E 02	0.02440	-3.9020E 02
0.02450	-4.0440E 02	0.02460	-4.1910E 02	0.02470	-4.3420E 02	0.02480	-4.4840E 02	0.02490	-4.6300E 02
0.02500	-4.7960E 02	0.02600	-6.6170E 02	0.02700	-8.9090E 02	0.02800	-1.1706E 03	0.02900	-1.5041E 03
0.03000	-1.8888E 03	0.03100	-2.3197E 03	0.03200	-2.7881E 03	0.03300	-3.2822E 03	0.03400	-3.7836E 03
0.03500	-4.2740E 03	0.03600	-4.7285E 03	0.03700	-5.1219E 03	0.03800	-5.4261E 03	0.03900	-5.6179E 03

0.04000	-5.6759E 03	0.04100	-5.5912E 03	0.04200	-5.3591E 03	0.04300	-4.9848E 03	0.04400	-4.4764E 03
0.04500	-3.8491E 03	0.04600	-3.1263E 03	0.04700	-2.3258E 03	0.04800	-1.4750E 03	0.04900	-6.0120E 02
0.05000	2.6840E 02	0.05100	1.1061E 03	0.05200	1.8899E 03	0.05300	2.5988E 03	0.05400	3.2171E 03
0.05500	3.7419E 03	0.05600	4.1771E 03	0.05700	4.5187E 03	0.05800	4.7713E 03	0.05900	4.9372E 03
0.06000	5.0196E 03	0.06100	5.0368E 03	0.06200	4.9969E 03	0.06300	4.8984E 03	0.06400	4.7479E 03
0.06500	4.5410E 03	0.06600	4.2869E 03	0.06700	3.9829E 03	0.06800	3.6296E 03	0.06900	3.2299E 03
0.07000	2.7830E 03	0.07100	2.2941E 03	0.07200	1.7683E 03	0.07300	1.2097E 03	0.07400	6.2700E 02
0.07500	2.5800E 01	0.07600	-5.8240E 02	0.07700	-1.1914E 03	0.07800	-1.7929E 03	0.07900	-2.3802E 03
0.08000	-2.9452E 03	0.08100	-3.4857E 03	0.08200	-3.9974E 03	0.08300	-4.4766E 03	0.08400	-4.9232E 03
0.08500	-5.3319E 03	0.08600	-5.7033E 03	0.08700	-6.0338E 03	0.08800	-6.3215E 03	0.08900	-6.5630E 03
0.09000	-6.7545E 03	0.09100	-6.8868E 03	0.09200	-6.9629E 03	0.09300	-6.9777E 03	0.09400	-6.9330E 03
0.09500	-6.8258E 03	0.09600	-6.6557E 03	0.09700	-6.4262E 03	0.09800	-6.1417E 03	0.09900	-5.8031E 03
0.10000	-5.4163E 03	0.10100	-4.9926E 03	0.10200	-4.5302E 03	0.10300	-4.0423E 03	0.10400	-3.5320E 03
0.10500	-3.0078E 03	0.10600	-2.4792E 03	0.10700	-1.9503E 03	0.10800	-1.4276E 03	0.10900	-9.1660E 02
0.11000	-4.2280E 02	0.11100	5.2500E 01	0.11200	5.0160E 02	0.11300	9.2490E 02	0.11400	1.3174E 03
0.11500	1.6778E 03	0.11600	2.0045E 03	0.11700	2.2955E 03	0.11800	2.5494E 03	0.11900	2.7661E 03
0.12000	2.9437E 03	0.12100	3.0950E 03	0.12200	3.1947E 03	0.12300	3.2567E 03	0.12400	3.2799E 03
0.12500	3.2671E 03	0.12600	3.2192E 03	0.12700	3.1385E 03	0.12800	3.0261E 03	0.12900	2.8856E 03
0.13000	2.7182E 03	0.13100	2.5260E 03	0.13200	2.3151E 03	0.13300	2.0846E 03	0.13400	1.8392E 03
0.13500	1.5829E 03	0.13600	1.3162E 03	0.13700	1.0443E 03	0.13800	7.7130E 02	0.13900	4.9690E 02
0.14000	2.2710E 02	0.14100	-3.7900E 01	0.14200	-2.9570E 02	0.14300	-5.4140E 02	0.14400	-7.7540E 02
0.14500	-9.9560E 02	0.14600	-1.2018E 03	0.14700	-1.3919E 03	0.14800	-1.5657E 03	0.14900	-1.7228E 03
0.15000	-1.8628E 03	0.15100	-1.9864E 03	0.15200	-2.0914E 03	0.15300	-2.1809E 03	0.15400	-2.2533E 03
0.15500	-2.3095E 03	0.15600	-2.3506E 03	0.15700	-2.3767E 03	0.15800	-2.3892E 03	0.15900	-2.3865E 03
0.16000	-2.3724E 03	0.16100	-2.3457E 03	0.16200	-2.3079E 03	0.16300	-2.2590E 03	0.16400	-2.2017E 03
0.16500	-2.1358E 03	0.16600	-2.0629E 03	0.16700	-1.9836E 03	0.16800	-1.8986E 03	0.16900	-1.8093E 03
0.17000	-1.7189E 03	0.17100	-1.6236E 03	0.17200	-1.5293E 03	0.17300	-1.4350E 03	0.17400	-1.3413E 03
0.17500	-1.2492E 03	0.17600	-1.1585E 03	0.17700	-1.0700E 03	0.17800	-9.8600E 02	0.17900	-9.0450E 02
0.18000	-8.2560E 02	0.18100	-7.5270E 02	0.18200	-6.8190E 02	0.18300	-6.1410E 02	0.18400	-5.5230E 02
0.18500	-4.9150E 02	0.18600	-4.3580E 02	0.18700	-3.8240E 02	0.18800	-3.3320E 02	0.18900	-2.8740E 02
0.19000	-2.4300E 02	0.19100	-2.0160E 02	0.19200	-1.6410E 02	0.19300	-1.2960E 02	0.19400	-9.6200E 01
0.19500	-6.7600E 01	0.19600	-4.1500E 01	0.19700	-1.6800E 01	0.19800	2.3000E 00	0.19900	1.9400E 01
0.20000	3.2500E 01	0.20200	4.8800E 01	0.20400	4.4300E 01	0.20600	2.3800E 01	0.20800	-1.5100E 01
0.21000	-7.0900E 01	0.21200	-1.4380E 02	0.21400	-2.3060E 02	0.21600	-3.2870E 02	0.21800	-4.3830E 02
0.22000	-5.5690E 02	0.22200	-6.7920E 02	0.22400	-8.0340E 02	0.22600	-9.2610E 02	0.22800	-1.0411E 03
0.23000	-1.1474E 03	0.23200	-1.2375E 03	0.23400	-1.3139E 03	0.23600	-1.3699E 03	0.23800	-1.4049E 03
0.24000	-1.4191E 03	0.24200	-1.4199E 03	0.24400	-1.3967E 03	0.24600	-1.3490E 03	0.24800	-1.2721E 03
0.25000	-1.1810E 03	0.25200	-1.0776E 03	0.25400	-9.6740E 02	0.25600	-8.5190E 02	0.25800	-7.3170E 02
0.26000	-6.1250E 02	0.26200	-4.9590E 02	0.26400	-3.8650E 02	0.26600	-2.8780E 02	0.26800	-2.0030E 02
0.27000	-1.3020E 02	0.27200	-7.9800E 01	0.27400	-4.5600E 01	0.27600	-3.0600E 01	0.27800	-3.1800E 01
0.28000	-4.4100E 01	0.28200	-6.9400E 01	0.28400	-9.7400E 01	0.28600	-1.2700E 02	0.28800	-1.5580E 02
0.29000	-1.8490E 02	0.29200	-2.0210E 02	0.29400	-2.0830E 02	0.29600	-2.0530E 02	0.29800	-1.9070E 02
0.30000	-1.6620E 02	0.30200	-1.3450E 02	0.30400	-9.7500E 01	0.30600	-5.9200E 01	0.30800	-2.4300E 01
0.31000	-1.6000E 00	0.31200	3.3000E 00	0.31400	-1.5000E 01	0.31600	-6.2600E 01	0.31800	-1.4000E 02
0.32000	-2.4680E 02	0.32200	-3.7820E 02	0.32400	-5.2830E 02	0.32600	-6.8770E 02	0.32800	-8.4860E 02
0.33000	-1.0001E 03	0.33200	-1.1316E 03	0.33400	-1.2342E 03	0.33600	-1.3021E 03	0.33800	-1.3298E 03
0.34000	-1.3135E 03	0.34200	-1.2544E 03	0.34400	-1.1533E 03	0.34600	-1.0176E 03	0.34800	-8.4920E 02
0.35000	-6.5700E 02	0.35200	-4.4860E 02	0.35400	-2.3200E 02	0.35600	-1.5600E 01	0.35800	1.9490E 02
0.36000	3.9240E 02	0.36200	5.7060E 02	0.36400	7.2810E 02	0.36600	8.6090E 02	0.36800	9.6640E 02
0.37000	1.0463E 03	0.37200	1.1000E 03	0.37400	1.1293E 03	0.37600	1.1362E 03	0.37800	1.1217E 03
0.38000	1.0900E 03	0.38200	1.0427E 03	0.38400	9.8170E 02	0.38600	9.0930E 02	0.38800	8.2860E 02
0.39000	7.3890E 02	0.39200	6.4490E 02	0.39400	5.4800E 02	0.39600	4.4730E 02	0.39800	3.4530E 02
0.40000	2.4560E 02	0.40200	1.4580E 02	0.40400	4.9500E 01	0.40600	-4.1000E 01	0.40800	-1.2620E 02
0.41000	-2.0590E 02	0.41200	-2.7650E 02	0.41400	-3.4190E 02	0.41600	-3.9030E 02	0.41800	-4.2740E 02
0.42000	-4.5210E 02	0.42200	-4.6490E 02	0.42400	-4.6810E 02	0.42600	-4.6560E 02	0.42800	-4.5730E 02
0.43000	-4.4460E 02	0.43200	-4.2760E 02	0.43400	-4.0320E 02	0.43600	-3.7240E 02	0.43800	-3.3570E 02
0.44000	-2.9240E 02	0.44200	-2.4420E 02	0.44400	-1.9390E 02	0.44600	-1.4100E 02	0.44800	-8.9200E 01
0.45000	-4.0300E 01	0.45200	5.1000E 00	0.45400	4.5000E 01	0.45600	8.1000E 01	0.45800	1.1140E 02
0.46000	1.3230E 02	0.46200	1.4750E 02	0.46400	1.5760E 02	0.46600	1.6590E 02	0.46800	1.7540E 02
0.47000	1.8400E 02	0.47200	1.9700E 02	0.47400	2.1360E 02	0.47600	2.3280E 02	0.47800	2.5600E 02
0.48000	2.8390E 02	0.48200	3.1150E 02	0.48400	3.4230E 02	0.48600	3.7290E 02	0.48800	4.0490E 02
0.49000	4.3390E 02	0.49200	4.6170E 02	0.49400	4.8650E 02	0.49600	5.0880E 02	0.49800	5.2810E 02
0.50000	5.4240E 02	0.50200	5.5330E 02						

TABLE 6.A-12
(SHEET 3 OF 28)

TIME FUNCTION NUMBER = (2)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 31 00>02$ 0. 0:3)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	3.0000E-01	0.00010	3.0000E-01	0.00020	3.0000E-01	0.00030	3.0000E-01	0.00040	3.0000E-01
0.00050	3.0000E-01	0.00060	3.0000E-01	0.00070	3.0000E-01	0.00080	3.0000E-01	0.00090	3.0000E-01
0.00100	3.0000E-01	0.00110	3.0000E-01	0.00120	3.0000E-01	0.00130	3.0000E-01	0.00140	3.0000E-01
0.00150	3.0000E-01	0.00160	3.0000E-01	0.00170	3.0000E-01	0.00180	3.0000E-01	0.00190	3.0000E-01
0.00200	3.0000E-01	0.00210	3.0000E-01	0.00220	3.0000E-01	0.00230	3.0000E-01	0.00240	3.0000E-01
0.00250	3.0000E-01	0.00260	3.0000E-01	0.00270	3.0000E-01	0.00280	3.0000E-01	0.00290	3.0000E-01
0.00300	3.0000E-01	0.00310	3.0000E-01	0.00320	3.0000E-01	0.00330	3.0000E-01	0.00340	3.0000E-01
0.00350	3.0000E-01	0.00360	3.0000E-01	0.00370	3.0000E-01	0.00380	3.0000E-01	0.00390	3.0000E-01
0.00400	-9.0000E-01	0.00410	3.0000E-01	0.00420	3.0000E-01	0.00430	3.0000E-01	0.00440	3.0000E-01
0.00450	3.0000E-01	0.00460	3.0000E-01	0.00470	3.0000E-01	0.00480	3.0000E-01	0.00490	3.0000E-01
0.00500	3.0000E-01	0.00510	3.0000E-01	0.00520	3.0000E-01	0.00530	3.0000E-01	0.00540	3.0000E-01
0.00550	3.0000E-01	0.00560	3.0000E-01	0.00570	3.0000E-01	0.00580	-9.0000E-01	0.00590	-9.0000E-01
0.00600	-9.0000E-01	0.00610	-9.0000E-01	0.00620	-9.0000E-01	0.00630	-9.0000E-01	0.00640	3.0000E-01
0.00650	3.0000E-01	0.00660	3.0000E-01	0.00670	3.0000E-01	0.00680	3.0000E-01	0.00690	3.0000E-01
0.00700	3.0000E-01	0.00710	3.0000E-01	0.00720	3.0000E-01	0.00730	3.0000E-01	0.00740	3.0000E-01
0.00750	3.0000E-01	0.00760	3.0000E-01	0.00770	-9.0000E-01	0.00780	-9.0000E-01	0.00790	-9.0000E-01
0.00800	-9.0000E-01	0.00810	-9.0000E-01	0.00820	-9.0000E-01	0.00830	-9.0000E-01	0.00840	-1.4000E 00
0.00850	-1.4000E 00	0.00860	-1.4000E 00	0.00870	-9.0000E-01	0.00880	-9.0000E-01	0.00890	-9.0000E-01
0.00900	-9.0000E-01	0.00910	-2.1000E 00	0.00920	-2.1000E 00	0.00930	-2.1000E 00	0.00940	-2.1000E 00
0.00950	-9.0000E-01	0.00960	-9.0000E-01	0.00970	-9.0000E-01	0.00980	-2.1000E 00	0.00990	-2.6000E 00
0.01000	-2.6000E 00	0.01010	-2.1000E 00	0.01020	-2.1000E 00	0.01030	-3.3000E 00	0.01040	-3.3000E 00
0.01050	-3.3000E 00	0.01060	-4.4000E 00	0.01070	-3.8000E 00	0.01080	-3.8000E 00	0.01090	-4.9000E 00
0.01100	-4.4000E 00	0.01110	-4.4000E 00	0.01120	-5.6000E 00	0.01130	-6.1000E 00	0.01140	-7.3000E 00
0.01150	-7.3000E 00	0.01160	-7.3000E 00	0.01170	-6.8000E 00	0.01180	-8.5000E 00	0.01190	-8.5000E 00
0.01200	-9.7000E 00	0.01210	-1.0900E 01	0.01220	-1.1400E 01	0.01230	-1.0900E 01	0.01240	-1.2100E 01
0.01250	-1.3200E 01	0.01260	-1.4900E 01	0.01270	-1.4900E 01	0.01280	-1.6100E 01	0.01290	-1.6100E 01
0.01300	-1.7300E 01	0.01310	-1.9700E 01	0.01320	-2.1300E 01	0.01330	-2.2500E 01	0.01340	-2.3200E 01
0.01350	-2.4900E 01	0.01360	-2.6100E 01	0.01370	-2.8900E 01	0.01380	-3.0100E 01	0.01390	-3.2000E 01
0.01400	-3.2500E 01	0.01410	-3.4900E 01	0.01420	-3.7700E 01	0.01430	-4.0100E 01	0.01440	-4.2500E 01
0.01450	-4.4200E 01	0.01460	-4.7700E 01	0.01470	-5.0600E 01	0.01480	-5.4100E 01	0.01490	-5.6500E 01
0.01500	-5.9400E 01	0.01510	-6.3400E 01	0.01520	-6.7000E 01	0.01530	-7.1000E 01	0.01540	-7.5100E 01
0.01550	-7.9100E 01	0.01560	-8.2700E 01	0.01570	-8.6700E 01	0.01580	-9.2000E 01	0.01590	-9.7200E 01
0.01600	-1.0200E 02	0.01610	-1.0720E 02	0.01620	-1.1290E 02	0.01630	-1.1940E 02	0.01640	-1.2530E 02
0.01650	-1.3220E 02	0.01660	-1.3790E 02	0.01670	-1.4390E 02	0.01680	-1.5200E 02	0.01690	-1.6010E 02
0.01700	-1.6770E 02	0.01710	-1.7580E 02	0.01720	-1.8270E 02	0.01730	-1.9150E 02	0.01740	-2.0080E 02
0.01750	-2.1050E 02	0.01760	-2.2050E 02	0.01770	-2.2910E 02	0.01780	-2.3960E 02	0.01790	-2.5120E 02
0.01800	-2.6220E 02	0.01810	-2.7390E 02	0.01820	-2.8650E 02	0.01830	-2.9820E 02	0.01840	-3.1080E 02
0.01850	-3.2370E 02	0.01860	-3.3700E 02	0.01870	-3.5200E 02	0.01880	-3.6650E 02	0.01890	-3.8200E 02
0.01900	-3.9660E 02	0.01910	-4.1280E 02	0.01920	-4.2940E 02	0.01930	-4.4680E 02	0.01940	-4.6470E 02
0.01950	-4.8210E 02	0.01960	-5.0000E 02	0.01970	-5.1900E 02	0.01980	-5.3930E 02	0.01990	-5.6000E 02
0.02000	-5.8080E 02	0.02010	-6.0270E 02	0.02020	-6.2460E 02	0.02030	-6.4600E 02	0.02040	-6.7020E 02
0.02050	-6.9450E 02	0.02060	-7.1970E 02	0.02070	-7.4500E 02	0.02080	-7.6980E 02	0.02090	-7.9580E 02
0.02100	-8.2390E 02	0.02110	-8.5160E 02	0.02120	-8.8040E 02	0.02130	-9.0860E 02	0.02140	-9.3910E 02
0.02150	-9.6960E 02	0.02160	-1.0018E 03	0.02170	-1.0328E 03	0.02180	-1.0655E 03	0.02190	-1.0989E 03
0.02200	-1.1335E 03	0.02210	-1.1678E 03	0.02220	-1.2046E 03	0.02230	-1.2408E 03	0.02240	-1.2781E 03
0.02250	-1.3160E 03	0.02260	-1.3551E 03	0.02270	-1.3940E 03	0.02280	-1.4348E 03	0.02290	-1.4744E 03
0.02300	-1.5169E 03	0.02310	-1.5598E 03	0.02320	-1.6040E 03	0.02330	-1.6469E 03	0.02340	-1.6927E 03
0.02350	-1.7381E 03	0.02360	-1.7839E 03	0.02370	-1.8321E 03	0.02380	-1.8796E 03	0.02390	-1.9283E 03
0.02400	-1.9786E 03	0.02410	-2.0290E 03	0.02420	-2.0805E 03	0.02430	-2.1326E 03	0.02440	-2.1841E 03
0.02450	-2.2378E 03	0.02460	-2.2922E 03	0.02470	-2.3472E 03	0.02480	-2.4037E 03	0.02490	-2.4581E 03
0.02500	-2.5164E 03	0.02600	-3.1309E 03	0.02700	-3.8023E 03	0.02800	-4.5195E 03	0.02900	-5.2585E 03
0.03000	-5.9951E 03	0.03100	-6.6967E 03	0.03200	-7.3394E 03	0.03300	-7.8910E 03	0.03400	-8.3296E 03
0.03500	-8.6390E 03	0.03600	-8.8111E 03	0.03700	-8.8420E 03	0.03800	-8.7389E 03	0.03900	-8.5123E 03

0.04000	-8.1784E 03	0.04100	-7.7530E 03	0.04200	-7.2482E 03	0.04300	-6.6725E 03	0.04400	-6.0354E 03
0.04500	-5.3401E 03	0.04600	-4.5835E 03	0.04700	-3.7696E 03	0.04800	-2.8984E 03	0.04900	-1.9756E 03
0.05000	-9.9890E 02	0.05100	2.3500E 01	0.05200	1.0843E 03	0.05300	2.1626E 03	0.05400	3.2360E 03
0.05500	4.2838E 03	0.05600	5.2924E 03	0.05700	6.2208E 03	0.05800	7.0394E 03	0.05900	7.7213E 03
0.06000	8.2254E 03	0.06100	8.5556E 03	0.06200	8.7236E 03	0.06300	8.7027E 03	0.06400	8.5002E 03
0.06500	8.1167E 03	0.06600	7.5830E 03	0.06700	6.9224E 03	0.06800	6.1514E 03	0.06900	5.2957E 03
0.07000	4.3684E 03	0.07100	3.3929E 03	0.07200	2.3747E 03	0.07300	1.3307E 03	0.07400	2.6330E 02
0.07500	-8.2100E 02	0.07600	-1.9152E 03	0.07700	-3.0188E 03	0.07800	-4.1275E 03	0.07900	-5.2348E 03
0.08000	-6.3315E 03	0.08100	-7.4073E 03	0.08200	-8.4534E 03	0.08300	-9.4533E 03	0.08400	-1.0395E 04
0.08500	-1.1265E 04	0.08600	-1.2048E 04	0.08700	-1.2735E 04	0.08800	-1.3313E 04	0.08900	-1.3776E 04
0.09000	-1.4117E 04	0.09100	-1.4317E 04	0.09200	-1.4399E 04	0.09300	-1.4366E 04	0.09400	-1.4225E 04
0.09500	-1.3980E 04	0.09600	-1.3636E 04	0.09700	-1.3201E 04	0.09800	-1.2680E 04	0.09900	-1.2080E 04
0.10000	-1.1405E 04	0.10100	-1.0680E 04	0.10200	-9.8754E 03	0.10300	-9.0307E 03	0.10400	-8.1361E 03
0.10500	-7.1867E 03	0.10600	-6.2093E 03	0.10700	-5.2130E 03	0.10800	-4.2129E 03	0.10900	-3.2192E 03
0.11000	-2.2434E 03	0.11100	-1.2962E 03	0.11200	-3.8950E 02	0.11300	4.6790E 02	0.11400	1.2678E 03
0.11500	2.0010E 03	0.11600	2.6677E 03	0.11700	3.2580E 03	0.11800	3.7737E 03	0.11900	4.2117E 03
0.12000	4.5732E 03	0.12100	4.8636E 03	0.12200	5.0741E 03	0.12300	5.2135E 03	0.12400	5.2838E 03
0.12500	5.2893E 03	0.12600	5.2335E 03	0.12700	5.1196E 03	0.12800	4.9494E 03	0.12900	4.7291E 03
0.13000	4.4644E 03	0.13100	4.1595E 03	0.13200	3.8186E 03	0.13300	3.4450E 03	0.13400	3.0470E 03
0.13500	2.6250E 03	0.13600	2.1853E 03	0.13700	1.7333E 03	0.13800	1.2720E 03	0.13900	8.0480E 02
0.14000	3.3870E 02	0.14100	-1.2820E 02	0.14200	-5.8700E 02	0.14300	-1.0351E 03	0.14400	-1.4731E 03
0.14500	-1.8931E 03	0.14600	-2.2958E 03	0.14700	-2.6777E 03	0.14800	-3.0333E 03	0.14900	-3.3645E 03
0.15000	-3.6677E 03	0.15100	-3.9413E 03	0.15200	-4.1827E 03	0.15300	-4.3935E 03	0.15400	-4.5733E 03
0.15500	-4.7200E 03	0.15600	-4.8327E 03	0.15700	-4.9164E 03	0.15800	-4.9704E 03	0.15900	-4.9953E 03
0.16000	-4.9917E 03	0.16100	-4.9631E 03	0.16200	-4.9106E 03	0.16300	-4.8377E 03	0.16400	-4.7450E 03
0.16500	-4.6347E 03	0.16600	-4.5126E 03	0.16700	-4.3746E 03	0.16800	-4.2274E 03	0.16900	-4.0717E 03
0.17000	-3.9083E 03	0.17100	-3.7423E 03	0.17200	-3.5713E 03	0.17300	-3.3997E 03	0.17400	-3.2270E 03
0.17500	-3.0548E 03	0.17600	-2.8828E 03	0.17700	-2.7113E 03	0.17800	-2.5422E 03	0.17900	-2.3756E 03
0.18000	-2.2115E 03	0.18100	-2.0525E 03	0.18200	-1.8958E 03	0.18300	-1.7425E 03	0.18400	-1.5936E 03
0.18500	-1.4506E 03	0.18600	-1.3130E 03	0.18700	-1.1807E 03	0.18800	-1.0549E 03	0.18900	-9.3560E 02
0.19000	-8.2280E 02	0.19100	-7.1530E 02	0.19200	-6.1480E 02	0.19300	-5.2370E 02	0.19400	-4.3980E 02
0.19500	-3.6410E 02	0.19600	-2.9630E 02	0.19700	-2.3800E 02	0.19800	-1.8720E 02	0.19900	-1.4520E 02
0.20000	-1.1290E 02	0.20200	-7.5400E 01	0.20400	-6.7200E 01	0.20600	-9.7100E 01	0.20800	-1.6400E 02
0.21000	-2.7150E 02	0.21200	-4.1130E 02	0.21400	-5.8280E 02	0.21600	-7.8020E 02	0.21800	-9.9970E 02
0.22000	-1.2274E 03	0.22200	-1.4574E 03	0.22400	-1.6783E 03	0.22600	-1.8845E 03	0.22800	-2.0738E 03
0.23000	-2.2445E 03	0.23200	-2.3897E 03	0.23400	-2.5057E 03	0.23600	-2.5810E 03	0.23800	-2.6121E 03
0.24000	-2.5956E 03	0.24200	-2.5437E 03	0.24400	-2.4554E 03	0.24600	-2.3329E 03	0.24800	-2.1858E 03
0.25000	-2.0283E 03	0.25200	-1.8715E 03	0.25400	-1.7178E 03	0.25600	-1.5716E 03	0.25800	-1.4267E 03
0.26000	-1.2866E 03	0.26200	-1.1477E 03	0.26400	-1.0197E 03	0.26600	-9.0280E 02	0.26800	-7.9660E 02
0.27000	-7.0010E 02	0.27200	-6.1070E 02	0.27400	-5.2930E 02	0.27600	-4.4480E 02	0.27800	-3.6000E 02
0.28000	-2.6680E 02	0.28200	-1.7240E 02	0.28400	-8.8000E 01	0.28600	2.8000E 01	0.28800	1.0610E 02
0.29000	2.2970E 02	0.29200	2.8460E 02	0.29400	4.2200E 02	0.29600	4.6800E 02	0.29800	4.6570E 02
0.30000	5.1260E 02	0.30200	4.7590E 02	0.30400	4.4800E 02	0.30600	3.6060E 02	0.30800	1.6990E 02
0.31000	-1.0420E 02	0.31200	-4.3350E 02	0.31400	-7.9090E 02	0.31600	-1.1522E 03	0.31800	-1.4912E 03
0.32000	-1.7883E 03	0.32200	-2.0276E 03	0.32400	-2.2051E 03	0.32600	-2.3138E 03	0.32800	-2.3593E 03
0.33000	-2.3388E 03	0.33200	-2.2650E 03	0.33400	-2.1434E 03	0.33600	-1.9806E 03	0.33800	-1.7877E 03
0.34000	-1.5740E 03	0.34200	-1.3453E 03	0.34400	-1.1050E 03	0.34600	-8.6250E 02	0.34800	-6.1560E 02
0.35000	-3.7200E 02	0.35200	-1.2770E 02	0.35400	1.1250E 02	0.35600	3.5060E 02	0.35800	5.8570E 02
0.36000	8.1560E 02	0.36200	1.0400E 03	0.36400	1.2547E 03	0.36600	1.4579E 03	0.36800	1.6467E 03
0.37000	1.8169E 03	0.37200	1.9653E 03	0.37400	2.0867E 03	0.37600	2.1775E 03	0.37800	2.2360E 03
0.38000	2.2572E 03	0.38200	2.2407E 03	0.38400	2.1842E 03	0.38600	2.0903E 03	0.38800	1.9584E 03
0.39000	1.7970E 03	0.39200	1.6067E 03	0.39400	1.3974E 03	0.39600	1.1701E 03	0.39800	9.3770E 02
0.40000	7.0530E 02	0.40200	4.7660E 02	0.40400	2.6250E 02	0.40600	6.3900E 01	0.40800	-1.0940E 02
0.41000	-2.5490E 02	0.41200	-3.6960E 02	0.41400	-4.6280E 02	0.41600	-5.3150E 02	0.41800	-5.8170E 02
0.42000	-6.1260E 02	0.42200	-6.2430E 02	0.42400	-6.1920E 02	0.42600	-5.9980E 02	0.42800	-5.6180E 02
0.43000	-5.1060E 02	0.43200	-4.5350E 02	0.43400	-3.9430E 02	0.43600	-3.3710E 02	0.43800	-2.8290E 02
0.44000	-2.3060E 02	0.44200	-1.9380E 02	0.44400	-1.5450E 02	0.44600	-1.1880E 02	0.44800	-8.0800E 01
0.45000	-3.9600E 01	0.45200	8.9000E 00	0.45400	6.3300E 01	0.45600	1.2780E 02	0.45800	2.0030E 02
0.46000	2.8090E 02	0.46200	3.6850E 02	0.46400	4.6240E 02	0.46600	5.5760E 02	0.46800	6.5230E 02
0.47000	7.4340E 02	0.47200	8.2900E 02	0.47400	9.0770E 02	0.47600	9.7840E 02	0.47800	1.0418E 03
0.48000	1.0947E 03	0.48200	1.1395E 03	0.48400	1.1767E 03	0.48600	1.2080E 03	0.48800	1.2343E 03
0.49000	1.2585E 03	0.49200	1.2814E 03	0.49400	1.3050E 03	0.49600	1.3320E 03	0.49800	1.3476E 03
0.50000	1.3703E 03	0.50200	1.3964E 03						

TIME FUNCTION NUMBER = (3)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 32 00>02$ 0. . 0.2)

NUMBER OF ABSCISSAE =.(577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	2.0000E-01	0.00010	2.0000E-01	0.00020	2.0000E-01	0.00030	2.0000E-01	0.00040	2.0000E-01
0.00050	2.0000E-01	0.00060	2.0000E-01	0.00070	2.0000E-01	0.00080	2.0000E-01	0.00090	2.0000E-01
0.00100	2.0000E-01	0.00110	2.0000E-01	0.00120	2.0000E-01	0.00130	2.0000E-01	0.00140	2.0000E-01
0.00150	2.0000E-01	0.00160	2.0000E-01	0.00170	2.0000E-01	0.00180	2.0000E-01	0.00190	2.0000E-01
0.00200	2.0000E-01	0.00210	2.0000E-01	0.00220	2.0000E-01	0.00230	2.0000E-01	0.00240	2.0000E-01
0.00250	2.0000E-01	0.00260	2.0000E-01	0.00270	2.0000E-01	0.00280	2.0000E-01	0.00290	2.0000E-01
0.00300	2.0000E-01	0.00310	2.0000E-01	0.00320	2.0000E-01	0.00330	2.0000E-01	0.00340	2.0000E-01
0.00350	2.0000E-01	0.00360	2.0000E-01	0.00370	2.0000E-01	0.00380	2.0000E-01	0.00390	2.0000E-01
0.00400	-5.0000E-01	0.00410	2.0000E-01	0.00420	2.0000E-01	0.00430	2.0000E-01	0.00440	2.0000E-01
0.00450	2.0000E-01	0.00460	2.0000E-01	0.00470	2.0000E-01	0.00480	2.0000E-01	0.00490	2.0000E-01
0.00500	2.0000E-01	0.00510	2.0000E-01	0.00520	2.0000E-01	0.00530	2.0000E-01	0.00540	2.0000E-01
0.00550	2.0000E-01	0.00560	2.0000E-01	0.00570	2.0000E-01	0.00580	-5.0000E-01	0.00590	-5.0000E-01
0.00600	-5.0000E-01	0.00610	-5.0000E-01	0.00620	-5.0000E-01	0.00630	-5.0000E-01	0.00640	2.0000E-01
0.00650	2.0000E-01	0.00660	2.0000E-01	0.00670	2.0000E-01	0.00680	2.0000E-01	0.00690	2.0000E-01
0.00700	2.0000E-01	0.00710	2.0000E-01	0.00720	2.0000E-01	0.00730	2.0000E-01	0.00740	2.0000E-01
0.00750	2.0000E-01	0.00760	2.0000E-01	0.00770	-5.0000E-01	0.00780	-5.0000E-01	0.00790	-5.0000E-01
0.00800	-5.0000E-01	0.00810	-5.0000E-01	0.00820	-5.0000E-01	0.00830	-5.0000E-01	0.00840	-8.0000E-01
0.00850	-8.0000E-01	0.00860	-8.0000E-01	0.00870	-5.0000E-01	0.00880	-5.0000E-01	0.00890	-5.0000E-01
0.00900	-5.0000E-01	0.00910	-1.2000E 00	0.00920	-1.2000E 00	0.00930	-1.2000E 00	0.00940	-1.2000E 00
0.00950	-5.0000E-01	0.00960	-5.0000E-01	0.00970	-5.0000E-01	0.00980	-1.2000E 00	0.00990	-1.4000E 00
0.01000	-1.4000E 00	0.01010	-1.2000E 00	0.01020	-1.2000E 00	0.01030	-1.8000E 00	0.01040	-1.8000E 00
0.01050	-1.8000E 00	0.01060	-2.5000E 00	0.01070	-2.1000E 00	0.01080	-2.1000E 00	0.01090	-2.8000E 00
0.01100	-2.5000E 00	0.01110	-2.5000E 00	0.01120	-3.1000E 00	0.01130	-3.4000E 00	0.01140	-4.1000E 00
0.01150	-4.1000E 00	0.01160	-4.1000E 00	0.01170	-3.8000E 00	0.01180	-4.7000E 00	0.01190	-4.7000E 00
0.01200	-5.4000E 00	0.01210	-6.1000E 00	0.01220	-6.3000E 00	0.01230	-6.1000E 00	0.01240	-6.7000E 00
0.01250	-7.4000E 00	0.01260	-8.3000E 00	0.01270	-8.3000E 00	0.01280	-9.0000E 00	0.01290	-9.0000E 00
0.01300	-9.6000E 00	0.01310	-1.1000E 01	0.01320	-1.1900E 01	0.01330	-1.2600E 01	0.01340	-1.2900E 01
0.01350	-1.3900E 01	0.01360	-1.4500E 01	0.01370	-1.6100E 01	0.01380	-1.6800E 01	0.01390	-1.7900E 01
0.01400	-1.8100E 01	0.01410	-1.9500E 01	0.01420	-2.1000E 01	0.01430	-2.2400E 01	0.01440	-2.3700E 01
0.01450	-2.4600E 01	0.01460	-2.6600E 01	0.01470	-2.8200E 01	0.01480	-3.0200E 01	0.01490	-3.1500E 01
0.01500	-3.3100E 01	0.01510	-3.5400E 01	0.01520	-3.7400E 01	0.01530	-3.9600E 01	0.01540	-4.1900E 01
0.01550	-4.4100E 01	0.01560	-4.6100E 01	0.01570	-4.8400E 01	0.01580	-5.1300E 01	0.01590	-5.4200E 01
0.01600	-5.6900E 01	0.01610	-5.9800E 01	0.01620	-6.3000E 01	0.01630	-6.6600E 01	0.01640	-6.9900E 01
0.01650	-7.3700E 01	0.01660	-7.6900E 01	0.01670	-8.0200E 01	0.01680	-8.4700E 01	0.01690	-8.9300E 01
0.01700	-9.3500E 01	0.01710	-9.8000E 01	0.01720	-1.0190E 02	0.01730	-1.0680E 02	0.01740	-1.1200E 02
0.01750	-1.1740E 02	0.01760	-1.2300E 02	0.01770	-1.2780E 02	0.01780	-1.3360E 02	0.01790	-1.4010E 02
0.01800	-1.4620E 02	0.01810	-1.5270E 02	0.01820	-1.5980E 02	0.01830	-1.6630E 02	0.01840	-1.7330E 02
0.01850	-1.8050E 02	0.01860	-1.8790E 02	0.01870	-1.9630E 02	0.01880	-2.0440E 02	0.01890	-2.1300E 02
0.01900	-2.2110E 02	0.01910	-2.3020E 02	0.01920	-2.3950E 02	0.01930	-2.4920E 02	0.01940	-2.5920E 02
0.01950	-2.6890E 02	0.01960	-2.7880E 02	0.01970	-2.8950E 02	0.01980	-3.0070E 02	0.01990	-3.1230E 02
0.02000	-3.2390E 02	0.02010	-3.3610E 02	0.02020	-3.4830E 02	0.02030	-3.6060E 02	0.02040	-3.7370E 02
0.02050	-3.8730E 02	0.02060	-4.0140E 02	0.02070	-4.1550E 02	0.02080	-4.2930E 02	0.02090	-4.4380E 02
0.02100	-4.5950E 02	0.02110	-4.7490E 02	0.02120	-4.9100E 02	0.02130	-5.0670E 02	0.02140	-5.2370E 02
0.02150	-5.4070E 02	0.02160	-5.5870E 02	0.02170	-5.7600E 02	0.02180	-5.9420E 02	0.02190	-6.1280E 02
0.02200	-6.3210E 02	0.02210	-6.5130E 02	0.02220	-6.7180E 02	0.02230	-6.9200E 02	0.02240	-7.1270E 02
0.02250	-7.3390E 02	0.02260	-7.5570E 02	0.02270	-7.7740E 02	0.02280	-8.0010E 02	0.02290	-8.2220E 02
0.02300	-8.4590E 02	0.02310	-8.6990E 02	0.02320	-8.9450E 02	0.02330	-9.1840E 02	0.02340	-9.4400E 02
0.02350	-9.6930E 02	0.02360	-9.9480E 02	0.02370	-1.0217E 03	0.02380	-1.0482E 03	0.02390	-1.0753E 03
0.02400	-1.1034E 03	0.02410	-1.1315E 03	0.02420	-1.1603E 03	0.02430	-1.1893E 03	0.02440	-1.2180E 03
0.02450	-1.2480E 03	0.02460	-1.2783E 03	0.02470	-1.3089E 03	0.02480	-1.3405E 03	0.02490	-1.3708E 03
0.02500	-1.4033E 03	0.02600	-1.7460E 03	0.02700	-2.1204E 03	0.02800	-2.5204E 03	0.02900	-2.9325E 03
0.03000	-3.3433E 03	0.03100	-3.7346E 03	0.03200	-4.0930E 03	0.03300	-4.4006E 03	0.03400	-4.6452E 03
0.03500	-4.8182E 03	0.03600	-4.9137E 03	0.03700	-4.9309E 03	0.03800	-4.8734E 03	0.03900	-4.7471E 03

TABLE 6.A-12
(SHEET 6 OF 28)

0.04000	-4.5609E 03	0.04100	-4.3236E 03	0.04200	-4.0421E 03	0.04300	-3.7211E 03	0.04400	-3.3658E 03
0.04500	-2.9780E 03	0.04600	-2.5561E 03	0.04700	-2.1022E 03	0.04800	-1.6164E 03	0.04900	-1.1017E 03
0.05000	-5.5710E 02	0.05100	1.3100E 01	0.05200	6.0470E 02	0.05300	1.2060E 03	0.05400	1.8046E 03
0.05500	2.3889E 03	0.05600	2.9514E 03	0.05700	3.4692E 03	0.05800	3.9257E 03	0.05900	4.3060E 03
0.06000	4.5871E 03	0.06100	4.7712E 03	0.06200	4.8649E 03	0.06300	4.8532E 03	0.06400	4.7403E 03
0.06500	4.5264E 03	0.06600	4.2288E 03	0.06700	3.8604E 03	0.06800	3.4304E 03	0.06900	2.9533E 03
0.07000	2.4361E 03	0.07100	1.8921E 03	0.07200	1.3243E 03	0.07300	7.4210E 02	0.07400	1.4680E 02
0.07500	-4.5780E 02	0.07600	-1.0681E 03	0.07700	-1.6835E 03	0.07800	-2.3018E 03	0.07900	-2.9193E 03
0.08000	-3.5309E 03	0.08100	-4.1308E 03	0.08200	-4.7142E 03	0.08300	-5.2719E 03	0.08400	-5.7967E 03
0.08500	-6.2822E 03	0.08600	-6.7189E 03	0.08700	-7.1018E 03	0.08800	-7.4242E 03	0.08900	-7.6825E 03
0.09000	-7.8727E 03	0.09100	-7.9844E 03	0.09200	-8.0302E 03	0.09300	-8.0117E 03	0.09400	-7.9328E 03
0.09500	-7.7961E 03	0.09600	-7.6042E 03	0.09700	-7.3619E 03	0.09800	-7.0715E 03	0.09900	-6.7368E 03
0.10000	-6.3604E 03	0.10100	-5.9558E 03	0.10200	-5.5072E 03	0.10300	-5.0362E 03	0.10400	-4.5373E 03
0.10500	-4.0078E 03	0.10600	-3.4627E 03	0.10700	-2.9071E 03	0.10800	-2.3494E 03	0.10900	-1.7953E 03
0.11000	-1.2511E 03	0.11100	-7.2290E 02	0.11200	-2.1720E 02	0.11300	2.6090E 02	0.11400	7.0700E 02
0.11500	1.1159E 03	0.11600	1.4877E 03	0.11700	1.8169E 03	0.11800	2.1045E 03	0.11900	2.3487E 03
0.12000	2.5503E 03	0.12100	2.7123E 03	0.12200	2.8297E 03	0.12300	2.9074E 03	0.12400	2.9467E 03
0.12500	2.9497E 03	0.12600	2.9186E 03	0.12700	2.8550E 03	0.12800	2.7601E 03	0.12900	2.6373E 03
0.13000	2.4897E 03	0.13100	2.3196E 03	0.13200	2.1295E 03	0.13300	1.9212E 03	0.13400	1.6992E 03
0.13500	1.4639E 03	0.13600	1.2187E 03	0.13700	9.6660E 02	0.13800	7.0940E 02	0.13900	4.4880E 02
0.14000	1.8890E 02	0.14100	-7.1500E 01	0.14200	-3.2740E 02	0.14300	-5.7730E 02	0.14400	-8.2150E 02
0.14500	-1.0557E 03	0.14600	-1.2803E 03	0.14700	-1.4933E 03	0.14800	-1.6916E 03	0.14900	-1.8763E 03
0.15000	-2.0454E 03	0.15100	-2.1980E 03	0.15200	-2.3325E 03	0.15300	-2.4501E 03	0.15400	-2.5504E 03
0.15500	-2.6322E 03	0.15600	-2.6951E 03	0.15700	-2.7417E 03	0.15800	-2.7718E 03	0.15900	-2.7857E 03
0.16000	-2.7837E 03	0.16100	-2.7678E 03	0.16200	-2.7385E 03	0.16300	-2.6979E 03	0.16400	-2.6462E 03
0.16500	-2.5846E 03	0.16600	-2.5165E 03	0.16700	-2.4396E 03	0.16800	-2.3575E 03	0.16900	-2.2707E 03
0.17000	-2.1796E 03	0.17100	-2.0870E 03	0.17200	-1.9916E 03	0.17300	-1.8959E 03	0.17400	-1.7996E 03
0.17500	-1.7036E 03	0.17600	-1.6077E 03	0.17700	-1.5120E 03	0.17800	-1.4177E 03	0.17900	-1.3248E 03
0.18000	-1.2333E 03	0.18100	-1.1446E 03	0.18200	-1.0573E 03	0.18300	-9.7180E 02	0.18400	-8.8870E 02
0.18500	-8.0900E 02	0.18600	-7.3220E 02	0.18700	-6.5840E 02	0.18800	-5.8830E 02	0.18900	-5.2170E 02
0.19000	-4.5880E 02	0.19100	-3.9890E 02	0.19200	-3.4290E 02	0.19300	-2.9210E 02	0.19400	-2.4530E 02
0.19500	-2.0310E 02	0.19600	-1.6520E 02	0.19700	-1.3270E 02	0.19800	-1.0440E 02	0.19900	-8.0900E 01
0.20000	-6.2900E 01	0.20200	-4.2100E 01	0.20400	-3.7500E 01	0.20600	-5.4100E 01	0.20800	-9.1400E 01
0.21000	-1.5140E 02	0.21200	-2.2940E 02	0.21400	-3.2500E 02	0.21600	-4.3510E 02	0.21800	-5.5750E 02
0.22000	-6.8450E 02	0.22200	-8.1270E 02	0.22400	-9.3590E 02	0.22600	-1.0509E 03	0.22800	-1.1565E 03
0.23000	-1.2517E 03	0.23200	-1.3327E 03	0.23400	-1.3974E 03	0.23600	-1.4394E 03	0.23800	-1.4567E 03
0.24000	-1.4475E 03	0.24200	-1.4186E 03	0.24400	-1.3693E 03	0.24600	-1.3010E 03	0.24800	-1.2189E 03
0.25000	-1.1311E 03	0.25200	-1.0437E 03	0.25400	-9.5800E 02	0.25600	-8.7640E 02	0.25800	-7.9570E 02
0.26000	-7.1750E 02	0.26200	-6.4000E 02	0.26400	-5.6860E 02	0.26600	-5.0350E 02	0.26800	-4.4420E 02
0.27000	-3.9040E 02	0.27200	-3.4060E 02	0.27400	-2.9520E 02	0.27600	-2.4800E 02	0.27800	-2.0080E 02
0.28000	-1.4880E 02	0.28200	-9.6100E 01	0.28400	-4.9100E 01	0.28600	1.5600E 01	0.28800	5.9200E 01
0.29000	1.2810E 02	0.29200	1.5870E 02	0.29400	2.3530E 02	0.29600	2.6100E 02	0.29800	2.5970E 02
0.30000	2.8580E 02	0.30200	2.6540E 02	0.30400	2.4990E 02	0.30600	2.0110E 02	0.30800	9.4700E 01
0.31000	-5.8100E 01	0.31200	-2.4170E 02	0.31400	-4.4110E 02	0.31600	-6.4250E 02	0.31800	-8.3160E 02
0.32000	-9.9730E 02	0.32200	-1.1309E 03	0.32400	-1.2297E 03	0.32600	-1.2903E 03	0.32800	-1.3157E 03
0.33000	-1.3043E 03	0.33200	-1.2631E 03	0.33400	-1.1953E 03	0.33600	-1.1045E 03	0.33800	-9.9700E 02
0.34000	-8.7780E 02	0.34200	-7.5030E 02	0.34400	-6.1620E 02	0.34600	-4.8100E 02	0.34800	-3.4330E 02
0.35000	-2.0750E 02	0.35200	-7.1200E 01	0.35400	6.2700E 01	0.35600	1.9550E 02	0.35800	3.2660E 02
0.36000	4.5480E 02	0.36200	5.8000E 02	0.36400	6.9970E 02	0.36600	8.1310E 02	0.36800	9.1830E 02
0.37000	1.0132E 03	0.37200	1.0960E 03	0.37400	1.1637E 03	0.37600	1.2143E 03	0.37800	1.2470E 03
0.38000	1.2588E 03	0.38200	1.2496E 03	0.38400	1.2180E 03	0.38600	1.1657E 03	0.38800	1.0921E 03
0.39000	1.0022E 03	0.39200	8.9600E 02	0.39400	7.7930E 02	0.39600	6.5260E 02	0.39800	5.2290E 02
0.40000	3.9330E 02	0.40200	2.6580E 02	0.40400	1.4640E 02	0.40600	3.5600E 01	0.40800	-6.1000E 01
0.41000	-1.4210E 02	0.41200	-2.0610E 02	0.41400	-2.5810E 02	0.41600	-2.9640E 02	0.41800	-3.2440E 02
0.42000	-3.4160E 02	0.42200	-3.4810E 02	0.42400	-3.4530E 02	0.42600	-3.3450E 02	0.42800	-3.1330E 02
0.43000	-2.8480E 02	0.43200	-2.5290E 02	0.43400	-2.1990E 02	0.43600	-1.8800E 02	0.43800	-1.5780E 02
0.44000	-1.3190E 02	0.44200	-1.0810E 02	0.44400	-8.6200E 01	0.44600	-6.6300E 01	0.44800	-4.5000E 01
0.45000	-2.2100E 01	0.45200	5.0000E 00	0.45400	3.5300E 01	0.45600	7.1300E 01	0.45800	1.1170E 02
0.46000	1.5660E 02	0.46200	2.0550E 02	0.46400	2.5790E 02	0.46600	3.1100E 02	0.46800	3.6380E 02
0.47000	4.1460E 02	0.47200	4.6230E 02	0.47400	5.0620E 02	0.47600	5.4560E 02	0.47800	5.8100E 02
0.48000	6.1050E 02	0.48200	6.3550E 02	0.48400	6.5620E 02	0.48600	6.7370E 02	0.48800	6.8830E 02
0.49000	7.0180E 02	0.49200	7.1460E 02	0.49400	7.2780E 02	0.49600	7.4280E 02	0.49800	7.5150E 02
0.50000	7.6420E 02	0.50200	7.7870E 02						

TIME FUNCTION NUMBER = (4)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 34 00>02$ 0. -143.7)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-1.4370E 02	0.00010	-1.4370E 02	0.00020	-1.4370E 02	0.00030	-1.4370E 02	0.00040	-1.4370E 02
0.00050	-1.4430E 02	0.00060	-1.4430E 02	0.00070	-1.4430E 02	0.00080	-1.4430E 02	0.00090	-1.4430E 02
0.00100	-1.4430E 02	0.00110	-1.4430E 02	0.00120	-1.4430E 02	0.00130	-1.4370E 02	0.00140	-1.4370E 02
0.00150	-1.4430E 02	0.00160	-1.4430E 02	0.00170	-1.4430E 02	0.00180	-1.4430E 02	0.00190	-1.4430E 02
0.00200	-1.4430E 02	0.00210	-1.4430E 02	0.00220	-1.4430E 02	0.00230	-1.4430E 02	0.00240	-1.4430E 02
0.00250	-1.4490E 02	0.00260	-1.4430E 02	0.00270	-1.4450E 02	0.00280	-1.4430E 02	0.00290	-1.4490E 02
0.00300	-1.4490E 02	0.00310	-1.4430E 02	0.00320	-1.4490E 02	0.00330	-1.4490E 02	0.00340	-1.4490E 02
0.00350	-1.4510E 02	0.00360	-1.4490E 02	0.00370	-1.4490E 02	0.00380	-1.4550E 02	0.00390	-1.4490E 02
0.00400	-1.4490E 02	0.00410	-1.4550E 02	0.00420	-1.4550E 02	0.00430	-1.4550E 02	0.00440	-1.4550E 02
0.00450	-1.4570E 02	0.00460	-1.4550E 02	0.00470	-1.4550E 02	0.00480	-1.4630E 02	0.00490	-1.4610E 02
0.00500	-1.4550E 02	0.00510	-1.4610E 02	0.00520	-1.4610E 02	0.00530	-1.4670E 02	0.00540	-1.4610E 02
0.00550	-1.4670E 02	0.00560	-1.4690E 02	0.00570	-1.4670E 02	0.00580	-1.4670E 02	0.00590	-1.4690E 02
0.00600	-1.4730E 02	0.00610	-1.4750E 02	0.00620	-1.4790E 02	0.00630	-1.4730E 02	0.00640	-1.4810E 02
0.00650	-1.4790E 02	0.00660	-1.4850E 02	0.00670	-1.4870E 02	0.00680	-1.4850E 02	0.00690	-1.4930E 02
0.00700	-1.4930E 02	0.00710	-1.4990E 02	0.00720	-1.5050E 02	0.00730	-1.5090E 02	0.00740	-1.5110E 02
0.00750	-1.5230E 02	0.00760	-1.5230E 02	0.00770	-1.5290E 02	0.00780	-1.5350E 02	0.00790	-1.5420E 02
0.00800	-1.5480E 02	0.00810	-1.5560E 02	0.00820	-1.5680E 02	0.00830	-1.5720E 02	0.00840	-1.5860E 02
0.00850	-1.5980E 02	0.00860	-1.6100E 02	0.00870	-1.6220E 02	0.00880	-1.6280E 02	0.00890	-1.6490E 02
0.00900	-1.6610E 02	0.00910	-1.6850E 02	0.00920	-1.6990E 02	0.00930	-1.7090E 02	0.00940	-1.7330E 02
0.00950	-1.7540E 02	0.00960	-1.7840E 02	0.00970	-1.8020E 02	0.00980	-1.8310E 02	0.00990	-1.8610E 02
0.01000	-1.8850E 02	0.01010	-1.9180E 02	0.01020	-1.9480E 02	0.01030	-1.9860E 02	0.01040	-2.0190E 02
0.01050	-2.0610E 02	0.01060	-2.1000E 02	0.01070	-2.1420E 02	0.01080	-2.1950E 02	0.01090	-2.2400E 02
0.01100	-2.2880E 02	0.01110	-2.3380E 02	0.01120	-2.4040E 02	0.01130	-2.4600E 02	0.01140	-2.5250E 02
0.01150	-2.5880E 02	0.01160	-2.6630E 02	0.01170	-2.7370E 02	0.01180	-2.8110E 02	0.01190	-2.8890E 02
0.01200	-2.9720E 02	0.01210	-3.0670E 02	0.01220	-3.1560E 02	0.01230	-3.2540E 02	0.01240	-3.3550E 02
0.01250	-3.4620E 02	0.01260	-3.5720E 02	0.01270	-3.6870E 02	0.01280	-3.8090E 02	0.01290	-3.9400E 02
0.01300	-4.0700E 02	0.01310	-4.2000E 02	0.01320	-4.3400E 02	0.01330	-4.4910E 02	0.01340	-4.6420E 02
0.01350	-4.8050E 02	0.01360	-4.9710E 02	0.01370	-5.1480E 02	0.01380	-5.3230E 02	0.01390	-5.5070E 02
0.01400	-5.6990E 02	0.01410	-5.9030E 02	0.01420	-6.1090E 02	0.01430	-6.3220E 02	0.01440	-6.5440E 02
0.01450	-6.7710E 02	0.01460	-7.0100E 02	0.01470	-7.2520E 02	0.01480	-7.5060E 02	0.01490	-7.7650E 02
0.01500	-8.0270E 02	0.01510	-8.3100E 02	0.01520	-8.5930E 02	0.01530	-8.8880E 02	0.01540	-9.1910E 02
0.01550	-9.5030E 02	0.01560	-9.8210E 02	0.01570	-1.0141E 03	0.01580	-1.0479E 03	0.01590	-1.0826E 03
0.01600	-1.1188E 03	0.01610	-1.1546E 03	0.01620	-1.1922E 03	0.01630	-1.2306E 03	0.01640	-1.2705E 03
0.01650	-1.3098E 03	0.01660	-1.3514E 03	0.01670	-1.3934E 03	0.01680	-1.4364E 03	0.01690	-1.4809E 03
0.01700	-1.5261E 03	0.01710	-1.5723E 03	0.01720	-1.6197E 03	0.01730	-1.6674E 03	0.01740	-1.7173E 03
0.01750	-1.7679E 03	0.01760	-1.8187E 03	0.01770	-1.8713E 03	0.01780	-1.9244E 03	0.01790	-1.9787E 03
0.01800	-2.0341E 03	0.01810	-2.0904E 03	0.01820	-2.1478E 03	0.01830	-2.2060E 03	0.01840	-2.2658E 03
0.01850	-2.3264E 03	0.01860	-2.3872E 03	0.01870	-2.4506E 03	0.01880	-2.5135E 03	0.01890	-2.5774E 03
0.01900	-2.6428E 03	0.01910	-2.7091E 03	0.01920	-2.7770E 03	0.01930	-2.8450E 03	0.01940	-2.9143E 03
0.01950	-2.9839E 03	0.01960	-3.0555E 03	0.01970	-3.1271E 03	0.01980	-3.1996E 03	0.01990	-3.2732E 03
0.02000	-3.3482E 03	0.02010	-3.4234E 03	0.02020	-3.4995E 03	0.02030	-3.5768E 03	0.02040	-3.6546E 03
0.02050	-3.7329E 03	0.02060	-3.8127E 03	0.02070	-3.8924E 03	0.02080	-3.9735E 03	0.02090	-4.0547E 03
0.02100	-4.1366E 03	0.02110	-4.2203E 03	0.02120	-4.3034E 03	0.02130	-4.3875E 03	0.02140	-4.4723E 03
0.02150	-4.5582E 03	0.02160	-4.6437E 03	0.02170	-4.7302E 03	0.02180	-4.8168E 03	0.02190	-4.9043E 03
0.02200	-4.9924E 03	0.02210	-5.0798E 03	0.02220	-5.1690E 03	0.02230	-5.2584E 03	0.02240	-5.3475E 03
0.02250	-5.4372E 03	0.02260	-5.5268E 03	0.02270	-5.6170E 03	0.02280	-5.7075E 03	0.02290	-5.7986E 03
0.02300	-5.8884E 03	0.02310	-5.9800E 03	0.02320	-6.0707E 03	0.02330	-6.1620E 03	0.02340	-6.2523E 03
0.02350	-6.3436E 03	0.02360	-6.4347E 03	0.02370	-6.5256E 03	0.02380	-6.6166E 03	0.02390	-6.7069E 03
0.02400	-6.7975E 03	0.02410	-6.8878E 03	0.02420	-6.9775E 03	0.02430	-7.0672E 03	0.02440	-7.1567E 03
0.02450	-7.2464E 03	0.02460	-7.3344E 03	0.02470	-7.4227E 03	0.02480	-7.5107E 03	0.02490	-7.5978E 03
0.02500	-7.6853E 03	0.02600	-8.5218E 03	0.02700	-9.2684E 03	0.02800	-9.8974E 03	0.02900	-1.0385E 04
0.03000	-1.0716E 04	0.03100	-1.0884E 04	0.03200	-1.0898E 04	0.03300	-1.0789E 04	0.03400	-1.0591E 04
0.03500	-1.0336E 04	0.03600	-1.0058E 04	0.03700	-9.7889E 03	0.03800	-9.5540E 03	0.03900	-9.3748E 03

TABLE 6.A-12
(SHEET 8 OF 28)

0.04000 -9.2582E 03	0.04100 -9.1957E 03	0.04200 -9.1786E 03	0.04300 -9.1952E 03	0.04400 -9.2314E 03
0.04500 -9.2721E 03	0.04600 -9.2993E 03	0.04700 -9.3053E 03	0.04800 -9.2752E 03	0.04900 -9.1973E 03
0.05000 -9.0618E 03	0.05100 -8.8640E 03	0.05200 -8.5983E 03	0.05300 -8.2655E 03	0.05400 -7.8699E 03
0.05500 -7.4197E 03	0.05600 -6.9342E 03	0.05700 -6.4220E 03	0.05800 -5.8946E 03	0.05900 -5.3587E 03
0.06000 -4.8194E 03	0.06100 -4.2965E 03	0.06200 -3.8195E 03	0.06300 -3.4025E 03	0.06400 -3.0656E 03
0.06500 -2.8279E 03	0.06600 -2.6998E 03	0.06700 -2.6937E 03	0.06800 -2.8203E 03	0.06900 -3.0802E 03
0.07000 -3.4738E 03	0.07100 -3.9977E 03	0.07200 -4.6407E 03	0.07300 -5.3917E 03	0.07400 -6.2368E 03
0.07500 -7.1591E 03	0.07600 -8.1482E 03	0.07700 -9.1834E 03	0.07800 -1.0254E 04	0.07900 -1.1339E 04
0.08000 -1.2420E 04	0.08100 -1.3480E 04	0.08200 -1.4503E 04	0.08300 -1.5476E 04	0.08400 -1.6385E 04
0.08500 -1.7213E 04	0.08600 -1.7917E 04	0.08700 -1.8537E 04	0.08800 -1.9069E 04	0.08900 -1.9500E 04
0.09000 -1.9847E 04	0.09100 -2.0060E 04	0.09200 -2.0163E 04	0.09300 -2.0209E 04	0.09400 -2.0151E 04
0.09500 -2.0032E 04	0.09600 -1.9845E 04	0.09700 -1.9604E 04	0.09800 -1.9268E 04	0.09900 -1.8896E 04
0.10000 -1.8469E 04	0.10100 -1.8045E 04	0.10200 -1.7631E 04	0.10300 -1.7223E 04	0.10400 -1.6833E 04
0.10500 -1.6453E 04	0.10600 -1.6071E 04	0.10700 -1.5640E 04	0.10800 -1.5250E 04	0.10900 -1.4847E 04
0.11000 -1.4459E 04	0.11100 -1.4081E 04	0.11200 -1.3711E 04	0.11300 -1.3344E 04	0.11400 -1.2935E 04
0.11500 -1.2559E 04	0.11600 -1.2168E 04	0.11700 -1.1793E 04	0.11800 -1.1433E 04	0.11900 -1.1068E 04
0.12000 -1.0712E 04	0.12100 -1.0373E 04	0.12200 -1.0060E 04	0.12300 -9.7725E 03	0.12400 -9.5186E 03
0.12500 -9.2468E 03	0.12600 -9.0222E 03	0.12700 -8.8159E 03	0.12800 -8.6413E 03	0.12900 -8.4999E 03
0.13000 -8.3367E 03	0.13100 -8.2013E 03	0.13200 -8.0889E 03	0.13300 -8.0138E 03	0.13400 -7.9794E 03
0.13500 -7.9708E 03	0.13600 -7.9330E 03	0.13700 -7.9008E 03	0.13800 -7.8942E 03	0.13900 -7.9285E 03
0.14000 -8.0028E 03	0.14100 -8.1186E 03	0.14200 -8.2113E 03	0.14300 -8.3241E 03	0.14400 -8.4663E 03
0.14500 -8.6413E 03	0.14600 -8.7870E 03	0.14700 -8.9415E 03	0.14800 -9.1204E 03	0.14900 -9.3240E 03
0.15000 -9.5301E 03	0.15100 -9.7486E 03	0.15200 -9.9786E 03	0.15300 -1.0162E 04	0.15400 -1.0343E 04
0.15500 -1.0514E 04	0.15600 -1.0691E 04	0.15700 -1.0876E 04	0.15800 -1.1065E 04	0.15900 -1.1241E 04
0.16000 -1.1372E 04	0.16100 -1.1501E 04	0.16200 -1.1635E 04	0.16300 -1.1771E 04	0.16400 -1.1893E 04
0.16500 -1.2000E 04	0.16600 -1.2066E 04	0.16700 -1.2127E 04	0.16800 -1.2191E 04	0.16900 -1.2252E 04
0.17000 -1.2304E 04	0.17100 -1.2344E 04	0.17200 -1.2321E 04	0.17300 -1.2275E 04	0.17400 -1.2230E 04
0.17500 -1.2188E 04	0.17600 -1.2090E 04	0.17700 -1.1988E 04	0.17800 -1.1898E 04	0.17900 -1.1816E 04
0.18000 -1.1692E 04	0.18100 -1.1573E 04	0.18200 -1.1470E 04	0.18300 -1.1381E 04	0.18400 -1.1306E 04
0.18500 -1.1240E 04	0.18600 -1.1130E 04	0.18700 -1.1022E 04	0.18800 -1.0912E 04	0.18900 -1.0820E 04
0.19000 -1.0751E 04	0.19100 -1.0697E 04	0.19200 -1.0659E 04	0.19300 -1.0636E 04	0.19400 -1.0630E 04
0.19500 -1.0586E 04	0.19600 -1.0552E 04	0.19700 -1.0523E 04	0.19800 -1.0520E 04	0.19900 -1.0493E 04
0.20000 -1.0490E 04	0.20200 -1.0584E 04	0.20400 -1.0782E 04	0.20600 -1.1036E 04	0.20800 -1.1137E 04
0.21000 -1.1292E 04	0.21200 -1.1502E 04	0.21400 -1.1758E 04	0.21600 -1.2038E 04	0.21800 -1.2125E 04
0.22000 -1.2234E 04	0.22200 -1.2371E 04	0.22400 -1.2535E 04	0.22600 -1.2718E 04	0.22800 -1.2912E 04
0.23000 -1.3093E 04	0.23200 -1.3069E 04	0.23400 -1.3062E 04	0.23600 -1.3056E 04	0.23800 -1.3030E 04
0.24000 -1.3074E 04	0.24200 -1.3053E 04	0.24400 -1.3135E 04	0.24600 -1.3291E 04	0.24800 -1.3482E 04
0.25000 -1.3688E 04	0.25200 -1.3891E 04	0.25400 -1.3874E 04	0.25600 -1.3872E 04	0.25800 -1.3913E 04
0.26000 -1.3994E 04	0.26200 -1.4077E 04	0.26400 -1.4188E 04	0.26600 -1.4302E 04	0.26800 -1.4402E 04
0.27000 -1.4483E 04	0.27200 -1.4539E 04	0.27400 -1.4599E 04	0.27600 -1.4624E 04	0.27800 -1.4653E 04
0.28000 -1.4631E 04	0.28200 -1.4625E 04	0.28400 -1.4681E 04	0.28600 -1.4524E 04	0.28800 -1.4691E 04
0.29000 -1.4491E 04	0.29200 -1.4780E 04	0.29400 -1.4532E 04	0.29600 -1.4649E 04	0.29800 -1.4869E 04
0.30000 -1.4710E 04	0.30200 -1.4973E 04	0.30400 -1.4942E 04	0.30600 -1.4902E 04	0.30800 -1.4884E 04
0.31000 -1.4780E 04	0.31200 -1.4606E 04	0.31400 -1.4374E 04	0.31600 -1.4103E 04	0.31800 -1.3806E 04
0.32000 -1.3495E 04	0.32200 -1.3185E 04	0.32400 -1.2887E 04	0.32600 -1.2610E 04	0.32800 -1.2350E 04
0.33000 -1.2110E 04	0.33200 -1.1891E 04	0.33400 -1.1684E 04	0.33600 -1.1489E 04	0.33800 -1.1302E 04
0.34000 -1.1120E 04	0.34200 -1.0944E 04	0.34400 -1.0771E 04	0.34600 -1.0596E 04	0.34800 -1.0414E 04
0.35000 -1.0229E 04	0.35200 -1.0040E 04	0.35400 -9.8456E 03	0.35600 -9.6536E 03	0.35800 -9.4734E 03
0.36000 -9.3035E 03	0.36200 -9.1520E 03	0.36400 -9.0178E 03	0.36600 -8.9016E 03	0.36800 -8.8053E 03
0.37000 -8.7354E 03	0.37200 -8.6971E 03	0.37400 -8.6871E 03	0.37600 -8.7046E 03	0.37800 -8.7485E 03
0.38000 -8.8185E 03	0.38200 -8.9097E 03	0.38400 -9.0118E 03	0.38600 -9.1188E 03	0.38800 -9.2235E 03
0.39000 -9.3169E 03	0.39200 -9.3942E 03	0.39400 -9.4549E 03	0.39600 -9.4968E 03	0.39800 -9.5239E 03
0.40000 -9.5377E 03	0.40200 -9.5363E 03	0.40400 -9.5233E 03	0.40600 -9.5020E 03	0.40800 -9.4814E 03
0.41000 -9.4683E 03	0.41200 -9.4663E 03	0.41400 -9.4852E 03	0.41600 -9.5127E 03	0.41800 -9.5365E 03
0.42000 -9.5644E 03	0.42200 -9.5983E 03	0.42400 -9.6409E 03	0.42600 -9.7057E 03	0.42800 -9.7818E 03
0.43000 -9.8559E 03	0.43200 -9.9243E 03	0.43400 -9.9853E 03	0.43600 -1.0035E 04	0.43800 -1.0073E 04
0.44000 -1.0094E 04	0.44200 -1.0098E 04	0.44400 -1.0083E 04	0.44600 -1.0050E 04	0.44800 -9.9949E 03
0.45000 -9.9200E 03	0.45200 -9.8272E 03	0.45400 -9.7188E 03	0.45600 -9.5976E 03	0.45800 -9.4794E 03
0.46000 -9.3514E 03	0.46200 -9.2136E 03	0.46400 -9.0744E 03	0.46600 -8.9390E 03	0.46800 -8.8098E 03
0.47000 -8.6885E 03	0.47200 -8.5767E 03	0.47400 -8.4723E 03	0.47600 -8.3746E 03	0.47800 -8.2818E 03
0.48000 -8.1950E 03	0.48200 -8.1146E 03	0.48400 -8.0413E 03	0.48600 -7.9663E 03	0.48800 -7.8871E 03
0.49000 -7.7998E 03	0.49200 -7.7065E 03	0.49400 -7.6094E 03	0.49600 -7.4973E 03	0.49800 -7.4134E 03
0.50000 -7.3240E 03	0.50200 -7.2459E 03			

TIME FUNCTION NUMBER = (5)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 35 00>02$ 0. -297.3)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-2.9730E 02	0.00010	-2.9730E 02	0.00020	-2.9730E 02	0.00030	-2.9730E 02	0.00040	-2.9730E 02
0.00050	-2.9860E 02	0.00060	-2.9860E 02	0.00070	-2.9860E 02	0.00080	-2.9860E 02	0.00090	-2.9860E 02
0.00100	-2.9860E 02	0.00110	-2.9860E 02	0.00120	-2.9860E 02	0.00130	-2.9730E 02	0.00140	-2.9730E 02
0.00150	-2.9860E 02	0.00160	-2.9860E 02	0.00170	-2.9860E 02	0.00180	-2.9860E 02	0.00190	-2.9860E 02
0.00200	-2.9860E 02	0.00210	-2.9860E 02	0.00220	-2.9860E 02	0.00230	-2.9860E 02	0.00240	-2.9860E 02
0.00250	-2.9980E 02	0.00260	-2.9860E 02	0.00270	-2.9910E 02	0.00280	-2.9860E 02	0.00290	-2.9980E 02
0.00300	-2.9980E 02	0.00310	-2.9860E 02	0.00320	-2.9980E 02	0.00330	-2.9980E 02	0.00340	-2.9980E 02
0.00350	-3.0030E 02	0.00360	-2.9980E 02	0.00370	-2.9980E 02	0.00380	-3.0110E 02	0.00390	-2.9980E 02
0.00400	-2.9980E 02	0.00410	-3.0110E 02	0.00420	-3.0110E 02	0.00430	-3.0110E 02	0.00440	-3.0110E 02
0.00450	-3.0160E 02	0.00460	-3.0110E 02	0.00470	-3.0110E 02	0.00480	-3.0280E 02	0.00490	-3.0230E 02
0.00500	-3.0110E 02	0.00510	-3.0230E 02	0.00520	-3.0230E 02	0.00530	-3.0350E 02	0.00540	-3.0230E 02
0.00550	-3.0350E 02	0.00560	-3.0410E 02	0.00570	-3.0350E 02	0.00580	-3.0350E 02	0.00590	-3.0410E 02
0.00600	-3.0480E 02	0.00610	-3.0530E 02	0.00620	-3.0600E 02	0.00630	-3.0480E 02	0.00640	-3.0660E 02
0.00650	-3.0600E 02	0.00660	-3.0730E 02	0.00670	-3.0780E 02	0.00680	-3.0730E 02	0.00690	-3.0900E 02
0.00700	-3.0900E 02	0.00710	-3.1030E 02	0.00720	-3.1150E 02	0.00730	-3.1230E 02	0.00740	-3.1280E 02
0.00750	-3.1530E 02	0.00760	-3.1530E 02	0.00770	-3.1650E 02	0.00780	-3.1780E 02	0.00790	-3.1900E 02
0.00800	-3.2030E 02	0.00810	-3.2200E 02	0.00820	-3.2450E 02	0.00830	-3.2520E 02	0.00840	-3.2820E 02
0.00850	-3.3070E 02	0.00860	-3.3320E 02	0.00870	-3.3570E 02	0.00880	-3.3700E 02	0.00890	-3.4120E 02
0.00900	-3.4370E 02	0.00910	-3.4870E 02	0.00920	-3.5170E 02	0.00930	-3.5370E 02	0.00940	-3.5870E 02
0.00950	-3.6290E 02	0.00960	-3.6910E 02	0.00970	-3.7290E 02	0.00980	-3.7890E 02	0.00990	-3.8510E 02
0.01000	-3.9010E 02	0.01010	-3.9690E 02	0.01020	-4.0310E 02	0.01030	-4.1110E 02	0.01040	-4.1780E 02
0.01050	-4.2650E 02	0.01060	-4.3450E 02	0.01070	-4.4320E 02	0.01080	-4.5420E 02	0.01090	-4.6350E 02
0.01100	-4.7340E 02	0.01110	-4.8390E 02	0.01120	-4.9740E 02	0.01130	-5.0920E 02	0.01140	-5.2260E 02
0.01150	-5.3560E 02	0.01160	-5.5110E 02	0.01170	-5.6630E 02	0.01180	-5.8180E 02	0.01190	-5.9780E 02
0.01200	-6.1500E 02	0.01210	-6.3470E 02	0.01220	-6.5320E 02	0.01230	-6.7340E 02	0.01240	-6.9440E 02
0.01250	-7.1640E 02	0.01260	-7.3910E 02	0.01270	-7.6310E 02	0.01280	-7.8830E 02	0.01290	-8.1530E 02
0.01300	-8.4230E 02	0.01310	-8.6920E 02	0.01320	-8.9820E 02	0.01330	-9.2940E 02	0.01340	-9.6070E 02
0.01350	-9.9440E 02	0.01360	-1.0286E 03	0.01370	-1.0654E 03	0.01380	-1.1016E 03	0.01390	-1.1396E 03
0.01400	-1.1793E 03	0.01410	-1.2215E 03	0.01420	-1.2643E 03	0.01430	-1.3083E 03	0.01440	-1.3542E 03
0.01450	-1.4012E 03	0.01460	-1.4507E 03	0.01470	-1.5007E 03	0.01480	-1.5532E 03	0.01490	-1.6070E 03
0.01500	-1.6612E 03	0.01510	-1.7198E 03	0.01520	-1.7783E 03	0.01530	-1.8393E 03	0.01540	-1.9021E 03
0.01550	-1.9666E 03	0.01560	-2.0324E 03	0.01570	-2.0986E 03	0.01580	-2.1687E 03	0.01590	-2.2405E 03
0.01600	-2.3153E 03	0.01610	-2.3893E 03	0.01620	-2.4671E 03	0.01630	-2.5467E 03	0.01640	-2.6293E 03
0.01650	-2.7106E 03	0.01660	-2.7967E 03	0.01670	-2.8835E 03	0.01680	-2.9727E 03	0.01690	-3.0648E 03
0.01700	-3.1581E 03	0.01710	-3.2538E 03	0.01720	-3.3519E 03	0.01730	-3.4505E 03	0.01740	-3.5540E 03
0.01750	-3.6586E 03	0.01760	-3.7638E 03	0.01770	-3.8725E 03	0.01780	-3.9624E 03	0.01790	-4.0949E 03
0.01800	-4.2096E 03	0.01810	-4.3261E 03	0.01820	-4.4448E 03	0.01830	-4.5653E 03	0.01840	-4.6891E 03
0.01850	-4.8144E 03	0.01860	-4.9402E 03	0.01870	-5.0715E 03	0.01880	-5.2015E 03	0.01890	-5.3339E 03
0.01900	-5.4692E 03	0.01910	-5.6063E 03	0.01920	-5.7469E 03	0.01930	-5.8876E 03	0.01940	-6.0310E 03
0.01950	-6.1751E 03	0.01960	-6.3233E 03	0.01970	-6.4715E 03	0.01980	-6.6215E 03	0.01990	-6.7737E 03
0.02000	-6.9289E 03	0.02010	-7.0847E 03	0.02020	-7.2422E 03	0.02030	-7.4020E 03	0.02040	-7.5630E 03
0.02050	-7.7251E 03	0.02060	-7.8902E 03	0.02070	-8.0552E 03	0.02080	-8.2231E 03	0.02090	-8.3910E 03
0.02100	-8.5606E 03	0.02110	-8.7338E 03	0.02120	-8.9057E 03	0.02130	-9.0799E 03	0.02140	-9.2553E 03
0.02150	-9.4330E 03	0.02160	-9.6100E 03	0.02170	-9.7890E 03	0.02180	-9.9682E 03	0.02190	-1.0149E 04
0.02200	-1.0332E 04	0.02210	-1.0513E 04	0.02220	-1.0697E 04	0.02230	-1.0882E 04	0.02240	-1.1067E 04
0.02250	-1.1252E 04	0.02260	-1.1438E 04	0.02270	-1.1624E 04	0.02280	-1.1812E 04	0.02290	-1.2000E 04
0.02300	-1.2186E 04	0.02310	-1.2375E 04	0.02320	-1.2563E 04	0.02330	-1.2752E 04	0.02340	-1.2939E 04
0.02350	-1.3128E 04	0.02360	-1.3317E 04	0.02370	-1.3505E 04	0.02380	-1.3693E 04	0.02390	-1.3880E 04
0.02400	-1.4067E 04	0.02410	-1.4254E 04	0.02420	-1.4440E 04	0.02430	-1.4625E 04	0.02440	-1.4811E 04
0.02450	-1.4996E 04	0.02460	-1.5178E 04	0.02470	-1.5361E 04	0.02480	-1.5543E 04	0.02490	-1.5724E 04
0.02500	-1.5904E 04	0.02600	-1.7636E 04	0.02700	-1.9181E 04	0.02800	-2.0482E 04	0.02900	-2.1492E 04
0.03000	-2.2177E 04	0.03100	-2.2523E 04	0.03200	-2.2554E 04	0.03300	-2.2327E 04	0.03400	-2.1917E 04
0.03500	-2.1390E 04	0.03600	-2.0815E 04	0.03700	-2.0258E 04	0.03800	-1.9772E 04	0.03900	-1.9401E 04

TABLE 6.A-12
(SHEET 10 OF 28)

0.04000	-1.9160E 04	0.04100	-1.9030E 04	0.04200	-1.8995E 04	0.04300	-1.9029E 04	0.04400	-1.9104E 04
0.04500	-1.9188E 04	0.04600	-1.9245E 04	0.04700	-1.9257E 04	0.04800	-1.9195E 04	0.04900	-1.9034E 04
0.05000	-1.8753E 04	0.05100	-1.8344E 04	0.05200	-1.7794E 04	0.05300	-1.7105E 04	0.05400	-1.6287E 04
0.05500	-1.5355E 04	0.05600	-1.4350E 04	0.05700	-1.3290E 04	0.05800	-1.2199E 04	0.05900	-1.1092E 04
0.06000	-9.9735E 03	0.06100	-8.8916E 03	0.06200	-7.9043E 03	0.06300	-7.0414E 03	0.06400	-6.3441E 03
0.06500	-5.8522E 03	0.06600	-5.5871E 03	0.06700	-5.5746E 03	0.06800	-5.8366E 03	0.06900	-6.3744E 03
0.07000	-7.1888E 03	0.07100	-8.2730E 03	0.07200	-9.6038E 03	0.07300	-1.1158E 04	0.07400	-1.2907E 04
0.07500	-1.4816E 04	0.07600	-1.6863E 04	0.07700	-1.9005E 04	0.07800	-2.1221E 04	0.07900	-2.3466E 04
0.08000	-2.5703E 04	0.08100	-2.7896E 04	0.08200	-3.0014E 04	0.08300	-3.2028E 04	0.08400	-3.3908E 04
0.08500	-3.5622E 04	0.08600	-3.7078E 04	0.08700	-3.8362E 04	0.08800	-3.9463E 04	0.08900	-4.0354E 04
0.09000	-4.1074E 04	0.09100	-4.1514E 04	0.09200	-4.1727E 04	0.09300	-4.1821E 04	0.09400	-4.1702E 04
0.09500	-4.1456E 04	0.09600	-4.1068E 04	0.09700	-4.0570E 04	0.09800	-3.9875E 04	0.09900	-3.9104E 04
0.10000	-3.8221E 04	0.10100	-3.7344E 04	0.10200	-3.6486E 04	0.10300	-3.5641E 04	0.10400	-3.4836E 04
0.10500	-3.4049E 04	0.10600	-3.3259E 04	0.10700	-3.2367E 04	0.10800	-3.1559E 04	0.10900	-3.0726E 04
0.11000	-2.9923E 04	0.11100	-2.9139E 04	0.11200	-2.8374E 04	0.11300	-2.7615E 04	0.11400	-2.6768E 04
0.11500	-2.5989E 04	0.11600	-2.5182E 04	0.11700	-2.4406E 04	0.11800	-2.3659E 04	0.11900	-2.2947E 04
0.12000	-2.2167E 04	0.12100	-2.1466E 04	0.12200	-2.0819E 04	0.12300	-2.0224E 04	0.12400	-1.9699E 04
0.12500	-1.9136E 04	0.12600	-1.8671E 04	0.12700	-1.8244E 04	0.12800	-1.7883E 04	0.12900	-1.7590E 04
0.13000	-1.7253E 04	0.13100	-1.6972E 04	0.13200	-1.6740E 04	0.13300	-1.6584E 04	0.13400	-1.6513E 04
0.13500	-1.6495E 04	0.13600	-1.6417E 04	0.13700	-1.6351E 04	0.13800	-1.6337E 04	0.13900	-1.6408E 04
0.14000	-1.6561E 04	0.14100	-1.6801E 04	0.14200	-1.6993E 04	0.14300	-1.7226E 04	0.14400	-1.7521E 04
0.14500	-1.7883E 04	0.14600	-1.8184E 04	0.14700	-1.8504E 04	0.14800	-1.8874E 04	0.14900	-1.9296E 04
0.15000	-1.9722E 04	0.15100	-2.0174E 04	0.15200	-2.0651E 04	0.15300	-2.1031E 04	0.15400	-2.1405E 04
0.15500	-2.1758E 04	0.15600	-2.2125E 04	0.15700	-2.2508E 04	0.15800	-2.2899E 04	0.15900	-2.3262E 04
0.16000	-2.3534E 04	0.16100	-2.3801E 04	0.16200	-2.4078E 04	0.16300	-2.4359E 04	0.16400	-2.4611E 04
0.16500	-2.4834E 04	0.16600	-2.4971E 04	0.16700	-2.5097E 04	0.16800	-2.5229E 04	0.16900	-2.5355E 04
0.17000	-2.5462E 04	0.17100	-2.5546E 04	0.17200	-2.5499E 04	0.17300	-2.5403E 04	0.17400	-2.5310E 04
0.17500	-2.5223E 04	0.17600	-2.5019E 04	0.17700	-2.4809E 04	0.17800	-2.4622E 04	0.17900	-2.4453E 04
0.18000	-2.4196E 04	0.18100	-2.3949E 04	0.18200	-2.3736E 04	0.18300	-2.3553E 04	0.18400	-2.3397E 04
0.18500	-2.3261E 04	0.18600	-2.3033E 04	0.18700	-2.2809E 04	0.18800	-2.2582E 04	0.18900	-2.2392E 04
0.19000	-2.2249E 04	0.19100	-2.2138E 04	0.19200	-2.2058E 04	0.19300	-2.2010E 04	0.19400	-2.1998E 04
0.19500	-2.1907E 04	0.19600	-2.1837E 04	0.19700	-2.1777E 04	0.19800	-2.1770E 04	0.19900	-2.1714E 04
0.20000	-2.1709E 04	0.20200	-2.1904E 04	0.20400	-2.2314E 04	0.20600	-2.2839E 04	0.20800	-2.3048E 04
0.21000	-2.3569E 04	0.21200	-2.3803E 04	0.21400	-2.4332E 04	0.21600	-2.4913E 04	0.21800	-2.5093E 04
0.22000	-2.5317E 04	0.22200	-2.5600E 04	0.22400	-2.5941E 04	0.22600	-2.6320E 04	0.22800	-2.6721E 04
0.23000	-2.7096E 04	0.23200	-2.7046E 04	0.23400	-2.7030E 04	0.23600	-2.7019E 04	0.23800	-2.6966E 04
0.24000	-2.7057E 04	0.24200	-2.7014E 04	0.24400	-2.7183E 04	0.24600	-2.7505E 04	0.24800	-2.7900E 04
0.25000	-2.8327E 04	0.25200	-2.8747E 04	0.25400	-2.8711E 04	0.25600	-2.8708E 04	0.25800	-2.8793E 04
0.26000	-2.8939E 04	0.26200	-2.9132E 04	0.26400	-2.9361E 04	0.26600	-2.9598E 04	0.26800	-2.9804E 04
0.27000	-2.9972E 04	0.27200	-3.0087E 04	0.27400	-3.0211E 04	0.27600	-3.0265E 04	0.27800	-3.0324E 04
0.28000	-3.0278E 04	0.28200	-3.0266E 04	0.28400	-3.0382E 04	0.28600	-3.0057E 04	0.28800	-3.0402E 04
0.29000	-2.9989E 04	0.29200	-3.0586E 04	0.29400	-3.0073E 04	0.29600	-3.0316E 04	0.29800	-3.0770E 04
0.30000	-3.0441E 04	0.30200	-3.0986E 04	0.30400	-3.0922E 04	0.30600	-3.0839E 04	0.30800	-3.0801E 04
0.31000	-3.0587E 04	0.31200	-3.0226E 04	0.31400	-2.9746E 04	0.31600	-2.9185E 04	0.31800	-2.8571E 04
0.32000	-2.7928E 04	0.32200	-2.7285E 04	0.32400	-2.6669E 04	0.32600	-2.6095E 04	0.32800	-2.5558E 04
0.33000	-2.5061E 04	0.33200	-2.4608E 04	0.33400	-2.4180E 04	0.33600	-2.3775E 04	0.33800	-2.3389E 04
0.34000	-2.3012E 04	0.34200	-2.2647E 04	0.34400	-2.2290E 04	0.34600	-2.1929E 04	0.34800	-2.1552E 04
0.35000	-2.1169E 04	0.35200	-2.0778E 04	0.35400	-2.0375E 04	0.35600	-1.9978E 04	0.35800	-1.9605E 04
0.36000	-1.9253E 04	0.36200	-1.8940E 04	0.36400	-1.8662E 04	0.36600	-1.8422E 04	0.36800	-1.8222E 04
0.37000	-1.8078E 04	0.37200	-1.7998E 04	0.37400	-1.7978E 04	0.37600	-1.8014E 04	0.37800	-1.8105E 04
0.38000	-1.8250E 04	0.38200	-1.8438E 04	0.38400	-1.8650E 04	0.38600	-1.8871E 04	0.38800	-1.9088E 04
0.39000	-1.9281E 04	0.39200	-1.9441E 04	0.39400	-1.9567E 04	0.39600	-1.9653E 04	0.39800	-1.9709E 04
0.40000	-1.9738E 04	0.40200	-1.9735E 04	0.40400	-1.9708E 04	0.40600	-1.9664E 04	0.40800	-1.9621E 04
0.41000	-1.9594E 04	0.41200	-1.9590E 04	0.41400	-1.9629E 04	0.41600	-1.9686E 04	0.41800	-1.9735E 04
0.42000	-1.9793E 04	0.42200	-1.9863E 04	0.42400	-1.9952E 04	0.42600	-2.0086E 04	0.42800	-2.0243E 04
0.43000	-2.0396E 04	0.43200	-2.0538E 04	0.43400	-2.0664E 04	0.43600	-2.0768E 04	0.43800	-2.0846E 04
0.44000	-2.0890E 04	0.44200	-2.0897E 04	0.44400	-2.0867E 04	0.44600	-2.0799E 04	0.44800	-2.0684E 04
0.45000	-2.0529E 04	0.45200	-2.0337E 04	0.45400	-2.0113E 04	0.45600	-1.9862E 04	0.45800	-1.9617E 04
0.46000	-1.9353E 04	0.46200	-1.9067E 04	0.46400	-1.8779E 04	0.46600	-1.8499E 04	0.46800	-1.8232E 04
0.47000	-1.7981E 04	0.47200	-1.7749E 04	0.47400	-1.7533E 04	0.47600	-1.7331E 04	0.47800	-1.7139E 04
0.48000	-1.6959E 04	0.48200	-1.6793E 04	0.48400	-1.6641E 04	0.48600	-1.6486E 04	0.48800	-1.6322E 04
0.49000	-1.6142E 04	0.49200	-1.5948E 04	0.49400	-1.5747E 04	0.49600	-1.5516E 04	0.49800	-1.5342E 04
0.50000	-1.5157E 04	0.50200	-1.4995E 04						

TABLE 6.A-12
(SHEET 11 OF 28)

TIME FUNCTION NUMBER = (6)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 37 00>02$ 0. -1.2)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-1.2000E 00	0.00010	-1.2000E 00	0.00020	-1.2000E 00	0.00030	-1.2000E 00	0.00040	-1.2000E 00
0.00050	-1.2000E 00	0.00060	-1.2000E 00	0.00070	-1.2000E 00	0.00080	-1.2000E 00	0.00090	-1.2000E 00
0.00100	-1.2000E 00	0.00110	-1.2000E 00	0.00120	-1.2000E 00	0.00130	-1.2000E 00	0.00140	-1.2000E 00
0.00150	-1.2000E 00	0.00160	-1.2000E 00	0.00170	-1.2000E 00	0.00180	-1.2000E 00	0.00190	-1.2000E 00
0.00200	-1.2000E 00	0.00210	-1.2000E 00	0.00220	-1.2000E 00	0.00230	-1.2000E 00	0.00240	-1.2000E 00
0.00250	-1.2000E 00	0.00260	-1.2000E 00	0.00270	-1.2000E 00	0.00280	-2.8000E 00	0.00290	-2.8000E 00
0.00300	-2.8000E 00	0.00310	-2.8000E 00	0.00320	-2.8000E 00	0.00330	-4.4000E 00	0.00340	-4.4000E 00
0.00350	-4.4000E 00	0.00360	-6.1000E 00	0.00370	-6.1000E 00	0.00380	-7.7000E 00	0.00390	-9.3000E 00
0.00400	-9.3000E 00	0.00410	-1.1000E 01	0.00420	-1.2600E 01	0.00430	-1.4200E 01	0.00440	-1.7500E 01
0.00450	-1.9100E 01	0.00460	-2.0700E 01	0.00470	-2.4000E 01	0.00480	-2.7300E 01	0.00490	-3.0500E 01
0.00500	-3.5000E 01	0.00510	-3.9900E 01	0.00520	-4.3200E 01	0.00530	-4.8100E 01	0.00540	-5.4600E 01
0.00550	-5.9500E 01	0.00560	-6.7200E 01	0.00570	-7.3700E 01	0.00580	-8.1900E 01	0.00590	-9.1200E 01
0.00600	-9.9400E 01	0.00610	-1.1030E 02	0.00620	-1.2130E 02	0.00630	-1.3270E 02	0.00640	-1.4600E 02
0.00650	-1.6030E 02	0.00660	-1.7450E 02	0.00670	-1.8920E 02	0.00680	-2.0510E 02	0.00690	-2.2260E 02
0.00700	-2.4290E 02	0.00710	-2.6370E 02	0.00720	-2.8450E 02	0.00730	-3.0970E 02	0.00740	-3.3490E 02
0.00750	-3.5940E 02	0.00760	-3.8810E 02	0.00770	-4.1820E 02	0.00780	-4.4840E 02	0.00790	-4.8130E 02
0.00800	-5.1590E 02	0.00810	-5.5370E 02	0.00820	-5.9160E 02	0.00830	-6.3230E 02	0.00840	-6.7660E 02
0.00850	-7.2120E 02	0.00860	-7.6800E 02	0.00870	-8.1810E 02	0.00880	-8.7170E 02	0.00890	-9.2620E 02
0.00900	-9.8240E 02	0.00910	-1.0418E 03	0.00920	-1.1046E 03	0.00930	-1.1717E 03	0.00940	-1.2388E 03
0.00950	-1.3071E 03	0.00960	-1.3815E 03	0.00970	-1.4564E 03	0.00980	-1.5384E 03	0.00990	-1.6212E 03
0.01000	-1.7062E 03	0.01010	-1.7956E 03	0.01020	-1.8866E 03	0.01030	-1.9841E 03	0.01040	-2.0829E 03
0.01050	-2.1840E 03	0.01060	-2.2901E 03	0.01070	-2.3994E 03	0.01080	-2.5117E 03	0.01090	-2.6271E 03
0.01100	-2.7461E 03	0.01110	-2.8704E 03	0.01120	-2.9971E 03	0.01130	-3.1283E 03	0.01140	-3.2611E 03
0.01150	-3.4011E 03	0.01160	-3.5412E 03	0.01170	-3.6374E 03	0.01180	-3.8360E 03	0.01190	-3.9910E 03
0.01200	-4.1462E 03	0.01210	-4.3086E 03	0.01220	-4.4722E 03	0.01230	-4.6430E 03	0.01240	-4.8151E 03
0.01250	-4.9926E 03	0.01260	-5.1739E 03	0.01270	-5.3571E 03	0.01280	-5.5466E 03	0.01290	-5.7391E 03
0.01300	-5.9374E 03	0.01310	-6.1380E 03	0.01320	-6.3419E 03	0.01330	-6.5523E 03	0.01340	-6.7662E 03
0.01350	-6.9846E 03	0.01360	-7.2070E 03	0.01370	-7.4325E 03	0.01380	-7.6654E 03	0.01390	-7.9000E 03
0.01400	-8.1380E 03	0.01410	-8.3809E 03	0.01420	-8.6272E 03	0.01430	-8.8785E 03	0.01440	-9.1319E 03
0.01450	-9.3904E 03	0.01460	-9.6535E 03	0.01470	-9.9180E 03	0.01480	-1.0190E 04	0.01490	-1.0463E 04
0.01500	-1.0741E 04	0.01510	-1.1022E 04	0.01520	-1.1307E 04	0.01530	-1.1596E 04	0.01540	-1.1888E 04
0.01550	-1.2184E 04	0.01560	-1.2484E 04	0.01570	-1.2785E 04	0.01580	-1.3093E 04	0.01590	-1.3403E 04
0.01600	-1.3716E 04	0.01610	-1.4035E 04	0.01620	-1.4354E 04	0.01630	-1.4678E 04	0.01640	-1.5003E 04
0.01650	-1.5332E 04	0.01660	-1.5665E 04	0.01670	-1.6003E 04	0.01680	-1.6341E 04	0.01690	-1.6683E 04
0.01700	-1.7027E 04	0.01710	-1.7376E 04	0.01720	-1.7726E 04	0.01730	-1.8080E 04	0.01740	-1.8436E 04
0.01750	-1.8795E 04	0.01760	-1.9154E 04	0.01770	-1.9518E 04	0.01780	-1.9884E 04	0.01790	-2.0252E 04
0.01800	-2.0622E 04	0.01810	-2.0995E 04	0.01820	-2.1370E 04	0.01830	-2.1746E 04	0.01840	-2.2128E 04
0.01850	-2.2508E 04	0.01860	-2.2893E 04	0.01870	-2.3283E 04	0.01880	-2.3671E 04	0.01890	-2.4063E 04
0.01900	-2.4456E 04	0.01910	-2.4851E 04	0.01920	-2.5251E 04	0.01930	-2.5651E 04	0.01940	-2.6053E 04
0.01950	-2.6456E 04	0.01960	-2.6863E 04	0.01970	-2.7268E 04	0.01980	-2.7676E 04	0.01990	-2.8085E 04
0.02000	-2.8497E 04	0.02010	-2.8908E 04	0.02020	-2.9323E 04	0.02030	-2.9735E 04	0.02040	-3.0150E 04
0.02050	-3.0567E 04	0.02060	-3.0983E 04	0.02070	-3.1400E 04	0.02080	-3.1815E 04	0.02090	-3.2233E 04
0.02100	-3.2650E 04	0.02110	-3.3069E 04	0.02120	-3.3488E 04	0.02130	-3.3903E 04	0.02140	-3.4323E 04
0.02150	-3.4739E 04	0.02160	-3.5156E 04	0.02170	-3.5573E 04	0.02180	-3.5990E 04	0.02190	-3.6405E 04
0.02200	-3.6818E 04	0.02210	-3.7232E 04	0.02220	-3.7646E 04	0.02230	-3.8057E 04	0.02240	-3.8469E 04
0.02250	-3.8879E 04	0.02260	-3.9286E 04	0.02270	-3.9694E 04	0.02280	-4.0098E 04	0.02290	-4.0504E 04
0.02300	-4.0906E 04	0.02310	-4.1305E 04	0.02320	-4.1705E 04	0.02330	-4.2102E 04	0.02340	-4.2496E 04
0.02350	-4.2890E 04	0.02360	-4.3280E 04	0.02370	-4.3668E 04	0.02380	-4.4054E 04	0.02390	-4.4439E 04
0.02400	-4.4819E 04	0.02410	-4.5197E 04	0.02420	-4.5574E 04	0.02430	-4.5946E 04	0.02440	-4.6316E 04
0.02450	-4.6684E 04	0.02460	-4.7050E 04	0.02470	-4.7411E 04	0.02480	-4.7772E 04	0.02490	-4.8127E 04
0.02500	-4.8480E 04	0.02600	-5.1833E 04	0.02700	-5.4808E 04	0.02800	-5.7371E 04	0.02900	-5.9642E 04
0.03000	-6.2415E 04	0.03100	-6.5735E 04	0.03200	-6.9368E 04	0.03300	-7.2665E 04	0.03400	-7.5383E 04
0.03500	-7.7558E 04	0.03600	-7.9155E 04	0.03700	-8.0208E 04	0.03800	-8.0634E 04	0.03900	-8.0671E 04

TABLE 6.A-12
(SHEET 12 OF 28)

0.04000 -8.0102E 04	0.04100 -7.9157E 04	0.04200 -7.7869E 04	0.04300 -7.6264E 04	0.04400 -7.4408E 04
0.04500 -7.2567E 04	0.04600 -7.0789E 04	0.04700 -6.9105E 04	0.04800 -6.7193E 04	0.04900 -6.5512E 04
0.05000 -6.3971E 04	0.05100 -6.2555E 04	0.05200 -6.1311E 04	0.05300 -6.0141E 04	0.05400 -5.9022E 04
0.05500 -5.8177E 04	0.05600 -5.7511E 04	0.05700 -5.7142E 04	0.05800 -5.6955E 04	0.05900 -5.6947E 04
0.06000 -5.7248E 04	0.06100 -5.7728E 04	0.06200 -5.8389E 04	0.06300 -5.9137E 04	0.06400 -6.0059E 04
0.06500 -6.0997E 04	0.06600 -6.1862E 04	0.06700 -6.3089E 04	0.06800 -6.4286E 04	0.06900 -6.5397E 04
0.07000 -6.6633E 04	0.07100 -6.7738E 04	0.07200 -6.8902E 04	0.07300 -7.0095E 04	0.07400 -7.1253E 04
0.07500 -7.2512E 04	0.07600 -7.3617E 04	0.07700 -7.4541E 04	0.07800 -7.5289E 04	0.07900 -7.5931E 04
0.08000 -7.6544E 04	0.08100 -7.6929E 04	0.08200 -7.7155E 04	0.08300 -7.7289E 04	0.08400 -7.7232E 04
0.08500 -7.7170E 04	0.08600 -7.6939E 04	0.08700 -7.6629E 04	0.08800 -7.6281E 04	0.08900 -7.5932E 04
0.09000 -7.5621E 04	0.09100 -7.5320E 04	0.09200 -7.5073E 04	0.09300 -7.4931E 04	0.09400 -7.4841E 04
0.09500 -7.4635E 04	0.09600 -7.4720E 04	0.09700 -7.4838E 04	0.09800 -7.5627E 04	0.09900 -7.5364E 04
0.10000 -7.5530E 04	0.10100 -7.5798E 04	0.10200 -7.5919E 04	0.10300 -7.5987E 04	0.10400 -7.5967E 04
0.10500 -7.5815E 04	0.10600 -7.5552E 04	0.10700 -7.5349E 04	0.10800 -7.5025E 04	0.10900 -7.4591E 04
0.11000 -7.4034E 04	0.11100 -7.3385E 04	0.11200 -7.2661E 04	0.11300 -7.1905E 04	0.11400 -7.1244E 04
0.11500 -7.0417E 04	0.11600 -6.9540E 04	0.11700 -6.8629E 04	0.11800 -6.7688E 04	0.11900 -6.6750E 04
0.12000 -6.5943E 04	0.12100 -6.5084E 04	0.12200 -6.4213E 04	0.12300 -6.3304E 04	0.12400 -6.2363E 04
0.12500 -6.1574E 04	0.12600 -6.0758E 04	0.12700 -5.9861E 04	0.12800 -5.9016E 04	0.12900 -5.8240E 04
0.13000 -5.7798E 04	0.13100 -5.7197E 04	0.13200 -5.6780E 04	0.13300 -5.6402E 04	0.13400 -5.6259E 04
0.13500 -5.6005E 04	0.13600 -5.6389E 04	0.13700 -5.6037E 04	0.13800 -5.6119E 04	0.13900 -5.6169E 04
0.14000 -5.6232E 04	0.14100 -5.6293E 04	0.14200 -5.6555E 04	0.14300 -5.6641E 04	0.14400 -5.6794E 04
0.14500 -5.6913E 04	0.14600 -5.7317E 04	0.14700 -5.7413E 04	0.14800 -5.7592E 04	0.14900 -5.8021E 04
0.15000 -5.7957E 04	0.15100 -5.8110E 04	0.15200 -5.8166E 04	0.15300 -5.8396E 04	0.15400 -5.8771E 04
0.15500 -5.8660E 04	0.15600 -5.8820E 04	0.15700 -5.8938E 04	0.15800 -5.9288E 04	0.15900 -5.9859E 04
0.16000 -5.9448E 04	0.16100 -5.9577E 04	0.16200 -5.9619E 04	0.16300 -5.9791E 04	0.16400 -5.9822E 04
0.16500 -6.0254E 04	0.16600 -5.9799E 04	0.16700 -5.9811E 04	0.16800 -5.9736E 04	0.16900 -5.9695E 04
0.17000 -5.9508E 04	0.17100 -5.9323E 04	0.17200 -5.9421E 04	0.17300 -5.9149E 04	0.17400 -5.9022E 04
0.17500 -5.9779E 04	0.17600 -5.8893E 04	0.17700 -5.8832E 04	0.17800 -5.8675E 04	0.17900 -5.9270E 04
0.18000 -5.8467E 04	0.18100 -5.8401E 04	0.18200 -5.8269E 04	0.18300 -5.8099E 04	0.18400 -5.7913E 04
0.18500 -5.7806E 04	0.18600 -5.7955E 04	0.18700 -5.8246E 04	0.18800 -5.7954E 04	0.18900 -5.7973E 04
0.19000 -5.8046E 04	0.19100 -5.7956E 04	0.19200 -5.7876E 04	0.19300 -5.7752E 04	0.19400 -5.7754E 04
0.19500 -5.8003E 04	0.19600 -5.8353E 04	0.19700 -5.8156E 04	0.19800 -5.9051E 04	0.19900 -5.8592E 04
0.20000 -5.8900E 04	0.20200 -5.9190E 04	0.20400 -5.9277E 04	0.20600 -5.8994E 04	0.20800 -5.9690E 04
0.21000 -6.0010E 04	0.21200 -5.9946E 04	0.21400 -5.9602E 04	0.21600 -5.9558E 04	0.21800 -5.9767E 04
0.22000 -5.9608E 04	0.22200 -5.9683E 04	0.22400 -5.9422E 04	0.22600 -5.9442E 04	0.22800 -5.9156E 04
0.23000 -5.8556E 04	0.23200 -5.8737E 04	0.23400 -5.8455E 04	0.23600 -5.8772E 04	0.23800 -5.8935E 04
0.24000 -5.9728E 04	0.24200 -6.0076E 04	0.24400 -6.1001E 04	0.24600 -6.1497E 04	0.24600 -6.1404E 04
0.25000 -6.1479E 04	0.25200 -6.1092E 04	0.25400 -6.1344E 04	0.25600 -6.1972E 04	0.25800 -6.2597E 04
0.26000 -6.2548E 04	0.26200 -6.2490E 04	0.26400 -6.2377E 04	0.26600 -6.1672E 04	0.26800 -6.0921E 04
0.27000 -6.0049E 04	0.27200 -6.0172E 04	0.27400 -5.9811E 04	0.27600 -5.9377E 04	0.27800 -5.7505E 04
0.28000 -5.6151E 04	0.28200 -5.5691E 04	0.28400 -5.5891E 04	0.28600 -5.6210E 04	0.28800 -5.6929E 04
0.29000 -5.7792E 04	0.29200 -5.8035E 04	0.29400 -5.8283E 04	0.29600 -5.8288E 04	0.29600 -5.9167E 04
0.30000 -6.0018E 04	0.30200 -6.0767E 04	0.30400 -6.0741E 04	0.30600 -6.0557E 04	0.30800 -6.1057E 04
0.31000 -6.1185E 04	0.31200 -6.1286E 04	0.31400 -6.1155E 04	0.31600 -6.1858E 04	0.31800 -6.1755E 04
0.32000 -6.1351E 04	0.32200 -6.1810E 04	0.32400 -6.2025E 04	0.32600 -6.1868E 04	0.32800 -6.0734E 04
0.33000 -6.0225E 04	0.33200 -5.9756E 04	0.33400 -5.8330E 04	0.33600 -5.7710E 04	0.33800 -5.7240E 04
0.34000 -5.6561E 04	0.34200 -5.6648E 04	0.34400 -5.6006E 04	0.34600 -5.5191E 04	0.34800 -5.4353E 04
0.35000 -5.4475E 04	0.35200 -5.3953E 04	0.35400 -5.3258E 04	0.35600 -5.3689E 04	0.35800 -5.4086E 04
0.36000 -5.3677E 04	0.36200 -5.4103E 04	0.36400 -5.3620E 04	0.36600 -5.2972E 04	0.36800 -5.3515E 04
0.37000 -5.4072E 04	0.37200 -5.4413E 04	0.37400 -5.4781E 04	0.37600 -5.5022E 04	0.37800 -5.5040E 04
0.38000 -5.5710E 04	0.38200 -5.5500E 04	0.38400 -5.4966E 04	0.38600 -5.5006E 04	0.38800 -5.4717E 04
0.39000 -5.4004E 04	0.39200 -5.3806E 04	0.39400 -5.3600E 04	0.39600 -5.3301E 04	0.39800 -5.3842E 04
0.40000 -5.3566E 04	0.40200 -5.3047E 04	0.40400 -5.2944E 04	0.40600 -5.2802E 04	0.40800 -5.3567E 04
0.41000 -5.4177E 04	0.41200 -5.4411E 04	0.41400 -5.4544E 04	0.41600 -5.4612E 04	0.41800 -5.4460E 04
0.42000 -5.5004E 04	0.42200 -5.5188E 04	0.42400 -5.5949E 04	0.42600 -5.6407E 04	0.42800 -5.7142E 04
0.43000 -5.7411E 04	0.43200 -5.7106E 04	0.43400 -5.7349E 04	0.43600 -5.7097E 04	0.43800 -5.7352E 04
0.44000 -5.7106E 04	0.44200 -5.7326E 04	0.44400 -5.7024E 04	0.44600 -5.7120E 04	0.44800 -5.6558E 04
0.45000 -5.6600E 04	0.45200 -5.6355E 04	0.45400 -5.6529E 04	0.45600 -5.6258E 04	0.45800 -5.6214E 04
0.46000 -5.6477E 04	0.46200 -5.6350E 04	0.46400 -5.6621E 04	0.46600 -5.6389E 04	0.46800 -5.6544E 04
0.47000 -5.6177E 04	0.47200 -5.6249E 04	0.47400 -5.5755E 04	0.47600 -5.5524E 04	0.47800 -5.4887E 04
0.48000 -5.4888E 04	0.48200 -5.4377E 04	0.48400 -5.4251E 04	0.48600 -5.2955E 04	0.48800 -5.2182E 04
0.49000 -5.1462E 04	0.49200 -5.1481E 04	0.49400 -5.1309E 04	0.49600 -5.1737E 04	0.49800 -5.1908E 04
0.50000 -5.2565E 04	0.50200 -5.2763E 04			

TABLE 6.A-12
(SHEET 13 OF 28)

TIME FUNCTION NUMBER = (7)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 38 00>02$ 0. -0.2)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-2.0000E-01	0.00010	-2.0000E-01	0.00020	-2.0000E-01	0.00030	-2.0000E-01	0.00040	-2.0000E-01
0.00050	-2.0000E-01	0.00060	-2.0000E-01	0.00070	-2.0000E-01	0.00080	-2.0000E-01	0.00090	-2.0000E-01
0.00100	-2.0000E-01	0.00110	-2.0000E-01	0.00120	-2.0000E-01	0.00130	-2.0000E-01	0.00140	-2.0000E-01
0.00150	-2.0000E-01	0.00160	-2.0000E-01	0.00170	-2.0000E-01	0.00180	-2.0000E-01	0.00190	-2.0000E-01
0.00200	-2.0000E-01	0.00210	-2.0000E-01	0.00220	-2.0000E-01	0.00230	-2.0000E-01	0.00240	-2.0000E-01
0.00250	-2.0000E-01	0.00260	-2.0000E-01	0.00270	-2.0000E-01	0.00280	-5.0000E-01	0.00290	-5.0000E-01
0.00300	-5.0000E-01	0.00310	-5.0000E-01	0.00320	-5.0000E-01	0.00330	-8.0000E-01	0.00340	-8.0000E-01
0.00350	-8.0000E-01	0.00360	-1.1000E 00	0.00370	-1.1000E 00	0.00380	-1.4000E 00	0.00390	-1.7000E 00
0.00400	-1.7000E 00	0.00410	-2.0000E 00	0.00420	-2.3000E 00	0.00430	-2.6000E 00	0.00440	-3.2000E 00
0.00450	-3.5000E 00	0.00460	-3.8000E 00	0.00470	-4.4000E 00	0.00480	-5.0000E 00	0.00490	-5.6000E 00
0.00500	-6.4000E 00	0.00510	-7.3000E 00	0.00520	-7.9000E 00	0.00530	-8.8000E 00	0.00540	-1.0000E 01
0.00550	-1.0900E 01	0.00560	-1.2300E 01	0.00570	-1.3500E 01	0.00580	-1.5000E 01	0.00590	-1.6800E 01
0.00600	-1.8300E 01	0.00610	-2.0300E 01	0.00620	-2.2300E 01	0.00630	-2.4400E 01	0.00640	-2.6800E 01
0.00650	-2.9400E 01	0.00660	-3.2000E 01	0.00670	-3.4700E 01	0.00680	-3.7700E 01	0.00690	-4.0900E 01
0.00700	-4.4600E 01	0.00710	-4.8400E 01	0.00720	-5.2200E 01	0.00730	-5.6900E 01	0.00740	-6.1500E 01
0.00750	-6.6000E 01	0.00760	-7.1300E 01	0.00770	-7.6800E 01	0.00780	-8.2300E 01	0.00790	-8.8400E 01
0.00800	-9.4700E 01	0.00810	-1.0170E 02	0.00820	-1.0860E 02	0.00830	-1.1610E 02	0.00840	-1.2430E 02
0.00850	-1.3250E 02	0.00860	-1.4100E 02	0.00870	-1.5020E 02	0.00880	-1.6010E 02	0.00890	-1.7010E 02
0.00900	-1.8040E 02	0.00910	-1.9130E 02	0.00920	-2.0290E 02	0.00930	-2.1520E 02	0.00940	-2.2750E 02
0.00950	-2.4010E 02	0.00960	-2.5370E 02	0.00970	-2.6750E 02	0.00980	-2.8250E 02	0.00990	-2.9770E 02
0.01000	-3.1330E 02	0.01010	-3.2980E 02	0.01020	-3.4650E 02	0.01030	-3.6440E 02	0.01040	-3.8250E 02
0.01050	-4.0110E 02	0.01060	-4.2060E 02	0.01070	-4.4060E 02	0.01080	-4.6130E 02	0.01090	-4.8250E 02
0.01100	-5.0430E 02	0.01110	-5.2710E 02	0.01120	-5.5040E 02	0.01130	-5.7450E 02	0.01140	-5.9890E 02
0.01150	-6.2460E 02	0.01160	-6.5030E 02	0.01170	-6.7720E 02	0.01180	-7.0450E 02	0.01190	-7.3290E 02
0.01200	-7.6140E 02	0.01210	-7.9130E 02	0.01220	-8.2130E 02	0.01230	-8.5270E 02	0.01240	-8.8430E 02
0.01250	-9.1690E 02	0.01260	-9.5020E 02	0.01270	-9.8380E 02	0.01280	-1.0186E 03	0.01290	-1.0540E 03
0.01300	-1.0904E 03	0.01310	-1.1272E 03	0.01320	-1.1647E 03	0.01330	-1.2033E 03	0.01340	-1.2426E 03
0.01350	-1.2827E 03	0.01360	-1.3236E 03	0.01370	-1.3650E 03	0.01380	-1.4077E 03	0.01390	-1.4508E 03
0.01400	-1.4945E 03	0.01410	-1.5391E 03	0.01420	-1.5844E 03	0.01430	-1.6305E 03	0.01440	-1.6771E 03
0.01450	-1.7245E 03	0.01460	-1.7728E 03	0.01470	-1.8214E 03	0.01480	-1.8713E 03	0.01490	-1.9215E 03
0.01500	-1.9726E 03	0.01510	-2.0242E 03	0.01520	-2.0765E 03	0.01530	-2.1296E 03	0.01540	-2.1832E 03
0.01550	-2.2376E 03	0.01560	-2.2927E 03	0.01570	-2.3480E 03	0.01580	-2.4045E 03	0.01590	-2.4614E 03
0.01600	-2.5190E 03	0.01610	-2.5775E 03	0.01620	-2.6361E 03	0.01630	-2.6956E 03	0.01640	-2.7553E 03
0.01650	-2.8157E 03	0.01660	-2.8769E 03	0.01670	-2.9389E 03	0.01680	-3.0009E 03	0.01690	-3.0638E 03
0.01700	-3.1270E 03	0.01710	-3.1911E 03	0.01720	-3.2554E 03	0.01730	-3.3203E 03	0.01740	-3.3857E 03
0.01750	-3.4517E 03	0.01760	-3.5176E 03	0.01770	-3.5845E 03	0.01780	-3.6516E 03	0.01790	-3.7192E 03
0.01800	-3.7871E 03	0.01810	-3.8556E 03	0.01820	-3.9245E 03	0.01830	-3.9937E 03	0.01840	-4.0637E 03
0.01850	-4.1336E 03	0.01860	-4.2042E 03	0.01870	-4.2758E 03	0.01880	-4.3471E 03	0.01890	-4.4191E 03
0.01900	-4.4913E 03	0.01910	-4.5638E 03	0.01920	-4.6372E 03	0.01930	-4.7108E 03	0.01940	-4.7846E 03
0.01950	-4.8586E 03	0.01960	-4.9333E 03	0.01970	-5.0078E 03	0.01980	-5.0827E 03	0.01990	-5.1578E 03
0.02000	-5.2333E 03	0.02010	-5.3088E 03	0.02020	-5.3851E 03	0.02030	-5.4608E 03	0.02040	-5.5370E 03
0.02050	-5.6136E 03	0.02060	-5.6900E 03	0.02070	-5.7665E 03	0.02080	-5.8427E 03	0.02090	-5.9196E 03
0.02100	-5.9962E 03	0.02110	-6.0730E 03	0.02120	-6.1500E 03	0.02130	-6.2263E 03	0.02140	-6.3033E 03
0.02150	-6.3798E 03	0.02160	-6.4563E 03	0.02170	-6.5330E 03	0.02180	-6.6095E 03	0.02190	-6.6856E 03
0.02200	-6.7617E 03	0.02210	-6.8376E 03	0.02220	-6.9136E 03	0.02230	-6.9891E 03	0.02240	-7.0648E 03
0.02250	-7.1400E 03	0.02260	-7.2147E 03	0.02270	-7.2897E 03	0.02280	-7.3640E 03	0.02290	-7.4384E 03
0.02300	-7.5123E 03	0.02310	-7.5857E 03	0.02320	-7.6590E 03	0.02330	-7.7320E 03	0.02340	-7.8043E 03
0.02350	-7.8766E 03	0.02360	-7.9484E 03	0.02370	-8.0195E 03	0.02380	-8.0905E 03	0.02390	-8.1611E 03
0.02400	-8.2309E 03	0.02410	-8.3004E 03	0.02420	-8.3696E 03	0.02430	-8.4379E 03	0.02440	-8.5059E 03
0.02450	-8.5735E 03	0.02460	-8.6406E 03	0.02470	-8.7070E 03	0.02480	-8.7732E 03	0.02490	-8.8384E 03
0.02500	-8.9032E 03	0.02600	-9.5190E 03	0.02700	-1.0065E 04	0.02800	-1.0536E 04	0.02900	-1.0953E 04
0.03000	-1.1462E 04	0.03100	-1.2072E 04	0.03200	-1.2739E 04	0.03300	-1.3345E 04	0.03400	-1.3844E 04
0.03500	-1.4243E 04	0.03600	-1.4537E 04	0.03700	-1.4730E 04	0.03800	-1.4819E 04	0.03900	-1.4815E 04

TABLE 6.A-12
(SHEET 14 OF 28)

0.04000	-1.4711E 04	0.04100	-1.4537E 04	0.04200	-1.4301E 04	0.04300	-1.4006E 04	0.04400	-1.3665E 04
0.04500	-1.3327E 04	0.04600	-1.3000E 04	0.04700	-1.2691E 04	0.04800	-1.2340E 04	0.04900	-1.2031E 04
0.05000	-1.1748E 04	0.05100	-1.1488E 04	0.05200	-1.1260E 04	0.05300	-1.1045E 04	0.05400	-1.0839E 04
0.05500	-1.0684E 04	0.05600	-1.0562E 04	0.05700	-1.0494E 04	0.05800	-1.0460E 04	0.05900	-1.0458E 04
0.06000	-1.0514E 04	0.06100	-1.0602E 04	0.06200	-1.0723E 04	0.06300	-1.0860E 04	0.06400	-1.1030E 04
0.06500	-1.1202E 04	0.06600	-1.1361E 04	0.06700	-1.1586E 04	0.06800	-1.1806E 04	0.06900	-1.2010E 04
0.07000	-1.2237E 04	0.07100	-1.2440E 04	0.07200	-1.2654E 04	0.07300	-1.2873E 04	0.07400	-1.3085E 04
0.07500	-1.3317E 04	0.07600	-1.3520E 04	0.07700	-1.3689E 04	0.07800	-1.3827E 04	0.07900	-1.3945E 04
0.08000	-1.4057E 04	0.08100	-1.4128E 04	0.08200	-1.4170E 04	0.08300	-1.4194E 04	0.08400	-1.4184E 04
0.08500	-1.4172E 04	0.08600	-1.4130E 04	0.08700	-1.4073E 04	0.08800	-1.4009E 04	0.08900	-1.3945E 04
0.09000	-1.3888E 04	0.09100	-1.3832E 04	0.09200	-1.3787E 04	0.09300	-1.3761E 04	0.09400	-1.3745E 04
0.09500	-1.3707E 04	0.09600	-1.3722E 04	0.09700	-1.3744E 04	0.09800	-1.3889E 04	0.09900	-1.3841E 04
0.10000	-1.3889E 04	0.10100	-1.3920E 04	0.10200	-1.3942E 04	0.10300	-1.3955E 04	0.10400	-1.3951E 04
0.10500	-1.3923E 04	0.10600	-1.3875E 04	0.10700	-1.3838E 04	0.10800	-1.3778E 04	0.10900	-1.3699E 04
0.11000	-1.3596E 04	0.11100	-1.3477E 04	0.11200	-1.3344E 04	0.11300	-1.3205E 04	0.11400	-1.3084E 04
0.11500	-1.2932E 04	0.11600	-1.2771E 04	0.11700	-1.2604E 04	0.11800	-1.2431E 04	0.11900	-1.2258E 04
0.12000	-1.2110E 04	0.12100	-1.1953E 04	0.12200	-1.1793E 04	0.12300	-1.1626E 04	0.12400	-1.1453E 04
0.12500	-1.1308E 04	0.12600	-1.1158E 04	0.12700	-1.0997E 04	0.12800	-1.0838E 04	0.12900	-1.0696E 04
0.13000	-1.0615E 04	0.13100	-1.0504E 04	0.13200	-1.0428E 04	0.13300	-1.0358E 04	0.13400	-1.0332E 04
0.13500	-1.0285E 04	0.13600	-1.0356E 04	0.13700	-1.0291E 04	0.13800	-1.0306E 04	0.13900	-1.0315E 04
0.14000	-1.0327E 04	0.14100	-1.0338E 04	0.14200	-1.0386E 04	0.14300	-1.0402E 04	0.14400	-1.0430E 04
0.14500	-1.0152E 04	0.14600	-1.0526E 04	0.14700	-1.0544E 04	0.14800	-1.0577E 04	0.14900	-1.0656E 04
0.15000	-1.0644E 04	0.15100	-1.0672E 04	0.15200	-1.0682E 04	0.15300	-1.0724E 04	0.15400	-1.0793E 04
0.15500	-1.0773E 04	0.15600	-1.0802E 04	0.15700	-1.0824E 04	0.15800	-1.0888E 04	0.15900	-1.0993E 04
0.16000	-1.0918E 04	0.16100	-1.0941E 04	0.16200	-1.0949E 04	0.16300	-1.0980E 04	0.16400	-1.0986E 04
0.16500	-1.1066E 04	0.16600	-1.0982E 04	0.16700	-1.0984E 04	0.16800	-1.0970E 04	0.16900	-1.0963E 04
0.17000	-1.0929E 04	0.17100	-1.0895E 04	0.17200	-1.0913E 04	0.17300	-1.0863E 04	0.17400	-1.0839E 04
0.17500	-1.0978E 04	0.17600	-1.0816E 04	0.17700	-1.0804E 04	0.17800	-1.0776E 04	0.17900	-1.0885E 04
0.18000	-1.0737E 04	0.18100	-1.0725E 04	0.18200	-1.0701E 04	0.18300	-1.0670E 04	0.18400	-1.0636E 04
0.18500	-1.0616E 04	0.18600	-1.0643E 04	0.18700	-1.0697E 04	0.18800	-1.0643E 04	0.18900	-1.0647E 04
0.19000	-1.0660E 04	0.19100	-1.0644E 04	0.19200	-1.0629E 04	0.19300	-1.0606E 04	0.19400	-1.0606E 04
0.19500	-1.0652E 04	0.19600	-1.0716E 04	0.19700	-1.0680E 04	0.19800	-1.0845E 04	0.19900	-1.0760E 04
0.20000	-1.0817E 04	0.20200	-1.0870E 04	0.20400	-1.0886E 04	0.20600	-1.0834E 04	0.20800	-1.0962E 04
0.21000	-1.1021E 04	0.21200	-1.1009E 04	0.21400	-1.0946E 04	0.21600	-1.0938E 04	0.21800	-1.0976E 04
0.22000	-1.0947E 04	0.22200	-1.0961E 04	0.22400	-1.0913E 04	0.22600	-1.0916E 04	0.22800	-1.0864E 04
0.23000	-1.0754E 04	0.23200	-1.0787E 04	0.23400	-1.0735E 04	0.23600	-1.0794E 04	0.23800	-1.0823E 04
0.24000	-1.0969E 04	0.24200	-1.1033E 04	0.24400	-1.1203E 04	0.24600	-1.1294E 04	0.24800	-1.1277E 04
0.25000	-1.1291E 04	0.25200	-1.1220E 04	0.25400	-1.1266E 04	0.25600	-1.1381E 04	0.25800	-1.1496E 04
0.26000	-1.1487E 04	0.26200	-1.1476E 04	0.26400	-1.1456E 04	0.26600	-1.1326E 04	0.26800	-1.1188E 04
0.27000	-1.1028E 04	0.27200	-1.1051E 04	0.27400	-1.0984E 04	0.27600	-1.0904E 04	0.27800	-1.0561E 04
0.28000	-1.0312E 04	0.28200	-1.0228E 04	0.28400	-1.0264E 04	0.28600	-1.0323E 04	0.28800	-1.0455E 04
0.29000	-1.0614E 04	0.29200	-1.0658E 04	0.29400	-1.0704E 04	0.29600	-1.0705E 04	0.29800	-1.0866E 04
0.30000	-1.1022E 04	0.30200	-1.1160E 04	0.30400	-1.1155E 04	0.30600	-1.1121E 04	0.30800	-1.1213E 04
0.31000	-1.1237E 04	0.31200	-1.1255E 04	0.31400	-1.1231E 04	0.31600	-1.1360E 04	0.31800	-1.1341E 04
0.32000	-1.1267E 04	0.32200	-1.1351E 04	0.32400	-1.1391E 04	0.32600	-1.1362E 04	0.32800	-1.1154E 04
0.33000	-1.1060E 04	0.33200	-1.0974E 04	0.33400	-1.0712E 04	0.33600	-1.0598E 04	0.33800	-1.0512E 04
0.34000	-1.0387E 04	0.34200	-1.0403E 04	0.34400	-1.0285E 04	0.34600	-1.0136E 04	0.34800	-9.9819E 03
0.35000	-1.0004E 04	0.35200	-9.9084E 03	0.35400	-9.7808E 03	0.35600	-9.8599E 03	0.35800	-9.9328E 03
0.36000	-9.8578E 03	0.36200	-9.9360E 03	0.36400	-9.8472E 03	0.36600	-9.7282E 03	0.36800	-9.8280E 03
0.37000	-9.9302E 03	0.37200	-9.9928E 03	0.37400	-1.0061E 04	0.37600	-1.0105E 04	0.37800	-1.0108E 04
0.38000	-1.0231E 04	0.38200	-1.0193E 04	0.38400	-1.0095E 04	0.38600	-1.0102E 04	0.38800	-1.0049E 04
0.39000	-9.9178E 03	0.39200	-9.8813E 03	0.39400	-9.6435E 03	0.39600	-9.7887E 03	0.39800	-9.8880E 03
0.40000	-9.8373E 03	0.40200	-9.7420E 03	0.40400	-9.7230E 03	0.40600	-9.6969E 03	0.40800	-9.8376E 03
0.41000	-9.9494E 03	0.41200	-9.9925E 03	0.41400	-1.0017E 04	0.41600	-1.0029E 04	0.41800	-1.0002E 04
0.42000	-1.0102E 04	0.42200	-1.0135E 04	0.42400	-1.0275E 04	0.42600	-1.0359E 04	0.42800	-1.0494E 04
0.43000	-1.0543E 04	0.43200	-1.0487E 04	0.43400	-1.0532E 04	0.43600	-1.0486E 04	0.43800	-1.0533E 04
0.44000	-1.0488E 04	0.44200	-1.0528E 04	0.44400	-1.0472E 04	0.44600	-1.0490E 04	0.44800	-1.0387E 04
0.45000	-1.0395E 04	0.45200	-1.0349E 04	0.45400	-1.0381E 04	0.45600	-1.0332E 04	0.45800	-1.0324E 04
0.46000	-1.0372E 04	0.46200	-1.0349E 04	0.46400	-1.0398E 04	0.46600	-1.0356E 04	0.46800	-1.0384E 04
0.47000	-1.0317E 04	0.47200	-1.0330E 04	0.47400	-1.0239E 04	0.47600	-1.0197E 04	0.47800	-1.0080E 04
0.48000	-1.0080E 04	0.48200	-9.9863E 03	0.48400	-9.9631E 03	0.48600	-9.7251E 03	0.48800	-9.5831E 03
0.49000	-9.4508E 03	0.49200	-9.4544E 03	0.49400	-9.4228E 03	0.49600	-9.5013E 03	0.49800	-9.5328E 03
0.50000	-9.6536E 03	0.50200	-9.6898E 03						

TABLE 6.A-12
(SHEET 15 OF 28)

TIME FUNCTION NUMBER = (8)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 39 00>02$ 0. 96.4)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	9.6400E 01	0.00010	9.6400E 01	0.00020	9.6400E 01	0.00030	9.6400E 01	0.00040	9.6400E 01
0.00050	9.6400E 01	0.00060	9.6400E 01	0.00070	9.5600E 01	0.00080	9.5600E 01	0.00090	9.5600E 01
0.00100	9.5600E 01	0.00110	9.4800E 01	0.00120	9.4000E 01	0.00130	9.3200E 01	0.00140	9.1600E 01
0.00150	9.0800E 01	0.00160	8.8400E 01	0.00170	8.6000E 01	0.00180	8.3600E 01	0.00190	8.0400E 01
0.00200	7.6400E 01	0.00210	7.1600E 01	0.00220	6.6000E 01	0.00230	5.9600E 01	0.00240	5.1800E 01
0.00250	4.3800E 01	0.00260	3.4200E 01	0.00270	2.3800E 01	0.00280	1.2600E 01	0.00290	-2.0000E-01
0.00300	-1.5200E 01	0.00310	-3.1200E 01	0.00320	-4.8600E 01	0.00330	-6.7000E 01	0.00340	-8.7600E 01
0.00350	-1.1010E 02	0.00360	-1.3390E 02	0.00370	-1.6010E 02	0.00380	-1.8710E 02	0.00390	-2.1860E 02
0.00400	-2.4960E 02	0.00410	-2.8440E 02	0.00420	-3.2020E 02	0.00430	-3.5960E 02	0.00440	-4.0160E 02
0.00450	-4.4630E 02	0.00460	-4.9450E 02	0.00470	-5.4570E 02	0.00480	-6.0030E 02	0.00490	-6.5870E 02
0.00500	-7.2080E 02	0.00510	-7.8700E 02	0.00520	-8.5720E 02	0.00530	-9.3140E 02	0.00540	-1.0107E 03
0.00550	-1.0933E 03	0.00560	-1.1820E 03	0.00570	-1.2746E 03	0.00580	-1.3721E 03	0.00590	-1.4754E 03
0.00600	-1.5829E 03	0.00610	-1.6956E 03	0.00620	-1.8151E 03	0.00630	-1.9388E 03	0.00640	-2.0685E 03
0.00650	-2.2036E 03	0.00660	-2.3446E 03	0.00670	-2.4912E 03	0.00680	-2.6438E 03	0.00690	-2.8026E 03
0.00700	-2.9674E 03	0.00710	-3.1384E 03	0.00720	-3.3159E 03	0.00730	-3.4991E 03	0.00740	-3.6882E 03
0.00750	-3.8854E 03	0.00760	-4.0881E 03	0.00770	-4.2959E 03	0.00780	-4.5121E 03	0.00790	-4.7335E 03
0.00800	-4.9623E 03	0.00810	-5.1966E 03	0.00820	-5.4379E 03	0.00830	-5.6854E 03	0.00840	-5.9396E 03
0.00850	-6.2004E 03	0.00860	-6.4669E 03	0.00870	-6.7411E 03	0.00880	-7.0212E 03	0.00890	-7.3084E 03
0.00900	-7.6019E 03	0.00910	-7.9016E 03	0.00920	-8.2096E 03	0.00930	-8.5229E 03	0.00940	-8.8443E 03
0.00950	-9.1712E 03	0.00960	-9.5051E 03	0.00970	-9.8475E 03	0.00980	-1.0196E 04	0.00990	-1.0551E 04
0.01000	-1.0913E 04	0.01010	-1.1282E 04	0.01020	-1.1657E 04	0.01030	-1.2040E 04	0.01040	-1.2429E 04
0.01050	-1.2826E 04	0.01060	-1.3229E 04	0.01070	-1.3638E 04	0.01080	-1.4055E 04	0.01090	-1.4478E 04
0.01100	-1.4907E 04	0.01110	-1.5344E 04	0.01120	-1.5787E 04	0.01130	-1.6237E 04	0.01140	-1.6694E 04
0.01150	-1.7157E 04	0.01160	-1.7626E 04	0.01170	-1.8103E 04	0.01180	-1.8585E 04	0.01190	-1.9074E 04
0.01200	-1.9571E 04	0.01210	-2.0073E 04	0.01220	-2.0582E 04	0.01230	-2.1097E 04	0.01240	-2.1618E 04
0.01250	-2.2145E 04	0.01260	-2.2679E 04	0.01270	-2.3218E 04	0.01280	-2.3764E 04	0.01290	-2.4316E 04
0.01300	-2.4874E 04	0.01310	-2.5437E 04	0.01320	-2.6006E 04	0.01330	-2.6580E 04	0.01340	-2.7160E 04
0.01350	-2.7748E 04	0.01360	-2.8340E 04	0.01370	-2.8938E 04	0.01380	-2.9542E 04	0.01390	-3.0150E 04
0.01400	-3.0763E 04	0.01410	-3.1381E 04	0.01420	-3.2003E 04	0.01430	-3.2631E 04	0.01440	-3.3262E 04
0.01450	-3.3897E 04	0.01460	-3.4537E 04	0.01470	-3.5182E 04	0.01480	-3.5830E 04	0.01490	-3.6483E 04
0.01500	-3.7139E 04	0.01510	-3.7798E 04	0.01520	-3.8461E 04	0.01530	-3.9127E 04	0.01540	-3.9796E 04
0.01550	-4.0468E 04	0.01560	-4.1143E 04	0.01570	-4.1820E 04	0.01580	-4.2500E 04	0.01590	-4.3182E 04
0.01600	-4.3865E 04	0.01610	-4.4551E 04	0.01620	-4.5239E 04	0.01630	-4.5928E 04	0.01640	-4.6619E 04
0.01650	-4.7307E 04	0.01660	-4.8002E 04	0.01670	-4.8696E 04	0.01680	-4.9391E 04	0.01690	-5.0086E 04
0.01700	-5.0781E 04	0.01710	-5.1477E 04	0.01720	-5.2173E 04	0.01730	-5.2867E 04	0.01740	-5.3561E 04
0.01750	-5.4254E 04	0.01760	-5.4947E 04	0.01770	-5.5637E 04	0.01780	-5.6327E 04	0.01790	-5.7014E 04
0.01800	-5.7663E 04	0.01810	-5.8345E 04	0.01820	-5.9029E 04	0.01830	-5.9706E 04	0.01840	-6.0368E 04
0.01850	-6.1071E 04	0.01860	-6.1769E 04	0.01870	-6.2460E 04	0.01880	-6.3165E 04	0.01890	-6.3838E 04
0.01900	-6.4523E 04	0.01910	-6.5204E 04	0.01920	-6.5876E 04	0.01930	-6.6545E 04	0.01940	-6.7206E 04
0.01950	-6.7863E 04	0.01960	-6.8527E 04	0.01970	-6.9166E 04	0.01980	-6.9816E 04	0.01990	-7.0460E 04
0.02000	-7.1096E 04	0.02010	-7.1728E 04	0.02020	-7.2353E 04	0.02030	-7.2972E 04	0.02040	-7.3587E 04
0.02050	-7.4204E 04	0.02060	-7.4815E 04	0.02070	-7.5398E 04	0.02080	-7.6000E 04	0.02090	-7.6596E 04
0.02100	-7.7186E 04	0.02110	-7.7769E 04	0.02120	-7.8347E 04	0.02130	-7.8918E 04	0.02140	-7.9484E 04
0.02150	-8.0045E 04	0.02160	-8.0598E 04	0.02170	-8.1163E 04	0.02180	-8.1694E 04	0.02190	-8.2242E 04
0.02200	-8.2784E 04	0.02210	-8.3321E 04	0.02220	-8.3850E 04	0.02230	-8.4376E 04	0.02240	-8.4894E 04
0.02250	-8.5407E 04	0.02260	-8.5914E 04	0.02270	-8.6416E 04	0.02280	-8.6912E 04	0.02290	-8.7403E 04
0.02300	-8.7888E 04	0.02310	-8.8368E 04	0.02320	-8.8843E 04	0.02330	-8.9312E 04	0.02340	-8.9776E 04
0.02350	-9.0251E 04	0.02360	-9.0688E 04	0.02370	-9.1143E 04	0.02380	-9.1581E 04	0.02390	-9.2032E 04
0.02400	-9.2453E 04	0.02410	-9.2883E 04	0.02420	-9.3307E 04	0.02430	-9.3726E 04	0.02440	-9.4142E 04
0.02450	-9.4551E 04	0.02460	-9.4956E 04	0.02470	-9.5357E 04	0.02480	-9.5751E 04	0.02490	-9.6142E 04
0.02500	-9.6529E 04	0.02600	-1.0012E 05	0.02700	-1.0323E 05	0.02800	-1.0581E 05	0.02900	-1.0430E 05
0.03000	-1.0489E 05	0.03100	-1.0505E 05	0.03200	-1.0467E 05	0.03300	-1.0397E 05	0.03400	-1.0293E 05
0.03500	-1.0173E 05	0.03600	-1.0038E 05	0.03700	-9.8980E 04	0.03800	-9.7599E 04	0.03900	-9.6247E 04

0.04000	-9.5164E 04	0.04100	-9.4027E 04	0.04200	-9.2950E 04	0.04300	-9.2085E 04	0.04400	-9.1353E 04
0.04500	-9.0639E 04	0.04600	-8.9752E 04	0.04700	-8.9282E 04	0.04800	-8.8431E 04	0.04900	-8.8259E 04
0.05000	-8.8231E 04	0.05100	-8.8298E 04	0.05200	-8.8609E 04	0.05300	-8.9148E 04	0.05400	-8.9898E 04
0.05500	-9.0747E 04	0.05600	-9.1803E 04	0.05700	-9.2981E 04	0.05800	-9.4316E 04	0.05900	-9.5714E 04
0.06000	-9.7181E 04	0.06100	-9.8640E 04	0.06200	-1.0014E 05	0.06300	-1.0174E 05	0.06400	-1.0329E 05
0.06500	-1.0501E 05	0.06600	-1.0675E 05	0.06700	-1.0818E 05	0.06800	-1.0964E 05	0.06900	-1.1094E 05
0.07000	-1.1205E 05	0.07100	-1.1299E 05	0.07200	-1.1435E 05	0.07300	-1.1449E 05	0.07400	-1.1437E 05
0.07500	-1.1407E 05	0.07600	-1.1361E 05	0.07700	-1.1305E 05	0.07800	-1.1235E 05	0.07900	-1.1145E 05
0.08000	-1.1045E 05	0.08100	-1.0937E 05	0.08200	-1.0823E 05	0.08300	-1.0711E 05	0.08400	-1.0604E 05
0.08500	-1.0499E 05	0.08600	-1.0400E 05	0.08700	-1.0304E 05	0.08800	-1.0216E 05	0.08900	-1.0129E 05
0.09000	-1.0051E 05	0.09100	-9.9721E 04	0.09200	-9.9706E 04	0.09300	-9.8464E 04	0.09400	-9.7815E 04
0.09500	-9.7153E 04	0.09600	-9.6476E 04	0.09700	-9.6588E 04	0.09800	-9.5313E 04	0.09900	-9.4707E 04
0.10000	-9.4499E 04	0.10100	-9.3483E 04	0.10200	-9.2873E 04	0.10300	-9.2301E 04	0.10400	-9.1722E 04
0.10500	-9.1127E 04	0.10600	-9.0543E 04	0.10700	-8.9976E 04	0.10800	-8.9391E 04	0.10900	-8.8810E 04
0.11000	-8.8227E 04	0.11100	-8.7635E 04	0.11200	-8.7043E 04	0.11300	-8.6419E 04	0.11400	-8.6339E 04
0.11500	-8.5302E 04	0.11600	-8.4734E 04	0.11700	-8.4127E 04	0.11800	-8.3549E 04	0.11900	-8.2926E 04
0.12000	-8.2316E 04	0.12100	-8.1689E 04	0.12200	-8.1056E 04	0.12300	-8.0613E 04	0.12400	-7.9875E 04
0.12500	-7.9289E 04	0.12600	-7.9417E 04	0.12700	-7.8245E 04	0.12800	-7.7746E 04	0.12900	-7.7219E 04
0.13000	-7.6686E 04	0.13100	-7.6109E 04	0.13200	-7.5551E 04	0.13300	-7.4989E 04	0.13400	-7.4470E 04
0.13500	-7.4009E 04	0.13600	-7.3390E 04	0.13700	-7.2815E 04	0.13800	-7.2354E 04	0.13900	-7.2009E 04
0.14000	-7.1410E 04	0.14100	-7.1117E 04	0.14200	-7.0636E 04	0.14300	-7.0267E 04	0.14400	-7.0056E 04
0.14500	-6.9639E 04	0.14600	-6.9351E 04	0.14700	-6.9219E 04	0.14800	-6.8885E 04	0.14900	-6.8682E 04
0.15000	-6.8571E 04	0.15100	-6.8773E 04	0.15200	-6.8214E 04	0.15300	-6.8136E 04	0.15400	-6.8068E 04
0.15500	-6.7963E 04	0.15600	-6.7891E 04	0.15700	-6.7828E 04	0.15800	-6.7746E 04	0.15900	-6.7825E 04
0.16000	-6.7687E 04	0.16100	-6.7481E 04	0.16200	-6.7394E 04	0.16300	-6.7262E 04	0.16400	-6.7126E 04
0.16500	-6.6975E 04	0.16600	-6.6724E 04	0.16700	-6.6607E 04	0.16800	-6.6355E 04	0.16900	-6.6162E 04
0.17000	-6.5975E 04	0.17100	-6.5763E 04	0.17200	-6.5552E 04	0.17300	-6.5319E 04	0.17400	-6.5101E 04
0.17500	-6.4892E 04	0.17600	-6.4597E 04	0.17700	-6.4443E 04	0.17800	-6.4179E 04	0.17900	-6.4019E 04
0.18000	-6.3757E 04	0.18100	-6.3626E 04	0.18200	-6.3379E 04	0.18300	-6.3228E 04	0.18400	-6.3100E 04
0.18500	-6.2802E 04	0.18600	-6.2628E 04	0.18700	-6.2481E 04	0.18800	-6.2308E 04	0.18900	-6.2148E 04
0.19000	-6.2027E 04	0.19100	-6.1937E 04	0.19200	-6.1833E 04	0.19300	-6.1758E 04	0.19400	-6.1516E 04
0.19500	-6.1376E 04	0.19600	-6.1251E 04	0.19700	-6.1126E 04	0.19800	-6.1051E 04	0.19900	-6.0752E 04
0.20000	-6.0566E 04	0.20200	-6.0308E 04	0.20400	-6.0020E 04	0.20600	-5.9901E 04	0.20800	-5.9309E 04
0.21000	-5.9082E 04	0.21200	-5.8898E 04	0.21400	-5.8949E 04	0.21600	-5.8617E 04	0.21800	-5.8696E 04
0.22000	-5.8779E 04	0.22200	-5.8471E 04	0.22400	-5.8579E 04	0.22600	-5.8378E 04	0.22800	-5.8485E 04
0.23000	-5.8776E 04	0.23200	-5.8750E 04	0.23400	-5.9137E 04	0.23600	-5.9314E 04	0.23800	-5.8814E 04
0.24000	-5.8962E 04	0.24200	-5.8265E 04	0.24400	-5.7858E 04	0.24600	-5.7712E 04	0.24800	-5.7791E 04
0.25000	-5.7528E 04	0.25200	-5.7668E 04	0.25400	-5.7466E 04	0.25600	-5.7131E 04	0.25800	-5.6581E 04
0.26000	-5.6477E 04	0.26200	-5.6135E 04	0.26400	-5.5660E 04	0.26600	-5.5899E 04	0.26800	-5.6084E 04
0.27000	-5.5950E 04	0.27200	-5.5330E 04	0.27400	-5.5467E 04	0.27600	-5.7663E 04	0.27800	-5.5827E 04
0.28000	-5.6298E 04	0.28200	-5.6210E 04	0.28400	-5.6065E 04	0.28600	-5.5962E 04	0.28800	-5.5699E 04
0.29000	-5.5330E 04	0.29200	-5.5546E 04	0.29400	-5.5853E 04	0.29600	-5.5870E 04	0.29800	-5.5466E 04
0.30000	-5.5032E 04	0.30200	-5.4694E 04	0.30400	-5.4997E 04	0.30600	-5.5528E 04	0.30800	-5.5333E 04
0.31000	-5.4593E 04	0.31200	-5.4686E 04	0.31400	-5.4602E 04	0.31600	-5.4029E 04	0.31800	-5.4228E 04
0.32000	-5.4017E 04	0.32200	-5.3700E 04	0.32400	-5.3406E 04	0.32600	-5.3285E 04	0.32800	-5.3970E 04
0.33000	-5.3437E 04	0.33200	-5.4736E 04	0.33400	-5.3965E 04	0.33600	-5.3851E 04	0.33800	-5.3990E 04
0.34000	-5.4026E 04	0.34200	-5.3700E 04	0.34400	-5.4117E 04	0.34600	-5.4226E 04	0.34800	-5.4607E 04
0.35000	-5.4311E 04	0.35200	-5.4786E 04	0.35400	-5.4916E 04	0.35600	-5.4672E 04	0.35800	-5.4382E 04
0.36000	-5.4788E 04	0.36200	-5.5921E 04	0.36400	-5.4438E 04	0.36600	-5.4509E 04	0.36800	-5.3947E 04
0.37000	-5.3457E 04	0.37200	-5.3096E 04	0.37400	-5.2622E 04	0.37600	-5.2131E 04	0.37800	-5.1764E 04
0.38000	-5.0998E 04	0.38200	-5.0925E 04	0.38400	-5.1119E 04	0.38600	-5.0535E 04	0.38800	-5.0374E 04
0.39000	-5.0602E 04	0.39200	-4.9643E 04	0.39400	-4.9460E 04	0.39600	-4.9365E 04	0.39800	-4.8849E 04
0.40000	-4.9083E 04	0.40200	-5.0103E 04	0.40400	-4.9163E 04	0.40600	-4.9213E 04	0.40800	-4.8799E 04
0.41000	-4.8577E 04	0.41200	-4.8594E 04	0.41400	-4.8679E 04	0.41600	-4.8705E 04	0.41800	-4.9058E 04
0.42000	-4.8830E 04	0.42200	-4.8901E 04	0.42400	-4.8553E 04	0.42600	-4.8456E 04	0.42800	-4.8106E 04
0.43000	-4.8066E 04	0.43200	-4.8317E 04	0.43400	-4.8262E 04	0.43600	-4.8530E 04	0.43800	-4.8387E 04
0.44000	-4.8592E 04	0.44200	-4.8446E 04	0.44400	-4.8695E 04	0.44600	-4.8788E 04	0.44800	-4.8638E 04
0.45000	-4.8517E 04	0.45200	-4.8853E 04	0.45400	-4.8616E 04	0.45600	-4.8759E 04	0.45800	-4.8711E 04
0.46000	-4.8410E 04	0.46200	-4.8558E 04	0.46400	-4.8306E 04	0.46600	-4.8413E 04	0.46800	-4.8208E 04
0.47000	-4.8318E 04	0.47200	-4.8234E 04	0.47400	-4.8619E 04	0.47600	-4.8138E 04	0.47800	-4.8257E 04
0.48000	-4.8293E 04	0.48200	-4.8544E 04	0.48400	-4.9691E 04	0.48600	-4.8746E 04	0.48800	-4.8777E 04
0.49000	-4.9028E 04	0.49200	-4.8833E 04	0.49400	-4.8906E 04	0.49600	-4.8487E 04	0.49800	-4.8469E 04
0.50000	-4.8018E 04	0.50200	-4.7924E 04						

TIME FUNCTION NUMBER = (9)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 40 00>02$ 0. 136.3)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	1.3630E 02	0.00010	1.3630E 02	0.00020	1.3630E 02	0.00030	1.3630E 02	0.00040	1.3630E 02
0.00050	1.3630E 02	0.00060	1.3630E 02	0.00070	1.3510E 02	0.00080	1.3510E 02	0.00090	1.3510E 02
0.00100	1.3510E 02	0.00110	1.3400E 02	0.00120	1.3290E 02	0.00130	1.3170E 02	0.00140	1.2950E 02
0.00150	1.2840E 02	0.00160	1.2500E 02	0.00170	1.2160E 02	0.00180	1.1820E 02	0.00190	1.1360E 02
0.00200	1.0800E 02	0.00210	1.0120E 02	0.00220	9.3300E 01	0.00230	8.4200E 01	0.00240	7.3200E 01
0.00250	6.1900E 01	0.00260	4.8300E 01	0.00270	3.3600E 01	0.00280	1.7800E 01	0.00290	-3.0000E-01
0.00300	-2.1500E 01	0.00310	-4.4100E 01	0.00320	-6.8700E 01	0.00330	-9.4700E 01	0.00340	-1.2380E 02
0.00350	-1.5550E 02	0.00360	-1.8920E 02	0.00370	-2.2620E 02	0.00380	-2.6440E 02	0.00390	-3.0890E 02
0.00400	-3.5280E 02	0.00410	-4.0190E 02	0.00420	-4.5250E 02	0.00430	-5.0820E 02	0.00440	-5.6760E 02
0.00450	-6.3070E 02	0.00460	-6.9880E 02	0.00470	-7.7120E 02	0.00480	-8.4830E 02	0.00490	-9.3080E 02
0.00500	-1.0187E 03	0.00510	-1.1122E 03	0.00520	-1.2114E 03	0.00530	-1.3162E 03	0.00540	-1.4283E 03
0.00550	-1.5450E 03	0.00560	-1.6704E 03	0.00570	-1.8012E 03	0.00580	-1.9390E 03	0.00590	-2.0850E 03
0.00600	-2.2370E 03	0.00610	-2.3963E 03	0.00620	-2.5651E 03	0.00630	-2.7399E 03	0.00640	-2.9232E 03
0.00650	-3.1140E 03	0.00660	-3.3134E 03	0.00670	-3.5206E 03	0.00680	-3.7363E 03	0.00690	-3.9607E 03
0.00700	-4.1936E 03	0.00710	-4.4352E 03	0.00720	-4.6861E 03	0.00730	-4.9449E 03	0.00740	-5.2121E 03
0.00750	-5.4908E 03	0.00760	-5.7772E 03	0.00770	-6.0710E 03	0.00780	-6.3765E 03	0.00790	-6.6894E 03
0.00800	-7.0126E 03	0.00810	-7.3438E 03	0.00820	-7.6848E 03	0.00830	-8.0346E 03	0.00840	-8.3939E 03
0.00850	-8.7624E 03	0.00860	-9.1390E 03	0.00870	-9.5264E 03	0.00880	-9.9223E 03	0.00890	-1.0328E 04
0.00900	-1.0743E 04	0.00910	-1.1167E 04	0.00920	-1.1602E 04	0.00930	-1.2045E 04	0.00940	-1.2499E 04
0.00950	-1.2961E 04	0.00960	-1.3433E 04	0.00970	-1.3917E 04	0.00980	-1.4409E 04	0.00990	-1.4911E 04
0.01000	-1.5422E 04	0.01010	-1.5944E 04	0.01020	-1.6474E 04	0.01030	-1.7015E 04	0.01040	-1.7565E 04
0.01050	-1.8126E 04	0.01060	-1.8695E 04	0.01070	-1.9273E 04	0.01080	-1.9862E 04	0.01090	-2.0460E 04
0.01100	-2.1067E 04	0.01110	-2.1684E 04	0.01120	-2.2310E 04	0.01130	-2.2946E 04	0.01140	-2.3591E 04
0.01150	-2.4247E 04	0.01160	-2.4909E 04	0.01170	-2.5583E 04	0.01180	-2.6265E 04	0.01190	-2.6956E 04
0.01200	-2.7658E 04	0.01210	-2.8366E 04	0.01220	-2.9087E 04	0.01230	-2.9814E 04	0.01240	-3.0551E 04
0.01250	-3.1296E 04	0.01260	-3.2050E 04	0.01270	-3.2812E 04	0.01280	-3.3583E 04	0.01290	-3.4364E 04
0.01300	-3.5151E 04	0.01310	-3.5948E 04	0.01320	-3.6751E 04	0.01330	-3.7563E 04	0.01340	-3.8383E 04
0.01350	-3.9213E 04	0.01360	-4.0050E 04	0.01370	-4.0895E 04	0.01380	-4.1749E 04	0.01390	-4.2608E 04
0.01400	-4.3474E 04	0.01410	-4.4347E 04	0.01420	-4.5226E 04	0.01430	-4.6113E 04	0.01440	-4.7006E 04
0.01450	-4.7904E 04	0.01460	-4.8808E 04	0.01470	-4.9720E 04	0.01480	-5.0635E 04	0.01490	-5.1557E 04
0.01500	-5.2484E 04	0.01510	-5.3416E 04	0.01520	-5.4352E 04	0.01530	-5.5295E 04	0.01540	-5.6240E 04
0.01550	-5.7189E 04	0.01560	-5.8143E 04	0.01570	-5.9099E 04	0.01580	-6.0061E 04	0.01590	-6.1024E 04
0.01600	-6.1989E 04	0.01610	-6.2959E 04	0.01620	-6.3932E 04	0.01630	-6.4906E 04	0.01640	-6.5881E 04
0.01650	-6.6855E 04	0.01660	-6.7836E 04	0.01670	-6.8817E 04	0.01680	-6.9799E 04	0.01690	-7.0782E 04
0.01700	-7.1764E 04	0.01710	-7.2747E 04	0.01720	-7.3730E 04	0.01730	-7.4712E 04	0.01740	-7.5691E 04
0.01750	-7.6671E 04	0.01760	-7.7651E 04	0.01770	-7.8625E 04	0.01780	-7.9601E 04	0.01790	-8.0572E 04
0.01800	-8.1490E 04	0.01810	-8.2453E 04	0.01820	-8.3419E 04	0.01830	-8.4377E 04	0.01840	-8.5312E 04
0.01850	-8.6306E 04	0.01860	-8.7292E 04	0.01870	-8.8268E 04	0.01880	-8.9265E 04	0.01890	-9.0216E 04
0.01900	-9.1184E 04	0.01910	-9.2146E 04	0.01920	-9.3096E 04	0.01930	-9.4040E 04	0.01940	-9.4975E 04
0.01950	-9.5903E 04	0.01960	-9.6842E 04	0.01970	-9.7745E 04	0.01980	-9.8664E 04	0.01990	-9.9574E 04
0.02000	-1.0047E 05	0.02010	-1.0137E 05	0.02020	-1.0225E 05	0.02030	-1.0312E 05	0.02040	-1.0399E 05
0.02050	-1.0486E 05	0.02060	-1.0573E 05	0.02070	-1.0655E 05	0.02080	-1.0740E 05	0.02090	-1.0824E 05
0.02100	-1.0908E 05	0.02110	-1.0990E 05	0.02120	-1.1072E 05	0.02130	-1.1153E 05	0.02140	-1.1233E 05
0.02150	-1.1312E 05	0.02160	-1.1390E 05	0.02170	-1.1470E 05	0.02180	-1.1545E 05	0.02190	-1.1622E 05
0.02200	-1.1699E 05	0.02210	-1.1775E 05	0.02220	-1.1850E 05	0.02230	-1.1924E 05	0.02240	-1.1997E 05
0.02250	-1.2070E 05	0.02260	-1.2141E 05	0.02270	-1.2212E 05	0.02280	-1.2282E 05	0.02290	-1.2352E 05
0.02300	-1.2420E 05	0.02310	-1.2488E 05	0.02320	-1.2555E 05	0.02330	-1.2622E 05	0.02340	-1.2687E 05
0.02350	-1.2754E 05	0.02360	-1.2816E 05	0.02370	-1.2880E 05	0.02380	-1.2942E 05	0.02390	-1.3006E 05
0.02400	-1.3065E 05	0.02410	-1.3126E 05	0.02420	-1.3186E 05	0.02430	-1.3245E 05	0.02440	-1.3304E 05
0.02450	-1.3362E 05	0.02460	-1.3419E 05	0.02470	-1.3476E 05	0.02480	-1.3532E 05	0.02490	-1.3587E 05
0.02500	-1.3641E 05	0.02600	-1.4149E 05	0.02700	-1.4589E 05	0.02800	-1.4953E 05	0.02900	-1.4739E 05
0.03000	-1.4824E 05	0.03100	-1.4846E 05	0.03200	-1.4792E 05	0.03300	-1.4693E 05	0.03400	-1.4546E 05
0.03500	-1.4376E 05	0.03600	-1.4185E 05	0.03700	-1.3988E 05	0.03800	-1.3793E 05	0.03900	-1.3602E 05

TABLE 6.A-12
(SHEET 18 OF 28)

0.04000 -1.3449E 05	0.04100 -1.3288E 05	0.04200 -1.3136E 05	0.04300 -1.3013E 05	0.04400 -1.2910E 05
0.04500 -1.2809E 05	0.04600 -1.2684E 05	0.04700 -1.2617E 05	0.04800 -1.2497E 05	0.04900 -1.2473E 05
0.05000 -1.2469E 05	0.05100 -1.2478E 05	0.05200 -1.2522E 05	0.05300 -1.2598E 05	0.05400 -1.2704E 05
0.05500 -1.2824E 05	0.05600 -1.2974E 05	0.05700 -1.3140E 05	0.05800 -1.3329E 05	0.05900 -1.3526E 05
0.06000 -1.3734E 05	0.06100 -1.3940E 05	0.06200 -1.4152E 05	0.06300 -1.4378E 05	0.06400 -1.4597E 05
0.06500 -1.4840E 05	0.06600 -1.5085E 05	0.06700 -1.5288E 05	0.06800 -1.5495E 05	0.06900 -1.5678E 05
0.07000 -1.5835E 05	0.07100 -1.5967E 05	0.07200 -1.6160E 05	0.07300 -1.6180E 05	0.07400 -1.6163E 05
0.07500 -1.6121E 05	0.07600 -1.6055E 05	0.07700 -1.5976E 05	0.07800 -1.5878E 05	0.07900 -1.5750E 05
0.08000 -1.5603E 05	0.08100 -1.5456E 05	0.08200 -1.5295E 05	0.08300 -1.5137E 05	0.08400 -1.4986E 05
0.08500 -1.4837E 05	0.08600 -1.4698E 05	0.08700 -1.4562E 05	0.08800 -1.4437E 05	0.08900 -1.4314E 05
0.09000 -1.4204E 05	0.09100 -1.4093E 05	0.09200 -1.4090E 05	0.09300 -1.3915E 05	0.09400 -1.3823E 05
0.09500 -1.3730E 05	0.09600 -1.3634E 05	0.09700 -1.3650E 05	0.09800 -1.3470E 05	0.09900 -1.3384E 05
0.10000 -1.3355E 05	0.10100 -1.3211E 05	0.10200 -1.3125E 05	0.10300 -1.3044E 05	0.10400 -1.2962E 05
0.10500 -1.2876E 05	0.10600 -1.2795E 05	0.10700 -1.2715E 05	0.10800 -1.2633E 05	0.10900 -1.2551E 05
0.11000 -1.2468E 05	0.11100 -1.2385E 05	0.11200 -1.2301E 05	0.11300 -1.2213E 05	0.11400 -1.2201E 05
0.11500 -1.2055E 05	0.11600 -1.1976E 05	0.11700 -1.1889E 05	0.11800 -1.1807E 05	0.11900 -1.1719E 05
0.12000 -1.1633E 05	0.12100 -1.1544E 05	0.12200 -1.1455E 05	0.12300 -1.1392E 05	0.12400 -1.1288E 05
0.12500 -1.1205E 05	0.12600 -1.1223E 05	0.12700 -1.1058E 05	0.12800 -1.0987E 05	0.12900 -1.0913E 05
0.13000 -1.0837E 05	0.13100 -1.0756E 05	0.13200 -1.0677E 05	0.13300 -1.0597E 05	0.13400 -1.0524E 05
0.13500 -1.0459E 05	0.13600 -1.0371E 05	0.13700 -1.0290E 05	0.13800 -1.0225E 05	0.13900 -1.0176E 05
0.14000 -1.0092E 05	0.14100 -1.0050E 05	0.14200 -9.9823E 04	0.14300 -9.9300E 04	0.14400 -9.9002E 04
0.14500 -9.8414E 04	0.14600 -9.8006E 04	0.14700 -9.7820E 04	0.14800 -9.7348E 04	0.14900 -9.7061E 04
0.15000 -9.6904E 04	0.15100 -9.7190E 04	0.15200 -9.6400E 04	0.15300 -9.6290E 04	0.15400 -9.6194E 04
0.15500 -9.6044E 04	0.15600 -9.5943E 04	0.15700 -9.5855E 04	0.15800 -9.5738E 04	0.15900 -9.5849E 04
0.16000 -9.5654E 04	0.16100 -9.5364E 04	0.16200 -9.5240E 04	0.16300 -9.5055E 04	0.16400 -9.4863E 04
0.16500 -9.4649E 04	0.16600 -9.4294E 04	0.16700 -9.4128E 04	0.16800 -9.3772E 04	0.16900 -9.3500E 04
0.17000 -9.3235E 04	0.17100 -9.2936E 04	0.17200 -9.2637E 04	0.17300 -9.2309E 04	0.17400 -9.2000E 04
0.17500 -9.1705E 04	0.17600 -9.1288E 04	0.17700 -9.1070E 04	0.17800 -9.0697E 04	0.17900 -9.0471E 04
0.18000 -9.0102E 04	0.18100 -8.9916E 04	0.18200 -8.9567E 04	0.18300 -8.9353E 04	0.18400 -8.9173E 04
0.18500 -8.8752E 04	0.18600 -8.8506E 04	0.18700 -8.8298E 04	0.18800 -8.8053E 04	0.18900 -8.7827E 04
0.19000 -8.7657E 04	0.19100 -8.7529E 04	0.19200 -8.7382E 04	0.19300 -8.7276E 04	0.19400 -8.6934E 04
0.19500 -8.6736E 04	0.19600 -8.6559E 04	0.19700 -8.6383E 04	0.19800 -8.6277E 04	0.19900 -8.5854E 04
0.20000 -8.5591E 04	0.20200 -8.5227E 04	0.20400 -8.4821E 04	0.20600 -8.4651E 04	0.20800 -8.3815E 04
0.21000 -8.3494E 04	0.21200 -8.3234E 04	0.21400 -8.3306E 04	0.21600 -8.2837E 04	0.21800 -8.2948E 04
0.22000 -8.3066E 04	0.22200 -8.2631E 04	0.22400 -8.2783E 04	0.22600 -8.2499E 04	0.22800 -8.2651E 04
0.23000 -8.3061E 04	0.23200 -8.3026E 04	0.23400 -8.3572E 04	0.23600 -8.3822E 04	0.23800 -8.3116E 04
0.24000 -8.3325E 04	0.24200 -8.2340E 04	0.24400 -8.1764E 04	0.24600 -8.1556E 04	0.24800 -8.1670E 04
0.25000 -8.1298E 04	0.25200 -8.1496E 04	0.25400 -8.1211E 04	0.25600 -8.0737E 04	0.25800 -7.9960E 04
0.26000 -7.9812E 04	0.26200 -7.9329E 04	0.26400 -7.8658E 04	0.26600 -7.8997E 04	0.26800 -7.9258E 04
0.27000 -7.9069E 04	0.27200 -7.8193E 04	0.27400 -7.8385E 04	0.27600 -8.1489E 04	0.27800 -7.8895E 04
0.28000 -7.9560E 04	0.28200 -7.9435E 04	0.28400 -7.9231E 04	0.28600 -7.9085E 04	0.28800 -7.8714E 04
0.29000 -7.8192E 04	0.29200 -7.8497E 04	0.29400 -7.8931E 04	0.29600 -7.8956E 04	0.29800 -7.8384E 04
0.30000 -7.7771E 04	0.30200 -7.7293E 04	0.30400 -7.7721E 04	0.30600 -7.8471E 04	0.30800 -7.8197E 04
0.31000 -7.7151E 04	0.31200 -7.7281E 04	0.31400 -7.7164E 04	0.31600 -7.6354E 04	0.31800 -7.6634E 04
0.32000 -7.6337E 04	0.32200 -7.5888E 04	0.32400 -7.5473E 04	0.32600 -7.5302E 04	0.32800 -7.6270E 04
0.33000 -7.5517E 04	0.33200 -7.7352E 04	0.33400 -7.6263E 04	0.33600 -7.6103E 04	0.33800 -7.6298E 04
0.34000 -7.6349E 04	0.34200 -7.5888E 04	0.34400 -7.6478E 04	0.34600 -7.6631E 04	0.34800 -7.7171E 04
0.35000 -7.6752E 04	0.35200 -7.7423E 04	0.35400 -7.7607E 04	0.35600 -7.7262E 04	0.35800 -7.6852E 04
0.36000 -7.7425E 04	0.36200 -7.9028E 04	0.36400 -7.6931E 04	0.36600 -7.7032E 04	0.36800 -7.6238E 04
0.37000 -7.5545E 04	0.37200 -7.5035E 04	0.37400 -7.4365E 04	0.37600 -7.3671E 04	0.37800 -7.3152E 04
0.38000 -7.2070E 04	0.38200 -7.1967E 04	0.38400 -7.2241E 04	0.38600 -7.1416E 04	0.38800 -7.1189E 04
0.39000 -7.1510E 04	0.39200 -7.0155E 04	0.39400 -6.9897E 04	0.39600 -6.9762E 04	0.39800 -6.9034E 04
0.40000 -6.9364E 04	0.40200 -7.0805E 04	0.40400 -6.9477E 04	0.40600 -6.9548E 04	0.40800 -6.8962E 04
0.41000 -6.8649E 04	0.41200 -6.8673E 04	0.41400 -6.8793E 04	0.41600 -6.8829E 04	0.41800 -6.9328E 04
0.42000 -6.9006E 04	0.42200 -6.9107E 04	0.42400 -6.8615E 04	0.42600 -6.8478E 04	0.42800 -6.7983E 04
0.43000 -6.7927E 04	0.43200 -6.8281E 04	0.43400 -6.8203E 04	0.43600 -6.8582E 04	0.43800 -6.8380E 04
0.44000 -6.8670E 04	0.44200 -6.8464E 04	0.44400 -6.8815E 04	0.44600 -6.8947E 04	0.44800 -6.8734E 04
0.45000 -6.8564E 04	0.45200 -6.9039E 04	0.45400 -6.6704E 04	0.45600 -6.8906E 04	0.45800 -6.8838E 04
0.46000 -6.8413E 04	0.46200 -6.8623E 04	0.46400 -6.8265E 04	0.46600 -6.8416E 04	0.46800 -6.8127E 04
0.47000 -6.8283E 04	0.47200 -6.8164E 04	0.47400 -6.8708E 04	0.47600 -6.8028E 04	0.47800 -6.8197E 04
0.48000 -6.8247E 04	0.48200 -6.8602E 04	0.48400 -7.0224E 04	0.48600 -6.8888E 04	0.48800 -6.8931E 04
0.49000 -6.9286E 04	0.49200 -6.9011E 04	0.49400 -6.9114E 04	0.49600 -6.8522E 04	0.49800 -6.8495E 04
0.50000 -6.7859E 04	0.50200 -6.7726E 04			

TABLE 6.A-12
(SHEET 19 OF 28)

TIME FUNCTION NUMBER = (10)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 42 00>02$ 0. 314.2)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	3.1420E 02	0.00010	-6.4718E 03	0.00020	-1.2815E 04	0.00030	-1.8818E 04	0.00040	-2.4544E 04
0.00050	-3.0042E 04	0.00060	-3.5340E 04	0.00070	-4.0471E 04	0.00080	-4.5462E 04	0.00090	-5.0324E 04
0.00100	-5.5078E 04	0.00110	-6.0862E 04	0.00120	-6.7604E 04	0.00130	-7.4140E 04	0.00140	-8.0497E 04
0.00150	-8.6694E 04	0.00160	-9.2762E 04	0.00170	-9.8720E 04	0.00180	-1.0458E 05	0.00190	-1.1037E 05
0.00200	-1.1608E 05	0.00210	-1.2174E 05	0.00220	-1.2734E 05	0.00230	-1.3291E 05	0.00240	-1.3844E 05
0.00250	-1.4396E 05	0.00260	-1.4947E 05	0.00270	-1.5496E 05	0.00280	-1.6046E 05	0.00290	-1.6595E 05
0.00300	-1.7145E 05	0.00310	-1.7697E 05	0.00320	-1.8248E 05	0.00330	-1.7938E 05	0.00340	-1.8502E 05
0.00350	-1.9084E 05	0.00360	-1.9686E 05	0.00370	-2.0307E 05	0.00380	-2.0950E 05	0.00390	-2.1612E 05
0.00400	-2.2295E 05	0.00410	-2.2997E 05	0.00420	-2.3716E 05	0.00430	-2.4461E 05	0.00440	-2.5225E 05
0.00450	-2.5982E 05	0.00460	-2.6737E 05	0.00470	-2.7489E 05	0.00480	-2.8235E 05	0.00490	-2.8976E 05
0.00500	-2.9714E 05	0.00510	-3.0450E 05	0.00520	-3.1182E 05	0.00530	-3.1911E 05	0.00540	-3.2633E 05
0.00550	-3.3357E 05	0.00560	-3.4071E 05	0.00570	-3.4782E 05	0.00580	-3.5491E 05	0.00590	-3.6199E 05
0.00600	-3.6904E 05	0.00610	-3.7605E 05	0.00620	-3.8305E 05	0.00630	-3.8992E 05	0.00640	-3.9686E 05
0.00650	-4.0367E 05	0.00660	-4.1054E 05	0.00670	-4.1731E 05	0.00680	-4.2411E 05	0.00690	-4.3080E 05
0.00700	-4.3749E 05	0.00710	-4.4416E 05	0.00720	-4.5081E 05	0.00730	-4.5742E 05	0.00740	-4.6400E 05
0.00750	-4.7058E 05	0.00760	-4.7708E 05	0.00770	-4.8353E 05	0.00780	-4.9000E 05	0.00790	-4.9637E 05
0.00800	-5.0272E 05	0.00810	-4.9823E 05	0.00820	-5.0453E 05	0.00830	-5.1066E 05	0.00840	-5.1676E 05
0.00850	-5.2282E 05	0.00860	-5.2883E 05	0.00870	-5.3481E 05	0.00880	-5.4076E 05	0.00890	-5.4666E 05
0.00900	-5.5260E 05	0.00910	-5.5846E 05	0.00920	-5.6420E 05	0.00930	-5.6990E 05	0.00940	-5.7556E 05
0.00950	-5.8118E 05	0.00960	-5.8676E 05	0.00970	-5.9236E 05	0.00980	-5.9788E 05	0.00990	-6.0317E 05
0.01000	-6.0863E 05	0.01010	-6.1403E 05	0.01020	-6.1936E 05	0.01030	-6.2447E 05	0.01040	-6.2975E 05
0.01050	-6.3498E 05	0.01060	-6.4016E 05	0.01070	-6.4513E 05	0.01080	-6.5026E 05	0.01090	-6.5535E 05
0.01100	-6.6038E 05	0.01110	-6.6515E 05	0.01120	-6.7014E 05	0.01130	-6.7507E 05	0.01140	-6.7992E 05
0.01150	-6.8458E 05	0.01160	-6.8940E 05	0.01170	-6.9415E 05	0.01180	-6.9870E 05	0.01190	-7.0339E 05
0.01200	-7.0802E 05	0.01210	-7.1258E 05	0.01220	-7.1694E 05	0.01230	-7.2143E 05	0.01240	-7.2587E 05
0.01250	-7.3011E 05	0.01260	-7.3444E 05	0.01270	-7.3873E 05	0.01280	-7.4285E 05	0.01290	-7.4704E 05
0.01300	-7.5108E 05	0.01310	-7.5518E 05	0.01320	-7.5915E 05	0.01330	-7.6316E 05	0.01340	-7.6704E 05
0.01350	-7.7102E 05	0.01360	-7.7487E 05	0.01370	-7.7864E 05	0.01380	-7.8237E 05	0.01390	-7.8605E 05
0.01400	-7.8968E 05	0.01410	-7.9325E 05	0.01420	-7.9677E 05	0.01430	-8.0024E 05	0.01440	-8.0367E 05
0.01450	-8.0705E 05	0.01460	-8.1038E 05	0.01470	-8.1340E 05	0.01480	-8.1674E 05	0.01490	-8.2005E 05
0.01500	-8.2333E 05	0.01510	-8.2657E 05	0.01520	-8.2976E 05	0.01530	-8.3303E 05	0.01540	-8.3593E 05
0.01550	-8.3913E 05	0.01560	-8.4200E 05	0.01570	-8.4508E 05	0.01580	-8.4797E 05	0.01590	-8.5043E 05
0.01600	-8.5359E 05	0.01610	-8.5646E 05	0.01620	-8.5945E 05	0.01630	-8.6228E 05	0.01640	-8.6494E 05
0.01650	-8.6772E 05	0.01660	-8.7068E 05	0.01670	-8.7315E 05	0.01680	-8.7637E 05	0.01690	-8.7884E 05
0.01700	-6.8194E 05	0.01710	-8.8453E 05	0.01720	-8.8742E 05	0.01730	-8.9001E 05	0.01740	-8.9212E 05
0.01750	-8.9548E 05	0.01760	-8.9731E 05	0.01770	-9.0040E 05	0.01780	-9.0223E 05	0.01790	-8.8782E 05
0.01800	-8.8976E 05	0.01810	-8.9185E 05	0.01820	-8.9388E 05	0.01830	-8.9588E 05	0.01840	-8.9791E 05
0.01850	-8.9992E 05	0.01860	-9.0190E 05	0.01870	-9.0387E 05	0.01880	-9.0572E 05	0.01890	-9.0762E 05
0.01900	-9.0949E 05	0.01910	-9.1134E 05	0.01920	-9.1292E 05	0.01930	-9.1481E 05	0.01940	-9.1666E 05
0.01950	-9.1848E 05	0.01960	-9.2019E 05	0.01970	-9.2194E 05	0.01980	-9.2366E 05	0.01990	-9.2534E 05
0.02000	-9.2700E 05	0.02010	-9.2864E 05	0.02020	-9.3025E 05	0.02030	-9.3183E 05	0.02040	-9.3339E 05
0.02050	-9.3491E 05	0.02060	-9.3633E 05	0.02070	-9.3780E 05	0.02080	-9.3923E 05	0.02090	-9.4041E 05
0.02100	-9.4188E 05	0.02110	-9.4332E 05	0.02120	-9.4473E 05	0.02130	-9.4612E 05	0.02140	-9.4752E 05
0.02150	-9.4892E 05	0.02160	-9.5028E 05	0.02170	-9.5154E 05	0.02180	-9.5282E 05	0.02190	-9.5408E 05
0.02200	-9.5531E 05	0.02210	-9.5652E 05	0.02220	-9.5768E 05	0.02230	-9.5883E 05	0.02240	-9.5994E 05
0.02250	-9.6103E 05	0.02260	-9.6209E 05	0.02270	-9.6290E 05	0.02280	-9.6398E 05	0.02290	-9.6503E 05
0.02300	-9.6604E 05	0.02310	-9.6703E 05	0.02320	-9.6799E 05	0.02330	-9.6893E 05	0.02340	-9.6984E 05
0.02350	-9.7072E 05	0.02360	-9.7156E 05	0.02370	-9.7239E 05	0.02380	-9.7319E 05	0.02390	-9.7396E 05
0.02400	-9.7471E 05	0.02410	-9.7543E 05	0.02420	-9.7614E 05	0.02430	-9.7681E 05	0.02440	-9.7746E 05
0.02450	-9.7808E 05	0.02460	-9.7869E 05	0.02470	-9.7927E 05	0.02480	-9.7961E 05	0.02490	-9.8021E 05
0.02500	-9.8079E 05	0.02600	-9.8633E 05	0.02700	-9.9082E 05	0.02800	-9.9553E 05	0.02900	-9.8077E 05
0.03000	-9.7927E 05	0.03100	-9.7801E 05	0.03200	-9.7793E 05	0.03300	-9.7755E 05	0.03400	-9.7743E 05
0.03500	-9.7747E 05	0.03600	-9.7757E 05	0.03700	-9.7748E 05	0.03800	-9.7768E 05	0.03900	-9.7797E 05

0.04000	-9.7847E 05	0.04100	-9.7904E 05	0.04200	-9.7963E 05	0.04300	-9.8045E 05	0.04400	-9.8139E 05
0.04500	-9.8291E 05	0.04600	-9.8456E 05	0.04700	-9.8665E 05	0.04800	-9.8954E 05	0.04900	-9.9351E 05
0.05000	-9.9604E 05	0.05100	-1.0020E 06	0.05200	-1.0087E 06	0.05300	-1.0161E 06	0.05400	-1.0240E 06
0.05500	-1.0323E 06	0.05600	-1.0404E 06	0.05700	-1.0486E 06	0.05800	-1.0565E 06	0.05900	-1.0641E 06
0.06000	-1.0714E 06	0.06100	-1.0778E 06	0.06200	-1.0835E 06	0.06300	-1.0880E 06	0.06400	-1.0918E 06
0.06500	-1.0946E 06	0.06600	-1.0962E 06	0.06700	-1.0971E 06	0.06800	-1.0972E 06	0.06900	-1.0968E 06
0.07000	-1.0960E 06	0.07100	-1.0949E 06	0.07200	-1.0936E 06	0.07300	-1.0923E 06	0.07400	-1.0910E 06
0.07500	-1.0898E 06	0.07600	-1.0887E 06	0.07700	-1.0876E 06	0.07800	-1.0868E 06	0.07900	-1.0861E 06
0.08000	-1.0856E 06	0.08100	-1.0852E 06	0.08200	-1.0848E 06	0.08300	-1.0844E 06	0.08400	-1.0841E 06
0.08500	-1.0838E 06	0.08600	-1.0834E 06	0.08700	-1.0831E 06	0.08800	-1.0825E 06	0.08900	-1.0820E 06
0.09000	-1.0814E 06	0.09100	-1.0809E 06	0.09200	-1.0799E 06	0.09300	-1.0790E 06	0.09400	-1.0782E 06
0.09500	-1.0772E 06	0.09600	-1.0763E 06	0.09700	-1.0752E 06	0.09800	-1.0740E 06	0.09900	-1.0730E 06
0.10000	-1.0719E 06	0.10100	-1.0708E 06	0.10200	-1.0698E 06	0.10300	-1.0687E 06	0.10400	-1.0676E 06
0.10500	-1.0666E 06	0.10600	-1.0655E 06	0.10700	-1.0645E 06	0.10800	-1.0633E 06	0.10900	-1.0622E 06
0.11000	-1.0611E 06	0.11100	-1.0600E 06	0.11200	-1.0589E 06	0.11300	-1.0579E 06	0.11400	-1.0568E 06
0.11500	-1.0556E 06	0.11600	-1.0546E 06	0.11700	-1.0537E 06	0.11800	-1.0526E 06	0.11900	-1.0517E 06
0.12000	-1.0506E 06	0.12100	-1.0496E 06	0.12200	-1.0487E 06	0.12300	-1.0477E 06	0.12400	-1.0467E 06
0.12500	-1.0457E 06	0.12600	-1.0447E 06	0.12700	-1.0435E 06	0.12800	-1.0424E 06	0.12900	-1.0414E 06
0.13000	-1.0403E 06	0.13100	-1.0392E 06	0.13200	-1.0381E 06	0.13300	-1.0372E 06	0.13400	-1.0360E 06
0.13500	-1.0349E 06	0.13600	-1.0337E 06	0.13700	-1.0326E 06	0.13800	-1.0315E 06	0.13900	-1.0304E 06
0.14000	-1.0294E 06	0.14100	-1.0282E 06	0.14200	-1.0270E 06	0.14300	-1.0260E 06	0.14400	-1.0249E 06
0.14500	-1.0237E 06	0.14600	-1.0228E 06	0.14700	-1.0216E 06	0.14800	-1.0205E 06	0.14900	-1.0195E 06
0.15000	-1.0185E 06	0.15100	-1.0175E 06	0.15200	-1.0165E 06	0.15300	-1.0155E 06	0.15400	-1.0145E 06
0.15500	-1.0137E 06	0.15600	-1.0127E 06	0.15700	-1.0120E 06	0.15800	-1.0118E 06	0.15900	-1.0110E 06
0.16000	-1.0104E 06	0.16100	-1.0098E 06	0.16200	-1.0095E 06	0.16300	-1.0092E 06	0.16400	-1.0089E 06
0.16500	-1.0088E 06	0.16600	-1.0088E 06	0.16700	-1.0087E 06	0.16800	-1.0087E 06	0.16900	-1.0087E 06
0.17000	-1.0087E 06	0.17100	-1.0088E 06	0.17200	-1.0089E 06	0.17300	-1.0089E 06	0.17400	-1.0089E 06
0.17500	-1.0089E 06	0.17600	-1.0091E 06	0.17700	-1.0091E 06	0.17800	-1.0090E 06	0.17900	-1.0089E 06
0.18000	-1.0089E 06	0.18100	-1.0087E 06	0.18200	-1.0085E 06	0.18300	-1.0081E 06	0.18400	-1.0078E 06
0.18500	-1.0074E 06	0.18600	-1.0069E 06	0.18700	-1.0064E 06	0.18800	-1.0059E 06	0.18900	-1.0053E 06
0.19000	-1.0046E 06	0.19100	-1.0039E 06	0.19200	-1.0032E 06	0.19300	-1.0024E 06	0.19400	-1.0016E 06
0.19500	-1.0007E 06	0.19600	-9.9996E 05	0.19700	-9.9911E 05	0.19800	-9.9815E 05	0.19900	-9.9722E 05
0.20000	-9.9641E 05	0.20200	-9.9461E 05	0.20400	-9.9268E 05	0.20600	-9.9109E 05	0.20800	-9.8897E 05
0.21000	-9.8717E 05	0.21200	-9.8561E 05	0.21400	-9.8371E 05	0.21600	-9.8137E 05	0.21800	-9.7974E 05
0.22000	-9.7785E 05	0.22200	-9.7605E 05	0.22400	-9.7424E 05	0.22600	-9.7201E 05	0.22800	-9.7098E 05
0.23000	-9.6897E 05	0.23200	-9.6697E 05	0.23400	-9.6549E 05	0.23600	-9.6347E 05	0.23800	-9.6241E 05
0.24000	-9.6033E 05	0.24200	-9.5862E 05	0.24400	-9.5683E 05	0.24600	-9.5562E 05	0.24800	-9.5398E 05
0.25000	-9.5213E 05	0.25200	-9.5084E 05	0.25400	-9.4974E 05	0.25600	-9.4851E 05	0.25800	-9.4754E 05
0.26000	-9.4636E 05	0.26200	-9.4555E 05	0.26400	-9.4478E 05	0.26600	-9.4381E 05	0.26800	-9.4292E 05
0.27000	-9.4199E 05	0.27200	-9.4118E 05	0.27400	-9.4028E 05	0.27600	-9.3911E 05	0.27800	-9.3799E 05
0.28000	-9.3676E 05	0.28200	-9.3567E 05	0.28400	-9.3463E 05	0.28600	-9.3321E 05	0.28800	-9.3206E 05
0.29000	-9.3085E 05	0.29200	-9.2978E 05	0.29400	-9.2865E 05	0.29600	-9.2713E 05	0.29800	-9.2594E 05
0.30000	-9.2493E 05	0.30200	-9.2402E 05	0.30400	-9.2312E 05	0.30600	-9.2208E 05	0.30800	-9.2134E 05
0.31000	-9.2062E 05	0.31200	-9.2003E 05	0.31400	-9.1930E 05	0.31600	-9.1857E 05	0.31800	-9.1800E 05
0.32000	-9.1748E 05	0.32200	-9.1690E 05	0.32400	-9.1622E 05	0.32600	-9.1553E 05	0.32800	-9.1489E 05
0.33000	-9.1437E 05	0.33200	-9.1386E 05	0.33400	-9.1307E 05	0.33600	-9.1225E 05	0.33800	-9.1150E 05
0.34000	-9.1071E 05	0.34200	-9.0974E 05	0.34400	-9.0886E 05	0.34600	-9.0806E 05	0.34800	-9.0723E 05
0.35000	-9.0627E 05	0.35200	-9.0540E 05	0.35400	-9.0427E 05	0.35600	-9.0334E 05	0.35800	-9.0241E 05
0.36000	-9.0148E 05	0.36200	-9.0070E 05	0.36400	-9.0004E 05	0.36600	-8.9918E 05	0.36800	-8.9855E 05
0.37000	-8.9786E 05	0.37200	-8.9735E 05	0.37400	-8.9700E 05	0.37600	-8.9674E 05	0.37800	-8.9641E 05
0.38000	-8.9586E 05	0.38200	-8.9561E 05	0.38400	-8.9541E 05	0.38600	-8.9518E 05	0.38800	-8.9500E 05
0.39000	-8.9451E 05	0.39200	-8.9415E 05	0.39400	-8.9367E 05	0.39600	-8.9360E 05	0.39800	-8.9325E 05
0.40000	-8.9285E 05	0.40200	-8.9235E 05	0.40400	-8.9189E 05	0.40600	-8.9149E 05	0.40800	-8.9110E 05
0.41000	-8.9058E 05	0.41200	-8.9016E 05	0.41400	-8.8964E 05	0.41600	-8.8922E 05	0.41800	-8.8882E 05
0.42000	-8.8830E 05	0.42200	-8.8786E 05	0.42400	-8.8728E 05	0.42600	-8.8683E 05	0.42800	-8.8644E 05
0.43000	-8.8603E 05	0.43200	-8.8567E 05	0.43400	-8.8505E 05	0.43600	-8.8459E 05	0.43800	-8.8420E 05
0.44000	-8.8378E 05	0.44200	-8.8346E 05	0.44400	-8.8327E 05	0.44600	-8.8315E 05	0.44800	-8.8283E 05
0.45000	-8.8264E 05	0.45200	-8.8241E 05	0.45400	-8.8210E 05	0.45600	-8.8190E 05	0.45800	-8.8164E 05
0.46000	-8.8141E 05	0.46200	-8.8100E 05	0.46400	-8.8068E 05	0.46600	-8.8018E 05	0.46800	-8.7972E 05
0.47000	-8.7928E 05	0.47200	-8.7869E 05	0.47400	-8.7820E 05	0.47600	-8.7770E 05	0.47800	-8.7696E 05
0.48000	-8.7630E 05	0.48200	-8.7565E 05	0.48400	-8.7501E 05	0.48600	-8.7446E 05	0.48800	-8.7395E 05
0.49000	-8.7310E 05	0.49200	-8.7240E 05	0.49400	-8.7181E 05	0.49600	-8.7117E 05	0.49800	-8.7071E 05
0.50000	-8.7019E 05	0.50200	-8.6969E 05						

TIME FUNCTION NUMBER = (11)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 43 00>02$ 0. 13.9)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	1.3900E 01	0.00010	-2.8610E 02	0.00020	-5.6650E 02	0.00030	-8.3180E 02	0.00040	-1.0849E 03
0.00050	-1.3280E 03	0.00060	-1.5622E 03	0.00070	-1.7890E 03	0.00080	-2.0096E 03	0.00090	-2.2246E 03
0.00100	-2.4347E 03	0.00110	-2.6904E 03	0.00120	-2.9884E 03	0.00130	-3.2773E 03	0.00140	-3.5584E 03
0.00150	-3.8323E 03	0.00160	-4.1005E 03	0.00170	-4.3639E 03	0.00180	-4.6231E 03	0.00190	-4.8787E 03
0.00200	-5.1314E 03	0.00210	-5.3813E 03	0.00220	-5.6292E 03	0.00230	-5.8751E 03	0.00240	-6.1198E 03
0.00250	-6.3638E 03	0.00260	-6.6071E 03	0.00270	-6.8500E 03	0.00280	-7.0929E 03	0.00290	-7.3358E 03
0.00300	-7.5790E 03	0.00310	-7.8227E 03	0.00320	-8.0664E 03	0.00330	-7.9296E 03	0.00340	-8.1787E 03
0.00350	-8.4362E 03	0.00360	-8.7021E 03	0.00370	-8.9765E 03	0.00380	-9.2607E 03	0.00390	-9.5537E 03
0.00400	-9.8553E 03	0.00410	-1.0166E 04	0.00420	-1.0484E 04	0.00430	-1.0813E 04	0.00440	-1.1151E 04
0.00450	-1.1485E 04	0.00460	-1.1819E 04	0.00470	-1.2151E 04	0.00480	-1.2481E 04	0.00490	-1.2809E 04
0.00500	-1.3135E 04	0.00510	-1.3460E 04	0.00520	-1.3784E 04	0.00530	-1.4106E 04	0.00540	-1.4425E 04
0.00550	-1.4745E 04	0.00560	-1.5061E 04	0.00570	-1.5375E 04	0.00580	-1.5689E 04	0.00590	-1.6002E 04
0.00600	-1.6313E 04	0.00610	-1.6623E 04	0.00620	-1.6933E 04	0.00630	-1.7236E 04	0.00640	-1.7543E 04
0.00650	-1.7844E 04	0.00660	-1.8148E 04	0.00670	-1.8447E 04	0.00680	-1.8748E 04	0.00690	-1.9044E 04
0.00700	-1.9339E 04	0.00710	-1.9634E 04	0.00720	-1.9928E 04	0.00730	-2.0220E 04	0.00740	-2.0511E 04
0.00750	-2.0802E 04	0.00760	-2.1089E 04	0.00770	-2.1375E 04	0.00780	-2.1660E 04	0.00790	-2.1942E 04
0.00800	-2.2223E 04	0.00810	-2.2024E 04	0.00820	-2.2303E 04	0.00830	-2.2574E 04	0.00840	-2.2843E 04
0.00850	-2.3111E 04	0.00860	-2.3377E 04	0.00870	-2.3641E 04	0.00880	-2.3904E 04	0.00890	-2.4165E 04
0.00900	-2.4427E 04	0.00910	-2.4687E 04	0.00920	-2.4940E 04	0.00930	-2.5192E 04	0.00940	-2.5442E 04
0.00950	-2.5691E 04	0.00960	-2.5937E 04	0.00970	-2.6185E 04	0.00980	-2.6429E 04	0.00990	-2.6663E 04
0.01000	-2.6904E 04	0.01010	-2.7143E 04	0.01020	-2.7379E 04	0.01030	-2.7605E 04	0.01040	-2.7838E 04
0.01050	-2.8069E 04	0.01060	-2.8298E 04	0.01070	-2.8518E 04	0.01080	-2.8744E 04	0.01090	-2.8969E 04
0.01100	-2.9192E 04	0.01110	-2.9403E 04	0.01120	-2.9623E 04	0.01130	-2.9841E 04	0.01140	-3.0056E 04
0.01150	-3.0262E 04	0.01160	-3.0475E 04	0.01170	-3.0685E 04	0.01180	-3.0886E 04	0.01190	-3.1093E 04
0.01200	-3.1298E 04	0.01210	-3.1499E 04	0.01220	-3.1692E 04	0.01230	-3.1891E 04	0.01240	-3.2087E 04
0.01250	-3.2274E 04	0.01260	-3.2466E 04	0.01270	-3.2656E 04	0.01280	-3.2837E 04	0.01290	-3.3023E 04
0.01300	-3.3201E 04	0.01310	-3.3383E 04	0.01320	-3.3558E 04	0.01330	-3.3735E 04	0.01340	-3.3907E 04
0.01350	-3.4083E 04	0.01360	-3.4253E 04	0.01370	-3.4419E 04	0.01380	-3.4585E 04	0.01390	-3.4747E 04
0.01400	-3.4907E 04	0.01410	-3.5065E 04	0.01420	-3.5221E 04	0.01430	-3.5375E 04	0.01440	-3.5526E 04
0.01450	-3.5675E 04	0.01460	-3.5823E 04	0.01470	-3.5956E 04	0.01480	-3.6104E 04	0.01490	-3.6250E 04
0.01500	-3.6395E 04	0.01510	-3.6538E 04	0.01520	-3.6680E 04	0.01530	-3.6824E 04	0.01540	-3.6952E 04
0.01550	-3.7093E 04	0.01560	-3.7220E 04	0.01570	-3.7357E 04	0.01580	-3.7484E 04	0.01590	-3.7593E 04
0.01600	-3.7733E 04	0.01610	-3.7860E 04	0.01620	-3.7992E 04	0.01630	-3.8117E 04	0.01640	-3.8234E 04
0.01650	-3.8357E 04	0.01660	-3.8488E 04	0.01670	-3.8597E 04	0.01680	-3.8740E 04	0.01690	-3.8849E 04
0.01700	-3.8986E 04	0.01710	-3.9100E 04	0.01720	-3.9228E 04	0.01730	-3.9343E 04	0.01740	-3.9436E 04
0.01750	-3.9584E 04	0.01760	-3.9666E 04	0.01770	-3.9802E 04	0.01780	-3.9883E 04	0.01790	-3.9246E 04
0.01800	-3.9331E 04	0.01810	-3.9424E 04	0.01820	-3.9514E 04	0.01830	-3.9602E 04	0.01840	-3.9692E 04
0.01850	-3.9781E 04	0.01860	-3.9868E 04	0.01870	-3.9955E 04	0.01880	-4.0037E 04	0.01890	-4.0121E 04
0.01900	-4.0204E 04	0.01910	-4.0285E 04	0.01920	-4.0356E 04	0.01930	-4.0439E 04	0.01940	-4.0521E 04
0.01950	-4.0601E 04	0.01960	-4.0677E 04	0.01970	-4.0754E 04	0.01980	-4.0830E 04	0.01990	-4.0905E 04
0.02000	-4.0978E 04	0.02010	-4.1050E 04	0.02020	-4.1121E 04	0.02030	-4.1191E 04	0.02040	-4.1260E 04
0.02050	-4.1328E 04	0.02060	-4.1390E 04	0.02070	-4.1455E 04	0.02080	-4.1518E 04	0.02090	-4.1571E 04
0.02100	-4.1636E 04	0.02110	-4.1699E 04	0.02120	-4.1762E 04	0.02130	-4.1823E 04	0.02140	-4.1885E 04
0.02150	-4.1947E 04	0.02160	-4.2007E 04	0.02170	-4.2062E 04	0.02180	-4.2119E 04	0.02190	-4.2175E 04
0.02200	-4.2229E 04	0.02210	-4.2283E 04	0.02220	-4.2334E 04	0.02230	-4.2385E 04	0.02240	-4.2434E 04
0.02250	-4.2482E 04	0.02260	-4.2529E 04	0.02270	-4.2565E 04	0.02280	-4.2612E 04	0.02290	-4.2659E 04
0.02300	-4.2704E 04	0.02310	-4.2747E 04	0.02320	-4.2790E 04	0.02330	-4.2831E 04	0.02340	-4.2871E 04
0.02350	-4.2910E 04	0.02360	-4.2948E 04	0.02370	-4.2984E 04	0.02380	-4.3020E 04	0.02390	-4.3054E 04
0.02400	-4.3087E 04	0.02410	-4.3119E 04	0.02420	-4.3150E 04	0.02430	-4.3179E 04	0.02440	-4.3208E 04
0.02450	-4.3236E 04	0.02460	-4.3263E 04	0.02470	-4.3288E 04	0.02480	-4.3303E 04	0.02490	-4.3330E 04
0.02500	-4.3356E 04	0.02600	-4.3601E 04	0.02700	-4.3799E 04	0.02800	-4.4007E 04	0.02900	-4.3365E 04
0.03000	-4.3288E 04	0.03100	-4.3233E 04	0.03200	-4.3229E 04	0.03300	-4.3213E 04	0.03400	-4.3207E 04
0.03500	-4.3209E 04	0.03600	-4.3213E 04	0.03700	-4.3209E 04	0.03800	-4.3218E 04	0.03900	-4.3231E 04

TABLE 6.A-12
(SHEET 22 OF 28)

0.04000 -4.3253E 04	0.04100 -4.3278E 04	0.04200 -4.3304E 04	0.04300 -4.3340E 04	0.04400 -4.3382E 04
0.04500 -4.3449E 04	0.04600 -4.3522E 04	0.04700 -4.3623E 04	0.04800 -4.3743E 04	0.04900 -4.3918E 04
0.05000 -4.4030E 04	0.05100 -4.4294E 04	0.05200 -4.4588E 04	0.05300 -4.4914E 04	0.05400 -4.5268E 04
0.05500 -4.5634E 04	0.05600 -4.5992E 04	0.05700 -4.6353E 04	0.05800 -4.6704E 04	0.05900 -4.7040E 04
0.06000 -4.7360E 04	0.06100 -4.7642E 04	0.06200 -4.7897E 04	0.06300 -4.8094E 04	0.06400 -4.8263E 04
0.06500 -4.8385E 04	0.06600 -4.8457E 04	0.06700 -4.8498E 04	0.06800 -4.8501E 04	0.06900 -4.8485E 04
0.07000 -4.8446E 04	0.07100 -4.8400E 04	0.07200 -4.8344E 04	0.07300 -4.8283E 04	0.07400 -4.8227E 04
0.07500 -4.8174E 04	0.07600 -4.8127E 04	0.07700 -4.8079E 04	0.07800 -4.8043E 04	0.07900 -4.8012E 04
0.08000 -4.7988E 04	0.08100 -4.7969E 04	0.08200 -4.7952E 04	0.08300 -4.7937E 04	0.08400 -4.7923E 04
0.08500 -4.7908E 04	0.08600 -4.7893E 04	0.08700 -4.7877E 04	0.08800 -4.7854E 04	0.08900 -4.7832E 04
0.09000 -4.7805E 04	0.09100 -4.7782E 04	0.09200 -4.7739E 04	0.09300 -4.7696E 04	0.09400 -4.7661E 04
0.09500 -4.7616E 04	0.09600 -4.7576E 04	0.09700 -4.7528E 04	0.09800 -4.7476E 04	0.09900 -4.7433E 04
0.10000 -4.7381E 04	0.10100 -4.7334E 04	0.10200 -4.7288E 04	0.10300 -4.7240E 04	0.10400 -4.7194E 04
0.10500 -4.7150E 04	0.10600 -4.7102E 04	0.10700 -4.7054E 04	0.10800 -4.7004E 04	0.10900 -4.6955E 04
0.11000 -4.6906E 04	0.11100 -4.6855E 04	0.11200 -4.6808E 04	0.11300 -4.6763E 04	0.11400 -4.6716E 04
0.11500 -4.6664E 04	0.11600 -4.6618E 04	0.11700 -4.6577E 04	0.11800 -4.6529E 04	0.11900 -4.6489E 04
0.12000 -4.6441E 04	0.12100 -4.6396E 04	0.12200 -4.6358E 04	0.12300 -4.6315E 04	0.12400 -4.6271E 04
0.12500 -4.6225E 04	0.12600 -4.6180E 04	0.12700 -4.6126E 04	0.12800 -4.6079E 04	0.12900 -4.6035E 04
0.13000 -4.5985E 04	0.13100 -4.5936E 04	0.13200 -4.5889E 04	0.13300 -4.5847E 04	0.13400 -4.5798E 04
0.13500 -4.5746E 04	0.13600 -4.5693E 04	0.13700 -4.5646E 04	0.13800 -4.5598E 04	0.13900 -4.5548E 04
0.14000 -4.5503E 04	0.14100 -4.5451E 04	0.14200 -4.5399E 04	0.14300 -4.5353E 04	0.14400 -4.5305E 04
0.14500 -4.5253E 04	0.14600 -4.5210E 04	0.14700 -4.5159E 04	0.14800 -4.5111E 04	0.14900 -4.5069E 04
0.15000 -4.5024E 04	0.15100 -4.4978E 04	0.15200 -4.4934E 04	0.15300 -4.4890E 04	0.15400 -4.4847E 04
0.15500 -4.4810E 04	0.15600 -4.4767E 04	0.15700 -4.4734E 04	0.15800 -4.4725E 04	0.15900 -4.4692E 04
0.16000 -4.4604E 04	0.16100 -4.4639E 04	0.16200 -4.4625E 04	0.16300 -4.4612E 04	0.16400 -4.4600E 04
0.16500 -4.4592E 04	0.16600 -4.4593E 04	0.16700 -4.4590E 04	0.16800 -4.4588E 04	0.16900 -4.4588E 04
0.17000 -4.4590E 04	0.17100 -4.4594E 04	0.17200 -4.4598E 04	0.17300 -4.4598E 04	0.17400 -4.4598E 04
0.17500 -4.4599E 04	0.17600 -4.4605E 04	0.17700 -4.4608E 04	0.17800 -4.4604E 04	0.17900 -4.4600E 04
0.18000 -4.4599E 04	0.18100 -4.4591E 04	0.18200 -4.4579E 04	0.18300 -4.4565E 04	0.18400 -4.4551E 04
0.18500 -4.4532E 04	0.18600 -4.4511E 04	0.18700 -4.4488E 04	0.18800 -4.4465E 04	0.18900 -4.4438E 04
0.19000 -4.4408E 04	0.19100 -4.4375E 04	0.19200 -4.4345E 04	0.19300 -4.4311E 04	0.19400 -4.4275E 04
0.19500 -4.4237E 04	0.19600 -4.4203E 04	0.19700 -4.4165E 04	0.19800 -4.4123E 04	0.19900 -4.4082E 04
0.20000 -4.4046E 04	0.20200 -4.3966E 04	0.20400 -4.3881E 04	0.20600 -4.3811E 04	0.20800 -4.3717E 04
0.21000 -4.3638E 04	0.21200 -4.3568E 04	0.21400 -4.3485E 04	0.21600 -4.3381E 04	0.21800 -4.3309E 04
0.22000 -4.3225E 04	0.22200 -4.3146E 04	0.22400 -4.3066E 04	0.22600 -4.2967E 04	0.22800 -4.2922E 04
0.23000 -4.2833E 04	0.23200 -4.2745E 04	0.23400 -4.2679E 04	0.23600 -4.2590E 04	0.23800 -4.2543E 04
0.24000 -4.2451E 04	0.24200 -4.2375E 04	0.24400 -4.2296E 04	0.24600 -4.2243E 04	0.24800 -4.2171E 04
0.25000 -4.2086E 04	0.25200 -4.2032E 04	0.25400 -4.1983E 04	0.25600 -4.1928E 04	0.25800 -4.1886E 04
0.26000 -4.1834E 04	0.26200 -4.1798E 04	0.26400 -4.1764E 04	0.26600 -4.1721E 04	0.26800 -4.1681E 04
0.27000 -4.1640E 04	0.27200 -4.1604E 04	0.27400 -4.1565E 04	0.27600 -4.1513E 04	0.27800 -4.1464E 04
0.28000 -4.1409E 04	0.28200 -4.1361E 04	0.28400 -4.1315E 04	0.28600 -4.1252E 04	0.28800 -4.1201E 04
0.29000 -4.1148E 04	0.29200 -4.1101E 04	0.29400 -4.1051E 04	0.29600 -4.0983E 04	0.29800 -4.0931E 04
0.30000 -4.0886E 04	0.30200 -4.0846E 04	0.30400 -4.0806E 04	0.30600 -4.0760E 04	0.30800 -4.0728E 04
0.31000 -4.0696E 04	0.31200 -4.0670E 04	0.31400 -4.0638E 04	0.31600 -4.0605E 04	0.31800 -4.0580E 04
0.32000 -4.0557E 04	0.32200 -4.0531E 04	0.32400 -4.0501E 04	0.32600 -4.0471E 04	0.32800 -4.0442E 04
0.33000 -4.0419E 04	0.33200 -4.0397E 04	0.33400 -4.0362E 04	0.33600 -4.0326E 04	0.33800 -4.0293E 04
0.34000 -4.0258E 04	0.34200 -4.0215E 04	0.34400 -4.0176E 04	0.34600 -4.0141E 04	0.34800 -4.0104E 04
0.35000 -4.0061E 04	0.35200 -4.0023E 04	0.35400 -3.9973E 04	0.35600 -3.9932E 04	0.35800 -3.9891E 04
0.36000 -3.9850E 04	0.36200 -3.9815E 04	0.36400 -3.9786E 04	0.36600 -3.9748E 04	0.36800 -3.9720E 04
0.37000 -3.9690E 04	0.37200 -3.9667E 04	0.37400 -3.9652E 04	0.37600 -3.9640E 04	0.37800 -3.9626E 04
0.38000 -3.9602E 04	0.38200 -3.9590E 04	0.38400 -3.9581E 04	0.38600 -3.9571E 04	0.38800 -3.9563E 04
0.39000 -3.9541E 04	0.39200 -3.9526E 04	0.39400 -3.9513E 04	0.39600 -3.9501E 04	0.39800 -3.9486E 04
0.40000 -3.9468E 04	0.40200 -3.9446E 04	0.40400 -3.9426E 04	0.40600 -3.9408E 04	0.40800 -3.9391E 04
0.41000 -3.9368E 04	0.41200 -3.9349E 04	0.41400 -3.9326E 04	0.41600 -3.9308E 04	0.41800 -3.9290E 04
0.42000 -3.9267E 04	0.42200 -3.9247E 04	0.42400 -3.9222E 04	0.42600 -3.9202E 04	0.42800 -3.9185E 04
0.43000 -3.9167E 04	0.43200 -3.9151E 04	0.43400 -3.9123E 04	0.43600 -3.9103E 04	0.43800 -3.9086E 04
0.44000 -3.9067E 04	0.44200 -3.9053E 04	0.44400 -3.9045E 04	0.44600 -3.9039E 04	0.44800 -3.9025E 04
0.45000 -3.9017E 04	0.45200 -3.9007E 04	0.45400 -3.8993E 04	0.45600 -3.8984E 04	0.45800 -3.8973E 04
0.46000 -3.8962E 04	0.46200 -3.8944E 04	0.46400 -3.8930E 04	0.46600 -3.8908E 04	0.46800 -3.8888E 04
0.47000 -3.8868E 04	0.47200 -3.8842E 04	0.47400 -3.8821E 04	0.47600 -3.8799E 04	0.47800 -3.8766E 04
0.48000 -3.8737E 04	0.48200 -3.8708E 04	0.48400 -3.8679E 04	0.48600 -3.8655E 04	0.48800 -3.8633E 04
0.49000 -3.8595E 04	0.49200 -3.8564E 04	0.49400 -3.8538E 04	0.49600 -3.8510E 04	0.49800 -3.8490E 04
0.50000 -3.8466E 04	0.50200 -3.8444E 04			

TIME FUNCTION NUMBER = (12)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 3 000000000000000000000000000)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	1.1313E 04	0.00010	1.1313E 04	0.00020	1.1312E 04	0.00030	1.1312E 04	0.00040	1.1312E 04
0.00050	1.1312E 04	0.00060	1.1312E 04	0.00070	1.1312E 04	0.00080	1.1313E 04	0.00090	1.1313E 04
0.00100	1.1313E 04	0.00110	1.1313E 04	0.00120	1.1313E 04	0.00130	1.1313E 04	0.00140	1.1313E 04
0.00150	1.1313E 04	0.00160	1.1313E 04	0.00170	1.1313E 04	0.00180	1.1313E 04	0.00190	1.1313E 04
0.00200	1.1313E 04	0.00210	1.1313E 04	0.00220	1.1313E 04	0.00230	1.1314E 04	0.00240	1.1313E 04
0.00250	1.1313E 04	0.00260	1.1313E 04	0.00270	1.1314E 04	0.00280	1.1314E 04	0.00290	1.1313E 04
0.00300	1.1314E 04	0.00310	1.1314E 04	0.00320	1.1315E 04	0.00330	1.1314E 04	0.00340	1.1314E 04
0.00350	1.1315E 04	0.00360	1.1315E 04	0.00370	1.1315E 04	0.00380	1.1315E 04	0.00390	1.1316E 04
0.00400	1.1316E 04	0.00410	1.1318E 04	0.00420	1.1317E 04	0.00430	1.1318E 04	0.00440	1.1319E 04
0.00450	1.1319E 04	0.00460	1.1319E 04	0.00470	1.1321E 04	0.00480	1.1322E 04	0.00490	1.1323E 04
0.00500	1.1324E 04	0.00510	1.1325E 04	0.00520	1.1327E 04	0.00530	1.1328E 04	0.00540	1.1331E 04
0.00550	1.1333E 04	0.00560	1.1335E 04	0.00570	1.1336E 04	0.00580	1.1338E 04	0.00590	1.1340E 04
0.00600	1.1343E 04	0.00610	1.1346E 04	0.00620	1.1348E 04	0.00630	1.1352E 04	0.00640	1.1356E 04
0.00650	1.1360E 04	0.00660	1.1364E 04	0.00670	1.1369E 04	0.00680	1.1373E 04	0.00690	1.1379E 04
0.00700	1.1385E 04	0.00710	1.1389E 04	0.00720	1.1398E 04	0.00730	1.1404E 04	0.00740	1.1410E 04
0.00750	1.1418E 04	0.00760	1.1427E 04	0.00770	1.1435E 04	0.00780	1.1445E 04	0.00790	1.1453E 04
0.00800	1.1465E 04	0.00810	1.1476E 04	0.00820	1.1489E 04	0.00830	1.1501E 04	0.00840	1.1513E 04
0.00850	1.1527E 04	0.00860	1.1542E 04	0.00870	1.1556E 04	0.00880	1.1573E 04	0.00890	1.1589E 04
0.00900	1.1607E 04	0.00910	1.1626E 04	0.00920	1.1644E 04	0.00930	1.1664E 04	0.00940	1.1685E 04
0.00950	1.1708E 04	0.00960	1.1730E 04	0.00970	1.1754E 04	0.00980	1.1778E 04	0.00990	1.1804E 04
0.01000	1.1833E 04	0.01010	1.1860E 04	0.01020	1.1888E 04	0.01030	1.1919E 04	0.01040	1.1952E 04
0.01050	1.1987E 04	0.01060	1.2020E 04	0.01070	1.2053E 04	0.01080	1.2090E 04	0.01090	1.2128E 04
0.01100	1.2167E 04	0.01110	1.2211E 04	0.01120	1.2253E 04	0.01130	1.2296E 04	0.01140	1.2337E 04
0.01150	1.2384E 04	0.01160	1.2431E 04	0.01170	1.2483E 04	0.01180	1.2535E 04	0.01190	1.2589E 04
0.01200	1.2642E 04	0.01210	1.2697E 04	0.01220	1.2756E 04	0.01230	1.2812E 04	0.01240	1.2874E 04
0.01250	1.2936E 04	0.01260	1.3000E 04	0.01270	1.3067E 04	0.01280	1.3136E 04	0.01290	1.3206E 04
0.01300	1.3276E 04	0.01310	1.3350E 04	0.01320	1.3429E 04	0.01330	1.3505E 04	0.01340	1.3583E 04
0.01350	1.3666E 04	0.01360	1.3749E 04	0.01370	1.3835E 04	0.01380	1.3925E 04	0.01390	1.4014E 04
0.01400	1.4109E 04	0.01410	1.4201E 04	0.01420	1.4298E 04	0.01430	1.4399E 04	0.01440	1.4499E 04
0.01450	1.4603E 04	0.01460	1.4709E 04	0.01470	1.4816E 04	0.01480	1.4926E 04	0.01490	1.5039E 04
0.01500	1.5153E 04	0.01510	1.5269E 04	0.01520	1.5388E 04	0.01530	1.5510E 04	0.01540	1.5636E 04
0.01550	1.5760E 04	0.01560	1.5888E 04	0.01570	1.6022E 04	0.01580	1.6155E 04	0.01590	1.6293E 04
0.01600	1.6430E 04	0.01610	1.6572E 04	0.01620	1.6715E 04	0.01630	1.6862E 04	0.01640	1.7007E 04
0.01650	1.7160E 04	0.01660	1.7313E 04	0.01670	1.7468E 04	0.01680	1.7628E 04	0.01690	1.7789E 04
0.01700	1.7954E 04	0.01710	1.8121E 04	0.01720	1.8291E 04	0.01730	1.8461E 04	0.01740	1.8635E 04
0.01750	1.8813E 04	0.01760	1.8990E 04	0.01770	1.9172E 04	0.01780	1.9358E 04	0.01790	1.9546E 04
0.01800	1.9736E 04	0.01810	1.9927E 04	0.01820	2.0120E 04	0.01830	2.0319E 04	0.01840	2.0518E 04
0.01850	2.0722E 04	0.01860	2.0926E 04	0.01870	2.1134E 04	0.01880	2.1345E 04	0.01890	2.1558E 04
0.01900	2.1774E 04	0.01910	2.1995E 04	0.01920	2.2212E 04	0.01930	2.2437E 04	0.01940	2.2664E 04
0.01950	2.2895E 04	0.01960	2.3126E 04	0.01970	2.3359E 04	0.01980	2.3595E 04	0.01990	2.3837E 04
0.02000	2.4076E 04	0.02010	2.4323E 04	0.02020	2.4567E 04	0.02030	2.4816E 04	0.02040	2.5065E 04
0.02050	2.5321E 04	0.02060	2.5578E 04	0.02070	2.5834E 04	0.02080	2.6095E 04	0.02090	2.6356E 04
0.02100	2.6621E 04	0.02110	2.6886E 04	0.02120	2.7156E 04	0.02130	2.7428E 04	0.02140	2.7700E 04
0.02150	2.7972E 04	0.02160	2.8253E 04	0.02170	2.8530E 04	0.02180	2.8809E 04	0.02190	2.9092E 04
0.02200	2.9375E 04	0.02210	2.9661E 04	0.02220	2.9948E 04	0.02230	3.0234E 04	0.02240	3.0525E 04
0.02250	3.0817E 04	0.02260	3.1110E 04	0.02270	3.1404E 04	0.02280	3.1699E 04	0.02290	3.1995E 04
0.02300	3.2294E 04	0.02310	3.2593E 04	0.02320	3.2894E 04	0.02330	3.3196E 04	0.02340	3.3499E 04
0.02350	3.3804E 04	0.02360	3.4109E 04	0.02370	3.4412E 04	0.02380	3.4718E 04	0.02390	3.5028E 04
0.02400	3.5333E 04	0.02410	3.5642E 04	0.02420	3.5950E 04	0.02430	3.6259E 04	0.02440	3.6572E 04
0.02450	3.6880E 04	0.02460	3.7190E 04	0.02470	3.7501E 04	0.02480	3.7813E 04	0.02490	3.8123E 04
0.02500	3.8433E 04	0.02600	4.1557E 04	0.02700	4.4611E 04	0.02800	4.7538E 04	0.02900	5.0320E 04
0.03000	5.3102E 04	0.03100	5.5843E 04	0.03200	5.8451E 04	0.03300	6.0725E 04	0.03400	6.2589E 04
0.03500	6.4040E 04	0.03600	6.5070E 04	0.03700	6.5688E 04	0.03800	6.5889E 04	0.03900	6.5695E 04

0.04000	6.5089E 04	0.04100	6.4124E 04	0.04200	6.2807E 04	0.04300	6.1140E 04	0.04400	5.9150E 04
0.04500	5.6913E 04	0.04600	5.4450E 04	0.04700	5.1792E 04	0.04800	4.8875E 04	0.04900	4.5845E 04
0.05000	4.2712E 04	0.05100	3.9508E 04	0.05200	3.6294E 04	0.05300	3.3091E 04	0.05400	2.9962E 04
0.05500	2.7006E 04	0.05600	2.4238E 04	0.05700	2.1760E 04	0.05800	1.9598E 04	0.05900	1.7790E 04
0.06000	1.6427E 04	0.06100	1.5475E 04	0.06200	1.4937E 04	0.06300	1.4843E 04	0.06400	1.5231E 04
0.06500	1.6075E 04	0.06600	1.7318E 04	0.06700	1.9061E 04	0.06800	2.1182E 04	0.06900	2.3640E 04
0.07000	2.6455E 04	0.07100	2.9532E 04	0.07200	3.2888E 04	0.07300	3.6472E 04	0.07400	4.0233E 04
0.07500	4.4166E 04	0.07600	4.8172E 04	0.07700	5.2204E 04	0.07800	5.6235E 04	0.07900	6.0232E 04
0.08000	6.4182E 04	0.08100	6.7980E 04	0.08200	7.1605E 04	0.08300	7.5036E 04	0.08400	7.8206E 04
0.08500	8.1120E 04	0.08600	8.3656E 04	0.08700	8.5874E 04	0.08800	8.7752E 04	0.08900	8.9274E 04
0.09000	9.0459E 04	0.09100	9.1192E 04	0.09200	9.1546E 04	0.09300	9.1617E 04	0.09400	9.1319E 04
0.09500	9.0650E 04	0.09600	8.9803E 04	0.09700	8.8652E 04	0.09800	8.7351E 04	0.09900	8.5537E 04
0.10000	8.3618E 04	0.10100	8.1554E 04	0.10200	7.9317E 04	0.10300	7.6983E 04	0.10400	7.4542E 04
0.10500	7.1987E 04	0.10600	6.9349E 04	0.10700	6.6638E 04	0.10800	6.3949E 04	0.10900	6.1242E 04
0.11000	5.8569E 04	0.11100	5.5958E 04	0.11200	5.3426E 04	0.11300	5.0998E 04	0.11400	4.8665E 04
0.11500	4.6470E 04	0.11600	4.4390E 04	0.11700	4.2475E 04	0.11800	4.0728E 04	0.11900	3.9168E 04
0.12000	3.7761E 04	0.12100	3.6527E 04	0.12200	3.5505E 04	0.12300	3.4661E 04	0.12400	3.3997E 04
0.12500	3.3495E 04	0.12600	3.3183E 04	0.12700	3.3004E 04	0.12800	3.2988E 04	0.12900	3.3148E 04
0.13000	3.3469E 04	0.13100	3.3875E 04	0.13200	3.4436E 04	0.13300	3.5124E 04	0.13400	3.5986E 04
0.13500	3.6898E 04	0.13600	3.7978E 04	0.13700	3.8897E 04	0.13800	3.9978E 04	0.13900	4.1109E 04
0.14000	4.2290E 04	0.14100	4.3510E 04	0.14200	4.4734E 04	0.14300	4.5910E 04	0.14400	4.7106E 04
0.14500	4.8293E 04	0.14600	4.9471E 04	0.14700	5.0529E 04	0.14800	5.1578E 04	0.14900	5.2668E 04
0.15000	5.3564E 04	0.15100	5.4472E 04	0.15200	5.5298E 04	0.15300	5.6045E 04	0.15400	5.6760E 04
0.15500	5.7264E 04	0.15600	5.7782E 04	0.15700	5.8235E 04	0.15800	5.8691E 04	0.15900	5.9132E 04
0.16000	5.9197E 04	0.16100	5.9351E 04	0.16200	5.9439E 04	0.16300	5.9521E 04	0.16400	5.9510E 04
0.16500	5.9549E 04	0.16600	5.9268E 04	0.16700	5.9079E 04	0.16800	5.8850E 04	0.16900	5.8607E 04
0.17000	5.8301E 04	0.17100	5.7973E 04	0.17200	5.7629E 04	0.17300	5.7158E 04	0.17400	5.6725E 04
0.17500	5.6538E 04	0.17600	5.5843E 04	0.17700	5.5367E 04	0.17800	5.4889E 04	0.17900	5.4631E 04
0.18000	5.3953E 04	0.18100	5.3486E 04	0.18200	5.3036E 04	0.18300	5.2605E 04	0.18400	5.2195E 04
0.18500	5.1831E 04	0.18600	5.1490E 04	0.18700	5.1209E 04	0.18800	5.0775E 04	0.18900	5.0462E 04
0.19000	5.0206E 04	0.19100	4.9939E 04	0.19200	4.9706E 04	0.19300	4.9495E 04	0.19400	4.9358E 04
0.19500	4.9251E 04	0.19600	4.9201E 04	0.19700	4.9030E 04	0.19800	4.9194E 04	0.19900	4.8983E 04
0.20000	4.9028E 04	0.20200	4.9199E 04	0.20400	4.9525E 04	0.20600	4.9898E 04	0.20800	5.0413E 04
0.21000	5.0974E 04	0.21200	5.1569E 04	0.21400	5.2210E 04	0.21600	5.3018E 04	0.21800	5.3691E 04
0.22000	5.4313E 04	0.22200	5.5046E 04	0.22400	5.5713E 04	0.22600	5.6453E 04	0.22800	5.7094E 04
0.23000	5.7597E 04	0.23200	5.7990E 04	0.23400	5.8214E 04	0.23600	5.8514E 04	0.23800	5.8661E 04
0.24000	5.8964E 04	0.24200	5.8999E 04	0.24400	5.9234E 04	0.24600	5.9362E 04	0.24800	5.9311E 04
0.25000	5.9291E 04	0.25200	5.9126E 04	0.25400	5.8845E 04	0.25600	5.8685E 04	0.25800	5.8581E 04
0.26000	5.8336E 04	0.26200	5.8126E 04	0.26400	5.7946E 04	0.26600	5.7641E 04	0.26800	5.7340E 04
0.27000	5.7017E 04	0.27200	5.6963E 04	0.27400	5.6820E 04	0.27600	5.6636E 04	0.27800	5.6089E 04
0.28000	5.5622E 04	0.28200	5.5427E 04	0.28400	5.5509E 04	0.28600	5.5302E 04	0.28800	5.5680E 04
0.29000	5.5550E 04	0.29200	5.5974E 04	0.29400	5.5561E 04	0.29600	5.5677E 04	0.29800	5.6216E 04
0.30000	5.6166E 04	0.30200	5.6752E 04	0.30400	5.6720E 04	0.30600	5.6709E 04	0.30800	5.7066E 04
0.31000	5.7338E 04	0.31200	5.7614E 04	0.31400	5.7827E 04	0.31600	5.8253E 04	0.31800	5.8442E 04
0.32000	5.8513E 04	0.32200	5.8775E 04	0.32400	5.8926E 04	0.32600	5.8924E 04	0.32800	5.8591E 04
0.33000	5.8350E 04	0.33200	5.8043E 04	0.33400	5.7390E 04	0.33600	5.6865E 04	0.33800	5.6295E 04
0.34000	5.5580E 04	0.34200	5.4999E 04	0.34400	5.4156E 04	0.34600	5.3204E 04	0.34800	5.2196E 04
0.35000	5.1406E 04	0.35200	5.0418E 04	0.35400	4.9374E 04	0.35600	4.8634E 04	0.35800	4.7915E 04
0.36000	4.7019E 04	0.36200	4.6403E 04	0.36400	4.5612E 04	0.36600	4.4844E 04	0.36800	4.4484E 04
0.37000	4.4220E 04	0.37200	4.4003E 04	0.37400	4.3903E 04	0.37600	4.3878E 04	0.37800	4.3900E 04
0.38000	4.4207E 04	0.38200	4.4377E 04	0.38400	4.4549E 04	0.38600	4.4947E 04	0.38800	4.5318E 04
0.39000	4.5613E 04	0.39200	4.6076E 04	0.39400	4.6552E 04	0.39600	4.6999E 04	0.39800	4.7666E 04
0.40000	4.8100E 04	0.40200	4.8439E 04	0.40400	4.8852E 04	0.40600	4.9210E 04	0.40800	4.9774E 04
0.41000	5.0256E 04	0.41200	5.0602E 04	0.41400	5.0899E 04	0.41600	5.1142E 04	0.41800	5.1273E 04
0.42000	5.1551E 04	0.42200	5.1700E 04	0.42400	5.1978E 04	0.42600	5.2175E 04	0.42800	5.2422E 04
0.43000	5.2520E 04	0.43200	5.2438E 04	0.43400	5.2485E 04	0.43600	5.2380E 04	0.43800	5.2387E 04
0.44000	5.2242E 04	0.44200	5.2200E 04	0.44400	5.1991E 04	0.44600	5.1866E 04	0.44800	5.1536E 04
0.45000	5.1341E 04	0.45200	5.1042E 04	0.45400	5.0834E 04	0.45600	5.0478E 04	0.45800	5.0188E 04
0.46000	4.9964E 04	0.46200	4.9623E 04	0.46400	4.9384E 04	0.46600	4.9015E 04	0.46800	4.8761E 04
0.47000	4.8377E 04	0.47200	4.8127E 04	0.47400	4.7738E 04	0.47600	4.7437E 04	0.47800	4.7039E 04
0.48000	4.6829E 04	0.48200	4.6497E 04	0.48400	4.6286E 04	0.48600	4.5766E 04	0.48800	4.5389E 04
0.49000	4.5020E 04	0.49200	4.4845E 04	0.49400	4.4619E 04	0.49600	4.4534E 04	0.49800	4.4433E 04
0.50000	4.4456E 04	0.50200	4.4370E 04						

TABLE 6.A-12
(SHEET 25 OF 28)

TIME FUNCTION NUMBER = (13)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 2 00>02$ 0. 9775.8)

NUMBER OF ABSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	9.7758E 03	0.00010	9.7776E 03	0.00020	9.7836E 03	0.00030	9.8002E 03	0.00040	9.8292E 03
0.00050	9.8718E 03	0.00060	9.9309E 03	0.00070	1.0009E 04	0.00080	1.0108E 04	0.00090	1.0228E 04
0.00100	1.0374E 04	0.00110	1.0544E 04	0.00120	1.0740E 04	0.00130	1.0963E 04	0.00140	1.1219E 04
0.00150	1.1508E 04	0.00160	1.1832E 04	0.00170	1.2192E 04	0.00180	1.2591E 04	0.00190	1.3029E 04
0.00200	1.3509E 04	0.00210	1.4031E 04	0.00220	1.4597E 04	0.00230	1.5206E 04	0.00240	1.5859E 04
0.00250	1.6558E 04	0.00260	1.7300E 04	0.00270	1.8093E 04	0.00280	1.8929E 04	0.00290	1.9810E 04
0.00300	2.0738E 04	0.00310	2.1711E 04	0.00320	2.2731E 04	0.00330	2.3803E 04	0.00340	2.5013E 04
0.00350	2.6367E 04	0.00360	2.7863E 04	0.00370	2.9492E 04	0.00380	3.1260E 04	0.00390	3.3157E 04
0.00400	3.5183E 04	0.00410	3.7332E 04	0.00420	3.9599E 04	0.00430	4.1979E 04	0.00440	4.4385E 04
0.00450	4.6794E 04	0.00460	4.9207E 04	0.00470	5.1623E 04	0.00480	5.4041E 04	0.00490	5.6460E 04
0.00500	5.8885E 04	0.00510	6.1318E 04	0.00520	6.3752E 04	0.00530	6.6187E 04	0.00540	6.8637E 04
0.00550	7.1085E 04	0.00560	7.3548E 04	0.00570	7.6004E 04	0.00580	7.8476E 04	0.00590	8.0955E 04
0.00600	8.3443E 04	0.00610	8.5934E 04	0.00620	8.8428E 04	0.00630	9.0934E 04	0.00640	9.3448E 04
0.00650	9.5961E 04	0.00660	9.8495E 04	0.00670	1.0103E 05	0.00680	1.0358E 05	0.00690	1.0612E 05
0.00700	1.0868E 05	0.00710	1.1125E 05	0.00720	1.1384E 05	0.00730	1.1643E 05	0.00740	1.1904E 05
0.00750	1.2165E 05	0.00760	1.2426E 05	0.00770	1.2680E 05	0.00780	1.2951E 05	0.00790	1.3214E 05
0.00800	1.3478E 05	0.00810	1.3333E 05	0.00820	1.3598E 05	0.00830	1.3860E 05	0.00840	1.4123E 05
0.00850	1.4386E 05	0.00860	1.4650E 05	0.00870	1.4915E 05	0.00880	1.5181E 05	0.00890	1.5447E 05
0.00900	1.5716E 05	0.00910	1.5984E 05	0.00920	1.6250E 05	0.00930	1.6517E 05	0.00940	1.6784E 05
0.00950	1.7052E 05	0.00960	1.7321E 05	0.00970	1.7592E 05	0.00980	1.7863E 05	0.00990	1.8129E 05
0.01000	1.8402E 05	0.01010	1.8674E 05	0.01020	1.8946E 05	0.01030	1.9214E 05	0.01040	1.9489E 05
0.01050	1.9764E 05	0.01060	2.0039E 05	0.01070	2.0311E 05	0.01080	2.0589E 05	0.01090	2.0867E 05
0.01100	2.1145E 05	0.01110	2.1418E 05	0.01120	2.1700E 05	0.01130	2.1981E 05	0.01140	2.2262E 05
0.01150	2.2536E 05	0.01160	2.2822E 05	0.01170	2.3105E 05	0.01180	2.3385E 05	0.01190	2.3671E 05
0.01200	2.3956E 05	0.01210	2.4241E 05	0.01220	2.4522E 05	0.01230	2.4808E 05	0.01240	2.5095E 05
0.01250	2.5378E 05	0.01260	2.5665E 05	0.01270	2.5953E 05	0.01280	2.6237E 05	0.01290	2.6526E 05
0.01300	2.6811E 05	0.01310	2.7101E 05	0.01320	2.7387E 05	0.01330	2.7677E 05	0.01340	2.7965E 05
0.01350	2.8258E 05	0.01360	2.8549E 05	0.01370	2.8838E 05	0.01380	2.9127E 05	0.01390	2.9416E 05
0.01400	2.9706E 05	0.01410	2.9995E 05	0.01420	3.0284E 05	0.01430	3.0573E 05	0.01440	3.0861E 05
0.01450	3.1150E 05	0.01460	3.1439E 05	0.01470	3.1721E 05	0.01480	3.2013E 05	0.01490	3.2307E 05
0.01500	3.2600E 05	0.01510	3.2894E 05	0.01520	3.3187E 05	0.01530	3.3485E 05	0.01540	3.3770E 05
0.01550	3.4067E 05	0.01560	3.4354E 05	0.01570	3.4650E 05	0.01580	3.4940E 05	0.01590	3.5218E 05
0.01600	3.5520E 05	0.01610	3.5814E 05	0.01620	3.6112E 05	0.01630	3.6406E 05	0.01640	3.6694E 05
0.01650	3.6988E 05	0.01660	3.7289E 05	0.01670	3.7573E 05	0.01680	3.7885E 05	0.01690	3.8171E 05
0.01700	3.8480E 05	0.01710	3.8771E 05	0.01720	3.9073E 05	0.01730	3.9365E 05	0.01740	3.9639E 05
0.01750	3.9960E 05	0.01760	4.0225E 05	0.01770	4.0538E 05	0.01780	4.0804E 05	0.01790	4.0476E 05
0.01800	4.0737E 05	0.01810	4.1012E 05	0.01820	4.1285E 05	0.01830	4.1557E 05	0.01840	4.1826E 05
0.01850	4.2105E 05	0.01860	4.2382E 05	0.01870	4.2658E 05	0.01880	4.2933E 05	0.01890	4.3203E 05
0.01900	4.3475E 05	0.01910	4.3746E 05	0.01920	4.4007E 05	0.01930	4.4277E 05	0.01940	4.4545E 05
0.01950	4.4812E 05	0.01960	4.5075E 05	0.01970	4.5335E 05	0.01980	4.5596E 05	0.01990	4.5856E 05
0.02000	4.6113E 05	0.02010	4.6368E 05	0.02020	4.6621E 05	0.02030	4.6872E 05	0.02040	4.7120E 05
0.02050	4.7369E 05	0.02060	4.7613E 05	0.02070	4.7851E 05	0.02080	4.8093E 05	0.02090	4.8327E 05
0.02100	4.8566E 05	0.02110	4.8808E 05	0.02120	4.9044E 05	0.02130	4.9279E 05	0.02140	4.9513E 05
0.02150	4.9746E 05	0.02160	4.9976E 05	0.02170	5.0204E 05	0.02180	5.0425E 05	0.02190	5.0651E 05
0.02200	5.0873E 05	0.02210	5.1093E 05	0.02220	5.1311E 05	0.02230	5.1526E 05	0.02240	5.1739E 05
0.02250	5.1949E 05	0.02260	5.2157E 05	0.02270	5.2356E 05	0.02280	5.2563E 05	0.02290	5.2767E 05
0.02300	5.2966E 05	0.02310	5.3167E 05	0.02320	5.3363E 05	0.02330	5.3558E 05	0.02340	5.3749E 05
0.02350	5.3942E 05	0.02360	5.4125E 05	0.02370	5.4311E 05	0.02380	5.4492E 05	0.02390	5.4674E 05
0.02400	5.4849E 05	0.02410	5.5024E 05	0.02420	5.5197E 05	0.02430	5.5367E 05	0.02440	5.5535E 05
0.02450	5.5701E 05	0.02460	5.5864E 05	0.02470	5.6025E 05	0.02480	5.6178E 05	0.02490	5.6338E 05
0.02500	5.6495E 05	0.02600	5.7971E 05	0.02700	5.9251E 05	0.02800	6.0356E 05	0.02900	5.9738E 05
0.03000	6.0142E 05	0.03100	6.0477E 05	0.03200	6.0744E 05	0.03300	6.0881E 05	0.03400	6.0875E 05
0.03500	6.0774E 05	0.03600	6.0574E 05	0.03700	6.0297E 05	0.03800	5.9974E 05	0.03900	5.9612E 05

TABLE 6.A-12
(SHEET 26 OF 28)

0.04000	5.9260E 05	0.04100	5.8861E 05	0.04200	5.8445E 05	0.04300	5.8049E 05	0.04400	5.7661E 05
0.04500	5.7291E 05	0.04600	5.6894E 05	0.04700	5.6610E 05	0.04800	5.6230E 05	0.04900	5.6050E 05
0.05000	5.5869E 05	0.05100	5.5818E 05	0.05200	5.5853E 05	0.05300	5.5963E 05	0.05400	5.6140E 05
0.05500	5.6376E 05	0.05600	5.6669E 05	0.05700	5.7029E 05	0.05800	5.7444E 05	0.05900	5.7890E 05
0.06000	5.8386E 05	0.06100	5.8886E 05	0.06200	5.9414E 05	0.06300	5.9950E 05	0.06400	6.0500E 05
0.06500	6.1079E 05	0.06600	6.1644E 05	0.06700	6.2181E 05	0.06800	6.2723E 05	0.06900	6.3227E 05
0.07000	6.3713E 05	0.07100	6.4162E 05	0.07200	6.4715E 05	0.07300	6.5028E 05	0.07400	6.5295E 05
0.07500	6.5546E 05	0.07600	6.5759E 05	0.07700	6.5936E 05	0.07800	6.6081E 05	0.07900	6.6170E 05
0.08000	6.6233E 05	0.08100	6.6260E 05	0.08200	6.6248E 05	0.08300	6.6221E 05	0.08400	6.6173E 05
0.08500	6.6107E 05	0.08600	6.6014E 05	0.08700	6.5897E 05	0.08800	6.5768E 05	0.08900	6.5618E 05
0.09000	6.5468E 05	0.09100	6.5292E 05	0.09200	6.5240E 05	0.09300	6.4930E 05	0.09400	6.4730E 05
0.09500	6.4490E 05	0.09600	6.4264E 05	0.09700	6.4186E 05	0.09800	6.3870E 05	0.09900	6.3570E 05
0.10000	6.3591E 05	0.10100	6.3032E 05	0.10200	6.2751E 05	0.10300	6.2466E 05	0.10400	6.2173E 05
0.10500	6.1861E 05	0.10600	6.1532E 05	0.10700	6.1206E 05	0.10800	6.0867E 05	0.10900	6.0517E 05
0.11000	6.0155E 05	0.11100	5.9783E 05	0.11200	5.9411E 05	0.11300	5.9034E 05	0.11400	5.8776E 05
0.11500	5.8309E 05	0.11600	5.7939E 05	0.11700	5.7568E 05	0.11800	5.7203E 05	0.11900	5.6842E 05
0.12000	5.6493E 05	0.12100	5.6148E 05	0.12200	5.5816E 05	0.12300	5.5524E 05	0.12400	5.5177E 05
0.12500	5.4877E 05	0.12600	5.4736E 05	0.12700	5.4320E 05	0.12800	5.4058E 05	0.12900	5.3811E 05
0.13000	5.3594E 05	0.13100	5.3359E 05	0.13200	5.3157E 05	0.13300	5.2970E 05	0.13400	5.2819E 05
0.13500	5.2674E 05	0.13600	5.2564E 05	0.13700	5.2386E 05	0.13800	5.2285E 05	0.13900	5.2210E 05
0.14000	5.2094E 05	0.14100	5.2043E 05	0.14200	5.1972E 05	0.14300	5.1911E 05	0.14400	5.1895E 05
0.14500	5.1833E 05	0.14600	5.1830E 05	0.14700	5.1820E 05	0.14800	5.1783E 05	0.14900	5.1808E 05
0.15000	5.1793E 05	0.15100	5.1868E 05	0.15200	5.1774E 05	0.15300	5.1792E 05	0.15400	5.1827E 05
0.15500	5.1800E 05	0.15600	5.1805E 05	0.15700	5.1815E 05	0.15800	5.1861E 05	0.15900	5.1945E 05
0.16000	5.1870E 05	0.16100	5.1842E 05	0.16200	5.1835E 05	0.16300	5.1834E 05	0.16400	5.1813E 05
0.16500	5.1833E 05	0.16600	5.1731E 05	0.16700	5.1706E 05	0.16800	5.1644E 05	0.16900	5.1598E 05
0.17000	5.1537E 05	0.17100	5.1468E 05	0.17200	5.1422E 05	0.17300	5.1323E 05	0.17400	5.1244E 05
0.17500	5.1268E 05	0.17600	5.1083E 05	0.17700	5.1017E 05	0.17800	5.0916E 05	0.17900	5.0922E 05
0.18000	5.0745E 05	0.18100	5.0676E 05	0.18200	5.0575E 05	0.18300	5.0489E 05	0.18400	5.0410E 05
0.18500	5.0302E 05	0.18600	5.0240E 05	0.18700	5.0199E 05	0.18800	5.0087E 05	0.18900	5.0013E 05
0.19000	4.9955E 05	0.19100	4.9685E 05	0.19200	4.9818E 05	0.19300	4.9752E 05	0.19400	4.9668E 05
0.19500	4.9624E 05	0.19600	4.9601E 05	0.19700	4.9514E 05	0.19800	4.9561E 05	0.19900	4.9408E 05
0.20000	4.9373E 05	0.20200	4.9298E 05	0.20400	4.9211E 05	0.20600	4.9138E 05	0.20800	4.9037E 05
0.21000	4.8955E 05	0.21200	4.8936E 05	0.21400	4.8893E 05	0.21600	4.8796E 05	0.21800	4.8812E 05
0.22000	4.8777E 05	0.22200	4.8699E 05	0.22400	4.8674E 05	0.22600	4.8604E 05	0.22800	4.8607E 05
0.23000	4.8575E 05	0.23200	4.8532E 05	0.23400	4.8545E 05	0.23600	4.8556E 05	0.23800	4.8442E 05
0.24000	4.8506E 05	0.24200	4.8328E 05	0.24400	4.8293E 05	0.24600	4.8296E 05	0.24800	4.8268E 05
0.25000	4.8186E 05	0.25200	4.8155E 05	0.25400	4.8097E 05	0.25600	4.8026E 05	0.25800	4.7933E 05
0.26000	4.7857E 05	0.26200	4.7751E 05	0.26400	4.7619E 05	0.26600	4.7568E 05	0.26800	4.7505E 05
0.27000	4.7365E 05	0.27200	4.7212E 05	0.27400	4.7168E 05	0.27600	4.7532E 05	0.27800	4.6915E 05
0.28000	4.6827E 05	0.28200	4.6717E 05	0.28400	4.6690E 05	0.28600	4.6642E 05	0.28800	4.6646E 05
0.29000	4.6587E 05	0.29200	4.6671E 05	0.29400	4.6685E 05	0.29600	4.6668E 05	0.29800	4.6670E 05
0.30000	4.6611E 05	0.30200	4.6640E 05	0.30400	4.6670E 05	0.30600	4.6731E 05	0.30800	4.6716E 05
0.31000	4.6548E 05	0.31200	4.6550E 05	0.31400	4.6484E 05	0.31600	4.6381E 05	0.31800	4.6358E 05
0.32000	4.6221E 05	0.32200	4.6136E 05	0.32400	4.6037E 05	0.32600	4.5936E 05	0.32800	4.5902E 05
0.33000	4.5670E 05	0.33200	4.5833E 05	0.33400	4.5462E 05	0.33600	4.5296E 05	0.33800	4.5212E 05
0.34000	4.5089E 05	0.34200	4.4949E 05	0.34400	4.4893E 05	0.34600	4.4764E 05	0.34800	4.4695E 05
0.35000	4.4564E 05	0.35200	4.4533E 05	0.35400	4.4409E 05	0.35600	4.4320E 05	0.35800	4.4230E 05
0.36000	4.4203E 05	0.36200	4.4407E 05	0.36400	4.3990E 05	0.36600	4.3879E 05	0.36800	4.3765E 05
0.37000	4.3679E 05	0.37200	4.3617E 05	0.37400	4.3525E 05	0.37600	4.3434E 05	0.37800	4.3355E 05
0.38000	4.3245E 05	0.38200	4.3204E 05	0.38400	4.3197E 05	0.38600	4.3078E 05	0.38800	4.3025E 05
0.39000	4.3005E 05	0.39200	4.2783E 05	0.39400	4.2734E 05	0.39600	4.2701E 05	0.39800	4.2652E 05
0.40000	4.2674E 05	0.40200	4.2835E 05	0.40400	4.2618E 05	0.40600	4.2614E 05	0.40800	4.2597E 05
0.41000	4.2609E 05	0.41200	4.2643E 05	0.41400	4.2667E 05	0.41600	4.2677E 05	0.41800	4.2740E 05
0.42000	4.2736E 05	0.42200	4.2770E 05	0.42400	4.2759E 05	0.42600	4.2783E 05	0.42800	4.2778E 05
0.43000	4.2796E 05	0.43200	4.2622E 05	0.43400	4.2818E 05	0.43600	4.2846E 05	0.43800	4.2827E 05
0.44000	4.2835E 05	0.44200	4.2808E 05	0.44400	4.2821E 05	0.44600	4.2831E 05	0.44800	4.2725E 05
0.45000	4.2678E 05	0.45200	4.2704E 05	0.45400	4.2639E 05	0.45600	4.2619E 05	0.45800	4.2577E 05
0.46000	4.2504E 05	0.46200	4.2490E 05	0.46400	4.2423E 05	0.46600	4.2384E 05	0.46800	4.2312E 05
0.47000	4.2261E 05	0.47200	4.2203E 05	0.47400	4.2198E 05	0.47600	4.2029E 05	0.47800	4.1945E 05
0.48000	4.1909E 05	0.48200	4.1875E 05	0.48400	4.2055E 05	0.48600	4.1691E 05	0.48800	4.1576E 05
0.49000	4.1513E 05	0.49200	4.1430E 05	0.49400	4.1400E 05	0.49600	4.1312E 05	0.49800	4.1306E 05
0.50000	4.1243E 05	0.50200	4.1220E 05						

TABLE 6.A-12
(SHEET 27 OF 28)

TIME FUNCTION NUMBER = (14)

FUNCTION DESCRIPTION = (FORCING FUNCTION AT NODE 1 00>02$ 0. -14766.8)

NUMBER OF /BSCISSAE = (577)
FUNCTION SCALE FACTOR = (1.0000E 00)

TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION	TIME VALUE	FUNCTION
0.	-1.4767E 04	0.00010	-1.4763E 04	0.00020	-1.4746E 04	0.00030	-1.4707E 04	0.00040	-1.4639E 04
0.00050	-1.4539E 04	0.00060	-1.4400E 04	0.00070	-1.4216E 04	0.00080	-1.3906E 04	0.00090	-1.3703E 04
0.00100	-1.3366E 04	0.00110	-1.2970E 04	0.00120	-1.2513E 04	0.00130	-1.1991E 04	0.00140	-1.1396E 04
0.00150	-1.0726E 04	0.00160	-9.9759E 03	0.00170	-9.1409E 03	0.00160	-8.2176E 03	0.00190	-7.2071E 03
0.00200	-6.1022E 03	0.00210	-4.9013E 03	0.00220	-3.6048E 03	0.00230	-2.2093E 03	0.00240	-7.1460E 02
0.00250	8.8200E 02	0.00260	2.5779E 03	0.00270	4.3781E 03	0.00280	6.2797E 03	0.00290	8.2780E 03
0.00300	1.0376E 04	0.00310	1.2575E 04	0.00320	1.4872E 04	0.00330	1.7288E 04	0.00340	2.0016E 04
0.00350	2.3074E 04	0.00360	2.6451E 04	0.00370	3.0139E 04	0.00380	3.4136E 04	0.00390	3.8425E 04
0.00400	4.3004E 04	0.00410	4.7861E 04	0.00420	5.2988E 04	0.00430	5.8358E 04	0.00440	6.3773E 04
0.00450	6.9184E 04	0.00460	7.4583E 04	0.00470	7.9967E 04	0.00480	8.5338E 04	0.00490	9.0691E 04
0.00500	9.6042E 04	0.00510	1.0138E 05	0.00520	1.0670E 05	0.00530	1.1200E 05	0.00540	1.1730E 05
0.00550	1.2258E 05	0.00560	1.2786E 05	0.00570	1.3311E 05	0.00580	1.3835E 05	0.00590	1.4359E 05
0.00600	1.4882E 05	0.00610	1.5402E 05	0.00620	1.5920E 05	0.00630	1.6437E 05	0.00640	1.6953E 05
0.00650	1.7466E 05	0.00660	1.7980E 05	0.00670	1.8490E 05	0.00680	1.9000E 05	0.00690	1.9506E 05
0.00700	2.0012E 05	0.00710	2.0518E 05	0.00720	2.1022E 05	0.00730	2.1524E 05	0.00740	2.2025E 05
0.00750	2.2524E 05	0.00760	2.3019E 05	0.00770	2.3513E 05	0.00780	2.4005E 05	0.00790	2.4493E 05
0.00800	2.4979E 05	0.00810	2.4498E 05	0.00820	2.4980E 05	0.00830	2.5449E 05	0.00840	2.5916E 05
0.00850	2.6381E 05	0.00860	2.6843E 05	0.00870	2.7303E 05	0.00880	2.7760E 05	0.00890	2.8214E 05
0.00900	2.8671E 05	0.00910	2.9122E 05	0.00920	2.9563E 05	0.00930	3.0002E 05	0.00940	3.0438E 05
0.00950	3.0871E 05	0.00960	3.1301E 05	0.00970	3.1732E 05	0.00980	3.2157E 05	0.00990	3.2569E 05
0.01000	3.2990E 05	0.01010	3.3406E 05	0.01020	3.3816E 05	0.01030	3.4213E 05	0.01040	3.4622E 05
0.01050	3.5026E 05	0.01060	3.5426E 05	0.01070	3.5813E 05	0.01080	3.6211E 05	0.01090	3.6605E 05
0.01100	3.6994E 05	0.01110	3.7366E 05	0.01120	3.7753E 05	0.01130	3.8136E 05	0.01140	3.8512E 05
0.01150	3.8875E 05	0.01160	3.9250E 05	0.01170	3.9619E 05	0.01180	3.9974E 05	0.01190	4.0340E 05
0.01200	4.0700E 05	0.01210	4.1054E 05	0.01220	4.1395E 05	0.01230	4.1745E 05	0.01240	4.2090E 05
0.01250	4.2422E 05	0.01260	4.2760E 05	0.01270	4.3094E 05	0.01280	4.3415E 05	0.01290	4.3742E 05
0.01300	4.4058E 05	0.01310	4.4379E 05	0.01320	4.4688E 05	0.01330	4.5002E 05	0.01340	4.5305E 05
0.01350	4.5617E 05	0.01360	4.5918E 05	0.01370	4.6210E 05	0.01380	4.6501E 05	0.01390	4.6787E 05
0.01400	4.7069E 05	0.01410	4.7347E 05	0.01420	4.7620E 05	0.01430	4.7890E 05	0.01440	4.8155E 05
0.01450	4.8417E 05	0.01460	4.8675E 05	0.01470	4.8914E 05	0.01480	4.9175E 05	0.01490	4.9434E 05
0.01500	4.9689E 05	0.01510	4.9942E 05	0.01520	5.0192E 05	0.01530	5.0447E 05	0.01540	5.0671E 05
0.01550	5.0922E 05	0.01560	5.1144E 05	0.01570	5.1385E 05	0.01580	5.1609E 05	0.01590	5.1803E 05
0.01600	5.2052E 05	0.01610	5.2277E 05	0.01620	5.2512E 05	0.01630	5.2734E 05	0.01640	5.2941E 05
0.01650	5.3161E 05	0.01660	5.3394E 05	0.01670	5.3586E 05	0.01680	5.3842E 05	0.01690	5.4034E 05
0.01700	5.4281E 05	0.01710	5.4483E 05	0.01720	5.4711E 05	0.01730	5.4914E 05	0.01740	5.5075E 05
0.01750	5.5344E 05	0.01760	5.5482E 05	0.01770	5.5733E 05	0.01780	5.5872E 05	0.01790	5.4614E 05
0.01800	5.4762E 05	0.01810	5.4924E 05	0.01820	5.5081E 05	0.01830	5.5234E 05	0.01840	5.5391E 05
0.01850	5.5547E 05	0.01860	5.5700E 05	0.01870	5.5852E 05	0.01880	5.5995E 05	0.01890	5.6140E 05
0.01900	5.6284E 05	0.01910	5.6426E 05	0.01920	5.6550E 05	0.01930	5.6697E 05	0.01940	5.6840E 05
0.01950	5.6981E 05	0.01960	5.7112E 05	0.01970	5.7246E 05	0.01980	5.7378E 05	0.01990	5.7507E 05
0.02000	5.7634E 05	0.02010	5.7759E 05	0.02020	5.7881E 05	0.02030	5.8001E 05	0.02040	5.8118E 05
0.02050	5.8234E 05	0.02060	5.8340E 05	0.02070	5.8448E 05	0.02080	5.8555E 05	0.02090	5.8645E 05
0.02100	5.8757E 05	0.02110	5.8866E 05	0.02120	5.8972E 05	0.02130	5.9076E 05	0.02140	5.9181E 05
0.02150	5.9286E 05	0.02160	5.9388E 05	0.02170	5.9482E 05	0.02180	5.9576E 05	0.02190	5.9670E 05
0.02200	5.9761E 05	0.02210	5.9849E 05	0.02220	5.9935E 05	0.02230	6.0019E 05	0.02240	6.0099E 05
0.02250	6.0178E 05	0.02260	6.0254E 05	0.02270	6.0313E 05	0.02280	6.0392E 05	0.02290	6.0469E 05
0.02300	6.0543E 05	0.02310	6.0614E 05	0.02320	6.0683E 05	0.02330	6.0750E 05	0.02340	6.0814E 05
0.02350	6.0876E 05	0.02360	6.0935E 05	0.02370	6.0992E 05	0.02380	6.1047E 05	0.02390	6.1100E 05
0.02400	6.1150E 05	0.02410	6.1198E 05	0.02420	6.1244E 05	0.02430	6.1288E 05	0.02440	6.1331E 05
0.02450	6.1370E 05	0.02460	6.1408E 05	0.02470	6.1444E 05	0.02480	6.1463E 05	0.02490	6.1503E 05
0.02500	6.1540E 05	0.02600	6.1885E 05	0.02700	6.2146E 05	0.02800	6.2424E 05	0.02900	6.1039E 05
0.03000	6.0781E 05	0.03100	6.0537E 05	0.03200	6.0389E 05	0.03300	6.0217E 05	0.03400	6.0061E 05
0.03500	5.9923E 05	0.03600	5.9792E 05	0.03700	5.9652E 05	0.03800	5.9542E 05	0.03900	5.9447E 05

0.04000	5.9381E 05	0.04100	5.9324E 05	0.04200	5.9275E 05	0.04300	5.9254E 05	0.04400	5.9249E 05
0.04500	5.9293E 05	0.04600	5.9345E 05	0.04700	5.9461E 05	0.04800	5.9603E 05	0.04900	5.9868E 05
0.05000	6.0064E 05	0.05100	6.0512E 05	0.05200	6.1029E 05	0.05300	6.1618E 05	0.05400	6.2266E 05
0.05500	6.2942E 05	0.05600	6.3609E 05	0.05700	6.4286E 05	0.05800	6.4951E 05	0.05900	6.5588E 05
0.06000	6.6196E 05	0.06100	6.6733E 05	0.06200	6.7221E 05	0.06300	6.7602E 05	0.06400	6.7933E 05
0.06500	6.8181E 05	0.06600	6.8339E 05	0.06700	6.8429E 05	0.06800	6.8454E 05	0.06900	6.8436E 05
0.07000	6.8374E 05	0.07100	6.8294E 05	0.07200	6.8207E 05	0.07300	6.8080E 05	0.07400	6.7954E 05
0.07500	6.7829E 05	0.07600	6.7711E 05	0.07700	6.7590E 05	0.07800	6.7469E 05	0.07900	6.7393E 05
0.08000	6.7305E 05	0.08100	6.7227E 05	0.08200	6.7150E 05	0.08300	6.7078E 05	0.08400	6.7011E 05
0.08500	6.6941E 05	0.08600	6.6875E 05	0.08700	6.6806E 05	0.08800	6.6730E 05	0.08900	6.6654E 05
0.09000	6.6573E 05	0.09100	6.6499E 05	0.09200	6.6408E 05	0.09300	6.6287E 05	0.09400	6.6194E 05
0.09500	6.6084E 05	0.09600	6.5982E 05	0.09700	6.5888E 05	0.09800	6.5746E 05	0.09900	6.5643E 05
0.10000	6.5534E 05	0.10100	6.5410E 05	0.10200	6.5302E 05	0.10300	6.5187E 05	0.10400	6.5079E 05
0.10500	6.4974E 05	0.10600	6.4862E 05	0.10700	6.4749E 05	0.10800	6.4633E 05	0.10900	6.4521E 05
0.11000	6.4406E 05	0.11100	6.4288E 05	0.11200	6.4179E 05	0.11300	6.4071E 05	0.11400	6.3975E 05
0.11500	6.3847E 05	0.11600	6.3740E 05	0.11700	6.3641E 05	0.11800	6.3530E 05	0.11900	6.3433E 05
0.12000	6.3322E 05	0.12100	6.3215E 05	0.12200	6.3122E 05	0.12300	6.3025E 05	0.12400	6.2920E 05
0.12500	6.2812E 05	0.12600	6.2727E 05	0.12700	6.2595E 05	0.12800	6.2491E 05	0.12900	6.2391E 05
0.13000	6.2277E 05	0.13100	6.2168E 05	0.13200	6.2062E 05	0.13300	6.1964E 05	0.13400	6.1854E 05
0.13500	6.1743E 05	0.13600	6.1624E 05	0.13700	6.1519E 05	0.13800	6.1414E 05	0.13900	6.1310E 05
0.14000	6.1207E 05	0.14100	6.1099E 05	0.14200	6.0989E 05	0.14300	6.0889E 05	0.14400	6.0793E 05
0.14500	6.0684E 05	0.14600	6.0593E 05	0.14700	6.0492E 05	0.14800	6.0392E 05	0.14900	6.0306E 05
0.15000	6.0219E 05	0.15100	6.0137E 05	0.15200	6.0039E 05	0.15300	5.9953E 05	0.15400	5.9871E 05
0.15500	5.9797E 05	0.15600	5.9714E 05	0.15700	5.9650E 05	0.15800	5.9625E 05	0.15900	5.9564E 05
0.16000	5.9507E 05	0.16100	5.9454E 05	0.16200	5.9421E 05	0.16300	5.9392E 05	0.16400	5.9363E 05
0.16500	5.9340E 05	0.16600	5.9330E 05	0.16700	5.9318E 05	0.16800	5.9303E 05	0.16900	5.9296E 05
0.17000	5.9292E 05	0.17100	5.9288E 05	0.17200	5.9286E 05	0.17300	5.9277E 05	0.17400	5.9268E 05
0.17500	5.9263E 05	0.17600	5.9263E 05	0.17700	5.9261E 05	0.17800	5.9245E 05	0.17900	5.9231E 05
0.18000	5.9220E 05	0.18100	5.9202E 05	0.18200	5.9173E 05	0.18300	5.9142E 05	0.18400	5.9112E 05
0.18500	5.9069E 05	0.18600	5.9026E 05	0.18700	5.8979E 05	0.18800	5.8931E 05	0.18900	5.8878E 05
0.19000	5.8820E 05	0.19100	5.8758E 05	0.19200	5.8698E 05	0.19300	5.8634E 05	0.19400	5.8563E 05
0.19500	5.8490E 05	0.19600	5.8424E 05	0.19700	5.8351E 05	0.19800	5.8272E 05	0.19900	5.8189E 05
0.20000	5.8117E 05	0.20200	5.7965E 05	0.20400	5.7801E 05	0.20600	5.7663E 05	0.20800	5.7475E 05
0.21000	5.7324E 05	0.21200	5.7187E 05	0.21400	5.7032E 05	0.21600	5.6833E 05	0.21800	5.6703E 05
0.22000	5.6546E 05	0.22200	5.6392E 05	0.22400	5.6247E 05	0.22600	5.6060E 05	0.22800	5.5975E 05
0.23000	5.5818E 05	0.23200	5.5654E 05	0.23400	5.5545E 05	0.23600	5.5365E 05	0.23800	5.5282E 05
0.24000	5.5117E 05	0.24200	5.4957E 05	0.24400	5.4800E 05	0.24600	5.4698E 05	0.24800	5.4566E 05
0.25000	5.4407E 05	0.25200	5.4305E 05	0.25400	5.4210E 05	0.25600	5.4098E 05	0.25800	5.4001E 05
0.26000	5.3899E 05	0.26200	5.3821E 05	0.26400	5.3744E 05	0.26600	5.3669E 05	0.26800	5.3599E 05
0.27000	5.3519E 05	0.27200	5.3433E 05	0.27400	5.3361E 05	0.27600	5.3322E 05	0.27800	5.3181E 05
0.28000	5.3094E 05	0.28200	5.3001E 05	0.28400	5.2912E 05	0.28600	5.2794E 05	0.28800	5.2692E 05
0.29000	5.2581E 05	0.29200	5.2499E 05	0.29400	5.2414E 05	0.29600	5.2292E 05	0.29800	5.2181E 05
0.30000	5.2086E 05	0.30200	5.2002E 05	0.30400	5.1935E 05	0.30600	5.1864E 05	0.30800	5.1796E 05
0.31000	5.1716E 05	0.31200	5.1669E 05	0.31400	5.1607E 05	0.31600	5.1530E 05	0.31800	5.1486E 05
0.32000	5.1437E 05	0.32200	5.1378E 05	0.32400	5.1313E 05	0.32600	5.1253E 05	0.32800	5.1218E 05
0.33000	5.1159E 05	0.33200	5.1151E 05	0.33400	5.1067E 05	0.33600	5.0995E 05	0.33800	5.0938E 05
0.34000	5.0876E 05	0.34200	5.0787E 05	0.34400	5.0726E 05	0.34600	5.0664E 05	0.34800	5.0609E 05
0.35000	5.0521E 05	0.35200	5.0462E 05	0.35400	5.0374E 05	0.35600	5.0289E 05	0.35800	5.0204E 05
0.36000	5.0140E 05	0.36200	5.0103E 05	0.36400	5.0007E 05	0.36600	4.9938E 05	0.36800	4.9869E 05
0.37000	4.9798E 05	0.37200	4.9745E 05	0.37400	4.9700E 05	0.37600	4.9663E 05	0.37800	4.9626E 05
0.38000	4.9559E 05	0.38200	4.9533E 05	0.38400	4.9520E 05	0.38600	4.9463E 05	0.38800	4.9462E 05
0.39000	4.9426E 05	0.39200	4.9371E 05	0.39400	4.9343E 05	0.39600	4.9319E 05	0.39800	4.9274E 05
0.40000	4.9248E 05	0.40200	4.9235E 05	0.40400	4.9171E 05	0.40600	4.9140E 05	0.40800	4.9095E 05
0.41000	4.9047E 05	0.41200	4.9014E 05	0.41400	4.8972E 05	0.41600	4.8939E 05	0.41800	4.8916E 05
0.42000	4.8867E 05	0.42200	4.8833E 05	0.42400	4.8776E 05	0.42600	4.8736E 05	0.42800	4.8693E 05
0.43000	4.8658E 05	0.43200	4.8637E 05	0.43400	4.8583E 05	0.43600	4.8554E 05	0.43800	4.8517E 05
0.44000	4.8469E 05	0.44200	4.8457E 05	0.44400	4.8449E 05	0.44600	4.8439E 05	0.44800	4.8411E 05
0.45000	4.8391E 05	0.45200	4.8381E 05	0.45400	4.8348E 05	0.45600	4.8336E 05	0.45800	4.8314E 05
0.46000	4.8265E 05	0.46200	4.8257E 05	0.46400	4.8222E 05	0.46600	4.8186E 05	0.46800	4.8142E 05
0.47000	4.8110E 05	0.47200	4.8058E 05	0.47400	4.8029E 05	0.47600	4.7975E 05	0.47800	4.7919E 05
0.48000	4.7865E 05	0.48200	4.7819E 05	0.48400	4.7795E 05	0.48600	4.7726E 05	0.48800	4.7685E 05
0.49000	4.7624E 05	0.49200	4.7560E 05	0.49400	4.7515E 05	0.49600	4.7449E 05	0.49800	4.7411E 05
0.50000	4.7355E 05	0.50200	4.7312E 05						

ATTACHMENT 6.B
RECIRCULATION SYSTEM SINGLE-LOOP OPERATION

ATTACHMENT 6.B

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ATTACHMENT 6.B

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ATTACHMENT 6.B

LIST OF FIGURES

6.B RECIRCULATION SYSTEM SINGLE-LOOP OPERATION

6.B.1 INTRODUCTION AND SUMMARY

Sections 6.B.2, 6.B.3, 6.B.4, and 6.B.5 describe the GE methodology for the MCPR safety limit calculation and single loop operation transient analyses. The transient analyses presented in this chapter are for a specific cycle, and are not re-performed for each reload.

6.B.1.1 GE Analysis

Single-loop operation at reduced power is highly desirable in the event recirculation pump or other component maintenance renders one loop inoperative. To justify single-loop operation, accidents and abnormal operational transients associated with power operations, as presented in Section 6.3 and Chapter 15.0, were reviewed for the single loop case with only one pump in operation.

Increased uncertainties in the core total flow and TIP readings resulted in a 0.01 incremental increase in the MCPR fuel cladding integrity safety limit during single-loop operation. This 0.01 increase is reflected in the MCPR operating limit. No other increase in this limit is required because all abnormal operational transients are bounded by the rated power/flow analyses performed. The least-stable power/flow condition, achieved by tripping both recirculation pumps, is not affected by one-pump operation.

6.B.1.2 FANP Analysis

To support operation with a single recirculation loop, the MCPR safety limit, pressurization transients, and slow flow excursions were evaluated in Reference 3.

During single loop operation (SLO), the uncertainties of some of the core parameters increase. As a result, the potential exists that the MCPR safety limit to support SLO is greater than the base case MCPR safety limit. FANP will perform analyses each cycle to support or establish both the two-loop and single-loop MCPR safety limits. Cycle specific analyses determine the adder to the base case MCPR safety limit to provide the necessary protection to ensure that 99.9% of the rods do not experience boiling transition during an anticipated operational occurrence.

FANP evaluates single loop operation (SLO) to provide limits to support SLO. This evaluation can be found in References 2 and 3. FANP has addressed the LOCA analysis (Section 6.B.6) in Reference 2 for ATRIUM-9B fuel and in Reference 7 for ATRIUM-10 fuel. FANP provides MCPR and MAPLHGR limits to support single loop operation.

6.B.2 MCPR FUEL CLADDING INTEGRITY SAFETY LIMIT

Except for core total flow and TIP reading, the uncertainties used in the statistical analysis to determine the MCPR fuel cladding integrity safety limit are not dependent on whether coolant flow is provided by one or two recirculation pumps. A 6% core flow measurement uncertainty has been established for single-loop operation (compared to 2.5% for two-loop operation). As shown below, this value conservatively reflects the one standard deviation (one sigma) accuracy of the core flow measurement system documented in Reference 1. The random noise component of the TIP reading uncertainty was revised for single recirculation loop operation to reflect the operating plant test results given in Subsection 6.B.2.4. This revision resulted in a single-loop operation process computer uncertainty of 6.8% for initial cores. Comparable two-loop process computer uncertainty values are 6.3% for initial cores. The net effect of these two revised uncertainties is a 0.01 incremental increase in the required MCPR fuel cladding integrity safety limit.

6.B.2.1 Core Flow Uncertainty

6.B.2.2 Core Flow Measurement During Single-Loop Operation

The jet pump core flow measurement system is calibrated to measure core flow when both sets of jet pumps are in forward flow; total core flow is the sum of the indicated loop flows. For single-loop operation, however, some inactive jet pumps will be backflowing. Therefore, the measured flow in the backflowing jet pumps must be subtracted from the measured flow in the active loop. In addition, the jet pump coefficient is different for reverse flow than for forward flow, and the measurement of reverse flow must be modified to account for this difference.

For single-loop operation the total core flow is derived by the following formula:

$$\begin{pmatrix} \text{Total Core} \\ \text{Flow} \end{pmatrix} = \begin{pmatrix} \text{Active Loop} \\ \text{Indicated Flow} \end{pmatrix} - C \begin{pmatrix} \text{Inactive Loop} \\ \text{Flow} \end{pmatrix}$$

Where C (= 0.95) is defined as the ratio of "Inactive Loop True Flow" to "Inactive Loop Indicated Flow," and "Loop Indicated Flow" is the flow indicated by the jet pump "single-tap" loop flow summers and indicators, which are set to indicate forward flow correctly.

The 0.95 factor was the result of a conservative analysis to appropriately modify the single-tap flow coefficient for reverse flow. (NOTE: The LSCS value of the "C" coefficient is 0.78 (±0.078) at reactor operating conditions.) If a more exact, less conservative core flow is required, special in-reactor calibration tests would have to be made. Such calibration tests would involve calibrating core support plate ΔP versus core flow during two-pump operation along the 100% flow control line, operating on one pump along the 100% flow control line, and calculating the correct value of C based on the core derived from the core support plate ΔP and the loop flow indicator readings.

6.B.2.3 Core Flow Uncertainty Analysis

The uncertainty analysis procedure used to establish the core flow uncertainty for one-pump operation is essentially the same as for two-pump operation, except for some extensions. The core flow uncertainty analysis is described in Reference 1. The analysis of one-pump core flow uncertainty is summarized below.

For single-loop operation, the total core flow can be expressed as follows (refer to Figure 6.B-1):

$$W_C = W_A - W_I$$

Where

W_C = total core flow,

W_A = active loop flow, and

W_I = inactive loop (true) flow.

By applying the "propagation of errors" method to the above equation, the variance of the total flow uncertainty can be approximated by:

$$\sigma_{W_C}^{\;2} = \left(\frac{1}{1-a}\right)^2 \sigma_{W_A}^{\;2} + \left(\frac{a}{1-a}\right)^2 \sigma_{W_I}^{\;2}$$

1-a 1-a

where

σW_C = uncertainty in total core flow (%),

σW_A = uncertainty in active loop flow (%),

σW_I = uncertainty in inactive loop flow (%), and

a = W_I / W_A

The uncertainty of σW_A was analyzed to be 2.8%. A conservative, bounding value of 3.0% was used for σW_A in the total flow uncertainty variance calculation. The uncertainty, σW_I is comprised of the uncertainty in the "C" coefficient and random uncertainties such as jet pump ΔP measurement uncertainty and instrumentation errors. The bounding value of 3.75% for σW_I was used in the determination of σW_I. Based on the above uncertainties and a bounding value of 0.36 for a, the variance of the total flow uncertainty is approximately:

$$\sigma_{W_C}^2 \left(\frac{1}{1 - 0.36}\right)^2 (3.0\%)^2 + \left(\frac{0.36}{1 - 0.36}\right)^2 (3.75\%)^2$$

$$= (5.0\%)^2$$

When the effect of 4.1% core bypass flow uncertainty at 12% (bounding case) bypass flow fraction is added to the above total core flow uncertainty, the active coolant flow uncertainty is:

$$\sigma^2_{active} = (5.0\%)^2 + \left(\frac{0.12}{1 - 0.12}\right)^2 (4.1\%)^2 = (5.7\%)^2$$

which is less than the 6% core flow uncertainty assumed in the statistical analysis.

In summary, core flow during one-pump operation is established in a conservative way and its uncertainty has been conservatively evaluated.

6.B.2.4 TIP Reading Uncertainty

To ascertain the TIP noise uncertainty for single recirculation loop operation, a test was performed at an operating BWR. The test was performed at a power level 59.3% of rated with a single recirculation pump in operation (core flow 46.3% of rated). A rotationally symmetric control rod pattern existed prior to the test.

Five consecutive traverses were made with each of five TIP machines, giving a total of 25 traverses. Analysis of their data resulted in a nodal TIP noise of 2.85%. Use of this TIP noise value as a component of the process computer total uncertainty results in a one-sigma process computer total uncertainty value for single-loop operation of 6.8% for initial cores.

6.B.3 MCPR OPERATING LIMIT

6.B.3.1 Abnormal Operational Transients

The consequences of an Anticipated Operational Occurrence (AOO) initiated from Single Loop Operation (SLO) are no different than the consequences of the same event initiated from two-loop operation, given the same initial power/flow conditions. One transient analyzed only for single loop operation, the abnormal startup of an idle recirculation loop, results in more severe consequences at low power levels than similar cold water injection transients (i.e. feedwater controller failure) as analyzed for two loop operation. An analysis of this event is given in Section 15.4.4. The fuel thermal-mechanical integrity and safety limit MCPR (as increased for SLO) are protected during a postulated AOO in SLO mode by adhering to thermal limits derived from the more limiting of either the two-loop operation AOO results or the results from the idle recirculation loop startup event. Results of these analyses, and a discussion of the applicability of these analyses to SLO, may be found in the LaSalle Administrative Technical Requirements and its associated references.

Figure 6.B-2 shows the consequences of a typical pressurization transient (turbine trip) as a function of power level. As can be seen, the consequences of operation at lower power (such as would occur during SLO) result in lower reactor pressurization and neutron flux levels. Therefore, in absolute terms of maximum pressure and flux, SLO results in a milder transient than two-loop operation.

The power and flow dependent thermal limits developed for two loop operation are applicable for SLO, except for portions of the thermal limits which must be adjusted for the more severe consequences of the idle recirculation loop startup event discussed above. The flow dependent thermal limits are based on the event where both recirculation loop controllers fail (in the case of SLO, this event bounds failure of one controller, as the flow and power increase would be less). However, for operation in SLO, the flow dependent thermal limits are adjusted to also bound the results of the idle recirculation loop startup event. These thermal limits are found in the LaSalle Administrative Technical Requirements.

The power dependent thermal limits are based on pressurization transients, such as the load rejection without bypass event, and the feedwater controller failure event (which is also a cold water injection event). As described above, the two loop results bound the SLO results for these events. Therefore, these SLO thermal limits are only different from the dual loop thermal limits in that they have been adjusted to protect a MCPR safety limit that is 0.01 higher than the dual loop value.

In the following sections, three of the most limiting transients of cold water increase, pressurization, and flow decrease events are analyzed for single-loop operation. These analyses were performed for the initial cycle core. For reload cores, the bounding two loop operation analysis results for events a and b below are found in the LaSalle Administrative Technical Requirements. The transients are, respectively:

a. feedwater flow controller failure (maximum demand),

b. generator load rejection with bypass failure, and

c. one pump seizure accident.

The plant initial conditions are given in Table 6.B-1.

6.B.3.2 Feedwater Controller Failure - Maximum Demand

This section presents initial cycle GE results.

6.B.3.2.1 Identification of Causes and Frequency Classification

This event is postulated on the basis of a single failure of a control device, specifically one which can directly cause an increase in coolant inventory by increasing the feedwater flow. The most severe applicable event is a feedwater controller failure during maximum flow demand. The feedwater controller is forced to its upper limit at the beginning of the event.

This event is considered to be an incident of moderate frequency.

6.B.3.2.2 Sequence of Events and Systems Operation

With excess feedwater flow the water level rises to the high-level reference point at which time the feedwater pumps and the main turbine are tripped and a scram is initiated. Table 6.B-2 lists the sequence of events for Figure 6.B-3. The figure shows the changes in important variables during this transient.

Identification of Operator Actions

a. Observe that high feedwater pump trip has terminated the failure event.

b. Switch the feedwater controller from auto to manual control in order to try to regain a correct output signal.

c. Identify causes of the failure and report all key plant parameters during the event.

Systems Operation

In order to properly simulate the expected sequence of events, the analysis of this event assumes normal functioning of plant instrumentation and controls, plant protection and reactor protection systems. Important system operational actions for this event are high level tripping of the main turbine, feedwater turbine, turbine stop valve scram trip initiation, recirculation pump trip (RPT), and low-water level initiation of the reactor core isolation cooling system and the high-pressure core spray system to maintain long-term water level control following tripping of feedwater pumps (not simulated).

6.B.3.2.3 Effect of Single Failures and Operator Errors

In Table 6.B-2 the first sensed event to initiate corrective action to the transient is the vessel high-water level (L8) trip. Multiple level sensors are used to sense and detect when the water level reaches the L8 setpoint. At this point in the logic, a single failure will not initiate or prevent a turbine trip signal. Turbine trip signal transmission, however, is not built to single-failure criterion. The result of a failure at this point would have the effect of delaying the pressurization "signature." However, high moisture levels entering the turbine will be detected by high levels in the moisture separators which are designed to trip the unit. In addition, excessive moisture entering the turbine will cause vibration to the point where it too will trip the unit.

Scram trip signals from the turbine are designed such that a single failure will neither initiate nor impede a reactor scram trip initiation.

6.B.3.2.4 Core and System Performance

Mathematical Model

The computer model described in Subsection 15.1.1.3 was used to simulate this event.

Input Parameters and Initial Conditions

The analysis has been performed with the plant condition tabulated in Table 6.B-1, except that the initial vessel water level is at level setpoint L4 for conservation. By lowering the initial water level, more feedwater will get in, hence higher neutron flux will be attained before Level 8 is reached.

The same void reactivity coefficient used for pressurization transient is applied since a more negative value conservatively increases the apparent severity of the power increase. End of cycle (all rods out) scram characteristics are assumed. The safety/relief valve action is conservatively assumed to occur with higher than nominal setpoints. The transient is simulated by programming an upper limit failure in the feedwater system such that 135% feedwater flow occurs at design pressure of feedwater spargers (1075 psia). Since the reactor is initially operating at a lower power level, the feedwater sparger experiences a pressure which is much lower than the design pressure, hence the feedwater runout capacity reaches 160% of rated.

Results

The simulated feedwater controller transient is shown in Figure 6.B-3 for the case of 78% power 63% core flow. The high-water level turbine trip and feedwater pump trip are initiated at approximately 5.46 seconds. Scram occurs simultaneously from stop valve closure, and limits the neutron flux peak and fuel thermal transient so that no fuel damage occurs. MCPR remains above safety limit and peak fuel center temperature increases less than 170° F. The turbine bypass system opens to limit peak pressure in the steamline near the safety valves to 1103 psig and the pressure at the bottom of the vessel to about 1118 psig.

Consideration of Uncertainties

All systems utilized for protection in this event were assumed to have the poorest allowable response (e.g., relief setpoints, scram stroke time, and work characteristics). Expected plant behavior is, therefore, expected to lead to a less severe transient.

6.B.3.2.5 Barrier Performance

As noted above, the consequences of this event do not result in any temperature or pressure transient in excess of the criteria for which the fuel, pressure vessel, or containment are designed; therefore, these barriers maintain integrity and function as designed.

6.B.3.2.6 Radiological Consequences

The consequences of this event do not result in any fuel failures; however, radioactive steam is discharged to the suppression pool as a result of SRV activation.

6.B.3.3 Generator Load Rejection Without Bypass With RPT

This section presents initial cycle GE results.

6.B.3.3.1 Identification of Causes and Frequency Classification

Fast closure of the turbine control valves (TCV) is initiated whenever electrical grid disturbances occur which result in significant loss of electrical load on the generator. The turbine control valves are required to close as rapidly as possible to prevent overspeed of the turbine-generator rotor. Closure of the main turbine control valves will increase system pressure.

This event is categorized as an infrequent incident with the following characteristics:

Frequency:	0.0036/plant-year
MTBE:	278 years

Frequency basis: thorough searches of domestic plant operating records have revealed three instances of bypass failure during 628 bypass system operations. This gives a probability of bypass failure of 0.0048. Combining the actual frequency of a generator load rejection with the failure rate of the bypass yields a frequency of a generator load rejection with bypass failure of 0.0036 event/plant year.

6.B.3.3.2 Sequence of Events and System Operation

Sequence of Events

A loss of generator electrical load at 78% and 63% flow under single recirculation loop operation produces the sequence of events listed in Table 6.B-3. Notice that the vessel level reaches L8 at 5.3 seconds. The trip of feedwater pumps on L8 is not simulated.

Identification of Operator Options

a. Verify proper bypass valve performance.

b. Observe that the pressure regulator is controlling reactor pressure at the desired value.

c. Record peak power and pressure.

d. Verify relief valve operation.

System Operation

Turbine control valve (TCV) fast closure initiates a scram trip signal for power levels greater than or equal to 25% of rated core thermal power. In addition, recirculation pump trip is initiated. Both of these trip signals satisfy single failure criterion and credit is taken for these protection features.

The pressure relief system which operates the relief valves independently when system pressure exceeds relief valve instrumentation setpoints is assumed to function normally during the time period analyzed.

All plant control systems maintain normal operation unless specifically designated to the contrary.

Mitigation of pressure increase, the basic nature of this transient, is accomplished by the reactor protection system functions. Turbine control valve trip scram and RPT are designed to satisfy the single failure criterion.

Mathematical Model

The computer model described in Subsection 15.1.1.3 was used to simulate this event.

Input Parameters and Initial Conditions

These analyses have been performed, unless otherwise noted, with the plant conditions tabulated in Table 6.B-1.

The turbine electrohydraulic control system (EHC) power/load imbalance device detects load rejection before a measurable speed change takes place.

The closure characteristics of the turbine control valves are assumed such that the valves operate in the full arc (FA) mode and have a full stroke closure time, from fully open to fully closed, of 0.15 second.

Auxiliary power would normally be independent of any turbine-generator overspeed effect and continuously supplied at rated frequency as automatic fast transfer to auxiliary power supplies normally occurs. For the purposes of worst case analysis, the recirculation pumps are assumed to remain tied to the main generator and thus increase in speed with the T-G overspeed until tripped by the recirculation pump trip system (RPT).

The reactor is operating in the manual flow-control mode when load rejection occurs. Results do not significantly differ if the plant had been operating in the automatic flow-control mode.

6.B.3.3.3 Results

Figure 6.B-4 shows that, for the case of bypass failure, peak neutron flux reaches about 135.6% of rated, average surface heat flux reaches 8% of rated. The calculated MCPR is 1.29, which is well above the safety limit.

Consideration of Uncertainties

The full-stroke closure rate of the turbine control valve of 0.15 second is conservative. Typically, the actual closure rate is more like 0.2 second. Clearly the less time it takes to close, the more severe the pressurization effect.

All systems utilized for protection in this event were assumed to have the poorest allowable response (e.g., relief setpoints, scram stroke time, and worth characteristics). Expected plant behavior is, therefore, expected to reduce the actual severity of the transient.

Peak pressure at the valves reaches 1128 psig. The peak nuclear system pressure reaches 1153 psig at the bottom of the vessel, well below the nuclear barrier transient pressure limit of 1375 psig.

6.B.3.3.4 Barrier Performance

The consequences of these events do not result in any temperature or pressure transient in excess of the criteria for which the fuel, pressure vessel, or containment are designed and, therefore, these barriers maintain their integrity as designed.

6.B.3.3.5 Radiological Consequences

The consequences of the events identified previously do not result in any fuel failures; however, radioactivity is nevertheless discharged to the suppression pool as a result of SRV activation.

6.B.3.4 Recirculation Pump Seizure Accident

This analysis presents initial cycle GE results.

6.B.3.4.1 Identification of Causes and Frequency Classification

The case of recirculation pump seizure represents the extremely unlikely event of instantaneous stoppage of the pump motor shaft of one recirculation pump. This produces a very rapid decrease of core flow as a result of the large hydraulic resistance introduced by the stopped rotor.

This event is considered to be a limiting fault.

Actual occurrence data is not available at this time.

6.B.3.4.2 Sequence of Events and Systems Operations

Table 6.B-4 lists the sequence of events for this recirculation pump seizure accident.

Identification of Operator Actions

The operator should ascertain that the reactor scrams with the turbine trip resulting from reactor water level swell. The operator should regain control of reactor water level through RCIC operation or by restart of a feedwater pump, and must monitor reactor water level and pressure control after shutdown.

6.B.3.4.3 Systems Operation

In order to properly simulate the expected sequence of events, the analysis of this event assumes normal functioning of plant instrumentation and controls, plant protection, and reactor protection systems.

Operation of HPCS and RCIC systems, though not included in this simulation, are expected to occur in order to maintain adequate water level.

6.B.3.4.4 Core and System Performance

Mathematical Model

The nonlinear dynamic model described briefly in Subsection 15.1.1.3 is used to simulate this event.

Input Parameters and Initial Conditions

This analysis has been performed, unless otherwise noted, with plant conditions tabulated in Table 6.B-1. For the purpose of evaluating consequences to the fuel thermal limits this transient event is assumed to occur as a consequence of an unspecified, instantaneous stoppage of the active recirculation pump shaft while the reactor is operating at 78% NB rated power under SLO conditions. Also, the reactor is assumed to be operating at thermally limited conditions.

The void coefficient is adjusted to the most conservative value; that is, the least negative value in Table 6.B-1.

6.B.3.4.5 Results

Figure 6.B-5 presents the results of the accident. Core coolant flow drops rapidly, reaching a minimum value of 76.4 at about 1.09 second. The level swell produces a trip of both the main and feedwater turbines which, in turn, results in stop valve closure scram. The turbine trip, occurring after the time at which MCPR results, does not significantly retard the heat flux decrease and imposes no threat to fuel thermal limits. Considerations of uncertainties are included in the GETAB analysis.

6.B.3.4.6 Barrier Performance

The bypass valves and momentary opening of some of the safety/relief valves limit the pressure to well within the range allowed by the ASME vessel code. Therefore, the reactor coolant pressure boundary is not threatened by overpressure.

6.B.3.4.7 Radiological Consequences

The consequences of this event do not result in any fuel failures; however, radioactivity is nevertheless discharged to the suppression pool as a result of SRV activation.

6.B.3.5 Summary and Conclusions

The transient results for these initial cycles analyses are summarized in Table 6.B-5. This table indicates that for the transient events analyzed here, the MCPRs are well above the safety limit value of 1.06 (original analysis MCPR safety limit). It is concluded that the thermal margin safety limits established for two-pump operation are also applicable to single-loop-operation conditions.

For pressurization, Table 6.B-5 indicates that the peak pressures are below the ASME code value of 1375 psig. Hence, it is concluded that the pressure barrier integrity is maintained under single-loop-operation conditions.

6.B.4 OPERATING MCPR LIMIT

For single-loop operation, the rated condition steady-state MCPR limit is increased by 0.01 to account for the increase in the fuel cladding integrity safety limit (Section 6.B.2). At lower flows, the steady-state operating MCPR limit is conservatively established by a flow dependent MCPR. The operating limit is the more conservative of the two. This ensures that the 99.9% statistical limit requirement is always satisfied for any postulated abnormal operational occurrence.

6.B.5 STABILITY ANALYSIS

The least stable power/flow condition attainable under normal conditions occurs at natural circulation with the control rods set for rated power and flow. This condition may be reached following the trip of both recirculation pumps. As shown in Figure 6.B-5, operation along the minimum forced recirculation line with one pump running, at minimum speed, is more stable than operating with natural circulation flow only, but is less stable than operating with both pumps operating at minimum speed. Because of the increased flow fluctuation during one-recirculation-loop operation, the flow control should be left in manual operation to preclude unnecessary wear on the automatic controls.

6.B.6 Loss-of-Coolant Accident Analysis

An analysis of single recirculation loop operation utilizing the models and assumptions documented in Reference 4 was performed for each LSCS unit. Using this method SAFER/GESTR-LOCA calculations were performed for the DBA. The SLO PCTs were calculated without a MAPLHGR reduction. GE determined the results were within the 10 CFR50.46 acceptance criteria. However, SLO without MAPLHGR reduction results in more limiting PCTs than the two loop LOCA. Reference 5 concluded that if ARTS power and flow dependent MAPLHGR multipliers are applied, then SLO results of the LOCA analysis are less limiting than the two loop LOCA results.

A limited spectrum of LOCA/ECCS analyses with SLO unique assumptions was performed in Reference 2 to determine the LaSalle ATRIUM-9B SLO MAPLHGR limits. The two-loop break spectrum results were used to select potentially limiting SLO LOCAs for the analysis. The most important parameters for the LOCA analyses are the break size, break location and the ECCS single failure assumption. Six different combinations were analyzed for SLO. These parameters are independent of the initial conditions. FANP determined that SLO analyses will show a similar limiting break size, break location and single failure to the two-loop break spectrum results.

The domain for Single Loop Operation (SLO) is not affected by Power Uprate to 3489 MWt. The current SLO analysis (Reference 4) is valid for uprated power conditions as evaluated in Reference 6.

A spectrum of LOCA/ECCS SLO analyses was performed for ATRIUM-10 fuel. The analyses determined the SLO multiplier to the two-loop MAPLHGR limits so that the limiting PCT for SLO is less than the limiting PCT for two-loop operation.

6.B.6.1.1 Break Spectrum Analysis

For GE Fuel, SAFER/GESTR-LOCA calculations were performed for LaSalle Units 1 and 2 for SLO using very conservative and bounding assumptions given in Section

5.3.1 of Reference 4. The most limiting SLO break was consistent with the limiting two-loop operation break, the DBA recirculation suction side break, single failure of the HPCS diesel generator.

For SPC Fuel, RELAX, FLEX, and HUXY calculations were performed for a limited spectrum using the assumptions given in Section 9.0 of Reference 2. Explicit analyses for DBA double-ended guillotine (DEG) break, and other breaks smaller and larger than the limiting case were used to confirm the limiting SLO case. The time of core reflood for the single loop operation of 184.4 seconds is consistent with the time of core reflood for the two-loop operation of 189.5 seconds. Both the single-loop and two-loop operation cases were for the 1.1 ft^2 break of the pump discharge piping with a single failure of the HPCS diesel generator.

For ATRIUM-10 fuel, a spectrum of LOCA/ECCS SLO analyses was performed (Reference 7). The SLO analyses were performed with a 0.90 multiplier applied to the two-loop MAPLHGR limit. The limiting SLO LOCA is the 1.0 DEG pump suction line break with a single failure of the LPCS diesel generator.

6.B.6.2.1 Single-Loop MAPLHGR Determination

For GE Fuel, the limiting break determined for two-loop operation is analyzed for SLO to confirm that the SLO PCT (1490° F Appendix K analysis basis from Reference 4) is less than the 10CFR50.46 limit. The SLO PCT for the limiting break is still well below the 10CFR50.46 limit assuming no MAPLHGR reduction for SLO. Therefore, no MAPLHGR reduction is required for LaSalle Units 1 and 2 under SLO for the GE fuel. Application of ARTS MAPLHGR multipliers assures that two loop LOCA results described in Section 6.3.3.9.1 remain the licensing basis for LaSalle Units 1 and 2.

For ATRIUM-9B fuel, the limiting break determined is analyzed for SLO to confirm that the SLO PCT is less than the two-loop operation PCT . Analyses were performed to confirm that the PCT trends for SLO and two-loop operation are generally the same. The MAPLHGR used for the Reference 2 SLO analyses is 13.5 kW/ft which is the same as the two-loop operation value; however a 0.9 multiplier is used for the SLO MAPLHGR. The SLO PCT is 1628 F with a 0.29% MWR. These results are less limiting than the maximum two-loop operation results; therefore, an SLO MAPLHGR multiplier of 0.9 is appropriate for ATRIUM-9B fuel.

For ATRIUM-10 fuel, the analyses show that the limiting two-loop LOCA results bound the limiting SLO LOCA results when a MAPLHGR multiplier of 0.90 is applied to the two-loop MAPLHGR limit.

6.B.6.3 Small Break Peak Cladding Temperature

Section 5.3.1 of Reference 4 discusses why the DBA break is more limiting than the smaller break sizes for SLO. Section 5.3.1 of Reference 4 also discusses the effect of the assumptions used in the one-pump operation analysis and the duration of nucleate boiling. GE did not calculate small break results for SLO because they are non-limiting.

FANP analyses for ATRIUM-9B and ATRIUM-10 fuel used a spectrum of break sizes that include small breaks to identify the limiting break. The limiting break for ATRIUM-9B fuel is a small break of 1.1 square feet in the recirculation pump discharge line. For ATRIUM-10, the limiting break is a double-ended guillotine break of the recirculation pump suction line. The analyses for both ATRIUM-9B and ATRIUM-10 show that the limiting two-loop LOCA results bound the SLO LOCA results when the SLO MAPLHGR multiplier of 0.90 is applied to the two-loop MAPLHGR limit.

6.B.7 REFERENCES

1. General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation, and Design Application, General Electric Company (NEDO-10958-A), January 1977.

2. "LOCA Break Spectrum Analysis for LaSalle Units 1 and 2," EMF-2174(P). Siemens Power Corporation, March 1999.

3. "LaSalle Extended Operating Domain (EOD) and Equipment Out of Service (EOOS) Safety Analysis for ATRIUM-9B Fuel," SPC Report EMF-95-205(P).

4. "LaSalle County station Units 1 and 2 SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis," NEDC-32258P, General Electric Company, October 1993.

5. "LaSalle County Station Units 1 and 2 SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis," NEDC-31510P, General Electric Company, December 1987.

6. LaSalle County Station Power Uprate Project, Task 407, “ECCS Performance,” GE-NE-A1300384-39-01, Revision 1, September 1999.

7. “LaSalle Units 1 and 2 LOCA Break Spectrum Analysis for ATRIUM-10 Fuel”, EMF-2639(P), Revision 0, Framatome ANP, November 2001.

INPUT PARAMETERS AND INITIAL CONDITIONS

FOR ANALYSIS OF INITIAL CORE TRANSIENTS AND ACCIDENTS

FOR SINGLE-LOOP OPERATION

(INITIAL CORE VALUES)**

1. Thermal Power Level, Analysis Value, % NBR	78
2. Steam Flow, lb/h	10.71×10^6
3. Core Flow, lb/h	68.26×10^6
4. Feedwater Flow Rate, lb/sec	2976
5. Feedwater Enthalpy, Btu/lb	367.3
6. Vessel Dome Pressure, psig	1001
7. Vessel Core Pressure, psig	1006
8. Turbine Bypass Capacity, % NBR	25
9. Core Coolant Inlet Enthalpy, Btu/lb	516.8
10. Turbine Inlet Pressure, psig	969.3
11. Fuel Lattice	8 x 8
12. Core Average Gap Conductance, Btu/sec-ft^2-°F	0.1662
13. Core Leakage Flow, %	12
14. Required MCPR Operating Limit	1.41 *
15. MCPR Safety Limit	1.06
16. Doppler Coefficient, -¢/°F	
Nominal EOC-1	0.221
Analysis Data	0.221
17. Void Coefficient, -¢/% Voids	
Nominal EOC-1	7.429
Analysis Data for Power Increase Events	12.63
Analysis Data for Power Increase Events	7.01
18. Core Average Rated Void Fraction, %	0.414
19. Scram Reactivity, Analysis Data	FSAR Figure 15.0-2
20. Control Rod Drive Speed, position versus time	FSAR Figure 15.0-2

* Dual-pump operation operating limit for 63% core flow, obtained by applying K_f-curve to operating limit CPR at rated condition (1.24).

** For cycle specific inputs, see the transient analysis input parameters.

TABLE 6.B-1
(SHEET 2 OF 2)

(INITIAL CORE VALUES)

21. Jet Pump M Ratio	3.20
22. Safety/Relief Valve Capacity, % NBR at 1165 psig	111.5
Manufacturer	Crosby
Quantity Installed	18
23. Relief Function Delay, sec	0.1
24. Relief Function Response, sec	0.1
25. Setpoints for Safety/Relief Valves	
Safety Function, psig	1150, 1175, 1185, 1195, 1205
Relief Function, psig	1076, 1086, 1096, 1106, 1116
26. Number of Valve Groupings Simulated	
Safety Function, No.	5
Relief Function, No.	5
27. Vessel Level Trips, Inches above Steam Dryer Skirt Bottom (Instrument Zero)	
Level 8 - (L8)	55.5
Level 3 - (L3)	12.5
Level 2 - (L2)	-50
28. RPT Delay, sec	0.14
29. RPT Inertia Time Constant for Analysis, sec	6.0

TABLE 6.B-2

SEQUENCE OF EVENTS FOR FIGURE 6.B-3
(INITIAL CORE RESULTS)

TIME (sec)	EVENT
0	Initiate simulated failure of 160% upper limit on feedwater flow.
5.46	L8 vessel level setpoint trips main turbine and feedwater pumps.
5.47	Reactor scram trip actuated from main turbine stop valve position switches.
5.47	Recirculation pump (RPT) actuated by turbine stop valve position switches.
5.57	Main turbine stop valves closed and main turbine bypass valves start to open.
8.01, 8.29	Relief valves actuated (groups 1, 2).
11.67, 12.23	Relief valves close (groups 2, 1).
29.32	Main turbine bypass valves closed.
48.35	Main turbine bypass valves start to open.

TABLE 6.B-3

SEQUENCE OF EVENTS FOR FIGURE 6.B-4
(INITIAL CORE RESULTS)

TIME (sec)	EVENT
-0.015 (approx)	Turbine-generator detection of loss of electrical load
0	Turbine-generator power load unbalance (PLU) devices trip to initiate turbine control valve fast closure
0	Turbine bypass valves fail to operate
0	Fast control valve closure (FCV) initiates scram trip
0	Fast control valve closure (FCV) initiates recirculation pump trip (RPT)
0.039	Turbine control valves closed
0.14	Recirculation pump motor circuit breakers open, causing decrease in core flow to natural circulation
1.98, 2.12, 2.27, 2.45, 2.74	Relief valves actuated (groups 1, 2, 3, 4, 5)
4.58, 4.91, 5.20 (est)	Relief valves close (groups 5, 4, 3)
5.30	Vessel level reaches L8 setpoint, feed water pumps tripped (not simulated)
5.50, 5.84 (est)	Relief valves close (groups 2, 1)
12.00	Relief valves actuated (group 1)
19.0 (est)	Relief valves close (group 1)
33 2	Relief valves actuated (group 1)
38.0 (est)	Relief valves close (group 1)

TABLE 6.B-4

SEQUENCE OF EVENTS FOR FIGURE 6.B-5
(INITIAL CORE RESULTS)

TIME (sec)	EVENT
0	Single pump seizure was initiated, core flow decreases to natural recirculation
1.23	Reverse flow ceases in the idle loop
4.93	High vessel water level (L8) trip initiates main turbine trip
4.93	High vessel water level (L8) trip initiates feedwater turbine trip
4.93	Main turbine trip initiates bypass operation
4.96	Main turbine valves reach 90% open position and initiate reactor scram trip
5.03	Turbine stop valves closed and turbine bypass valves start to open to regulate pressure
10.0 (est)	Turbine bypass valves start to close
25.1	Turbine bypass valves closed
38.6	Turbine bypass valves reopen on pressure increase at turbine inlet

TABLE 6.B-5

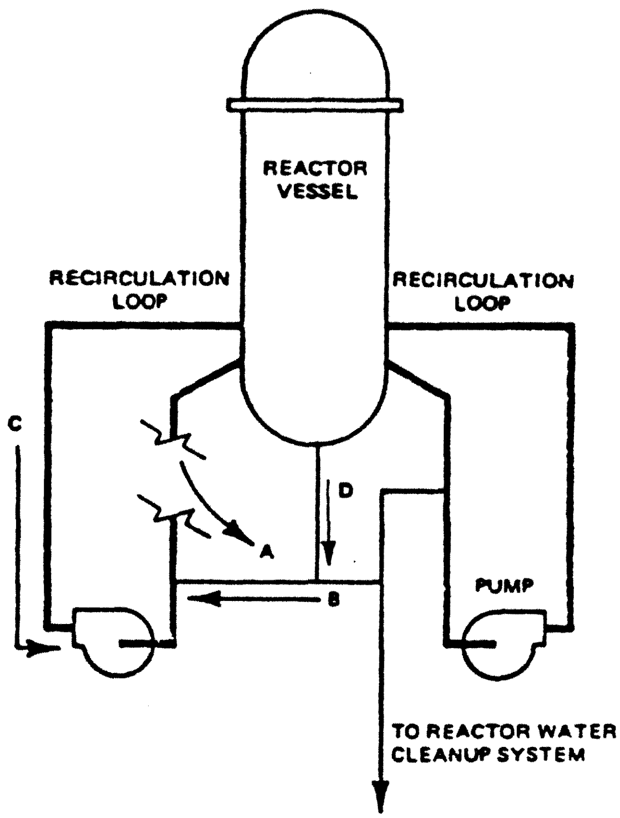
SUMMARY OF EVENT RESULTS

SINGLE RECIRCULATION LOOP OPERATION
(Typical)

PARAGRAPH	FIGURE	DESCRIPTION	MAXIMUM NEUTRON FLOW (% NBR)	MAXIMUM DOME PRESSURE (psig)	MAXIMUM VESSEL PRESSURE (psig)	MAXIMUM STEAMLINE PRESSURE (psig)	MAXIMUM CORE AVERAGE SURFACE HEAT FLUX (% of Initial)	MCPR	FREQUENCY* CATEGORY
6.B.3.2	6.B-3	Feedwater flow Controller Failure (Maximum Demand)	119.3	1112	1126	1103	108.8	1.26	a
6.B.3.3	6.B-4	Generator Load Rejection	135.6	1138	1153	1128	103.5	1.29	b
6.B.3.4	6.B-5	Seizure of Active Recirculation Pump	78.0	1021	1031	1018	100.0	1.17	c

* a = incident of moderate frequency; b = infrequent incident; c = limiting faults

POINT OF CRITICAL FLOW	
A.	RECIRCULATION LINE
B.	CLEANUP LINE
C.	COMBINED AREA OF ALL JET PUMP NOZZLES ASSOCIATED WITH THE BROKEN LOOP
D.	BOTTOM HEAD DRAIN



SCHEMATIC SHOWING COMPOSITION OF TOTAL RECIRCULATION LINE BREAK AREA

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FIGURE 6.2-1 DIAGRAM OF THE RECIRCULATION LINE BREAK LOCATION

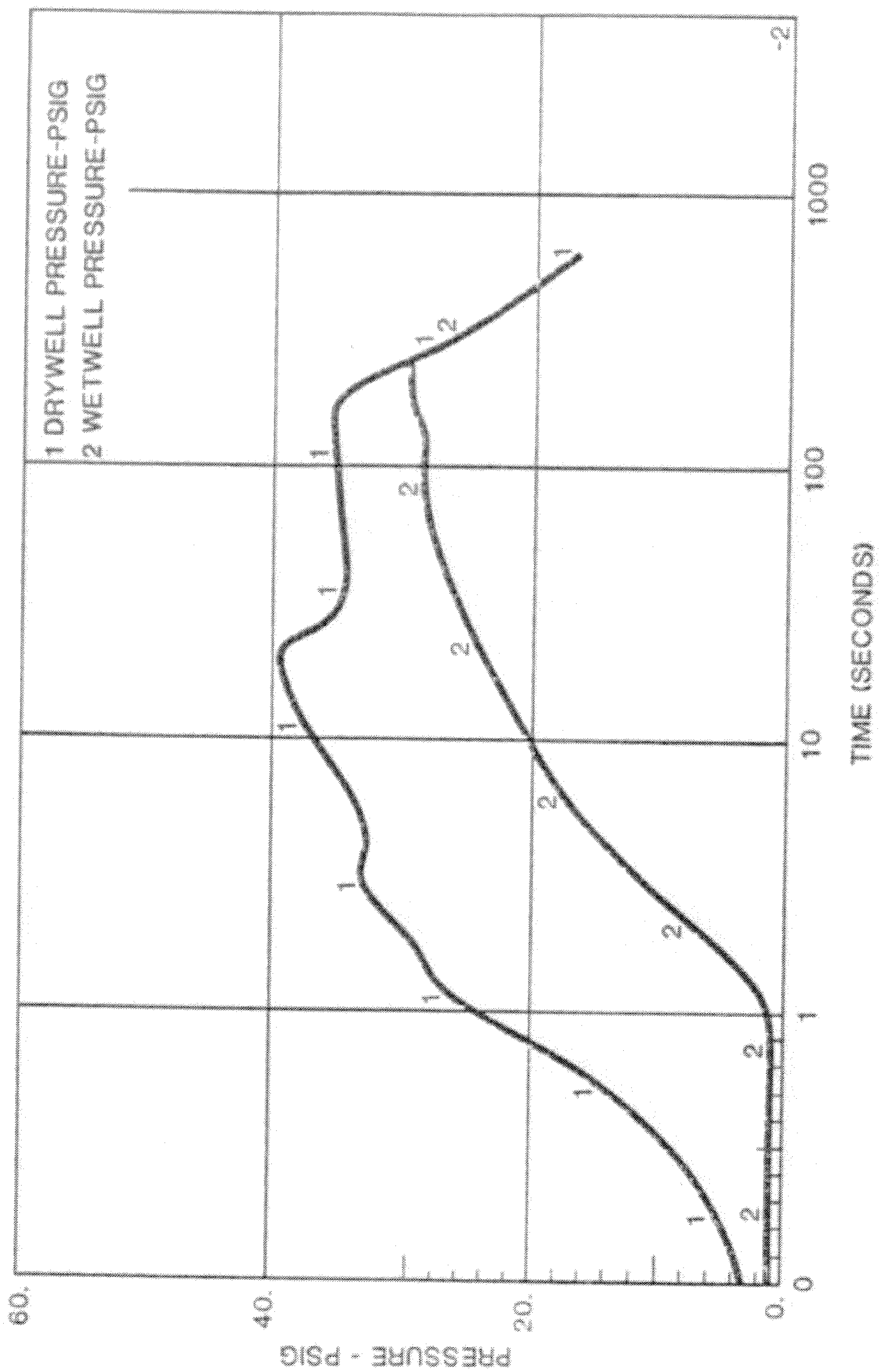

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FIGURE 6.2-2

RECIRCULATION LINE BREAK
PRESSURE RESPONSE (At 3434 MWt)

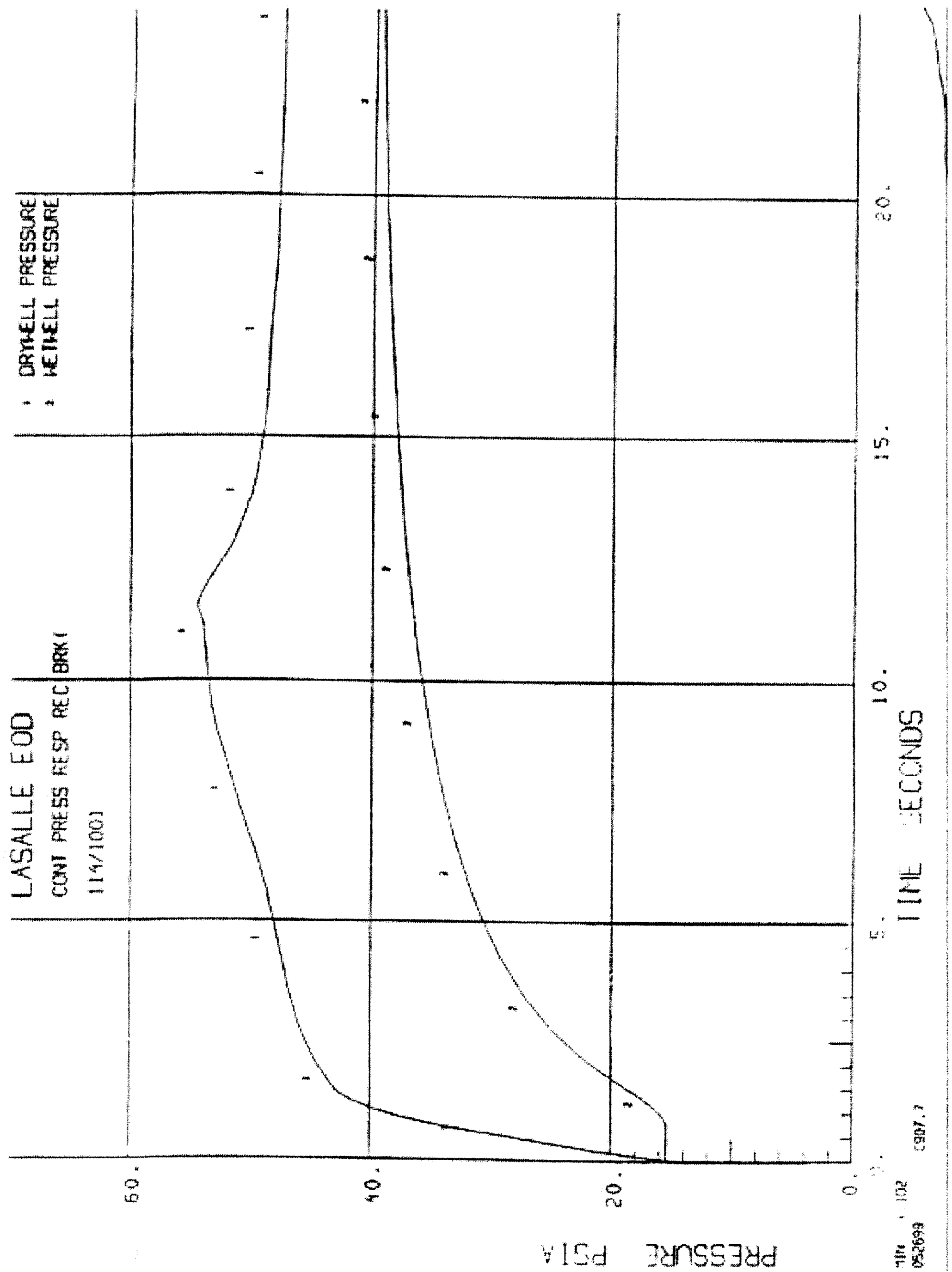

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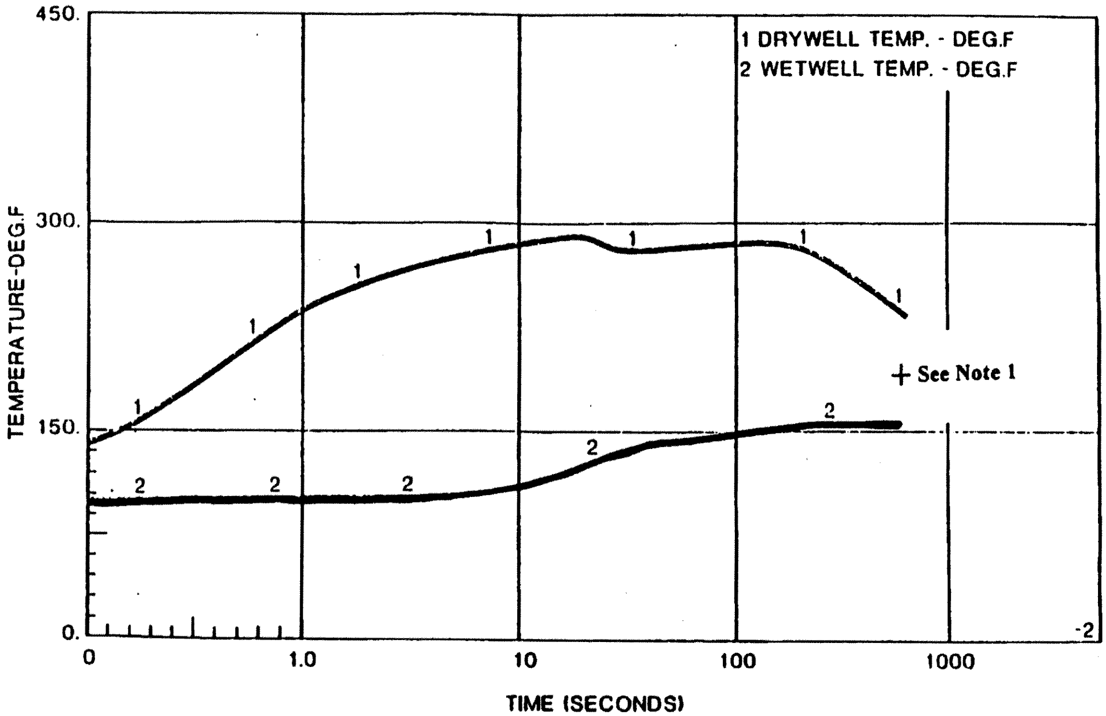
FIGURE 6.2-2A

SHORT-TERM PRESSURE RESPONSE FOLLOWING A RECIRCULATION LINE BREAK (At 3559 MWt)



Notes: 1. This point represents the projected suppression pool temperature due to the feedwater coastdown/injection. This point is a starting temperature for the assessment of peak long term suppression pool temperature. This evaluation is discussed in detail in Section 6.2.1.1.3.1.1 in the paragraph titled, "Evaluation of Post-LOCA Feedwater Injection".

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FIGURE 6.2-3 TEMPERATURE RESPONSE FOR RECIRCULATION LINE BREAK (At 3434 MWt)

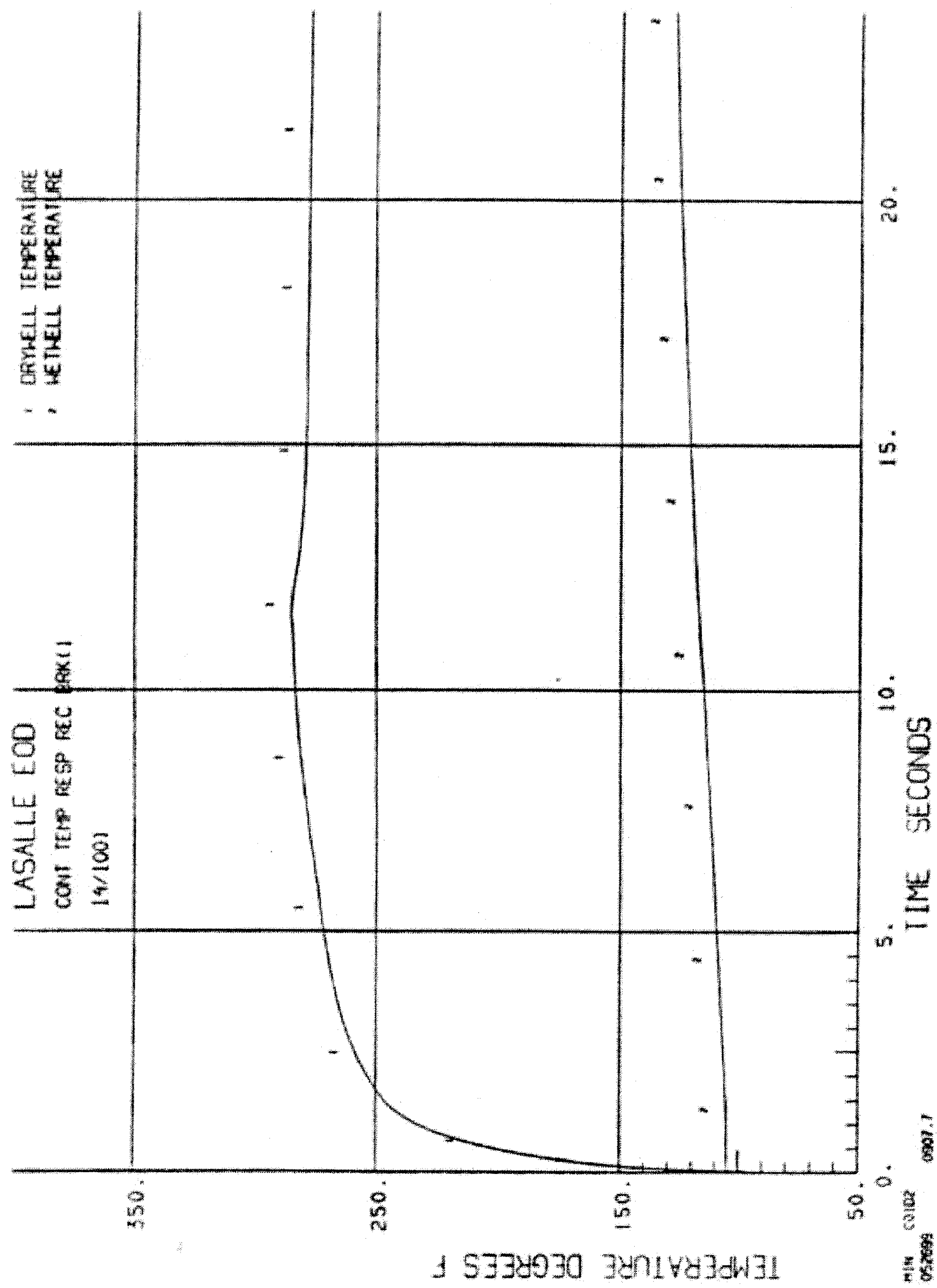

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FIGURE 6.2-3a SHORT-TERM TEMPERATURE RESPONSE FOLLOWING A RECIRCULATION LINE BREAK (At 3559 MWt)

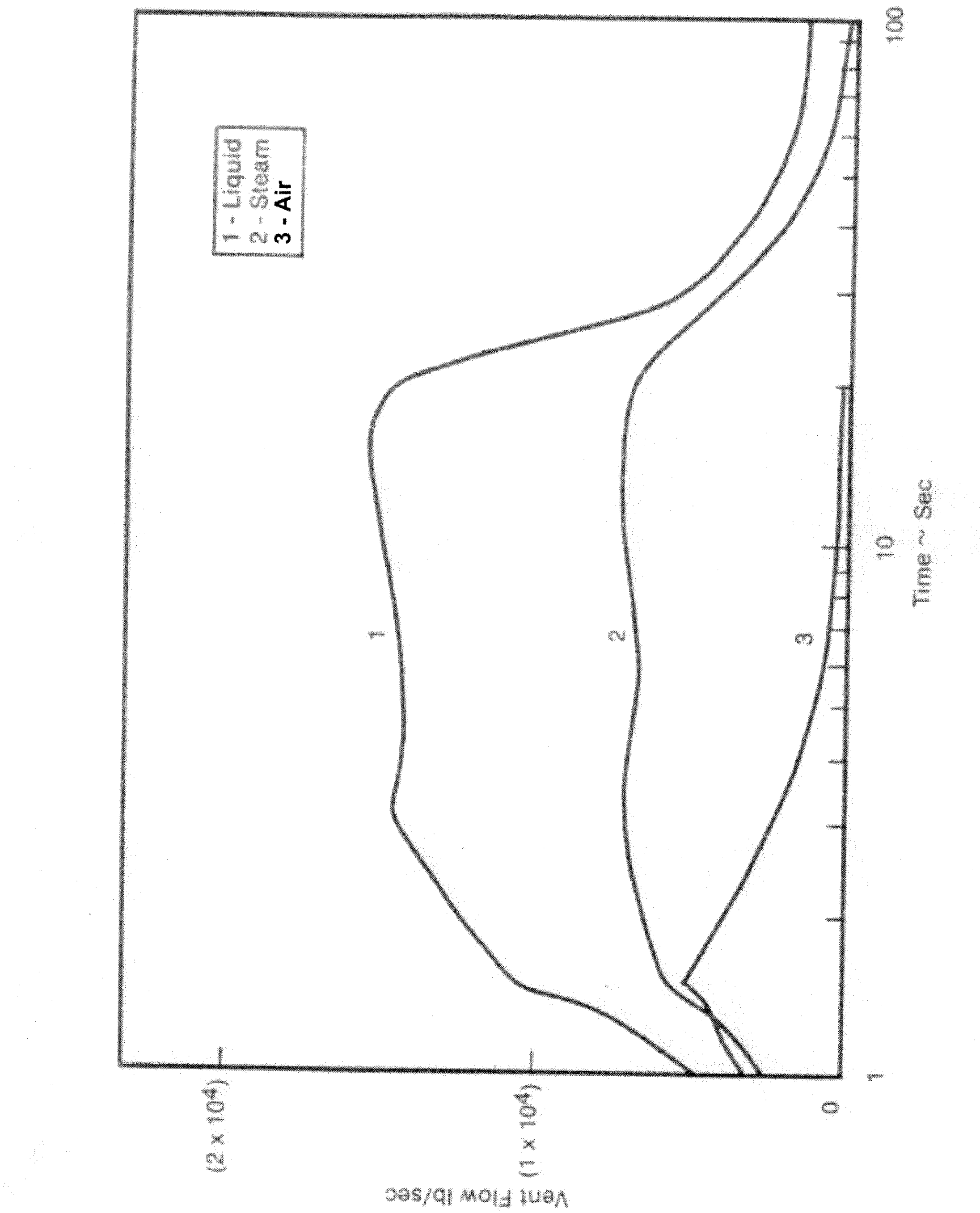

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FIGURE 6.2-4

CONTAINMENT VENT SYSTEM FLOW RATE VS. TIME FOR RECIRCULATION LINE BREAK (At 3434 MWt)

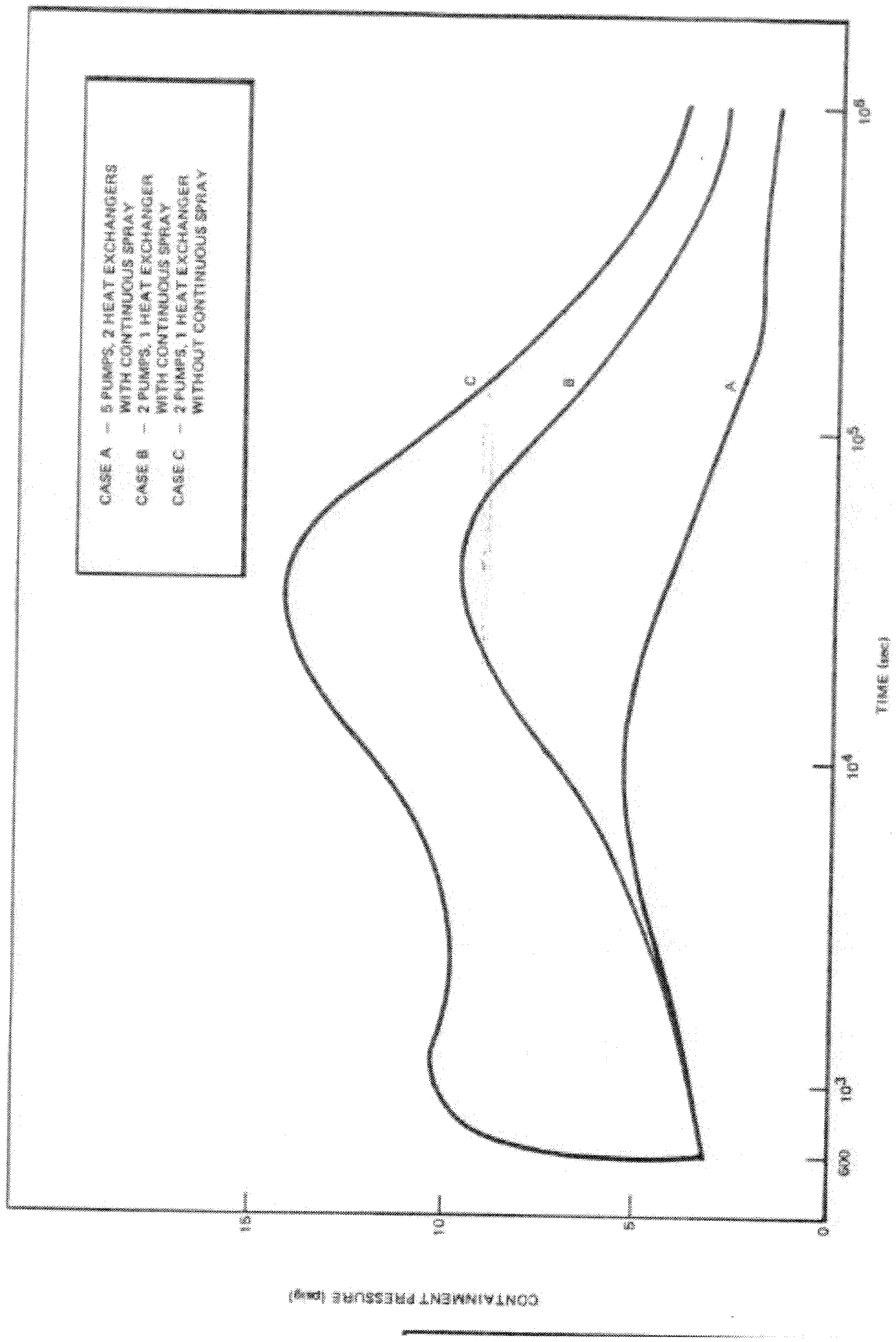

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FIGURE 6.2-5

CONTAINMENT PRESSURE RESPONSE
(At 3434 MWt)

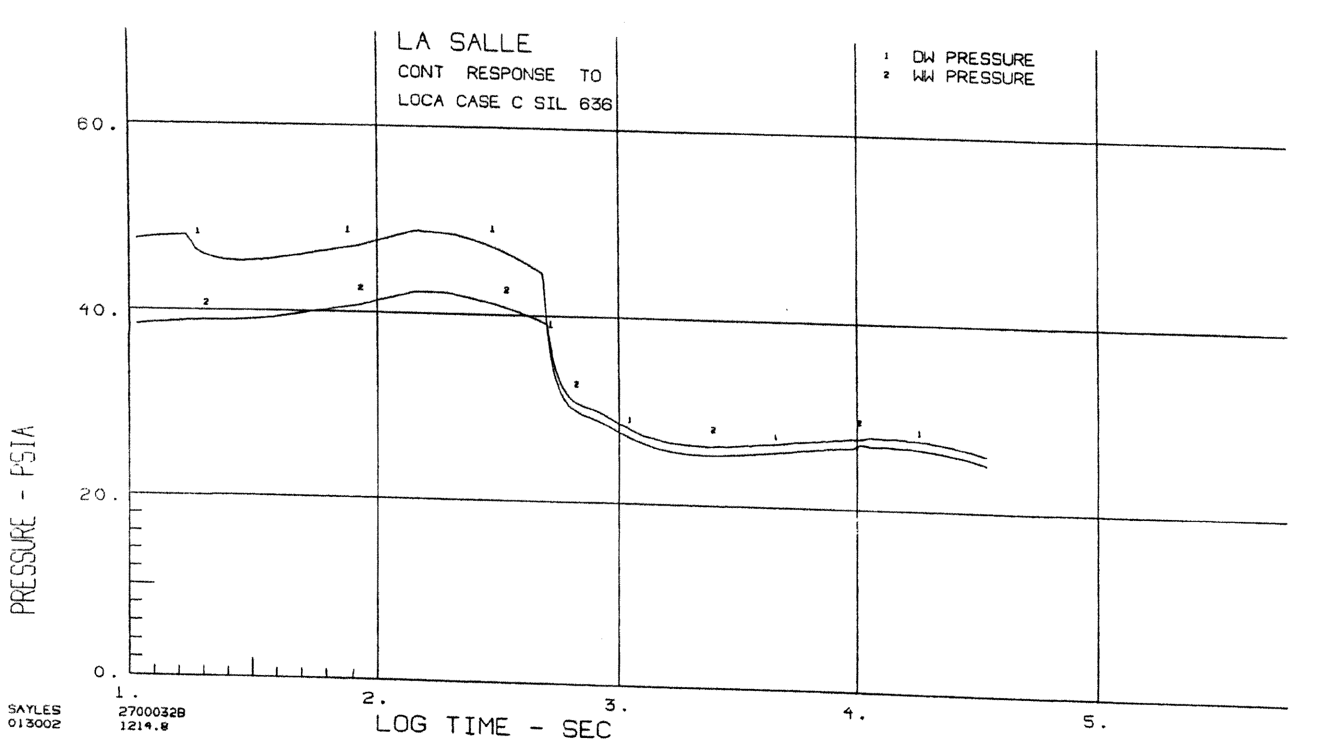

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FIGURE 6.2-5a LONG TERM CONTAINMENT PRESSURE RESPONSE FOLLOWING A RECIRCULATION LINE BREAK (At 3559 MWt) CASE C (2 PUMPS, 1 HEAT EXCHANGER WITHOUT CONTINUOUS SPRAY)

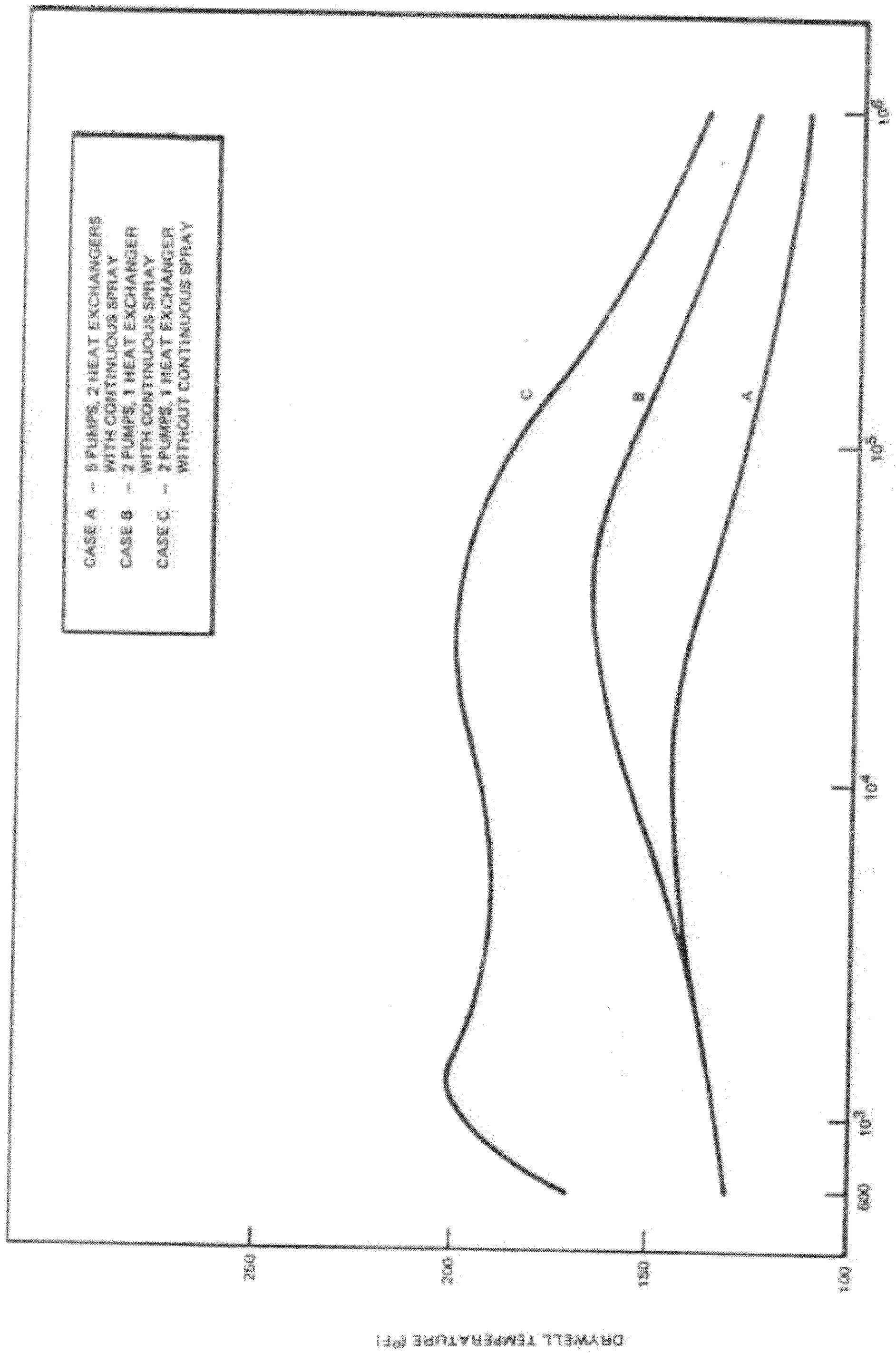

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FIGURE 6.2-6

DRYWELL TEMPERATURE RESPONSE
(At 3434 MWt)

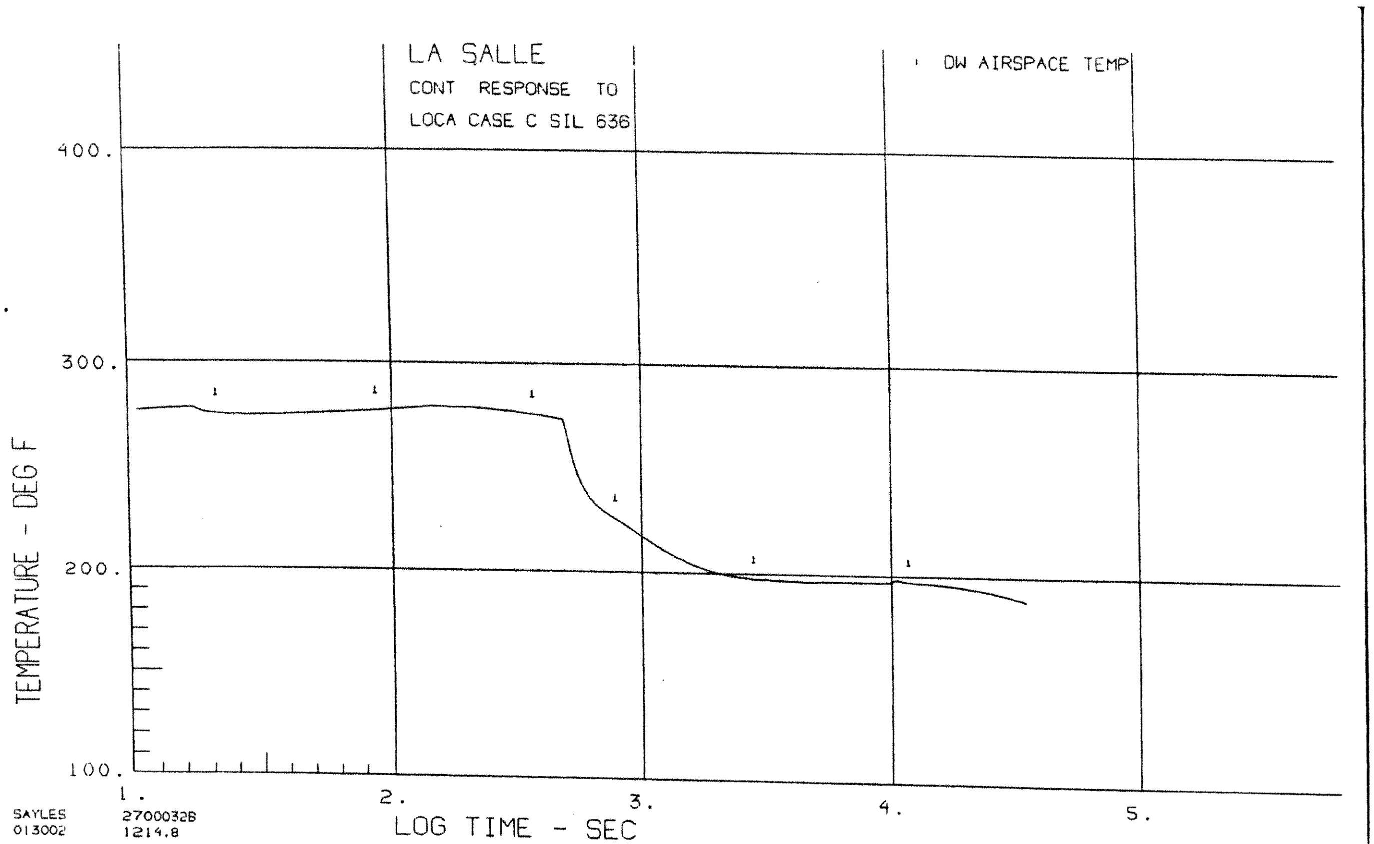

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FIGURE 6.2-6a

LONG TERM DRYWELL TEMPERATURE RESPONSE FOLLOWING A RECIRCULATION LINE BREAK (At 3559 MWt)
CASE C (2 PUMPS, 1 HEAT EXCHANGER WITHOUT CONTINUOUS SPRAY)

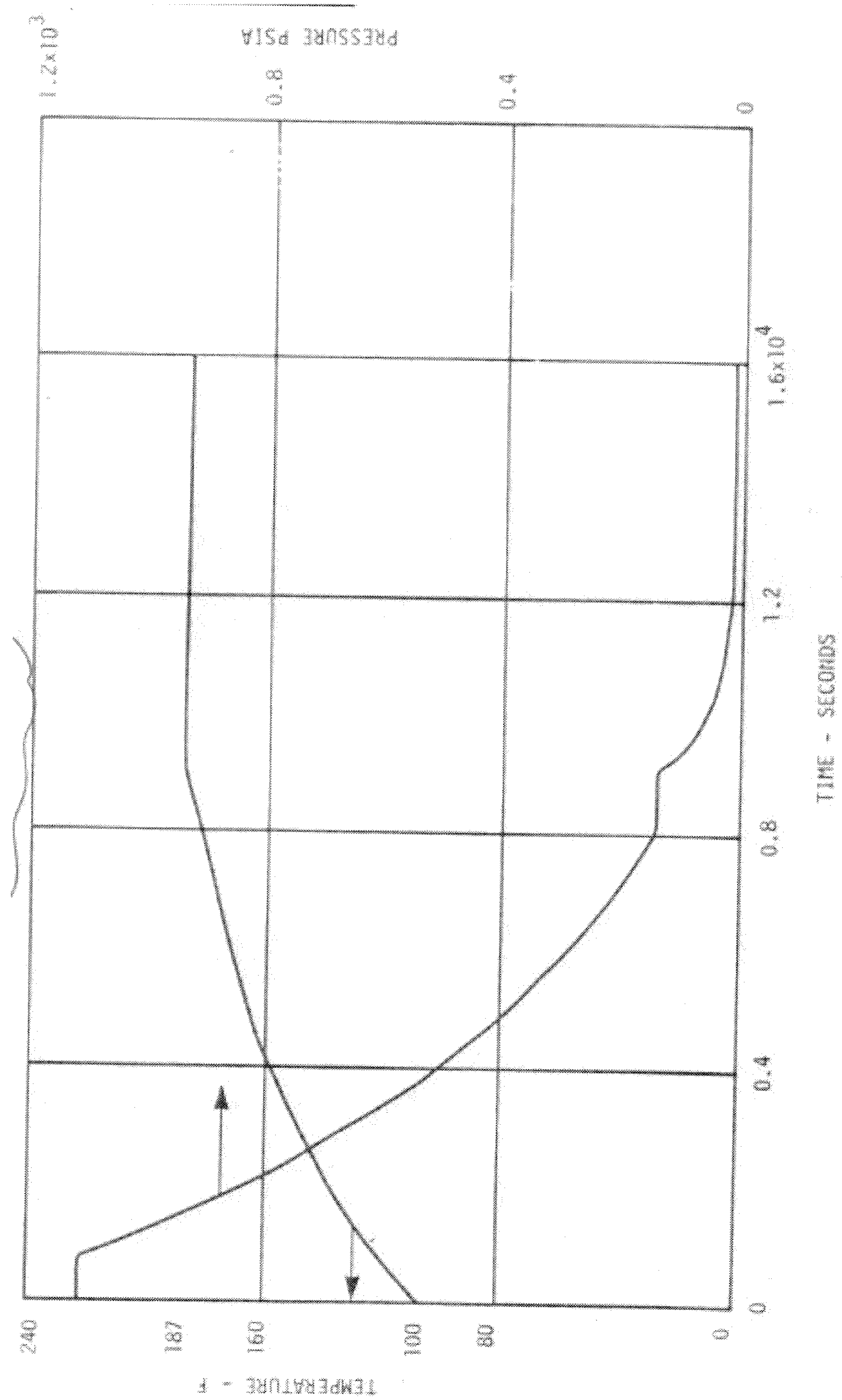

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FIGURE 6.2-7

POOL TEMPERATURE RESPONSE – ISOLATION/SCRAM, 1RHR AVAILABLE (At 3434 MWt)

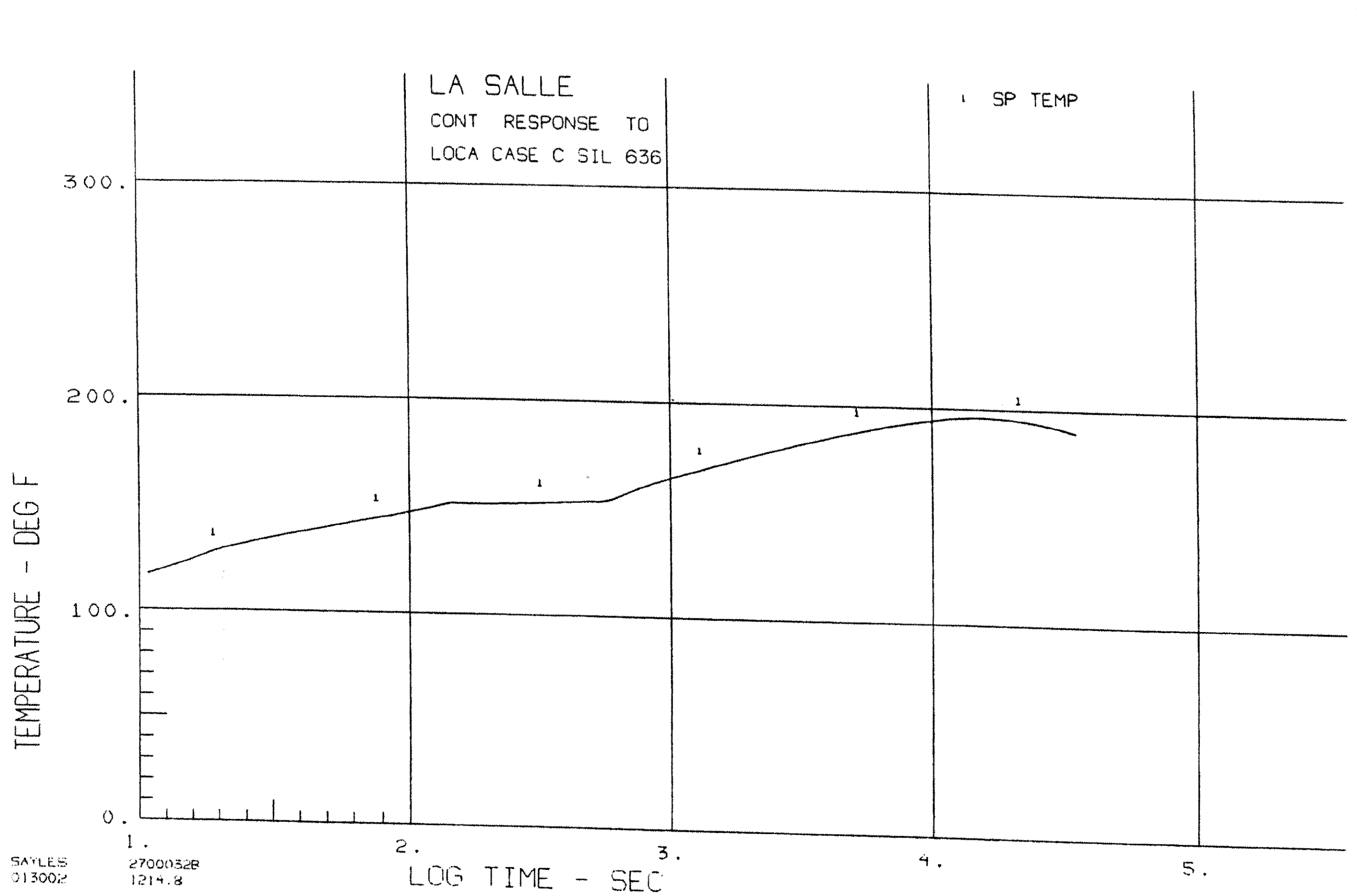

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FIGURE 6.2-7a LONG TERM SUPPRESSION POOL RESPONSE FOLLOWING A RECIRCULATION LINE BREAK (At 3559 MWt) CASE C (2 PUMPS, 1 HEAT EXCHANGER WITHOUT CONTINUOUS SPRAY)

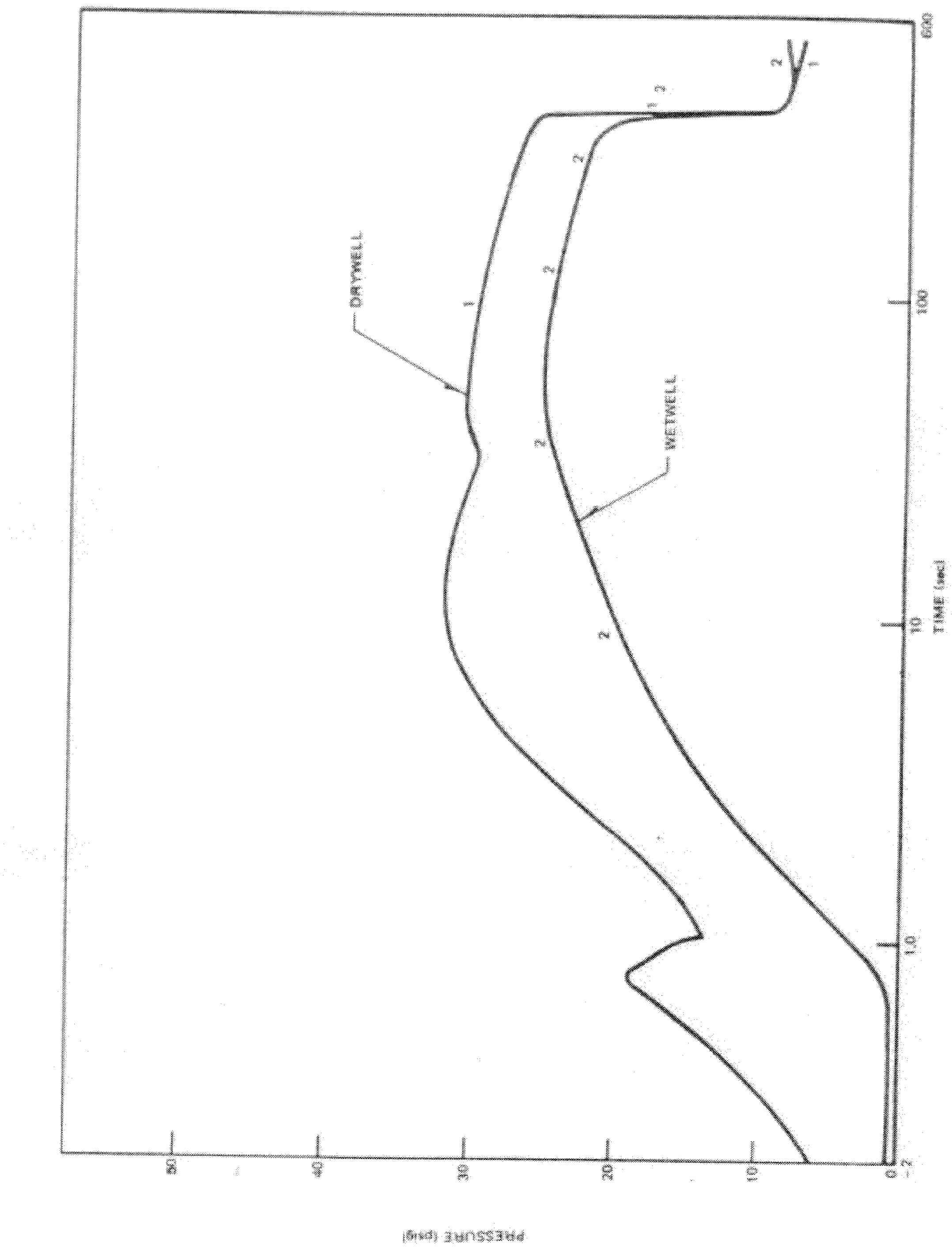

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FIGURE 6.2-8

PRESSURE RESPONSE FOR A MAIN

STEAMLINE BREAK

(At 3434 MWt)

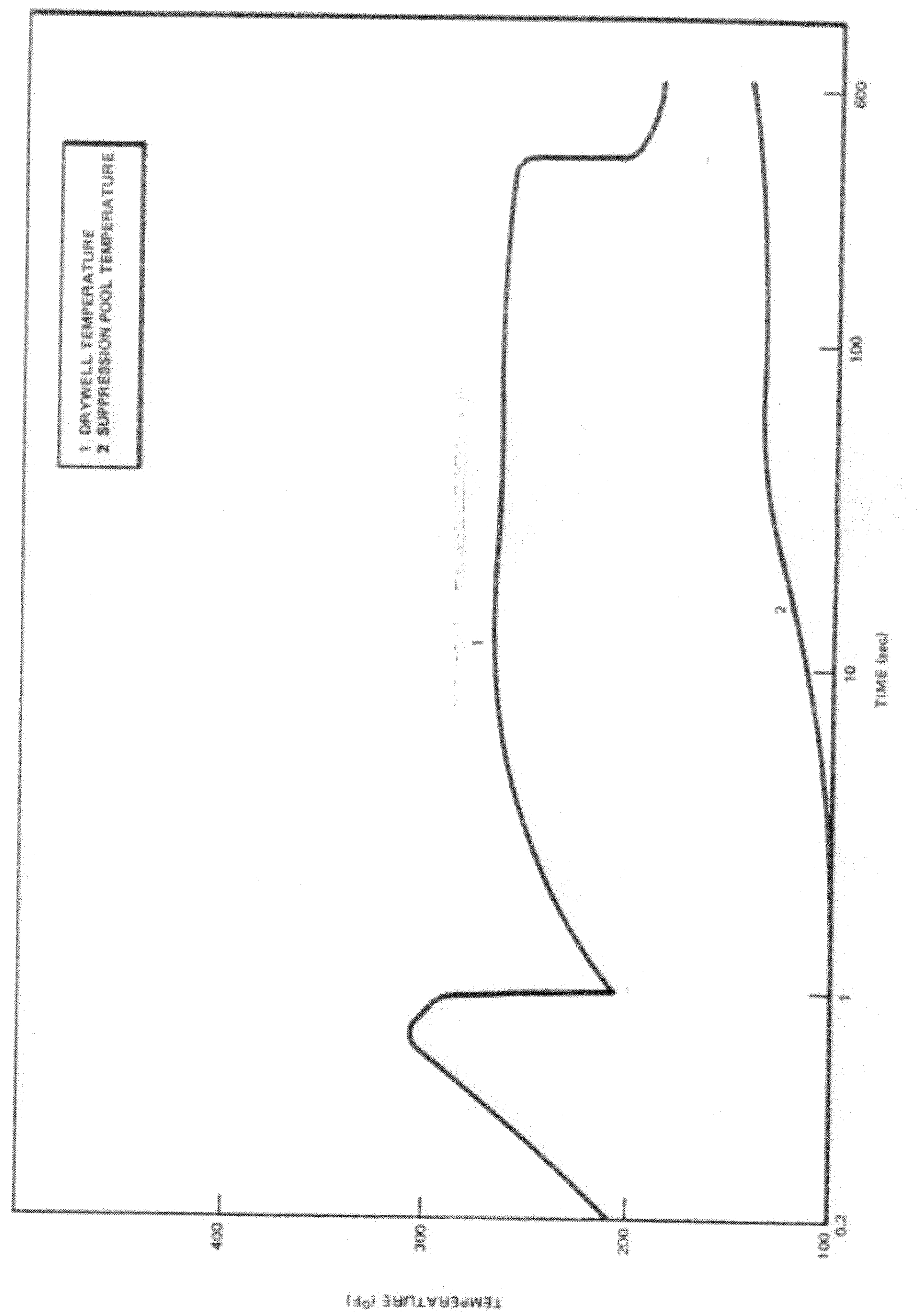

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FIGURE 6.2-9

TEMPERATURE RESPONSE FOLLOWING
A MAIN STEAMLINE BREAK
(At 3434 MWt)

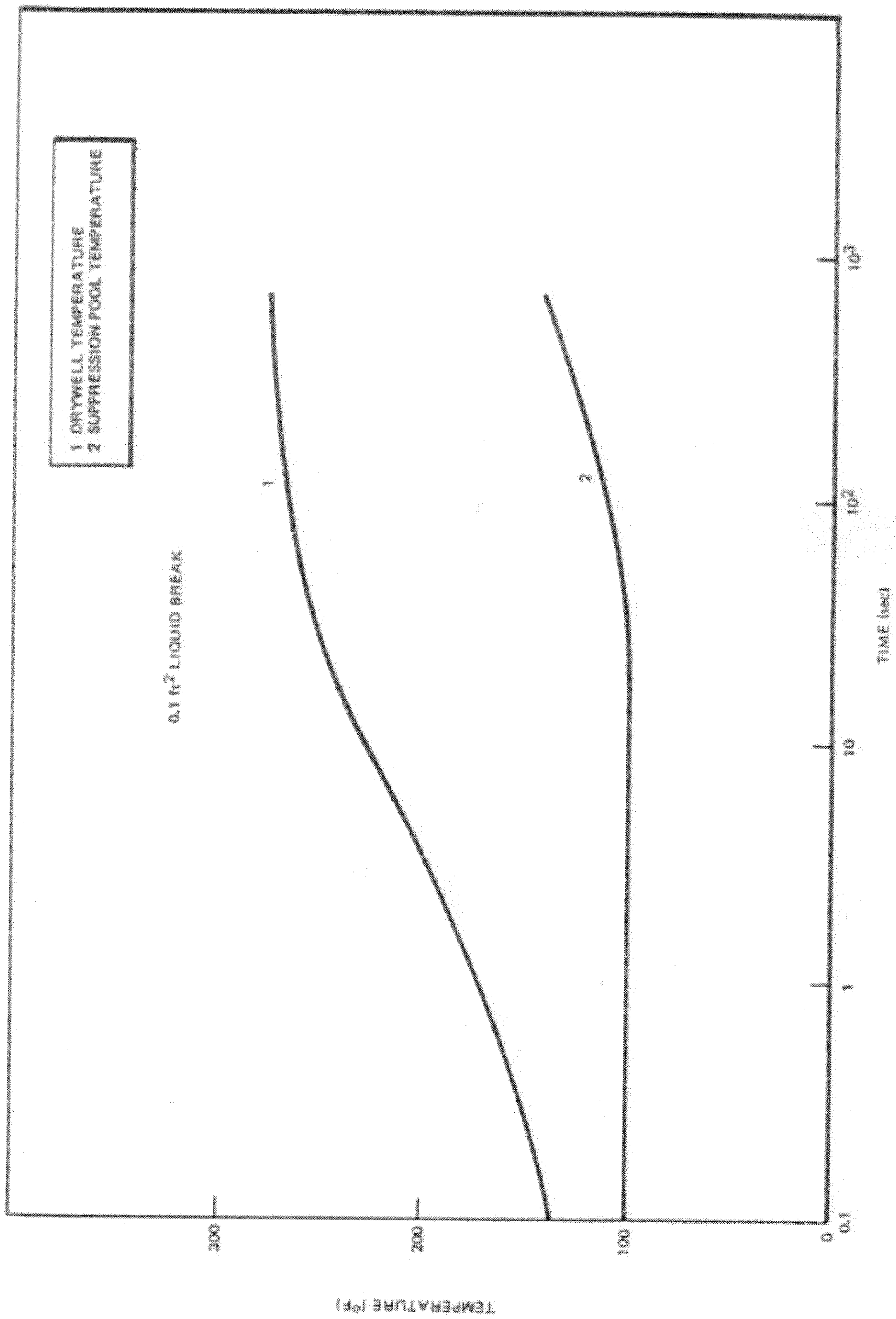

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FIGURE 6.2-10 TEMPERATURE RESPONSE FOR 0.1 FT^2 LIQUID LINE BREAK (At 3434 MWt)

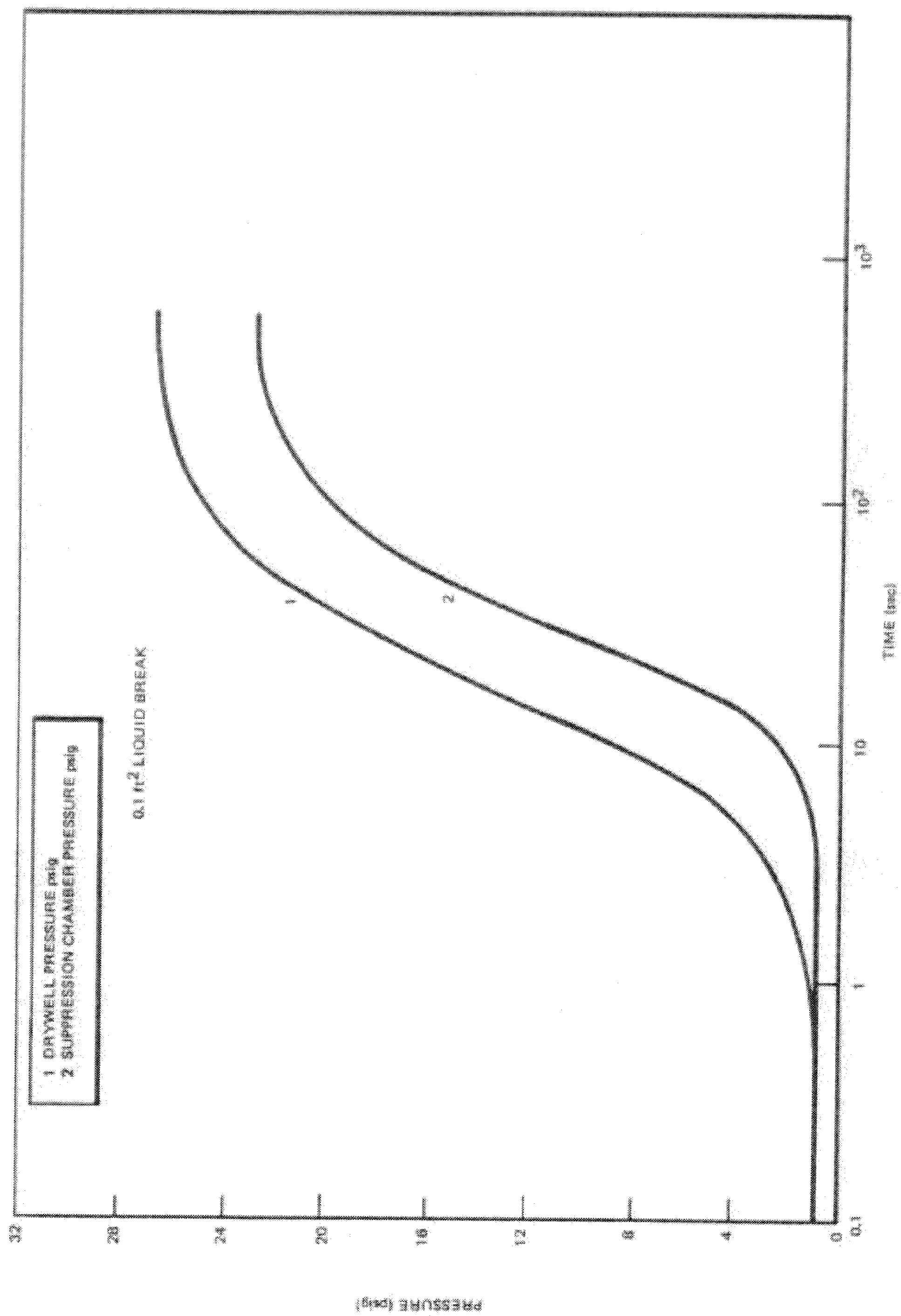

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FIGURE 6.2-10

PRESSURE RESPONSE FOR 0.1 FT^2

LIQUID LINE BREAK

(At 3434 MWt)

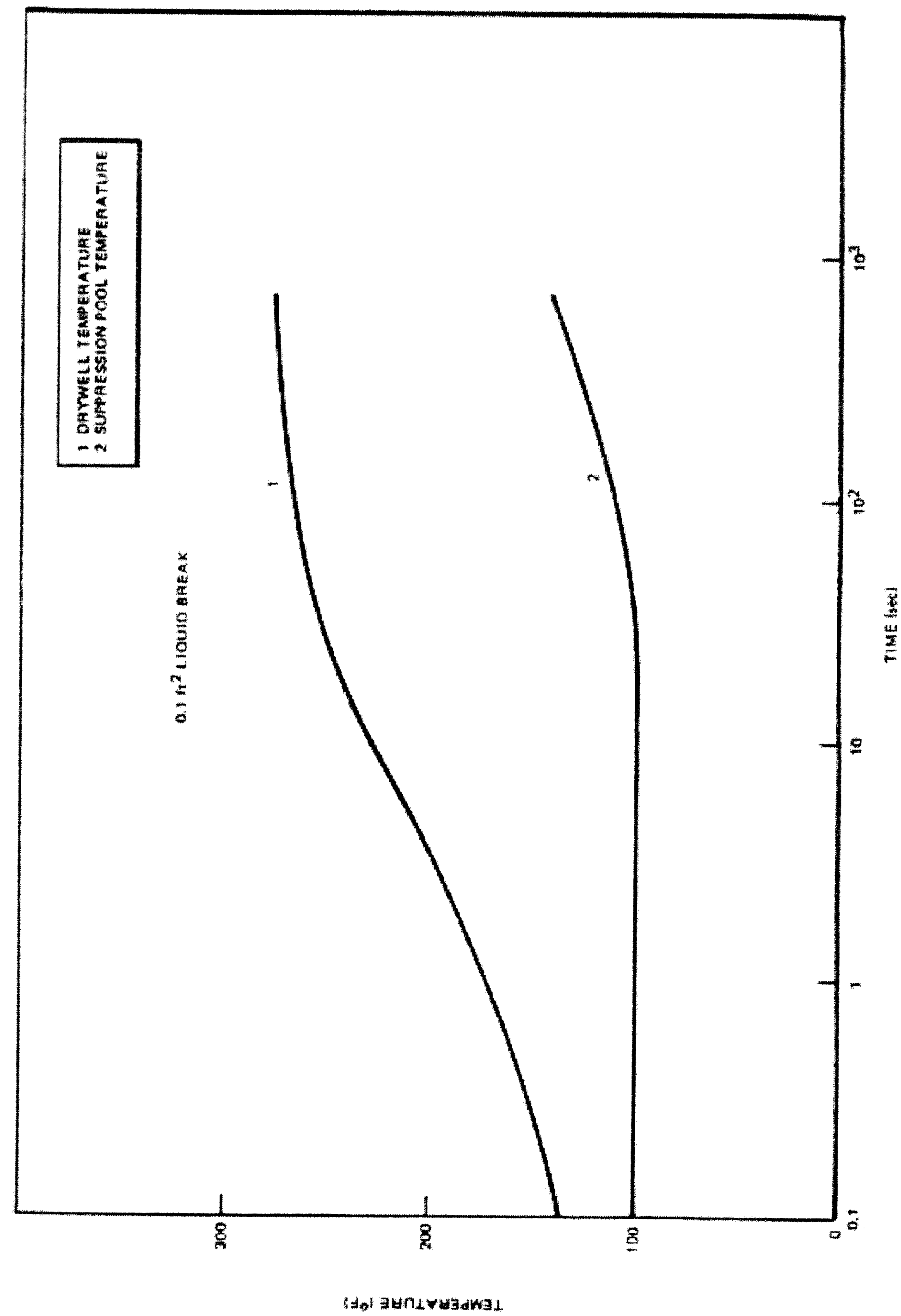

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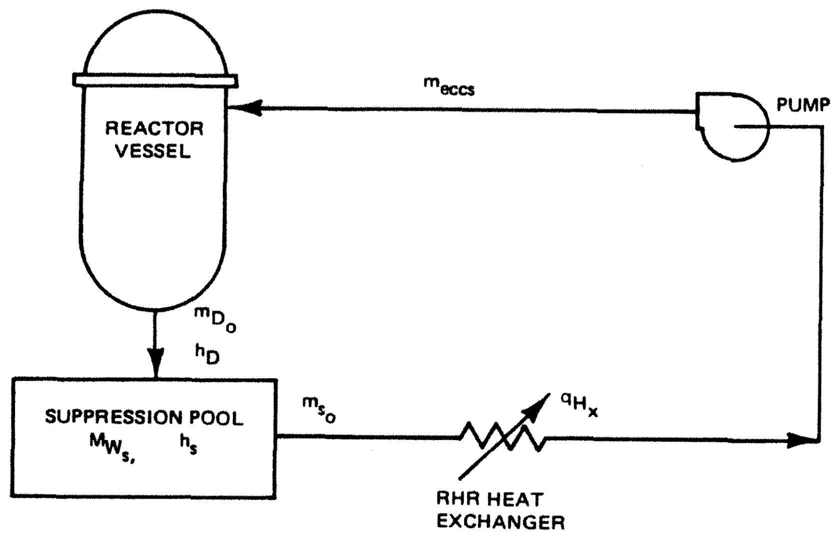
FIGURE 6.2-11 TEMPERATURE RESPONSE FOR 0.1 FT^2 LIQUID LINE BREAK (At 3434 MWt)



h_D	=	ENTHALPY OF WATER LEAVING REACTOR, Btu/lb
m_{D_o}	=	FLOW RATE OUT OF REACTOR, lb/sec
h_s	=	ENTHALPY OF WATER IN SUPPRESSION POOL, Btu/lb
m_{s_o}	=	FLOW OUT OF SUPPRESSION POOL, lb/sec
q_{H_x}	=	HEAT REMOVAL RATE OF HEAT EXCHANGER, Btu/sec
M_{W_s}	=	MASS OF WATER IN SUPPRESSION POOL
q_D	=	CORE DECAY HEAT RATE, Btu/sec
q	=	STORED ENERGY RELEASE RATE, Btu/sec

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FIGURE 6.2-12

SCHEMATIC OF ECCS LOOP

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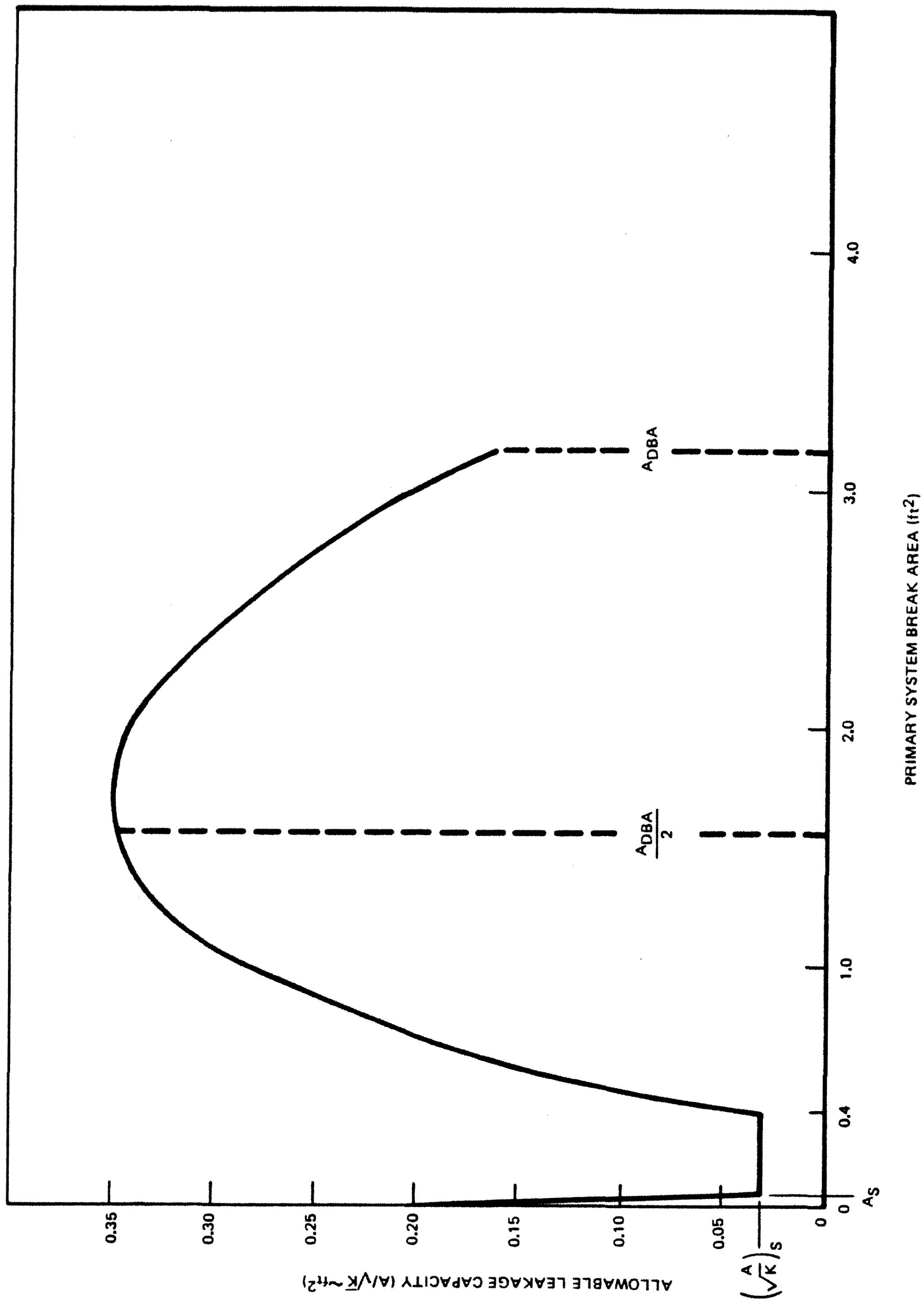

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FIGURE 6.2-13

ALLOWABLE STEAM BYPASS
LEAKAGE CAPACITY

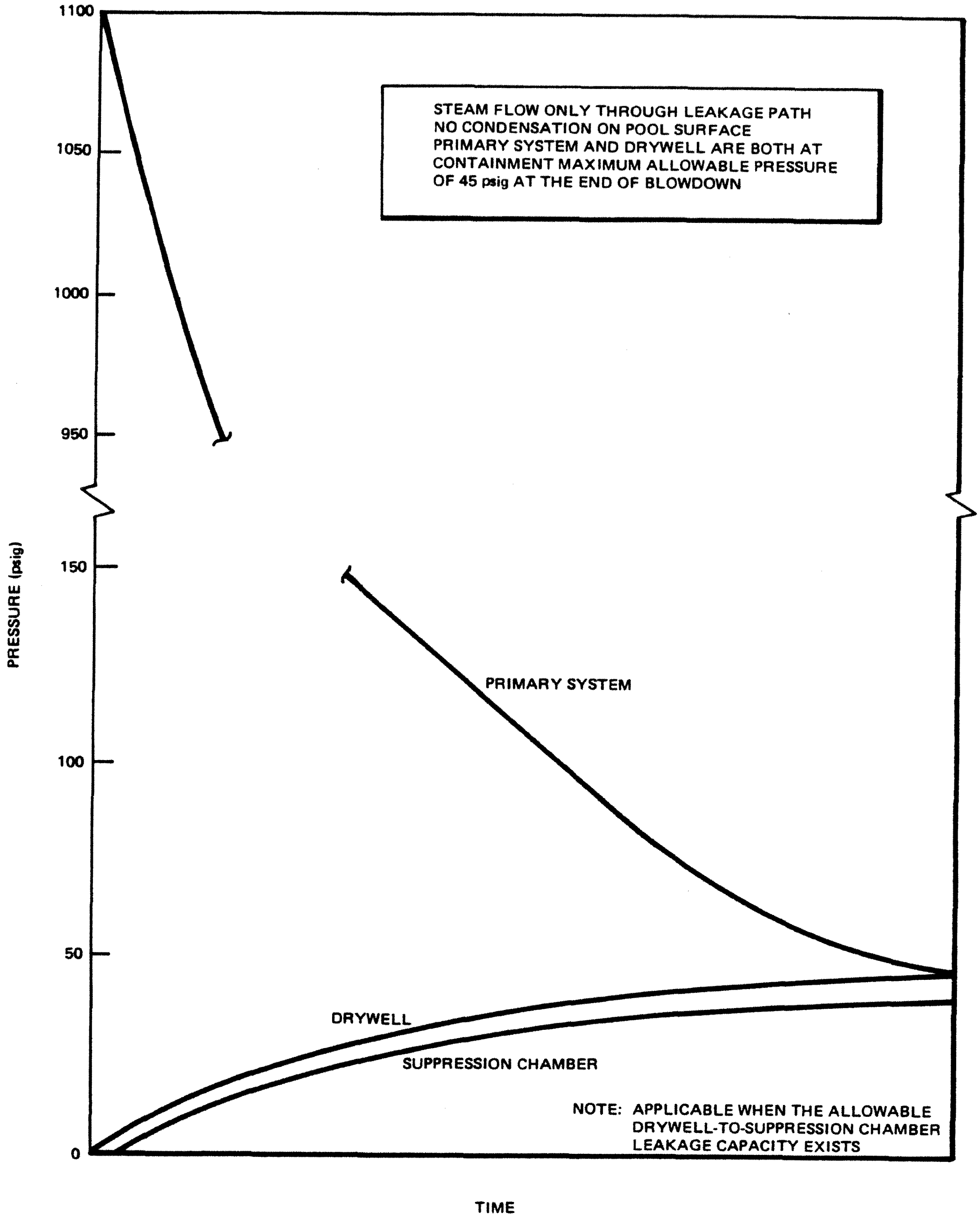

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FIGURE 6.2-14

CONTAINMENT RESPONSE TO LARGE PRIMARY SYSTEM BREAKS

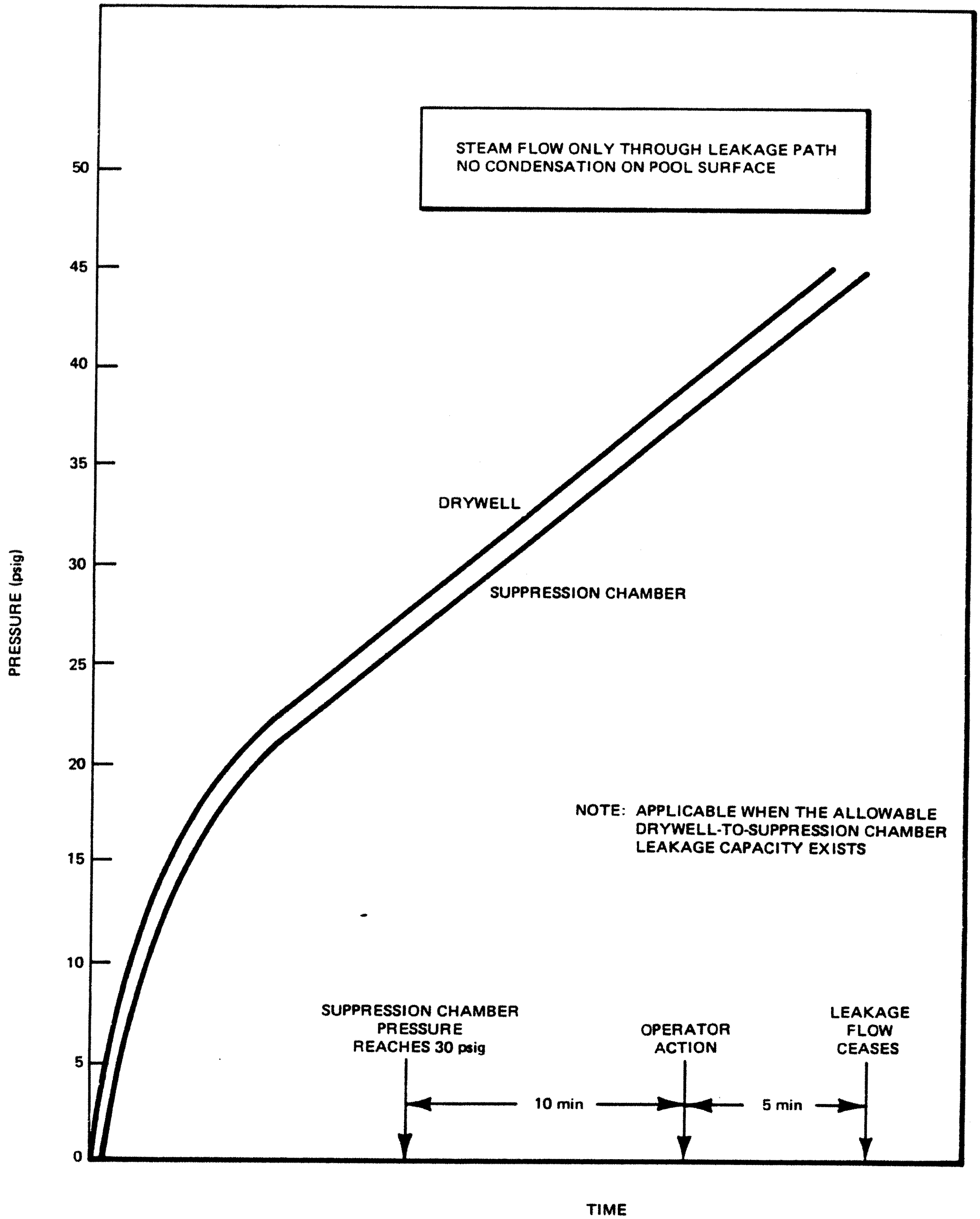

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FIGURE 6.2-15

CONTAINMENT RESPONSE TO SMALL PRIMARY SYSTEM BREAKS

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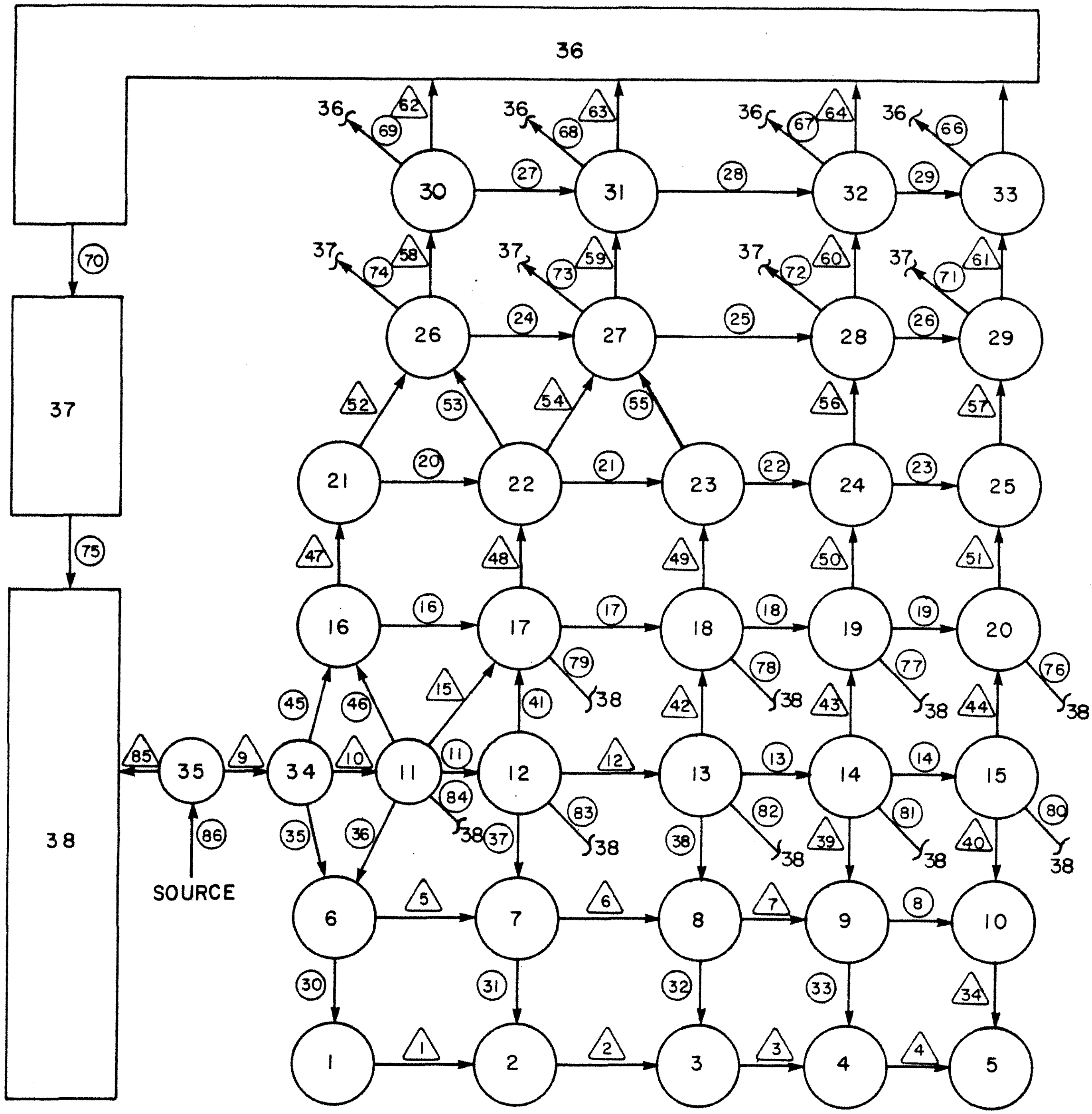

INDICATES NODE

INDICATES INCOMPRESSIBLE VENT PATH

INDICATES COMPRESSIBLE VENT PATH

VENT PATH TO CONTAINMENT

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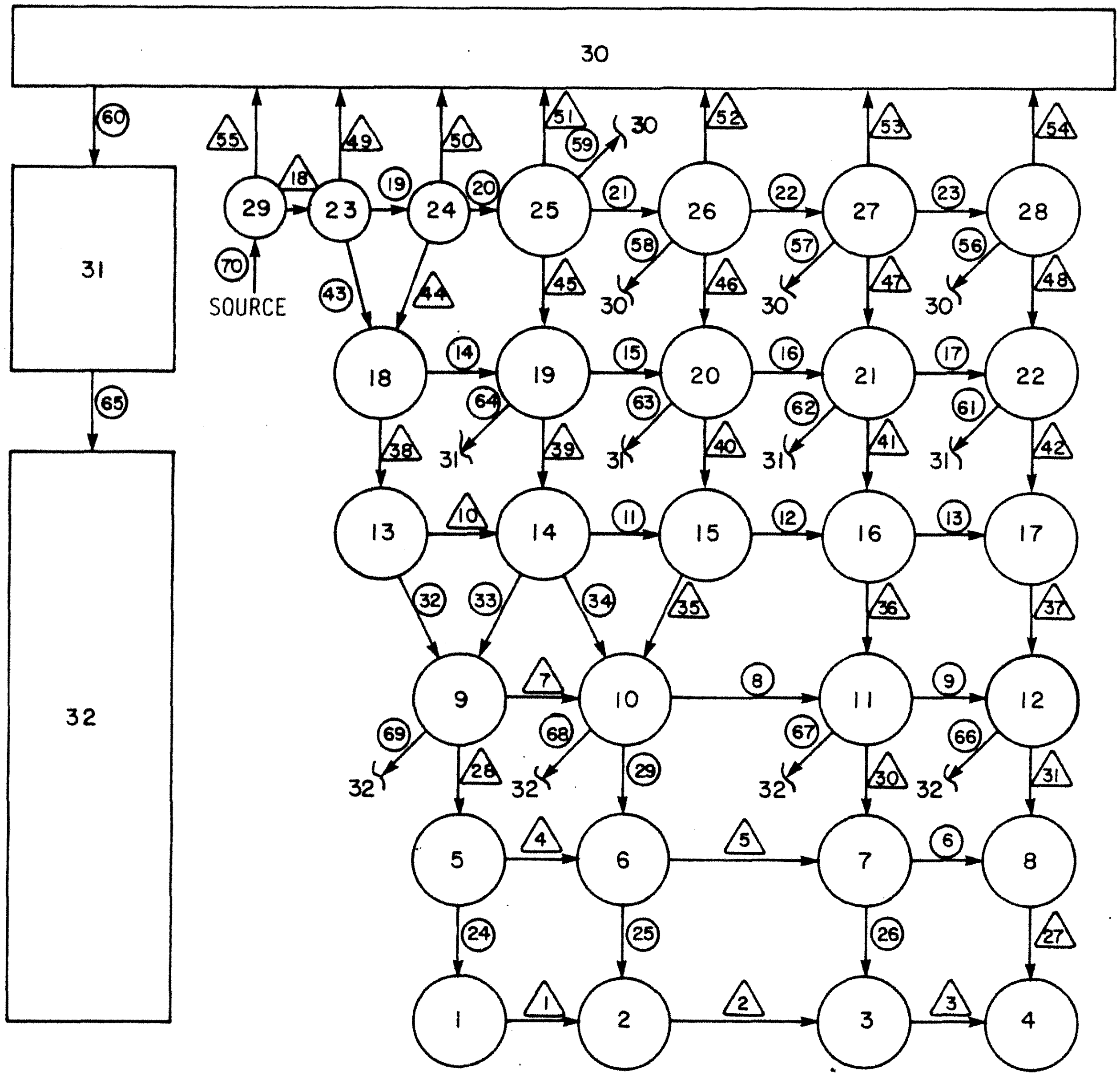
FIGURE 6.2-16

NODALIZATION SCHEMATIC FOR RECIRCULATION LINE BREAK



INDICATES NODE

INDICATES INCOMPRESSIBLE VENT PATH

INDICATES COMPRESSIBLE VENT PATH

VENT PATH TO CONTAINMENT

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FIGURE 6.2-17

NODALIZATION SCHEMATIC FOR
FEEDWATER LINE BREAK

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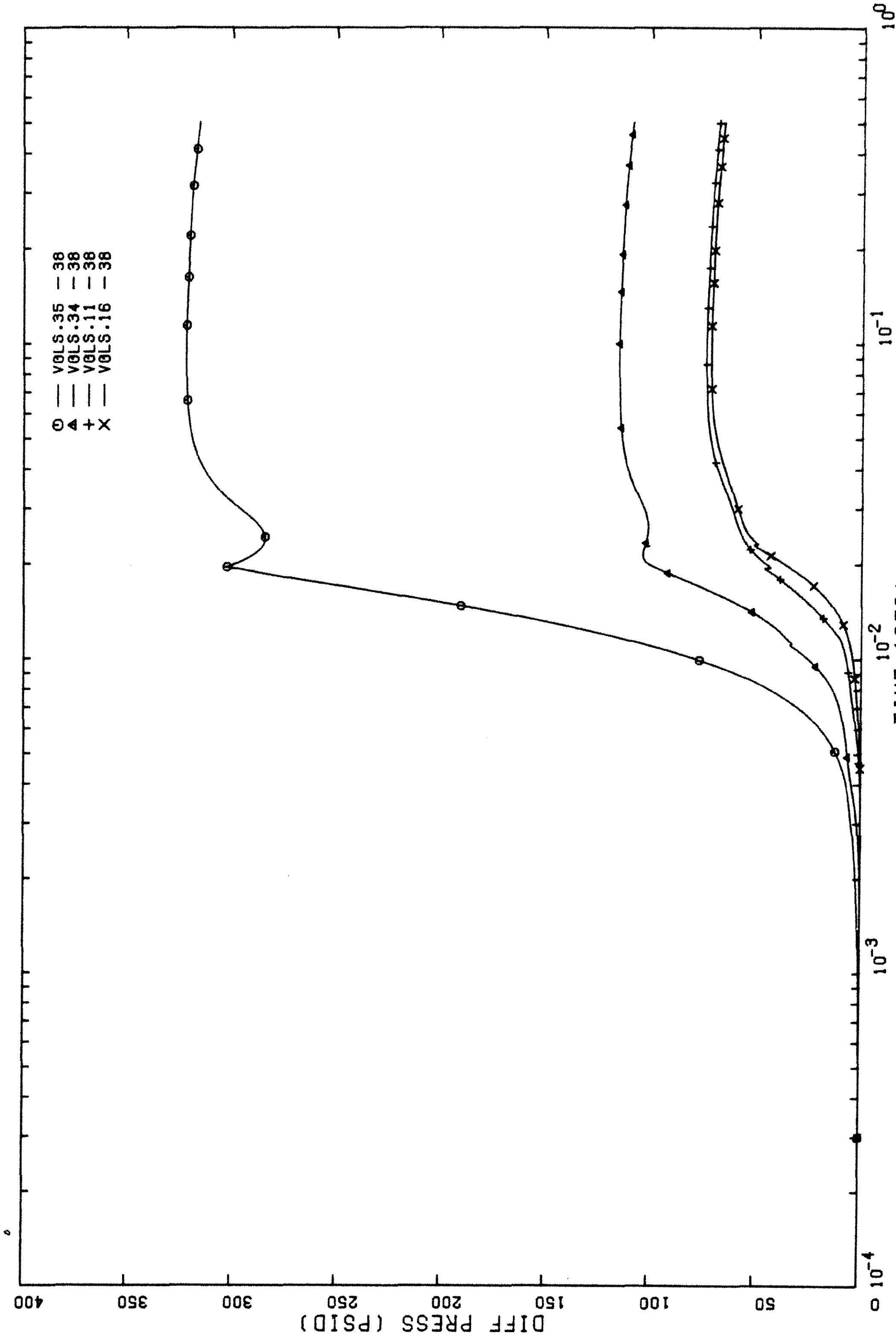

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FIGURE 6.2-18

ΔP VS. LOG t ABOUT BREAK -
RECIRCULATION LINE BREAK

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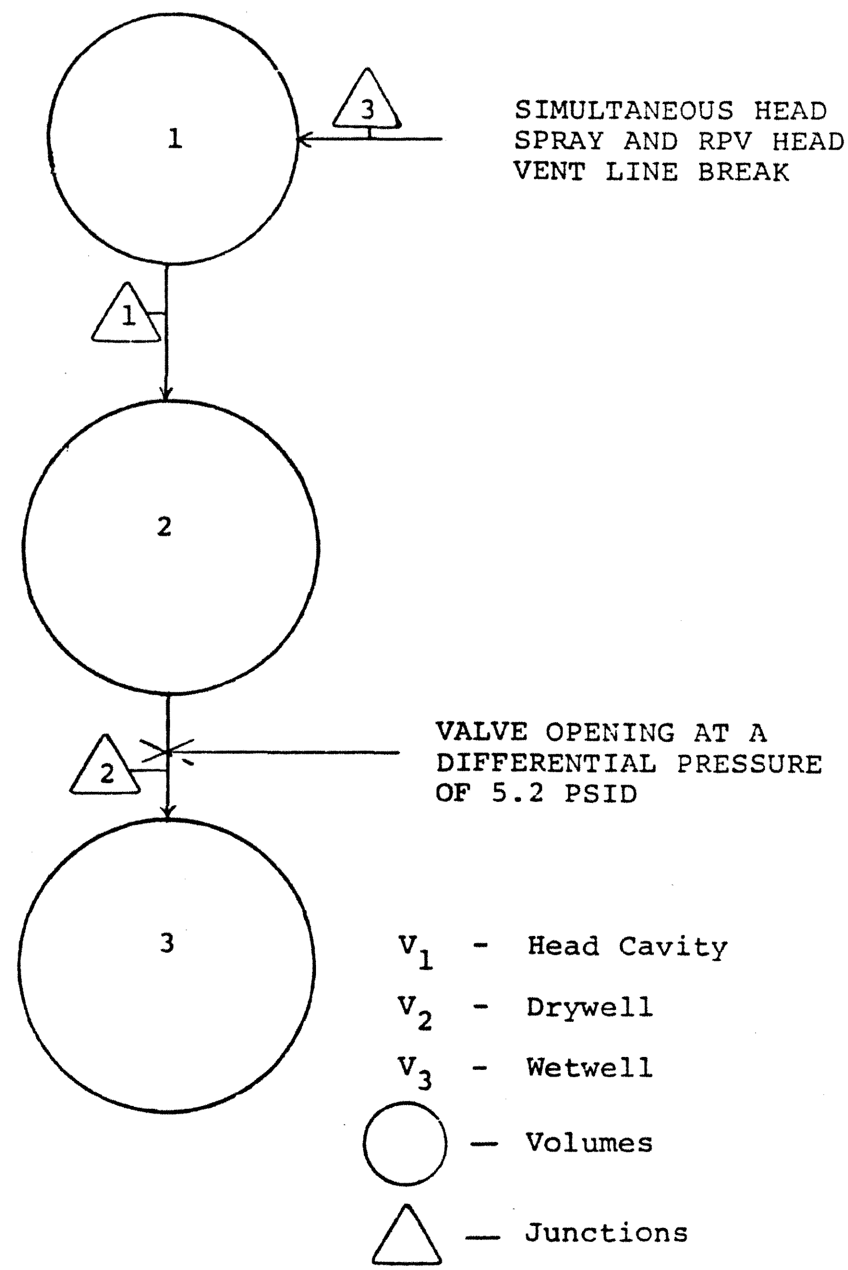

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FIGURE 6.2-19

HEAD SPRAY LINE BREAK NODALIZATION

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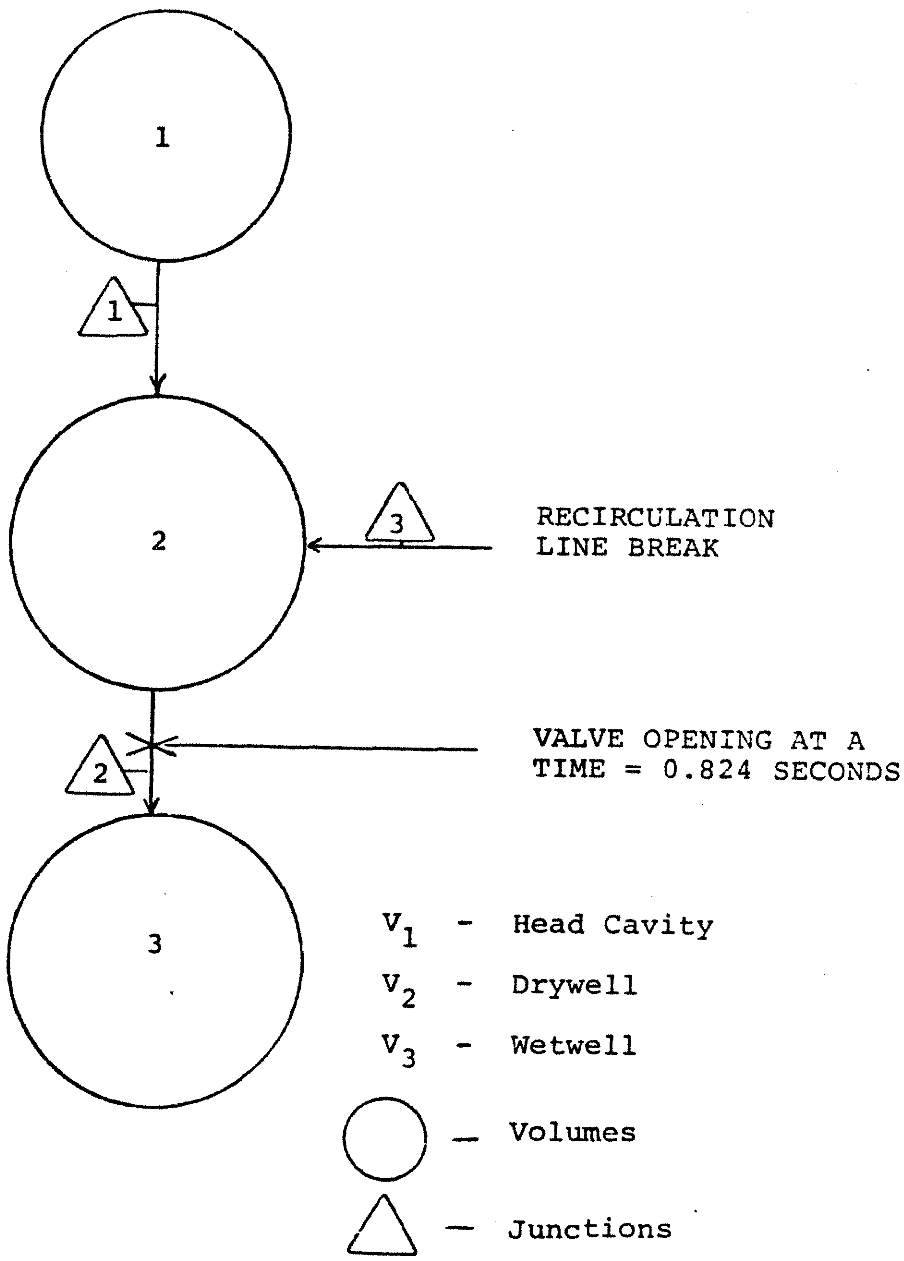

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FIGURE 6.2-20

RECIRCULATION LINE BREAK NODALIZATION

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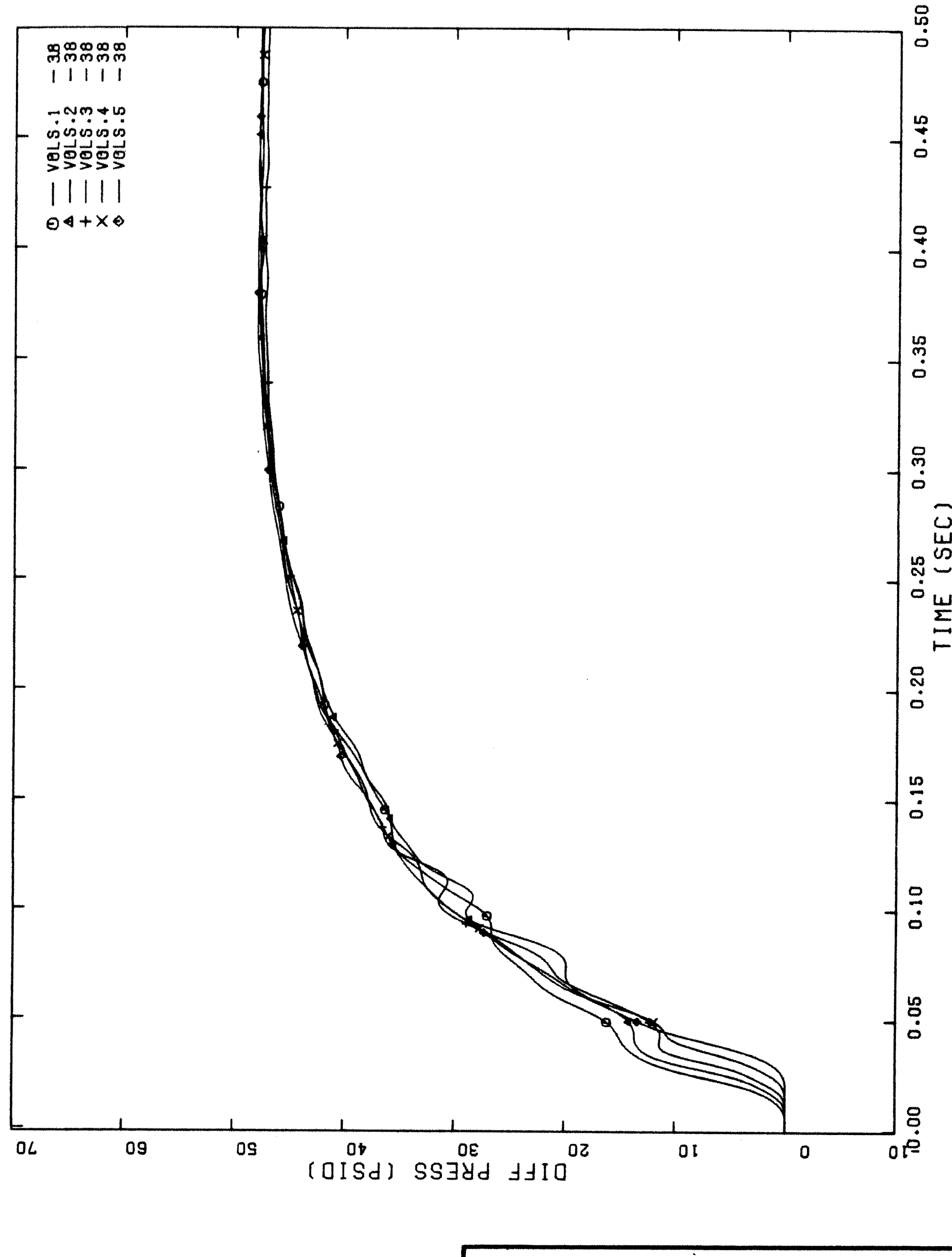

ΔP VS.t FOR LOWER REACTOR SKIRT

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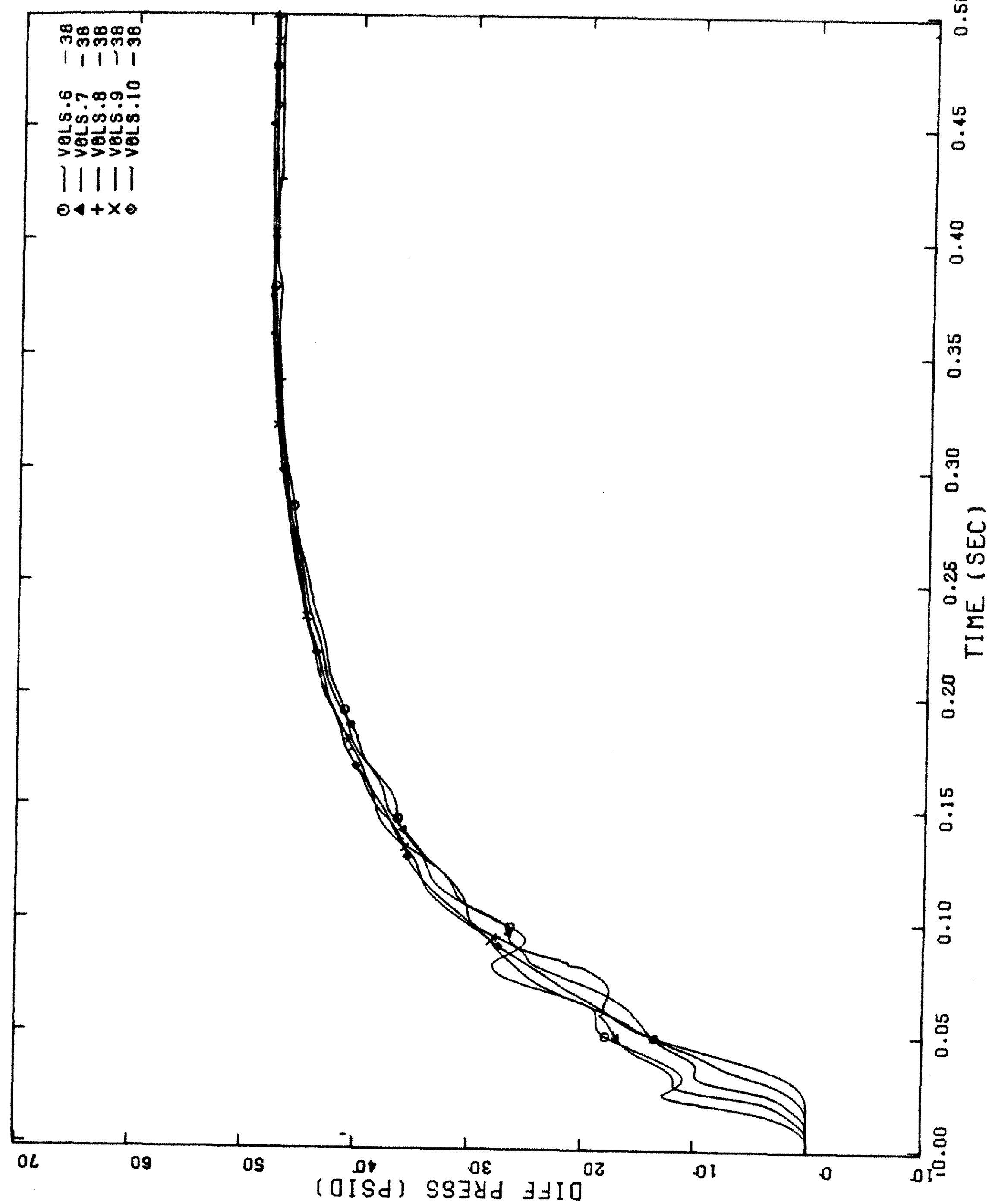
FIGURE 6.2-21 PRESSURE RESPONSE FOR RECIRCULATION LINE BREAK (SHEET 1 of 9) REV. 0 - APRIL 1984



ΔP VS. t FOR UPPER REACTOR SKIRT

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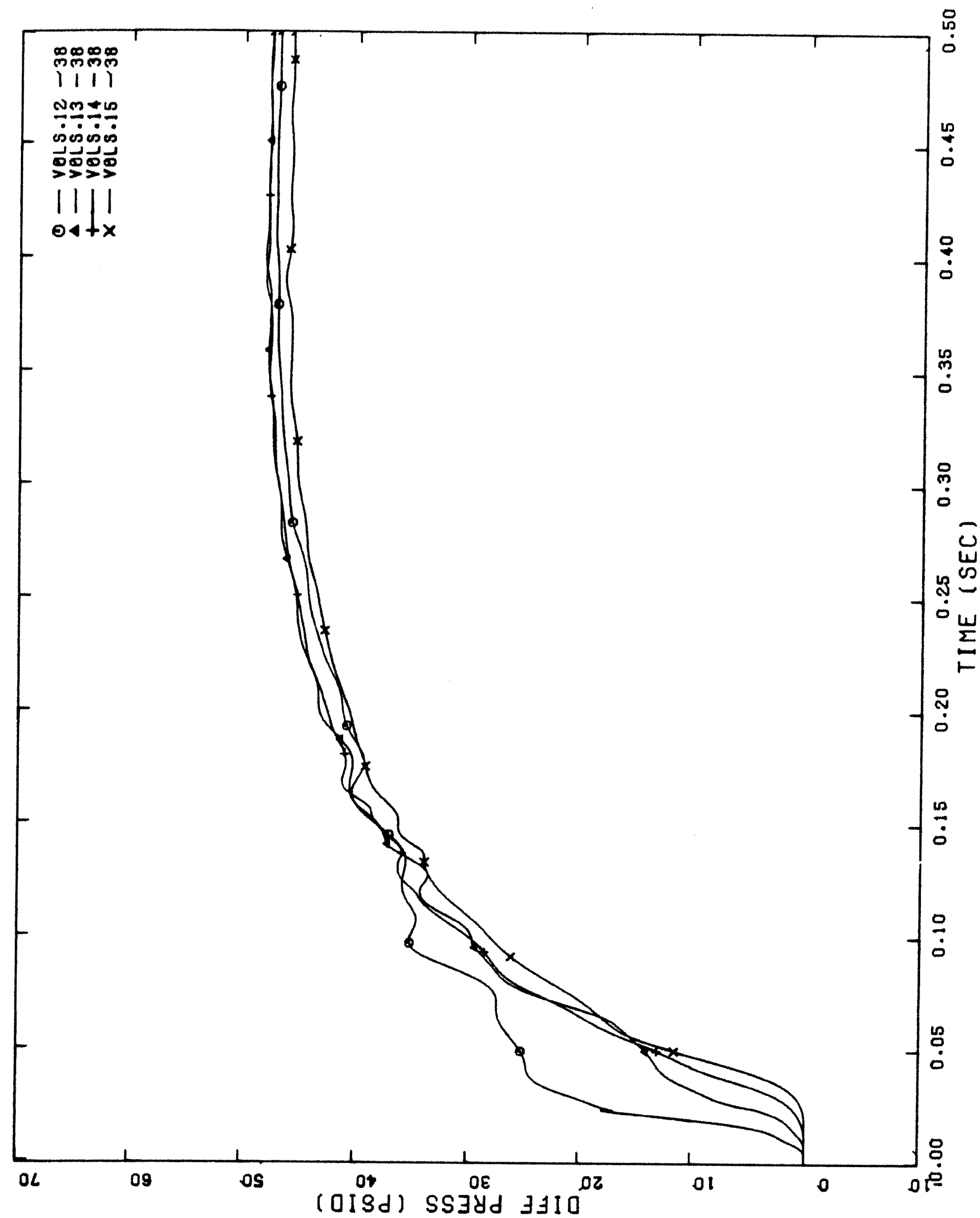
FIGURE 6.2-21 PRESSURE RESPONSE FOR RECIRCULATION LINE BREAK (SHEET 2 of 9) REV. 0 - APRIL 1984



ΔP VS. t FOR LOWER RECIRCULATION
NOZZLE SECTION

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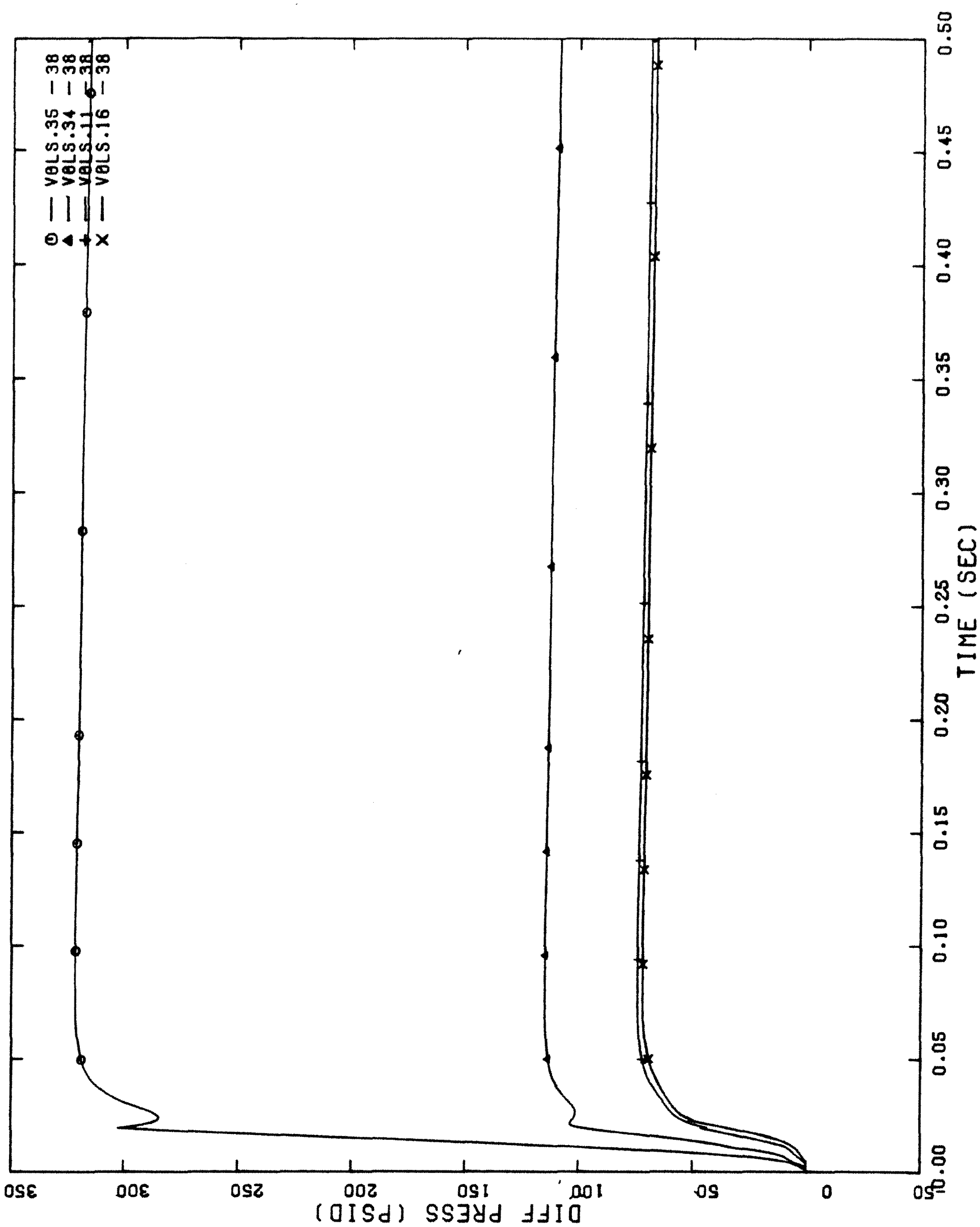
FIGURE 6.2-21 PRESSURE RESPONSE FOR RECIRCULATION LINE BREAK (SHEET 3 of 9) REV. 0 - APRIL 1984



ΔP VS. t ABOUT BREAK

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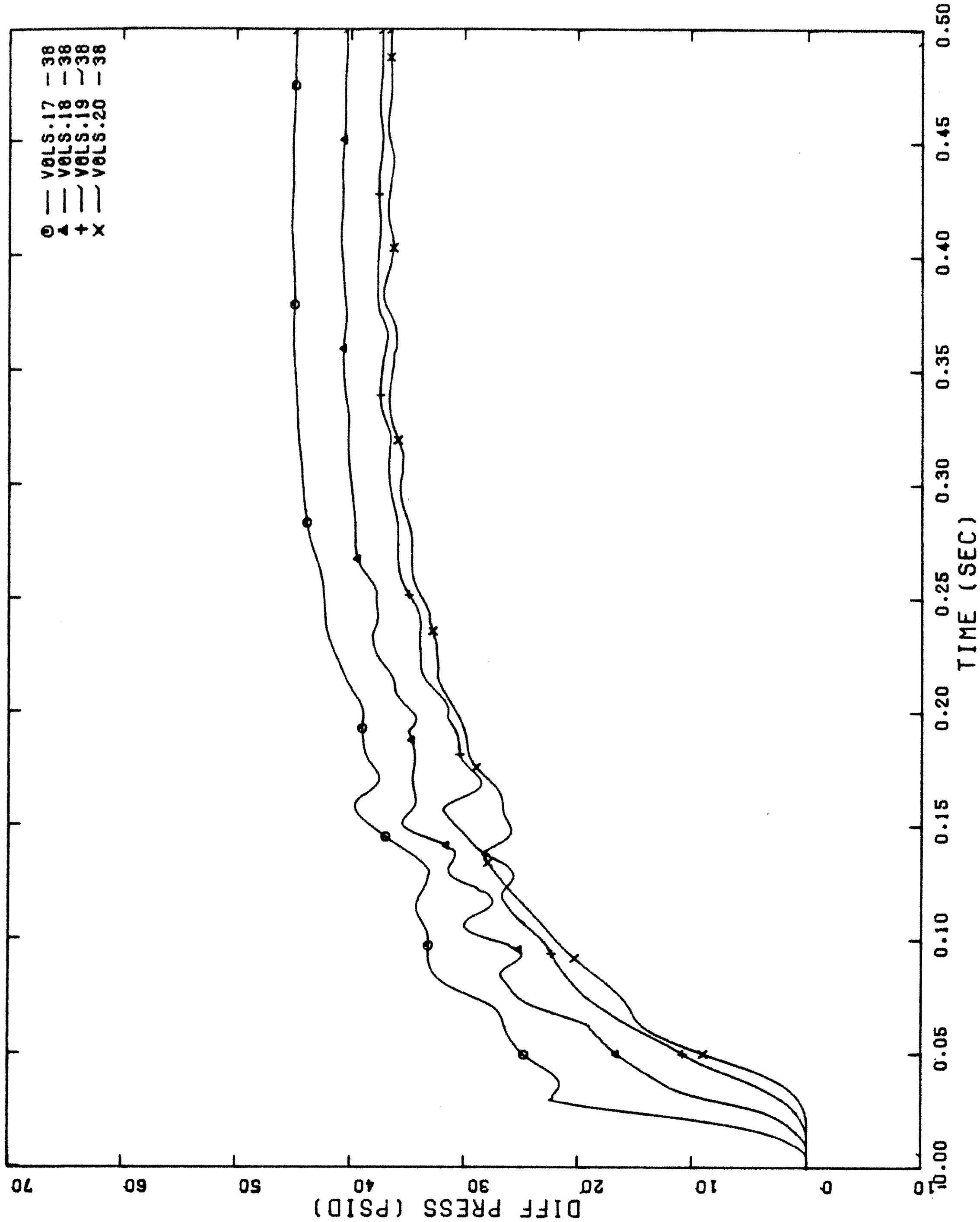
FIGURE 6.2-21 PRESSURE RESPONSE FOR RECIRCULATION LINE BREAK (SHEET 4 of 9) REV. 0 - APRIL 1984



ΔP VS. t FOR UPPER RECIRCULATION NOZZLE SECTION

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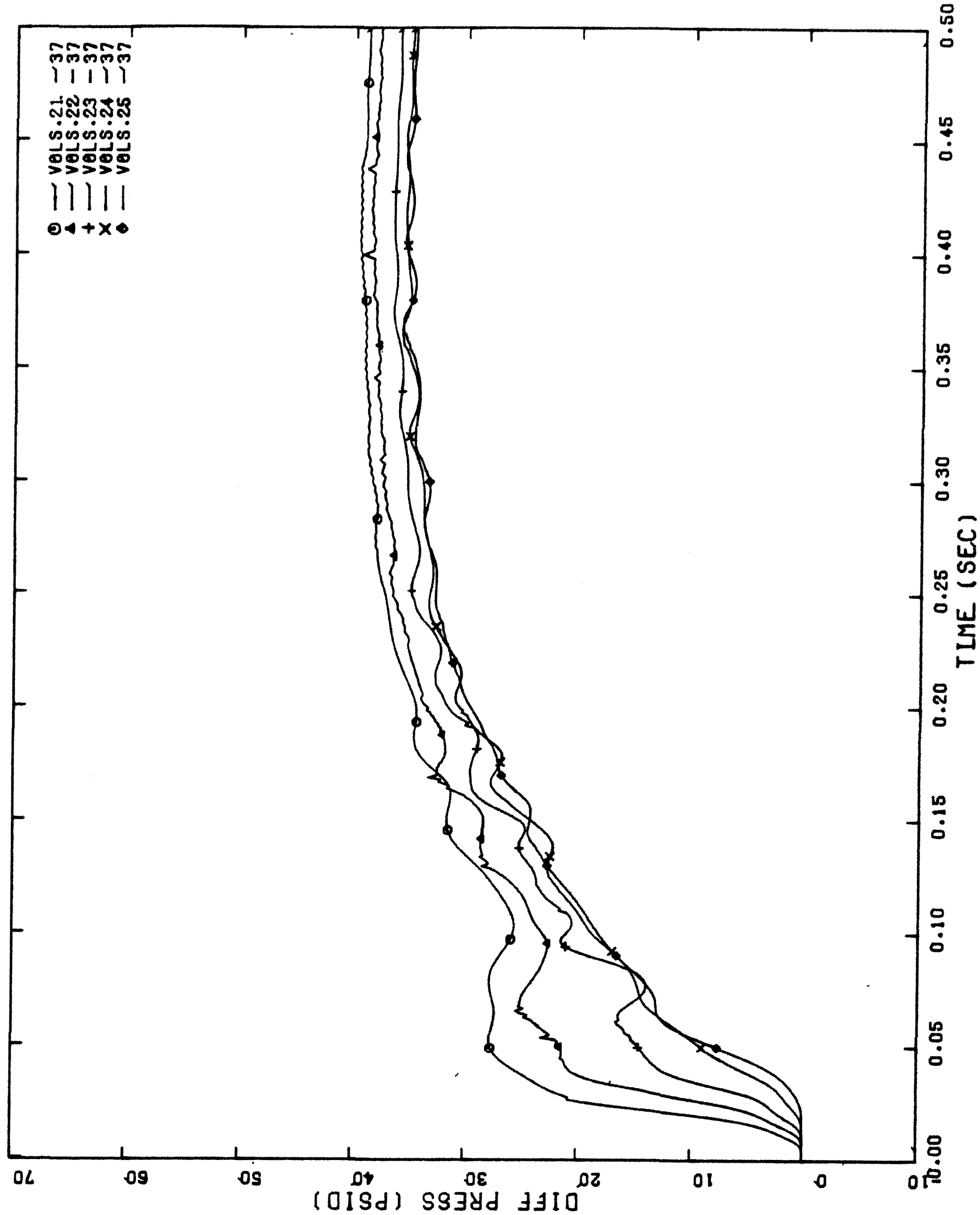
FIGURE 6.2-21 PRESSURE RESPONSE FOR RECIRCULATION LINE BREAK (SHEET 5 of 9) REV. 0 - APRIL 1984



ΔP VS. t FOR MID SECTION

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FIGURE 6.2-21

PRESSURE RESPONSE FOR RECIRCULATION LINE BREAK

(SHEET 6 of 9)

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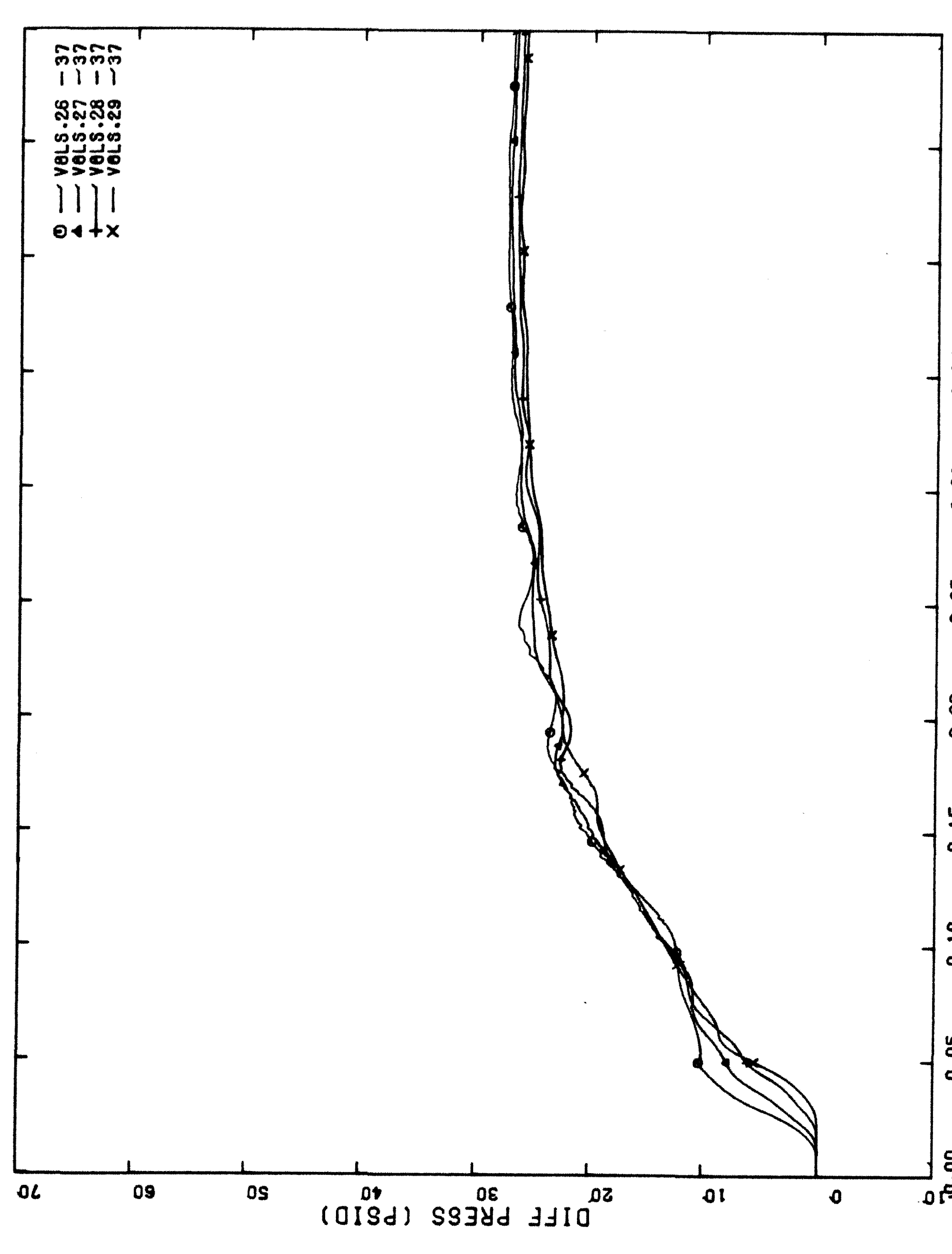

ΔP VS. t FOR LPCI NOZZLE SECTION

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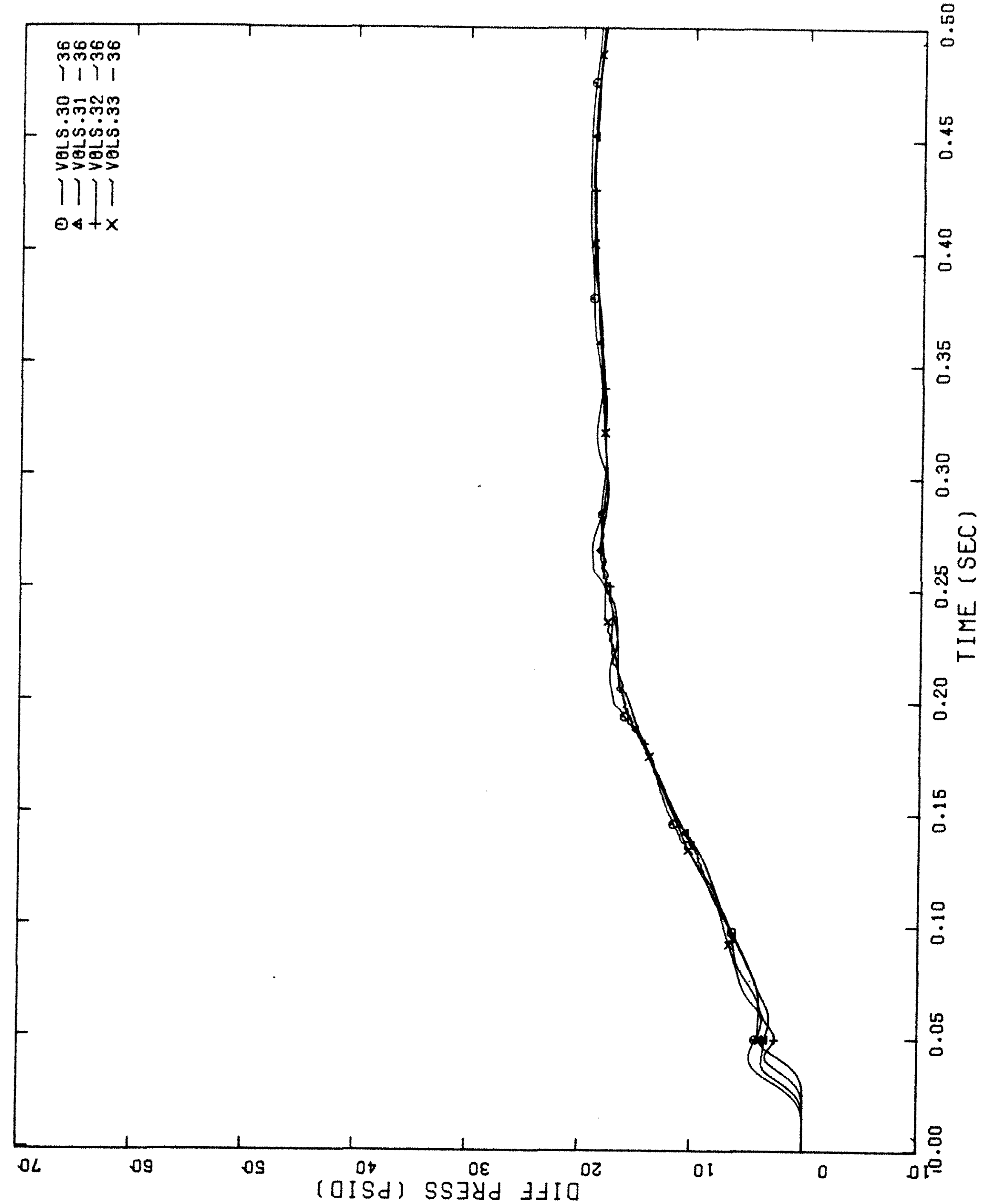
FIGURE 6.2-21 PRESSURE RESPONSE FOR RECIRCULATION LINE BREAK (SHEET 7 of 9) REV. 0 - APRIL 1984



ΔP VS. t FOR FEEDWATER NOZZLE SECTION

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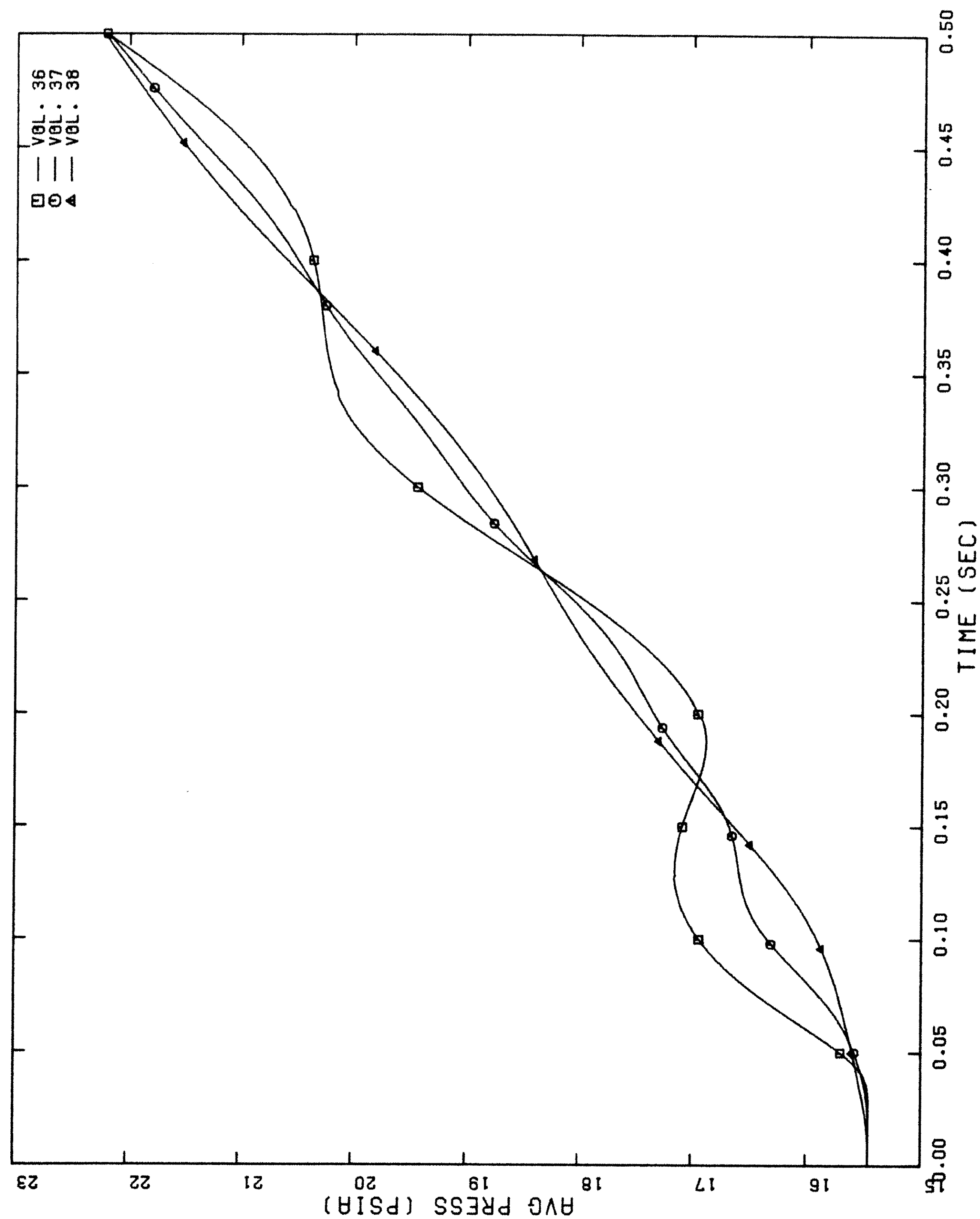
FIGURE 6.2-21

PRESSURE RESPONSE FOR RECIRCULATION LINE BREAK

(SHEET 8 of 9)

REV. 0 - APRIL 1984



CONTAINMENT PRESSURE RESPONSE

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FIGURE 6.2-21 PRESSURE RESPONSE FOR RECIRCULATION LINE BREAK (SHEET 9 of 9) REV. 0 - APRIL 1984

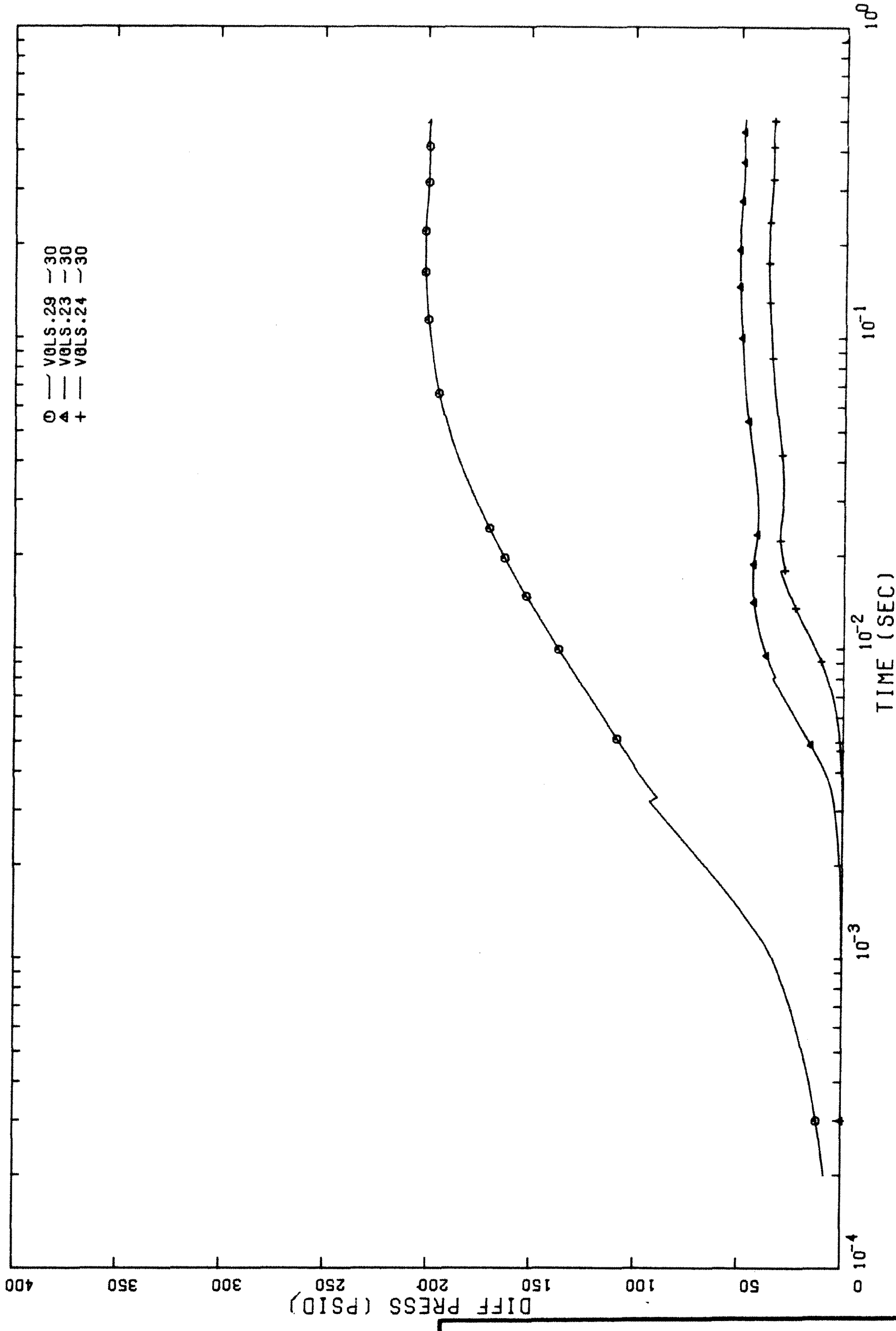

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FIGURE 6.2-22

ΔP VS. LOG t ABOUT BREAK - FEEDWATER LINE BREAK

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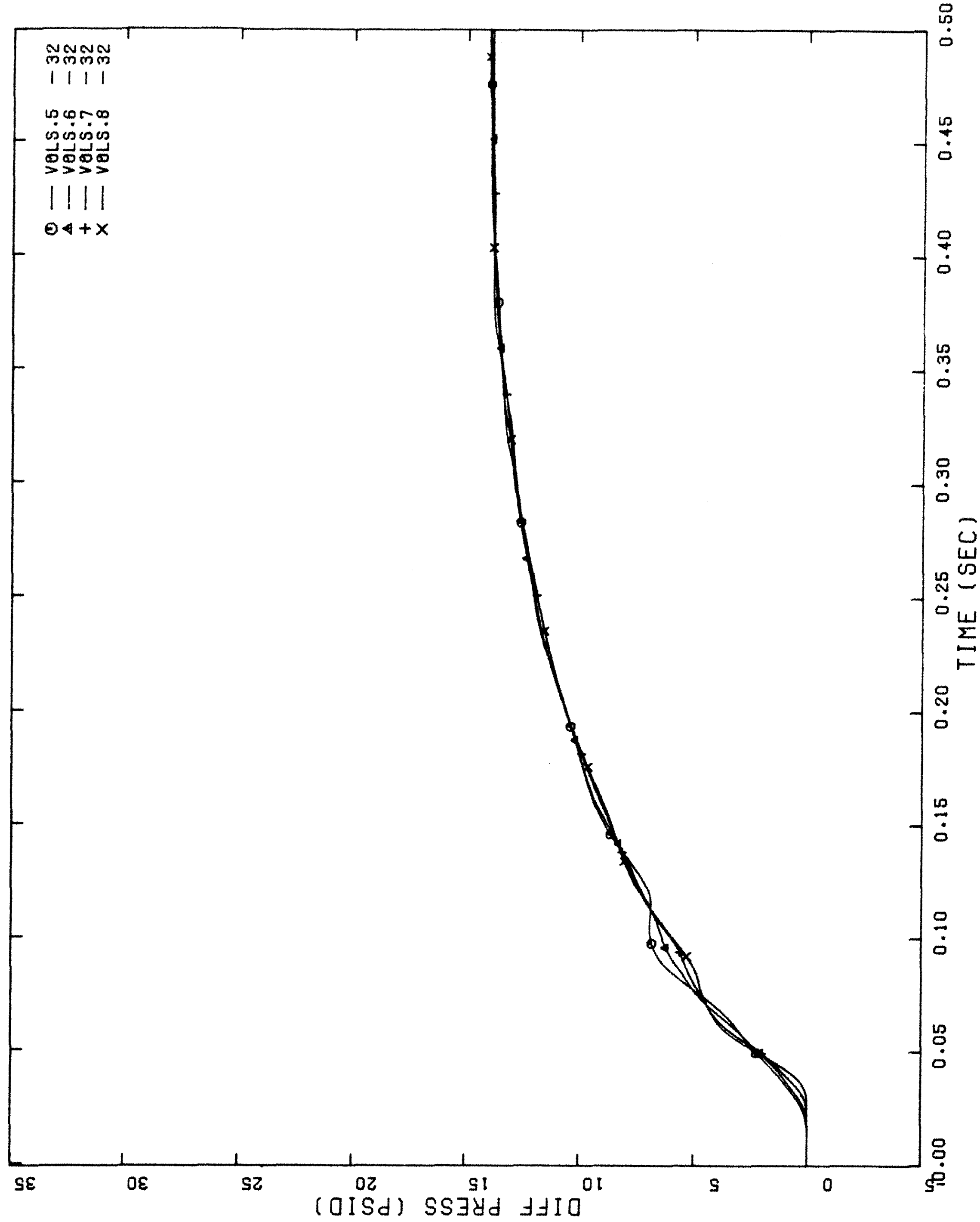

ΔP VS. t FOR LOWER REACTOR SKIRT

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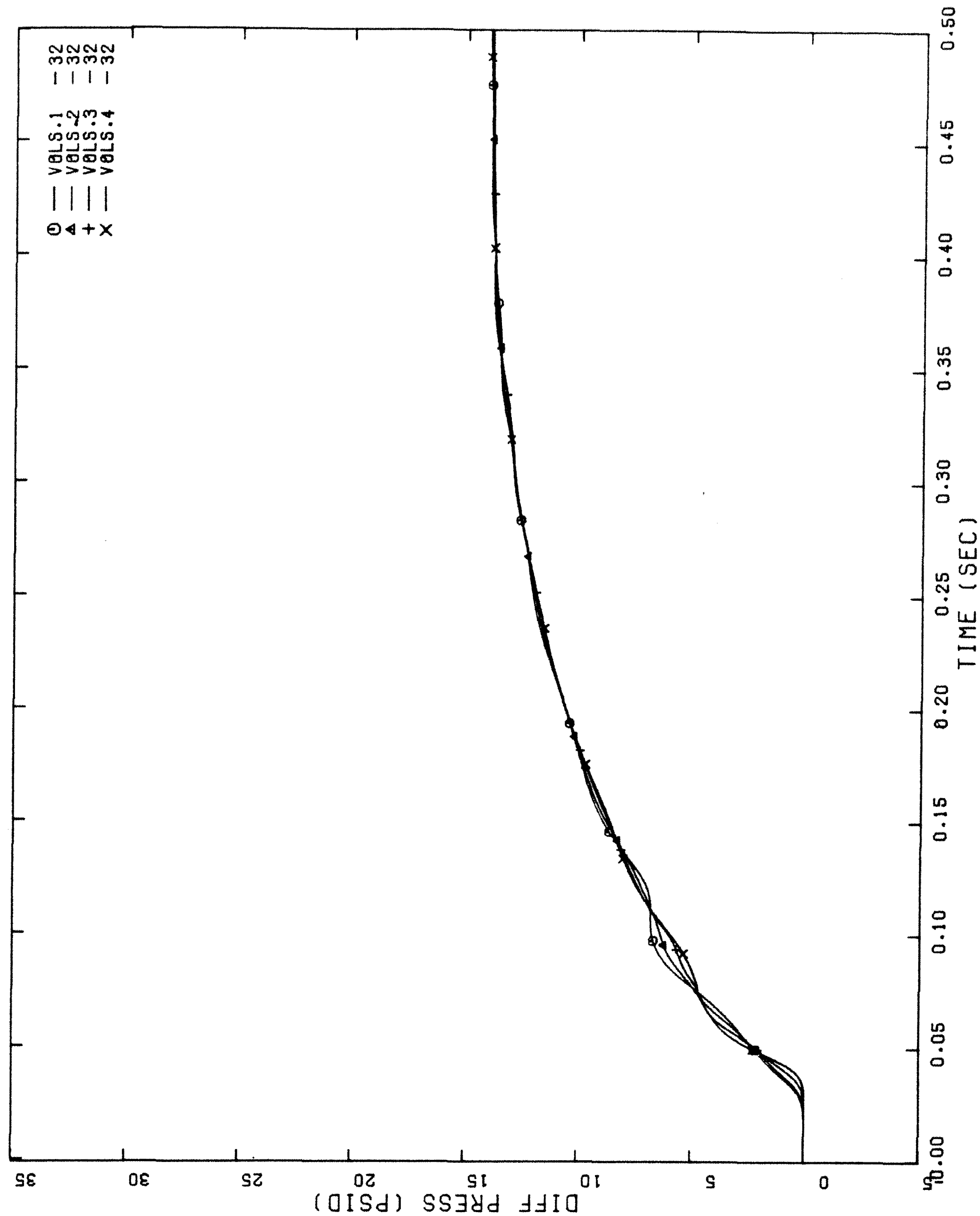
FIGURE 6.2-23

PRESSURE RESPONSE FOR FEEDWATER LINE BREAK

(SHEET 1 of 8)

REV. 0 - APRIL 1984



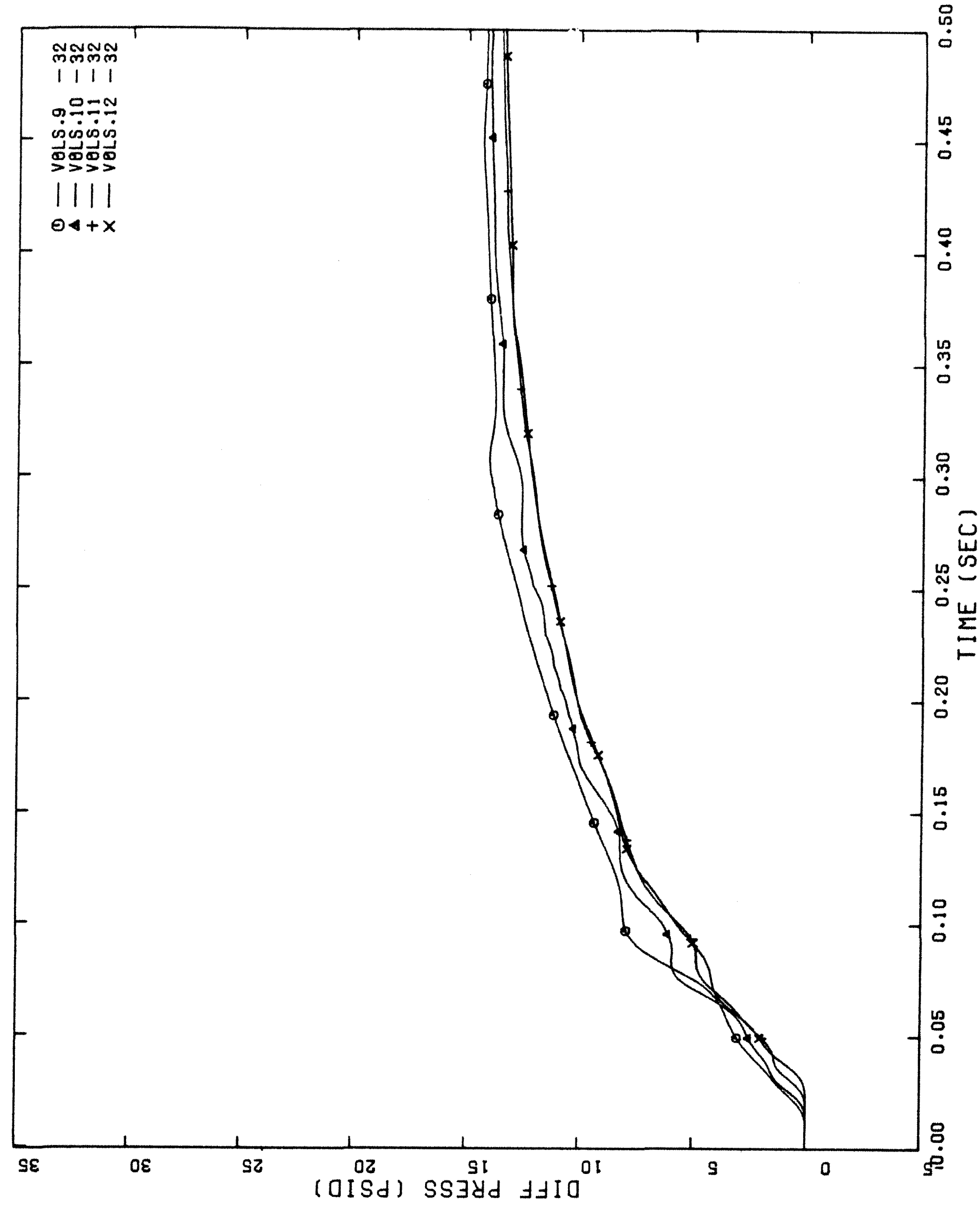
ΔP VS. t FOR UPPER REACTOR SKIRT

LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-23

PRESSURE RESPONSE FOR FEEDWATER LINE BREAK
(SHEET 2 of 8)

REV. 0 - APRIL 1984



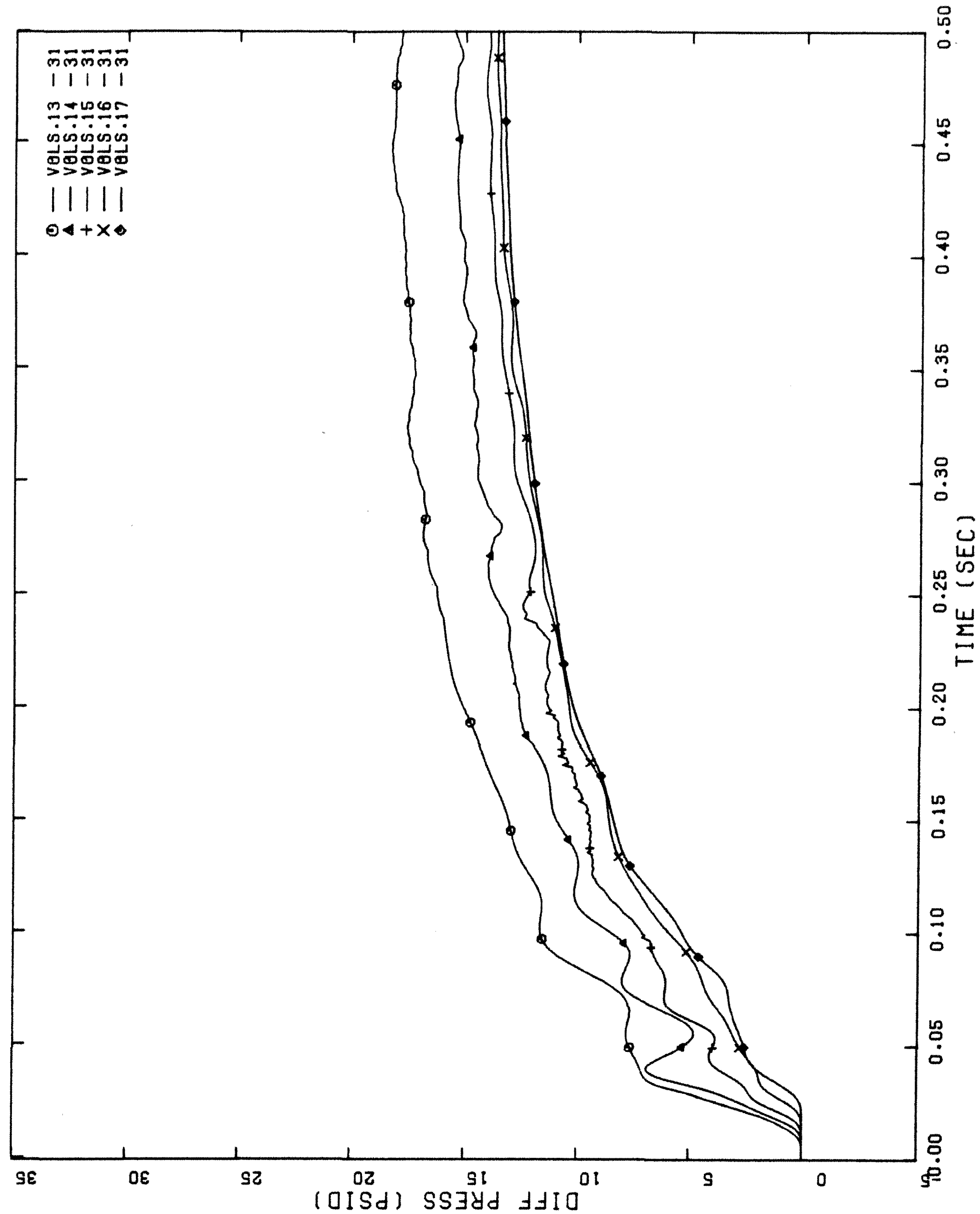
ΔP VS. t FOR RECIRCULATION NOZZLE SECTION

LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-23

PRESSURE RESPONSE FOR FEEDWATER LINE BREAK
(SHEET 3 of 8)

REV. 0 - APRIL 1984



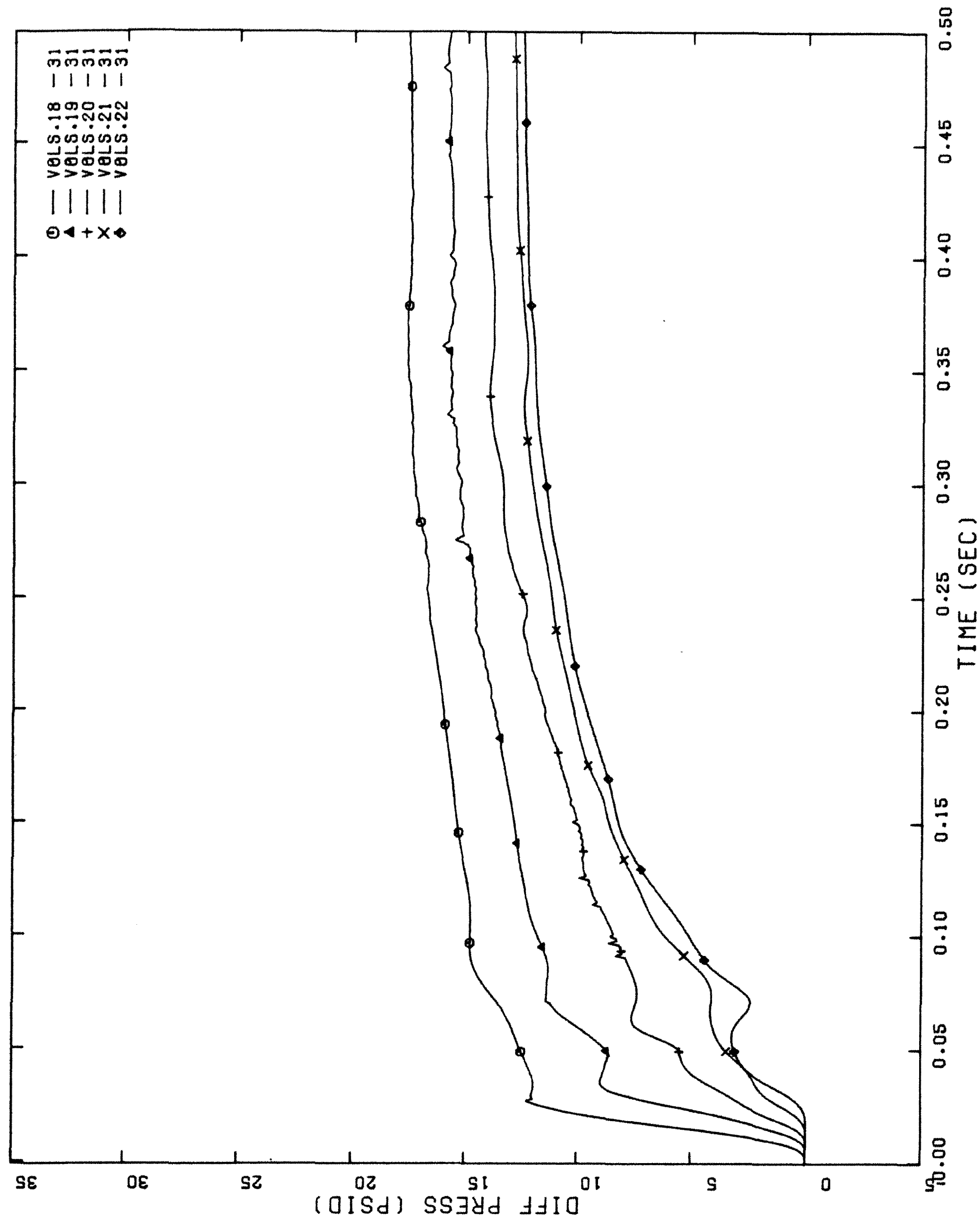
ΔP VS. t FOR MID SECTION

LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-23

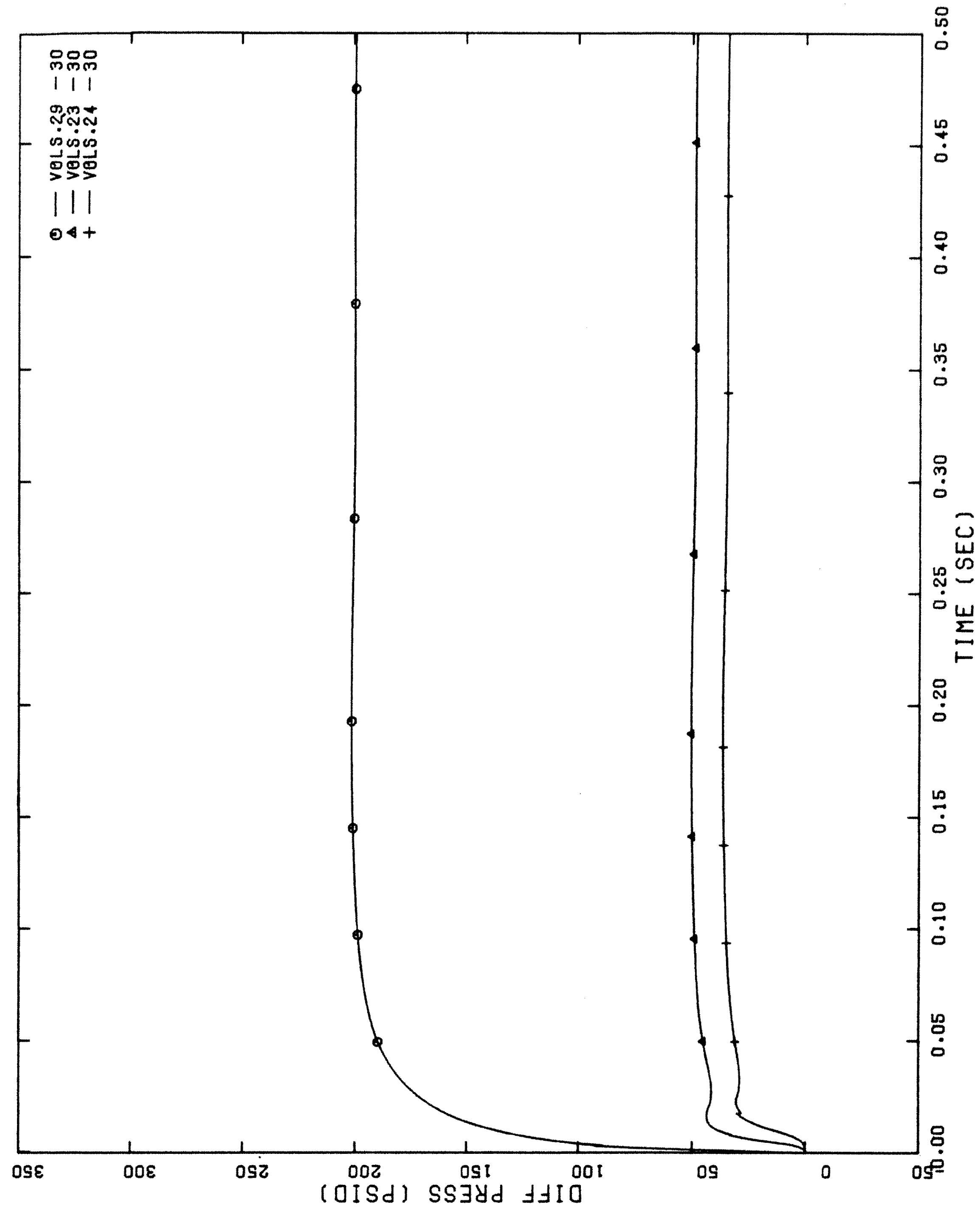
PRESSURE RESPONSE FOR FEEDWATER LINE BREAK
(SHEET 4 of 8)

REV. 0 - APRIL 1984



ΔP VS. t FOR LPCI NOZZLE SECTION

LA SALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.2-23 PRESSURE RESPONSE FOR FEEDWATER LINE BREAK (SHEET 5 of 8) REV. 0 - APRIL 1984



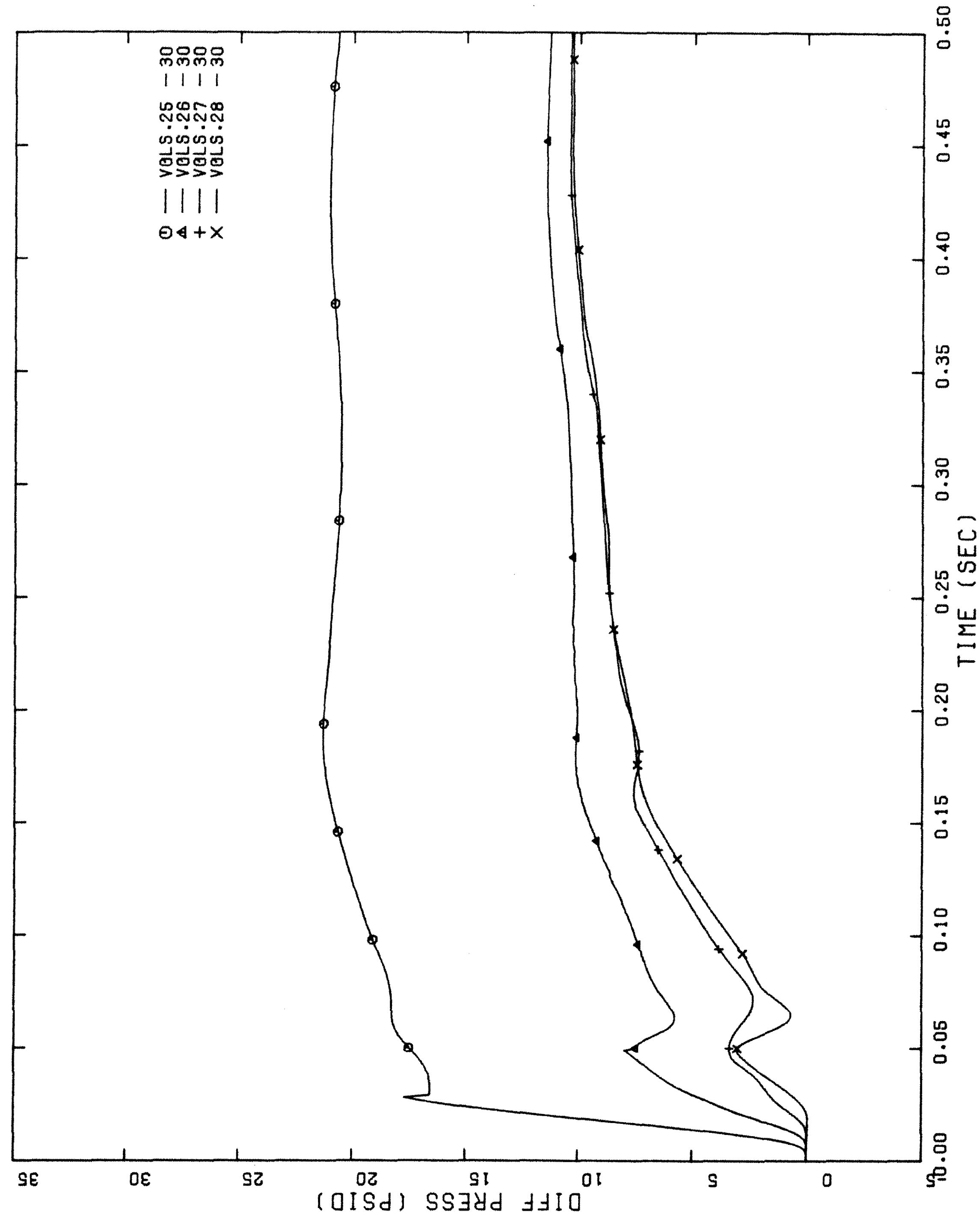
ΔP VS. t ABOUT BREAK

LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-23

PRESSURE RESPONSE FOR FEEDWATER LINE BREAK
(SHEET 6 of 8)

REV. 0 - APRIL 1984



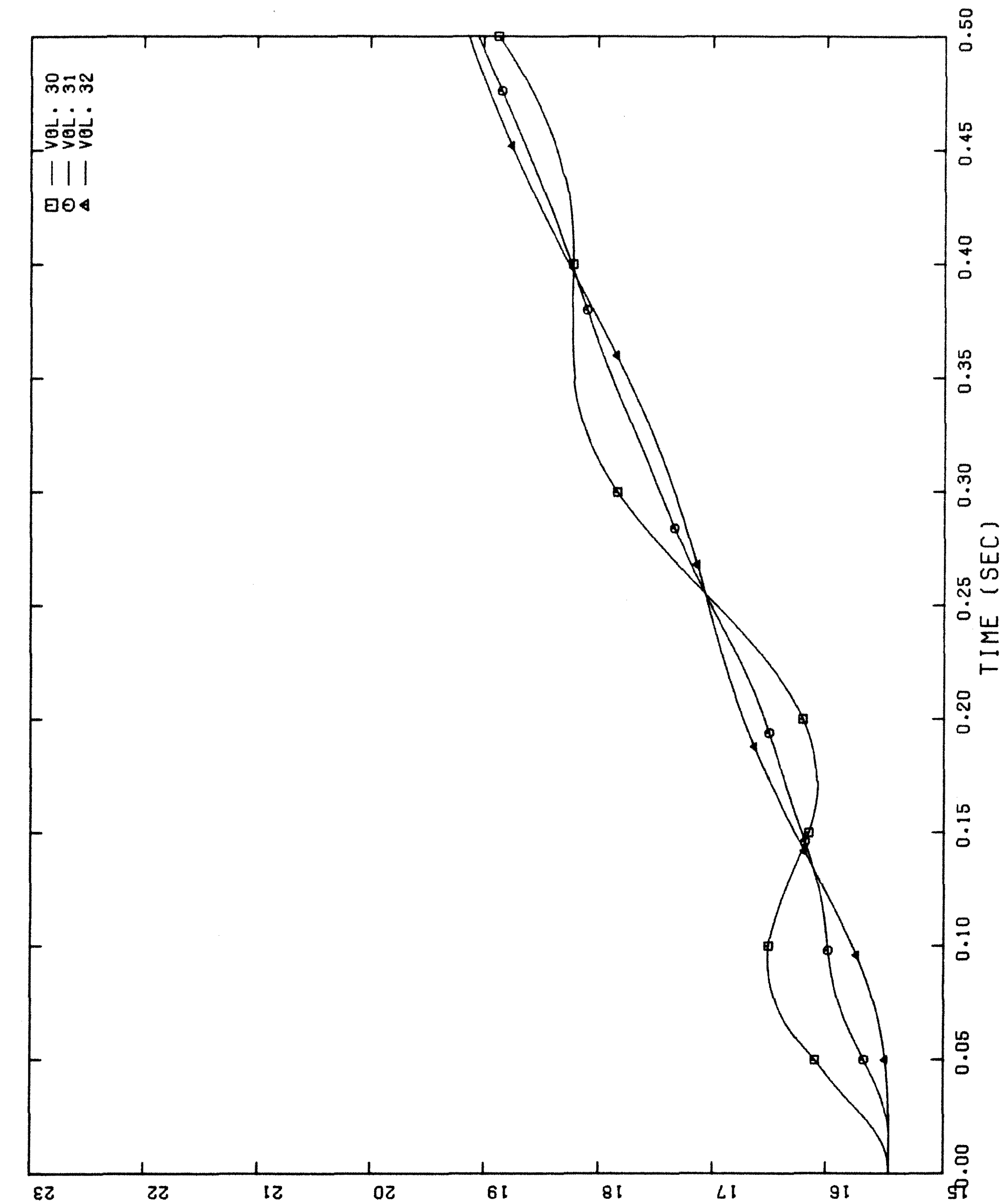
ΔP VS. t FOR FEEDWATER NOZZLE SECTION

LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-23

PRESSURE RESPONSE FOR FEEDWATER LINE BREAK
(SHEET 7 of 8)

REV. 0 - APRIL 1984



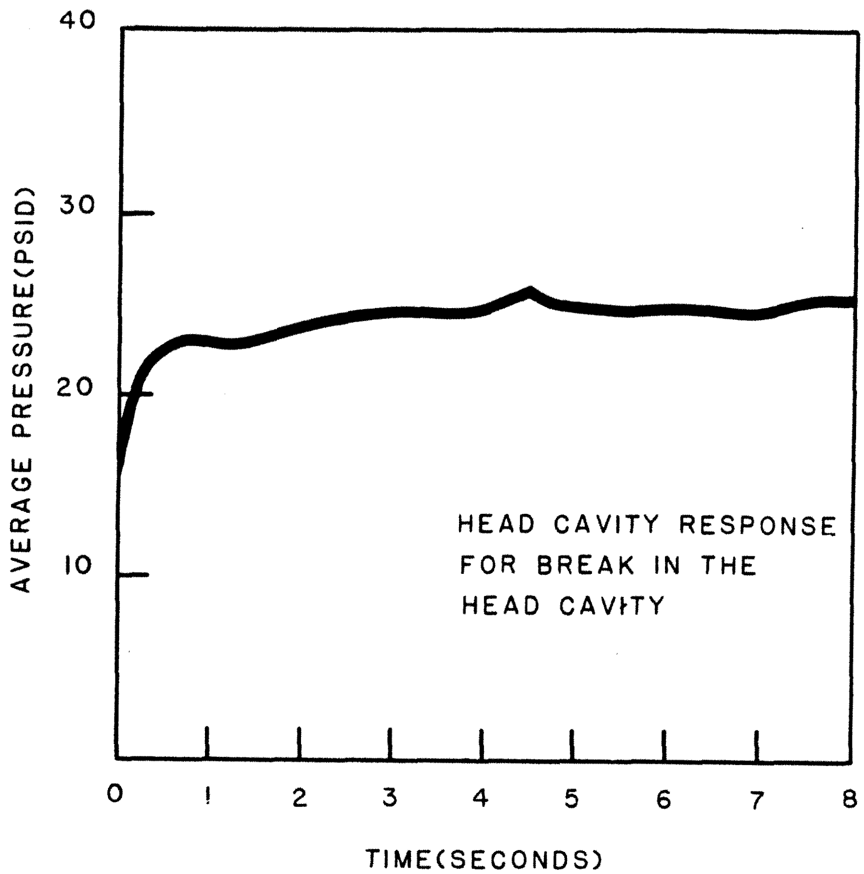
CONTAINMENT PRESSURE RESPONSE

LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-23

PRESSURE RESPONSE FOR FEEDWATER LINE BREAK
(SHEET 8 of 8)

REV. 0 - APRIL 1984

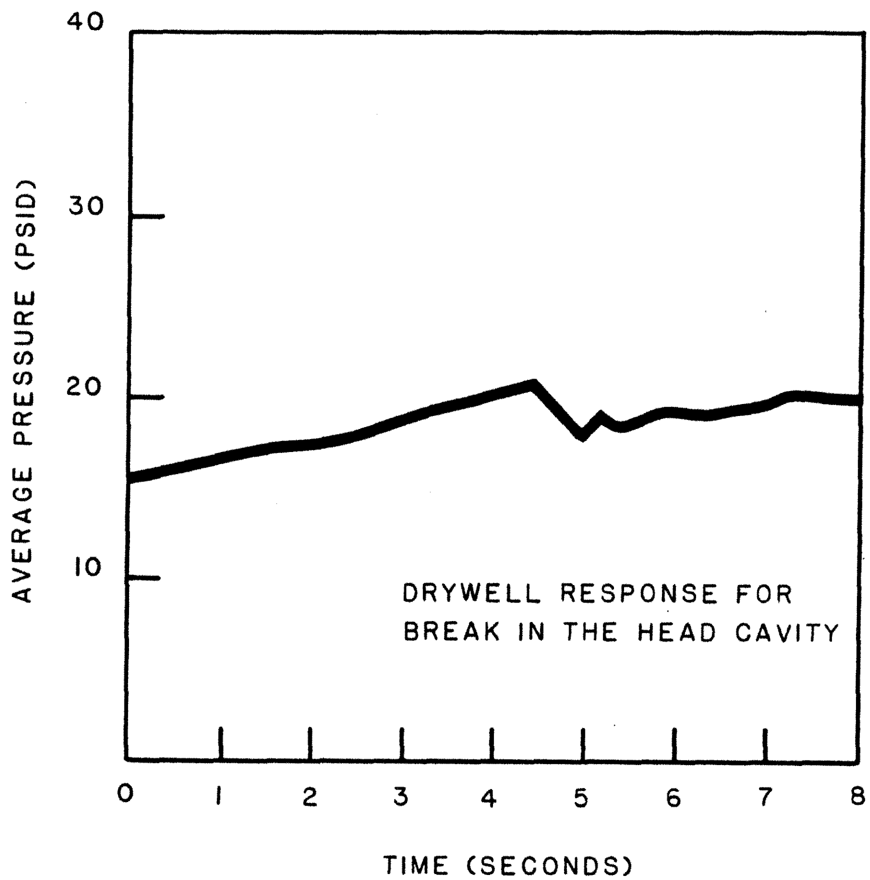


LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-24

PRESSURE HISTORIES OF NODES FOR WORST BREAK CASES

(SHEET 1 of 4)



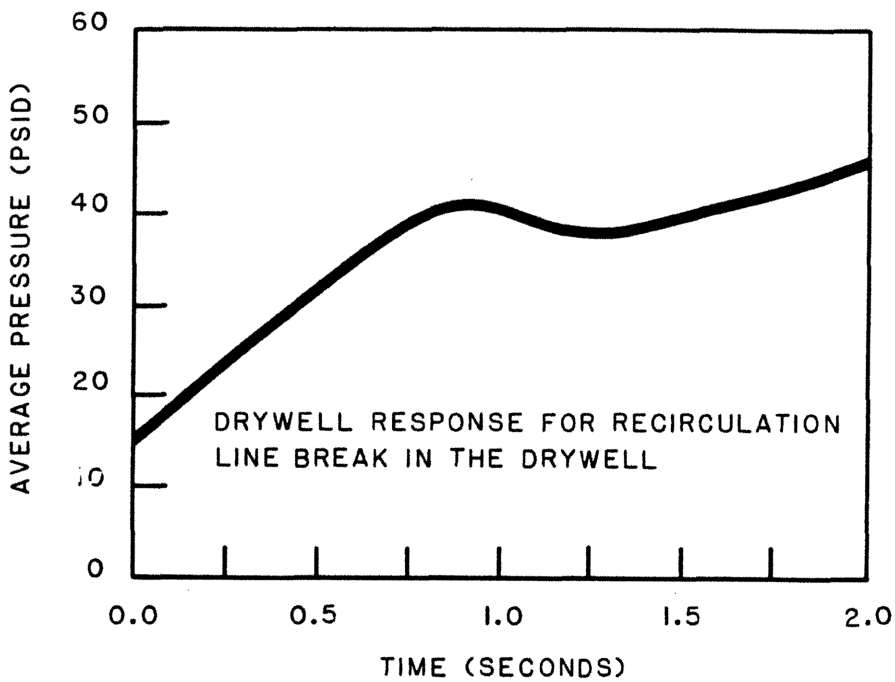
LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-24

PRESSURE HISTORIES OF NODES
FOR WORST BREAK CASES

(SHEET 2 of 4)

REV. 0 - APRIL 1984

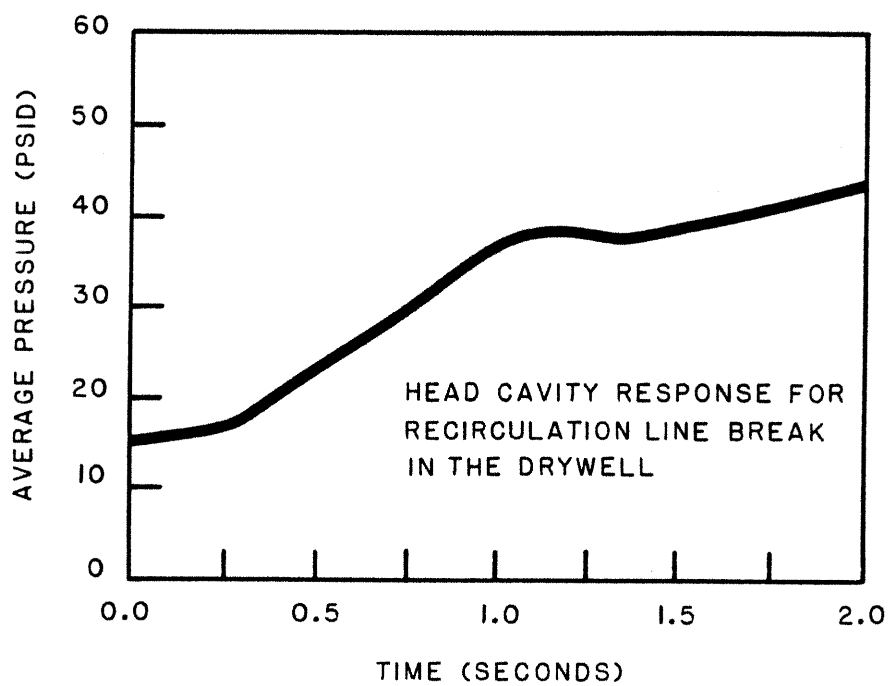


LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-24

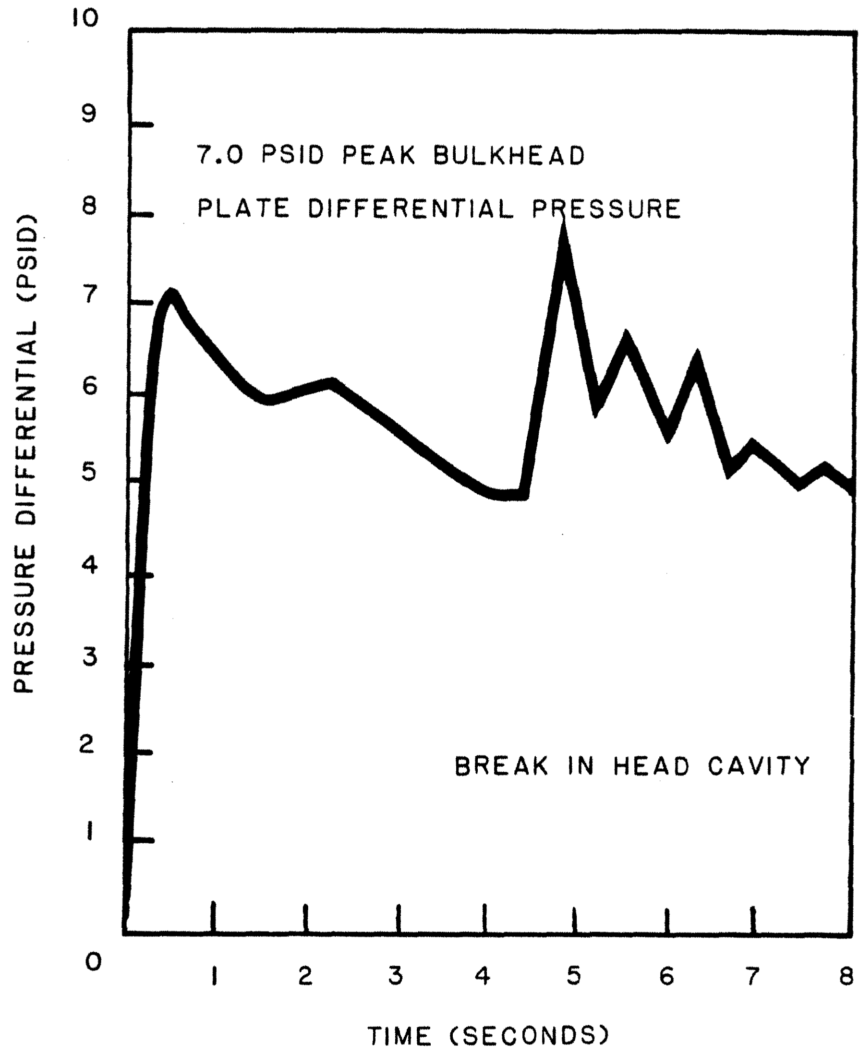
PRESSURE HISTORIES OF NODES FOR WORST BREAK CASES

(SHEET 3 of 4)



LA SALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.2-24 PRESSURE HISTORIES OF NODES FOR WORST BREAK CASES (SHEET 4 of 4)

REV. 0 - APRIL 1984



LA SALLE COUNTY STATION
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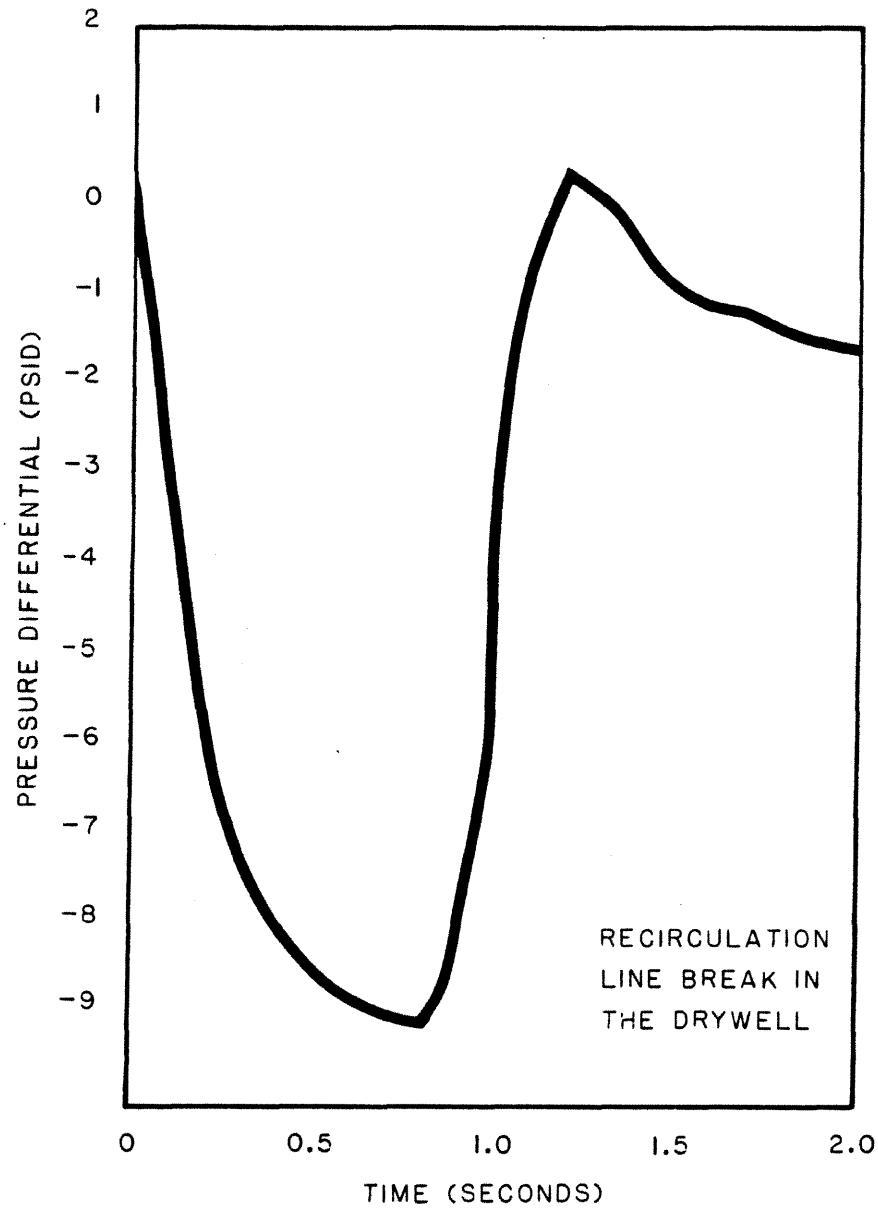
FIGURE 6.2-25

PRESSURE DIFFERENTIAL ACROSS THE BULKHEAD PLATE FOR THE WORST BREAK CASES

(SHEET 1 of 2)

REV. 0 - APRIL 1984



LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2- 25

PRESSURE DIFFERENTIAL ACROSS THE BULKHEAD PLATE FOR THE WORST BREAK CASES

(SHEET 2 of 2)

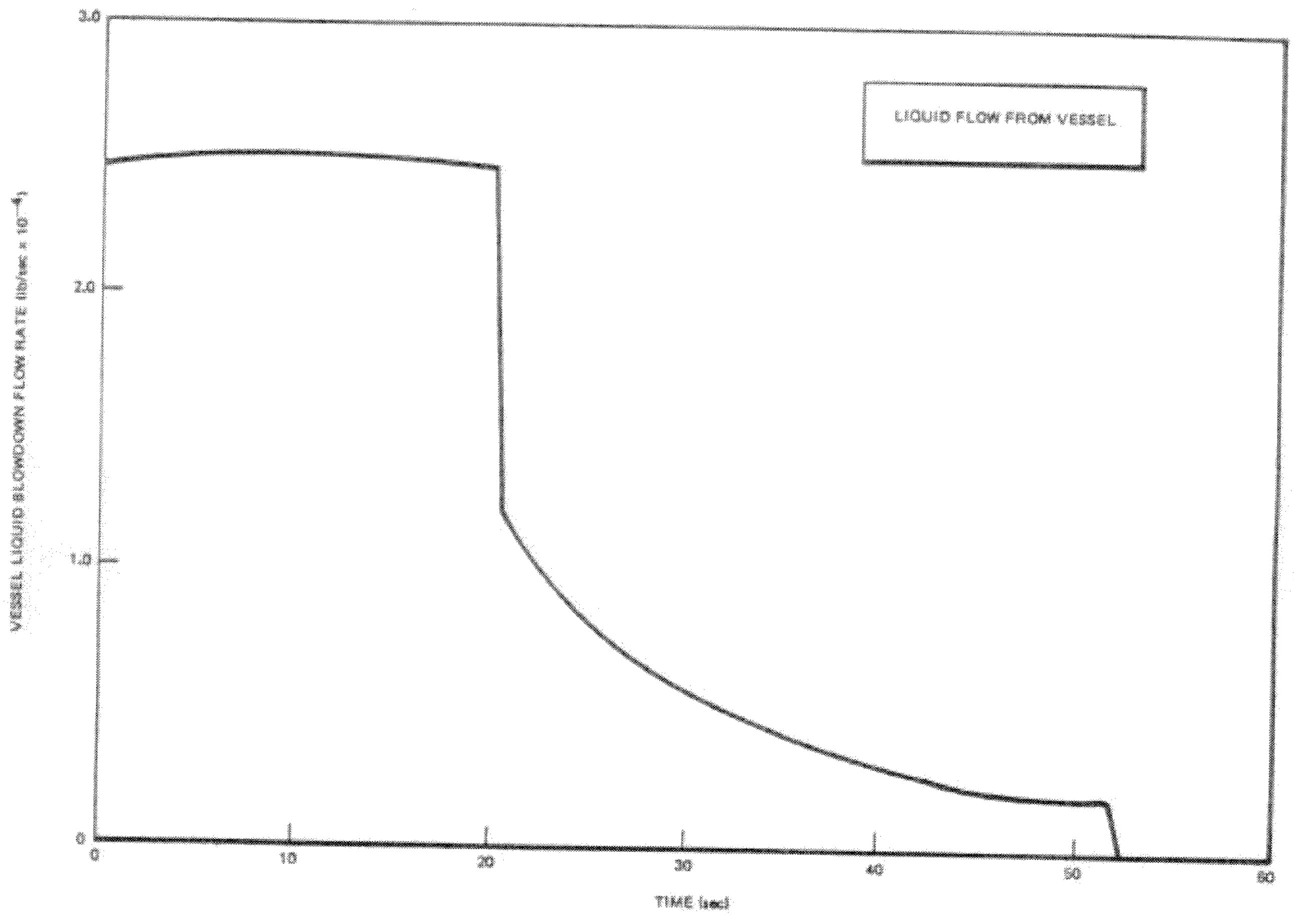


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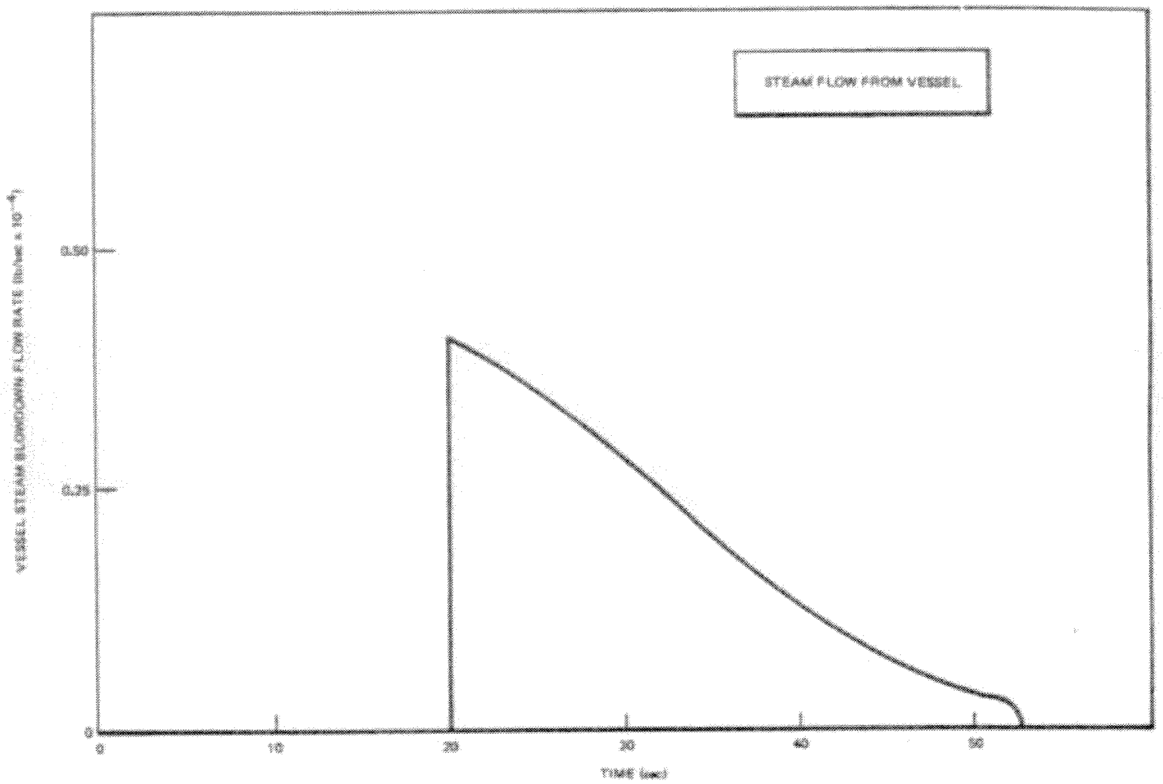
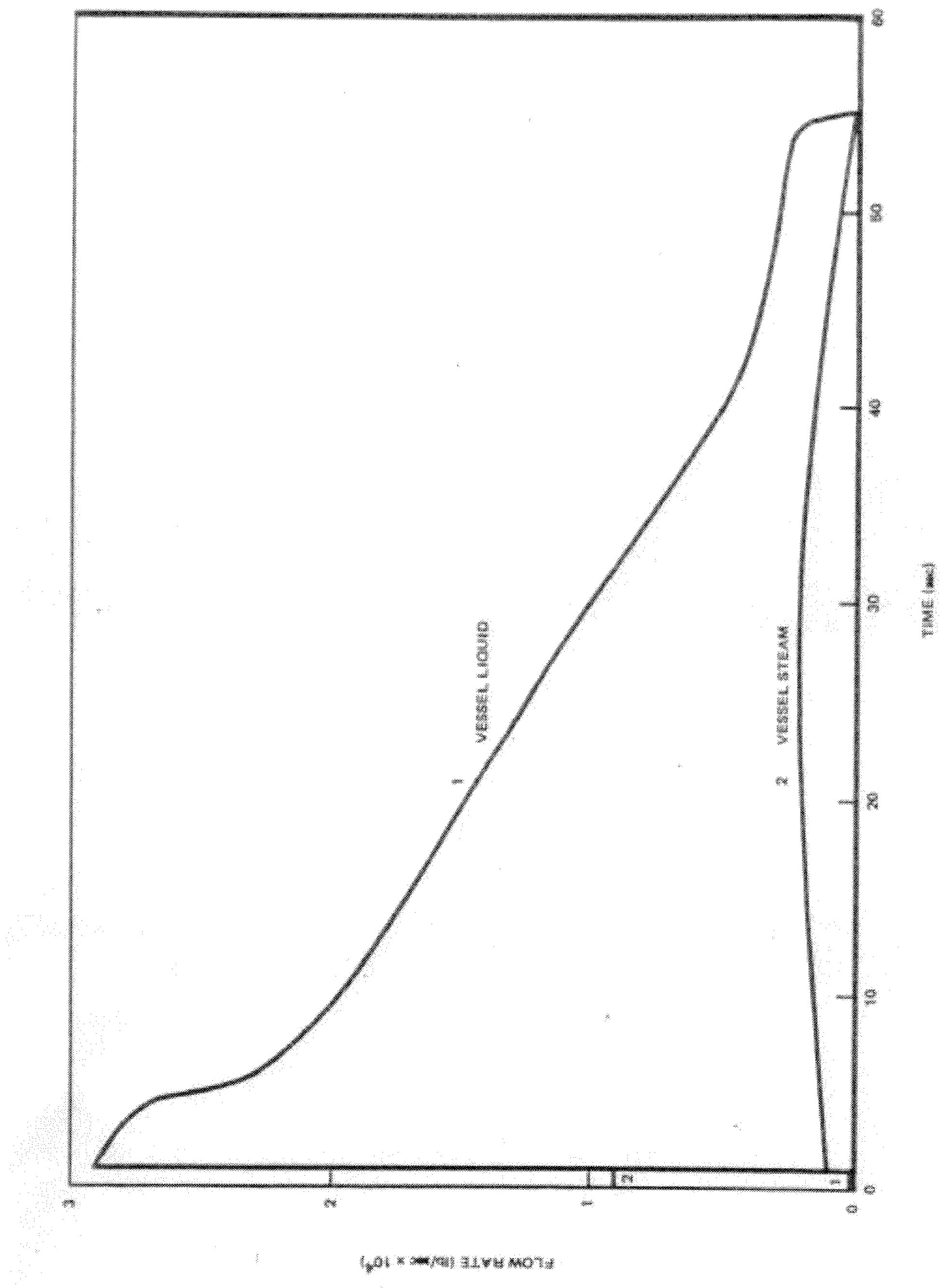
FIGURE 6.2-26 VESSEL LIQUID BLOWDOWN RATE (At 3434 MWt)



LASALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-27

VESSEL STEAM BLOWDOWN RATE
(At 3434 MWt)



LASALLE COUNTY STATION
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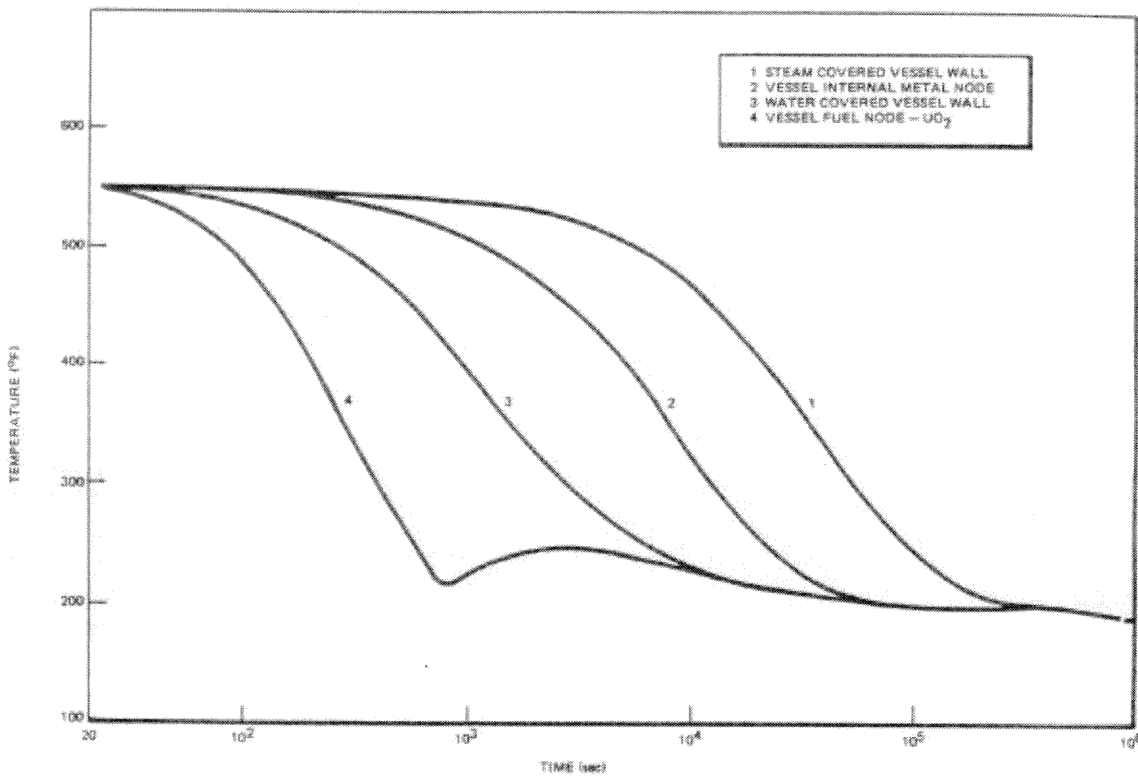
FIGURE 6.2-28

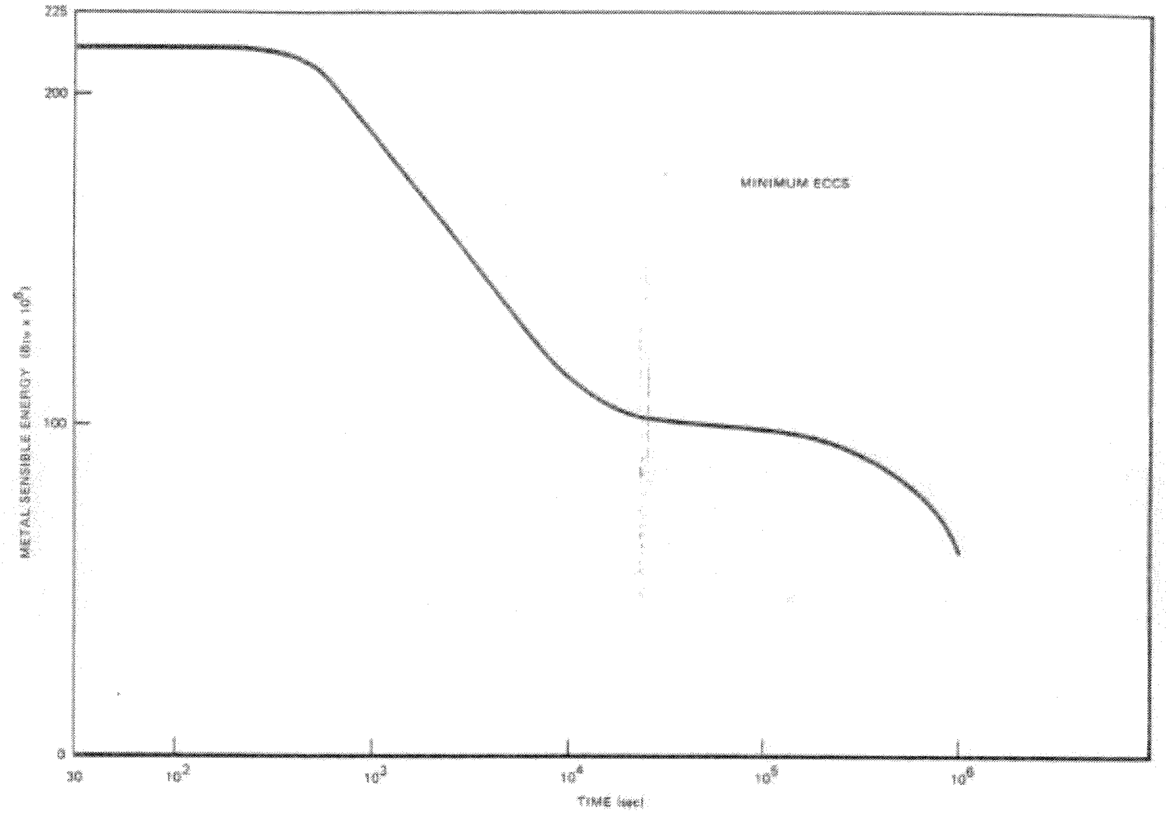
MAIN STEAMLINE BREAK RESPONSE
PARAMETERS BLOWDOWN FLOW
(At 3434 MWt)



LASALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-29

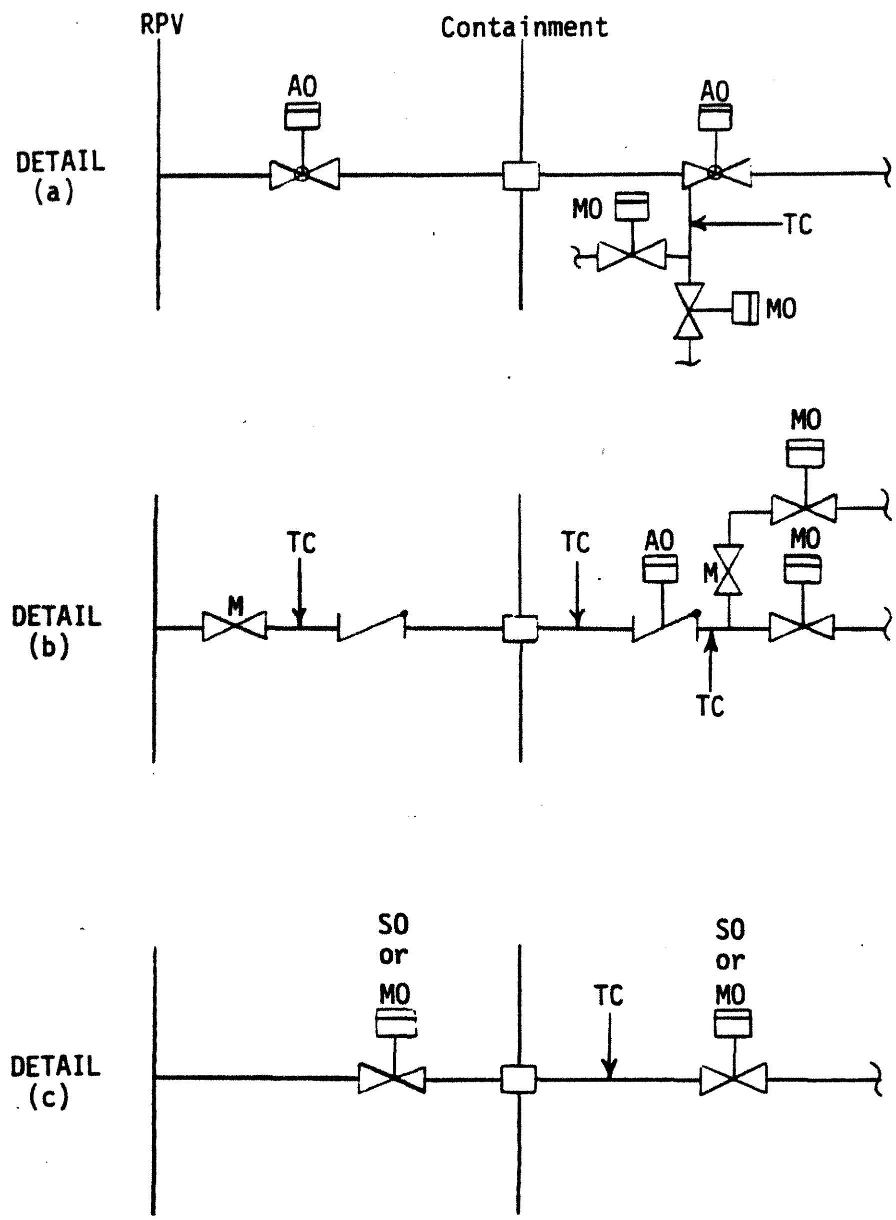
TEMPERATURE RESPONSE OR REACTOR VESSEL
(At 3434 MWt)



LASALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-30

SENSIBLE ENERGY TRANSIENT IN THE REACTOR VESSEL AND INTERNAL METALS (At 3434 MWt)



NOTE: TC DESIGNATES TEST CONNECTION.

LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS

(SHEET 1 of 10)

REV. 9 - APRIL 1993

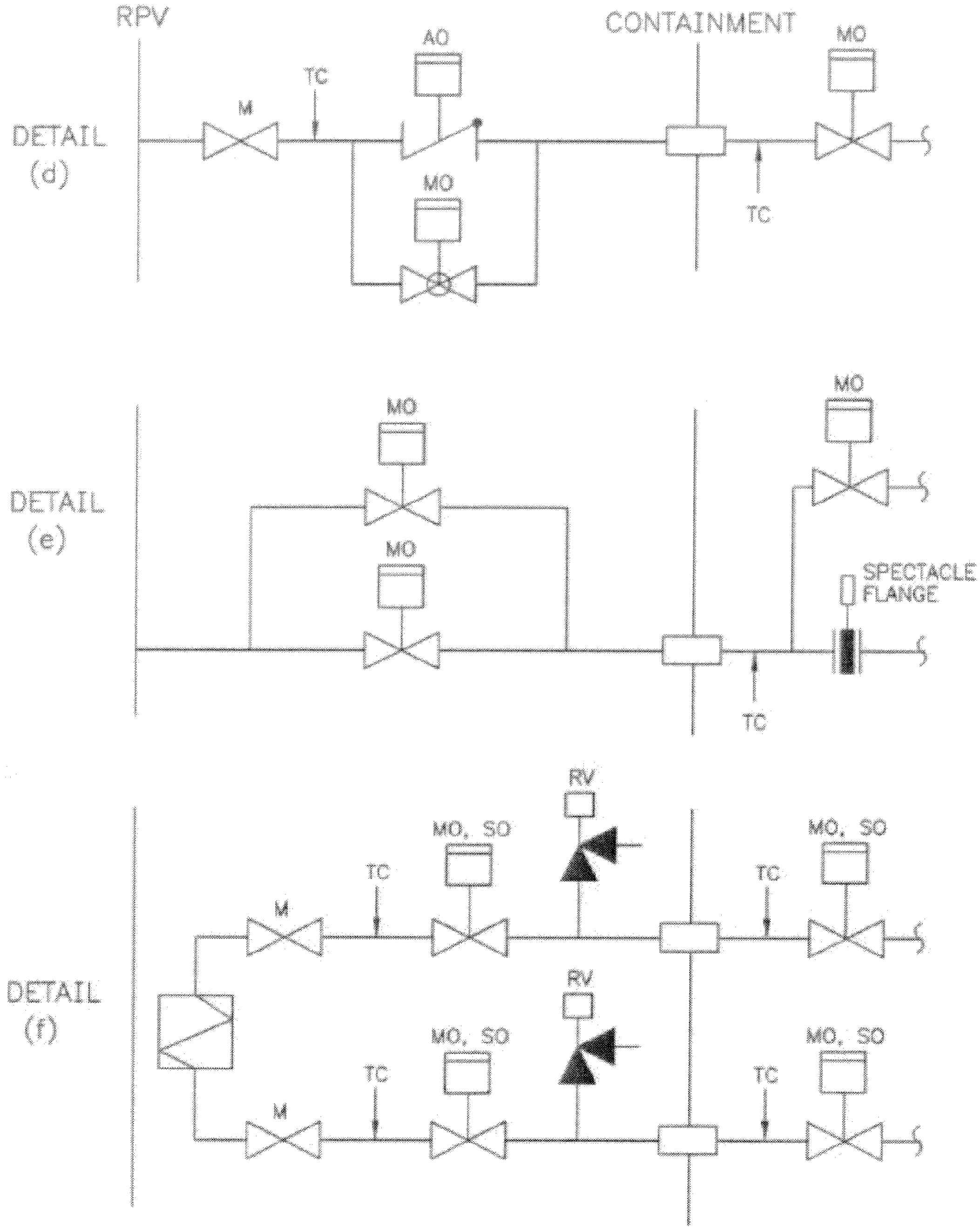


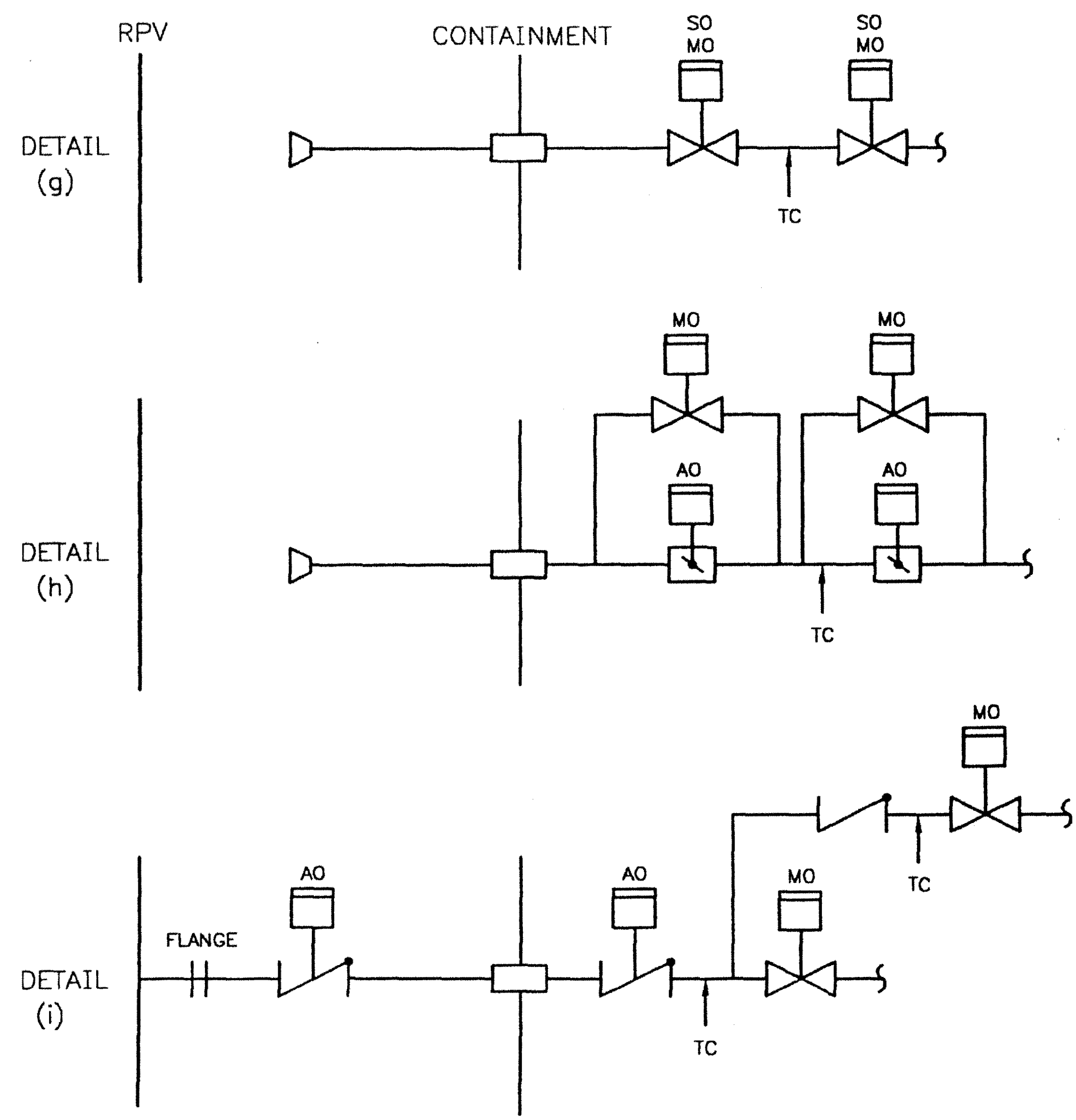
FIGURE 6.2-31

LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS
(SHEET 2 OF 10)

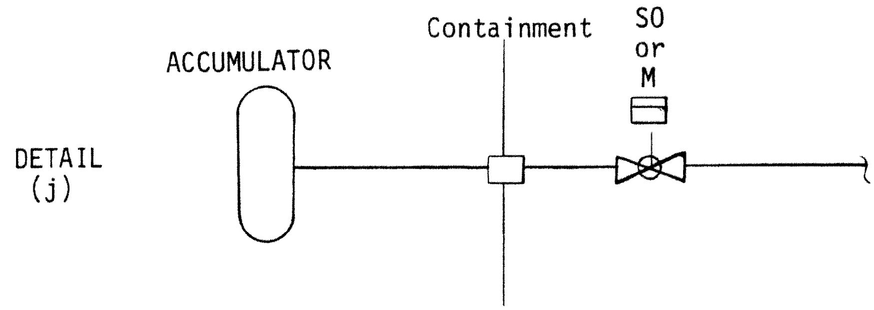
LSCS-UFSAR
FIGURE 6.2-31

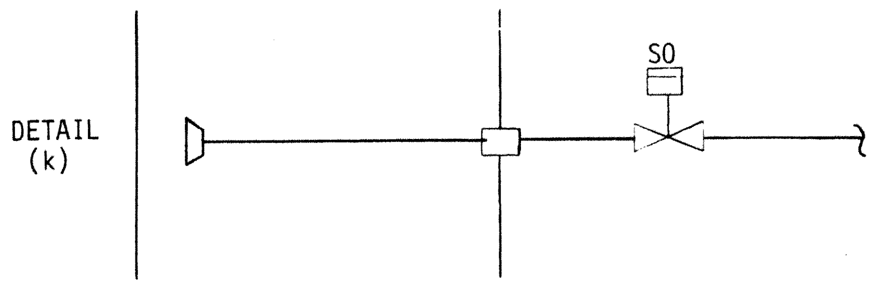


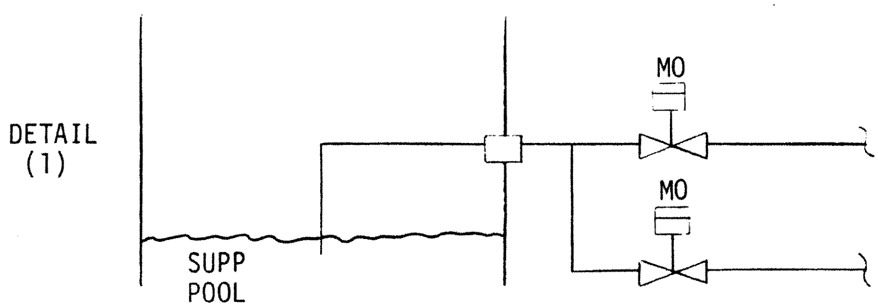
LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS
(SHEET 3 OF 10)







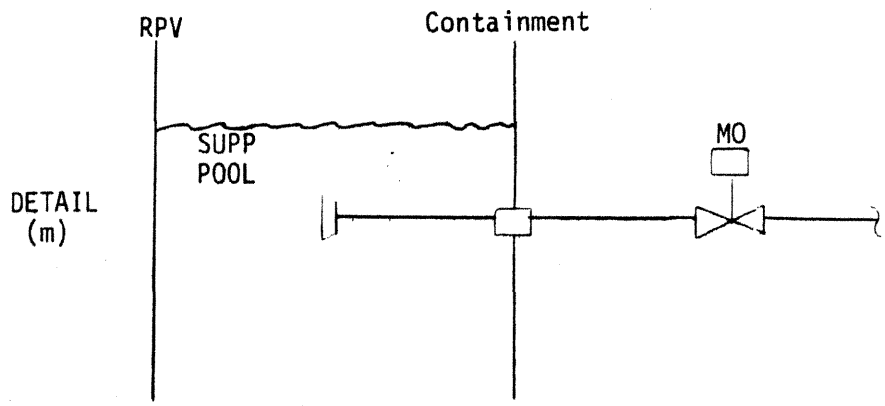
LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

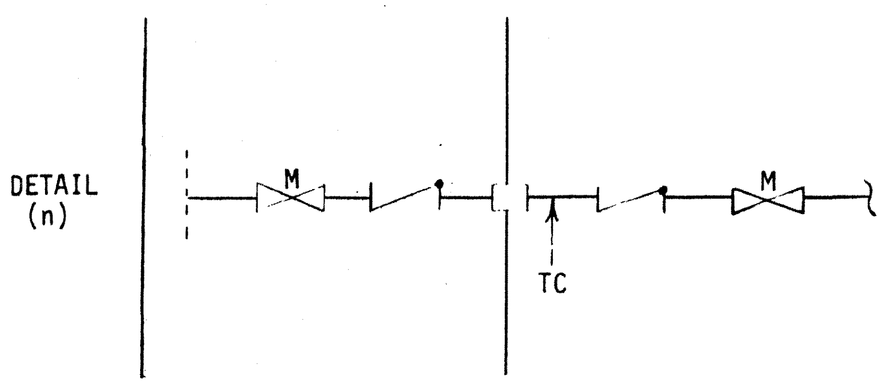
FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS

(SHEET 4 of 10)

REV. 0 - APRIL 1984





LA SALLE COUNTY STATION
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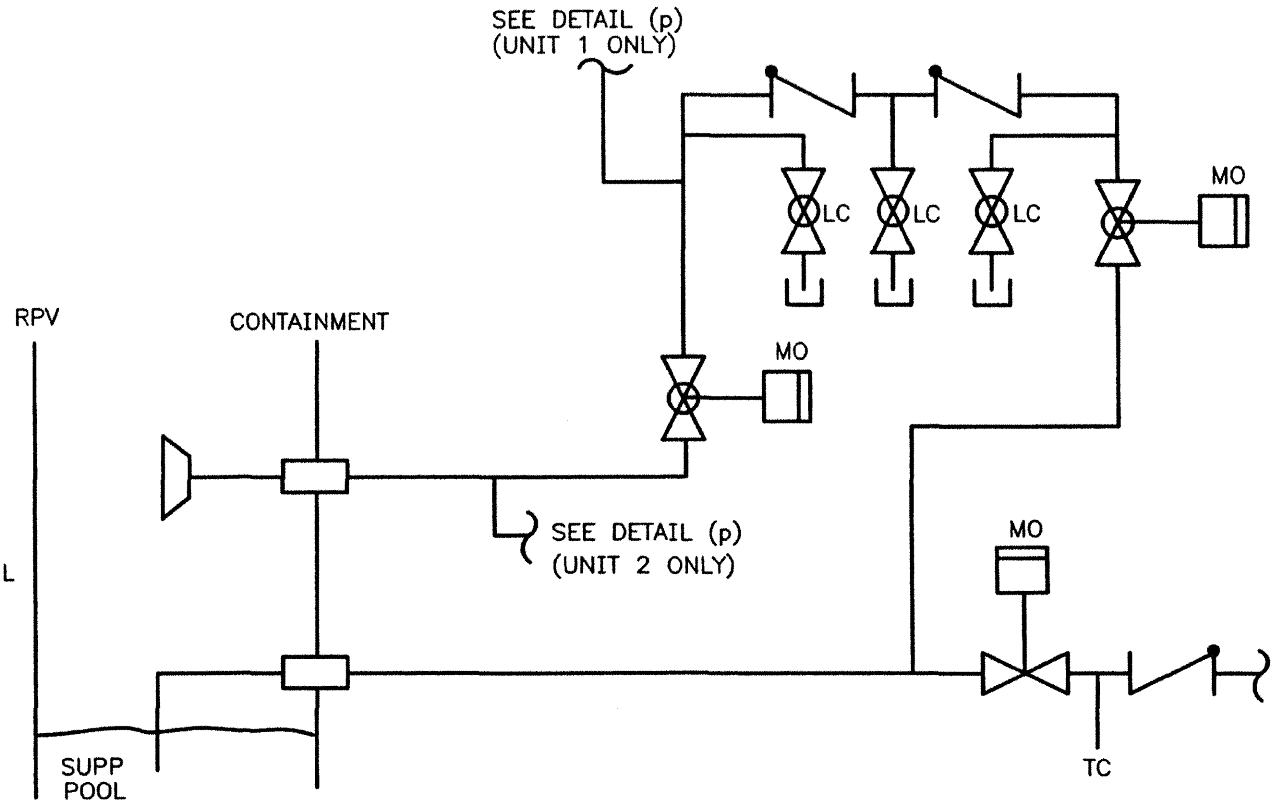
FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS

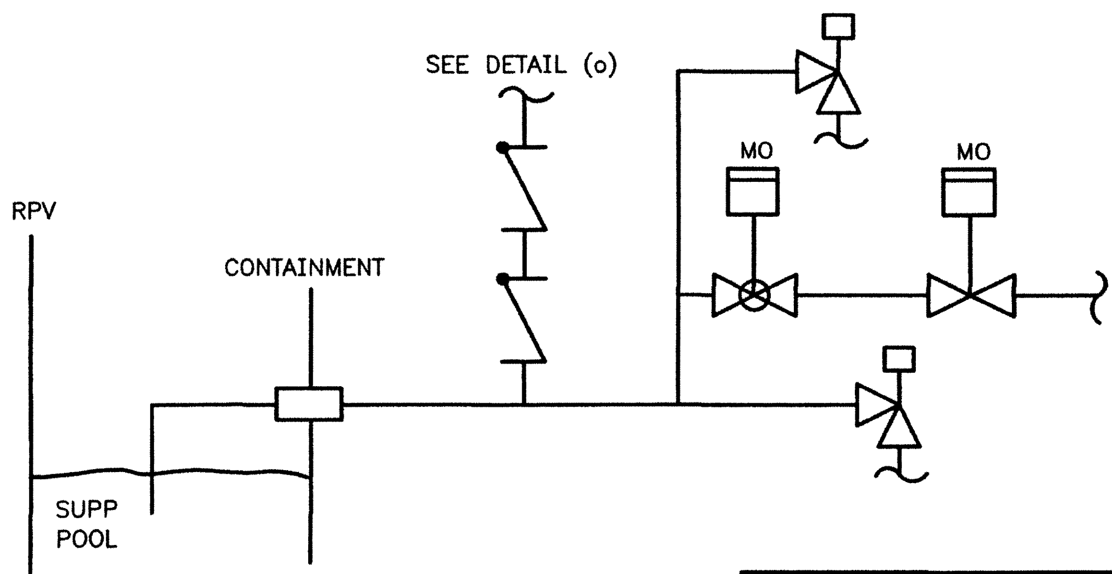
(SHEET 5 of 10)

REV. 0 - APRIL 1984

DETAIL (o)



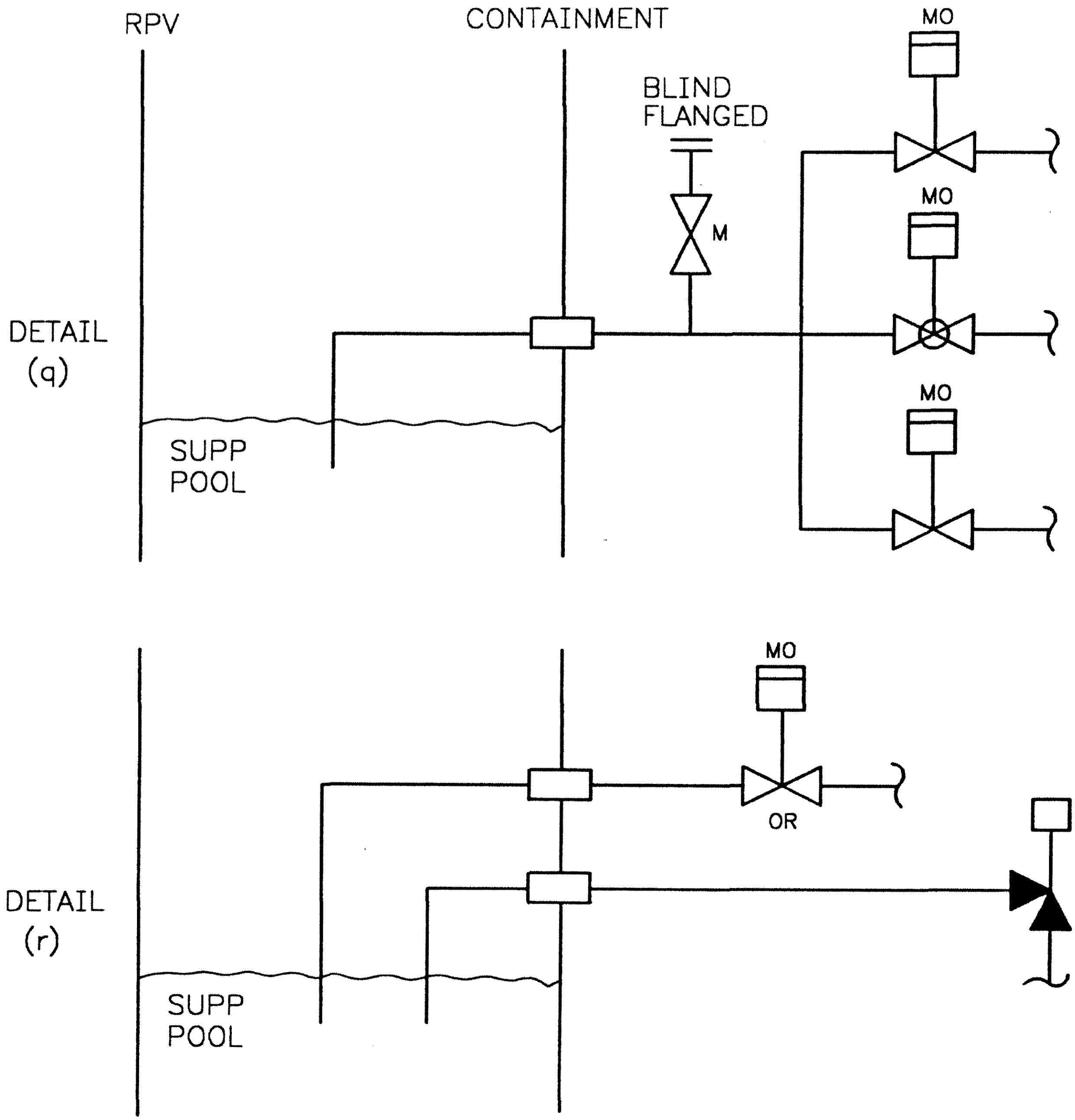
DETAIL (p)



LASALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS
(SHEET 6 OF 10)

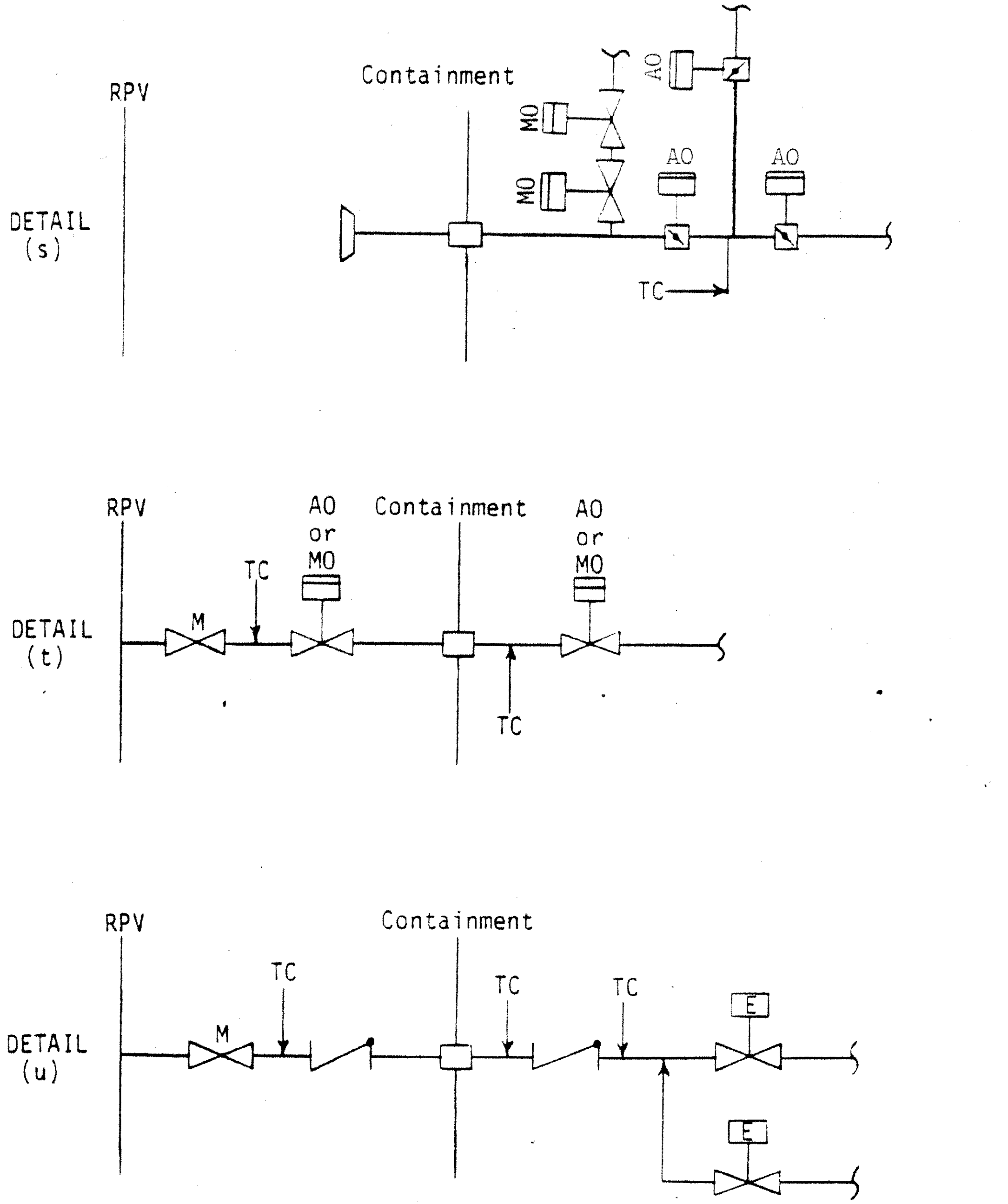


LASALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS
REPORT

FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS
(SHEET 7 OF 10)

REVISION 13



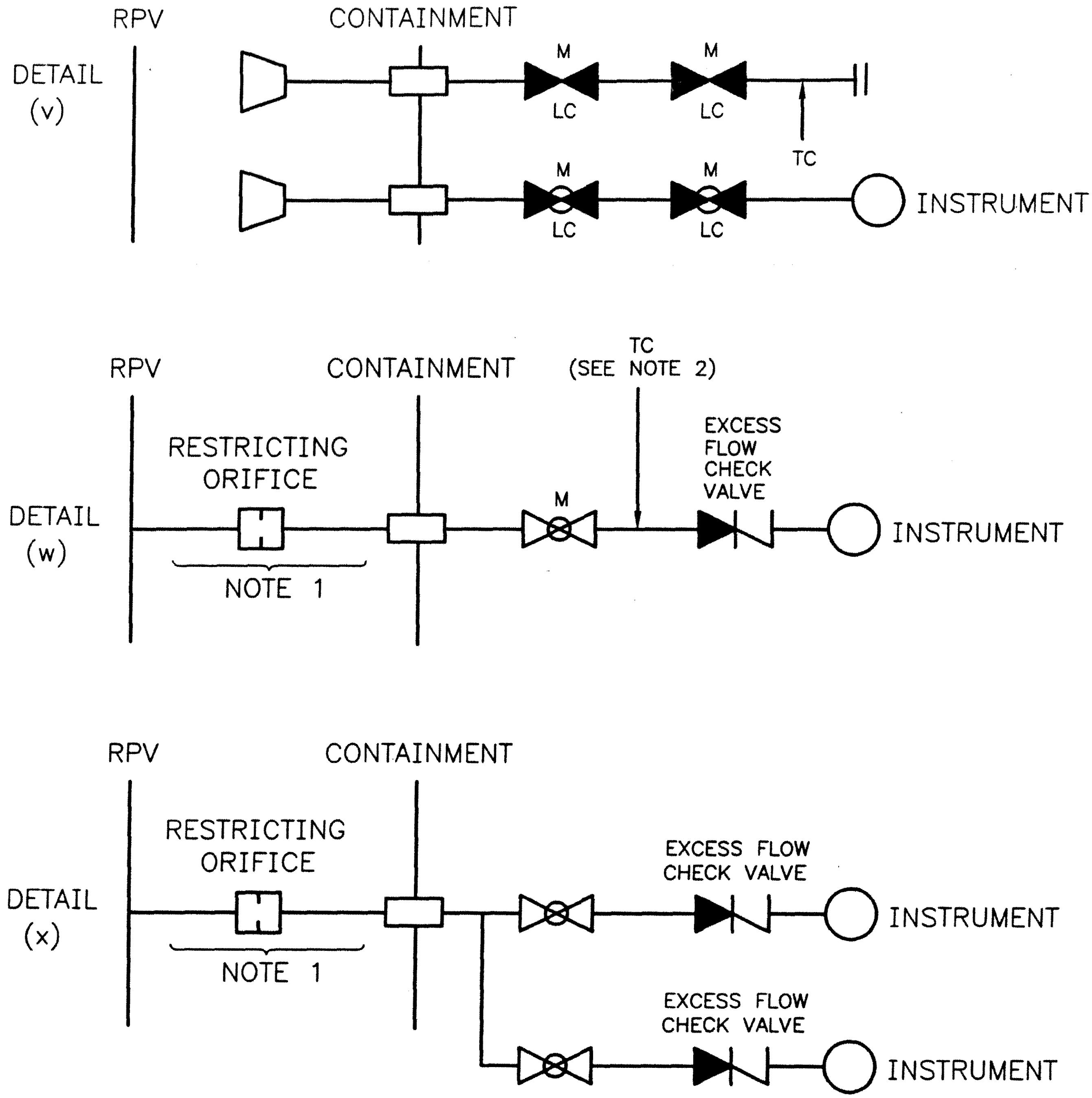
LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS

(SHEET 8 of 10)

REV. 3 - APRIL 1987

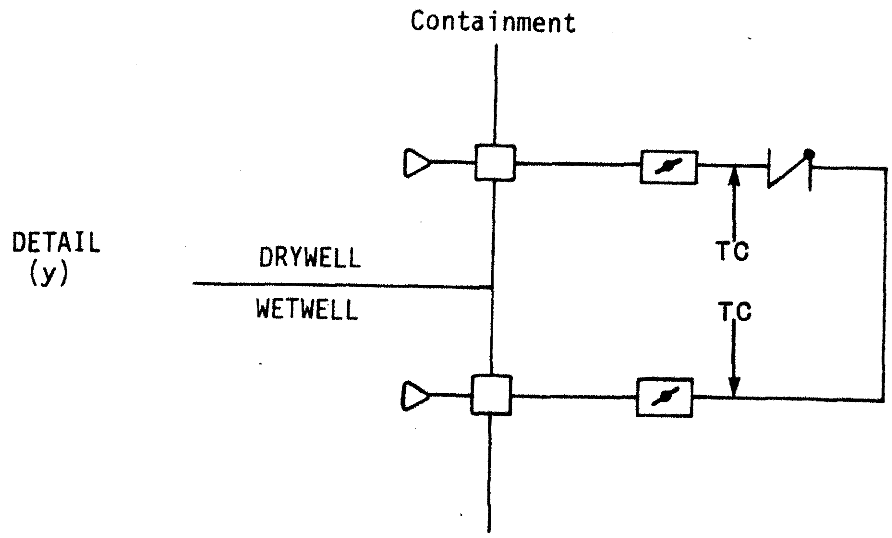


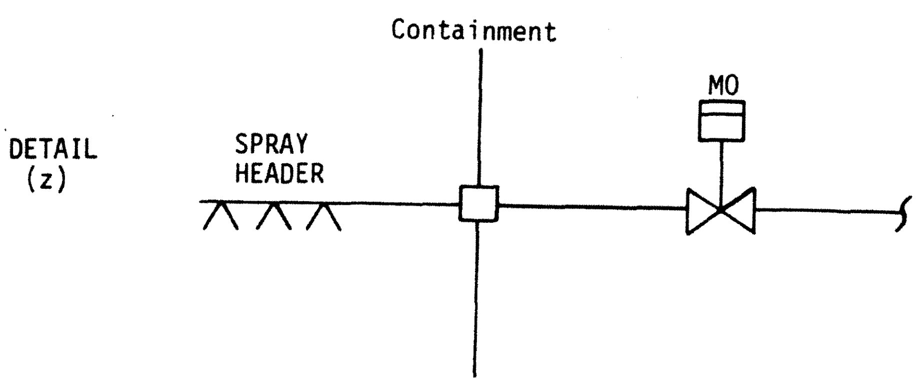
NOTE 1: IN THOSE CASES WHERE INSTRUMENT LINES ARE DIRECTLY CONNECTED TO THE CONTAINMENT ATMOSPHERE, THE INBOARD PORTION IS BETTER REPRESENTED BY THE INBOARD PORTION IN DETAIL (v); HOWEVER, THE OUTBOARD PORTION REMAINS AS SHOWN HERE.

'TE 2: WHERE PROVIDED, SEE CURRENT P & ID.

LA SALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.2-31 CONTAINMENT VALVE ARRANGEMENTS (SHEET 9 OF 10)

REVISION 13





LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS

(SHEET 10 of 10)

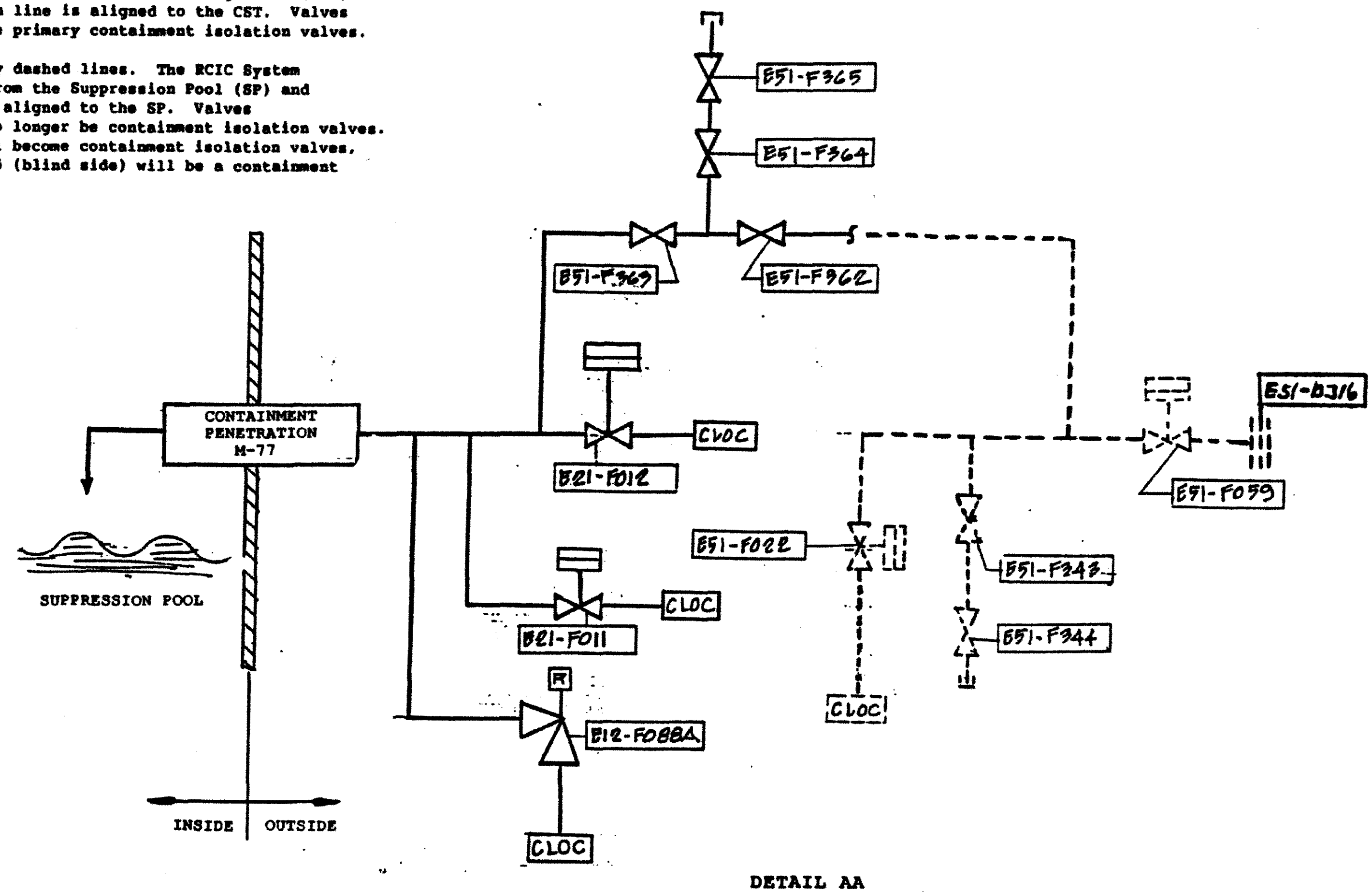
REV. 0 - APRIL 1984

Discussion:

The CLOC represents system boundaries (valves, flanges, pump seals, etc.) which are normally sealed closed, automatically closed, or are closed with a remote manual operator to accomplish containment isolation.

Test Mode 1 is represented by solid lines. The RCIC System is aligned to take suction from the condensate storage tank (CST) and the full flow test return line is aligned to the CST. Valves E51-F362 and F363 will become primary containment isolation valves.

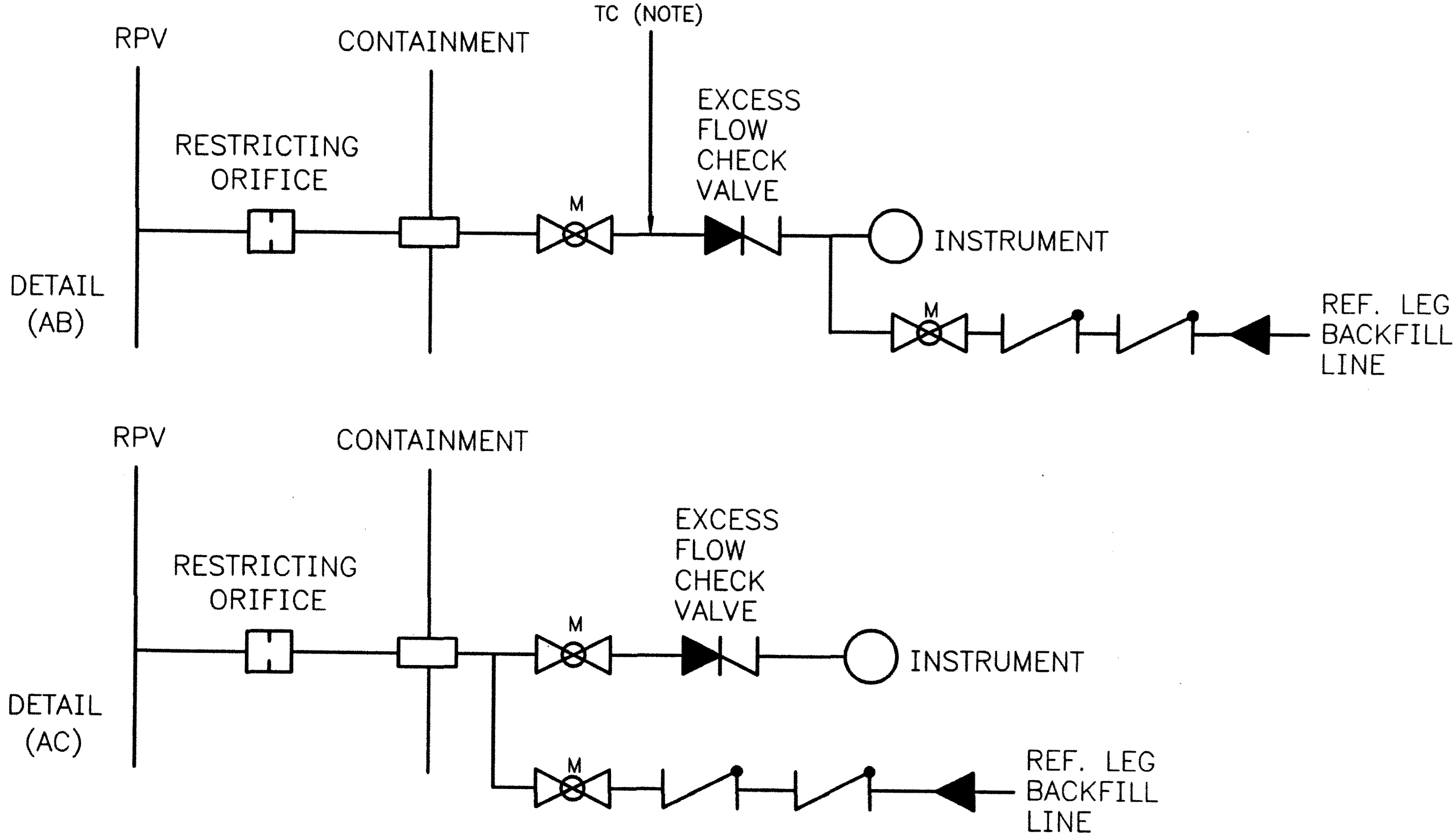
Test Mode 2 is represented by dashed lines. The RCIC System is aligned to take suction from the Suppression Pool (SP) and the flow test return line is aligned to the SP. Valves E51-F362 and E51-F363 will no longer be containment isolation valves. Valves E51-F022 and F059 will become containment isolation valves, and spectacle flange E51-D316 (blind side) will be a containment isolation boundary.



LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-31

Containment Valve Arrangements
(Sheet 10a of 10)



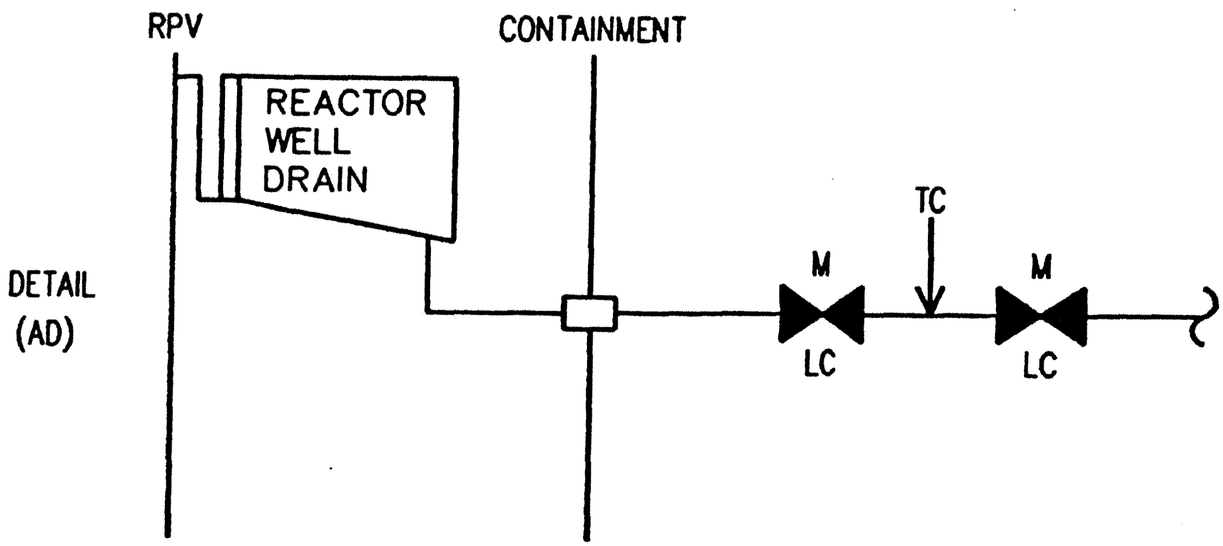
NOTE: WHERE PROVIDED, SEE CURRENT P & ID.

FIGURE 6.2-31

LA SALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.2-31 CONTAINMENT VALVE ARRANGEMENTS (SHEET 10B OF 10)

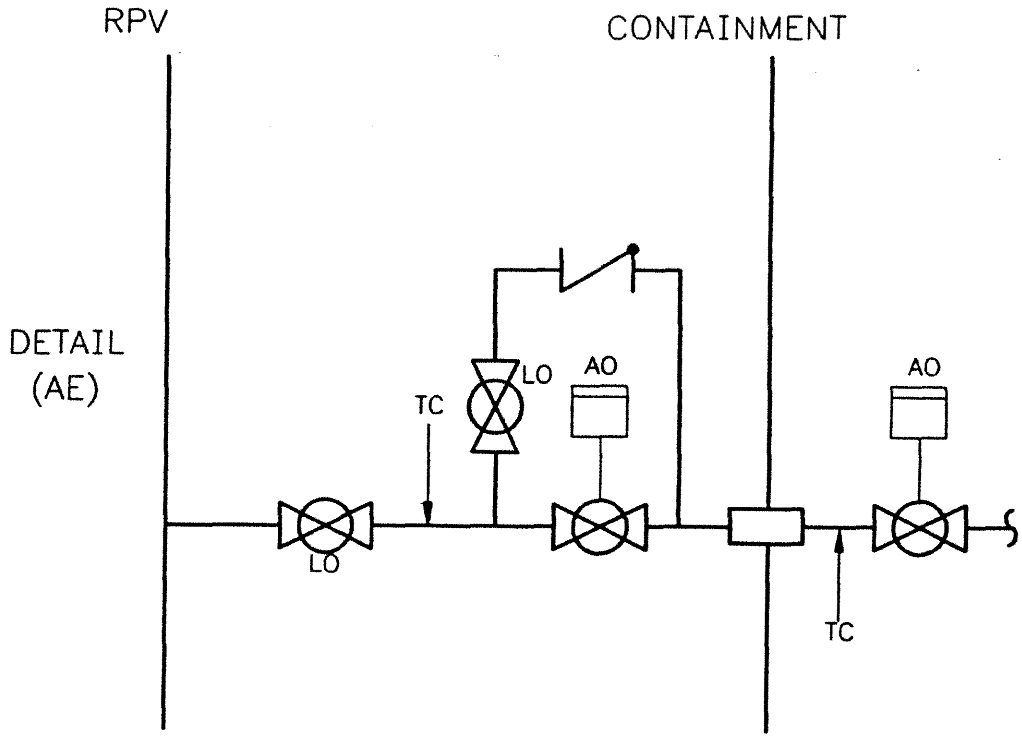
REVISION 13

FIGURE 6.2-31



NOTE: THIS FIGURE APPLIES TO UNIT 2 ONLY.

LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.2-31 CONTAINMENT VALVE ARRANGEMENTS (SHEET 10C OF 10)

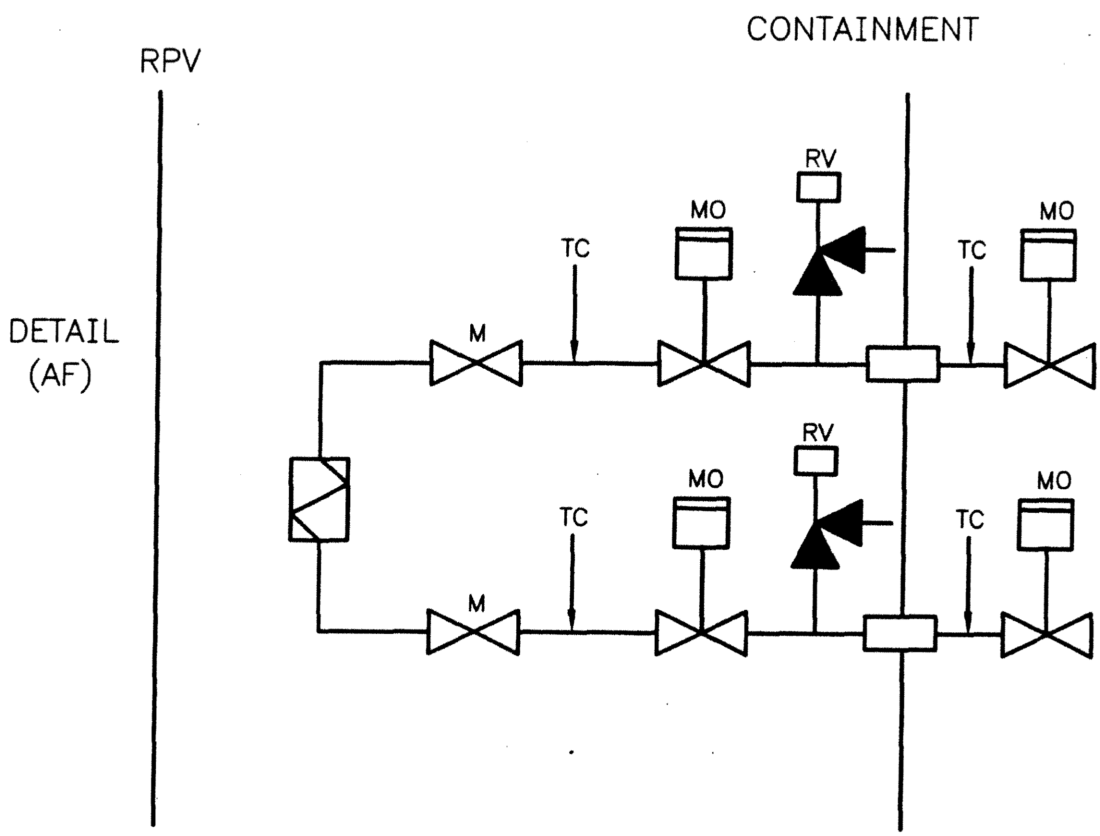


LASALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS
REPORT

FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS
(SHEET 10D OF 10)

REVISION 13

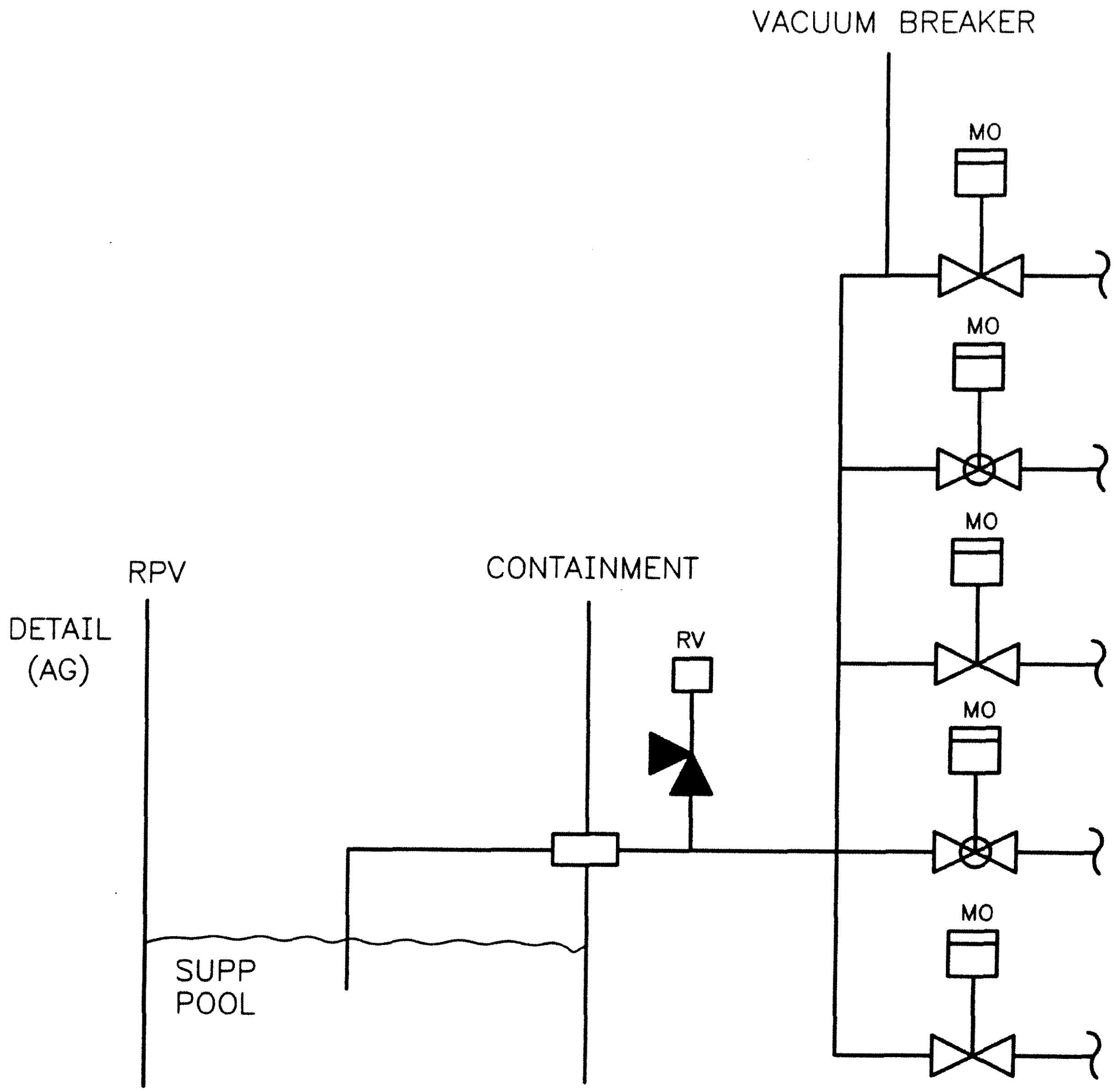


LASALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS
REPORT

FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS
(SHEET 10E OF 10)

REVISION 13

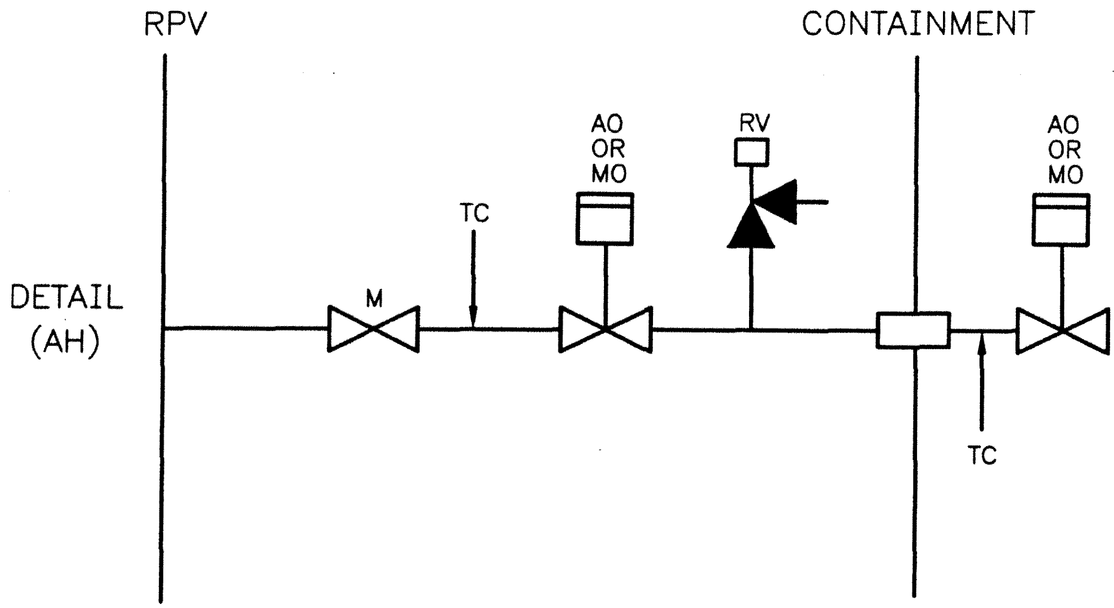


LASALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS
REPORT

FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS
(SHEET 10F OF 10)

REVISION 13

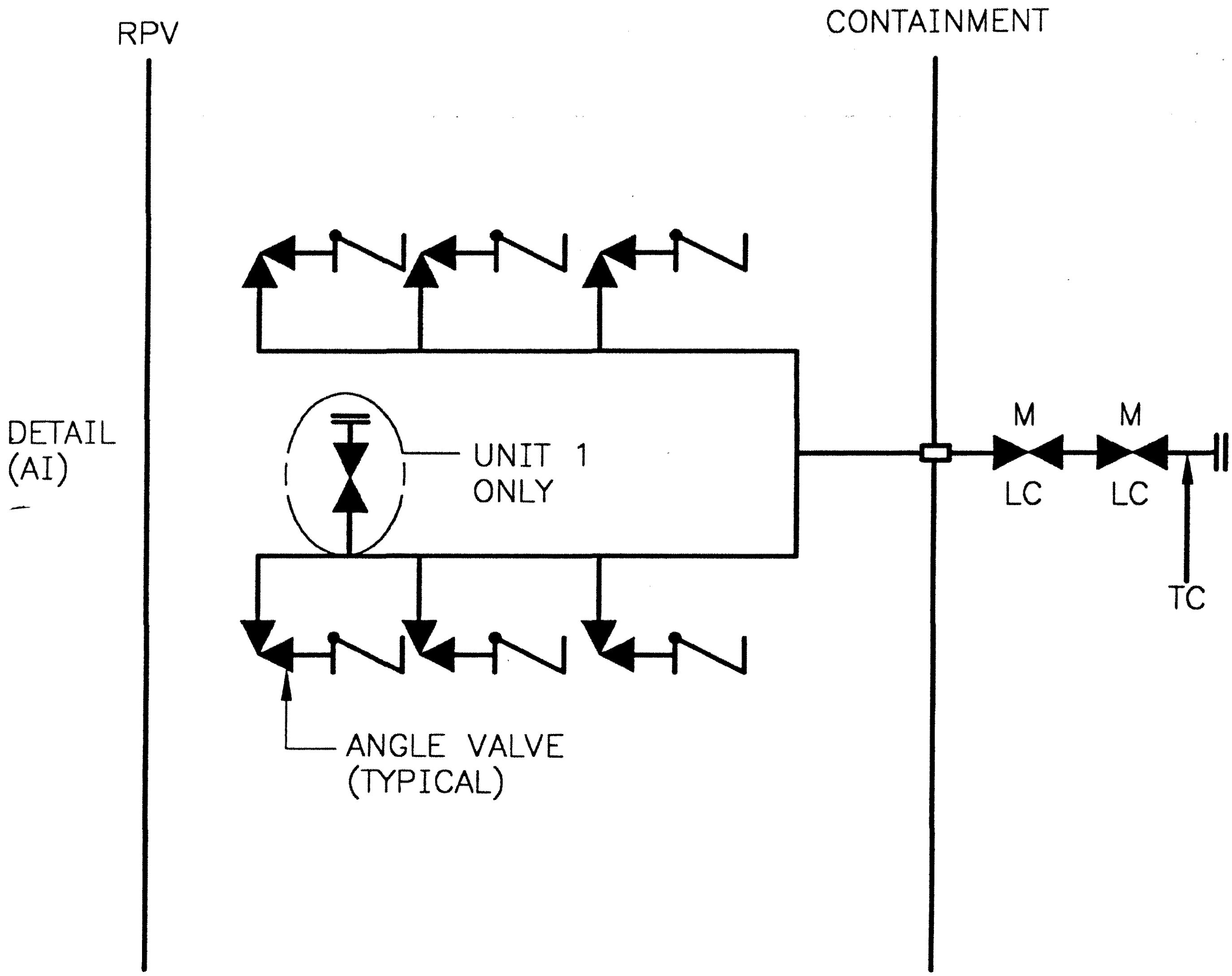


LASALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS
REPORT

FIGURE 6.2-31

CONTAINMENT VALVE ARRANGEMENTS
(SHEET 10G OF 10)

REVISION 13

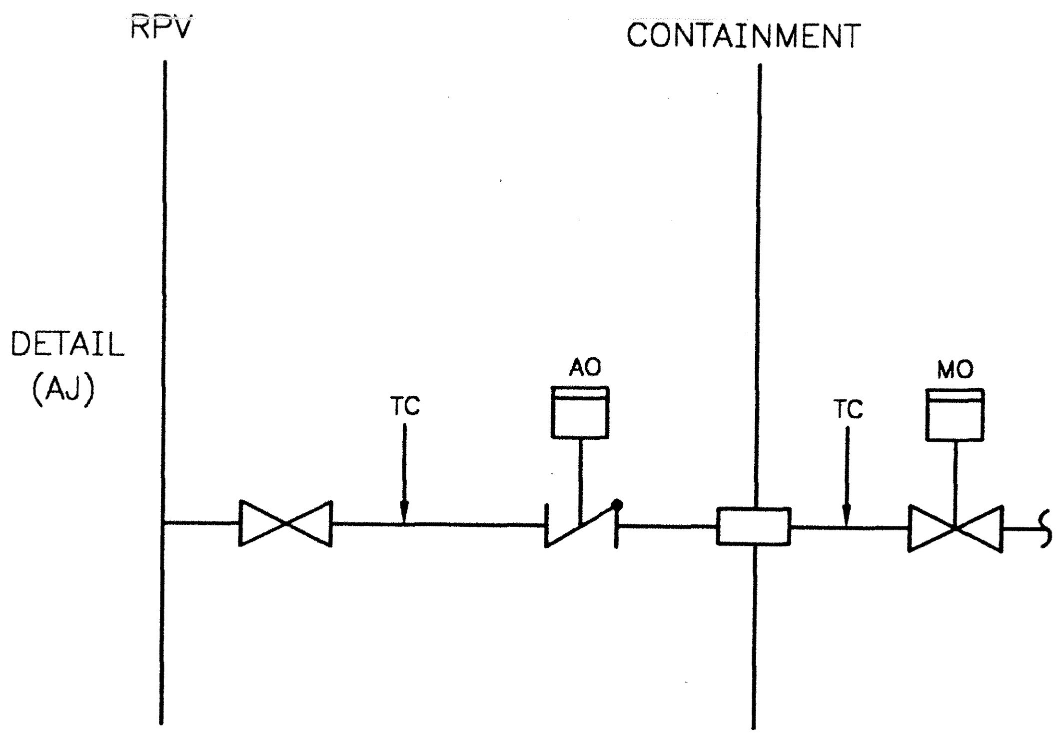


LASALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS
REPORT

FIGURE 6.2-31
CONTAINMENT VALVE ARRANGEMENTS
(SHEET 10H OF 10)

REV. 13

FIGURE 6.2-31

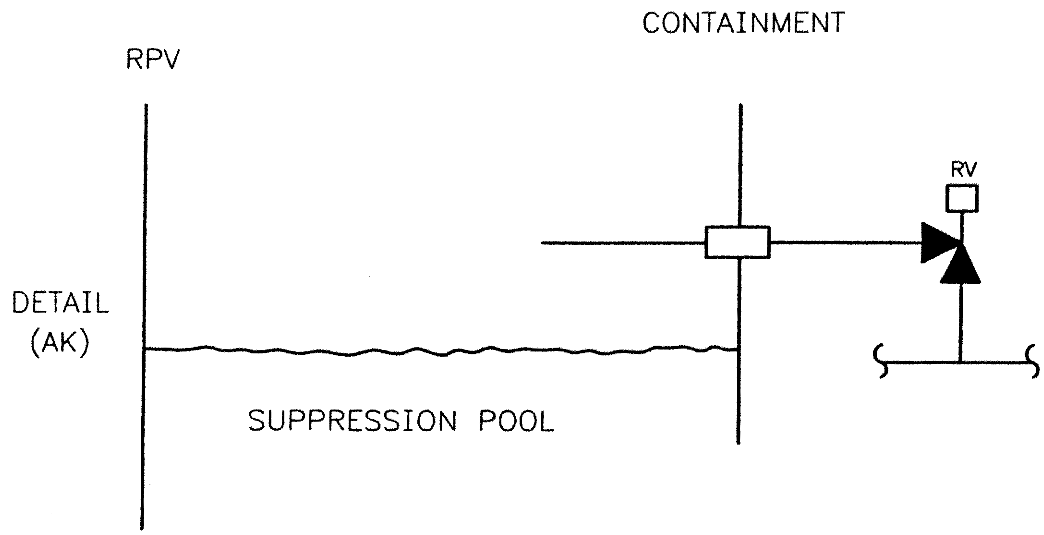


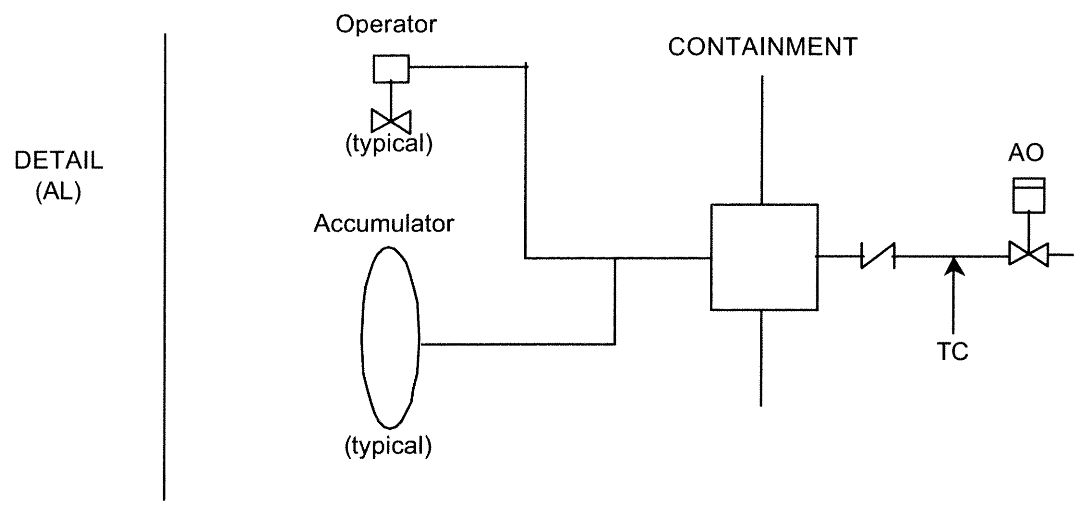
LASALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS
REPORT

FIGURE 6.2-31

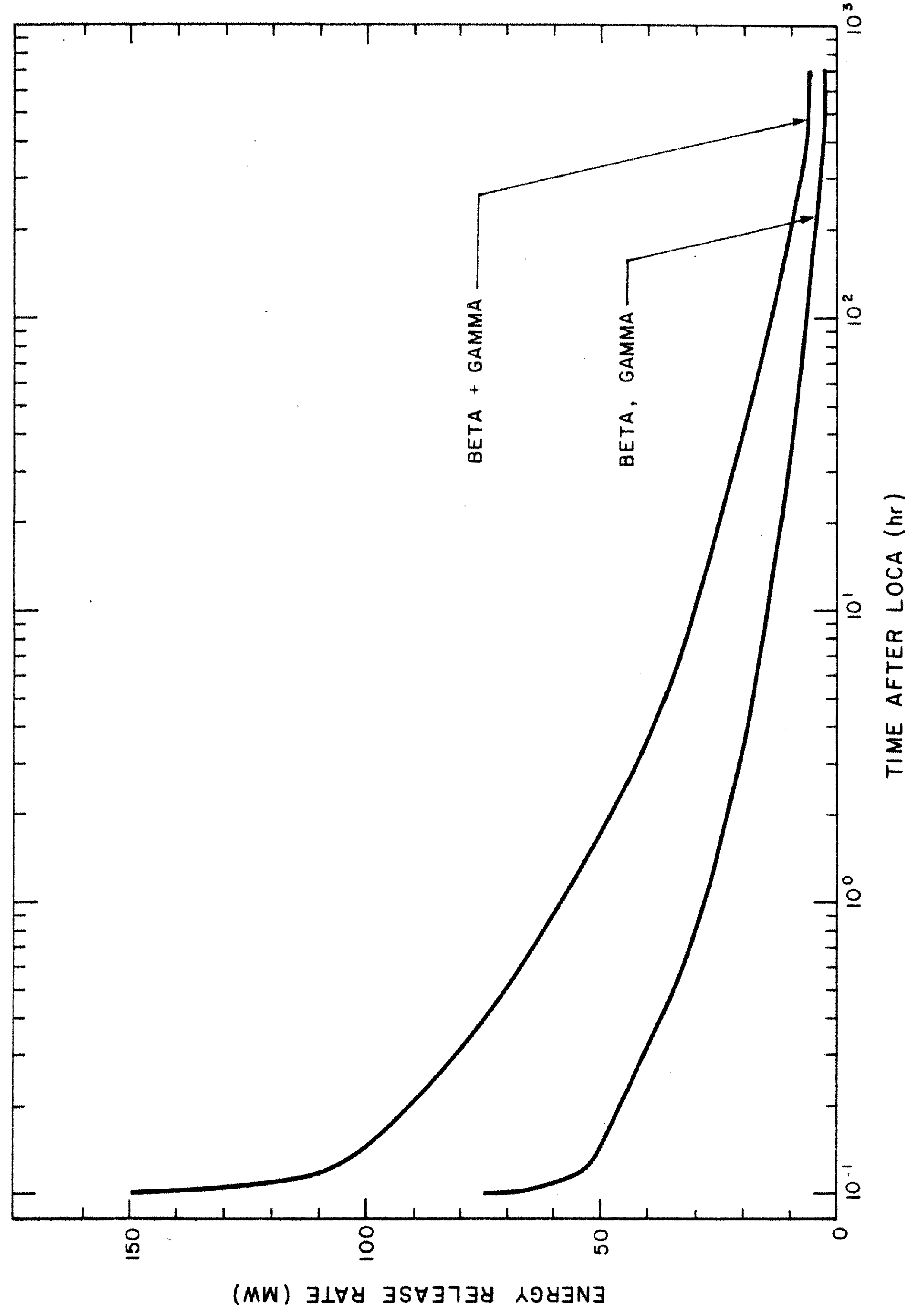
CONTAINMENT VALVE ARRANGEMENTS
(SHEET 10I OF 10)

REVISION 13





LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.2-31 CONTAINMENT VALVE ARRANGEMENTS (SHEET 10J OF 10)



LA SALLE COUNTY STATION
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FIGURE 6.2-32

ENERGY RELEASE RATES AS
A FUNCTION OF TIME

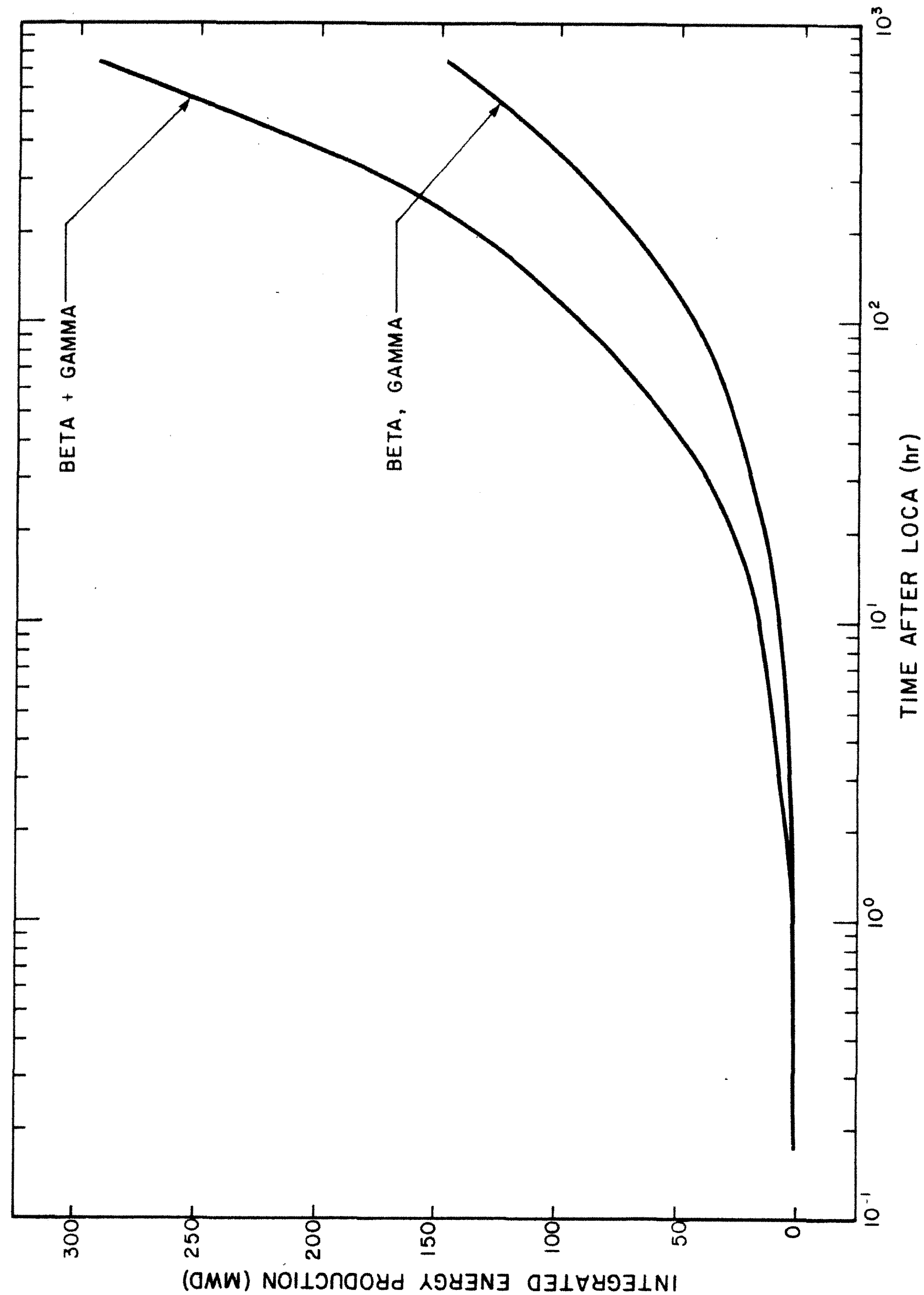

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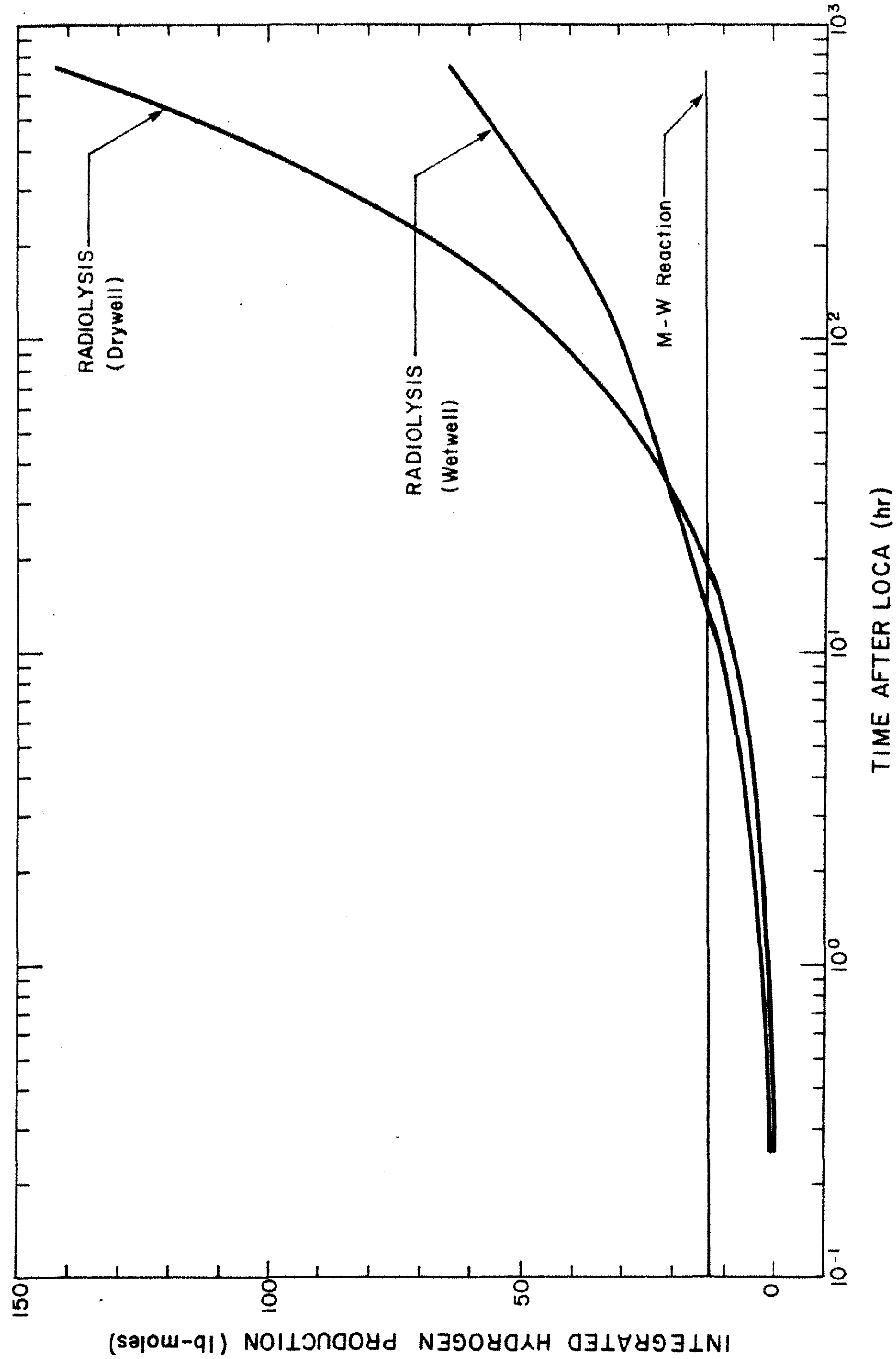
FIGURE 6.2-33

INTEGRATED ENERGY RELEASE AS
A FUNCTION OF TIME



LA SALLE COUNTY STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

FIGURE 6.2-34

INTEGRATED HYDROGEN PRODUCTION AS A FUNCTION OF TIME

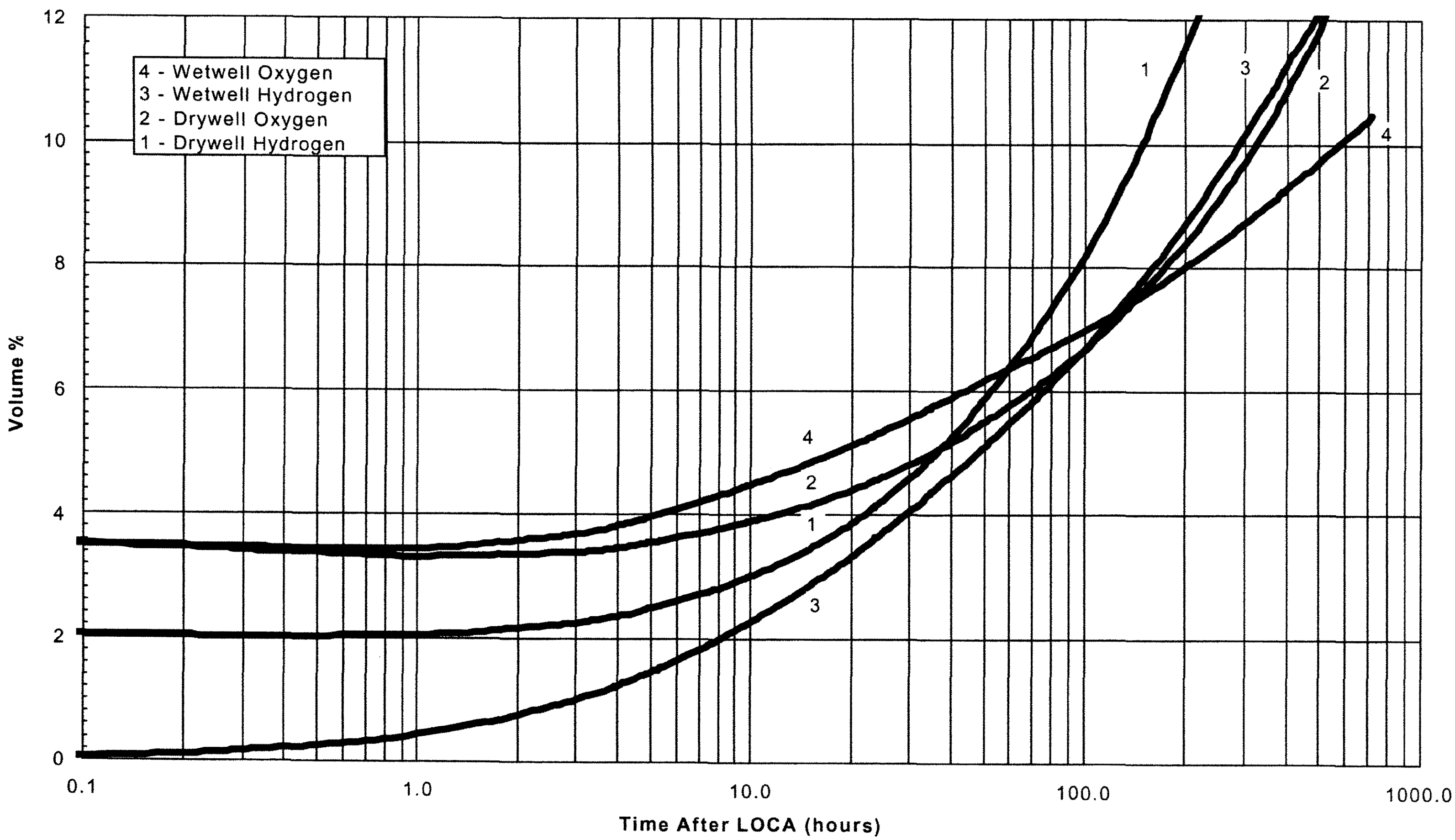


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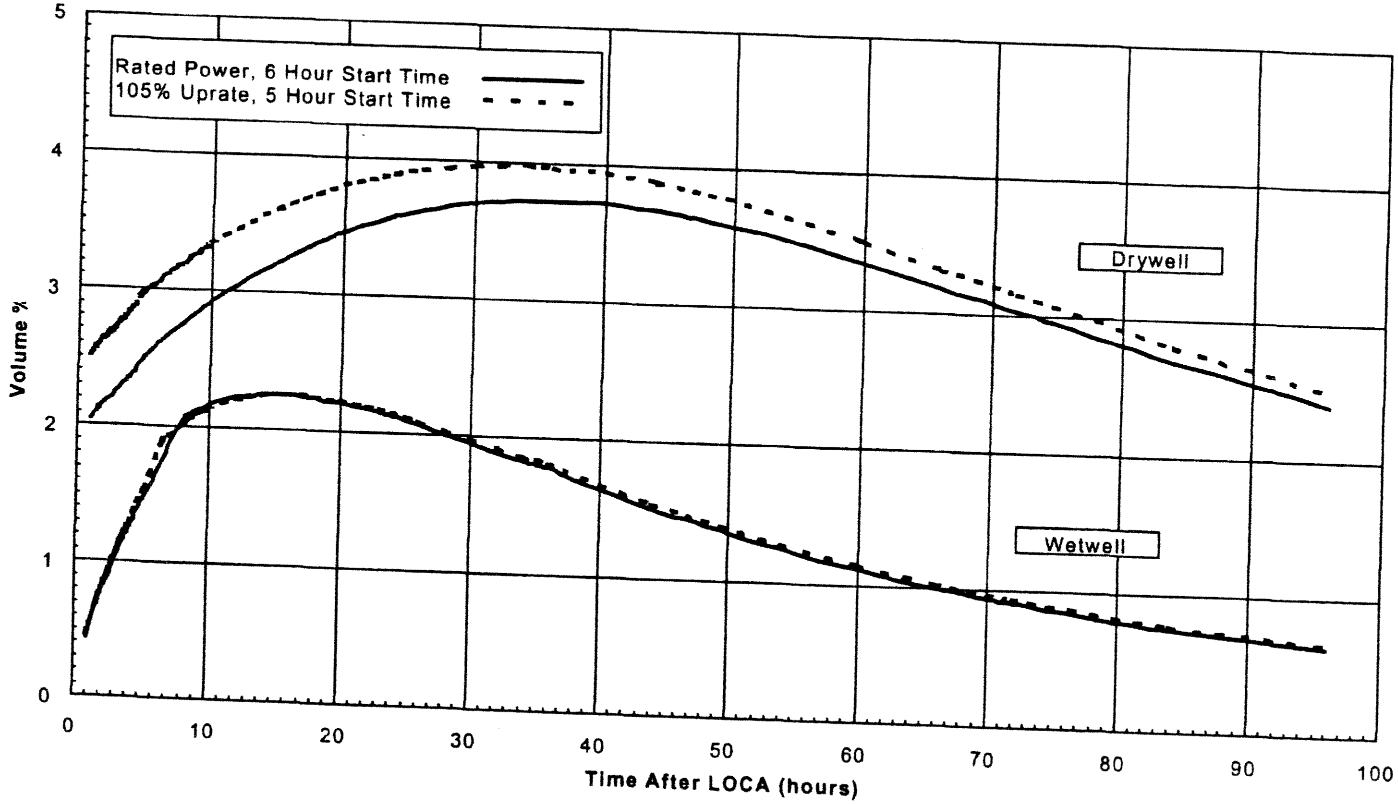
FIGURE 6.2-35

UNCONTROLLED HYDROGEN
AND OXYGEN GENERATION



Note: The information provide in this figure is historical. The hydrogen recombining function of the hydrogen recombiners is abandoned in place.

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FIGURE 6.2-36

HYDROGEN CONCENTRATION WITH 125 SCFM

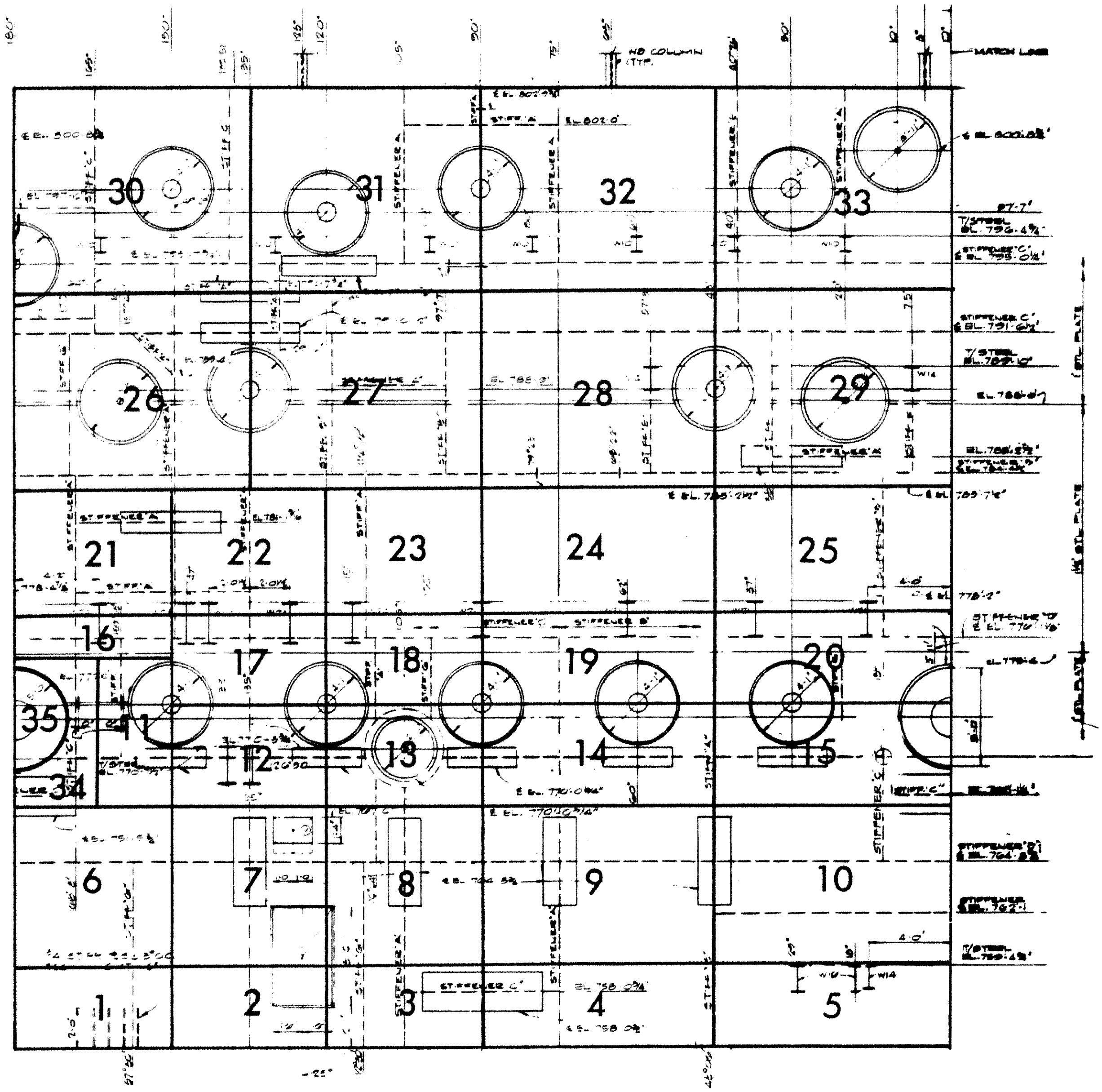

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FIGURE 6.2-37

NODALIZATION OVERLAY FOR RECIRCULATION LINE BREAK

REV. 0 - APRIL 1984

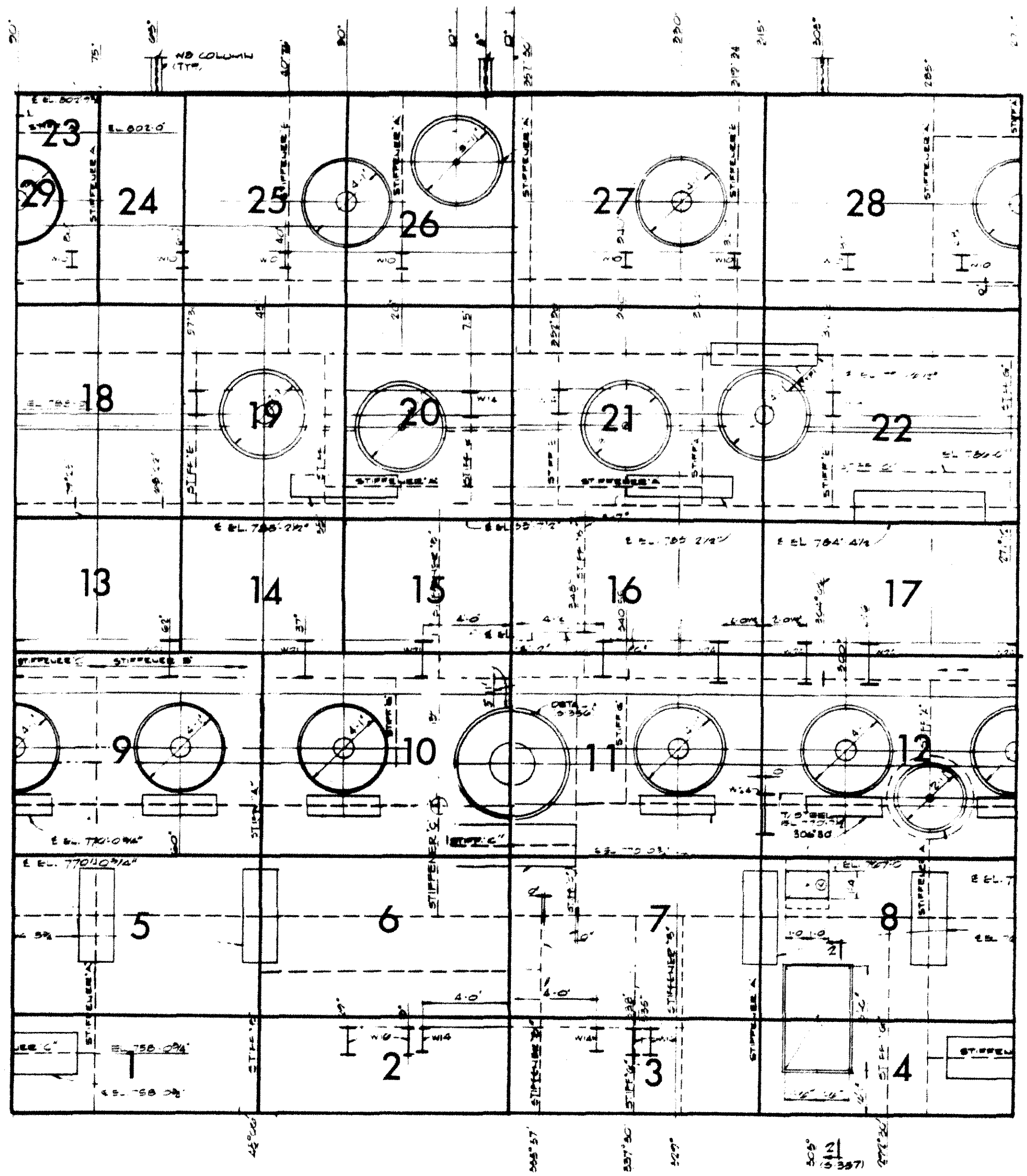

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FIGURE 6.2-38

NODALIZATION OVERLAY FOR FEEDWATER LINE BREAK

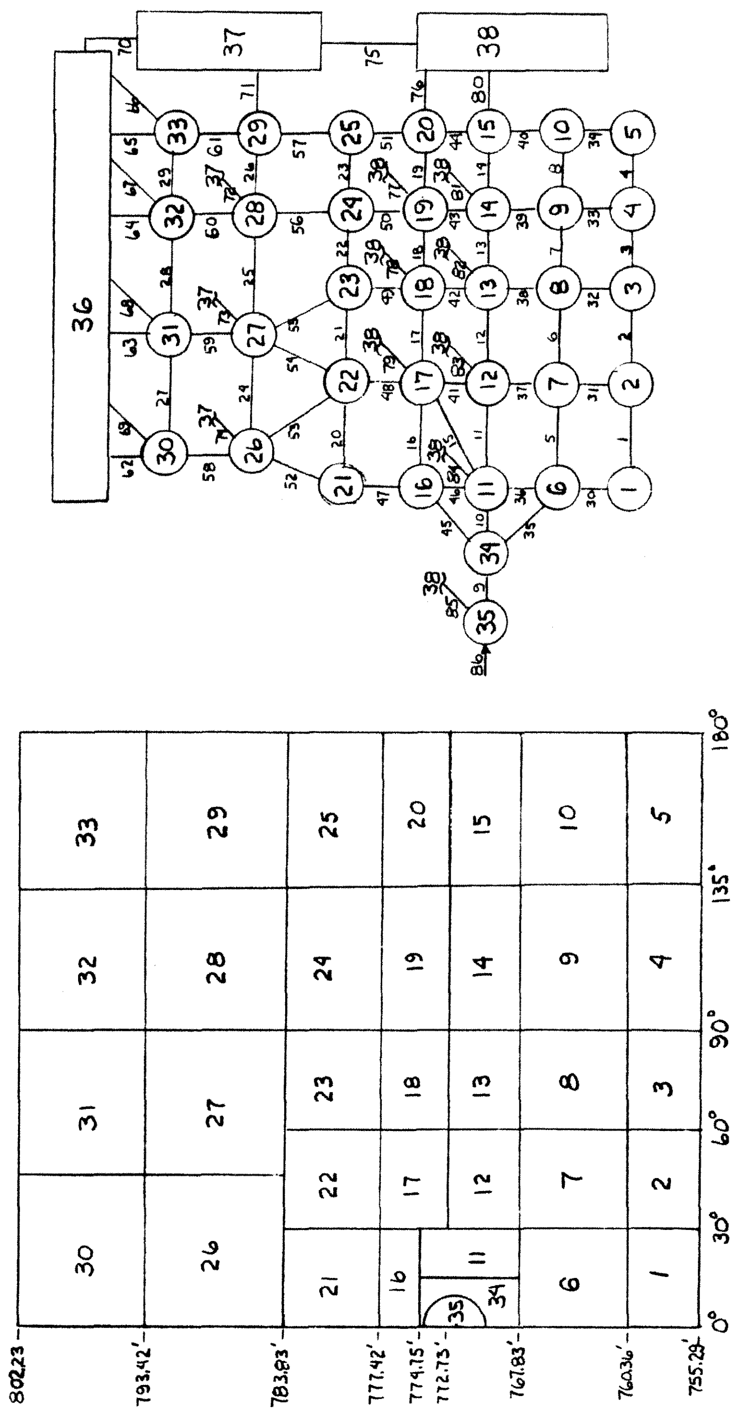

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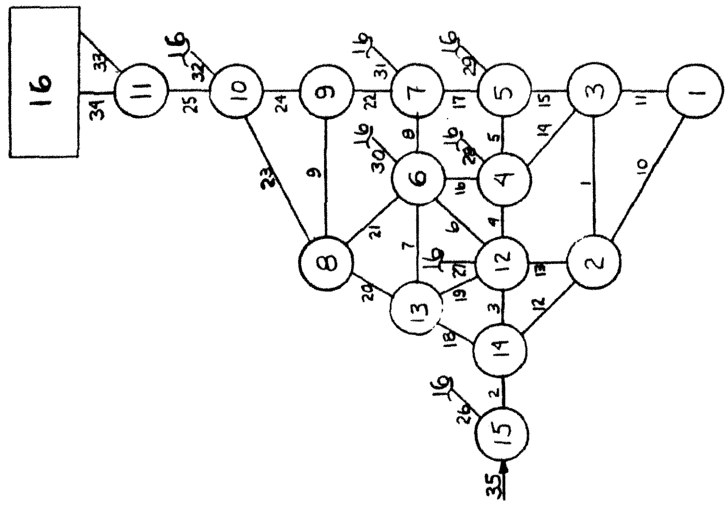
FIGURE 6.2-39

NODALIZATION FOR ORIGINAL
RECIRCULATION LINE BREAK ANALYSIS

REV. 0 - APRIL 1984



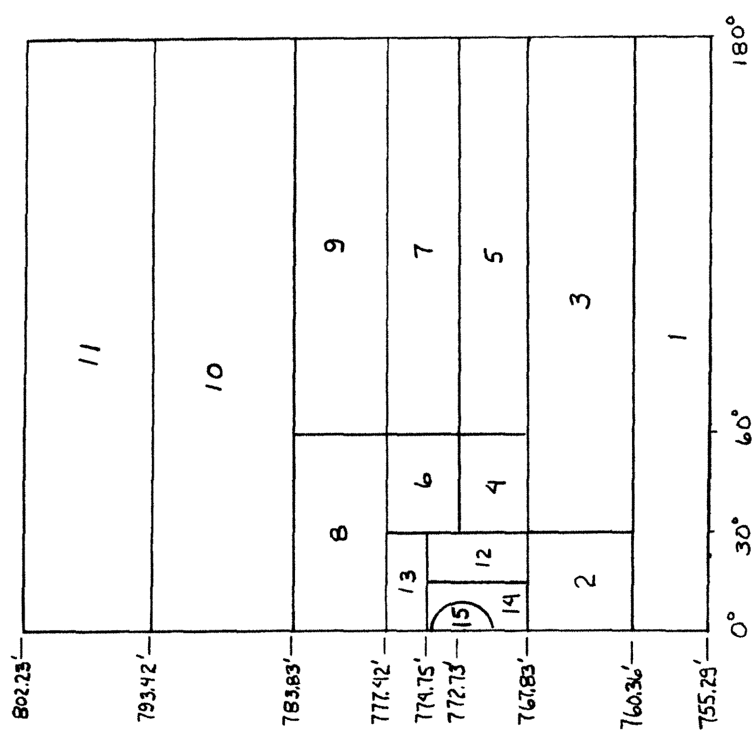


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FIGURE 6.2-40

"EQUIVALENT" NODALIZATION (CASE A)

REV. 0 - APRIL 1984

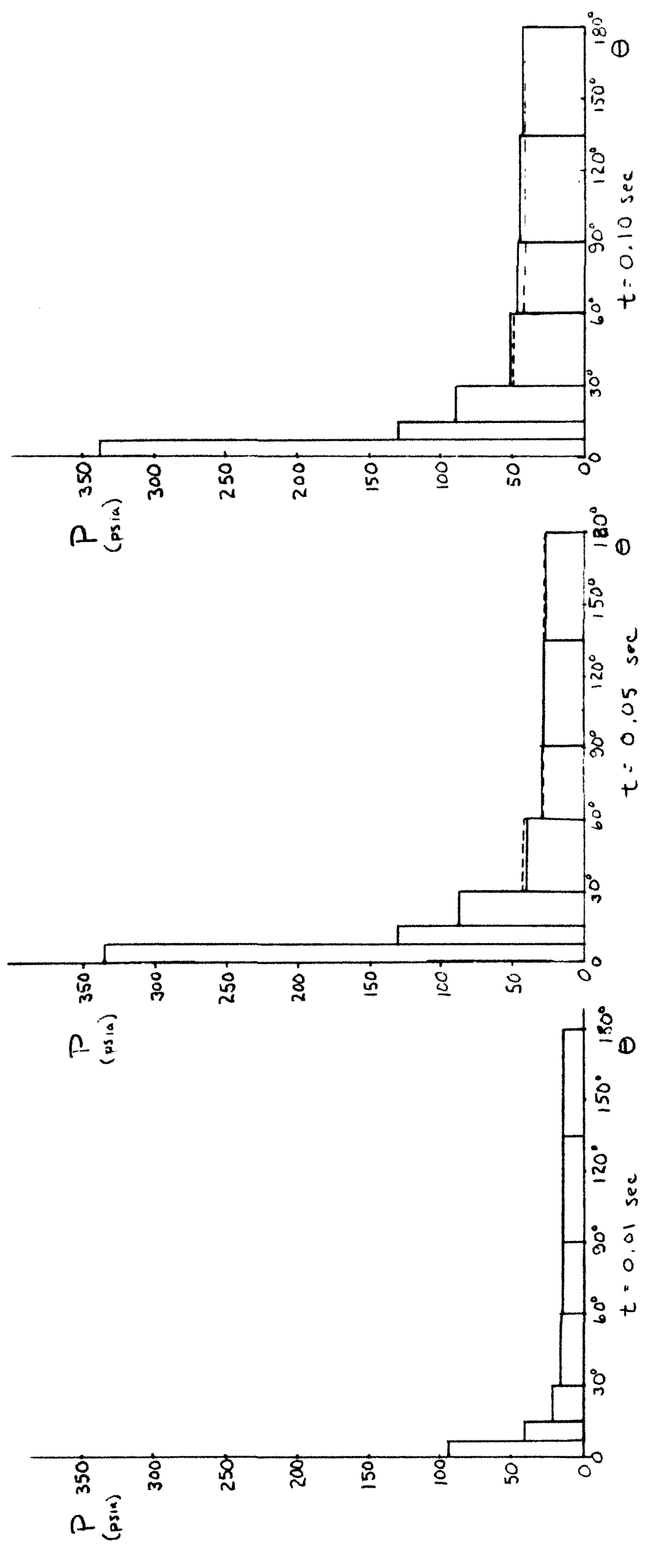

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FIGURE 6.2-41

AZIMUTHAL PRESSURE DISTRIBUTION
(AT ℄ RECIRCULATION OUTLET NOZZLE)
ORIGINAL DATA AND CASE A

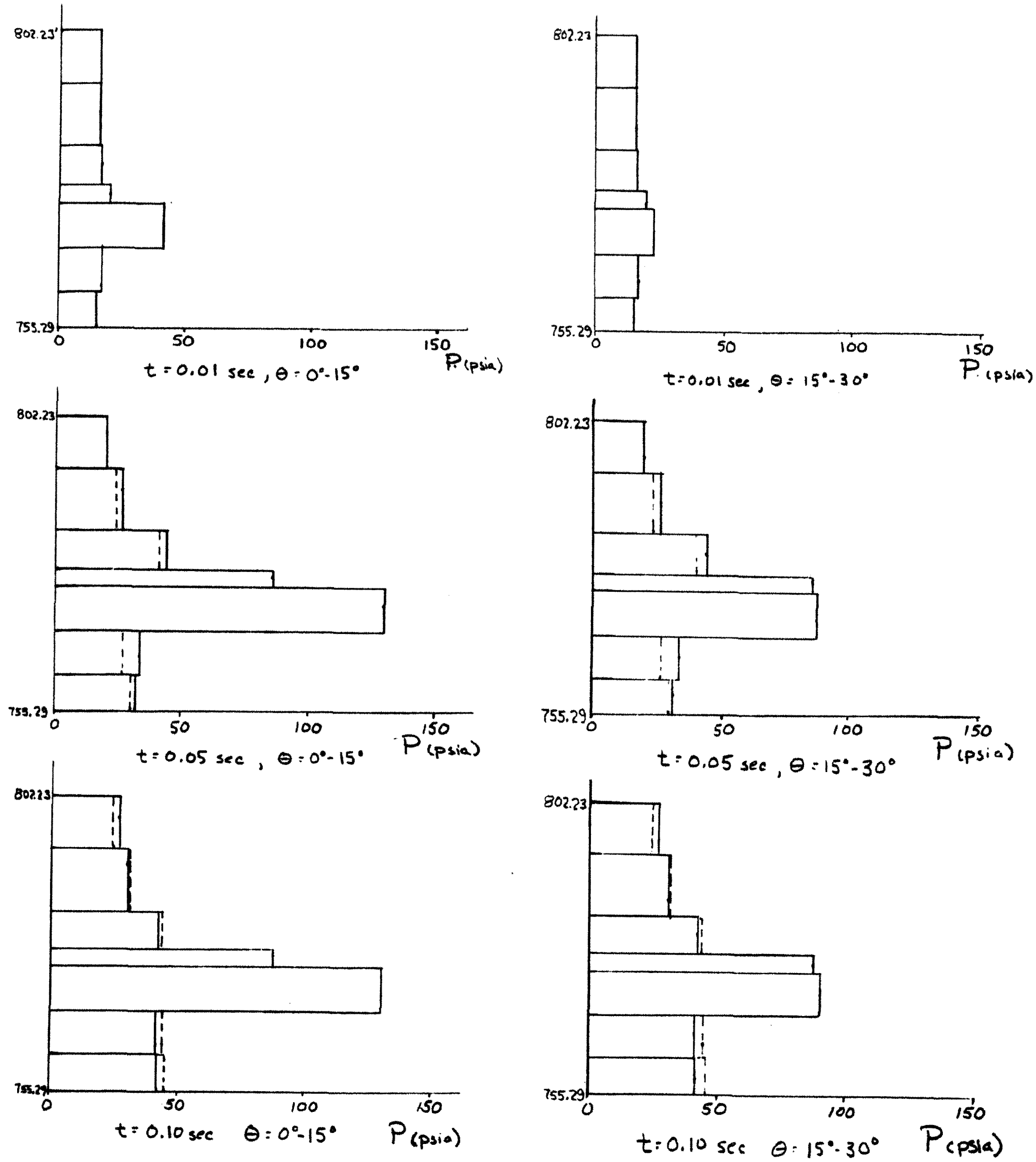

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FIGURE 6.2-42

AXIAL PRESSURE DISTRIBUTION
ORIGINAL DATA AND CASE A

REV. 0 - APRIL 1984

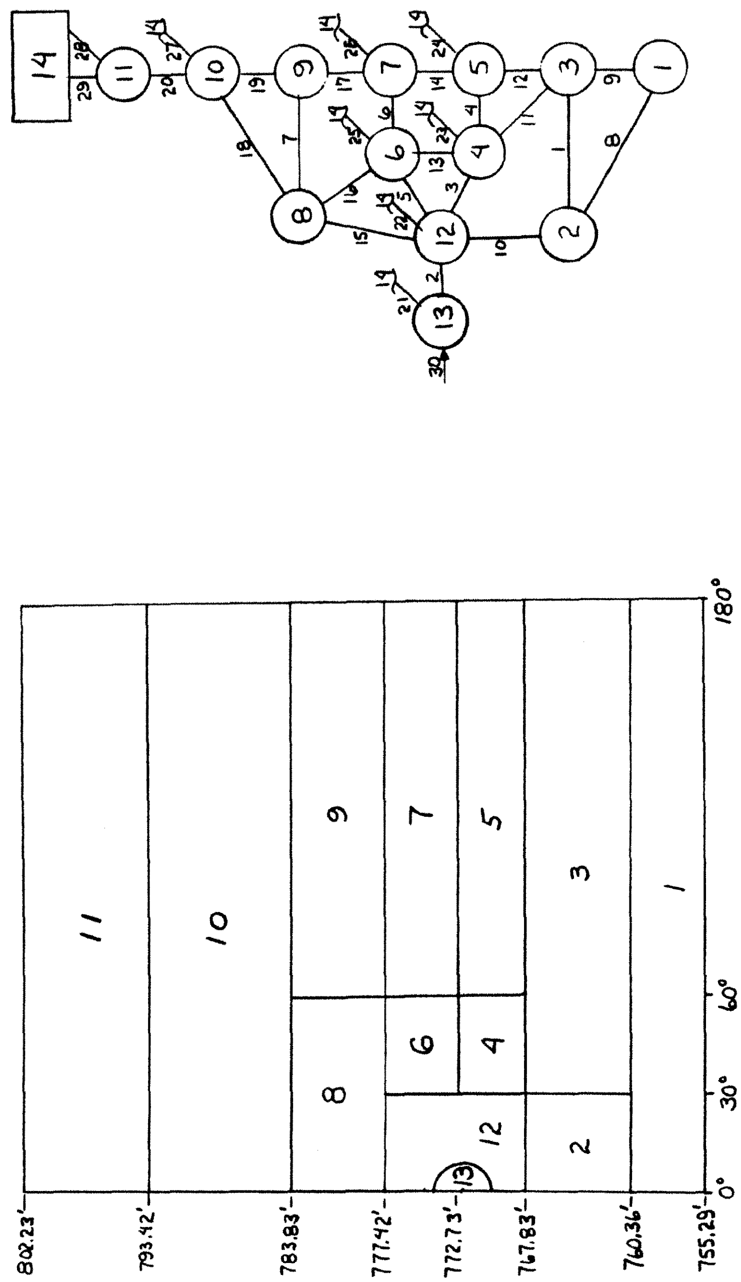

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FIGURE 6.2-43

SIMPLIFIED NODALIZATION (CASE B)

REV. 0 - APRIL 1984

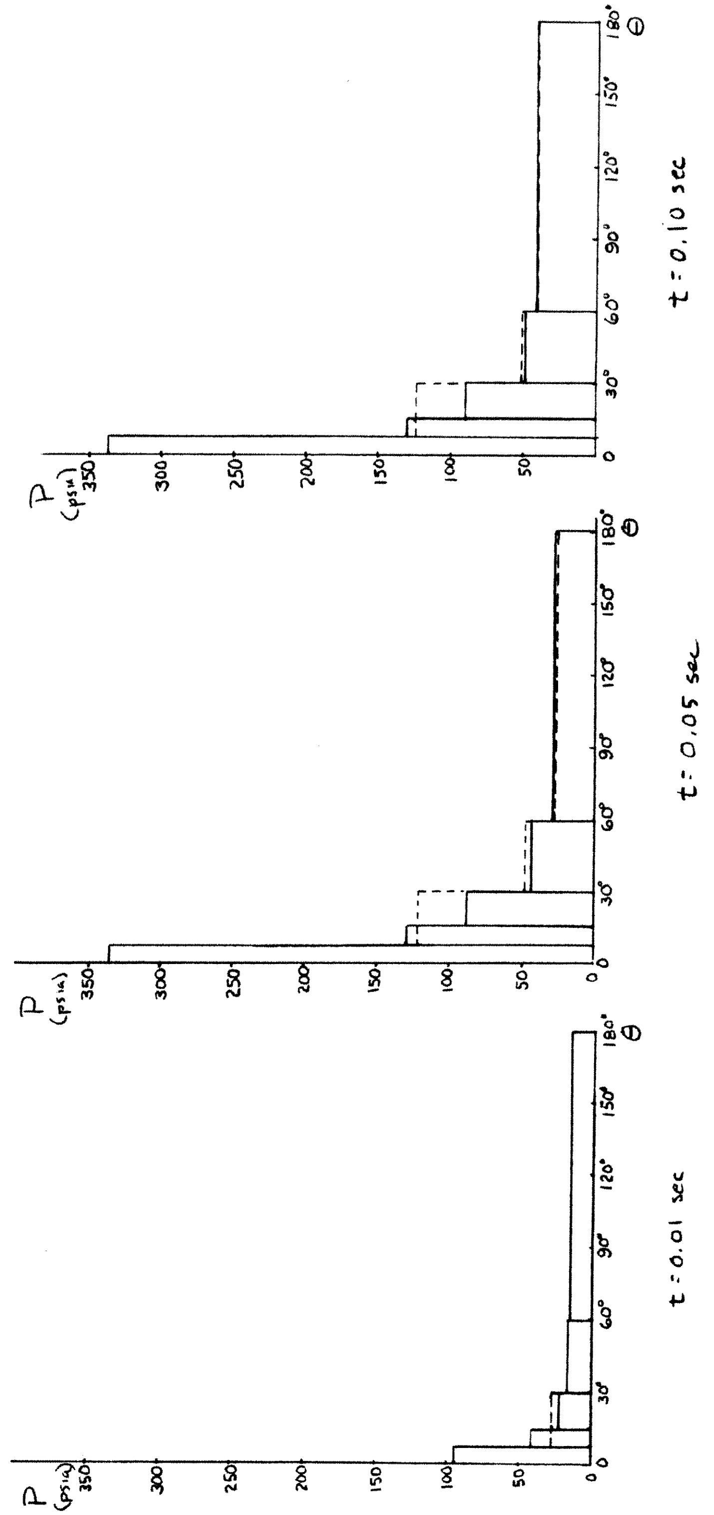

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FIGURE 6.2-44

AZIMUTHAL PRESSURE DISTRIBUTION
(AT ℄ RECIRCULATION OUTLET NOZZLE)
CASE A AND CASE B

REV. 0 - APRIL 1984

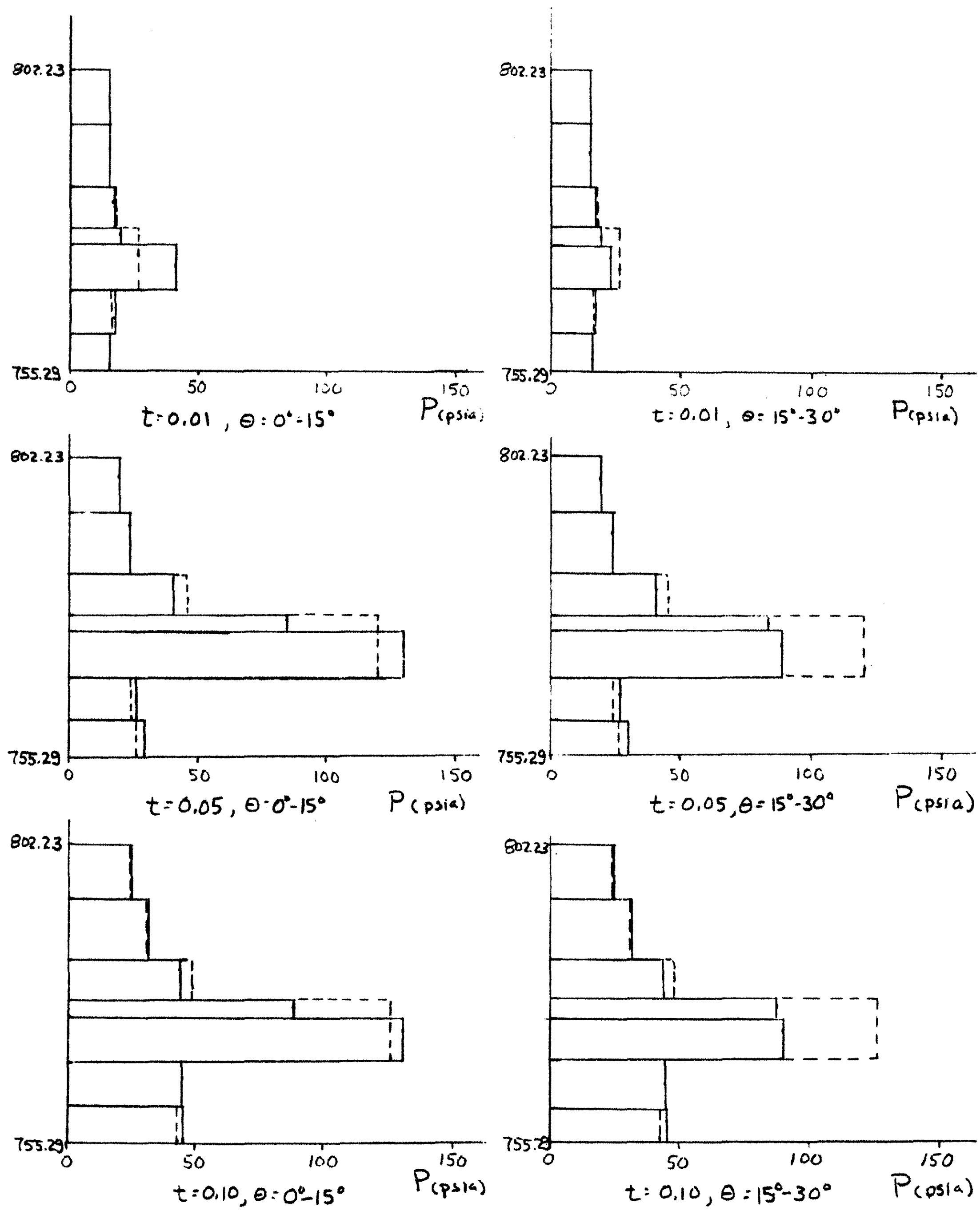

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FIGURE 6.2-45

AXIAL PRESSURE DISTRIBUTION CASE A AND CASE B

REV. 0 - APRIL 1984

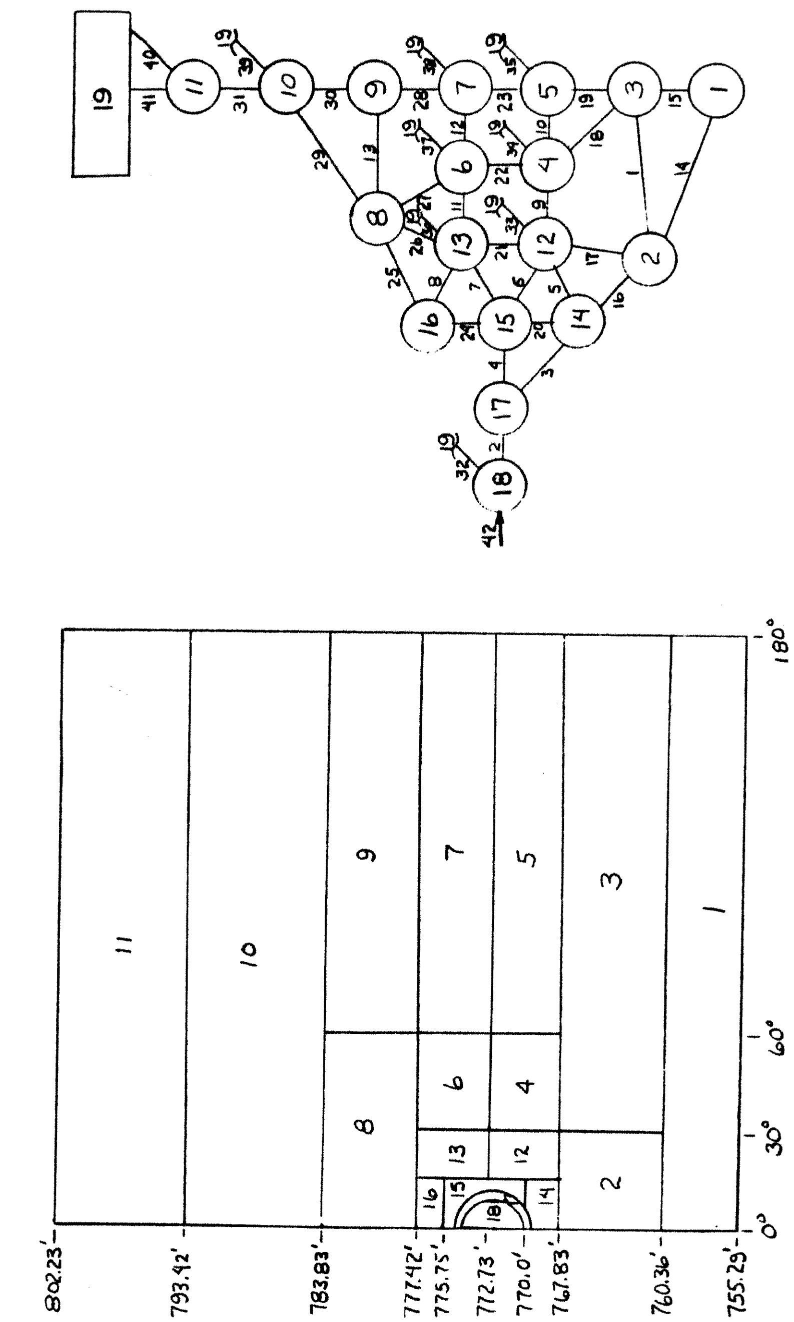

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FIGURE 6.2-46

COMPLEX NODALIZATION (CASE C)

REV. 0 - APRIL 1984

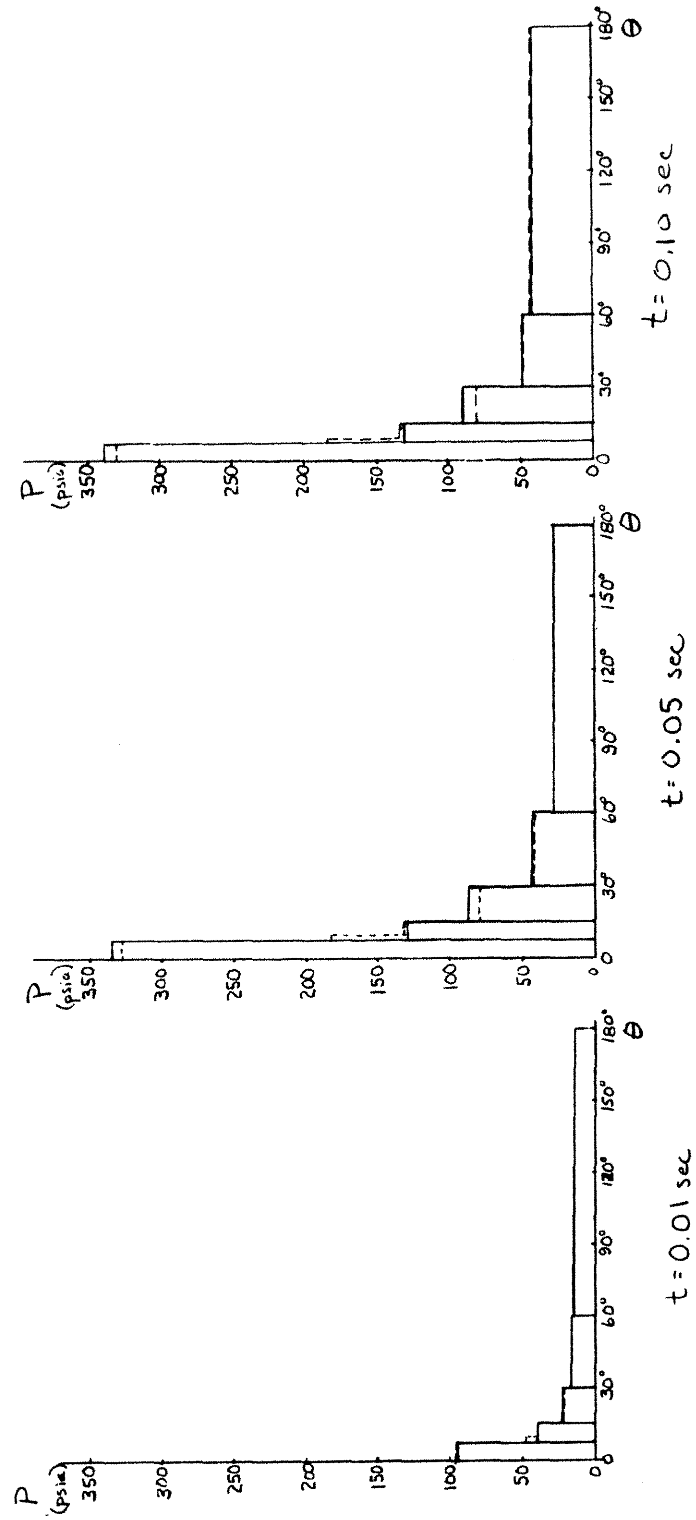

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FIGURE 6.2-47

AZIMUTHAL PRESSURE DISTRIBUTION
(AT ℄ RECIRCULATION OUTLET NOZZLE)
CASE A AND CASE C

REV. 0 - APRIL 1984

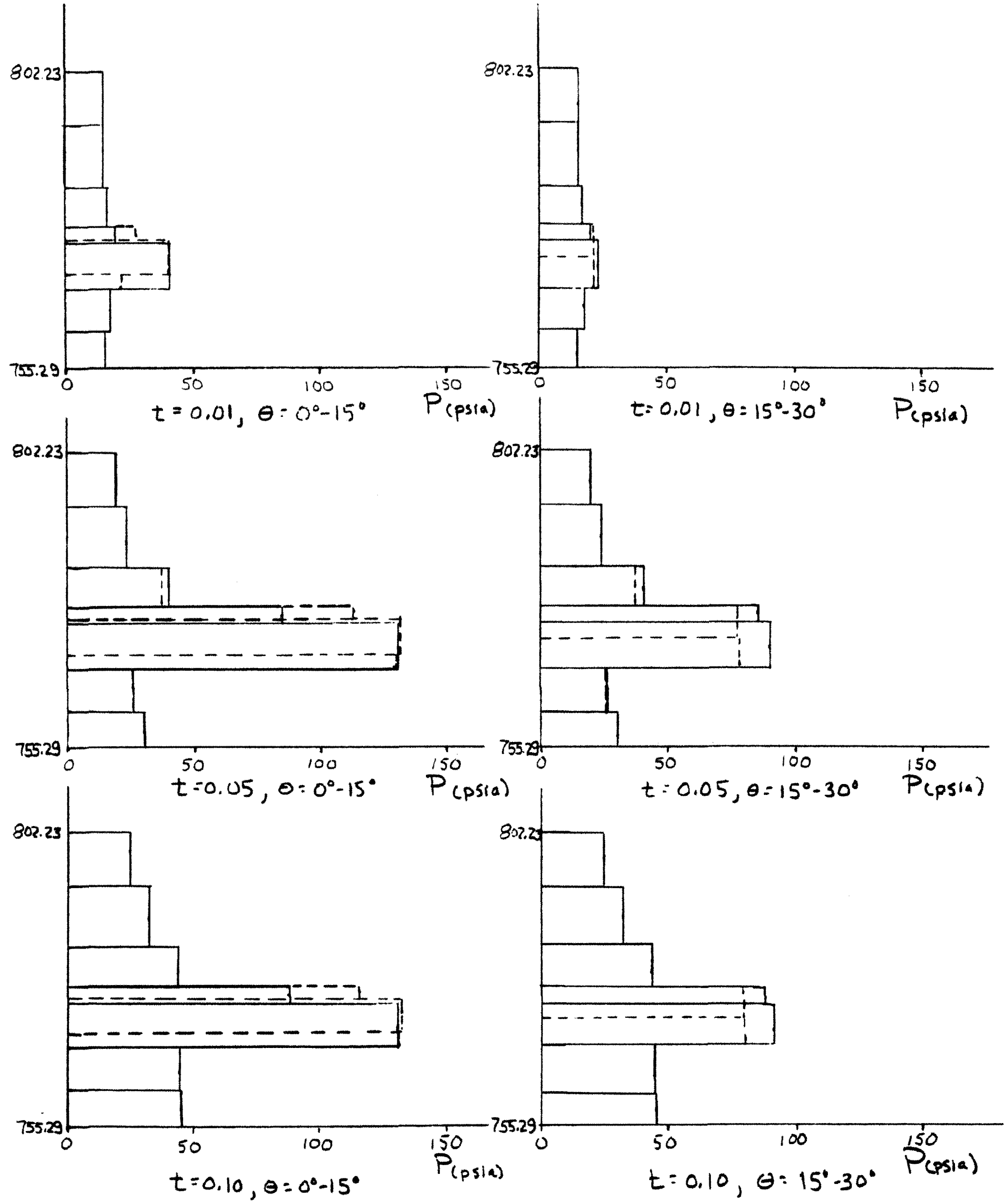

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FIGURE 6.2-48

AXIAL PRESSURE DISTRIBUTION
(CASE A AND CASE C)

REV. 0 - APRIL 1984

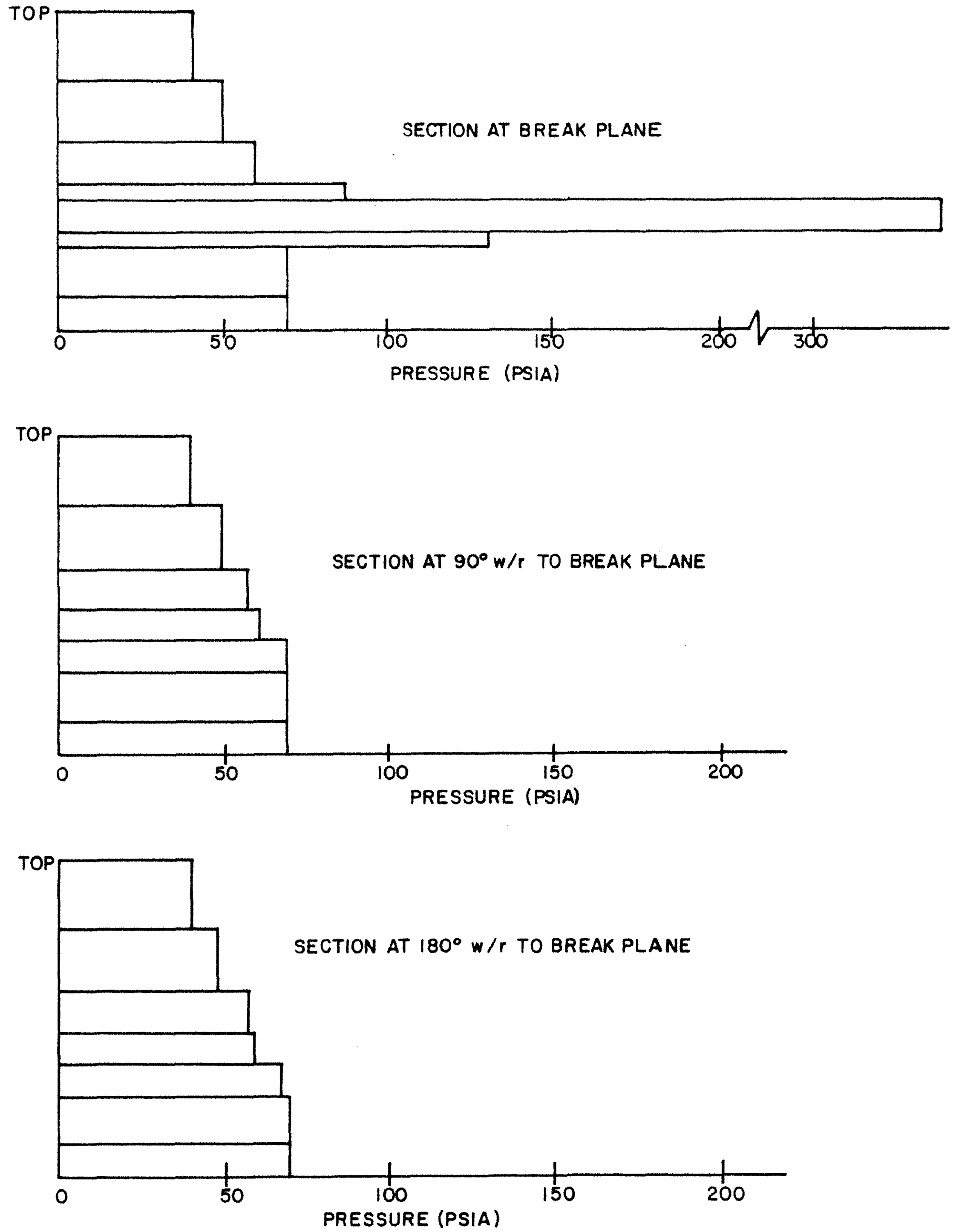

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FIGURE 6.2-49

AXIAL PRESSURE DISTRIBUTION AT
t = 0.500 SECONDS

REV. 0 - APRIL 1984

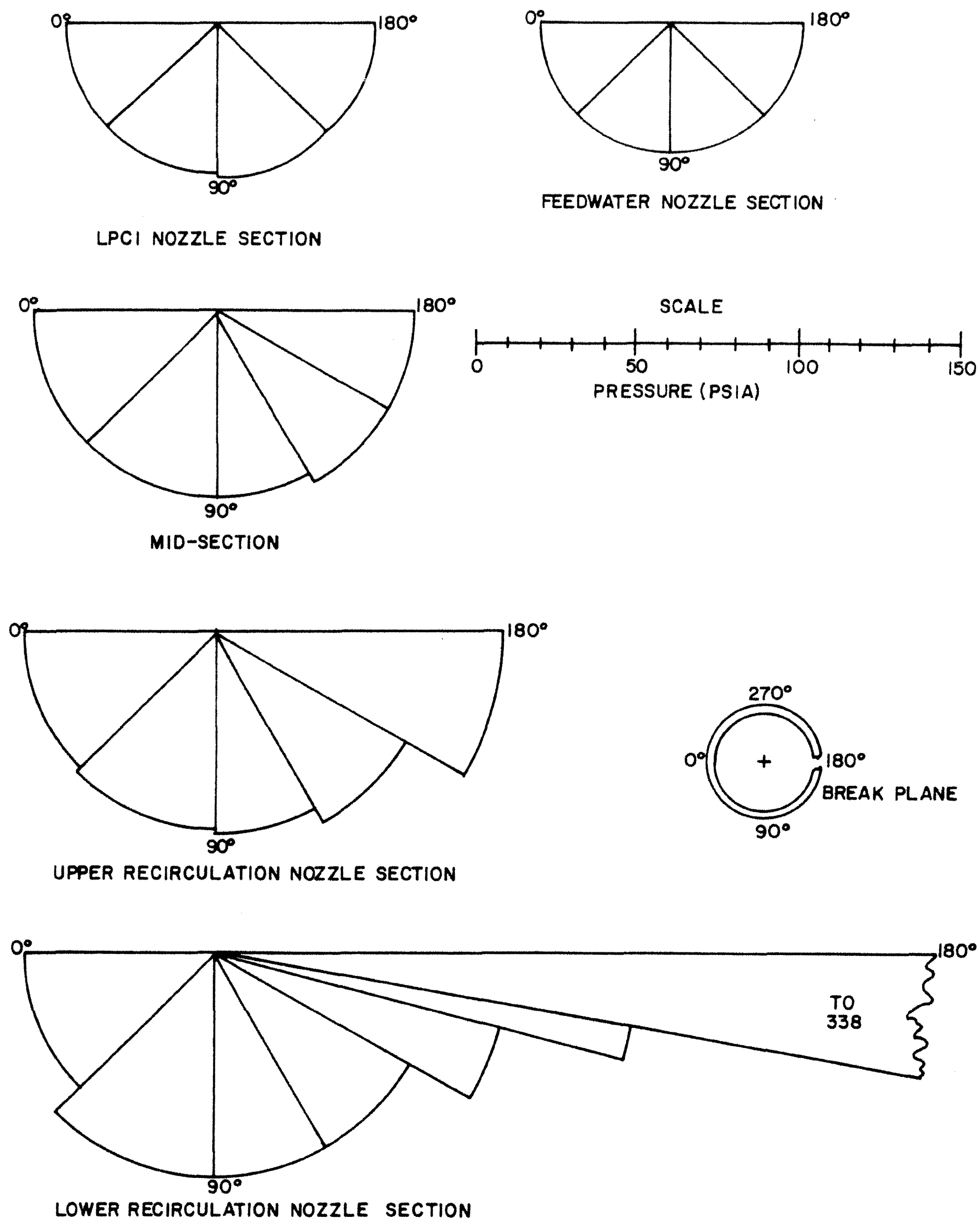

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FIGURE 6.2-50

CIRCUMFERENTIAL PRESSURE DISTRIBUTION AT
t = 0.500 SECONDS
(SHEET 1 of 2)

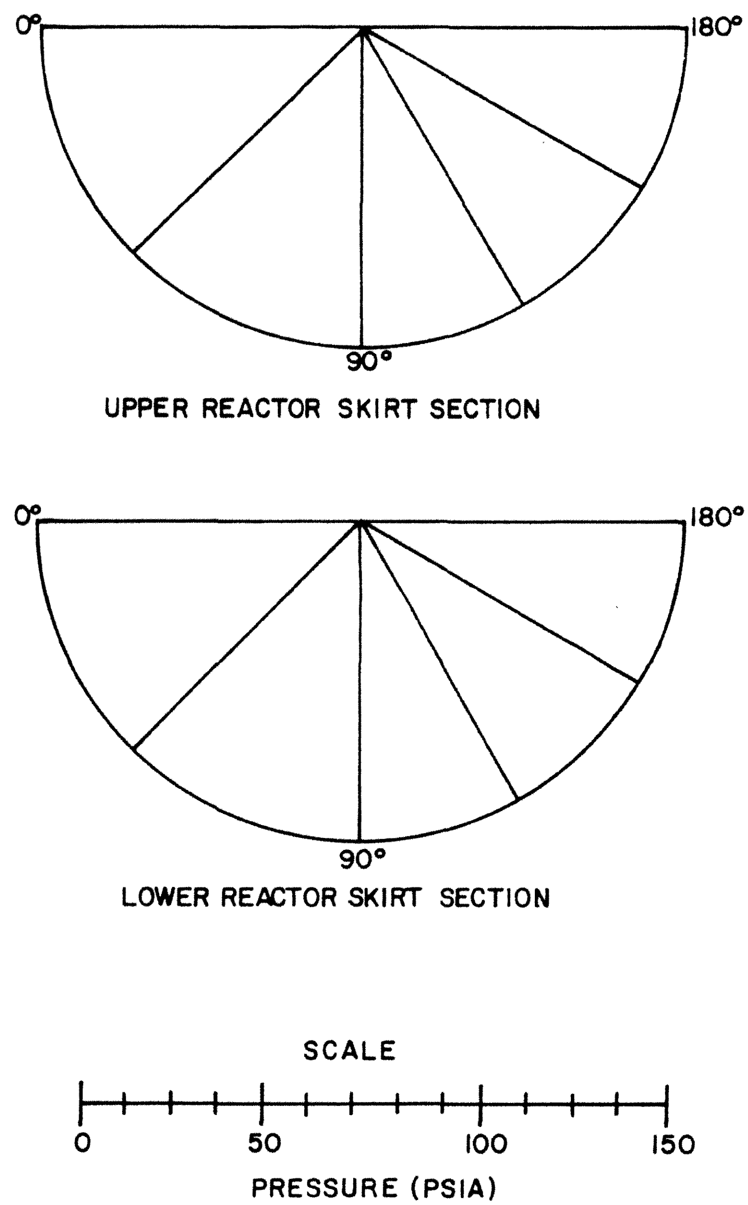

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FIGURE 6.2-50

CIRCUMFERENTIAL PRESSURE DISTRIBUTION AT t = 0.500 SECONDS

(SHEET 2 of 2)

REV. 0 - APRIL 1984

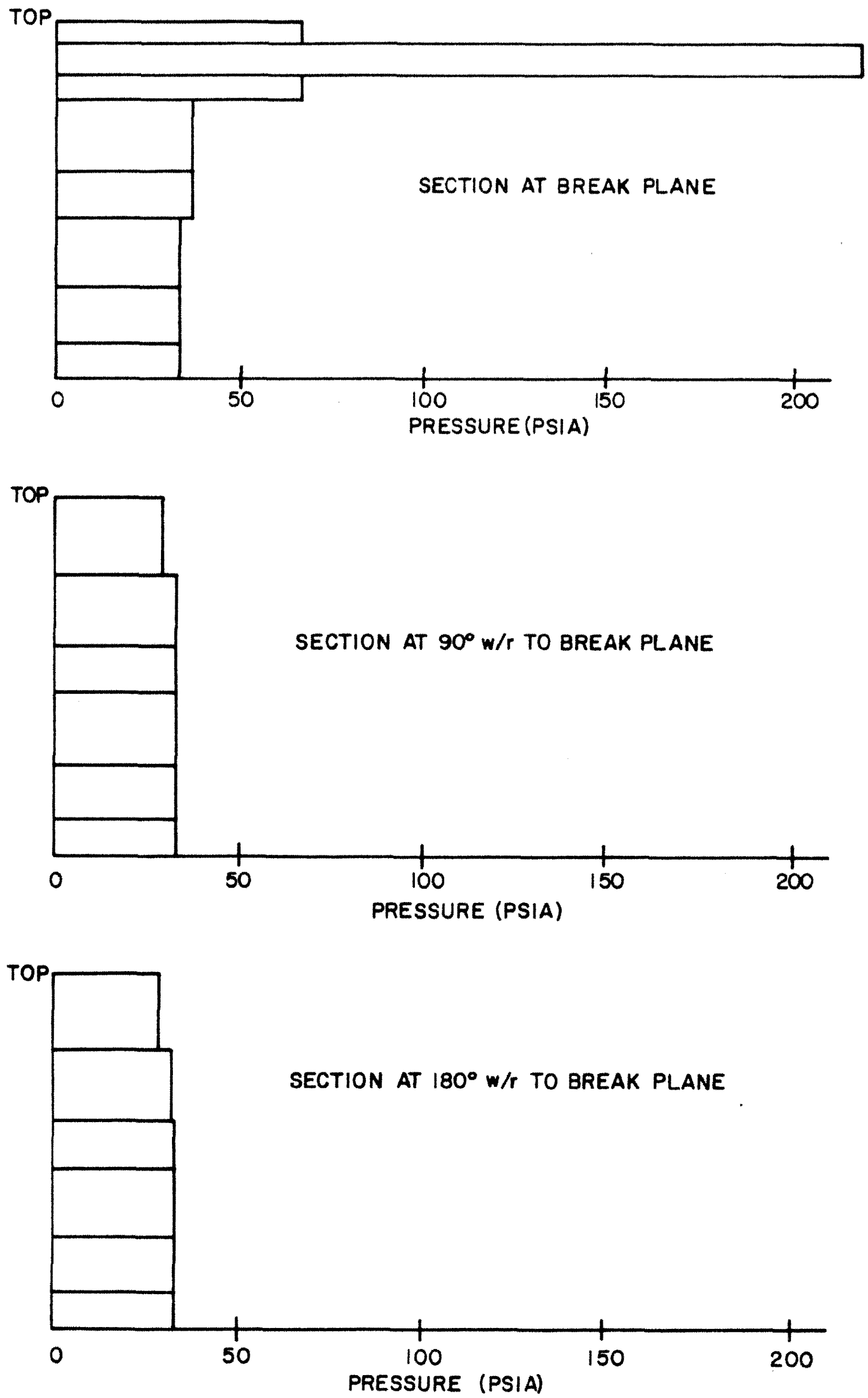

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FIGURE 6.2-51

AXIAL PRESSURE DISTRIBUTION AT
t = 0.500 SECONDS (CASE C)

REV. 0 - APRIL 1984

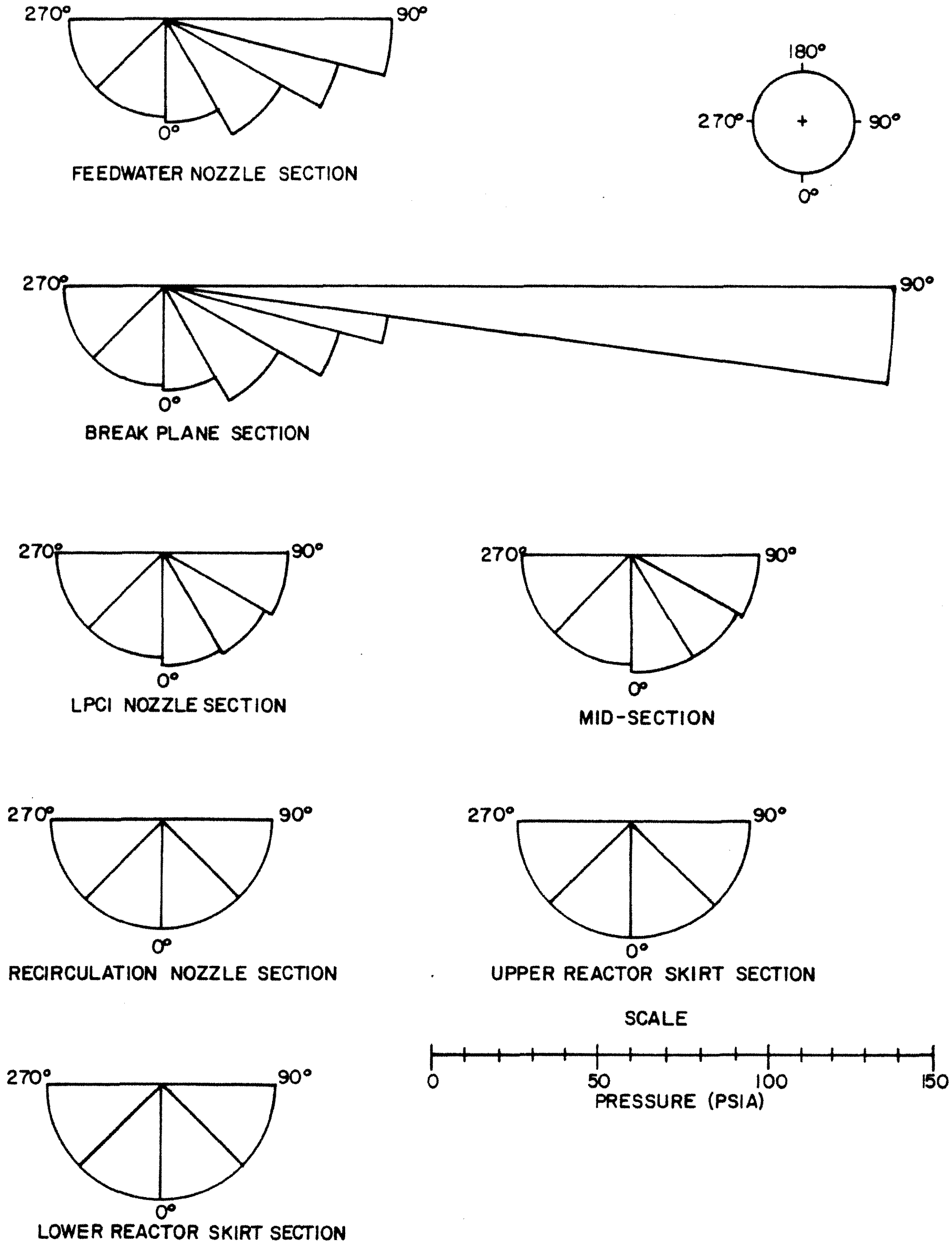

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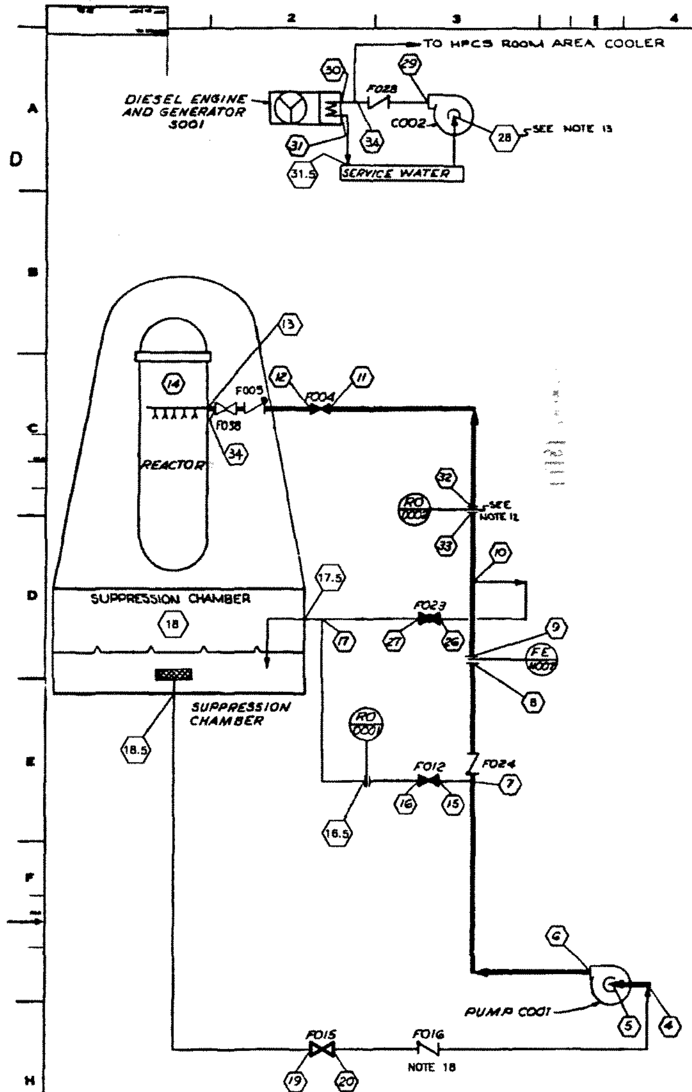
FIGURE 6.2-52

CIRCUMFERENTIAL PRESSURE DISTRIBUTION AT
t = 0.500 SECONDS (CASE C)

REV. 0 - APRIL 1984



PRIMARY MODES

MODE B ACCIDENT, REACTOR AT HIGH PRESSURE SUCTION FROM SUPPRESSION POOL

POSITION ◯	4	5	6	7	8	9	10	11	12	13	14	19	20	18
FLOW GPM	1550	←	—	—	—	—	—	—	→	1550	N/A	1550	1550	N/A
PRESS PSIA											1143			14.7
TEMP °F	120/40	←	—	—	—	—	—	—	→	120/40	AMB	120/40	120/40	AMB
MAX PRESS DROP FEET		← 2787 →												

MODE C ACCIDENT SYSTEM INJECTION AT RATED CORE SPRAY SUCTION FROM SUPPRESSION POOL

POSITION ◯	4	5	6	7	8	9	10	11	12	13	14	19	20	18	28	29	30	31	34
FLOW GPM	6200	←	—	—	—	—	—	—	→	6200	N/A	6200	6200	N/A	1000	1000	800	800	800
PRESS PSIA											215			14.7	SEE NOTE 13				
TEMP °F	170/40	←	—	—	—	—	—	—	→	170/40	AMB	170/40	170/40	AMB	100	100	100	130	100
MAX PRESS DROP FEET		← 845 →			← 21 →			← 2.2 →		← 198 →		← 0.30 →			← 150 →		← 15 →		

MODE D ACCIDENT SYSTEM INJECTION AT CORE FLOOD SUCTION FROM SUPPRESSION POOL

POSITION ◯	4	5	6	7	8	9	10	11	12	13	14	19	20	18
FLOW GPM	6856	←	—	—	—	—	—	—	→	6856	N/A	6856	6856	N/A
PRESS PSIA											41			14.7
TEMP °F	170/40	←	—	—	—	—	—	—	→	170/40	AMB	170/40	170/40	AMB
MAX PRESS DROP FEET		← 596 →			← 24 →			← 2.5 →		← 2.51 →				

MODE F ACCIDENT SYSTEM OPERATING AT RUNOUT SUCTION FROM SUPPRESSION POOL

POSITION ◯	4	5	6	7	8	9	10	11	12	13	14	19	20	18
FLOW GPM SEE NOTE 9	7175	←	—	—	—	—	—	—	→	7175	N/A	7175	7175	N/A
PRESS PSIA		SEE NOTE 7									14.7			14.7
TEMP °F	212/40	←	—	—	—	—	—	—	→	212/40	AMB	212/40	212/40	AMB
MAX PRESS DROP FEET		← 450 →										← 0.48 →		

MODE G SYSTEM TEST SUCTION FROM SUPPRESSION POOL

POSITION ◯	4	5	6	7	8	9	10	21	26	27	17	19	20	18
FLOW GPM SEE NOTE 9	7175	←	—	—	—	—	—	—	—	—	—	→	7175	N/A
PRESS PSIA	X	X	X	X	X	X	X	X	X	X	X	X	X	14.7
TEMP °F	110/40	←	—	—	—	—	—	—	—	—	—	→	120/40	AMB
MAX PRESS DROP FEET		← 450 →							← 50 → SEE NOTE 10					

MODE S SYSTEM ON STANDBY DUTY

POSITION ◯	4	5	6	7	8	9	10	11	12	13	14	18	19	20
FLOW GPM	0	←	—	—	—	—	—	—	→	O	N/A	N/A	0	0
PRESS PSIA	X		X	X	X	X	X	X	X	X	SEE REF 2	14.7		
TEMP °F	170/40	←	—	—	—	→	110/40	AMB	←	→	AMB	AMB	170/40	170/40
MAX PRESS DROP FEET		← 0 →												

TABLE I
VALVE POSITION TABLE

VALVE	F001	F004	F010	F011	F012	F015	F023	F038
MODE B	C	O	C	C	C	O	C	O
MODE C	C	O	C	C	C	O	C	O
MODE D	C	O	C	C	C	O	C	O
MODE F	C	O	C	C	C	O	C	O
MODE G	C	C	C	C	C	O	O	O
MODE J	C	C	C	C	O	O	C	O
MODE S	C	C	C	C	C	O	C	O

O VALVE OPEN
C VALVE CLOSED

MODE J PUMP OPERATING ON BYPASS, SUCTION FROM SUPPRESSION POOL

POSITION ◯	4	5	6	7	15	16	17	18	19	20
FLOW GPM	1000	←	—	—	—	→	1000	N/A	1000	1000
PRESS PSIA	X	X	X	X	X	X	X	47		
TEMP °F	170/40	←	—	—	—	→	170/40	AMB	170/40	170/40
MAX PRESS DROP FEET		← 3000 →			← 20 →					

TABLE II
LIMITING LINE LOSS

MODE	FLOW PATH	COMMENT
F	18.5-19-20-4-5	SEE NOTE 7
C	6-7-8-9-10-11-12-13	SEE NOTE 5
J	7-15-16-16.5-17	
G	21-26-27-17-17.5	

NOTES:

1. ALL EMPTY PRESSURE DATA BLANKS CAN BE FILLED IN BY OTHERS (BASED ON ACTUAL ARRANGEMENT) OR EQUIV. HYDRAULIC DATA SUBMITTED TO APED FOR REVIEW [ ] NO DATES THE DATA IS NOT SIGNIFICANT.
2. [MAX/MIN] INDICATES MAXIMUM & MINIMUM VALUE OF PARAMETER FOR THE MODE SPECIFIED.
3. ELEVATIONS ARE NOT INCLUDED IN ΔP VALUES GIVEN. ELEVATIONS SHALL BE INCLUDED WHEN DETERMINING FINAL VALUES FOR THE EMPTY PRESSURE BLANKS.
4. THE PUMP MAXIMUM SHUTOFF HEAD WILL NOT EXCEED 3450 FT.
5. IN MODE E WITH A PUMP TDH OF 845 FT. AND A VESSEL PRESSURE OF 215 PSIA THE FLOW MUST BE EQUAL TO OR GREATER THAN 5200 GPM.
6. THE PUMP TDH GIVEN FOR MODE E BASED ON A MAXIMUM CONTAINMENT PRESSURE OF 45 PSIG. BWRSD BE ADVISED IF THE CONTAINMENT DESIGN IS BASED ON HIGHER PRESSURE AND THE IMPACT ON THE HIGH PRESSURE CORE SPRAY SYSTEM EVALUATED.
7. IN MODE F, THE NET POSITIVE SUCTION HEAD (NPSH) AVAILABLE AT THE CENTERLINE OF THE PUMP SUCTION NOZZLE MUST EQUAL OR EXCEED 16.0 FT.
8. DELETED.
9. THE FLOW SPECIFIED FOR MODES F AND G IS APPROXIMATE AND MUST BE DETERMINED BASED ON FINAL SYSTEM DESIGN. THE FLOW GIVEN FOR THE MAXIMUM ALLOWABLE.
10. THE ΔP GIVEN FOR THE VALVES IN MODE G IS THE MINIMUM POSSIBLE AND MAY BE INCREASED BY OTHERS (THROTTLING) TO ACCOMMODATE PIPING ARRANGEMENT.
11. DELETED.
12. THE ΔP BETWEEN LOCATION (32) AND (33) WILL BE DETERMINED IN PRE-OPERATIONAL TEST. THE ΔP WILL BE ADJUSTED TO MEET THE FLOW REQUIREMENTS OF MODE C, D AND/OR E, AND TO LIMIT MAXIMUM RUNOUT FLOW TO 7175 GPM.
13. THE MINIMUM AVAILABLE NPSH TO THE DIESEL SERVICE WATER PUMP OCCURS IN MODE C AND MUST BE 22 FEET OR GREATER.
14. ΔP VALUES FOR EQUIPMENT WITHIN GE-BWRSD SCOPE ARE AS NOTED.
15. TABLE 1 INDICATES VALVE POSITION DURING VARIOUS OPERATING MODES.
16. PIPING SYSTEM DESIGN PRESSURE AND TEMPERATURE AND THE ESTIMATED LINE SIZES ARE FOR INFORMATION ONLY. ACTUAL DESIGN TEMPERATURE AND PRESSURE AND LINE SIZES AS DETERMINED BY OTHERS SHALL MET THE PROCESS DIAGRAM HYDRAULIC REQUIREMENTS.
17. IN MODE D AND WITH A VESSEL PRESSURE OF 14.7 PSIA, THE FLOW SHALL NOT EXCEED 7175 GPM.
18. THE INTERNALS OF CHECK VALVE 1E22-F016 (2E22-F016) HAVE BEEN REMOVED PER DCP 9500324 (9500325).

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING.

	REFERENCE DESIGNATOR
1. HIGH PRESSURE CORE SPRAY P&ID	E22-1010
2. NUCLEAR BOILER SYSTEM PROC. DIAGRAM	B21-1020
3. HIGH PRESSURE CORE SPRAY DESIGN SPEC	E22-4010

MISCELLANEOUS INFORMATION
(SEE NOTE 16)

LOCATION													
DESIGN TEMP (°F)	140	[illegible]	[illegible]	212	*	SEE REF 2	212	212	212	140	100	DIESEL HEAT EXCHANGER	130
DESIGN PRESS (PSIG)	100		100	1325	*	SEE REF 2	1325 / 100	1325 / 100	1325	100	100		100
EST MATED LINE SIZE (")	16		18	16		12	4	12	10		5		5
	CONDENSATE STG SUCTION LINE		SUPPRESSION POOL SUCTION LINE	MAIN HPCS LINE TO REACTOR			BY PASS LINE	SUPPRESSION POOL TEST LINE	CONDENSATE STORAGE TEST RETURN LINE		DIESEL COOLING WATER LINE		

* DUAL DESIGN CONDITION 250 PSIG @ 575 °F OR 1150 PSIG @ 140 °F.

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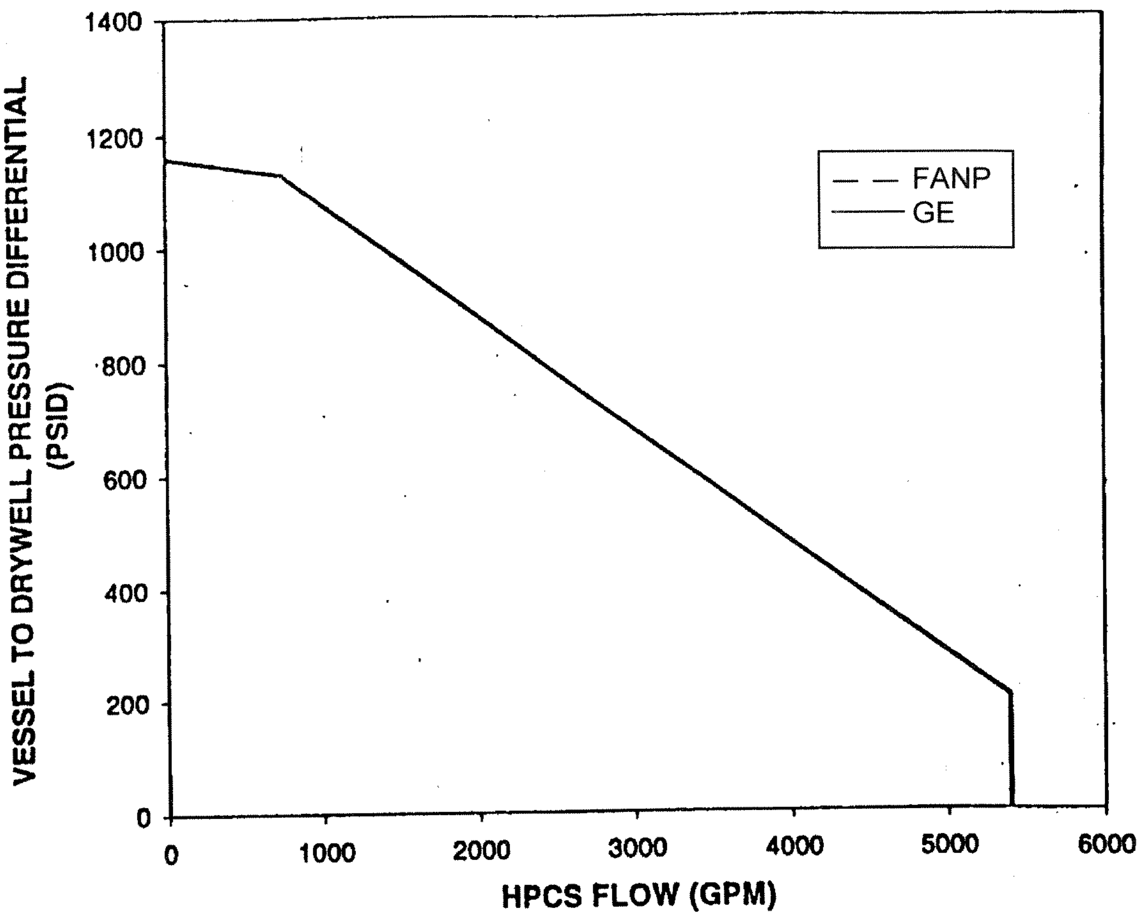
FIGURE 6.3-1

HPCS SYSTEM PROCESS DIAGRAM

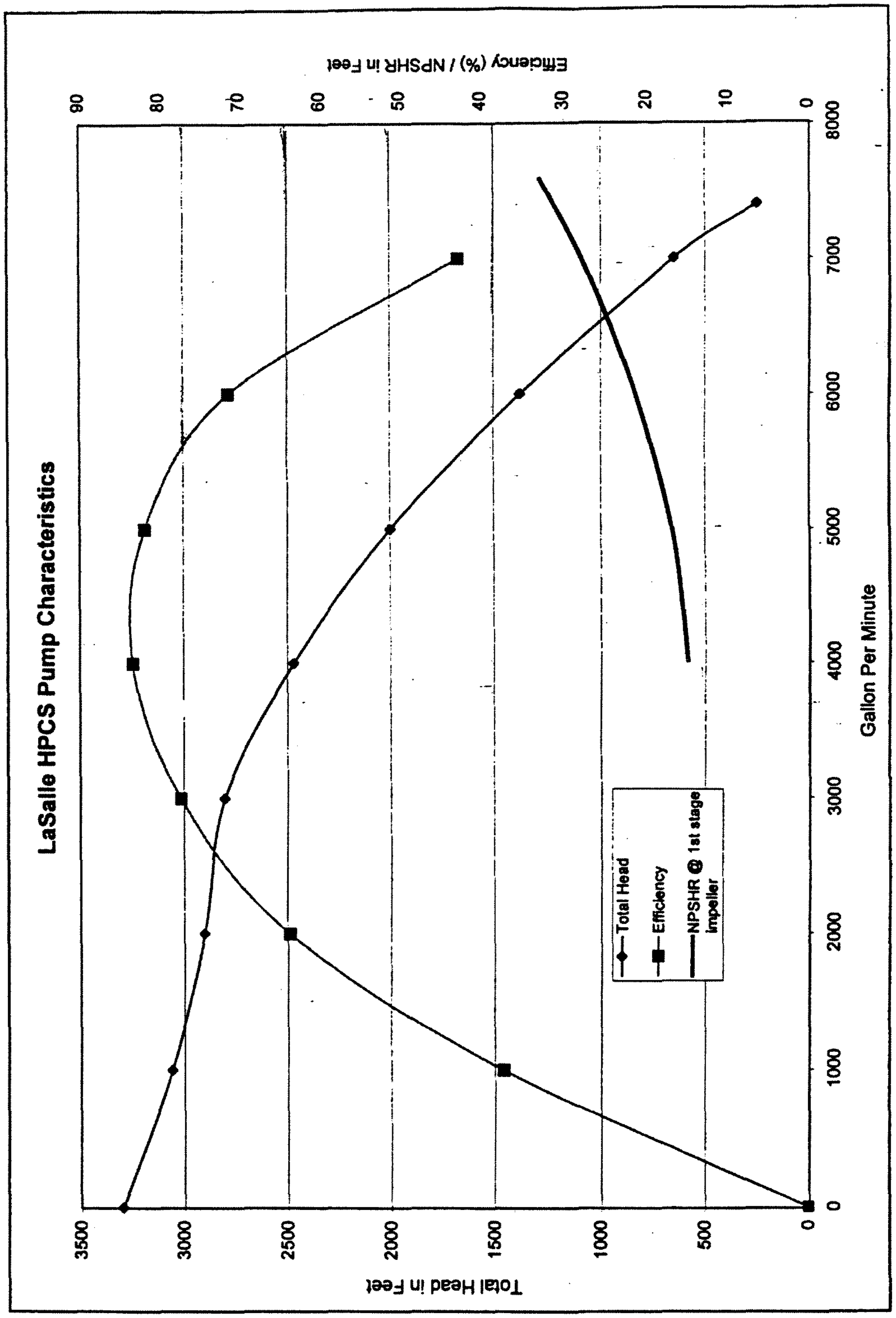
REV. 13

731E932AA

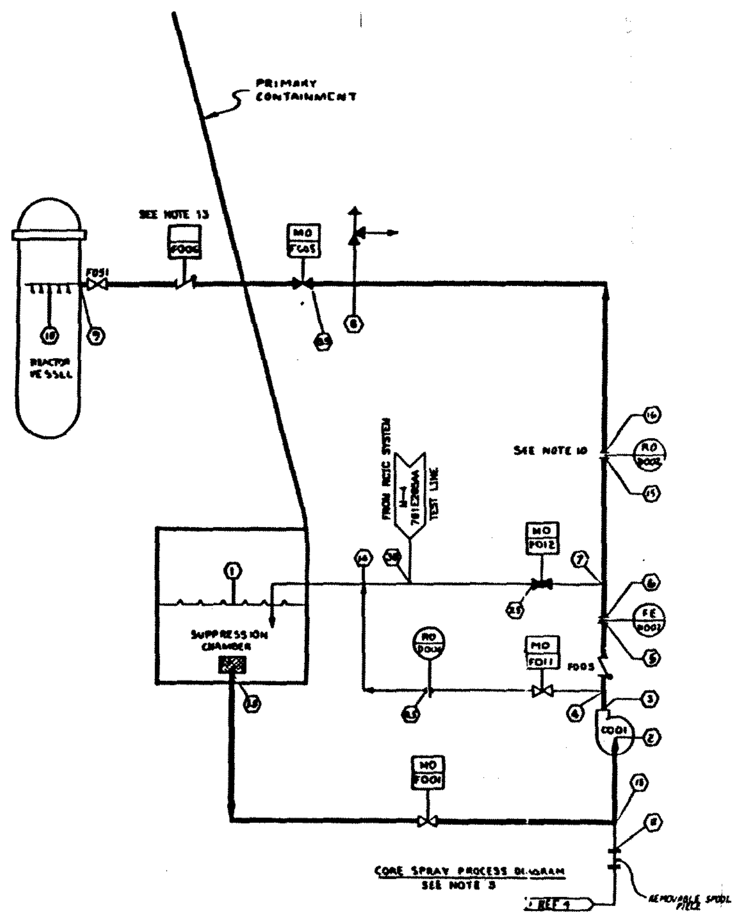


Source: EMF-95-041, Revision 2
NEDC-32835P

LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-2 VESSEL PRESSURE VS. HPCS FLOW ASSUMED IN FANP AND GE LOCA ANALYSES



LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-3 HPCS PUMP CHARACTERISTICS



MODE A SYSTEM TEST, SUCTION FROM SUPPRESSION POOL

LOCATION ○	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FLOW - GPM	N/A	7000 ←				→	7000	0	0	0	0	0	0	7000
PRESS - PSIA	14.7	X	X	X	X	X		X	X	X	X	X	X	
TEMP - °F	120/40	←				→	120/38	AMB ←					→ AMB	?/38
MAX PRESS DIFFERENCE - FT		•500•												

MODE B SYSTEM TEST, SUCTION FROM RESIDUAL HEAT REMOVAL SYS TP

LOCATION ○	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FLOW - GPM	N/A	8200 ←								→ 8200	N/A	8200	8200	
PRESS - PSIA	14.7		X	X	X	X	X	X	X	14.7	14.7			X
TEMP - °F	N/A	125/40 ←								→ 125/40	N/A	125/40	125/40	AMB
MAX PRESS DIFFERENCE - FT		•650•												

MODE C PUMP OPERATING ON BYPASS, SUCTION FROM SUPPRESSION POOL

LOCATION ○	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FLOW - GPM	N/A	635	635	635	0	0	0	0	0	0	0	0	0	635
PRESS - PSIA	14.7	X	X		X	X	X	X	X	X	X	X	X	
TEMP - °F	212/40	←	→	212/40	AMB ←								→ AMB	212/40
MAX PRESS DIFFERENCE - FT		1105/1020												

MODE D ACCIDENT, SYSTEM INJECTION AT RATED CORE SPRAY (128 PSID)

LOCATION ○	1	2	3	4	5	6	7	8	9	10
FLOW - GPM	N/A	6310 ←							→	6310
PRESS - PSIA	14.7									142.7
TEMP - °F	170	←							→	170
MAX PRESS DIFFERENCE - FT		•674•			•17•				•178•	

MODE E ACCIDENT, SYSTEM INJECTION AT RATED CORE FLOOD

LOCATION ○	1	2	3	4	5	6	7	8	9	10
FLOW - GPM	N/A	7214 ←							→	7214
PRESS - PSIA	14.7	X	X	X	X	X	X	X	X	40.7
TEMP - °F	135/40	←							→	135/40
MAX PRESS DIFFERENCE - FT		•515•								

MODE F ACCIDENT, SYSTEM OPERATING AT RUNOUT

LOCATION ○	1	2	3	4	5	6	7	8	9	10
FLOW - GPM	N/A	7800 ←							→	7800
PRESS - PSIA	14.7		X	X	X	X	X	X	X	14.7
TEMP - °F	212	←							→	212
MAX PRESS DIFFERENCE - FT		•500•								

MODE S SYSTEM ON STANDBY DUTY

LOCATION ○	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FLOW - GPM	N/A	0	←										→	0
PRESS - PSIA	14.7		X	X	X	X	X	X	X	30	14.7	X	X	X
TEMP - °F	120/40	←				→	120/40	AMB	AMB	AMB	120/40	←	→	120/40
MAX PRESS DIFFERENCE - FT		•0•												

FCF-239A2871AA (E21 1020)

NOTES:

1. [illegible]
2. [illegible]
3. [illegible]
4.
5. [illegible]
6. [illegible]
7. [illegible]
8. [illegible]
9. [illegible]
10. [illegible]
11. [illegible]
12. [illegible]
13. FREE SWINGING DISC. THE ACTUATOR IS USED FOR LOCAL LEAK RATE TESTING ONLY.

REFERENCE DOCUMENTS: — NO. / ITEM NO.

1. LPCS SYSTEM P&ID — E21-1010
2. LPCS SYS DESIGN SPEC — E21-4010
3. NUCLEAR BOILER SYS PROC DIAG — B21-1020
4. RESIDUAL HEAT REMOVAL SYS P&ID — E12-1010

SUPPORTING DOCUMENTS: — NO. / ITEM NO.

1. PIPING & INSTRUMENT SYM — A42-1010

TABLE II
LIMITING LINE LOSS

MODE	FLOW PATH	COMMENTS
F	13-13-2	SEE NOTE 6
D OR E	3-4 5-6 15 16-8-8.5 9-10	
A	7-7.5-14	
C	4-4.5-14	
B	12-15	

VALVE POSITIONS

CONDITION	VALVE NO					
	F001		F005	F007	F012	D01
MODE A	O		C	O	P	C
MODE B	C		O	O	C	C
MODE C	O		C	O	C	O
MODE D	O		O	O	C	C
MODE E	O		O	O	C	C
MODE F	O	–	O	O	C	C
MODE S	O		C	O	C	O

P - PARTIALLY OPEN
C - FULLY CLOSED
O - FULLY OPEN

MISCELLANEOUS INFORMATION - SEE NOTE 12

LOCATION ○	1.5	2	3 – 8	8.5	9	4 – 16	7	7.5	14	12 – 13
DESIGN TEMP (°F)	212	LPCS PUMP	← 480 →	SEE NO. 3		← 212 →		480 / 212		← 212 →
DESIGN PRESS (PSIG)	100		← 800 →	SEE NO. 3		550 / 100		550 / 100		← 100 →
ESTIMATED LINE SIZES (IN)	18"		← 16" →	12"		← 4" →		← 12" →		← 16" →
	MAIN CORE SPRAY LINE TO REACTOR					BYPASS LINE		TEST LINE		CONDENSATE LINE

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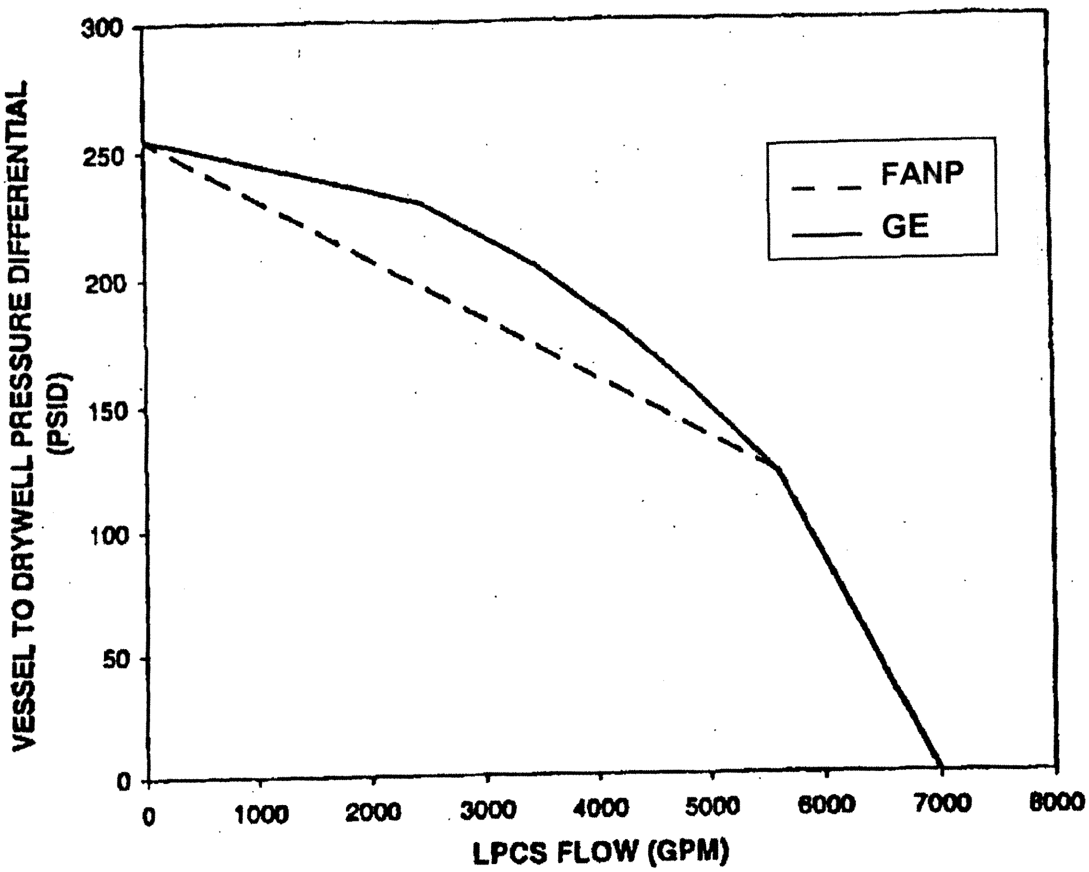
FIGURE 6.3-4

LPCS SYSTEM PROCESS DIAGRAM

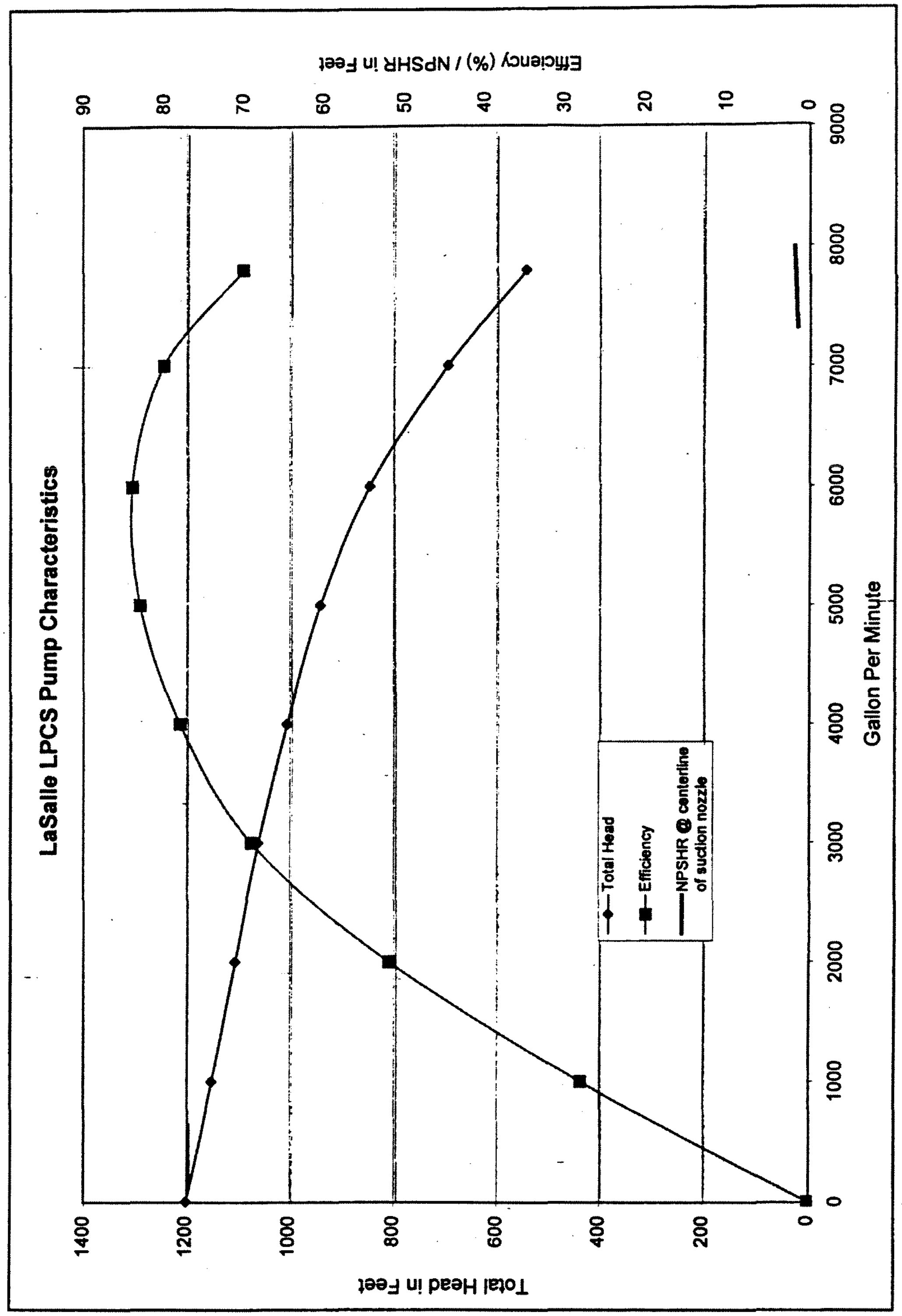
REV. 13

761E220AA

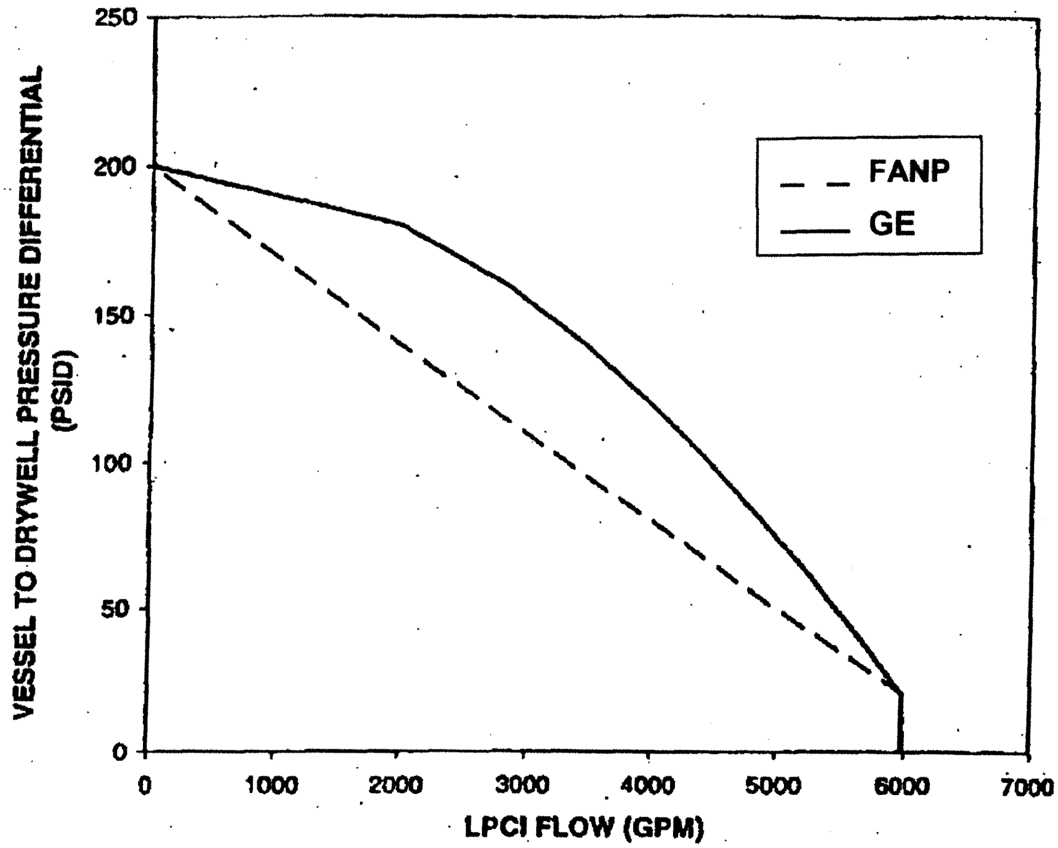


Source: EMF-95-041, Revision 2
NEDC-32835P

LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-5 VESSEL PRESSURE VS. LPCS FLOW ASSUMED IN FANP AND GE LOCA ANALYSES Prior to GE14 Analysis



LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-6 LPCS PUMP CHARACTERISTICS



Source: EMF-95-041, Revision 2
NEDC-32835P

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FIGURE 6.3-7

VESSEL PRESSURE VS. LPCI FLOW
ASSUMED IN FANP AND GE LOCA ANALYSES
Prior to GE14 Analysis

FCF 238X184AA G1&2, E12-1020

MODE F

POSITION ○	1	2	3	4	5	6	49	7	8	9	10	13	24	1
FLOW-GPM	—	7450	←									→	7450	—
PRESS-PSIA	14.7	X	X	X	X	X	X	X	X	X	X			14.7
TEMP °F	—	120/40	←									→	120/40	—
MAX. PRESS DROP-FEET					TDH=267									

LOOP A & B TEST — LOOP C TEST

MODE G

Rx PRESS 110 PSIG

POSITION ○	29	25	55	26	4	5	6	43 A,B	24 A,B	1		1	2	3	4	5	6	42	45 A,B	24 A,B	1
FLOW-GPM	—	550	←					→	550	—		—	550	←					→	550	—
PRESS-PSIA	125	X	X	X	X			X		14.7		14.7	X	X	X	X				X	14.7
TEMP °F	—	344	←					→	344	—		—	125/40	←					→	125/40	—
MAX. PRESS DROP-FEET						TDH=425 MAX SEE NOTE 22											TDH=425 MAX SEE NOTE 22				

LOOP A & B — LOOP A — B&C LOOPS

MODE S

POSITION ○	1	2	3	4	5	6	18 A,B	19 A,B	20 A,B	9	10	46	11	48 A,B	21 A,B	50 A,B	27 A,B	51	33	52 A,B	53 A,B
FLOW-GPM	N/A	←																		→	N/A
PRESS-PSIA	14.7	X	X	X	X	X	X	X	X	X	X	X	1015	X	1015	X	1015	X	1015	X	X
TEMP °F	90/40	←									→	90/40	547	90/40	135	90/40	547	90/40	547	90/40	90/40
MAX PRESS DROP-FEET						0															

MODE S (CONT'D)

POSITION ○	54	56	55 A,B		34	35	36 A,B	37 A,B	12 A,B		30 A,B	38 A,B	40 A,B	41	42
FLOW-GPM	N/A	N/A	N/A		N/A	←		→	N/A		N/A	←		→	N/A
PRESS-PSIA	X	X	X		X	X	X	X	X		X	X	X	X	X
TEMP °F	AMB	AMB	AMB		AMB	AMB	AMB	90/40	90/40		90/40	90/40	AMB	AMB	AMB
MAX PRESS DROP-FEET															

MODE A-1

(SEE NOTE 14)

POSITION ○	1	2	3	4	5	6	7	8	9	10	15	11	29
FLOW-GPM	—	7450	←								→	7450	—
PRESS-PSIA	59.7/14.7	X	X	X	X								59.7/14.7
TEMP °F	—	170/40	←								→	170/40	—
MAX PRESS DROP-FEET					TDH=267				ΔH=17			ΔH=40	

LOOP A & B — LOOP C

MODE A-2

(SEE NOTE 14)

POSITION ○	1	2	3	4	5	6	7	8	9	10	16	11	29
FLOW-GPM	—	8400	←								→	8400	—
PRESS-PSIA	14.7	X	X	X	X	X	X	X	X	X	X	X	14.7
TEMP °F	—	150/50	←								→	150/50	—
MAX PRESS DROP-FEET					TDH=235								

LOOP A & B — LOOP C

MODE B

POSITION ○	1	2B	3B	4B	5B	6B	7B	17B	18B	19B	20B	8B	9B	10B	13B	14	15B	21B	22	23B	1		60B	61B
FLOW-GPM	—	8400	←													→	8400	7950	—	450	—		7400	7400
PRESS-PSIA	59.7/14.7					X	X	X	X	X	X	X	X	X	X	X			59.7/14.7		59.7/14.7		X	X
TEMP °F	—	212	←					→	212	170.4	←						→	170.4	—	170.4	—		160	142
MAX PRESS DROP-FEET					TDH=235																			

HEAT REMOVAL PER HX 155×10[6] SEE NOTE 16 (1 HX OPERATING) (SEE NOTE 21)

INDICATES FLOW PASSING THRU ABOVE POSITIONS (TYP)

SEE NOTE 7 (TYP)

MODE D

SEE NOTE 23 — RX PRESS 110 PSIG

POSITION ○	29	25	26	5A	6A	7A	18A	19A	8A	9A	10A	14	30	31	66	33	29	47A	16A	27A	28	29	60 A,B	61 A,B
FLOW/GPM	—	7450	7450	7450	7450	7450	7450	7450	7450	←	→	7450	870/0	870/0	870/0	870/0	—	7450/[illegible]	[illegible]	[illegible]	[illegible]	—	7400	7400
PRESS-PSIA	125			X	X	X	X	X	X	X	X	X					125	X	X	X	X	125	X	X
TEMP °F	—	344	←				344	252.5	←					→	252.5	REF 3	—	252.5	252.5	252.5	252.5	—	90	182.1
MAX PRESS DROP-FEET				TDH=267									ΔH=17			ΔH=4								

HEAT REMOVAL PER HX 35.2×10[6] BTU/HR (1HX OPERATING) SEE NOTE 21)

HEAD SPRAY — SEE REF 3 — VESSEL COOLANT — HEAD SPRAY & VESSEL COOLANT

MODE E

RX PRESS 0 PSIG

POSITION ○	29	25	26	56.1	4	5	6	18 A,B	19 A,B	9	10	16 A,B	11	27 A,B	28 F	29		60 A,B	61 A,B
FLOW-GPM	—	[illegible]	14,900	7450	←									→	7450	—		7400	7400
PRESS-PSIA	14.7	X	X	X	X	X	X	X	X	X	X	X			X	14.7		X	X
TEMP °F	—	120/[illegible]	←				[illegible]	[illegible]						→	[illegible]8	—		90	131.3
MAX PRESS DROP-FEET							[illegible]								[illegible]			ΔH=23	

DUTY PER HX 41.6×10[6] BTU/HR (2 HX'S OPERATING)

LOOP A&B — LOOP A&B TEST — LOOP C TEST

MODES:

A-1. ACCIDENT WITH RECIRCULATION LINE BREAK IN EITHER SIDE AND THREE PUMP OPERATION, [illegible] STRAINER 50% [illegible].

A-2. ACCIDENT WITH RECIRC. LINE BREAK IN EITHER SIDE AND THREE PUMP OPERATION, [illegible] STRAINER 50% CLOGGED. [illegible]

B. POST ACCIDENT CONTAINMENT SPRAY WITH HEAT REJECTION WITH ONE PUMP OPERATION AND STRAINER 50% PLUGGED. [illegible] SUPPRESSION POOL [illegible]

D. NORMAL SHUTDOWN AFTER FLOWDOWN TO MAIN CONDENSER

E. CONTINUATION OF NORMAL SHUTDOWN FROM PLANT MODE "D" (AT 0 PSIG) AND FUNCTIONAL PUMP TEST AFTER SHUTDOWN.

F. RHR SYSTEM TEST DURING PLANT OPERATION.

G. MINIMUM FLOW BYPASS MODE.

S. SYSTEM ON STANDBY DUTY

LEGEND

RX PRESS - - - - REACTOR VESSEL PRESSURE
TDH - - - - - - TOTAL DYNAMIC HEAD
SOH - - - - - - SHUTOFF HEAD
ΔH - - - - - - - HEAD LOSS
ΔP - - - - - - - PRESSURE LOSS

REFERENCE DRAWINGS: — DWG. ITEM NO.

1. RESIDUAL HEAT REMOVAL SYSTEM P&ID - - - - - E12-1010
2. RESIDUAL HEAT REMOVAL SYSTEM DESIGN SPEC - E12-4010
3. RCIC P&ID - - - - - - - - - - - - - - E51-1020
4. RECIRC SYSTEM PROCESS FLOW DIAGRAM - - - - B33-1040
5. LOW PRESSURE CORE SPRAY P&ID - - - - - - - E21-1020

NOTES:

1.

2. PIPING BETWEEN POINTS WITH EMPTY DATA BLANKS (SEE ALSO TABLE 3) SHALL BE SIZED BY OTHERS BASED ON SPECIFIED OPERATING CONDITIONS. EMPTY DATA BLANKS CAN BE FILLED IN CASE OF ACTUAL ARRANGEMENT BY OTHERS.

X - INDICATES THE DATA IS NOT SIGNIFICANT.

3. SHOWN AS TYPICAL FOR ONE LOOP. IF LOOPS ON SIDE I AND SIDE II ARE NOT SYMMETRICALLY ARRANGED, VALUES FOR BOTH SIDES SHALL BE SHOWN TYPED.

4. ΔH VALUES FOR EQUIPMENT WITHIN GE-SUPPLIED SCOPE ARE AS NOTED.

5. ELEVATIONS ARE NOT INCLUDED IN ΔP, VALUES GIVEN. ELEVATIONS SHALL BE INCLUDED WHEN DETERMINING FINAL VALUES FOR THE EMPTY DATA BLANKS.

6. X/Y - INDICATES MAXIMUM (X) AND MINIMUM (Y) VALUES FOR THE MODE SPECIFIED.

7. DASHED LINES INDICATE FLOW DOES NOT PASS THRU THESE POINTS.

8. THE NPSH AVAILABLE IN MODES B & D AT CENTERLINE OF PUMP SUCTION NOZZLE MUST EQUAL OR EXCEED 15.7 FT.

9. FLOODING LINE SHALL BE SIZED TO FLOW 30% [illegible]. HEAD MUST BE SUFFICIENT TO FLOOD THE PRIMARY CONTAINMENT.

10. THIS PORTION OF PIPING TO BE SIZED BASED ON FLOW SHOWN ON FUEL POOL COOLING AND FILTERING SYSTEM.

11. TABLE 1 INDICATES VALVE POSITIONS DURING VARIOUS MODES OPERATION.

12.

13.

14. TYPICAL VALUES FOR MAX. AND MIN. SUPPRESSION POOL TEMP SHOWN. FINAL TEMPERATURES DEPEND ON INITIAL POOL WATER TEMPERATURE & POOL WATER VOLUME.

15. WATER FLOWS ARE IN GPM, STEAM FLOWS ARE IN 1000 LBS/HR.

16. HEAT EXCHANGER HEAT REMOVAL AND SPRAY BASED UPON 7400 GPM SHELL SIDE FLOW.

17. FOR LINE SIZING INFORMATION SEE REF. 3.

18. THE WEIGHT OF WATER IN THE SHUTDOWN COOLING SUBSYSTEM PIPING, INCLUDING THE HEAT EXCHANGERS AND PUMPS SHALL NOT EXCEED 225,200 LBS. AT 70°F TO PREVENT [illegible] OF STANDBY LIQUID CONTROL [illegible] BELOW MINIMUM REQUIREMENTS.

19.

20. PIPING SYSTEM DESIGN PRESSURE AND TEMPERATURE AND THE ESTIMATED LINE SIZES ARE FOR INFORMATION ONLY. ACTUAL DESIGN PRESSURE & TEMPERATURE AND LINE SIZES AS DETERMINED BY OTHERS SHALL MEET THE PROCESS DATA HYDRAULIC REQUIREMENT.

21. HX HEAT REMOVAL SHOWN FOR FULL FLOW AND MAXIMUM TEMPERATURE DIFFERENCE UNDER NORMAL OPERATING CONDITIONS THE TUBE SIDE OUTLET TEMPERATURE SHOULD NOT EXCEED 125°F.

22. SOH = 700 FT. MAX.

23. ONLY ONE LOOP IS REQUIRED AT THIS STAGE OF SHUTDOWN. THE A LOOP IS SHOWN AS TYPICAL OF EITHER A OR B EXCEPT FOR THE HEAD SPRAY.

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FIGURE 6.3-8

RESIDUAL HEAT REMOVAL SYSTEM (RHR)

(SHEET 1 of 3)

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SEE NOTE 20

POSITION ◯	3.1	3.2	4	5	6	7	8	9	10	47	16	46	11	7	7.1	18	19	20	8	31	4 C	5 C	6	9	10	16	46	11	25	54.1	26	4 A,B	5 A,B	16	50	27
DESIGN PRESS. IN PSIG	125	220		RHR PUMP A,B,C	500								1250	500		RHR Hx	500			220		RHR Hx	500			500	1250		SEE REF 4 M5 1-2	220				500	SEE REF 4 M5 11-1	
DESIGN TEMP IN °F	212	358			358						480		575	358			358			212			212			480	575			358				480		
ESTIMATED LINE SIZE	24"				18"						12"			18"			18"			24"			18"				12"		20"		18"	24"		12"		
	LPCI LINE (VIA RHR Hx BYPASS)													Hx LINE						LPCI LINE (DIRECT TO REACTOR)									SHUTDOWN SUCTION					SHUTDOWN RETURN LINE		

POSITION ◯	56	56.1	4	49	49.1	45	6c	6.1c	6.2	43	6 A&B	6.1 A&B	43
DESIGN PRESS. IN PSIG	125			500	125		500	125			500	125	
DESIGN TEMP IN °F	212			212			212					212	
ESTIMATED LINE SIZE	18"			18"			3"		3"		3"		
	SYSTEM TEST LINES (LOOP C)						MIN FLOW BYPASS LINES (LOOP C)				MIN FLOW BYPASS (LOOPS A&B)		

TABLE 1 - VALVE POSITION CHART

SEE NOTE 11

F004 A&B / F004C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	F043	STRAINER AB	STRAINER C
MODE A-1	O	O						O		O	O																						1-50% P	
MODE A-2	O	O						O		O	O																						1-50% P	
MODE B		O					O		O							O	O	O													O		[illegible]	---
MODE D			O				O	T-C	O					T	O					T		O							O	O	O			
MODE E			O				O		O					T-C	O													O	O	O	O			
MODE F	O	O						O											O-T				O-T										CLEAR	CLEAR
MODE G	O	O	O																									O	O	O		O	CLEAR	CLEAR
MODE S	O	O					O	O	O																							O	CLEAR	CLEAR

O - VALVE OPEN
T - VALVE THROTTLED
P - STRAINER PLUGGED
T-C - VALVE THROTTLED OR CLOSED
O-T - VALVE OPEN OR THROTTLED
BLANK SPACE INDICATES VALVE IS CLOSED

TABLE 3 LIMITING LINE LOSSES (NUMBERS REFER TO POSITION ◯)

MODE A-1	6-11 PUMP DISCHARGE LINE TO RPV FLOODING PENETRATION
MODE A-2	NONE
MODE B	1-2-3 (SUCTION LINE SUPPRESSION POOL TO PUMP), 47-21 & 15-23 (CONTAINMENT SPRAY LINES PUMP DISCHARGE TO TO SPRAY HEADERS)
MODE D	14-51-33-29 (VESSEL HEAD SPRAY LINE) SEE NOTE 10 29 25-5 (SHUTDOWN SUCUTION LINE RPV TO PUMP) 56-4 (SHUTDOWN SUCUTION LINE TEST BRANCH TO PUMP)
MODE E	16-27 (SHUTDOWN DISCHARGE LINE LPCI BRANCH TO RECIRC LOOP)
MODE F	13-43-24 14 49 45 (TEST LINE TO SUPPRESSION POOL)
MODE G	6-43 (PUMP MINIMUM BYPASS LINE)

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FIGURE 6.3-8

RESIDUAL HEAT REMOVAL SYSTEM (RHR)
(SHEET 2 of 3)

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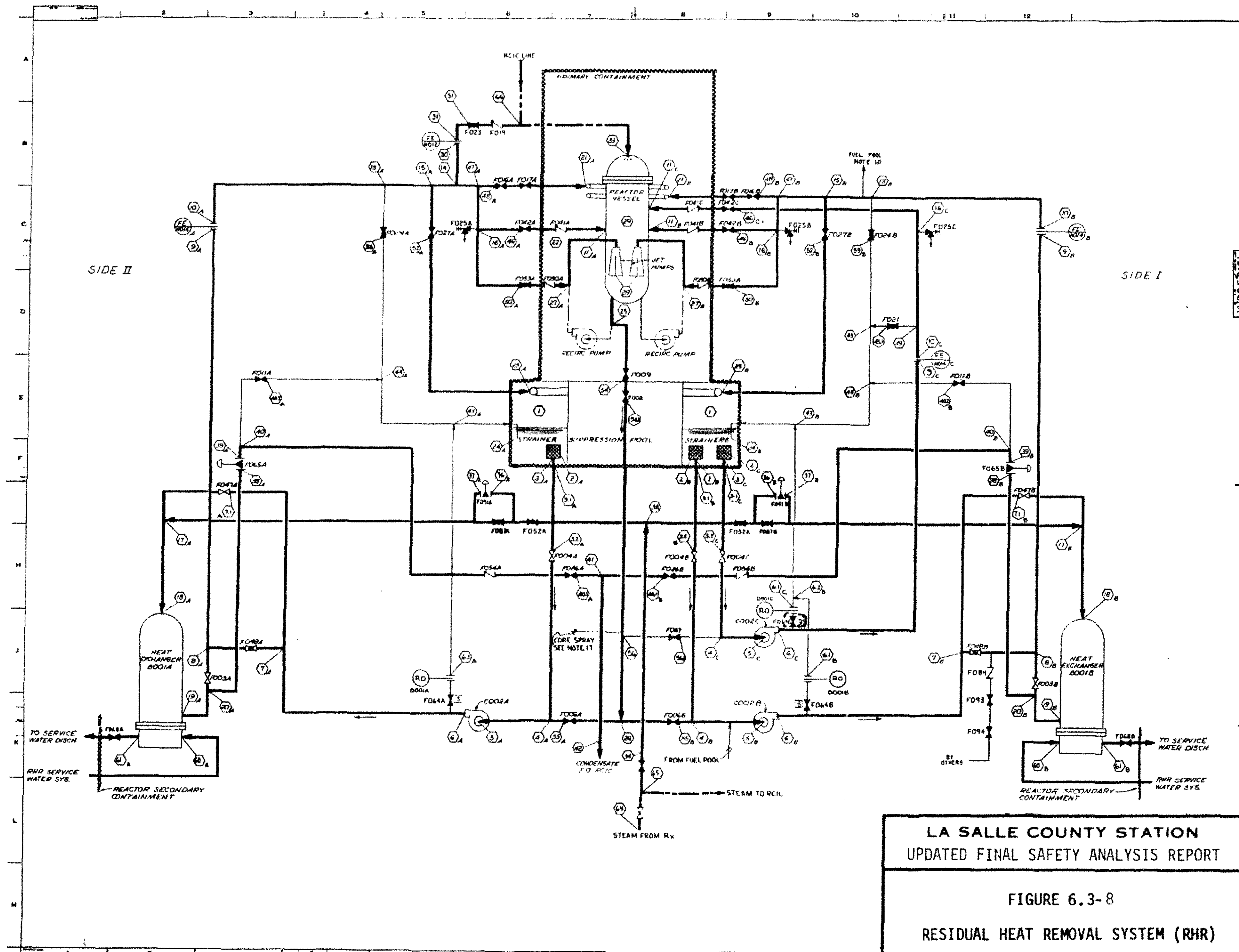

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FIGURE 6.3-8

RESIDUAL HEAT REMOVAL SYSTEM (RHR)

(SHEET 3 of 3)

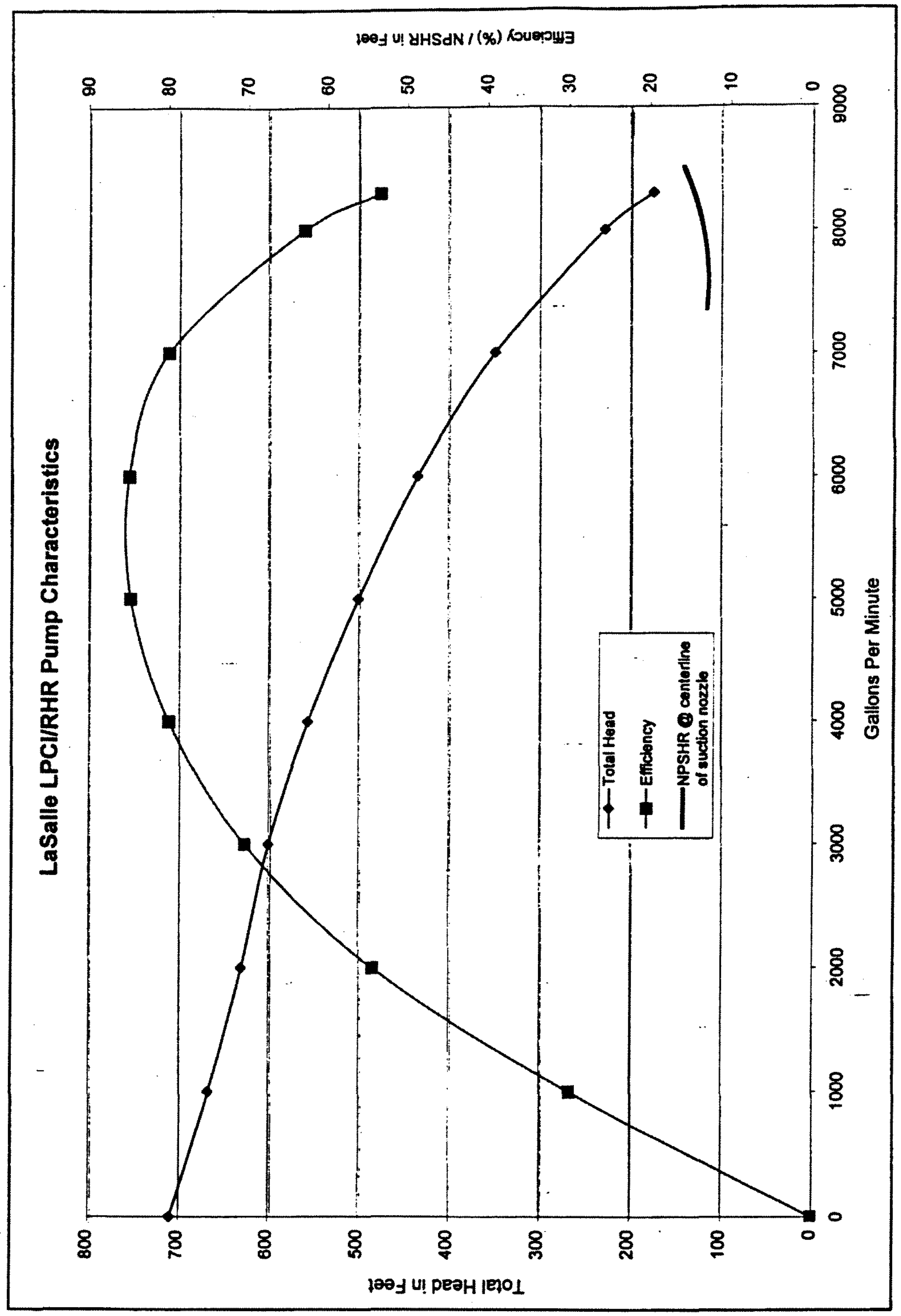

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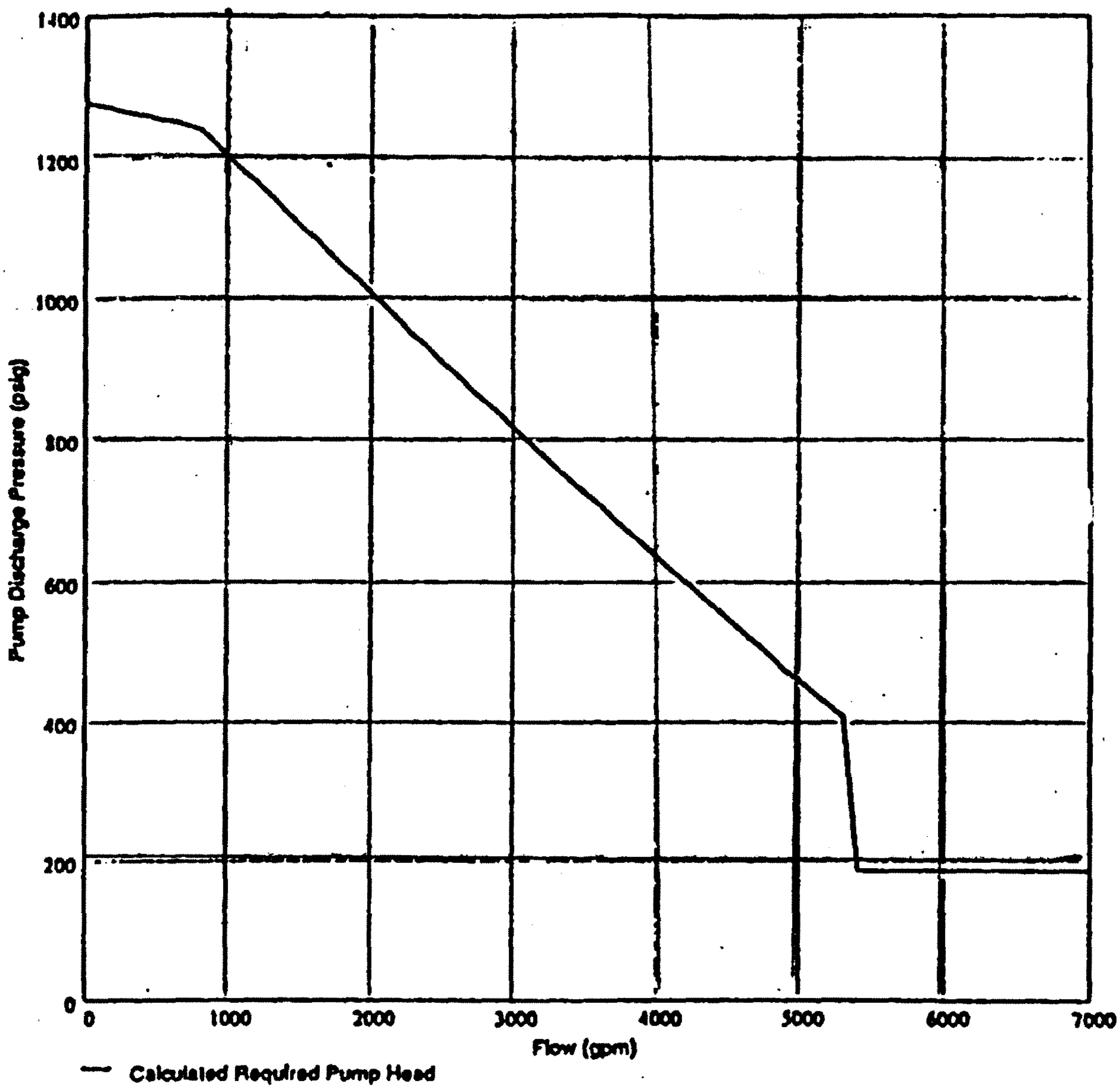
FIGURE 6.3-9

LPCI PUMP CHARACTERISTICS

Sheet 1 of 1



Source: Reference 26

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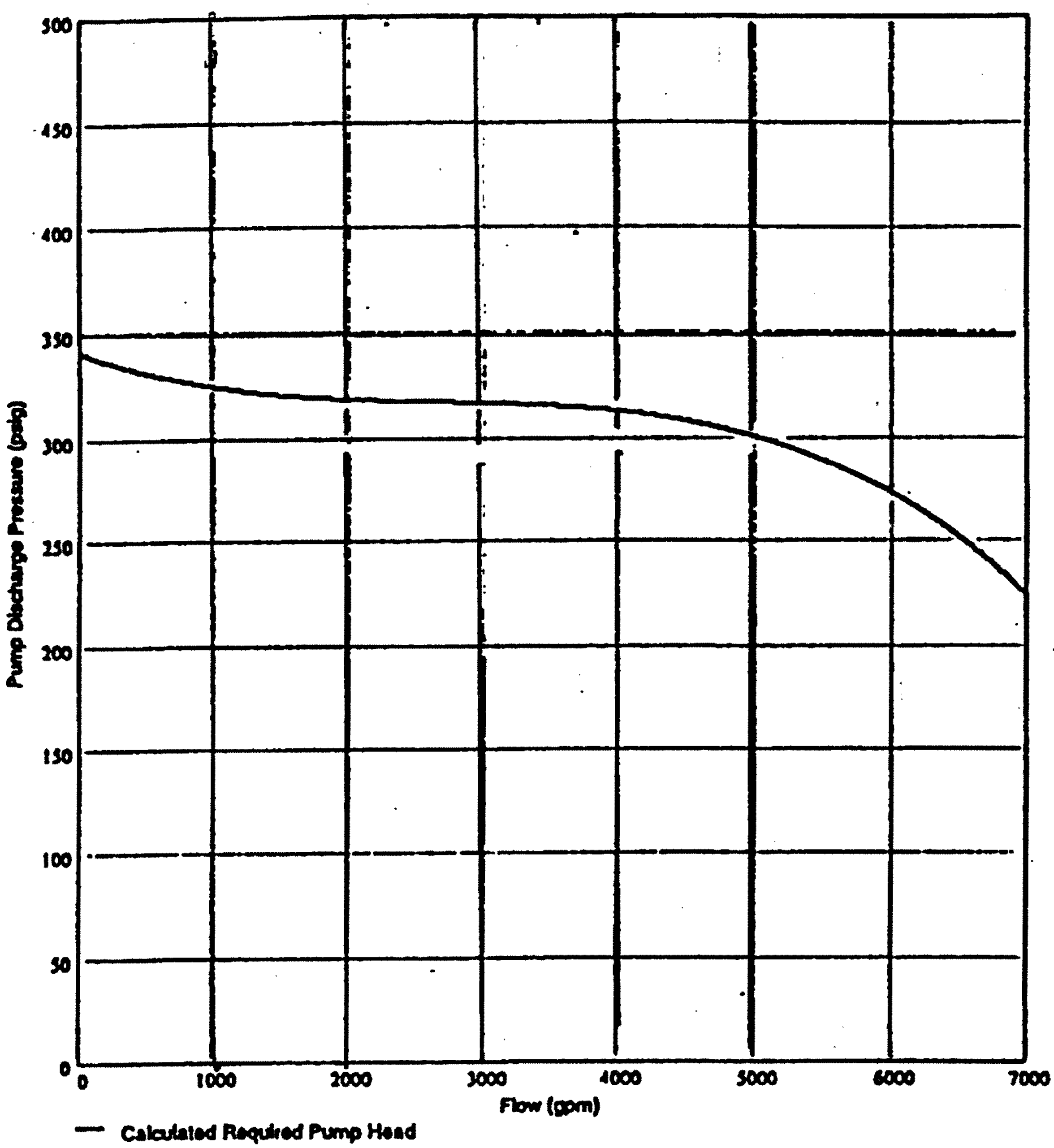
FIGURE 6.3-10 HPCS MINIMUM REQUIRED PUMP HEAD TO MEET LOCA ANALYSES ASSUMPTIONS



Source: Reference 26

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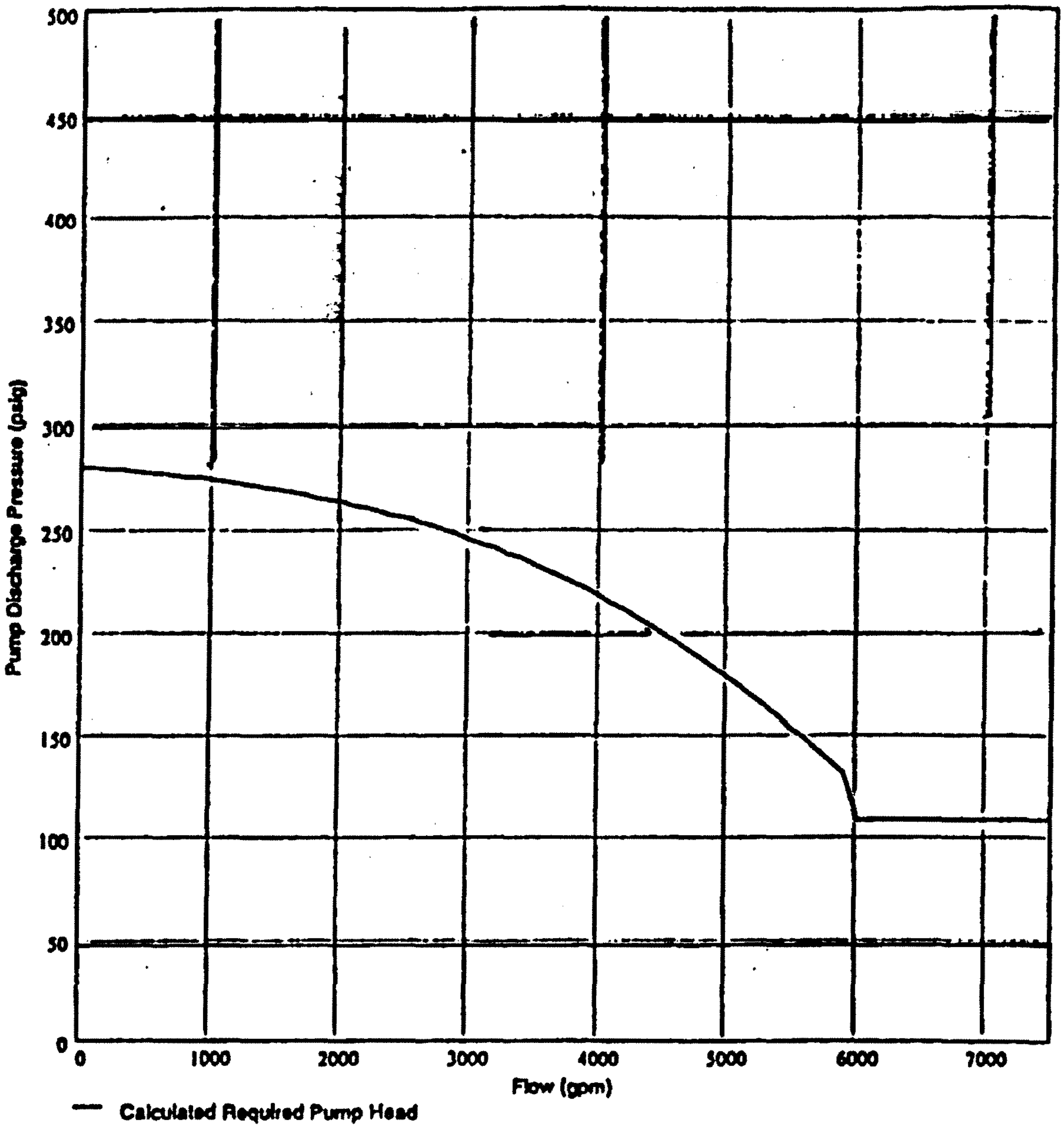
FIGURE 6.3-11 LPCS MINIMUM REQUIRED PUMP HEAD TO MEET LOCA ANALYSES ASSUMPTIONS



Source: Reference 26

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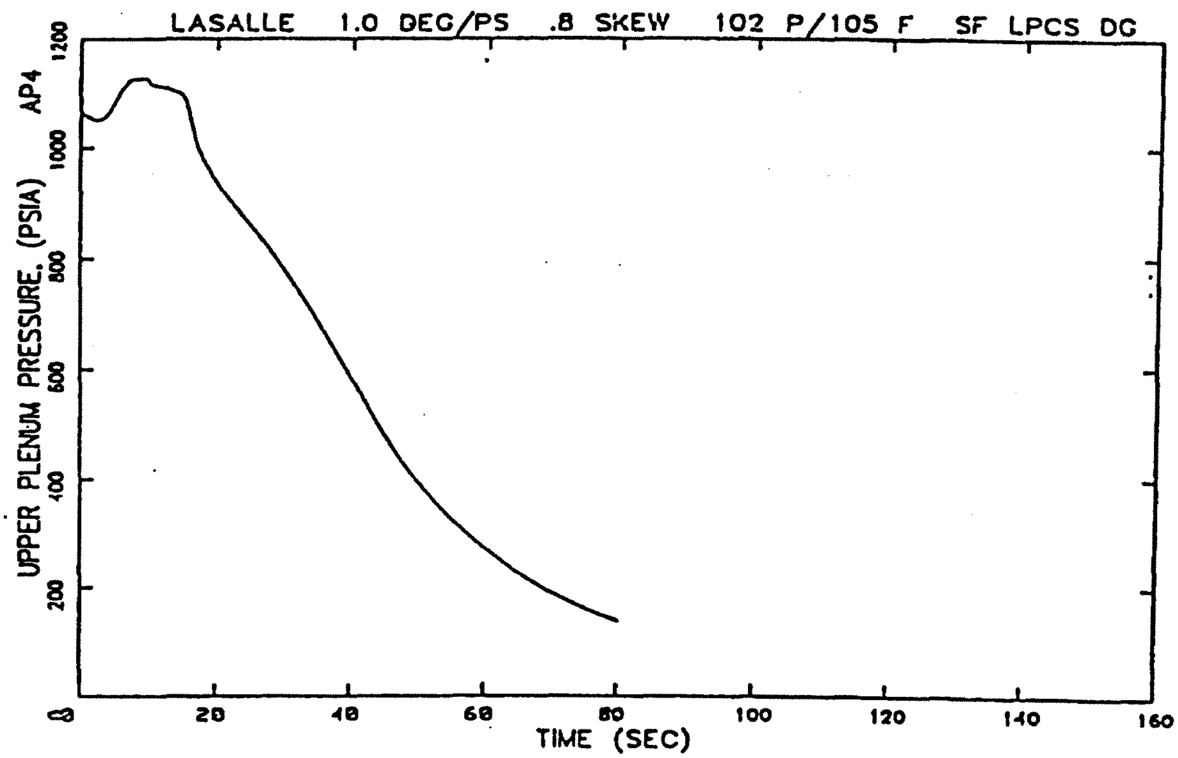
FIGURE 6.3-12 LPCI MINIMUM REQUIRED PUMP HEAD TO MEET LOCA ANALYSES ASSUMPTIONS



Source: EMF-2174(P)

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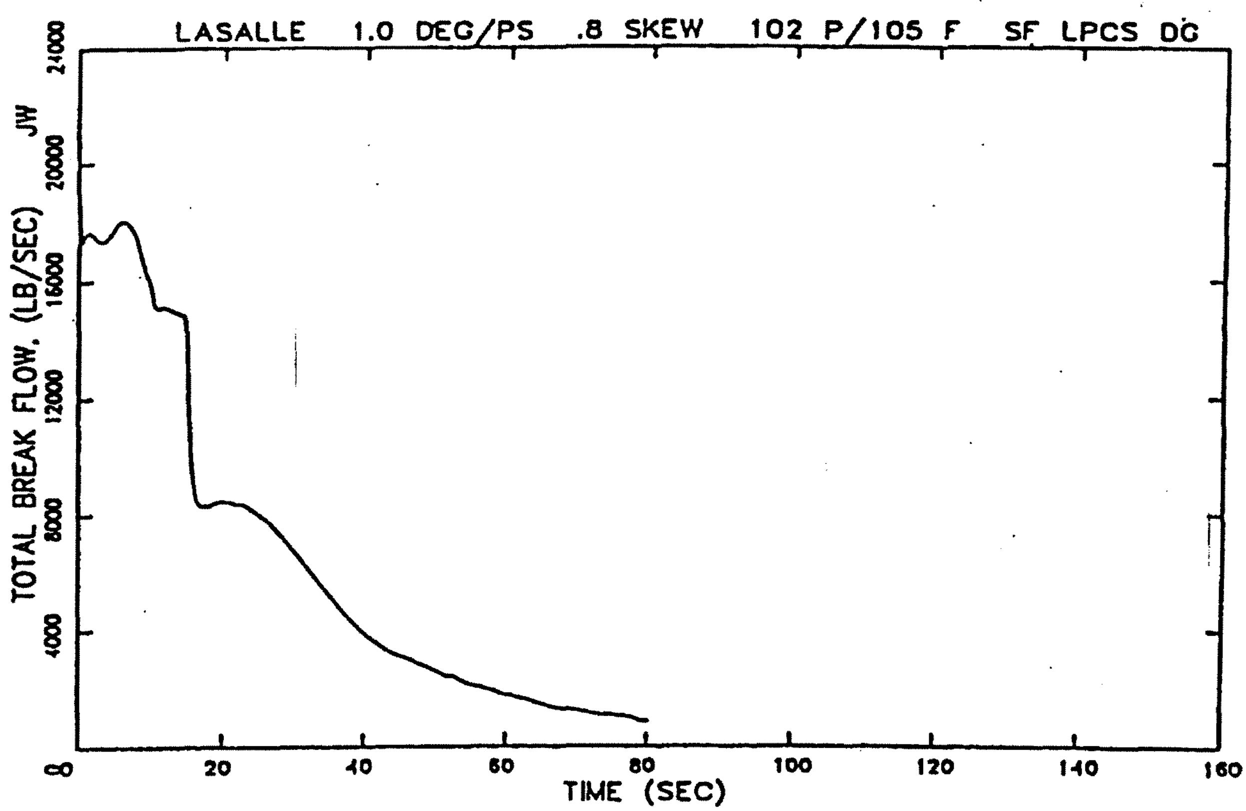
FIGURE 6.3-13 UPPER PLENUM PRESSURE VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION BREAK, LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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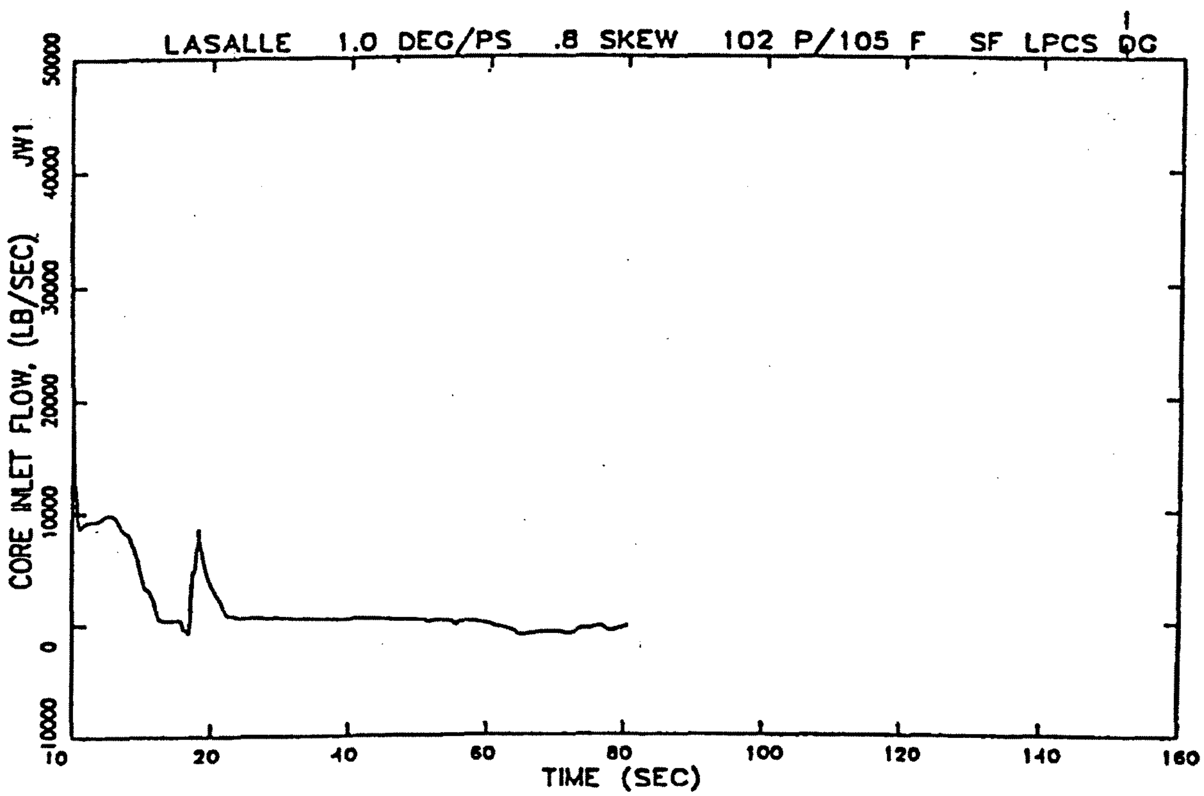
FIGURE 6.3-14

TOTAL BREAK FLOW VS. TIME AFTER BREAK
(1.0 DEG PUMP SUCTION BREAK, LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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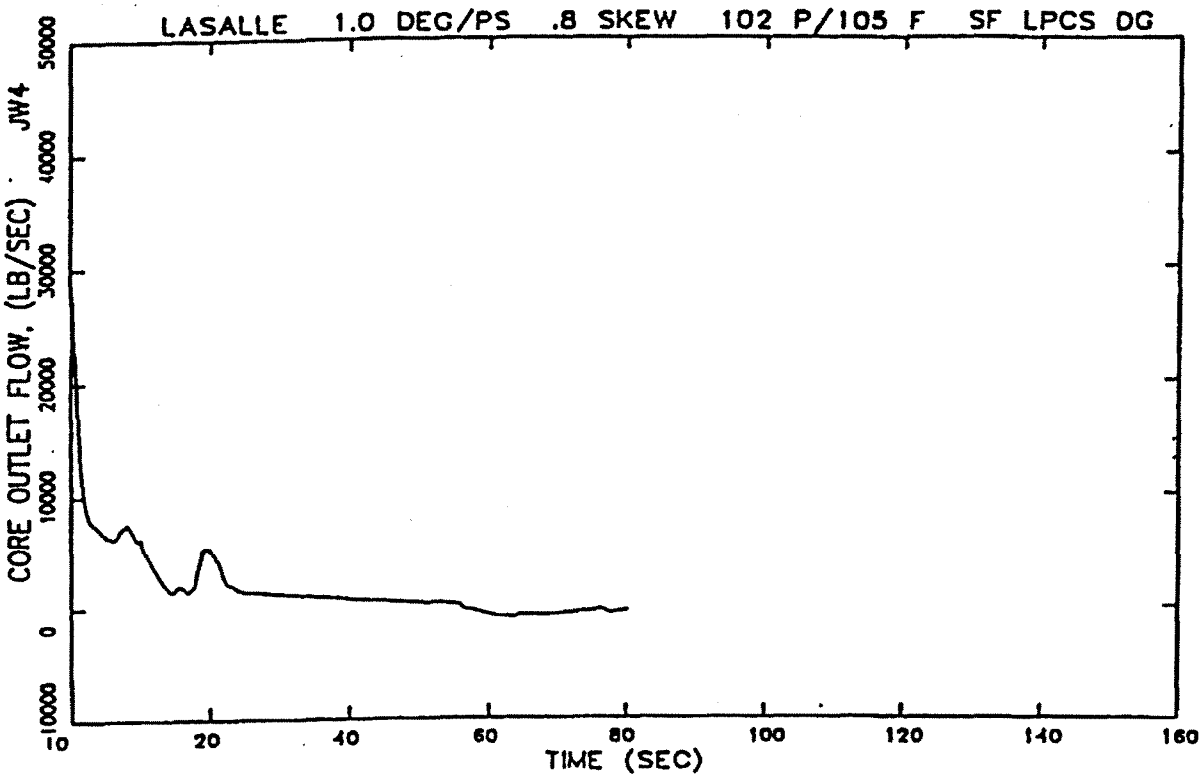
FIGURE 6.3-15 CORE INLET FLOW VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION BREAK, LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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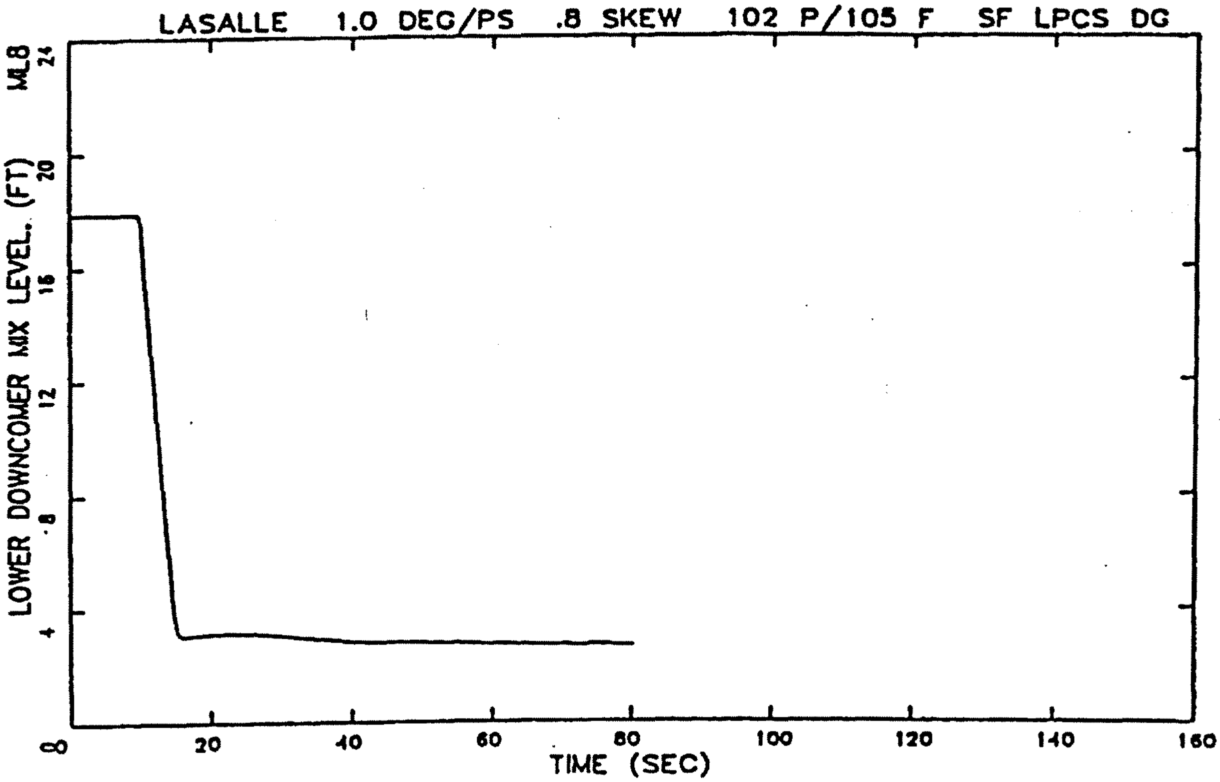
FIGURE 6.3-16 CORE OUTLET FLOW VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION BREAK, LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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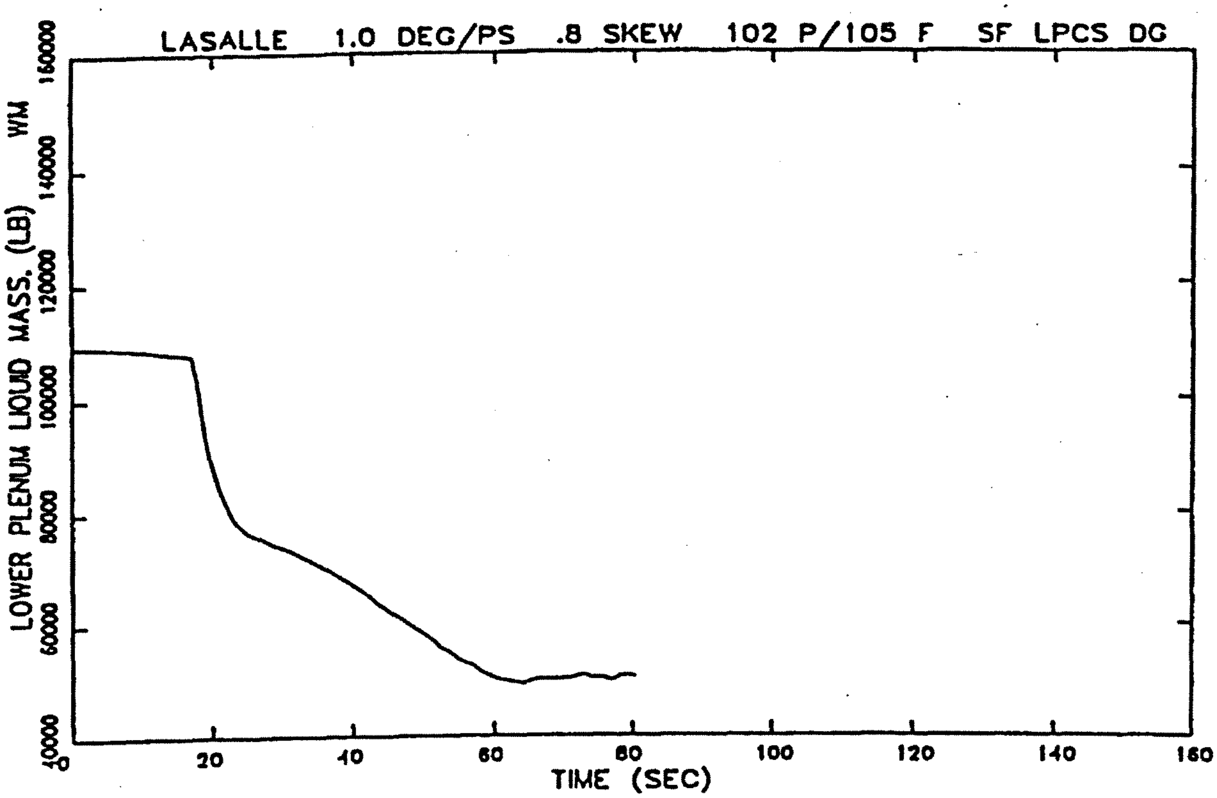
FIGURE 6.3-17 LOWER DOWNCOMER MIXTURE LEVEL VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION BREAK, LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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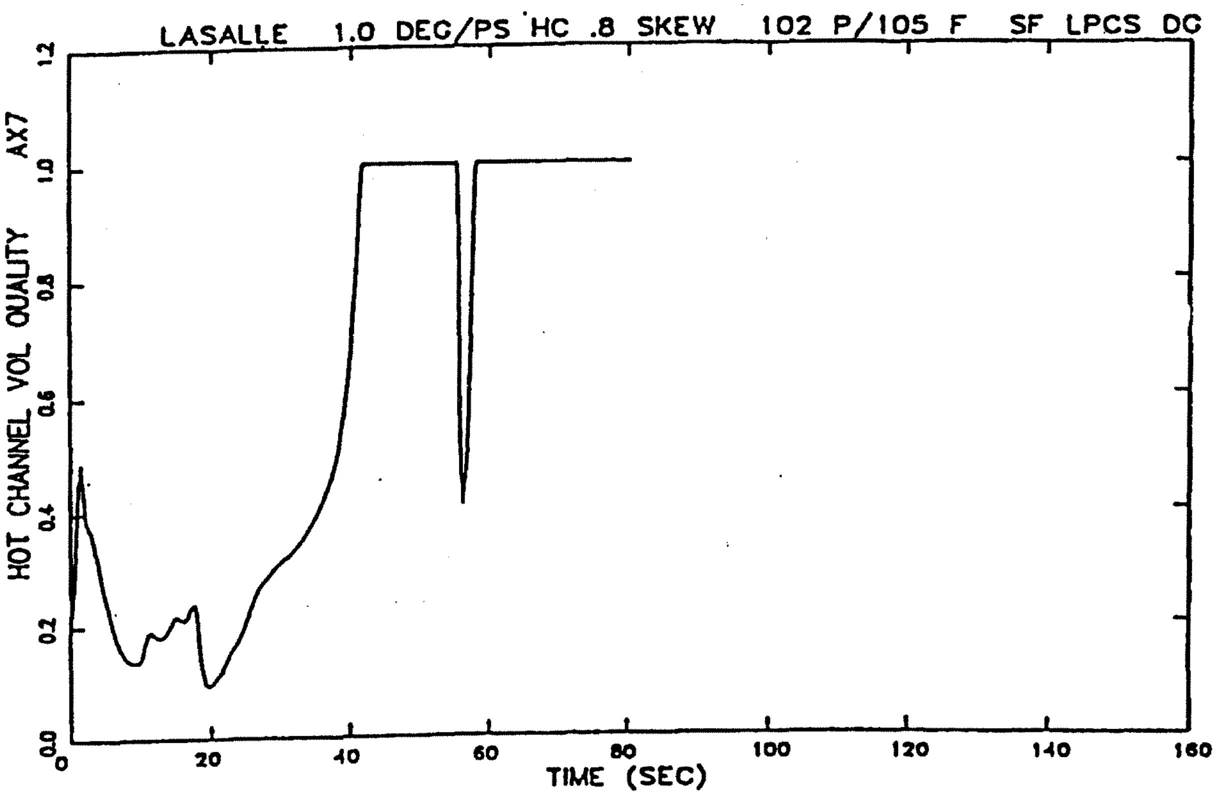
FIGURE 6.3-18 LOWER PLENUM LIQUID MASS VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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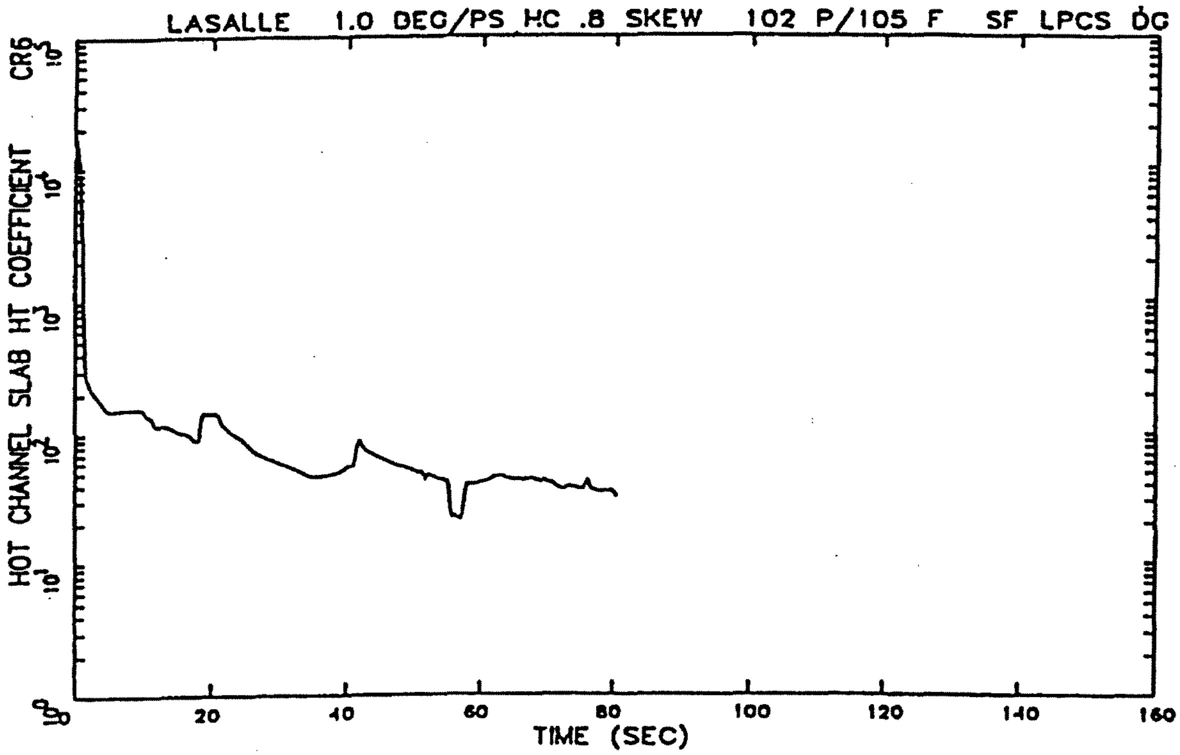
FIGURE 6.3-19

HOT CHANNEL HIGH POWER NODE QUALIFTY VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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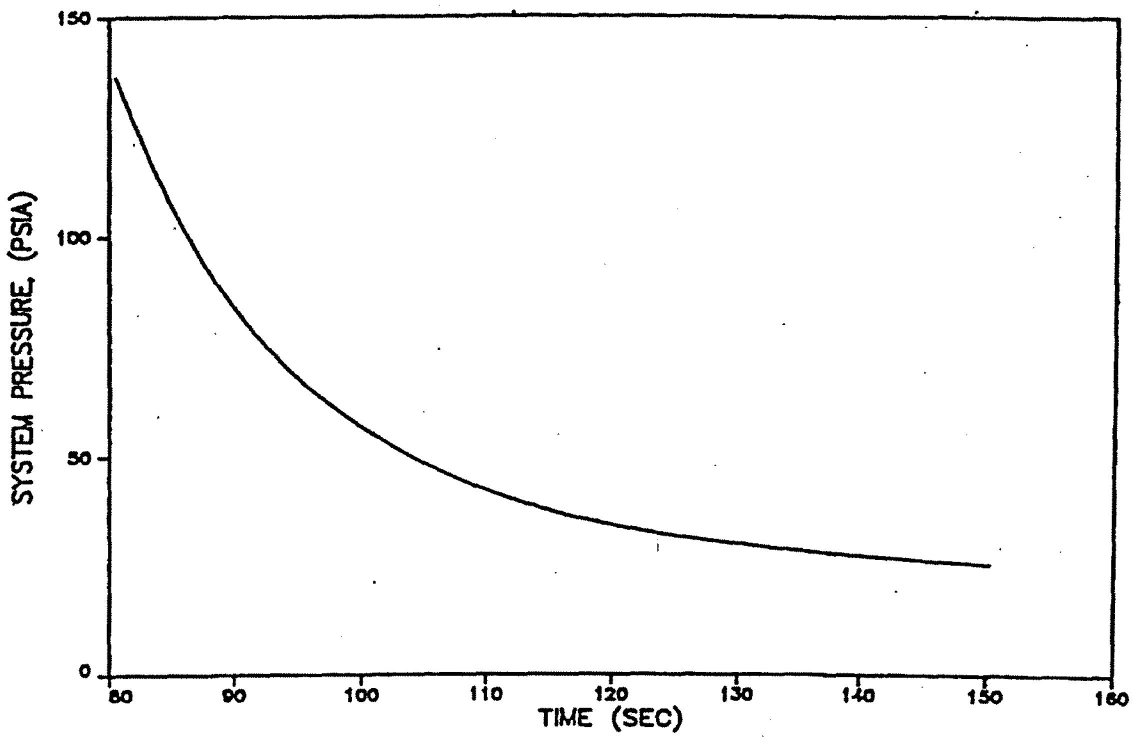
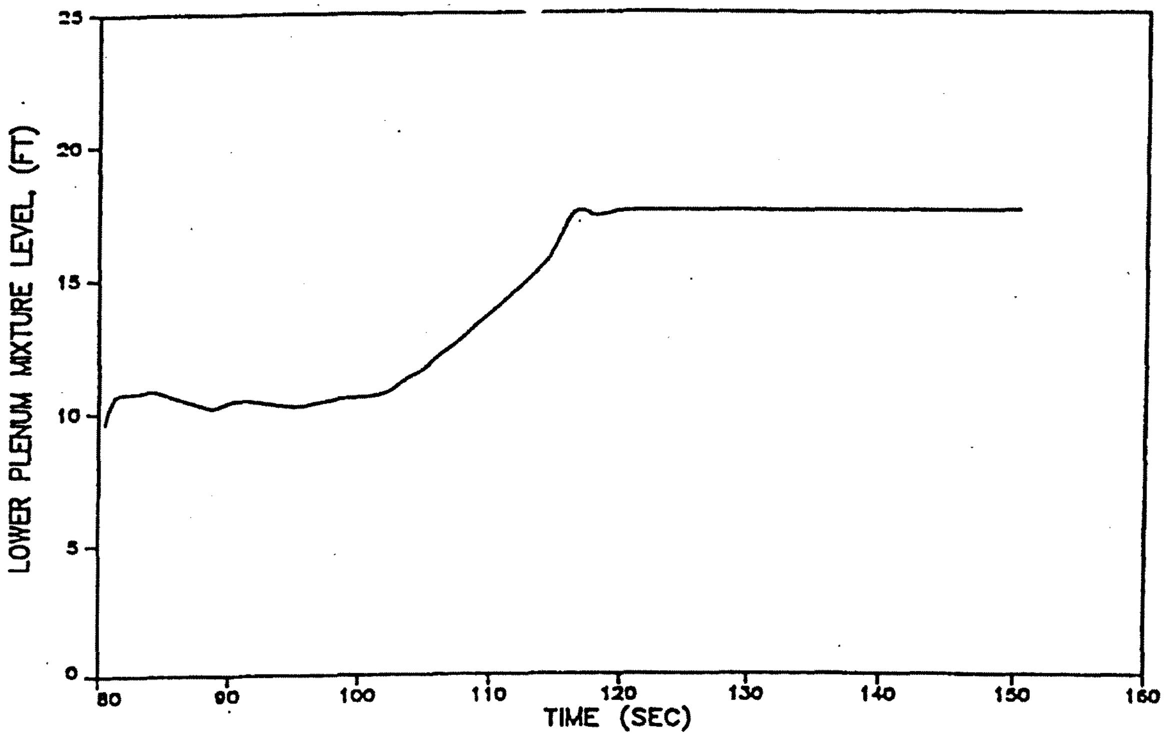
FIGURE 6.3-20

HOT CHANNEL HIGH POWER NODE HEAT TRANSFER COEFFICIENT VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



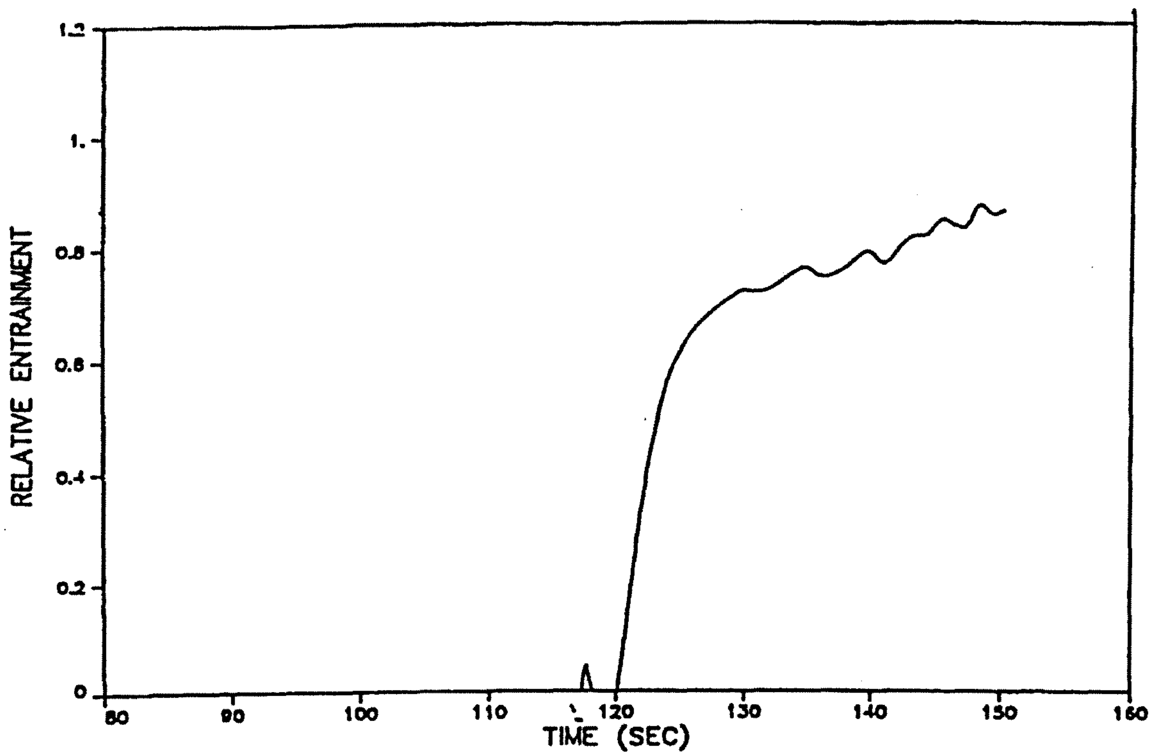
Source: EMF-2174(P)

LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-21 SYSTEM PRESSURE VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



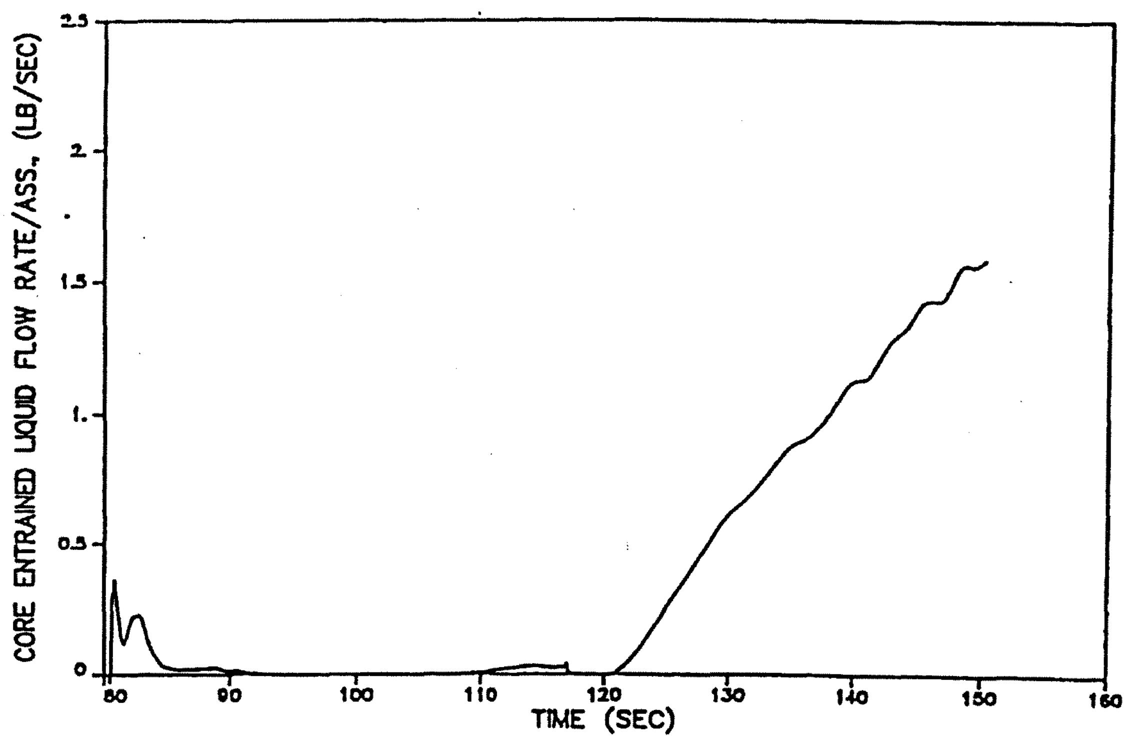
Source: EMF-2174(P)

LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-22
LOWER PLENUM MIXTURE LEVEL VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B)



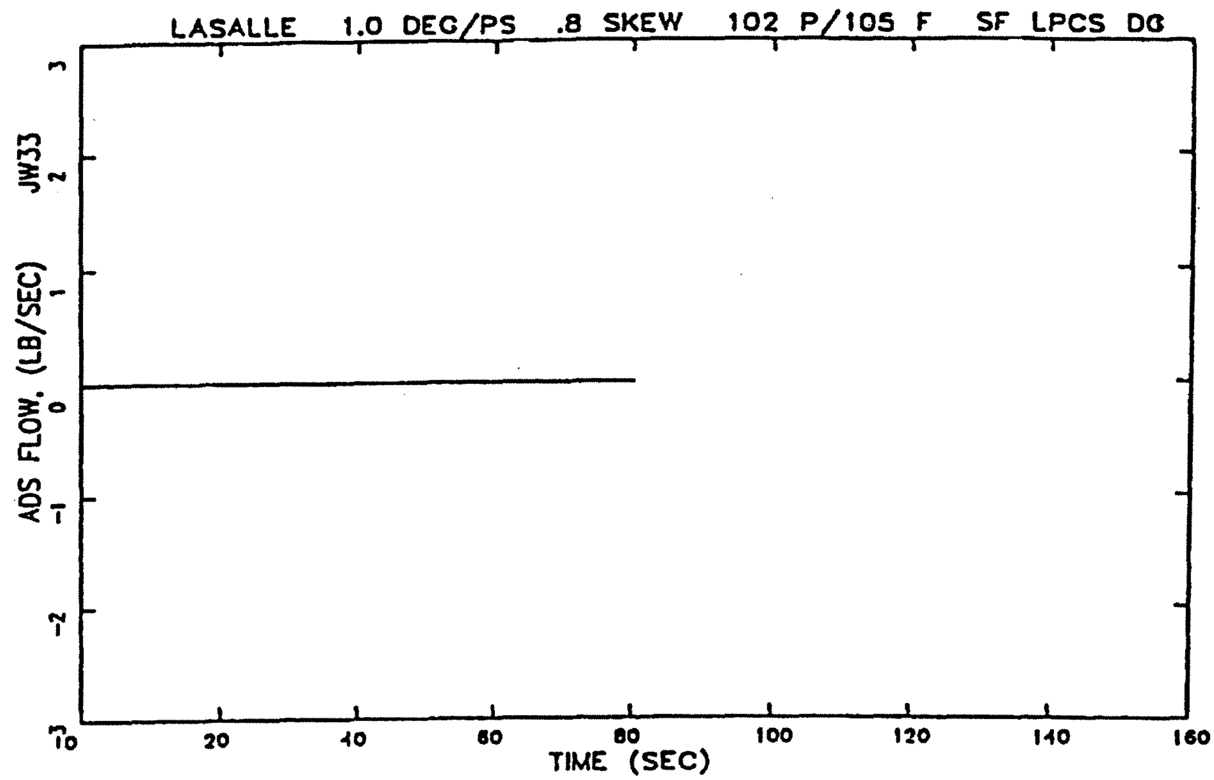
Source: EMF-2174(P)

LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-23 RELATIVE ENTRAINMENT VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



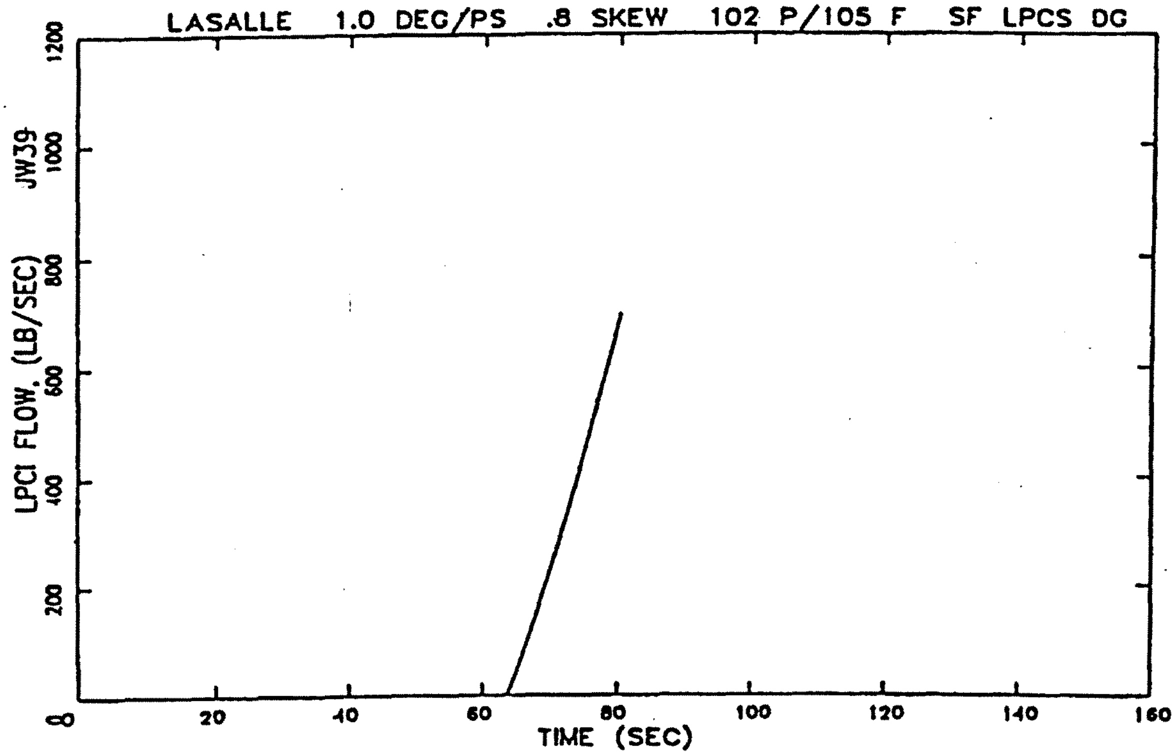
Source: EMF-2174(P)

LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-24 CORE ENTRAINED LIQUID FLOW VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B)



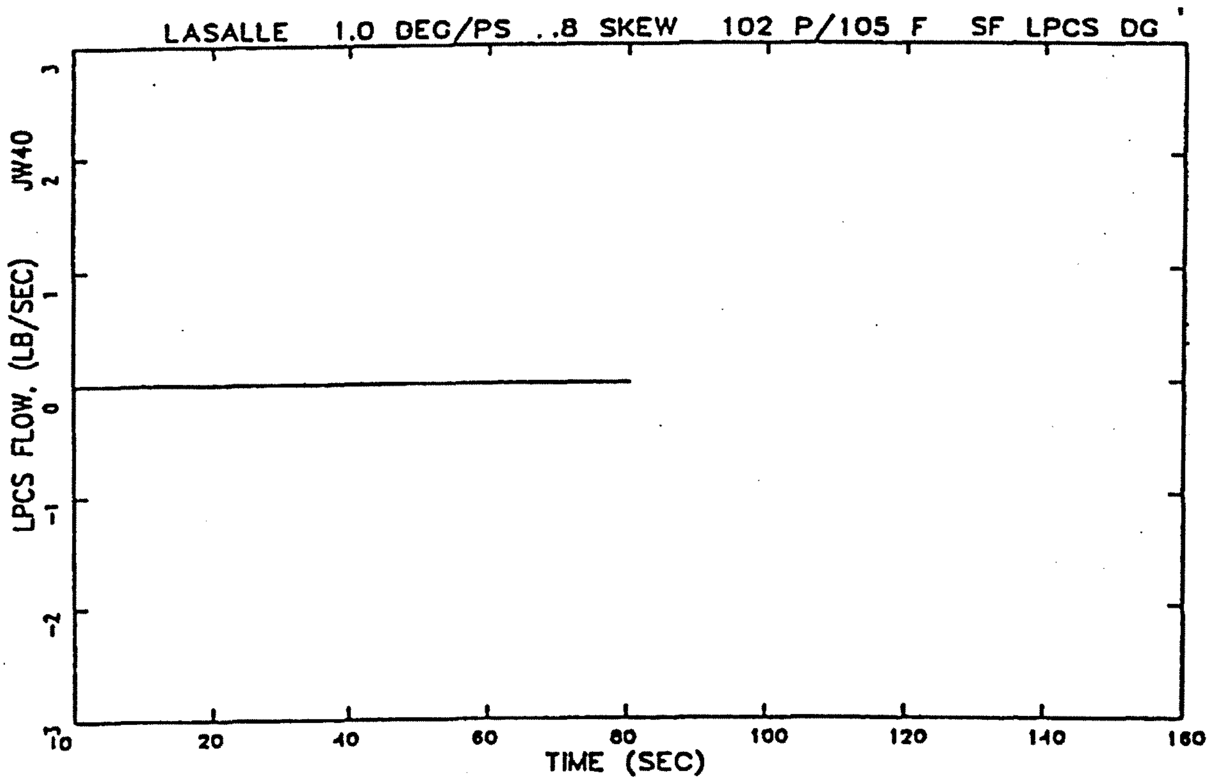
Source: EMF-2174(P)

LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-25 ADS FLOW VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-26 LPCI FLOW VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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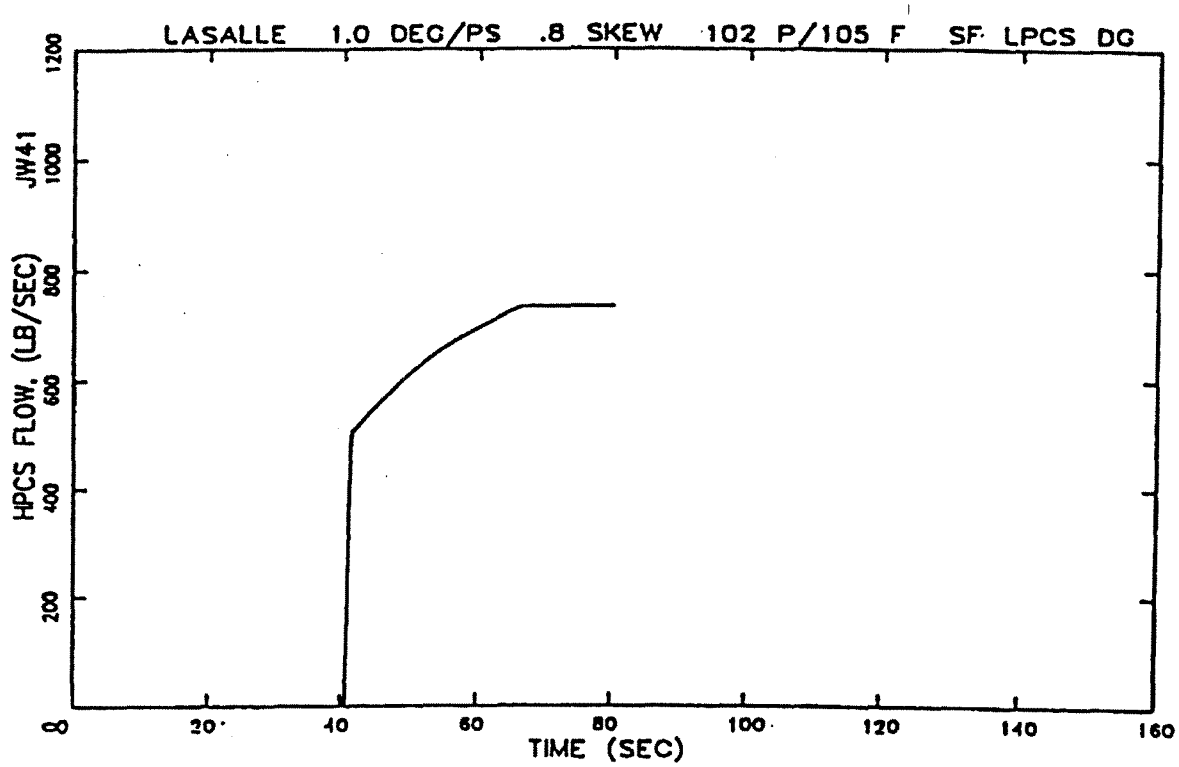
FIGURE 6.3-27

LPCS FLOW VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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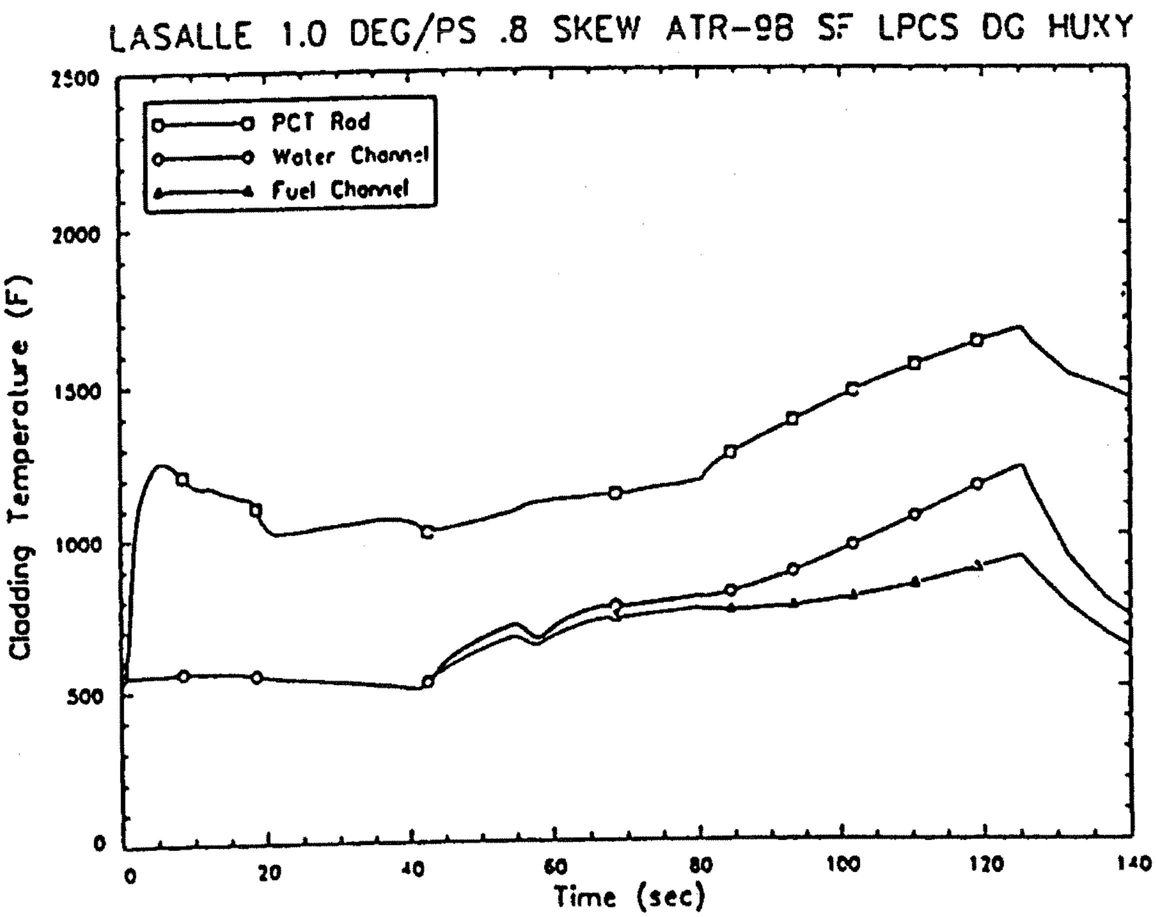
FIGURE 6.3-28 HPCS FLOW VS. TIME AFTER BREAK (1.0 DEG PUMP SUCTION LPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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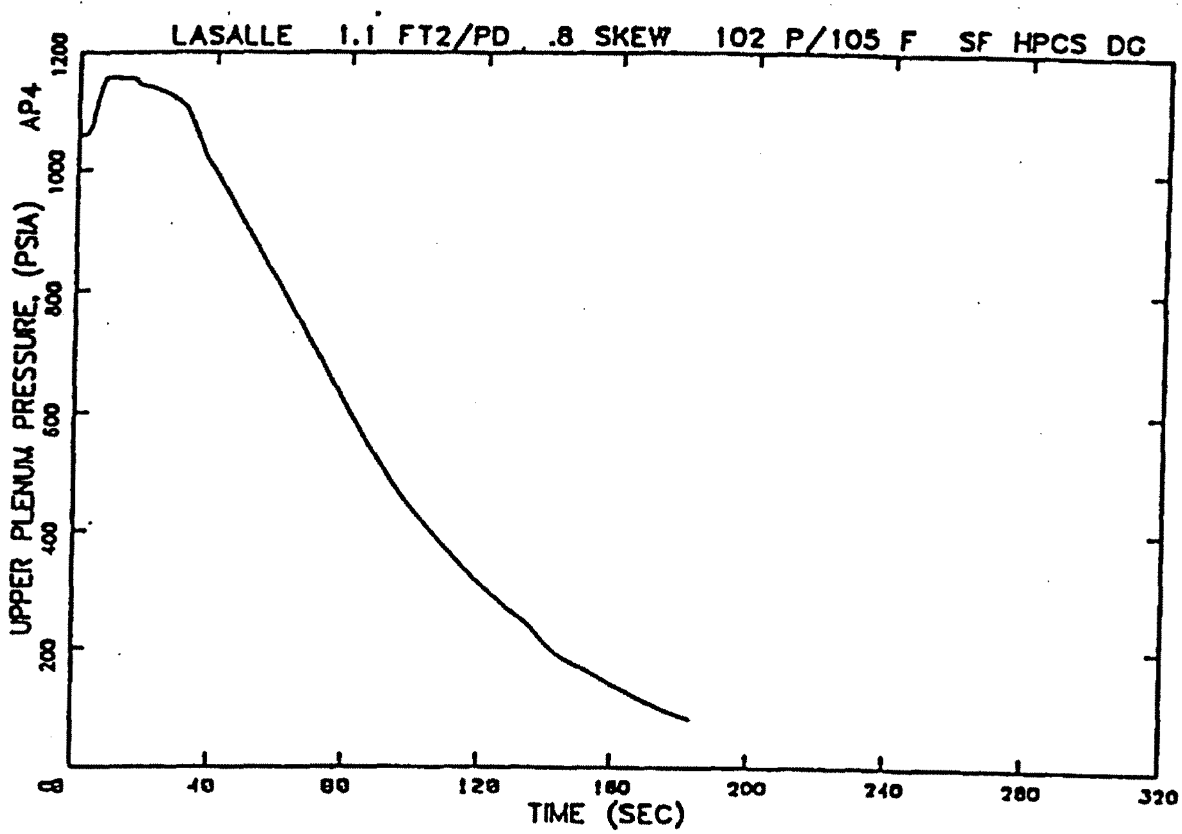
FIGURE 6.3-29

PEAK CLADDING TEMPERATURE VS. TIME AFTER BREAK
(1.0 DEG PUMP SUCTION LPCS DIESEL GENERATOR
FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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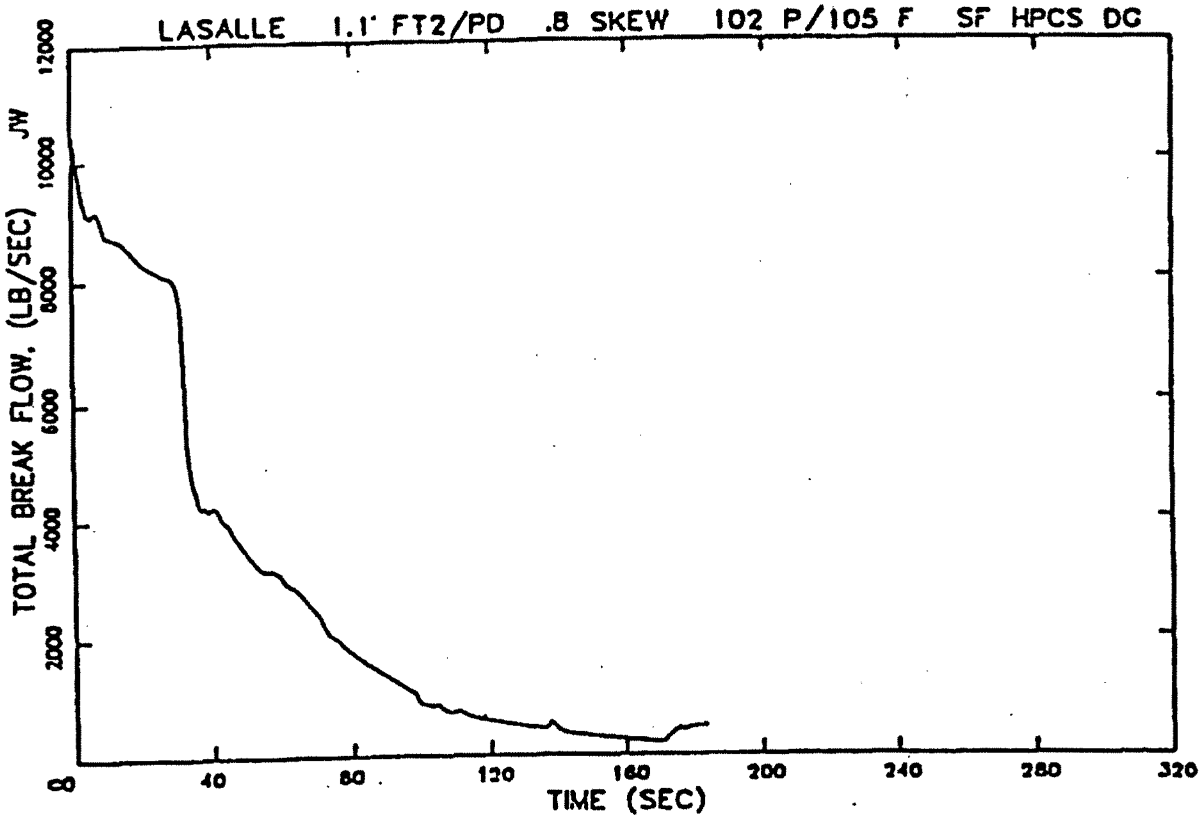
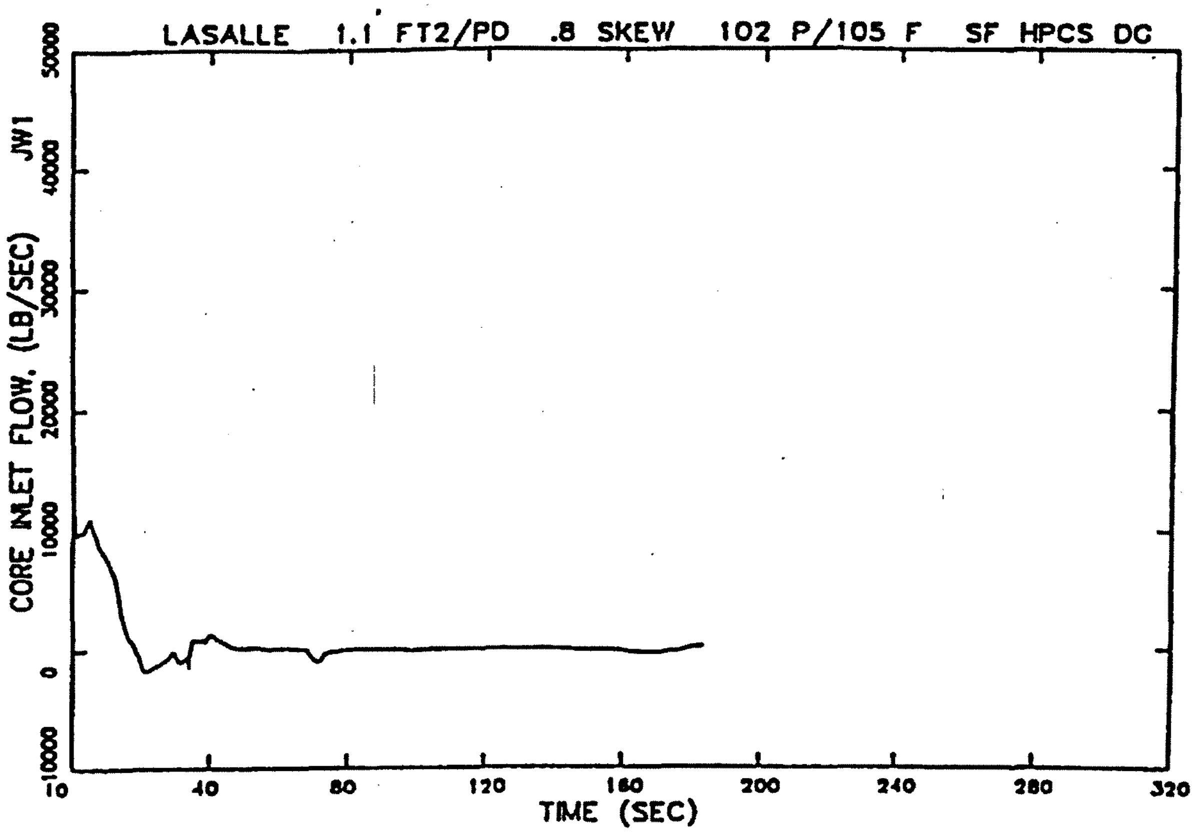
FIGURE 6.3-30

UPPER PLENUM PRESSURE VS. TIME AFTER BREAK (1.1 FT^2 PUMP DISCHARGE BREAK, HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



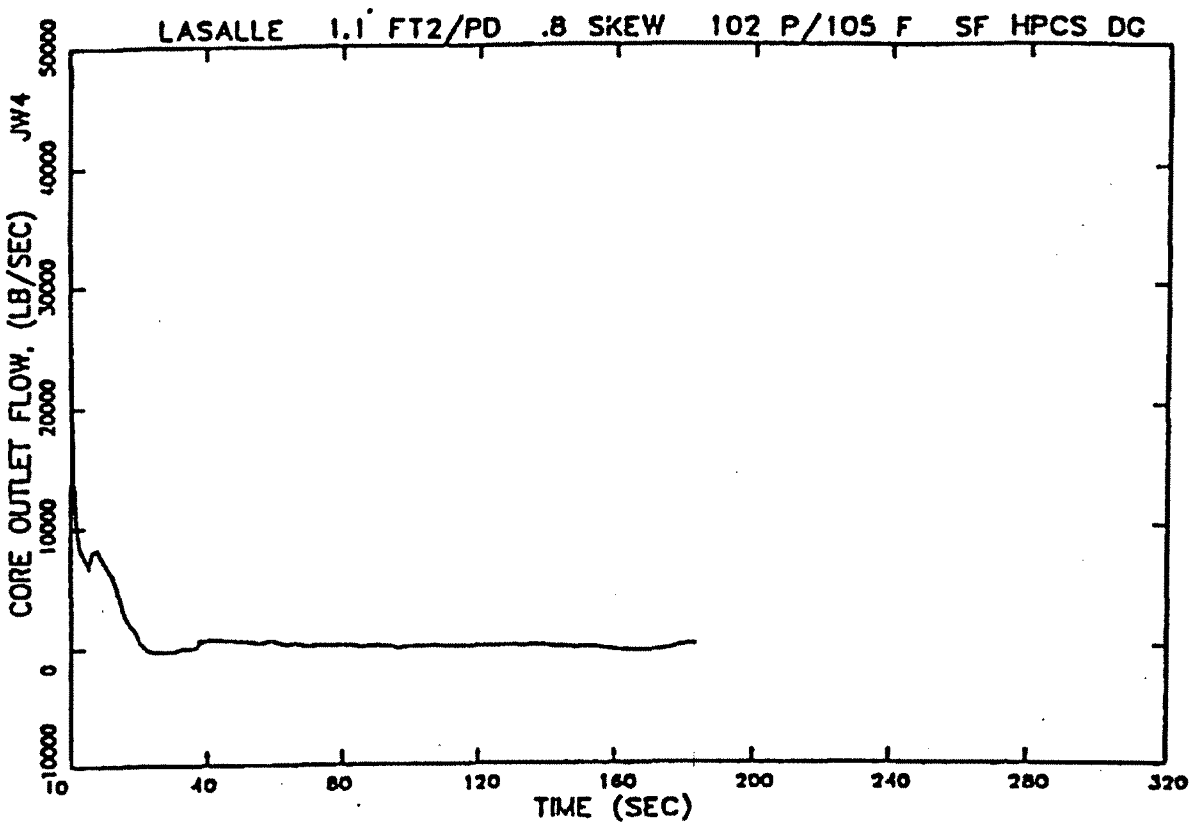
Source: EMF-2174(P)

LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-31 TOTAL BREAK FLOW VS. TIME AFTER BREAK (1.1 FT^2 PUMP DISCHARGE BREAK, HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source EMF-2174(P)

LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-32 CORE INLET FLOW VS. TIME AFTER BREAK (1.1 FT² PUMP DISCHARGE BREAK, HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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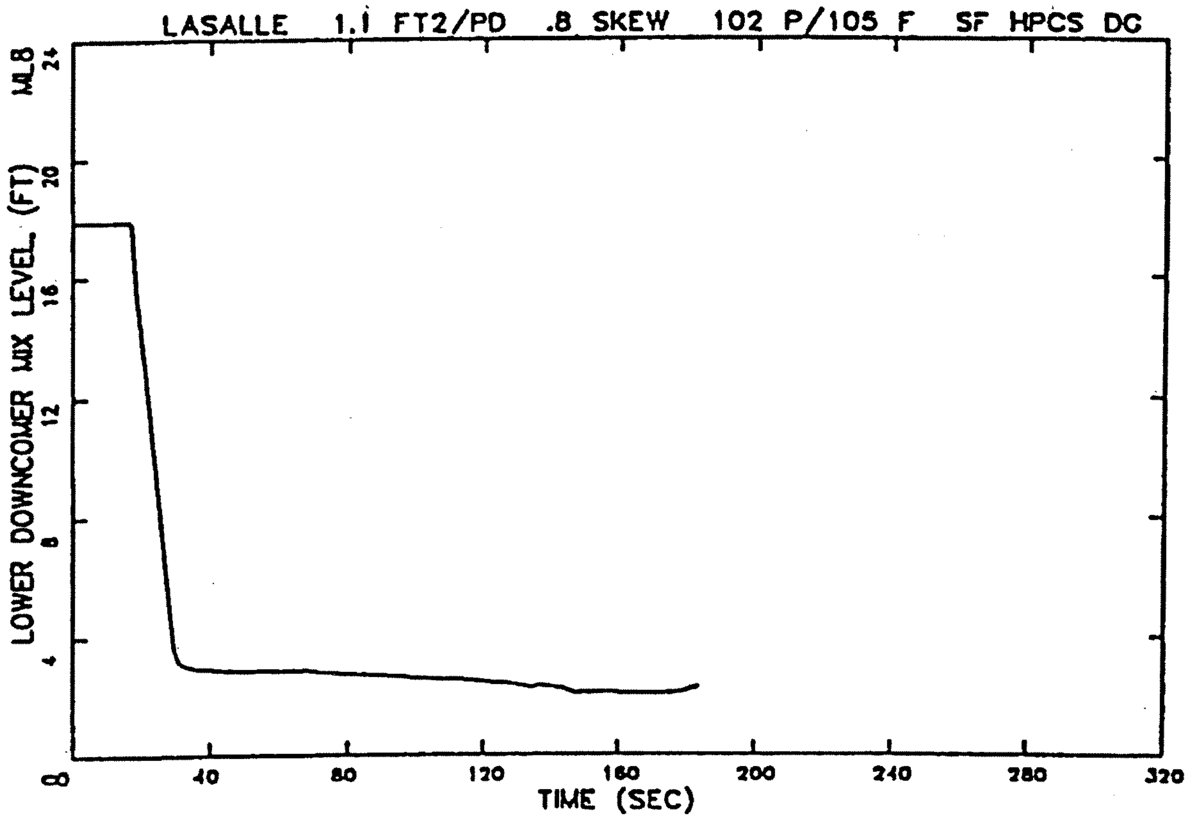
FIGURE 6.3-33 CORE OUTLET FLOW VS. TIME AFTER BREAK (1.1 FT² PUMP DISCHARGE BREAK, HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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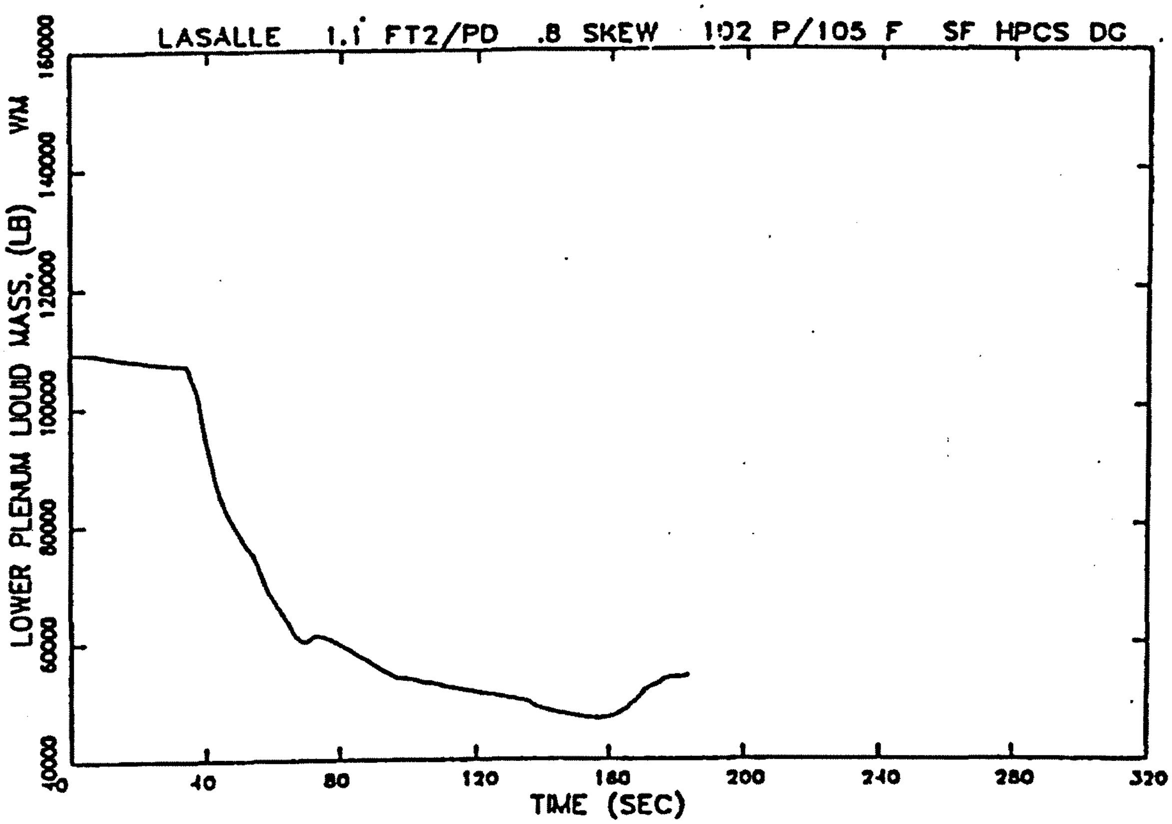
FIGURE 6.3-34 LOWER DOWNCOMER MIXTURE LEVEL VS. TIME AFTER BREAK (1.1 FT^2 PUMP DISCHARGE BREAK, HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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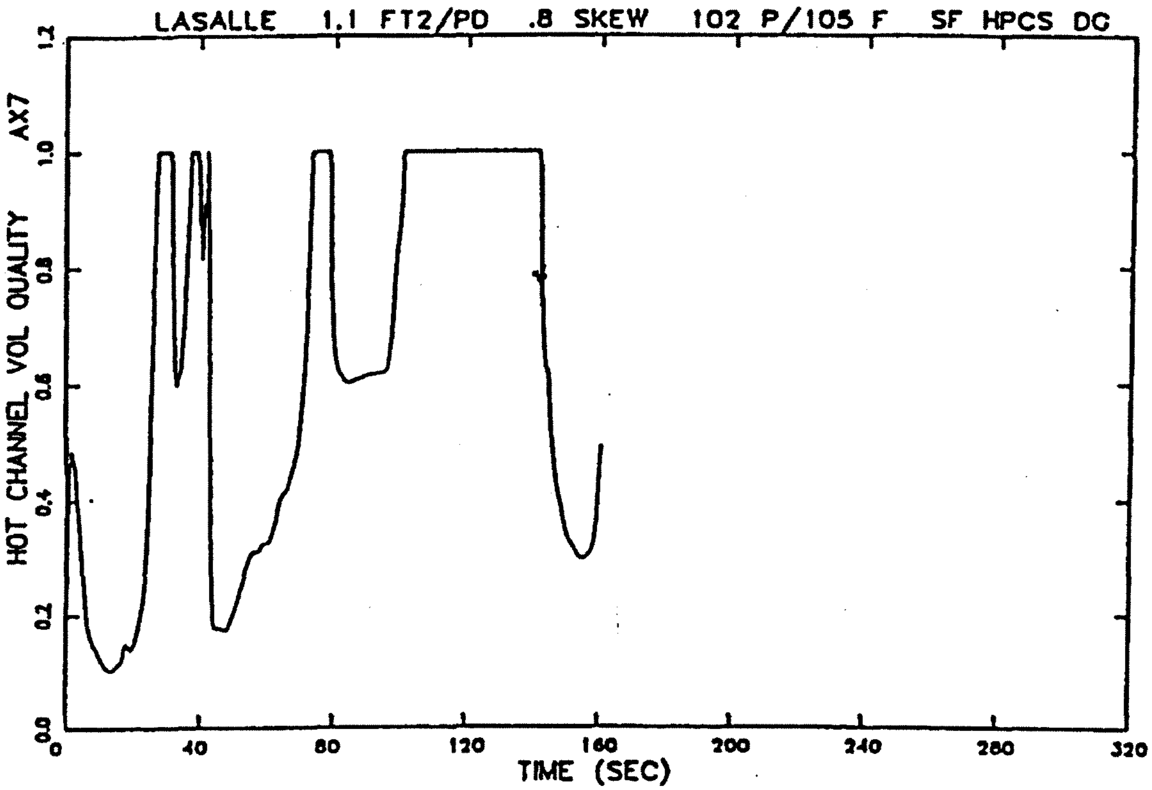
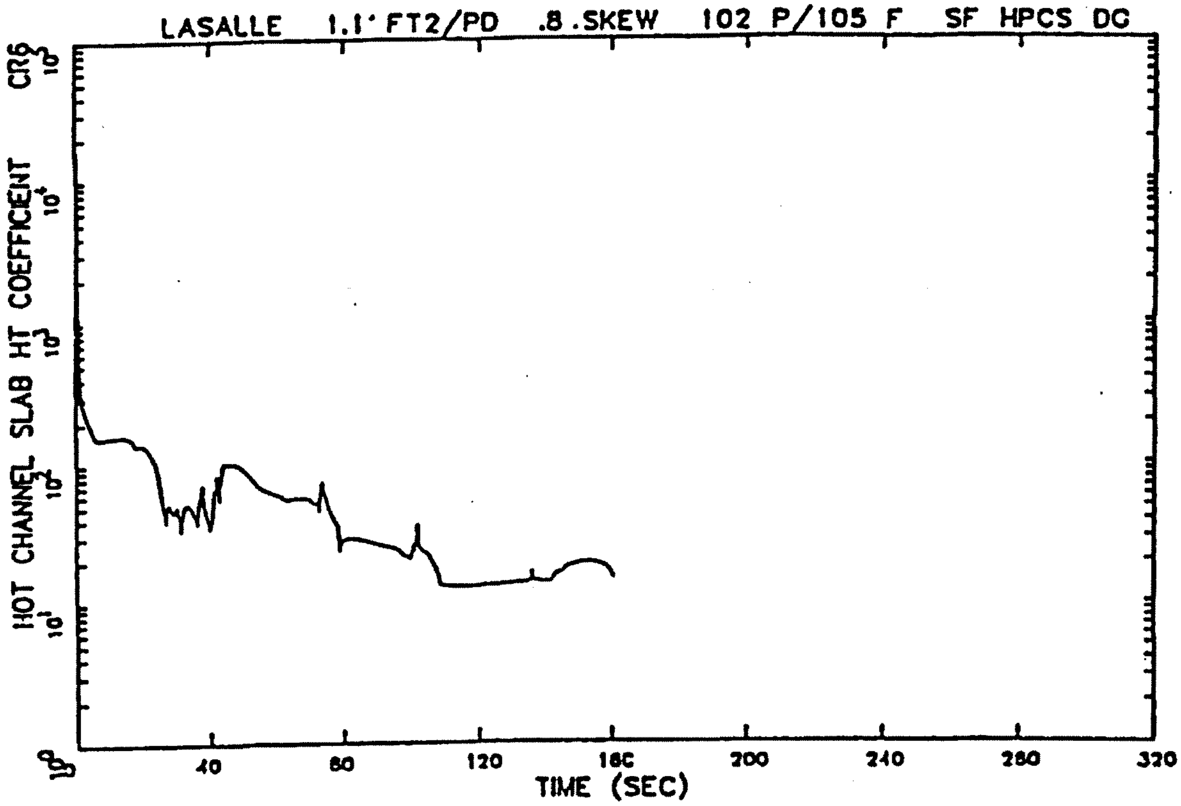
FIGURE 6.3-35

LOWER PLENUM LIQUID MASS VS. TIME AFTER BREAK
(1.1 FT^2 PUMP DISCHARGE HPCS DIESEL GENERATOR
FAILURE, ATRIUM-9B FUEL)



Source EMF-2174(P)

LASALLE COUNTY STATION UPDATED FINAL SAFETY ANALYSIS REPORT
FIGURE 6.3-36 HOT CHANNEL HIGH POWER NODE QUALITY VS. TIME AFTER BREAK (1.1 FT^2 PUMP DISCHARGE HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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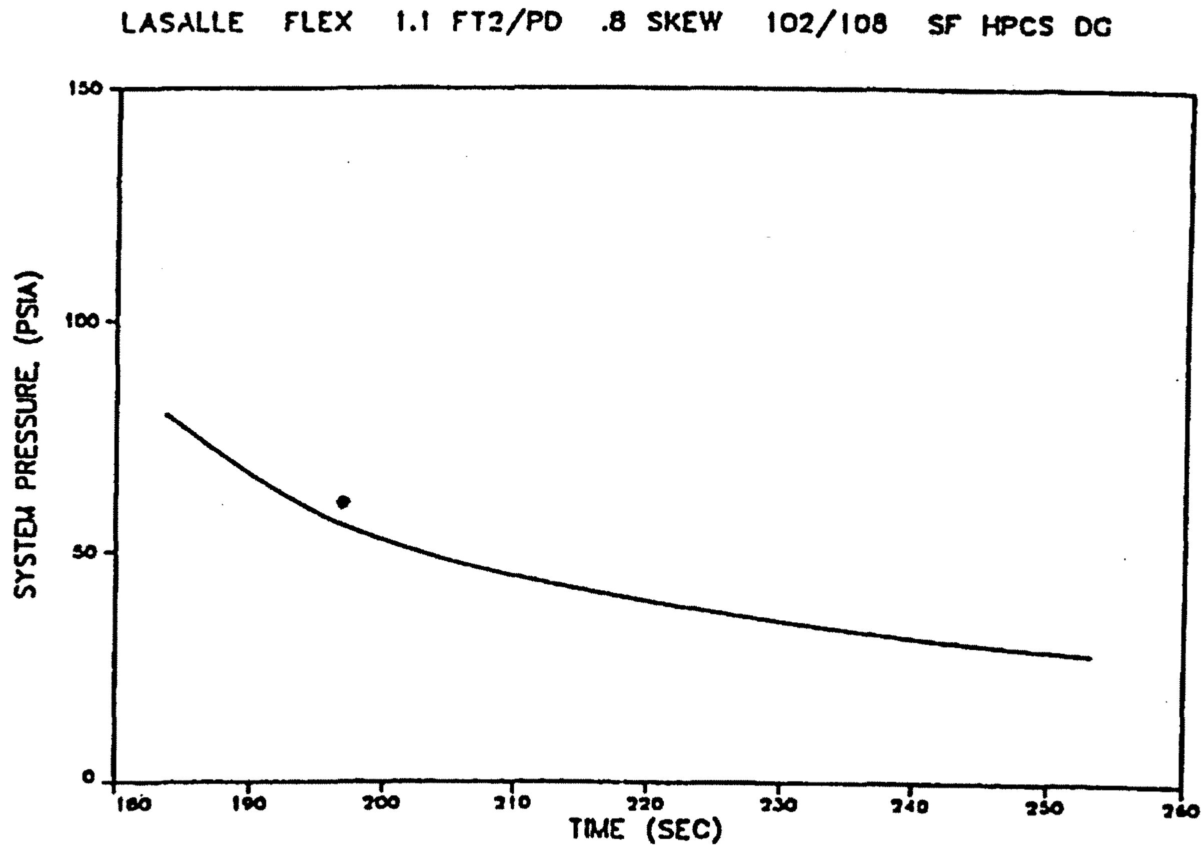
FIGURE 6.3-37 HOT CHANNEL HIGH POWER NODE HEAT TRANSFER COEFFICIENT VS. TIME AFTER BREAK (1.1 FT² PUMP DISCHARGE HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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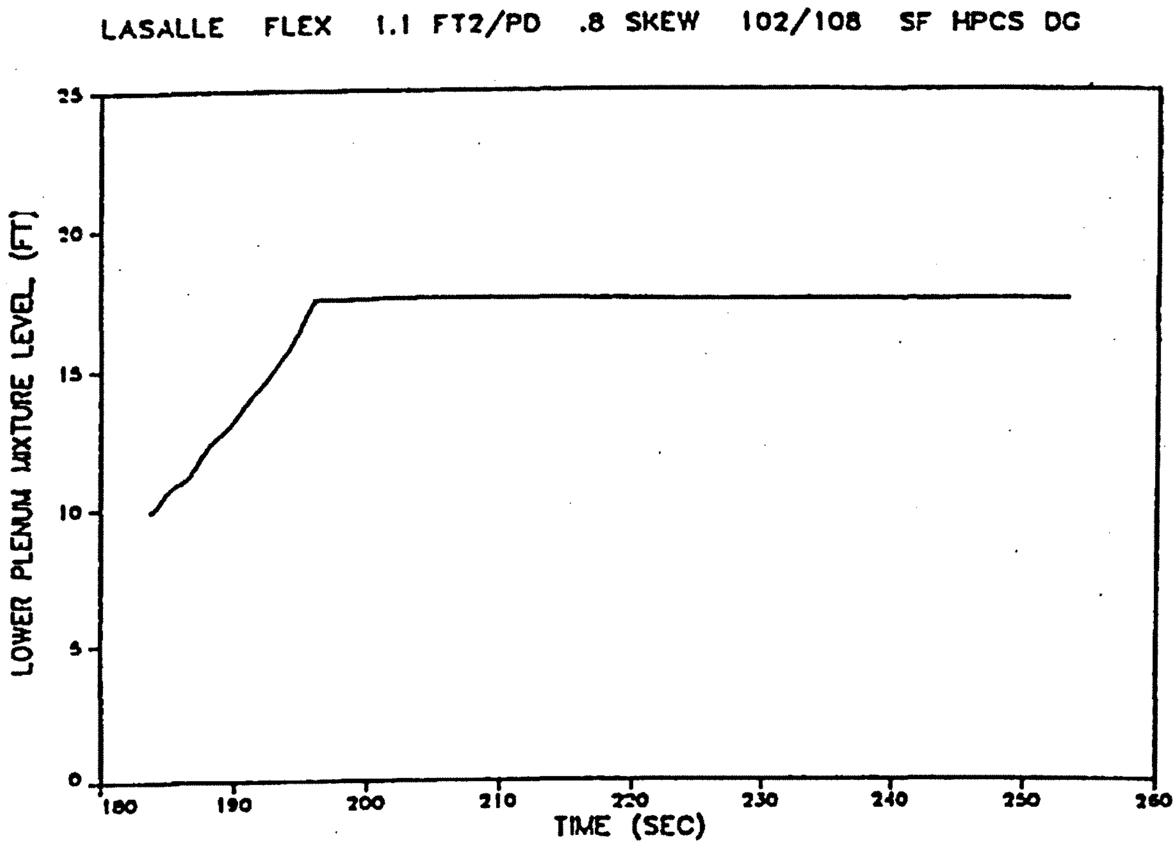
FIGURE 6.3-38

SYSTEM PRESSURE VS. TIME AFTER BREAK (1.1 FT² PUMP DISCHARGE HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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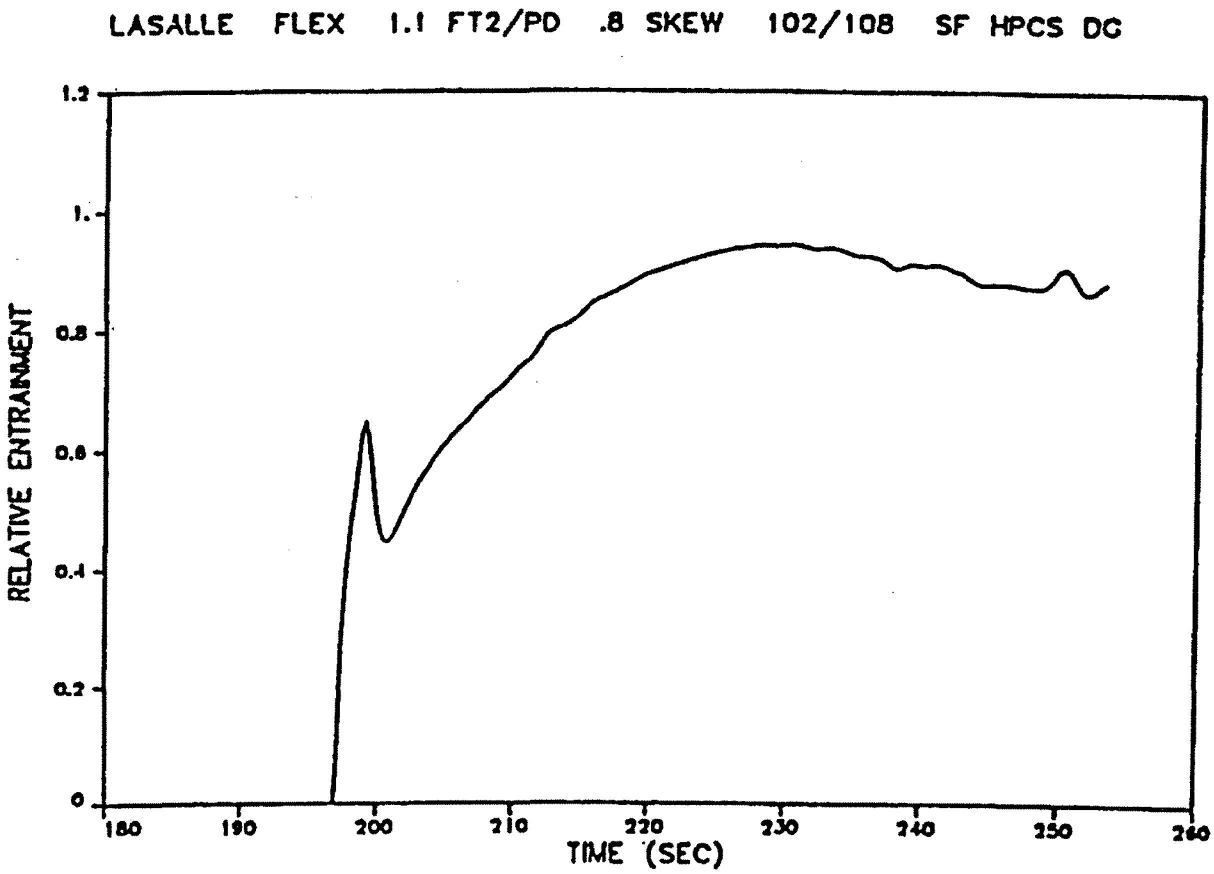
FIGURE 6.3-39 LOWER PLENUM MIXTURE LEVEL VS. TIME AFTER BREAK (1.1 FT² PUMP DISCHARGE HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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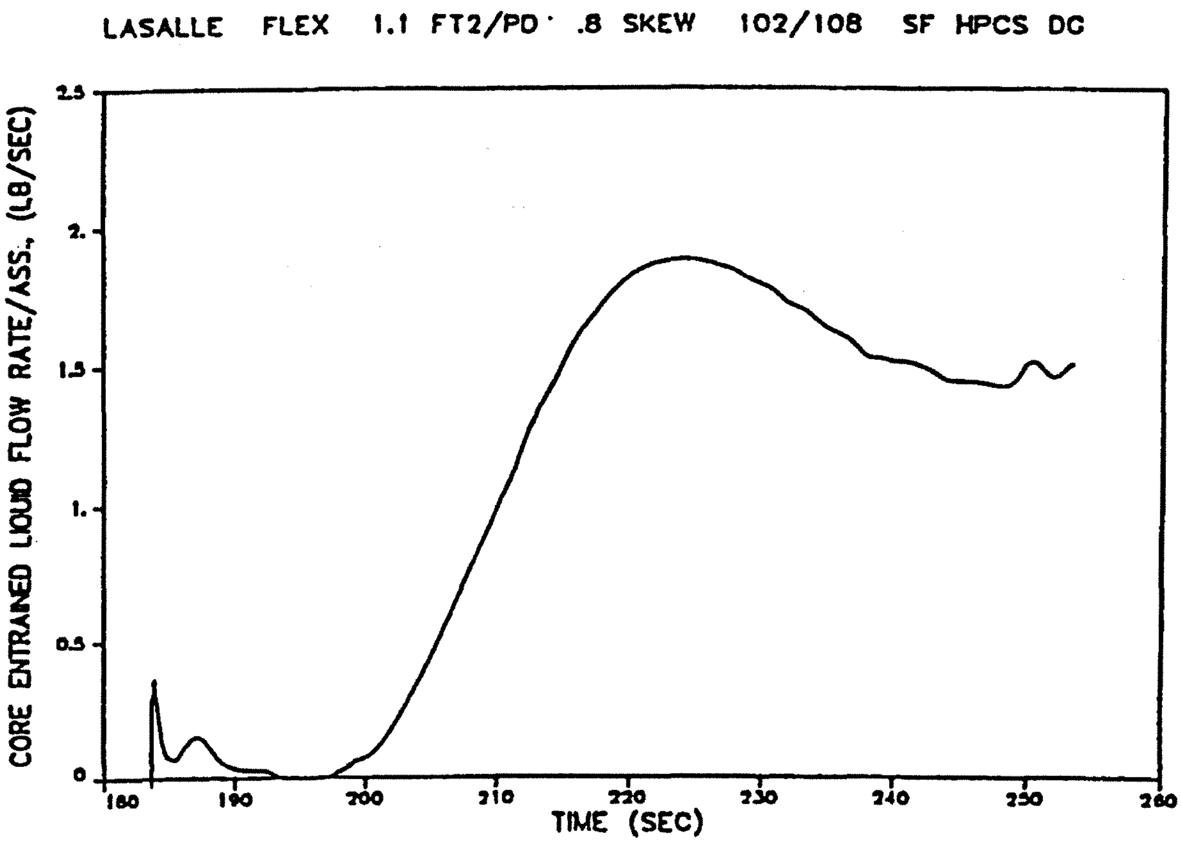
FIGURE 6.3-40 RELATIVE ENTRAINMENT VS. TIME AFTER BREAK (1.1 FT^2 PUMP DISCHARGE HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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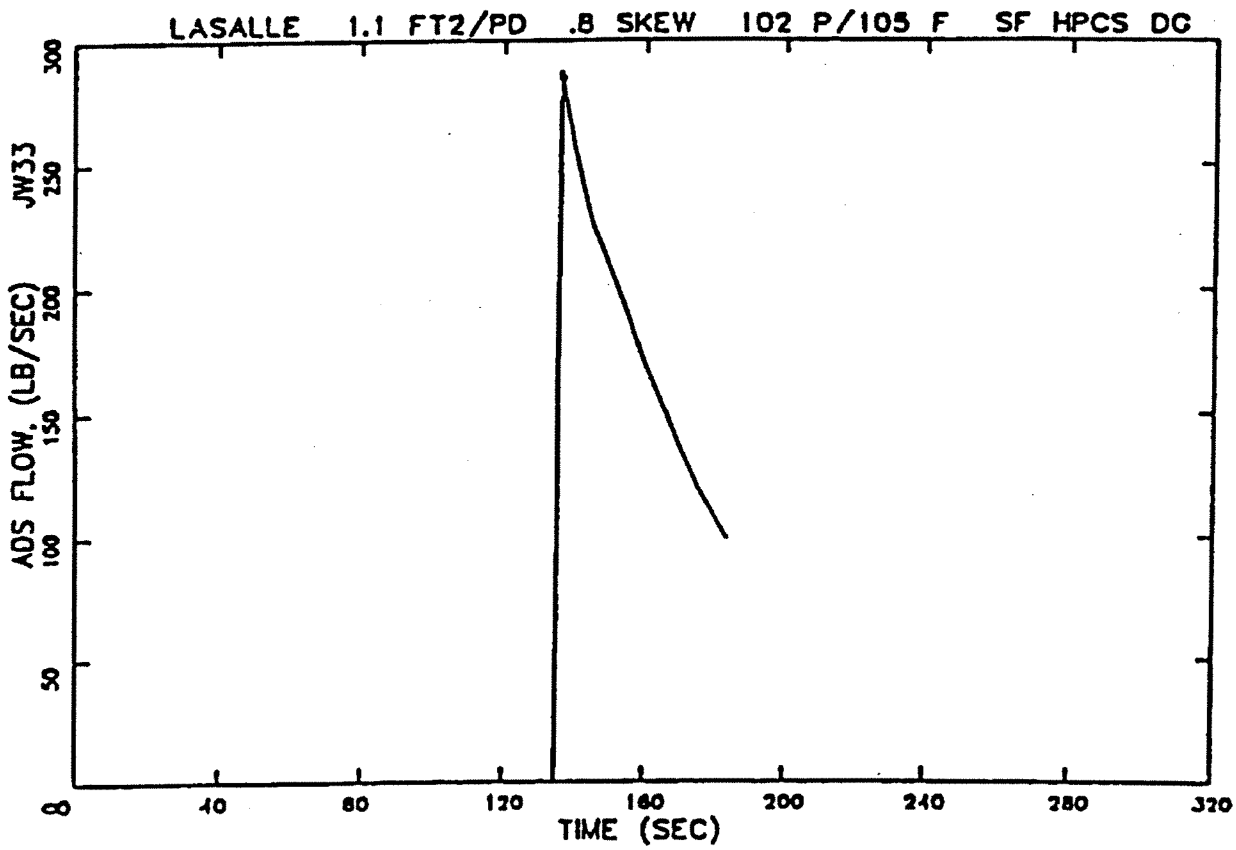
FIGURE 6.3-41
CORE ENTRAINED LIQUID FLOW VS. TIME AFTER REAK (1.1 FT^2 PUMP DISCHARGE HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2147(P)

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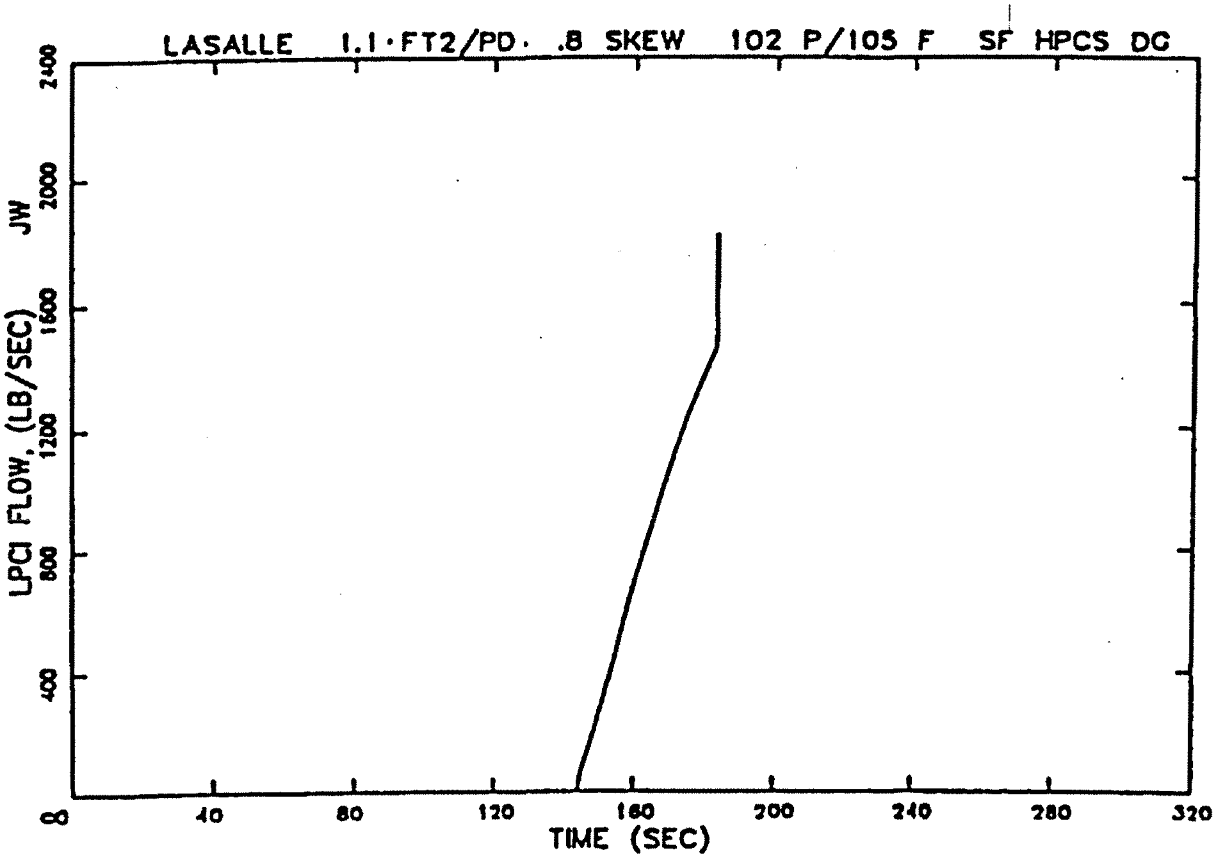
FIGURE 6.3-42

ADS FLOW VS. TIME AFTER BREAK (1.1 FT^2 PUMP DISCHARGE HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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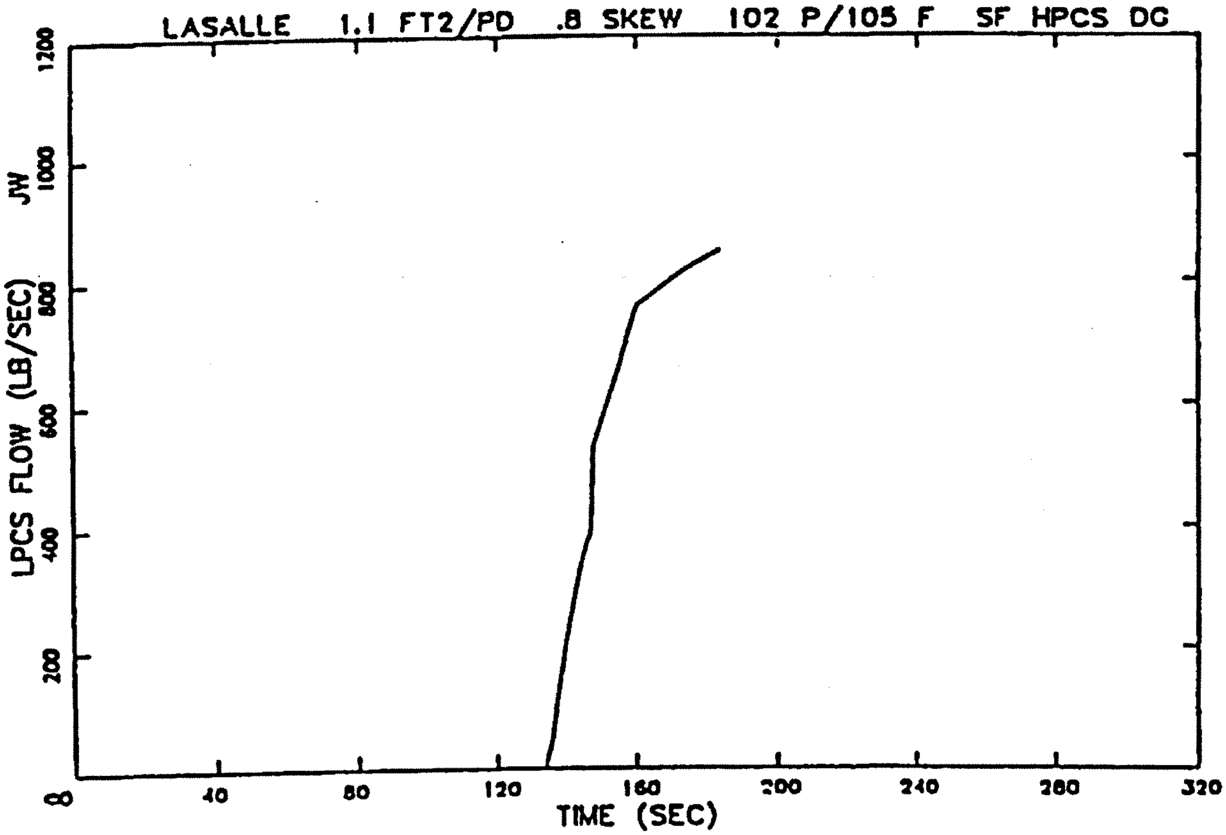
FIGURE 6.3-43

LPCI FLOW VS. TIME AFTER BREAK (1.1 FT^2 PUMP DISCHARGE HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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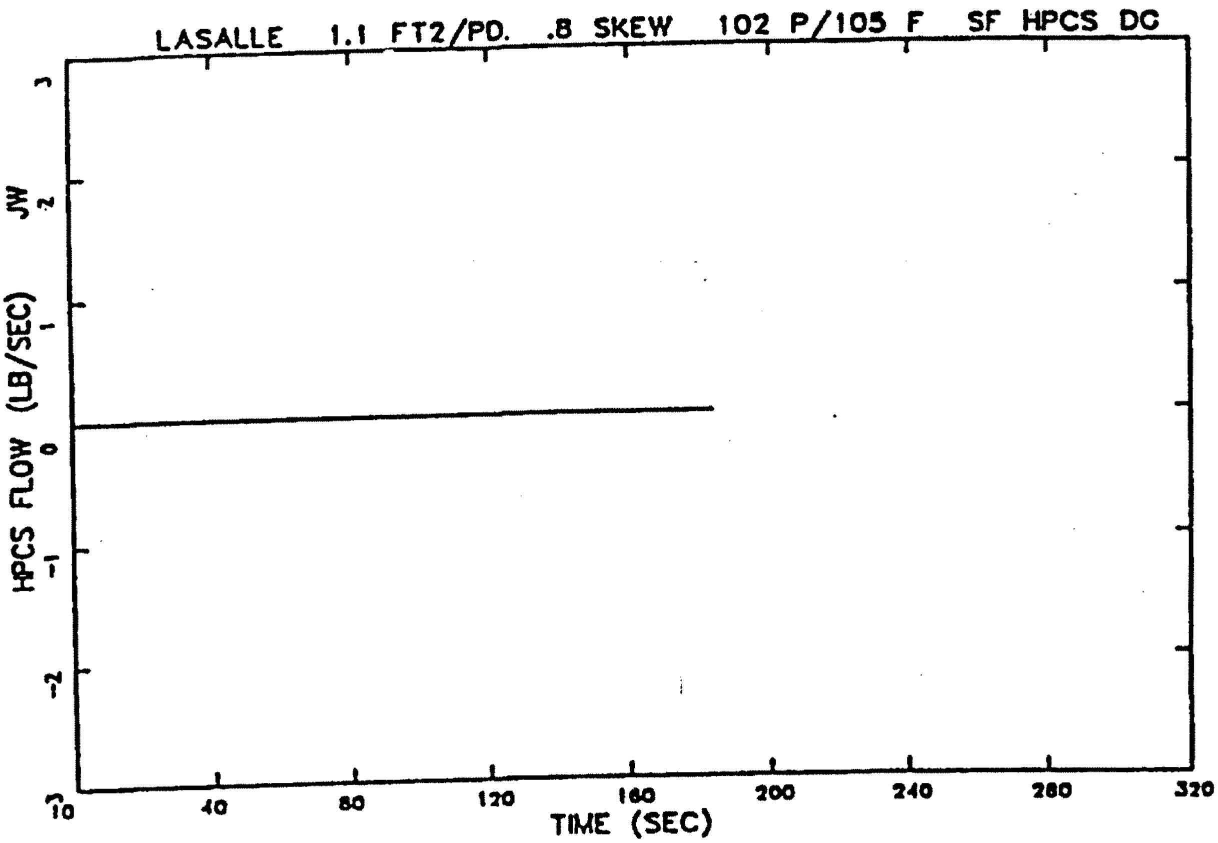
FIGURE 6.3-44

LPCS FLOW VS. TIME AFTER BREAK (1.1 FT^2 PUMP DISCHARGE HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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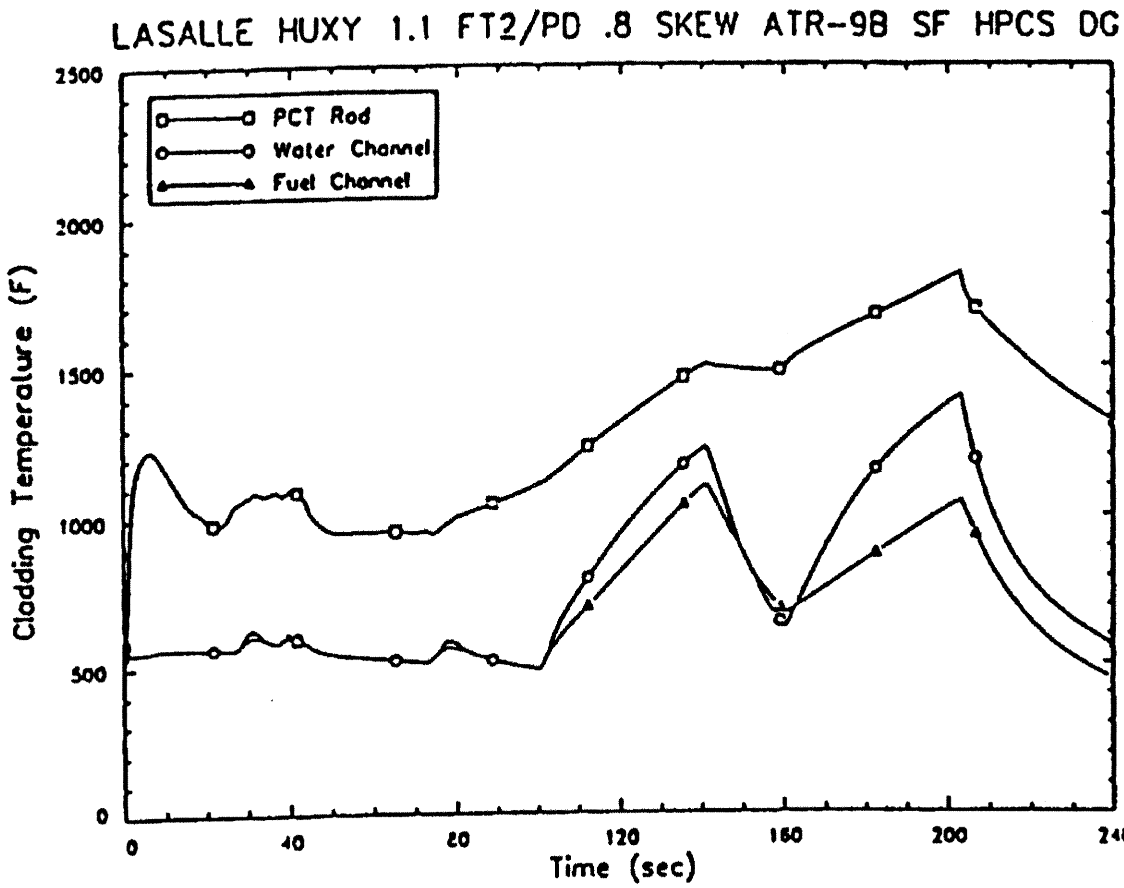
FIGURE 6.3-45 HPCS FLOW VS. TIME AFTER BREAK (1.1 FT^2 PUMP DISCHARGE HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)



Source: EMF-2174(P)

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FIGURE 6.3-46 PEAK CLADDING TEMPERATURE VS. TIME AFTER BREAK (1.1 FT^2 PUMP DISCHARGE HPCS DIESEL GENERATOR FAILURE, ATRIUM-9B FUEL)

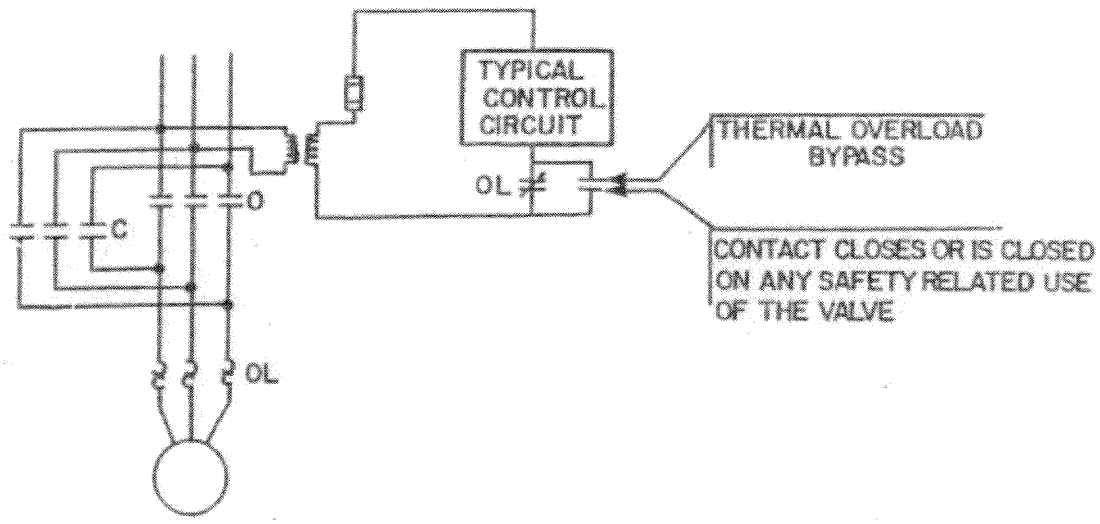

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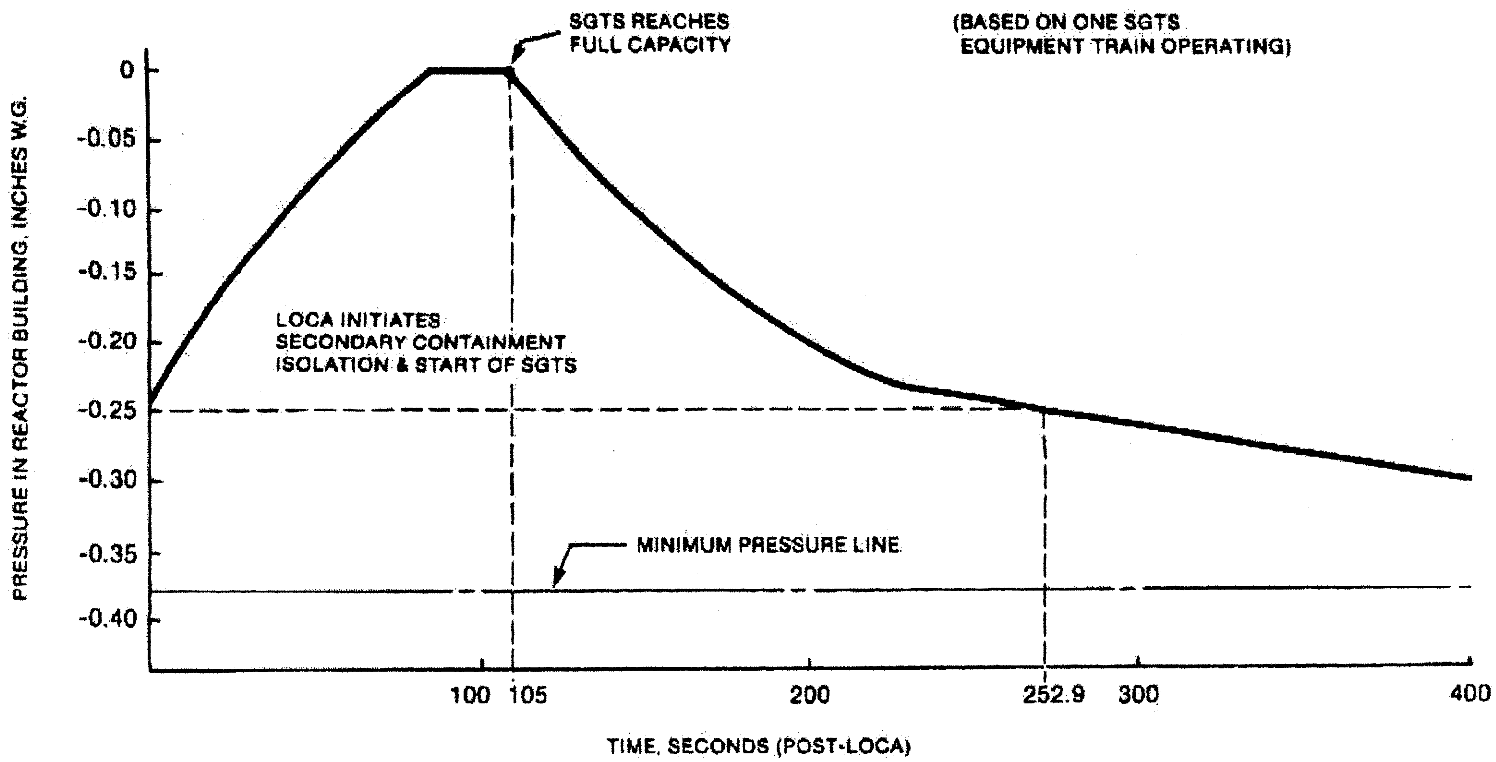
FIGURE 6.3-47

SCHEMATIC OF THERMAL OVERLOAD BYPASS CIRCUITRY



NOTE: This figure was used to support original licensing. For current licensing requirements for system pressure-time response, see the Technical Specifications.

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FIGURE 6.3-80

POST LOCA TIME-PRESSURE IN SECONDARY CONTAINMENT

(BASED ON ONE SGTS EQUIPMENT TRAIN OPERATING)

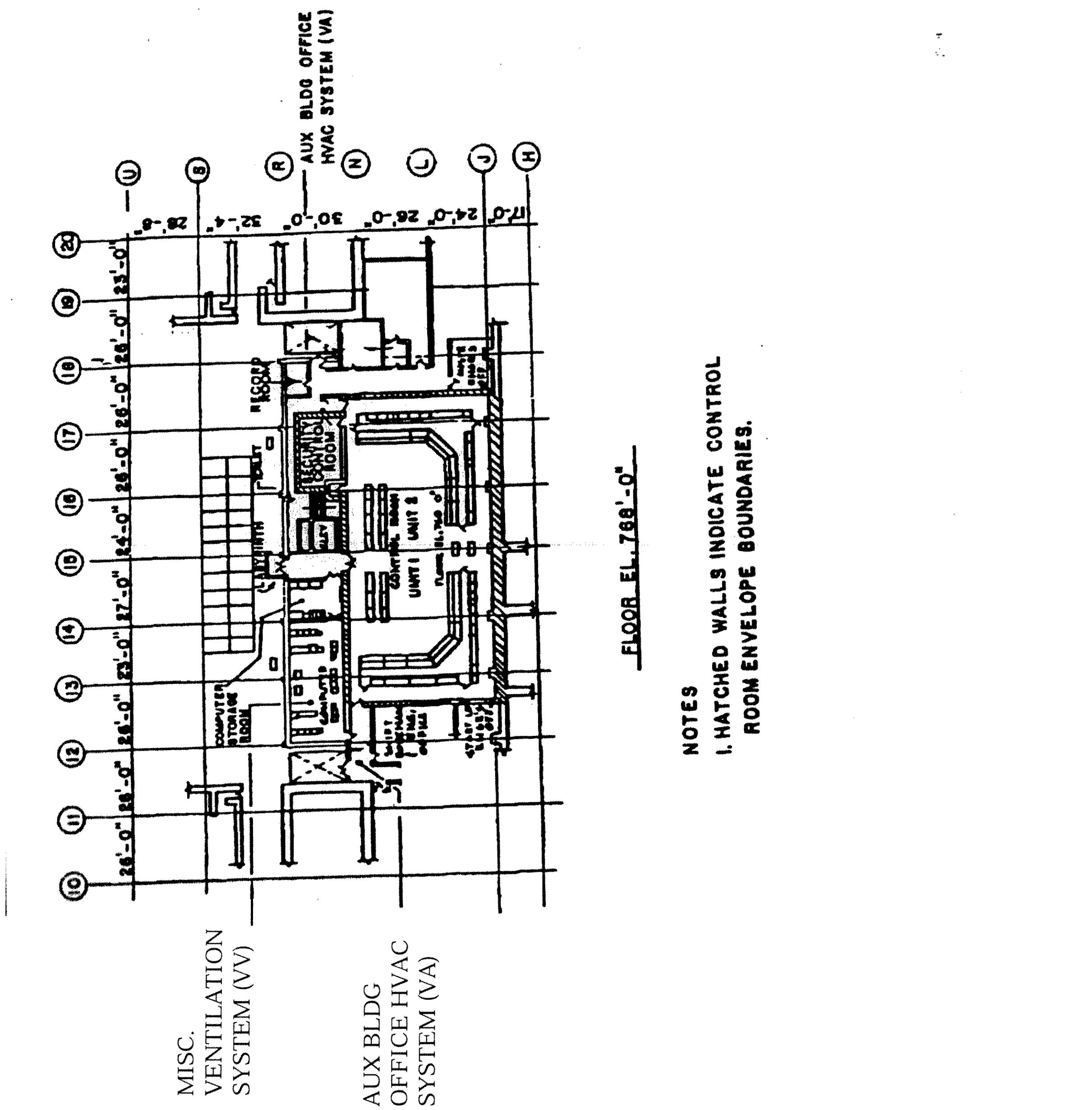

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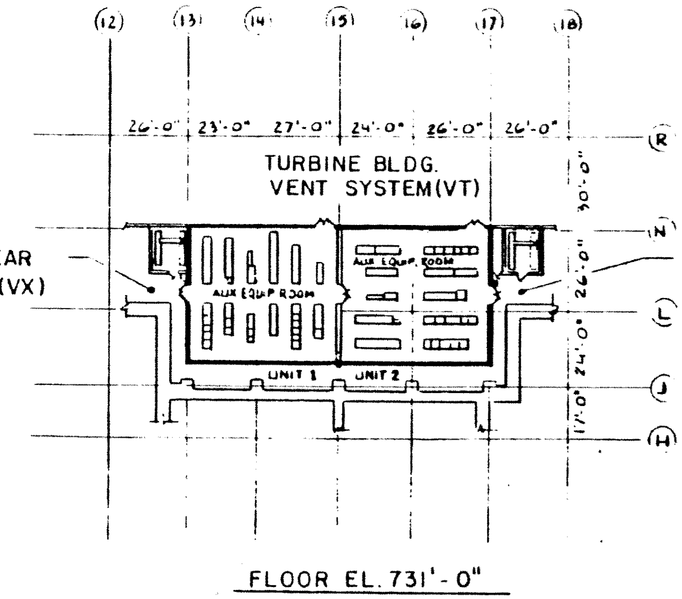
FIGURE 6.4-1

CONTROL AND AUXILIARY ELECTRIC ROOM LAYOUT
(SHEET 1 OF 2)



NOTE: SHADED WALLS AUX. ELEC.
EQUIPMENT ROOM ENVELOPE
BOUNDARIES.

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FIGURE 6.4-1

CONTROL AND AUXILIARY ELECTRIC
EQUIPMENT ROOM LAYOUT

(SHEET 2 OF 2)

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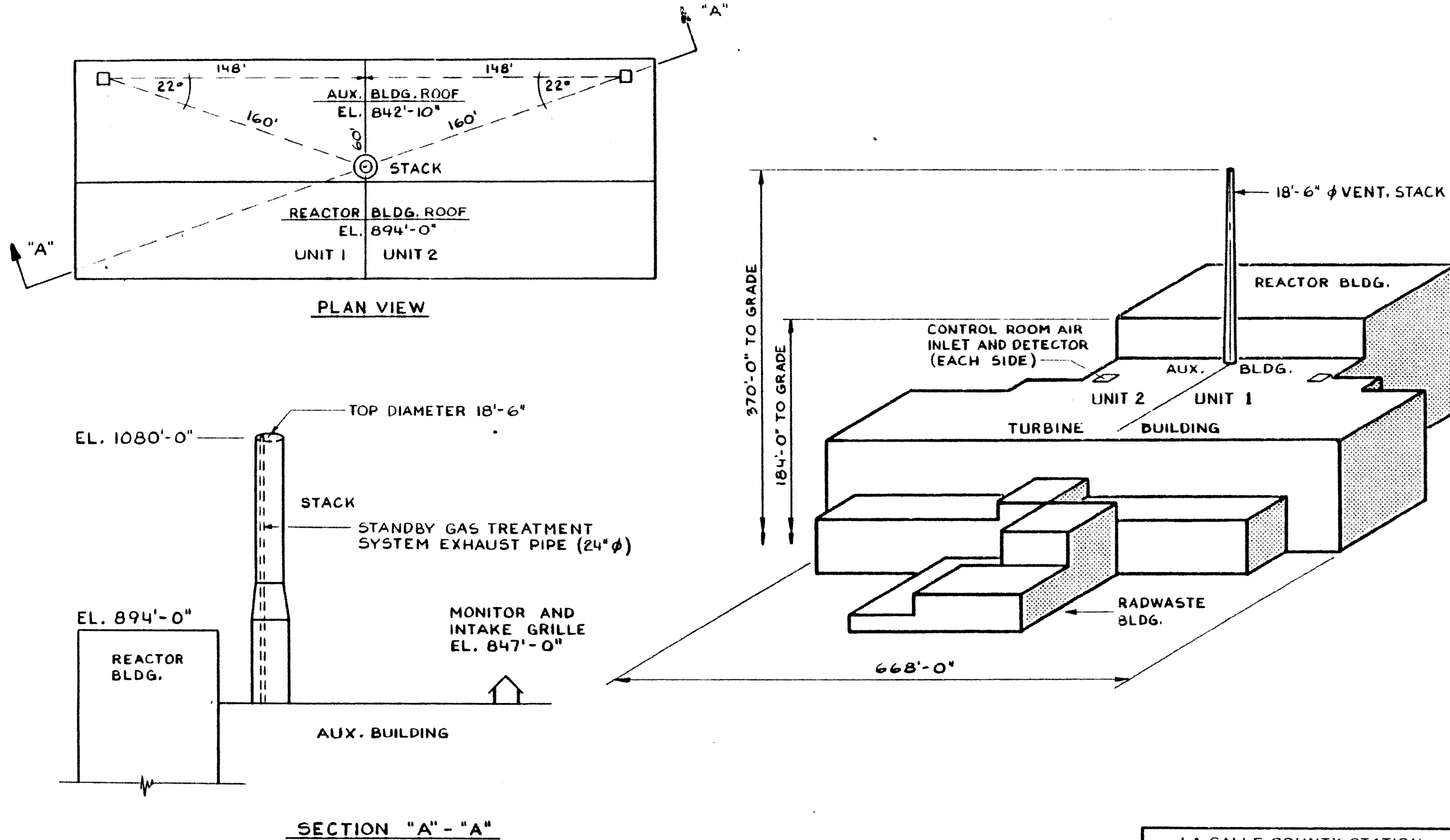

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FIGURE 6.4-2

LOCATION OF OUTSIDE AIR INTAKES

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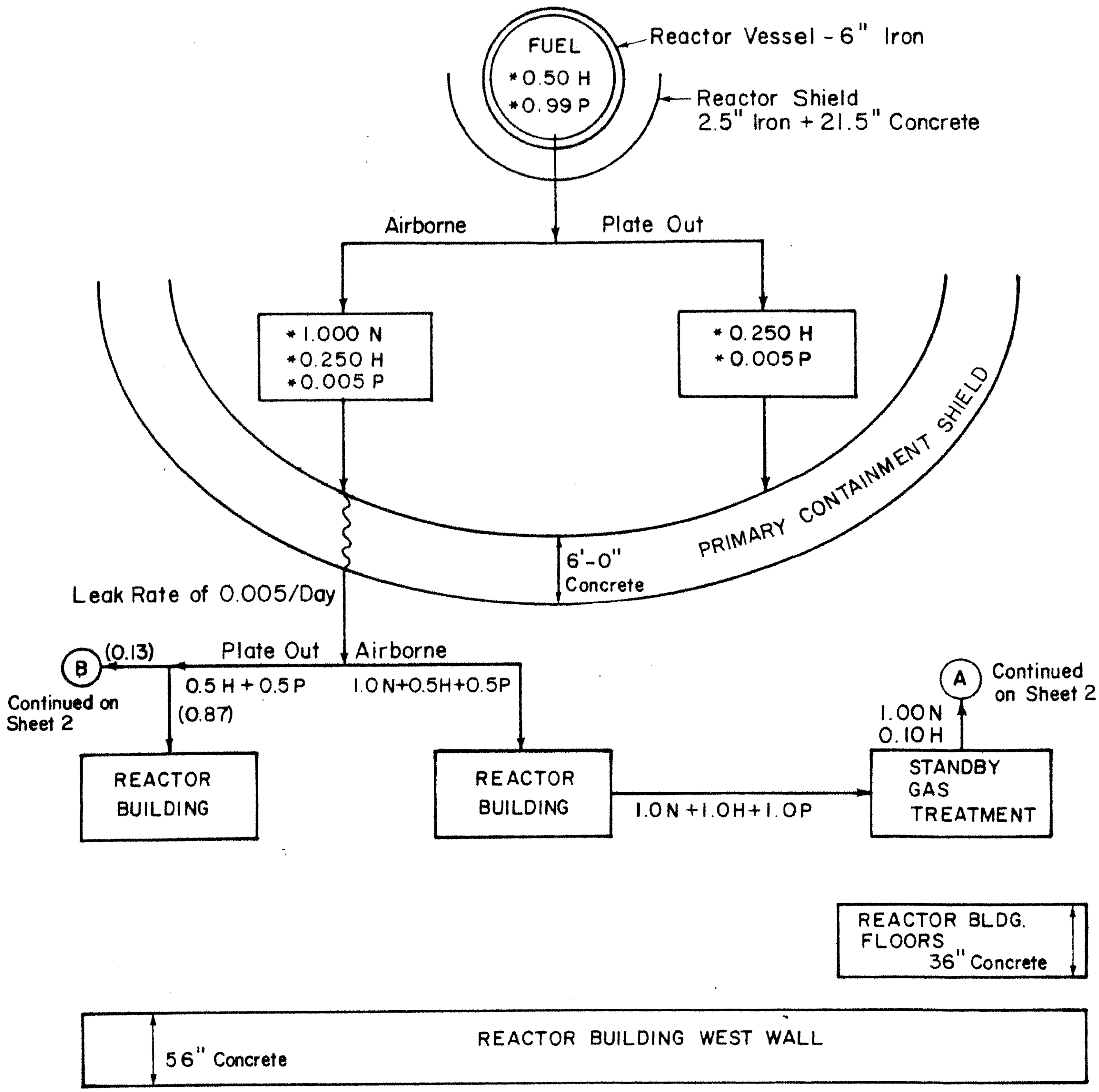

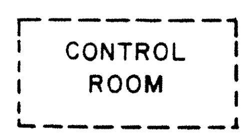

LEGEND

- N - Noble Gases
- H - Halogen
- P - Particulates
- * - Distribution of fission products immediately following a LOCA

NOTES

1. Flows beyond the primary containment are fractions of the upstream input.
2. The .635 % per day leak rate will increase the downstream sources by approximately 25%
$$\left[(1-e^{-.00635t})/(1-e^{-.005t}) \simeq 1.25\right]$$

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FIGURE 6.4-3

CONTROL ROOM SHIELDING MODEL

(SHEET 1 of 2)

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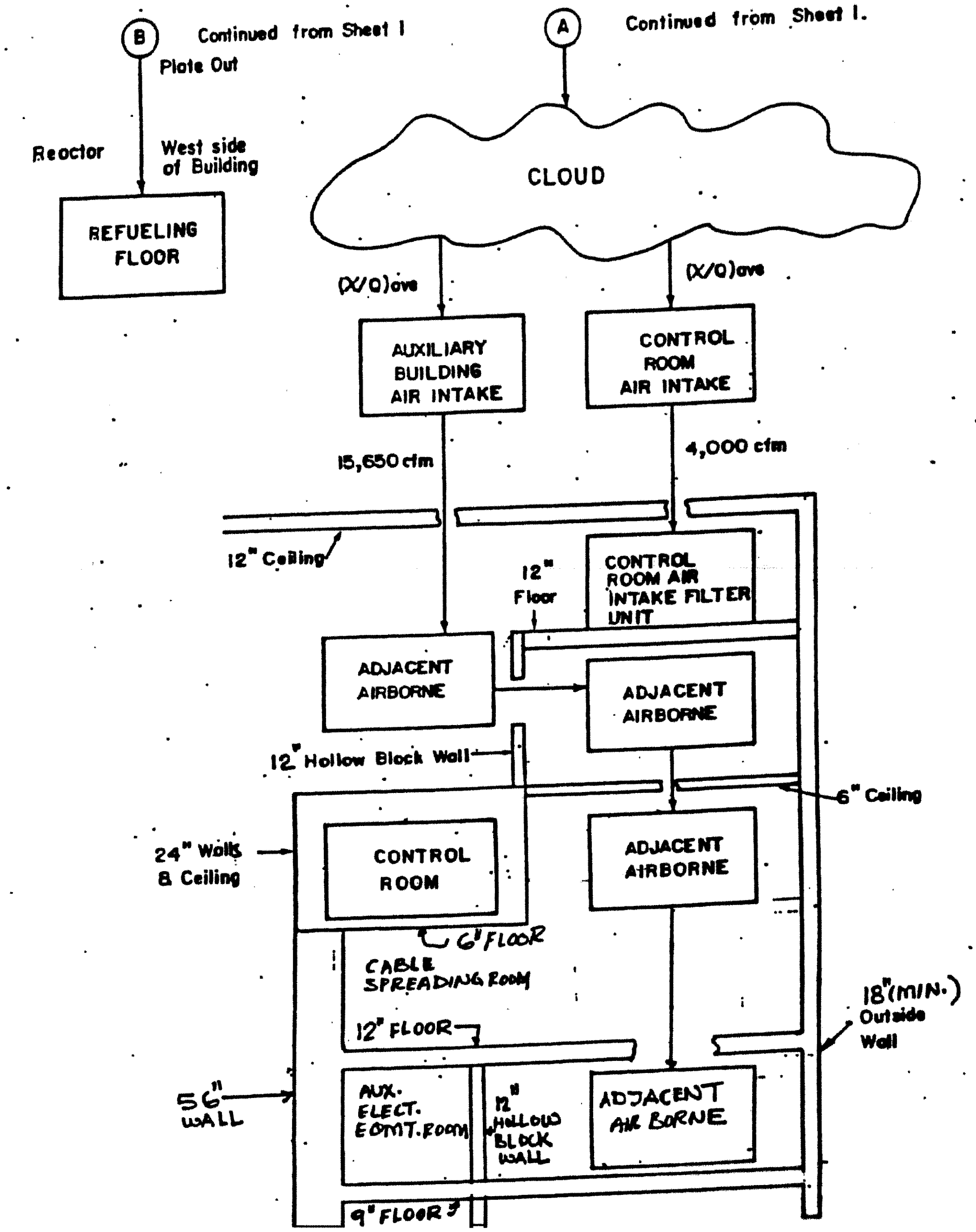

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FIGURE 6.4-3

CONTROL ROOM SHIELDING MODEL
(SHEET 2 OF 2)

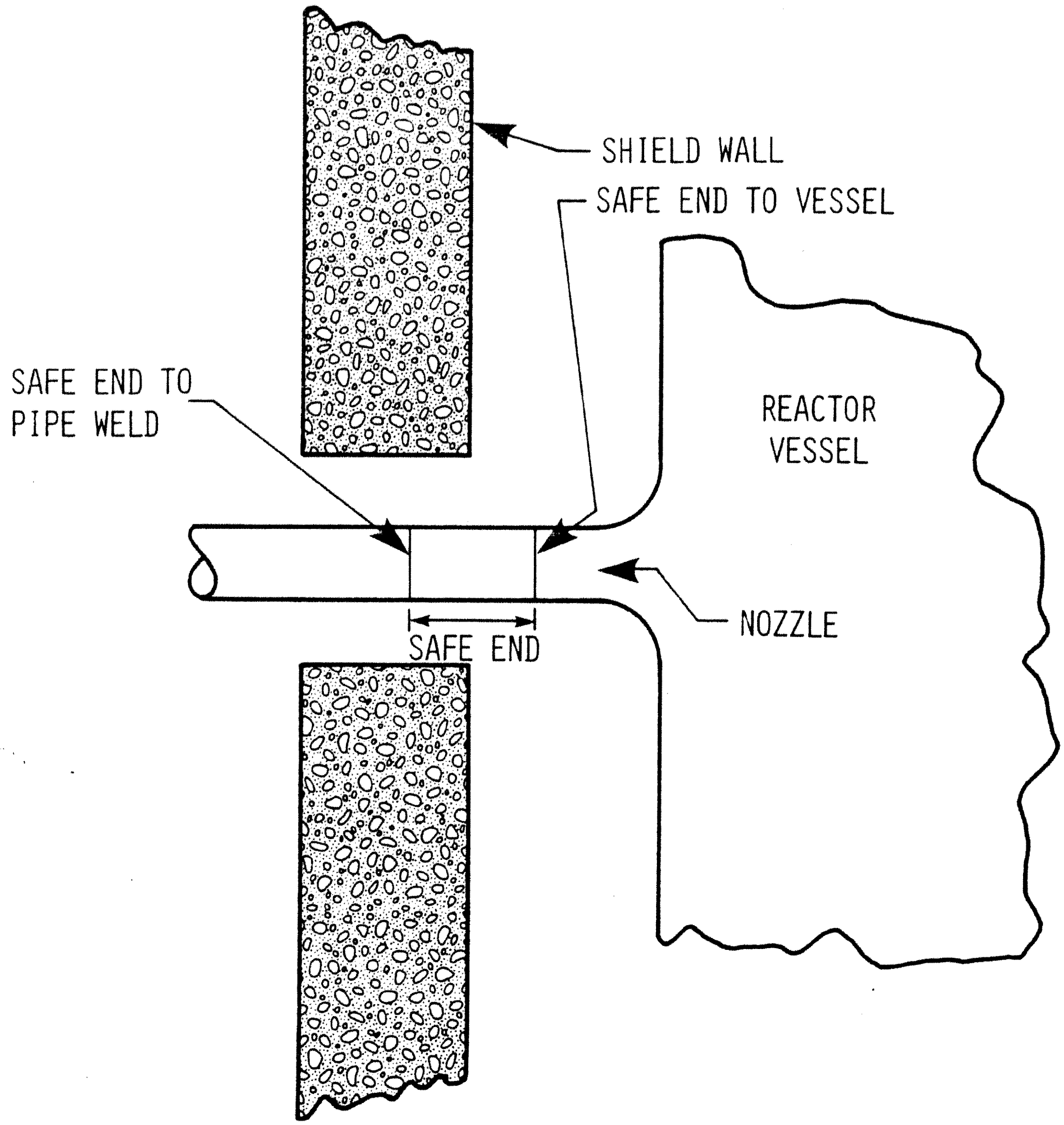

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FIGURE 6.A-1

SAFE END BREAK LOCATION

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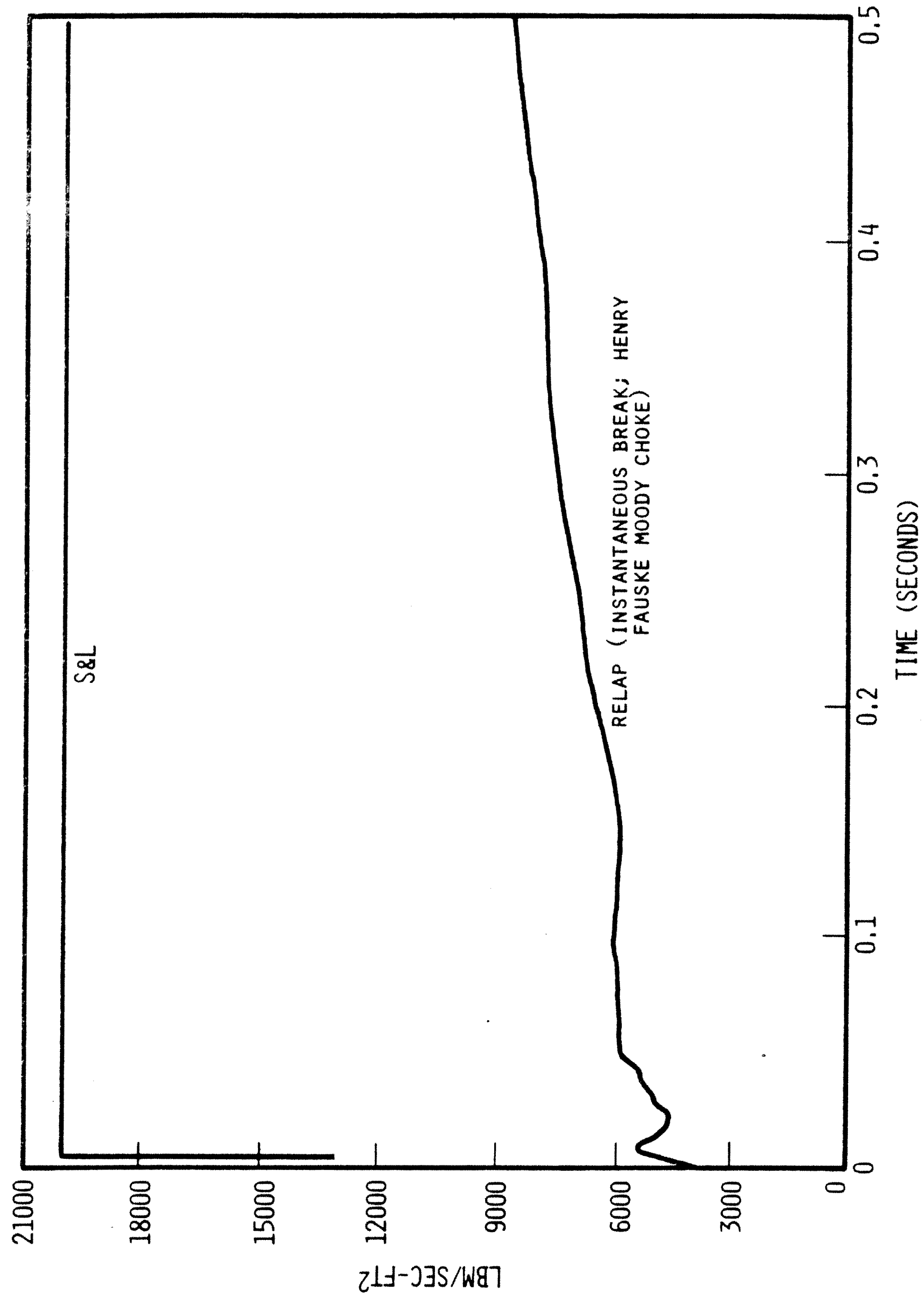

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FIGURE 6.A-2

BREAK FLOW VS. TIME - FEEDWATER LINE BREAK

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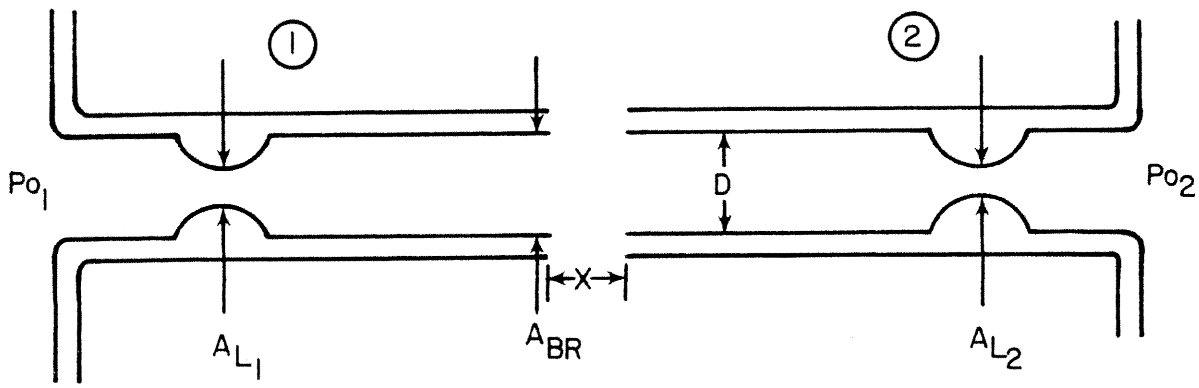

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FIGURE 6.A-3

GEOMETRY

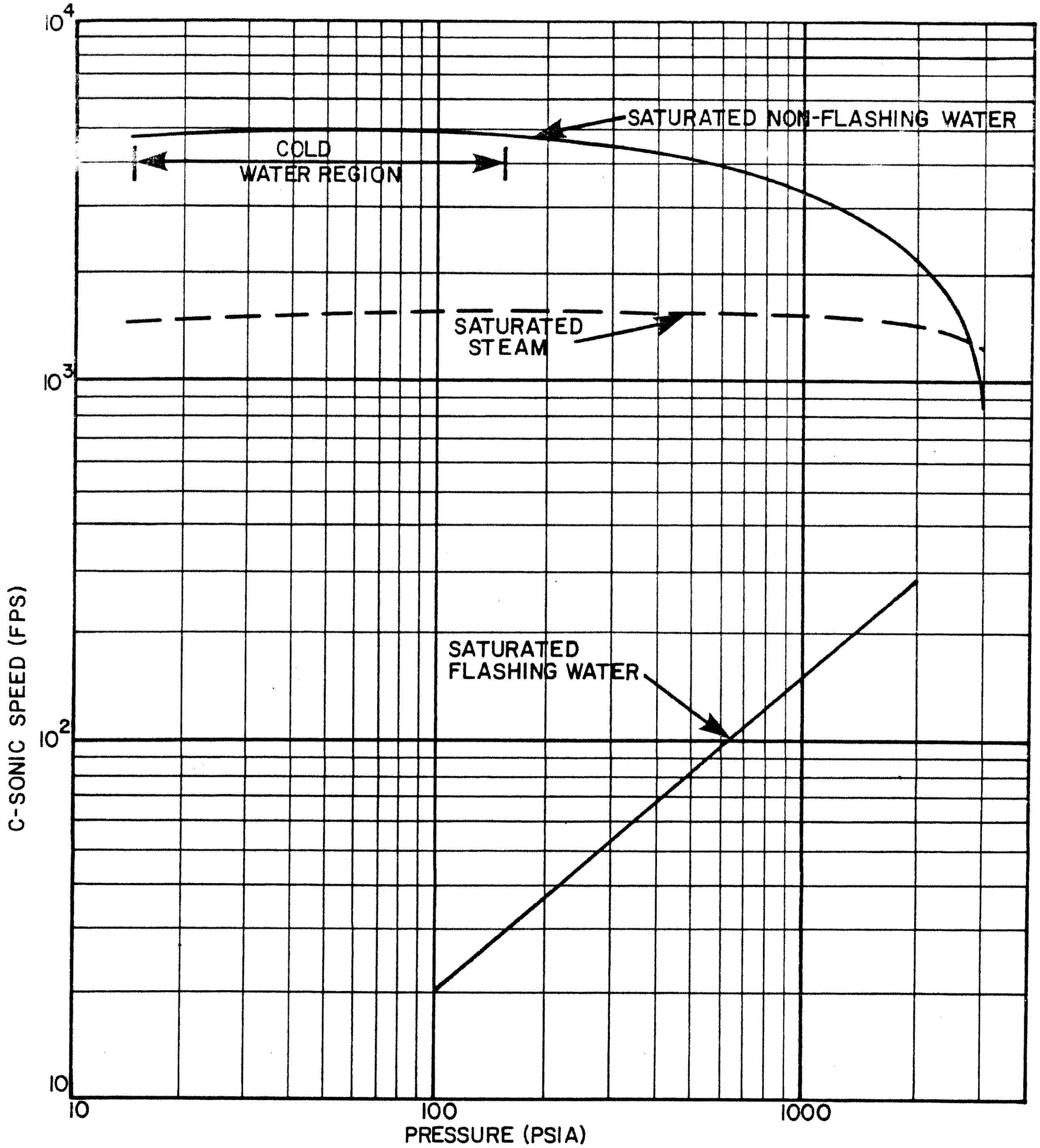

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FIGURE 6.A-4

WAVE SPEED

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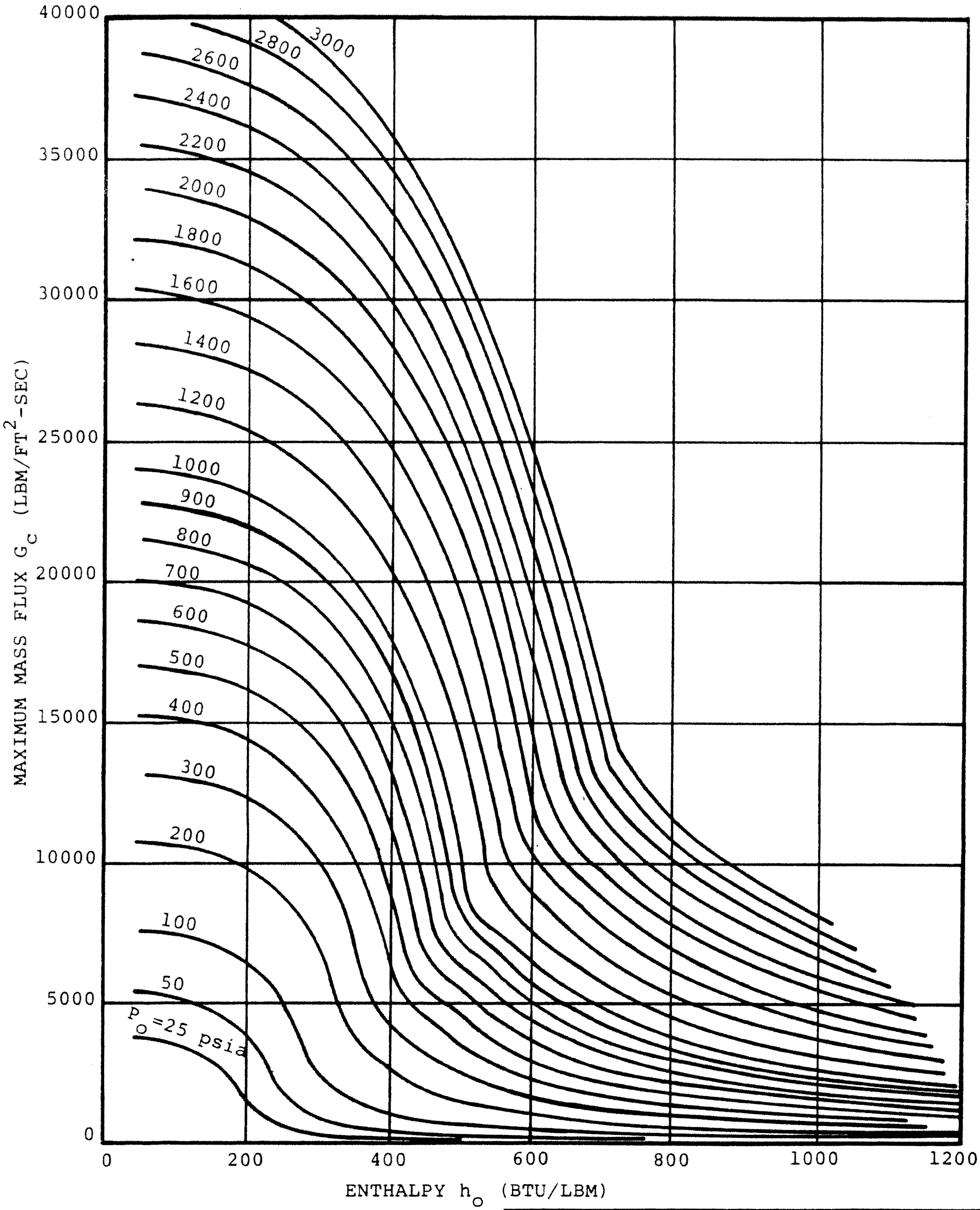

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FIGURE 6.A-5

MASS FLUX, MOODY STEADY SLIP FLOW

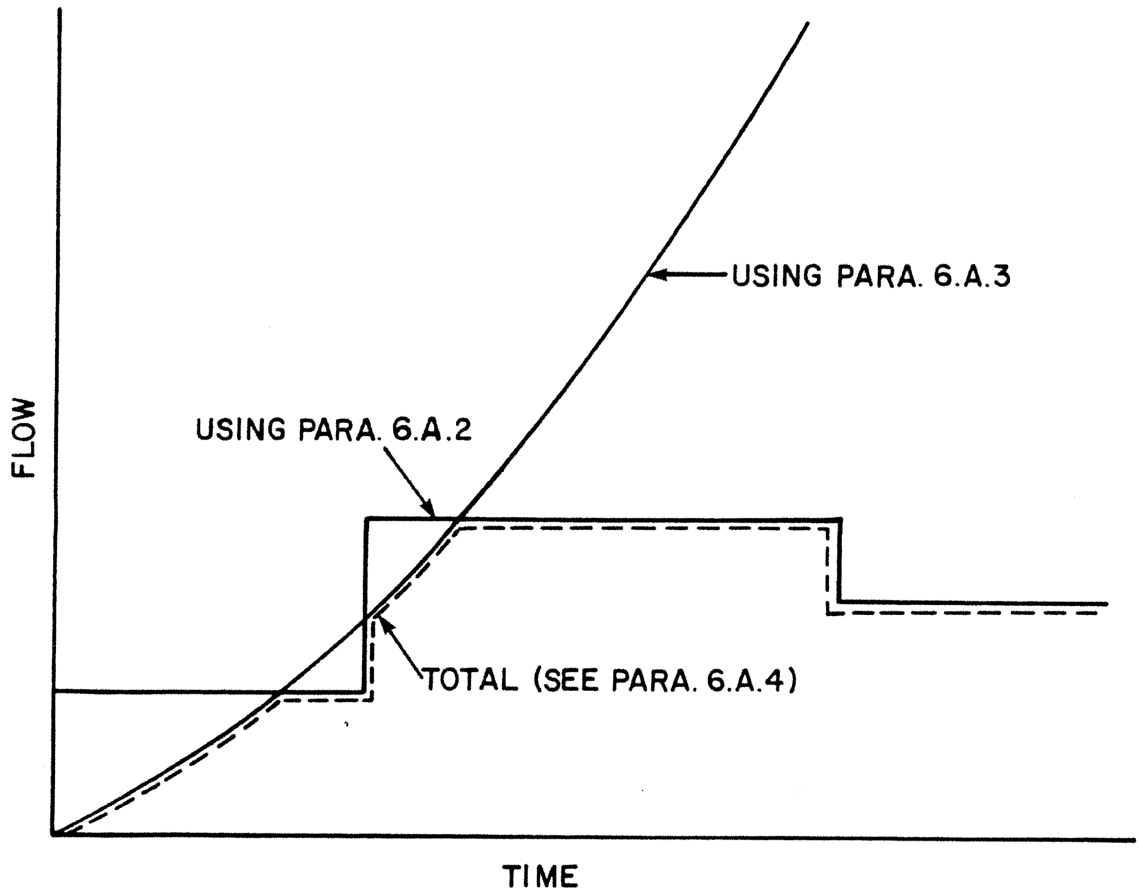

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FIGURE 6.A-6

BREAK FLOW VS. TIME

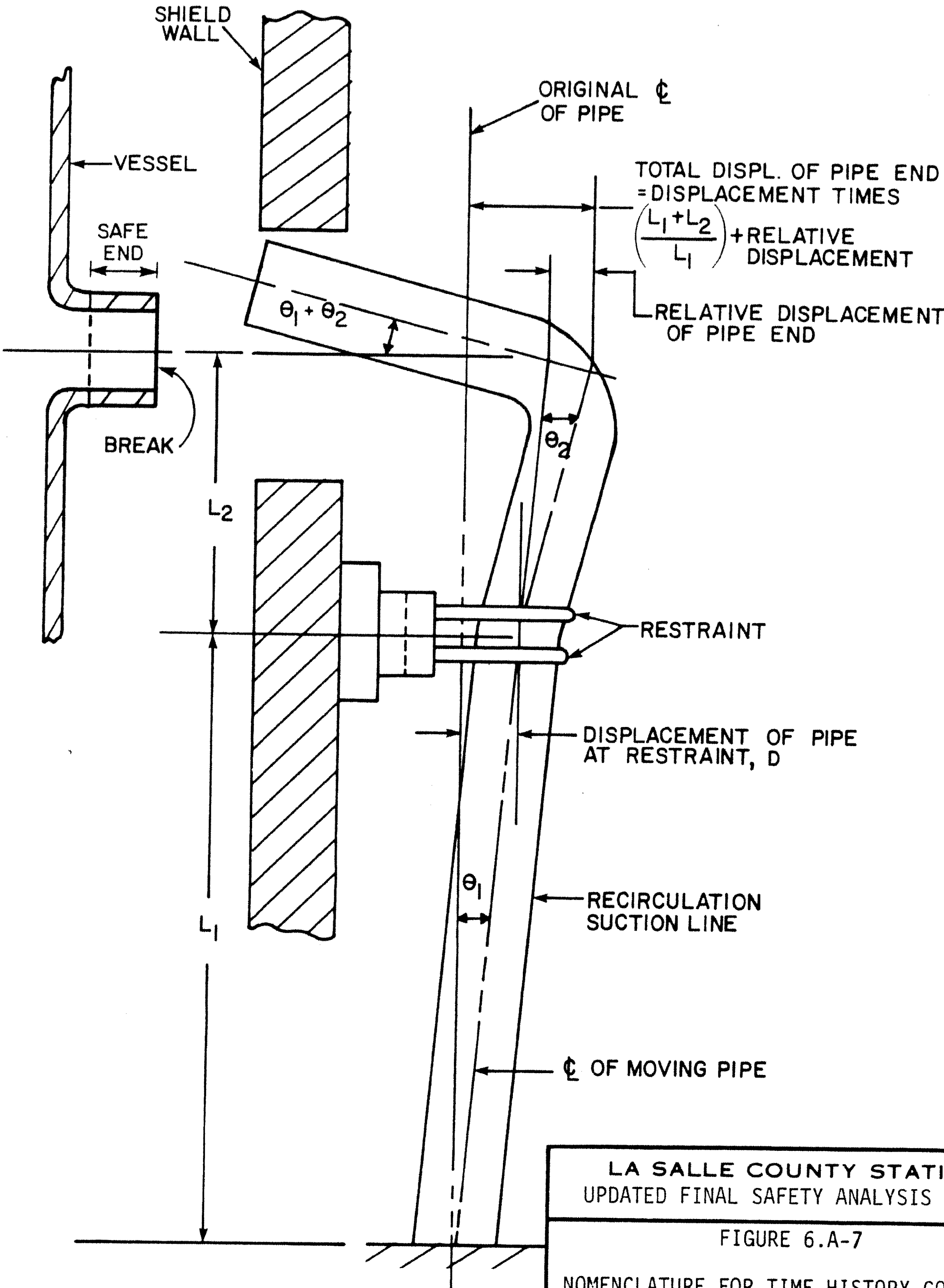

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FIGURE 6.A-7

NOMENCLATURE FOR TIME HISTORY COMPUTER PRINTOUT

REV. 0 - APRIL 1984

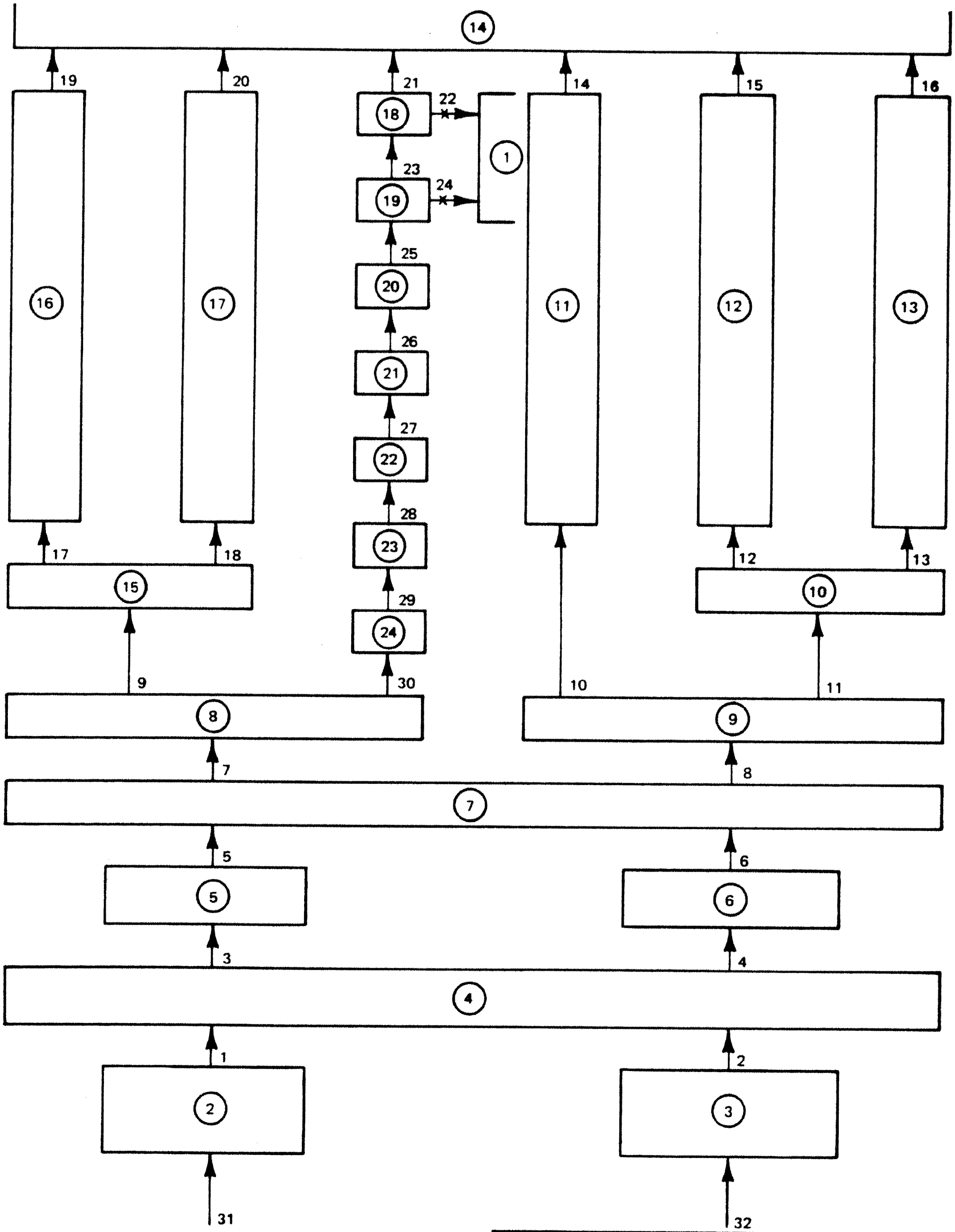

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FIGURE 6.A-8

FEEDWATER LINE SYSTEM NODALIZATION - LEG EA

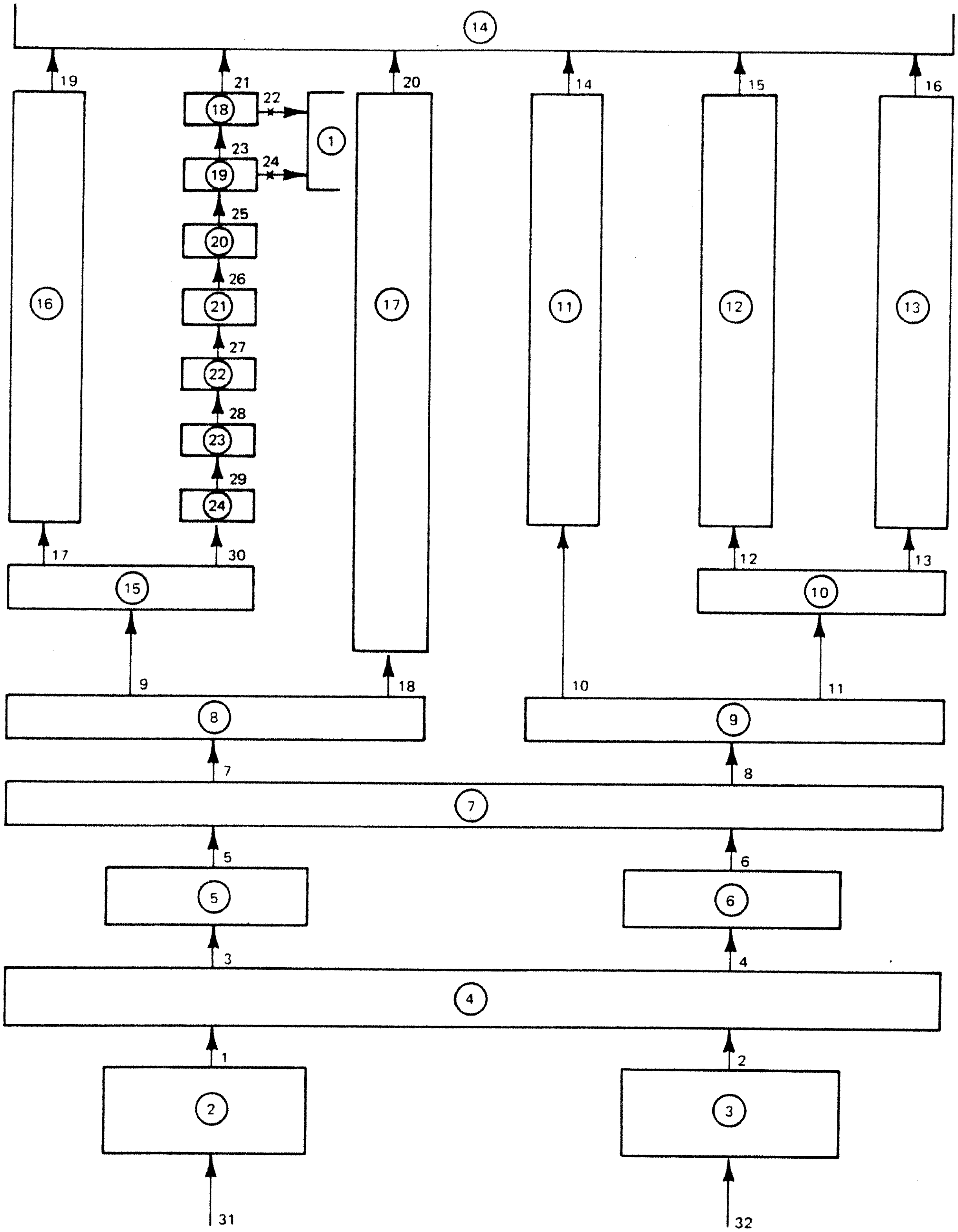

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FIGURE 6.A-9

FEEDWATER LINE SYSTEM NODALIZATION - LEG EB

REV. 0 - APRIL 1984

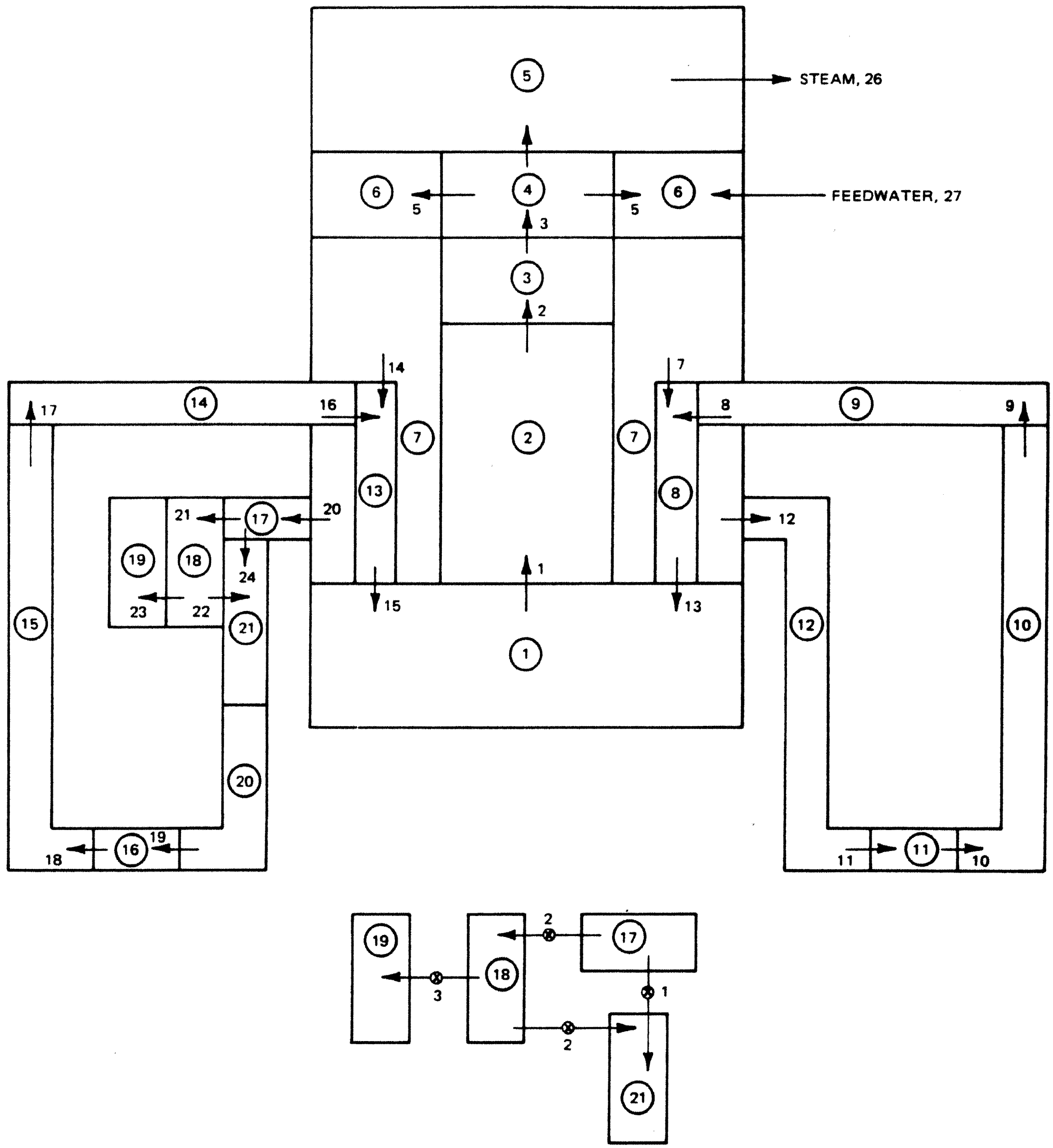

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FIGURE 6.A-10

RECIRCULATION LINE SYSTEM
NODALIZATION

REV. 0 - APRIL 1984

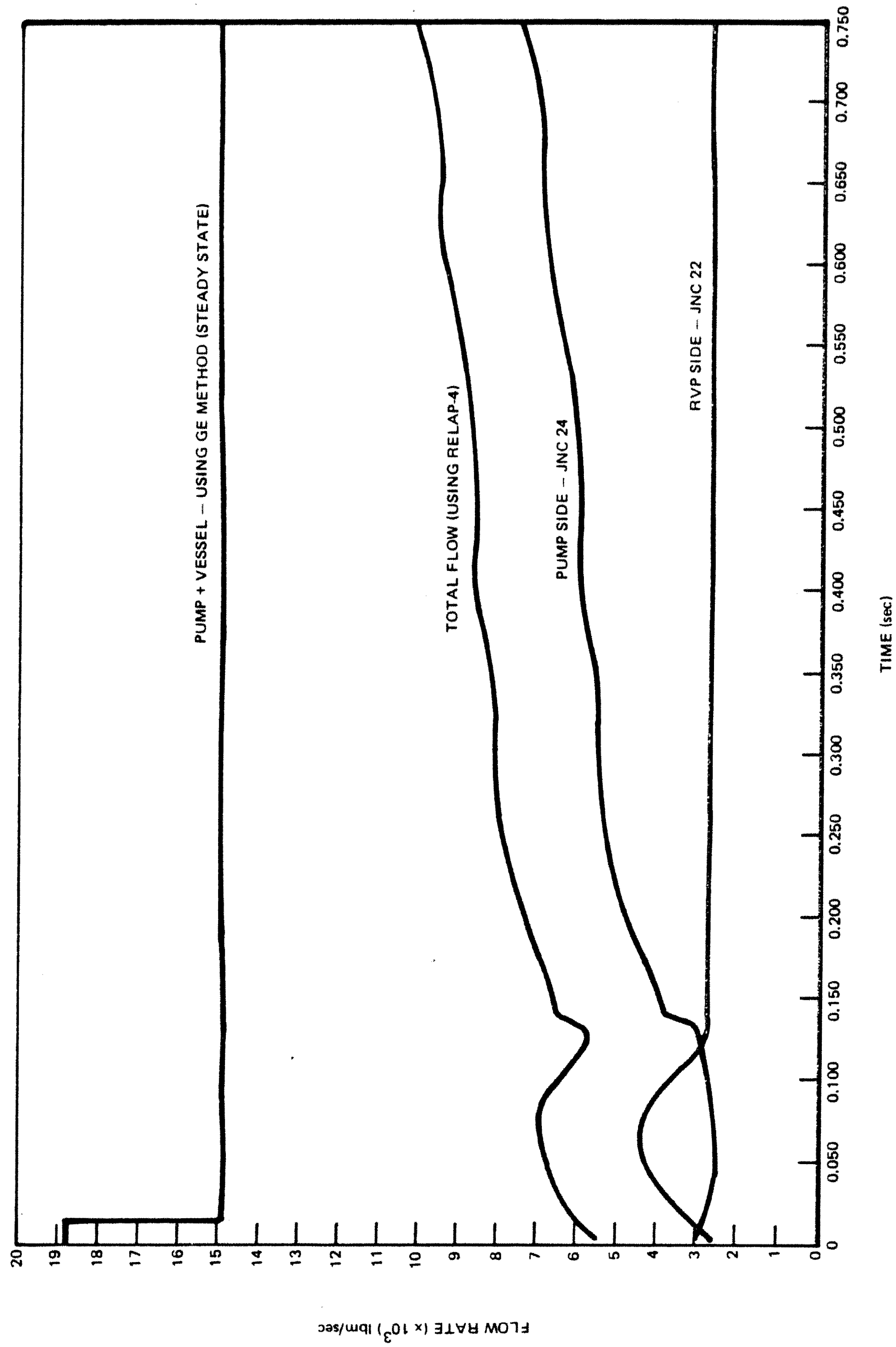

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FIGURE 6.A-11

COMPARISON OF THE GE AND RELAP4/MOD5 METHODS - FEEDWATER LINE BREAK, LEG EA

REV. 0 - APRIL 1984

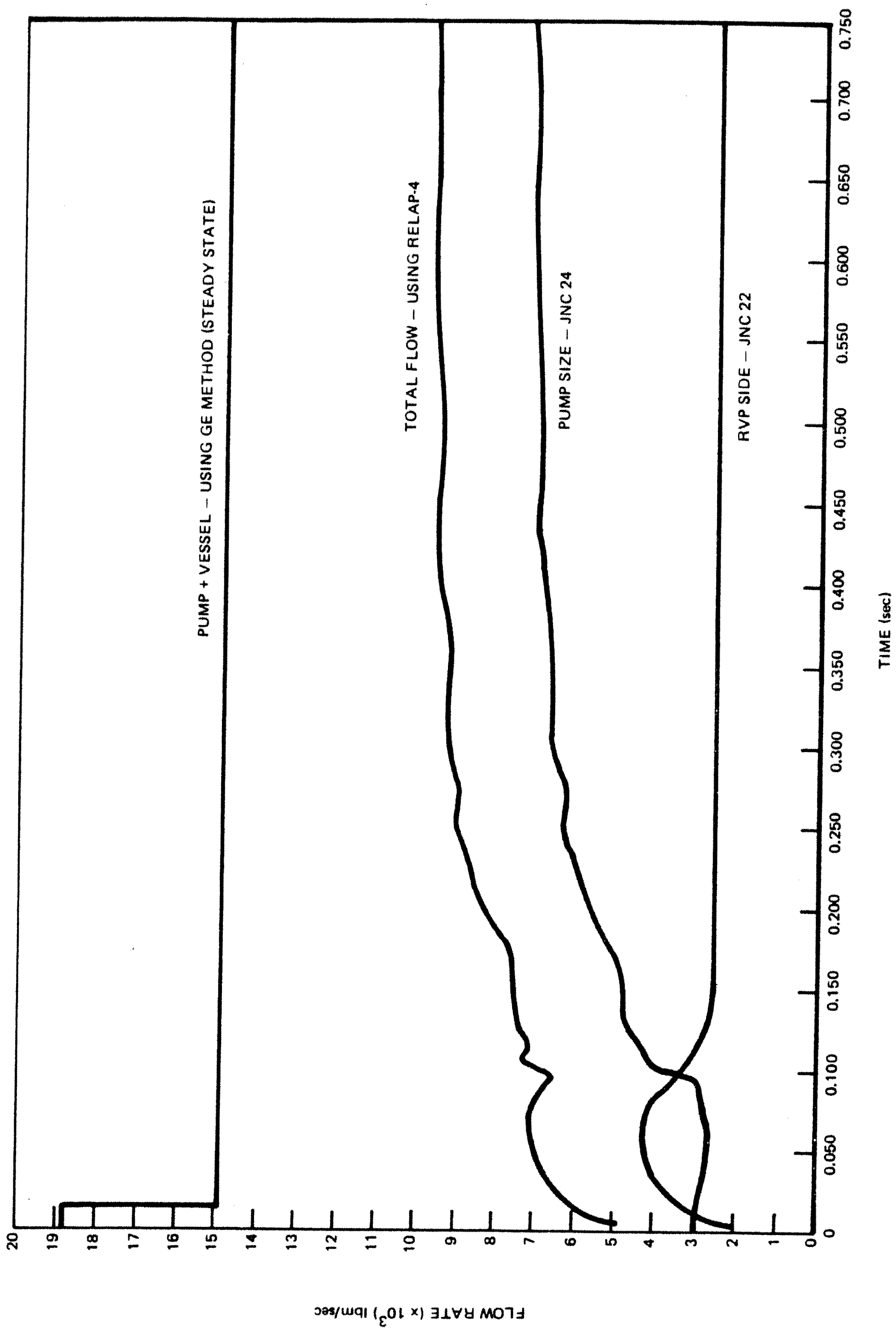

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FIGURE 6.A-12

COMPARISON OF THE GE AND
RELAP4/MOD5 METHODS - FEEDWATER
LINE BREAK, LEG EB

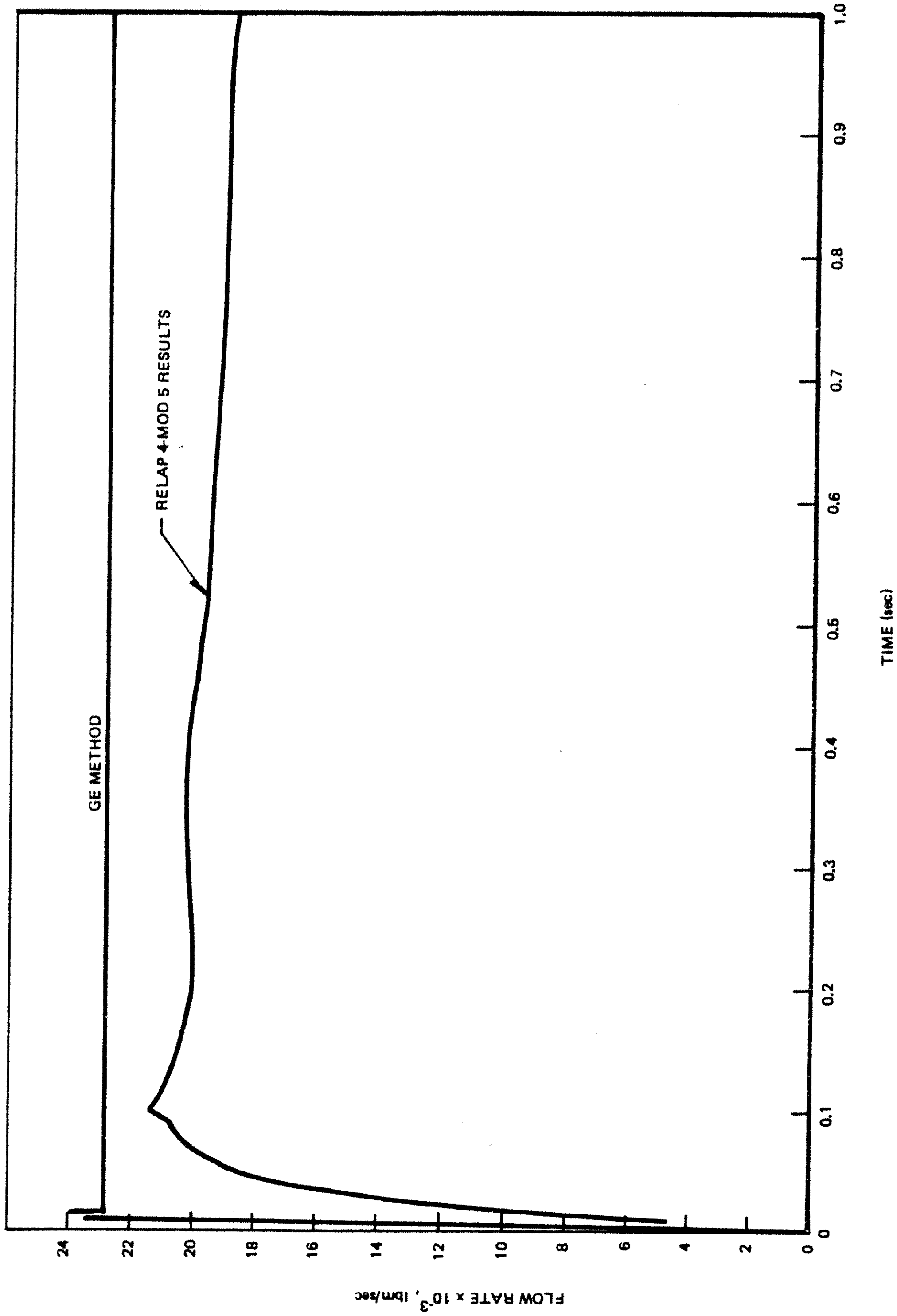

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FIGURE 6.A-13

COMPARISON OF THE GE AND RELAP4/MOD5 METHODS - RECIRCULATION LINE BREAK, FINITE OPENING TIME

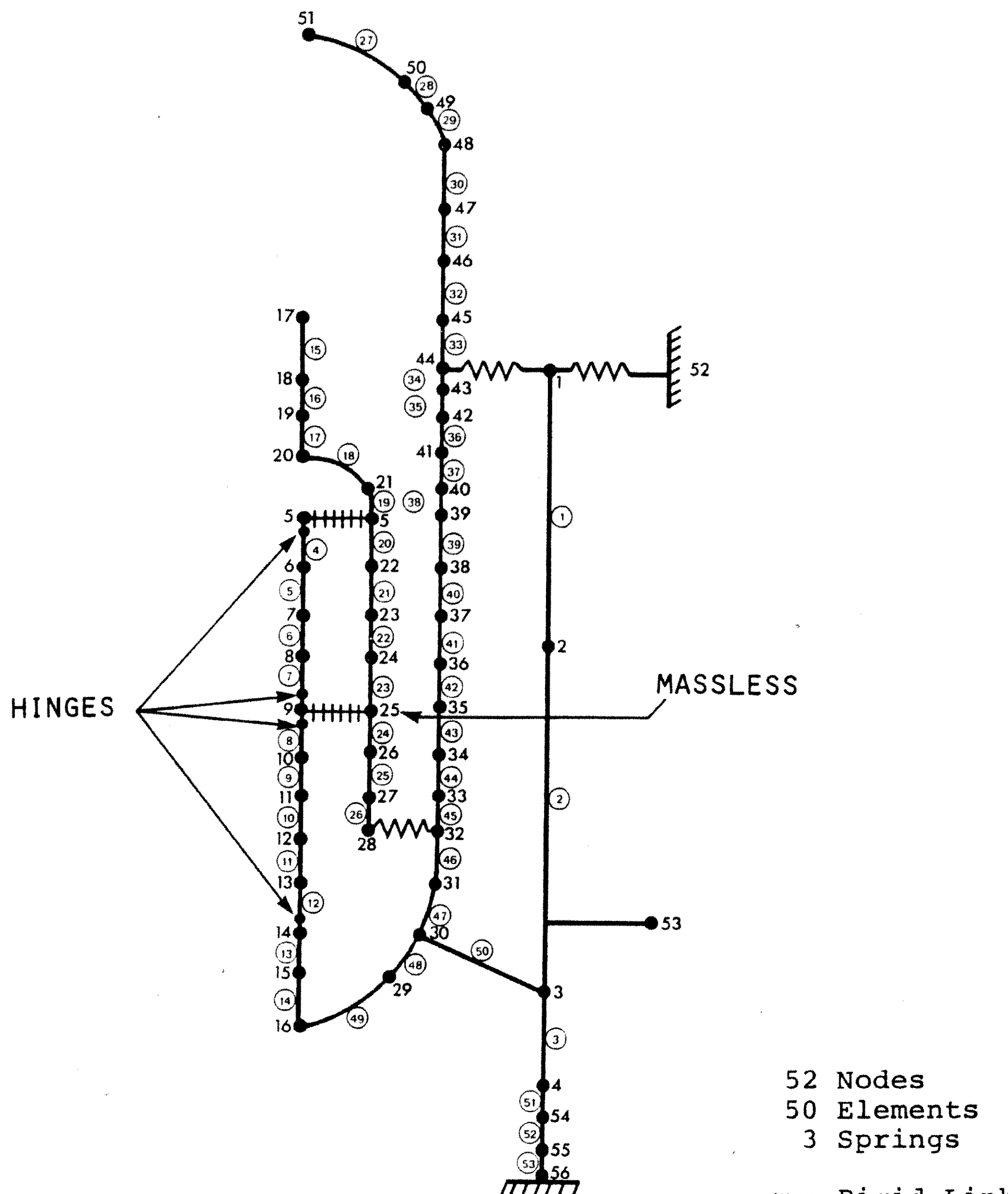

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FIGURE 6.A-14

HORIZONTAL MODEL FOR ANNULUS PRESSURIZATION

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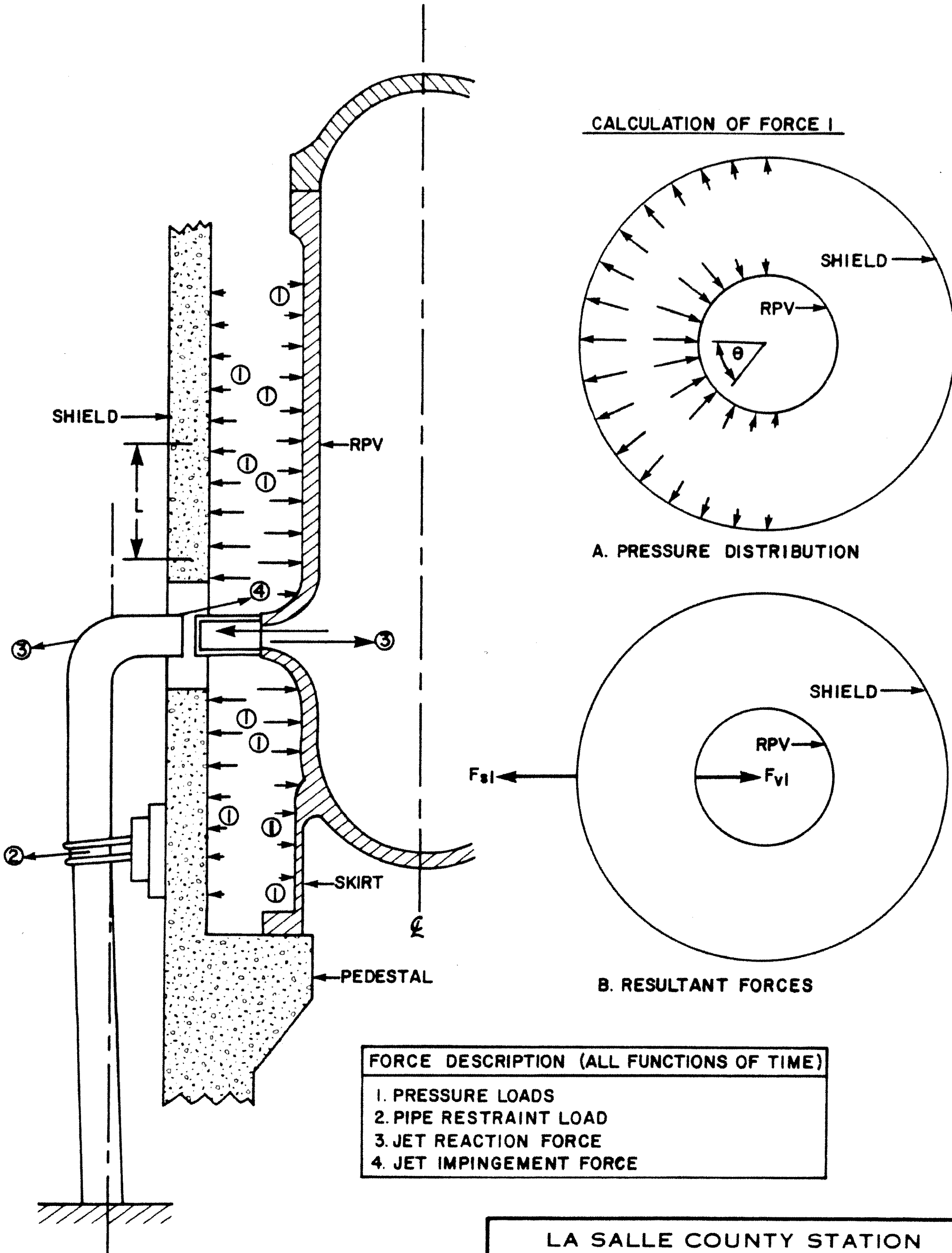

FORCE DESCRIPTION (ALL FUNCTIONS OF TIME)
1. PRESSURE LOADS
2. PIPE RESTRAINT LOAD
3. JET REACTION FORCE
4. JET IMPINGEMENT FORCE

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FIGURE 6.A-15

ANNULUS PRESSURIZATION
LOADING DESCRIPTION

REV. 0 - APRIL 1984

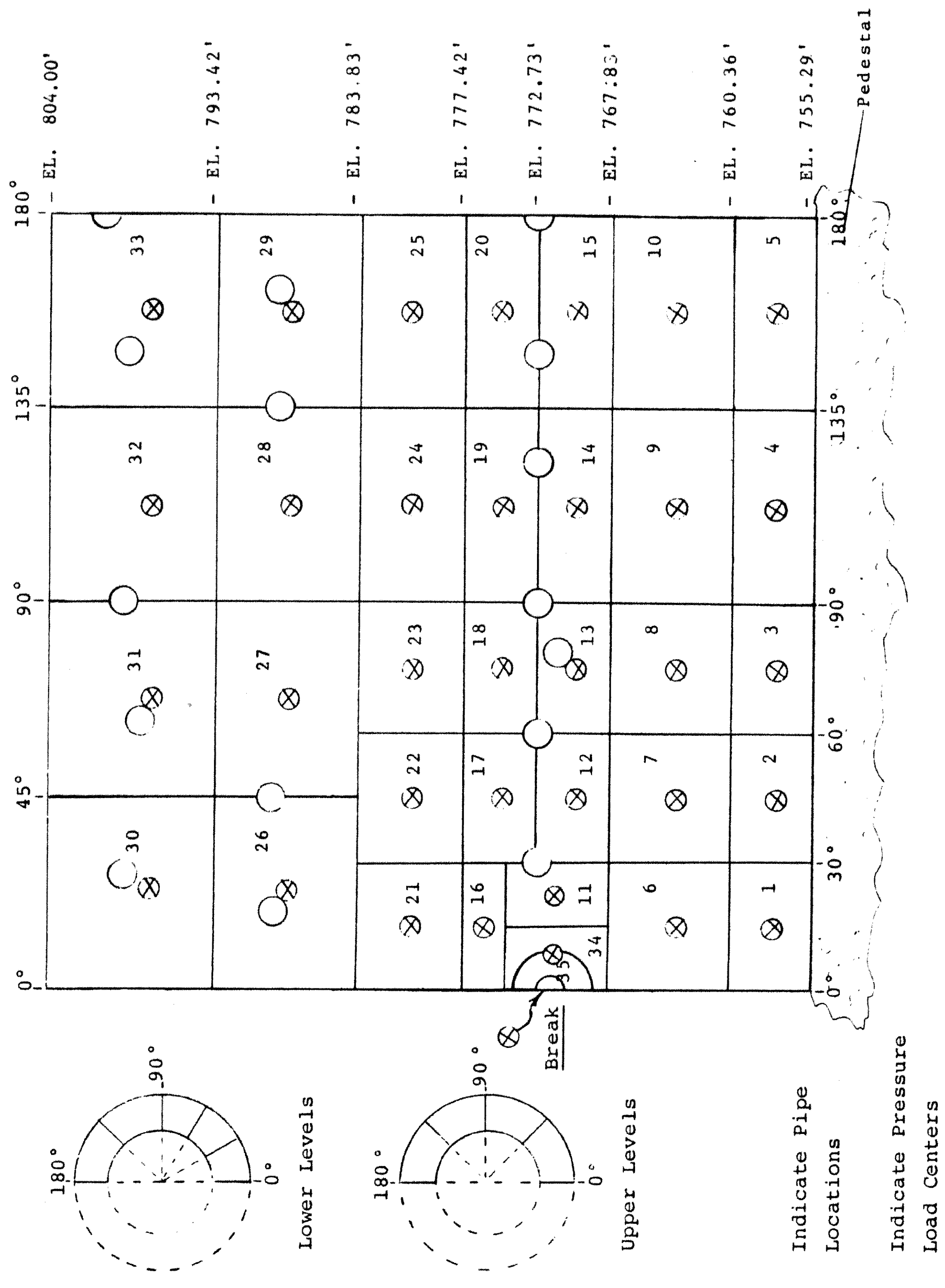

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FIGURE 6.A-16

ANNULAR SPACE NODALIZATION FOR RECIRCULATION LINE BREAK

REV. 0 - APRIL 1984

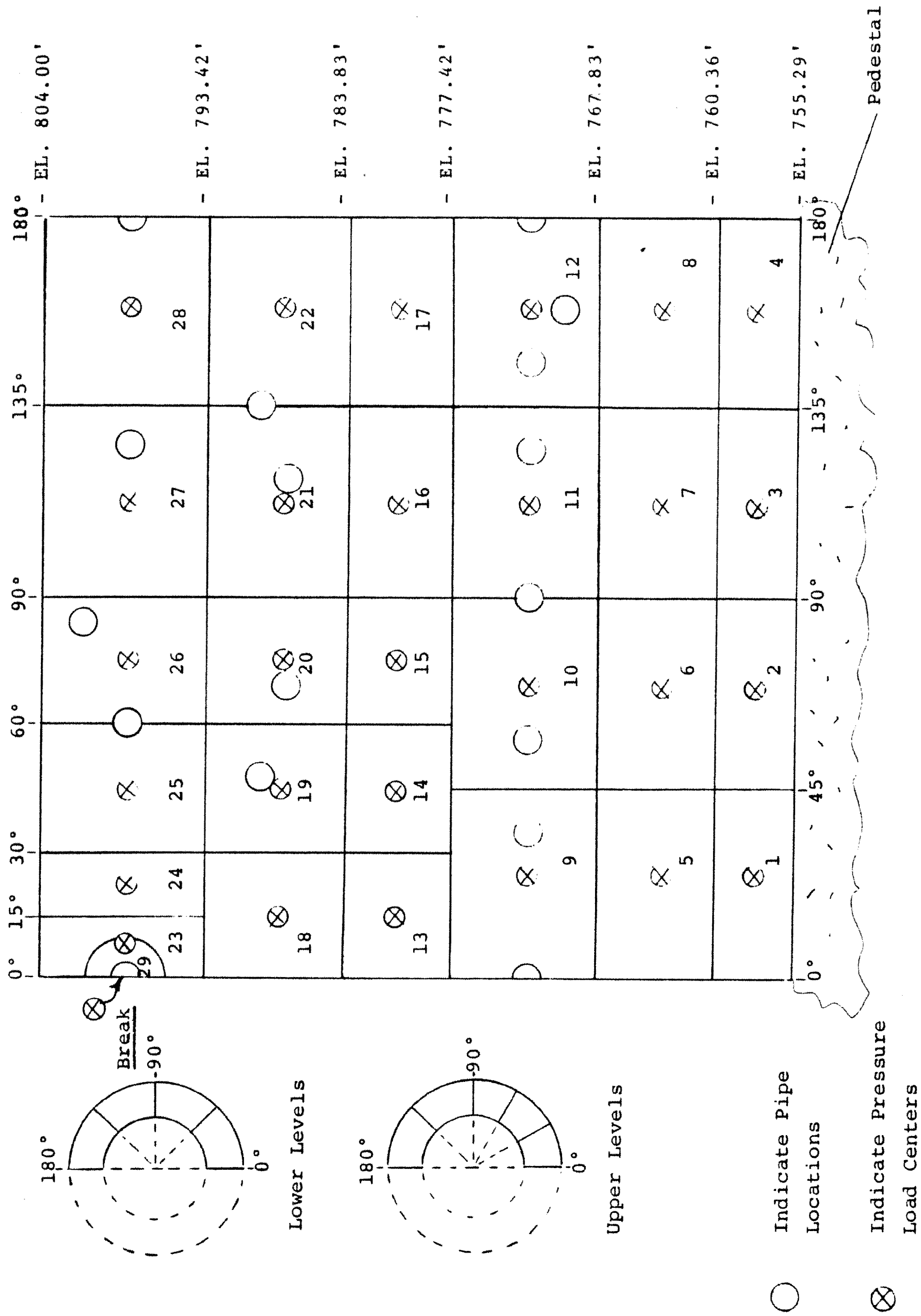

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FIGURE 6.A-17

ANNULAR SPACE NODALIZATION FOR
FEEDWATER LINE BREAK

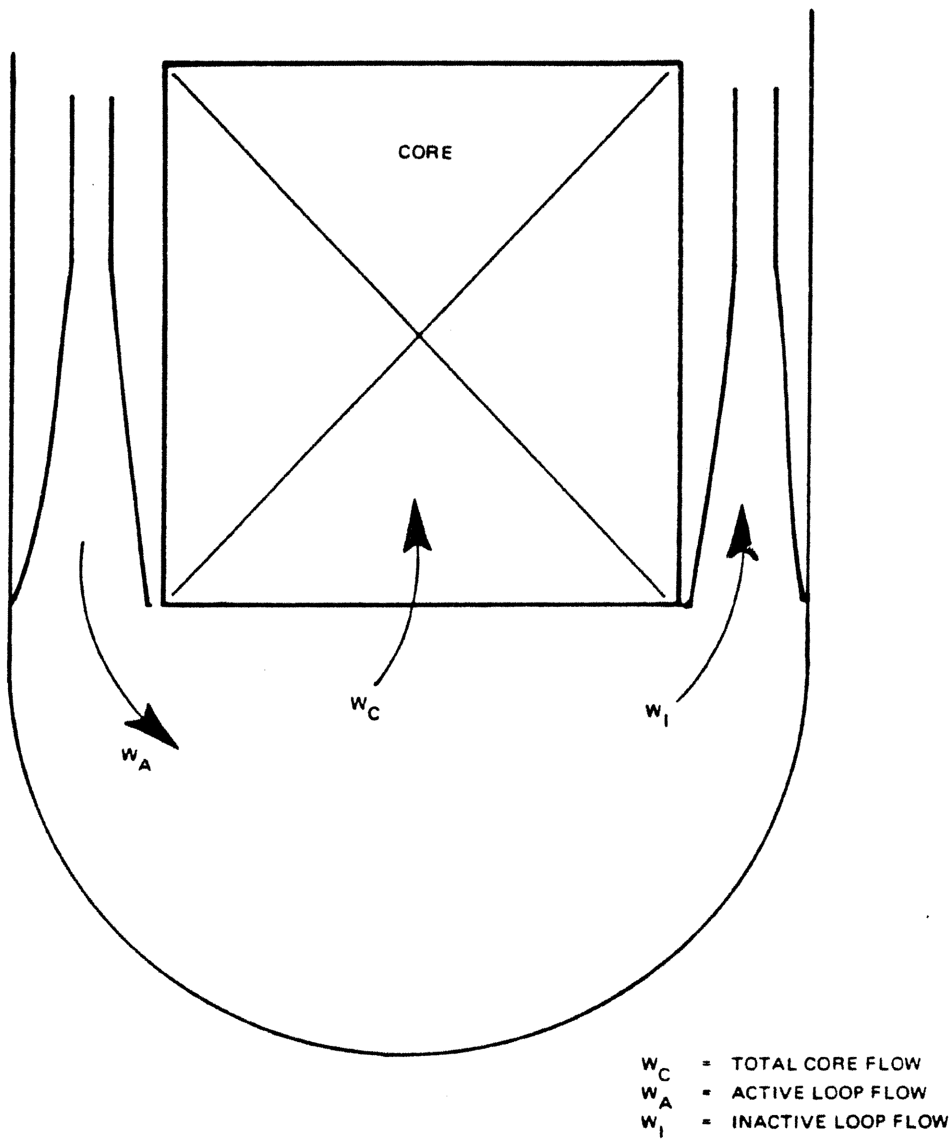

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FIGURE 6.B-1

ILLUSTRATION OF SINGLE RECIRCULATION LOOP OPERATION FLOWS

REV. 0 - APRIL 1984

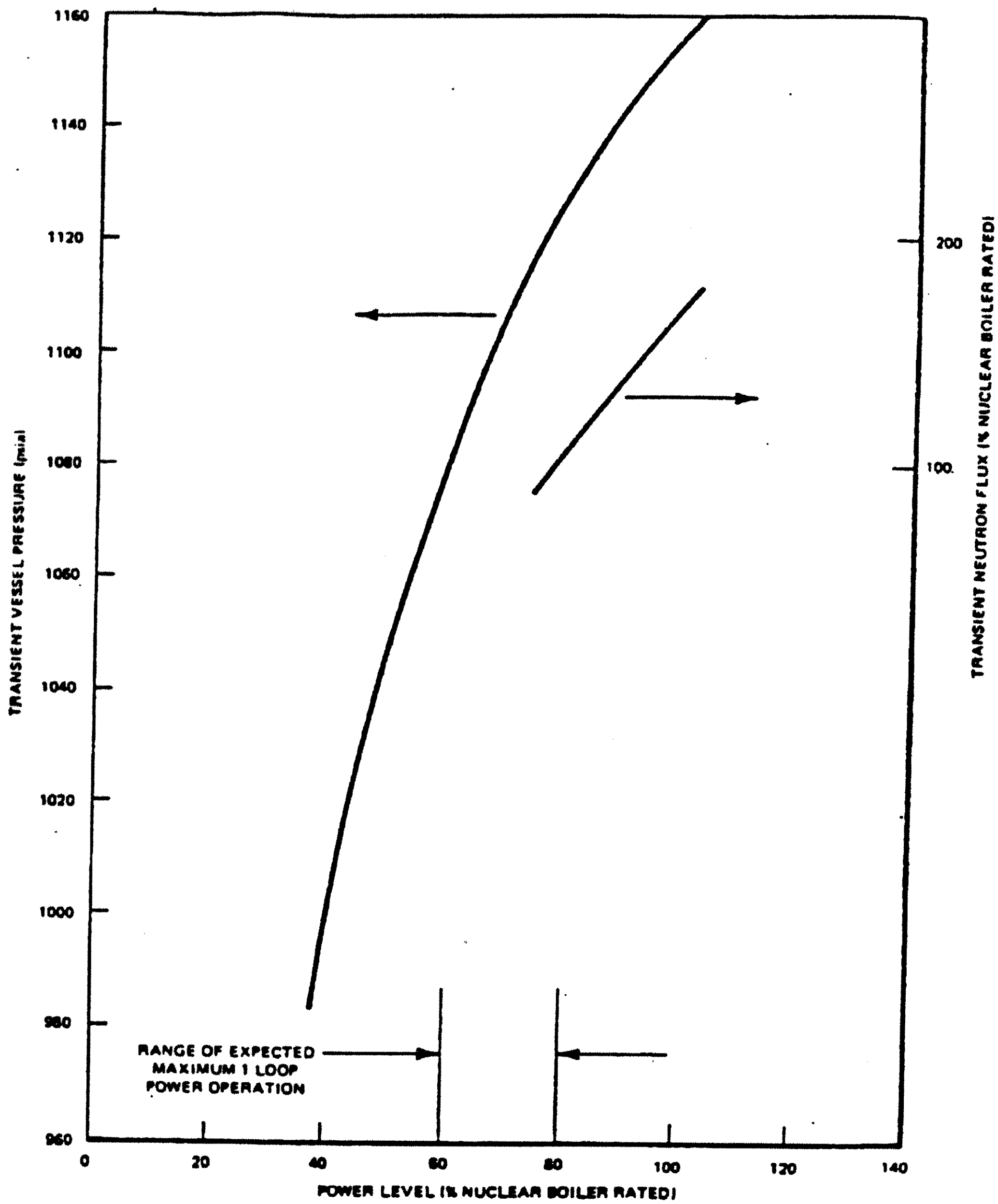

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FIGURE 6.B-2 FEEDWATER CF WITH ONE PUMP OPERATION TYPICAL (GE)

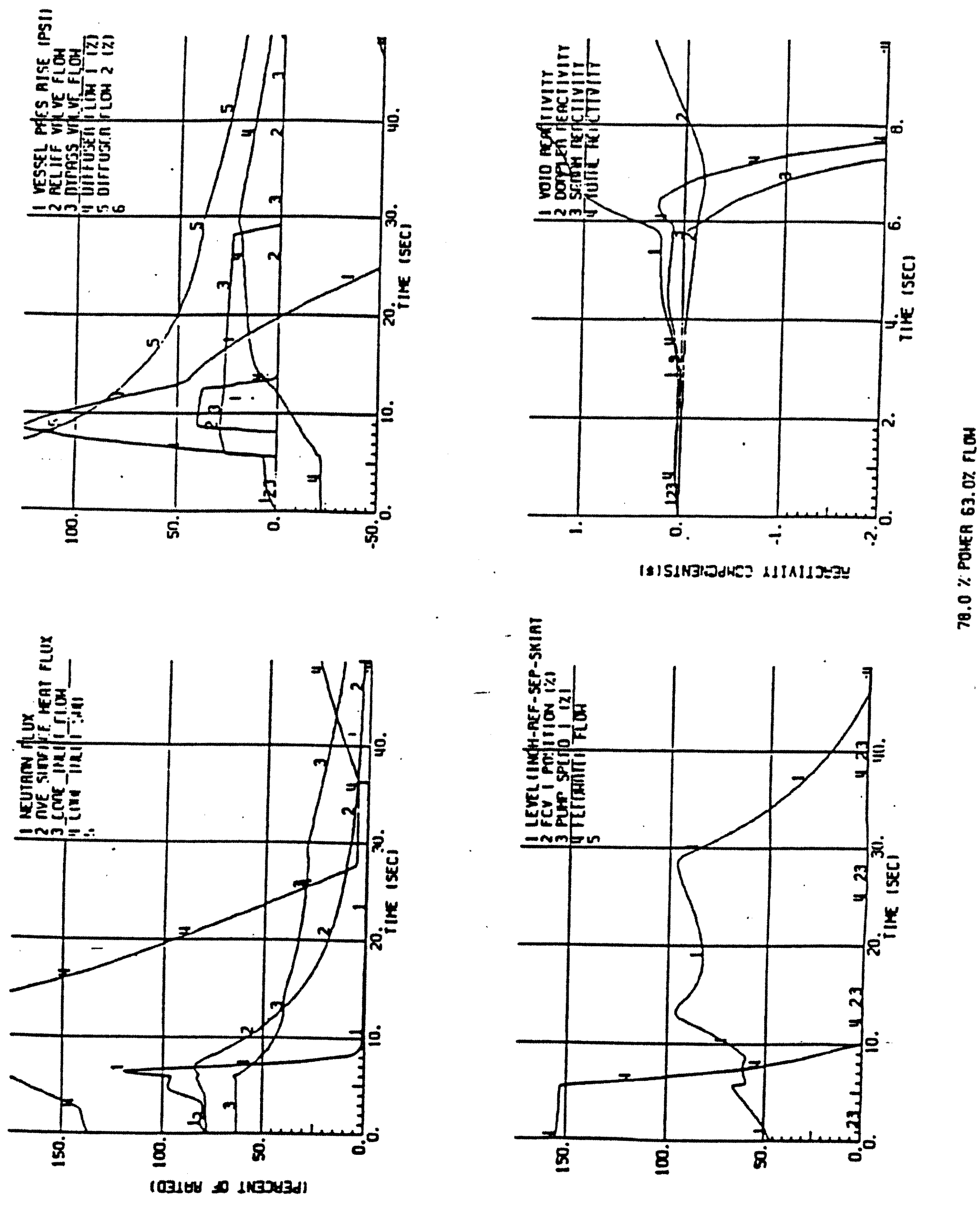

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FIGURE 6.B-3

FEEDWATER CF WITH ONE PUMP OPERATION
TYPICAL (GE)

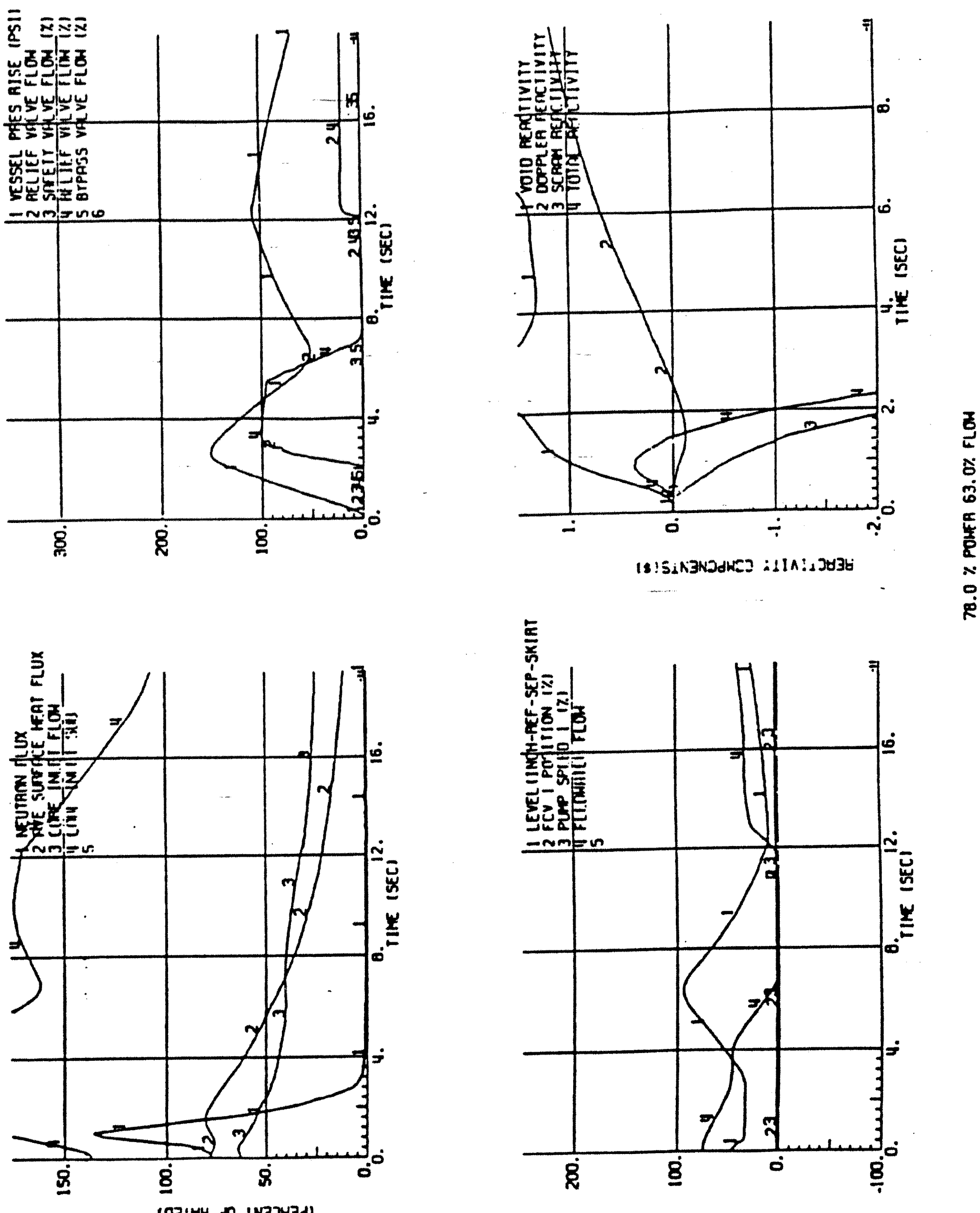

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FIGURE 6.B-4

TYPICAL
LOAD REJECTION WITH ONE PUMP OPERATION

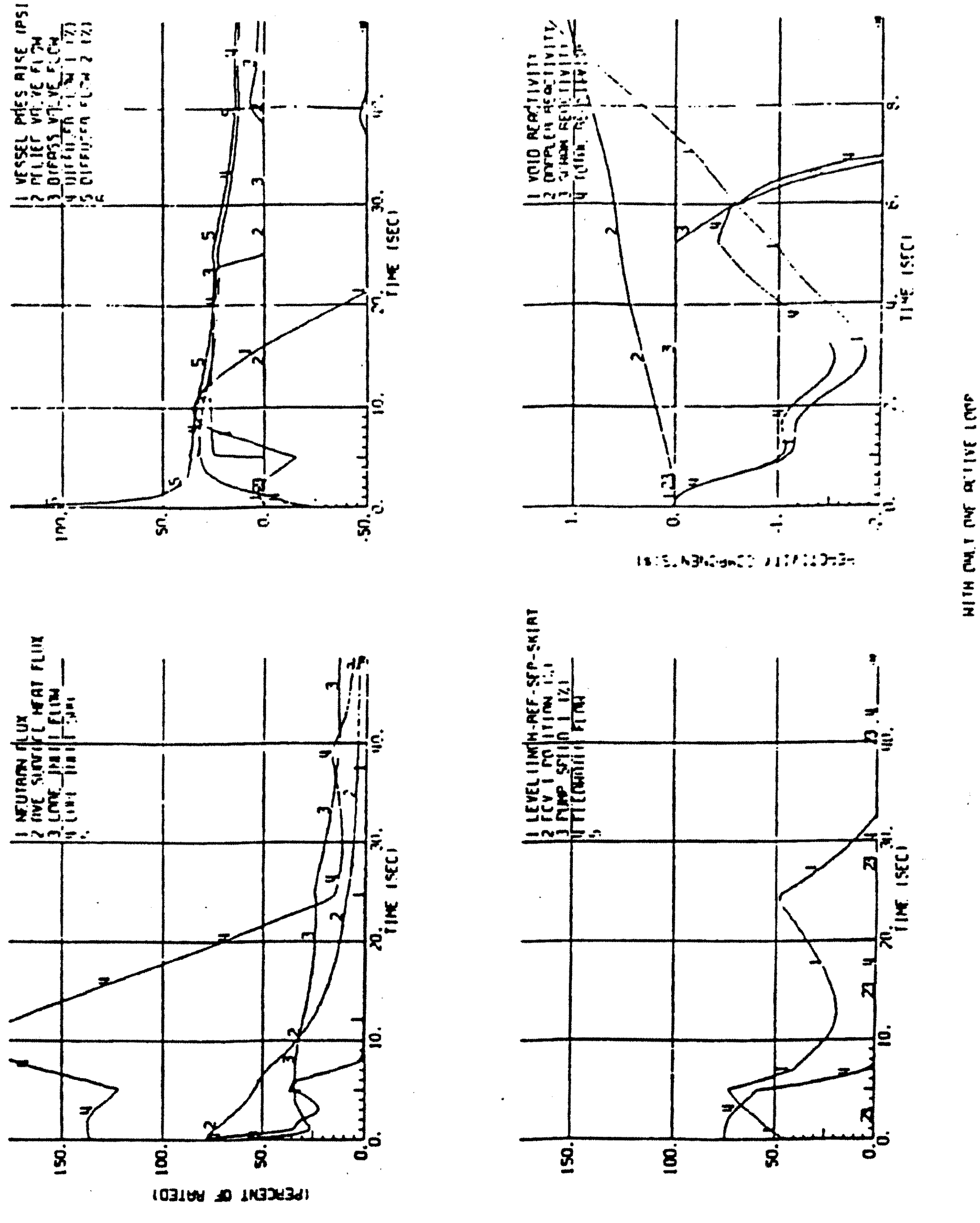

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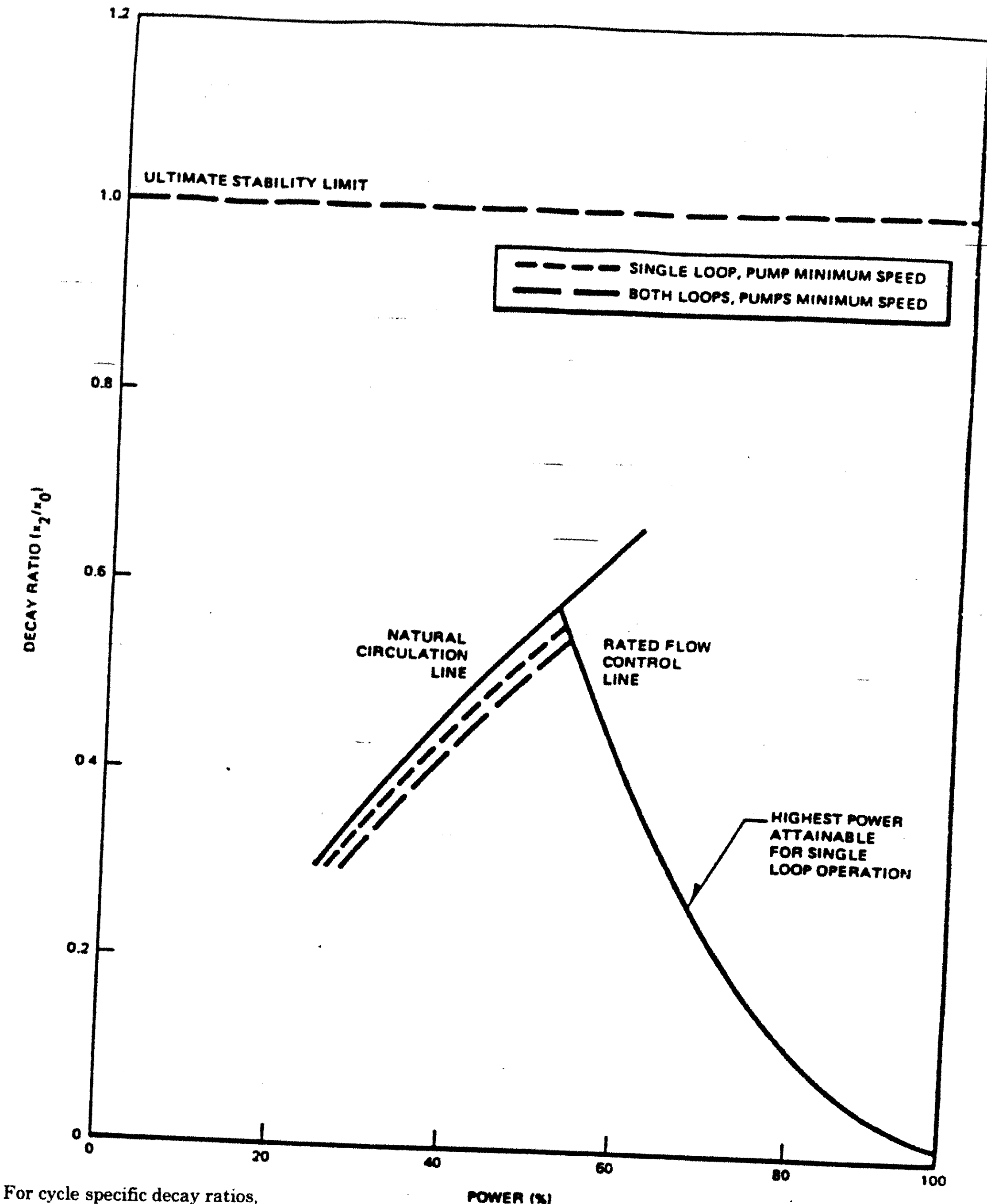
FIGURE 6.B-5

TYPICAL
SEIZURE OF ONE RECIRCULATION PUMP



* For cycle specific decay ratios, SEE the LaSalle Administrative Technical requirements

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FIGURE 6.B-6

Typical, GE

DECAY RATIO VERSUS POWER CURVE FOR TWO-LOOP AND SINGLE-LOOP OPERATION*

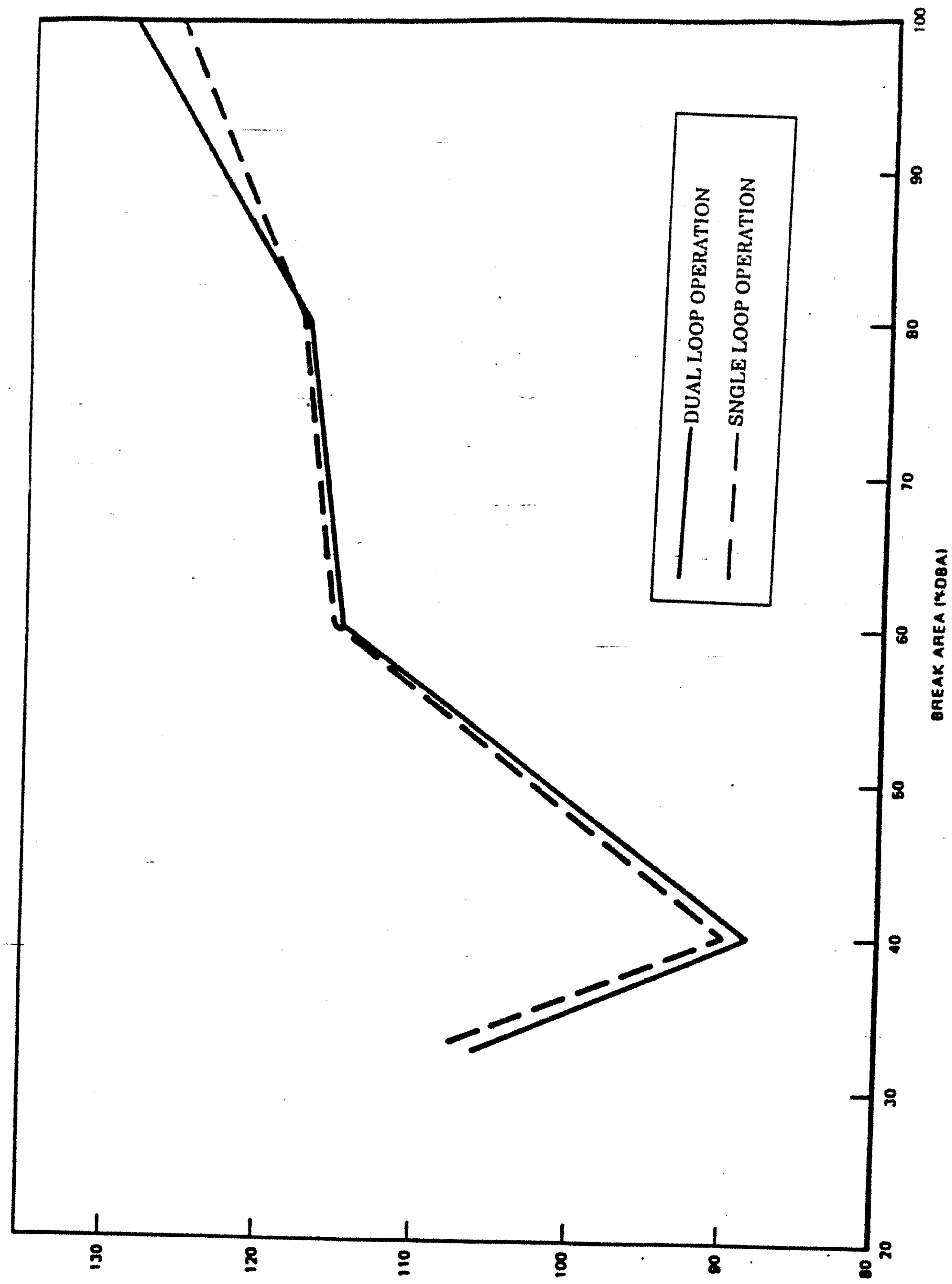

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FIGURE 6.B-7

UNCOVERED TIME VS. BREAK AREA – LASALLE 1 AND 2
SUCTION BREAK LPCS/DG FAILURE