6.2 Containment Systems

6.2.1 Containment Functional Design

6.2.1.1 Containment Structure

6.2.1.1.1 Design Basis

The containment system is designed such that for all break sizes, up to and including the double-ended severance of a reactor coolant pipe or secondary side pipe, the containment peak pressure is below the design pressure. A summary of the results is presented in Table ~~6.2.1.1-2~~6.2.1.1-1.

This capability is maintained by the containment system assuming the worst single failure affecting the operation of the passive containment cooling system (PCS). For primary system breaks, loss of offsite power (LOOP) is assumed. For secondary system breaks, offsite power is assumed to be available where it maximizes the mass and energy released from the break. Additional discussion of the assumptions made for secondary side pipe breaks may be found in Subsection 6.2.1.4.

The single failure postulated for the containment pressure/temperature calculations is the failure of one of the valves controlling the cooling water flow for the PCS. Failure of one of these valves would lead to cooling water flow being delivered to the containment vessel through one of two delivery headers. This results in reduced cooling flow for PCS operation. No other single failures are postulated in the containment analysis.

The containment integrity analyses for the AP600 employed two types of models of the containment. A multivolume lumped parameter model is used to study the long term containment response to a postulated Loss of Coolant Accident (LOCA) and the Main Steam Line Break (MSLB) accidents. The second model is a detailed distributed or finite volume model of the AP600 containment that is used to analyze the short-term response (i.e., the peak pressure transient) of the containment.

The analyses presented in this section are based on assumptions that are conservative with respect to the containment and its heat removal systems, such as minimum heat removal, and maximum initial containment pressure.

The containment design for the Safe Shutdown Earthquake (SSE) is discussed in Subsection 3.8.2.

The minimum containment backpressure used in the Passive Core Cooling System (PXS) analysis is discussed in Subsection 6.2.1.5.

6.2.1.1.2 Design Features

The operation of the PCS is discussed in Subsection 6.2.2. The arrangement of the containment and internal structures is described in Section 1.2.

The reactor coolant loop is surrounded by structural walls of the containment internal structures. These structural walls are a minimum of two feet - six inches thick and enclose the reactor vessel, steam generators, reactor coolant pumps, and the pressurizer.

The containment vessel is designed and constructed in accordance with the ASME Code, Section III, Subsection NE, Metal Containment, including Addenda through 1989, as described in Subsection 3.8.2.

Structural steel non-pressure retaining parts such as ladders, walkways, and handrails are designed to the requirements for steel structures defined in Subsection 3.8.4.

The design features provide adequate containment sump levels following a design basis event as described in Subsection 3.4.

Containment and subcompartment atmospheres are maintained during normal operation within prescribed pressure, temperature, and humidity limits by means of the containment air recirculation system (VCS), the containment air filtration system (VFS), and the central chilled water system (VWS). The recirculation system cooling coils are provided with 45°F chilled water for temperature control. The filtration supply and exhaust subsystem can be utilized periodically to purge the containment air for pressure control. Periodic inspection and maintenance verify functional capability.

6.2.1.1.3 Design Evaluation

The Westinghouse-GOTHIC (WGOTHIC) computer code (Reference 1) is a computer ~~state-of-the-art~~ program for modeling multiphase flow in a containment analysis. It solves the conservation equations in integral form for mass, energy, and momentum for multicomponent flow. The momentum conservation equations are written separately for each phase in the flow field (drops, liquid pools, and atmosphere vapor). The following terms are included in the momentum equation: storage, convection, surface stress, body force, boundary source, phase interface source, and equipment source. |

~~In order to model the passive cooling features of the AP600, several assumptions were made in creating the plant deck. The external cooling water does not completely wet the containment shell, therefore, both wet and dry sections of the shell were modeled in the WGOTHIC analyses. The analysis assumed coverage from 40 percent on the top of the dome, to 70 percent on the side walls. Heat conduction from the dry to wet sections is not considered in the analysis, although calculations show this to be a benefit. Representative external cooling water flowrates, which included the single failure assumption described earlier, are used for the wet sections. The analysis also conservatively assumes that the external cooling water is not initiated until 11 minutes into the transient, allowing for time to~~

~~initiate the signal and to fill the headers and weirs. The effects of water flowing down the shell from gravity forces are implicitly considered in the analysis. Since the air baffle is not leak tight, air leakage flowpaths are included to simulate the effects of air leaking through the baffle, thus bypassing the normal air flowpath. The net effect of these assumptions is to produce a conservative plant analysis, thus maximizing the containment pressure and temperature response.~~

~~In order~~ to model the passive cooling features of the AP600, several assumptions were made in creating the plant decks. The external cooling water does not completely wet the containment shell, therefore, both wet and dry sections of the shell were modeled in the WGOTHIC analyses. The analyses assumed conservative coverage fractions that were selected based on the duration of the transient. For example, a transient run extending 24 hours assumes the coverages calculated at 24 hours for the entire transient. Table 6.2.1.1-2 provides the coverage fractions versus time calculated for the AP600.

Heat conduction from the dry to wet section is not considered in the analysis, although calculations show this to be a benefit. Representative external cooling water flowrates, which included the single failure assumption described earlier, are used for the wet sections. The analyses also conservatively assume that the external cooling water is not initiated until 11 minutes into the transient, allowing for time to initiate the signal and to fill the headers and weirs and develope the flow down the containment side walls. The effects of water flowing down the shell from gravitational forces are explicitly considered in the analysis.

The containment initial conditions of pressure, temperature, and humidity are provided in Table 6.2.1.1-~~1~~3.

For the LOCA events, two double-ended guillotine RCS ~~pipe~~ breaks are analyzed. The breaks are postulated to occur in ~~both~~ ~~either the~~ a hot ~~and~~ or a cold legs of the RCS. The hot leg break results in the highest blowdown peak pressure. The cold leg break results in the ~~highest~~ higher post-blowdown peak pressure. The cold leg break analysis includes the long term contribution to containment pressure from the sources of stored energy, such as the steam generators. The LOCA mass and energy releases described in Subsection 6.2.1.3 are used for these calculations.

For the MSLB event, a representative pipe break spectrum is analyzed. Various break sizes, power levels, and failure assumptions are analyzed with the WGOTHIC code. The MSLB mass and energy releases described in Subsection 6.2.1.4 are used for these calculations.

~~The results of the LOCA and MSLB postulated accidents are provided in Table 6.2.1.1-2.~~

The results of the LOCA and MSLB postulated accidents are provided in Table 6.2.1.1-4. A comparison of the containment integrity analyses results to General Design Criterion 38 and the Acceptance Criteria presented in the Standard Review Plan are also provided in Table 6.2.1.1-4. An exception has been taken to the Standard Review Plan Acceptance Criterion of ~~rapidly~~ reducing the containment pressure at 24 hours to less than 50 percent of the peak calculated pressure. The exception is that 50 percent of the containment design pressure is being used instead of the peak calculated pressure.

The containment pressure response for the peak pressure steam line break case is provided in Figure 6.2.1.1-1. The temperature response for this case is provided in Figure 6.2.1.1-~~1~~ 2. Figures 6.2.1.1-~~7~~ and 6.2.1.1-~~8~~ provide the containment pressure and temperature response for the peak temperature steam line break case. Insert (A)

The passive internal containment heat sink data used in the WGOTHIC analysis is presented in Tables 6.2.1.1-~~38~~ 5 ~~through and~~ 6.2.1.1-~~49~~ 8. Data for both metallic and concrete heat sinks are presented. The physical properties of the materials corresponding to the heat sink information is presented in Table 6.2.1.1-~~510~~ 9.

The containment shell temperature response is provided at three distinct elevations: the dome, the spring line, and the operating deck level. Values for both wet and dry sections are presented in Table 6.2.1.1 ~~611~~ 10.

A discussion of the instrumentation provided inside containment to monitor and record the containment pressure and temperature is found in Section 7.

6.2.1.1.4 External Pressure Analysis

Certain design basis events and credible inadvertent systems actuation have the potential to result in containment external pressure loads. Evaluations of these events show that a loss of all ac power sources during extreme cold ambient conditions has the potential for creating the worst-case external pressure load on the containment vessel. This event leads to a reduction in the internal containment heat loads from the reactor coolant system and other active components, thus resulting in a temperature reduction within the containment and an accompanying pressure reduction. Evaluations are performed to determine the maximum external pressure to which the containment may be subjected during a postulated loss of all ac power sources. For the loss of all ac power sources, ASME Service Level C limits are applicable and a containment external pressure of ~~3.0 2.04~~ 3.0 psid is permitted.

The evaluations are performed with the assumption of a -40°F ambient temperature with a steady 458 mph wind blowing to maximize cooling of the containment vessel. The initial internal containment temperature is conservatively assumed to be 120°F, creating the largest possible temperature differential to maximize the heat removal rate through the containment vessel wall. A negative 0.2 psig initial containment pressure is used for this evaluation. A conservative maximum initial containment relative humidity of 100% is used to produce the greatest reduction in containment pressure due to the loss of steam partial pressure by condensation. It is also conservatively assumed that no air leakage occurs into the containment during the transient.

Evaluations are performed with conservatively low estimates of the containment heat loads and conservatively high heat removal through the containment vessel consistent with the limiting assumptions stated above. ~~Results of these evaluations confirm that even under long-~~

A

The containment pressure and temperature responses to a double ended cold leg guillotine are presented in Figures 6.2.1.1-5 and 6.2.1.1-6 for the distributed parameter model and Figures 6.2.1.1-7 and 6.2.1.1-8 for the lumped parameter model. The lumped parameter model containment pressure and temperature response to a double ended hot leg guillotine break are presented in Figures 6.2.1.1-9 and 6.2.1.1-10.

is well within the

3.0

at one hour after the event

~~term loss of all ac power sources, the containment net external pressure does not exceed the 3.0 psid Service Level C limit.~~ Results of these evaluations demonstrate that ~~there are more than 30 minutes before~~ the net external pressure ~~exceeds the 2.04~~ psid service level C limit. ~~This is sufficient time~~ for operator action to prevent the containment pressure from dropping below the service level C limit, based on the PAM's indications (four containment pressure instruments) and the ability to mitigate the pressure reduction by opening either set of containment ventilation purge isolation valves, which are powered by the 1E batteries.

containment pressure

The limiting case containment pressure transient is shown in Figure 6.2.1.1-~~9~~ 11.

6.2.1.2 Containment Subcompartments

6.2.1.2.1 Design Basis

Subcompartments within containment are designed to withstand the transient differential pressures of a postulated pipe break. These subcompartments are vented so that differential pressures remain within structural limits. The subcompartment walls are challenged by the differential pressures resulting from a break in a high energy line. Therefore, a high energy line is postulated, with a break size chosen consistent with the position presented in Section 3.6, for analyzing the maximum differential pressures across subcompartment walls.

Section 3.6 describes the application of the mechanistic pipe break criteria, commonly referred to as leak-before-break (LBB), to the evaluation of pipe ruptures of pipes with a four inch or greater nominal diameter. This eliminates the need to consider the dynamic effects of postulated pipe breaks for pipes which qualify for LBB. However, the analyses of containment pressure and temperature, emergency core cooling, and environmental qualification of equipment are based on double-ended guillotine (DEG) reactor coolant system breaks and through-wall cracks.

6.2.1.2.1.1 Summary of Subcompartment Pipe Break Analyses

Because LBB is applicable to pipes of four inches or greater in diameter, a postulated double ended guillotine rupture of a three-inch line in the reactor coolant system (RCS) is analyzed to determine the maximum differential pressure across the subcompartment walls. The characteristics of the postulated rupture are determined in accordance with the methods and criteria of Section 3.6. Analyses are performed for a double ended guillotine break occurring in each of the subcompartments containing high energy piping, with the exception of the reactor vessel cavity where all piping is qualified to LBB (no high energy lines smaller than four inches are located in the reactor vessel cavity). Typical analysis models and results are described for breaks in a steam generator compartment, the pressurizer enclosure valve room, maintenance floor, and the operating deck.

The steam generator compartment is analyzed for the effects of a three-inch double ended guillotine break occurring in both the hot leg and cold leg pipe. In conformance with the ~~previous~~ Westinghouse mass and energy release methodology for subcompartment design, a 10 percent margin is applied to the releases for both postulated breaks.

different

The pressurizer enclosure valve room is analyzed for the effects of several breaks ~~that could occur~~. The three-inch double-ended cold-leg pipe release with 10 percent margin ~~would be used to~~ bound other breaks in this compartment.

be postulated to

The maintenance floor and operating deck regions are analyzed for the effects of several different breaks that could occur in primary or secondary side piping. The releases from a one square foot area rupture ~~could be used to~~ bound other breaks in these compartments.

postulated be postulated to

The CVS room is analyzed for the effects of several breaks that could occur. The three-inch double-ended cold-leg pipe release with 10 percent margin ~~would be used to~~ bound other breaks in this compartment.

The reactor vessel cavity pressurization loads are not considered, consistent with the position in Subsection 3.6.1.2.

6.2.1.2.2 Design Features

The plant general arrangement drawings shown in Section 1.2 include descriptions of the ~~steam generator containment sub~~-compartment and surrounding areas. The general arrangement drawings are used in assembling the subcompartment analysis model. A detailed noding diagram of the model is presented in Figure 6.2.1.2-1, Sheets 1 through 912.

To account for uncertainty between the as-built subcompartment configuration and the configuration modeled, 40 percent margin is added to the calculated differential pressures, as discussed in Subsection 6.2.1.2.3.6.

The subcompartment free volumes and the areas of the vent paths are presented in Tables 6.2.1.2-1 through 6.2.1.2-~~8~~3. Vent paths considered in the analyses are shown in the general arrangement drawings and consist of floor gratings and openings through walls. In the AP600 subcompartment analyses, no credit is taken for vent paths that become available only after the occurrence of the postulated break (such as blowout panels, doors, hinged panels and insulation collapsing).

6.2.1.2.3 Design Evaluation

The TMD computer code (Reference 2) is used in the subcompartment analysis to calculate the differential pressures across subcompartment walls. The TMD code has been reviewed by the NRC and approved for use in subcompartment differential pressure analyses. ~~The code has been used extensively for analyzing both ice condenser plants and large, dry containment designs.~~

The methodology used to generate the short term mass and energy releases is described in Subsection 6.2.1.3.1.

The initial atmospheric conditions used in the TMD subcompartment analysis are selected so that the calculated differential pressures are maximized. These conditions are chosen according to criteria identified in Subsection 6.2.1.2 of NUREG-0800 and include the maximum allowable air temperature, minimum absolute pressure, and zero percent relative humidity. The initial conditions used in the analysis are tabulated in Tables 6.2.1.2-~~1 and 6.2.1.2-2~~ 4.

The containment and subcompartment atmospheres during normal operating conditions are maintained within prescribed pressure, temperature, and humidity limits by means of the containment air recirculation system (VCS), the containment air filtration system (VFS), and the central chilled water system (VWS). The recirculation system cooling coils are provided with 45°F chilled water to provide sufficient temperature control. The filtration supply and exhaust subsystem can be utilized to purge the containment air for pressure control. Periodic inspection and maintenance are performed to verify functional capability.

Leave 45°

6.2.1.2.3.1 Flow Equation

The flow equations used by the TMD code to calculate the flow between nodes are described in Reference 2. These flow equations are based on the unaugmented critical flow model, which demonstrate conservatively low critical flow velocity predictions compared to experimental test data. Due to the TMD calculation methods presented in Section 1.3.1 of Reference 2, 100 percent entrainment results in the highest calculated differential pressures and therefore this degree of entrainment is conservatively assumed in the subcompartment analysis.

6.2.1.2.3.2 Piping Systems

The subcompartment analysis for the steam generator compartment ~~is~~ was performed assuming a double-ended guillotine break in a three-inch inside diameter reactor coolant system hot leg or ~~and~~ cold leg pipe ~~in the east steam generator compartment~~. The break is ~~is~~ assumed to occur between the 84 foot, six inch elevation and the 104 foot, three inch elevation of the steam generator compartment. Node 1 is the hot leg break node of the TMD model and Node 2 is the cold leg break node (See Figure 6.2.1.2-1 for the noding diagram). Because the TMD code assumes homogeneous mixtures within a node, the specific location of the break within the node is not critical to the differential pressure calculation. No flow restrictions exist that limit the flow out of the break.

is ~~was~~ SG7

The analysis for the pressurizer compartment pipe and valve room ~~was~~ is performed assuming a double-ended guillotine break in a three-inch inside diameter RCS hot leg pipe. This break ~~would~~ envelopes the branch lines that could be postulated to rupture in this area. The break is assumed to occur between the 107-foot, 2-inch elevation and the 117-foot 6-inch elevation of the pressurizer pipe and valve room compartment. Node 59 is the break node of the TMD model (see Figure 6.2.1.2-1 for the noding diagram).

The analysis for the steam generator vertical access area ~~was~~ is performed assuming a double-ended guillotine break in a three-inch inside diameter RCS cold-leg pipe. This break ~~would~~ envelopes the branch lines that could be postulated to rupture in this area. The break is assumed to occur between the 83-foot, 0-inch elevation and the 103-foot 5.5-inch elevation of the steam generator vertical access area compartment. Node 23 is the break node of the TMD model (see Figure 6.2.1.2-1 for the noding diagram).

The analysis for the maintenance floor and operating deck compartments ~~were~~ are performed assuming a one square foot rupture of a main steam line pipe. This break ~~would~~ envelopes the branch lines that could be postulated to rupture in these areas. The break is assumed to occur between the 107-foot, 2-inch elevation and the 135-foot, 3-inch elevation of the maintenance floor compartment and between the 135-foot, 3-inch elevation and the 256-foot, 2.375-inch elevation of the operating deck region. Node 56 is the maintenance room break node and Node 57 is the operating deck room break node of the TMD model (see Figure 6.2.1.2-1 for the noding diagram).

The analysis for the CVS room ~~was~~ is performed assuming a double ended guillotine break in a three-inch diameter RCS cold-leg pipe. This break ~~would~~ envelopes the branch lines that could be postulated to rupture in this area. The break is assumed to occur between the 91-foot, 10-inch elevation and the 105-foot, 2-inch elevation of the CVS room compartment. Node 66 is the break node of the TMD model (see Figure 6.2.1.2-1 for the noding diagram).

6.2.1.2.3.3 Node Selection

The nodalization for the ~~steam generator sub-~~compartments is analyzed in sufficient detail such that nodal boundaries are at the location of flow obstructions or geometrical changes within the subcompartment. These discontinuities create pressure differentials between adjoining nodes. There are no significant discontinuities within each node, and hence the pressure gradient is negligible within any node. Details concerning the noding scheme are provided in Figure 6.2.1.2-1.

6.2.1.2.3.4 Vent Flowpath Flow Conditions

The flow characteristics for each of the subcompartments are tabulated in Tables 6.2.1.2-~~12~~ 1 through 6.2.1.2-~~84~~ 3. These tables show that at no time during the transient does critical flow exist through vent paths. The time-dependent mass and energy flow conditions are provided in Tables 6.2.1.3-2 and 6.2.1.3-3.

6.2.1.2.3.5 Vent Flowpath Flow Coefficients

The subcompartment vent path data is tabulated in Tables 6.2.1.2-~~32~~ 1 through 6.2.1.2-~~84~~ 3. Loss coefficients are included in these tables.

6.2.1.2.3.6 Results

The time-dependent pressures of each of the break nodes within the respective subcompartments ~~node 1 within the steam generator subcompartment for both cold leg and hot leg three inch line breaks~~ are shown in the graphs of Figures 6.2.1.2-2 and 6.2.1.2-37. Figures 6.2.1.2-48 ~~and~~ through 6.2.1.2-513 show the time dependant pressures of the node-57, which reaches the highest pressure difference relative to the break node ~~1~~for each respective case.

through 6.2.1.2-9

The resultant maximum differential pressures of each node relative to the break node ~~1~~ are shown in Table 6.2.1.2-~~9~~5. The design of the ~~steam generator~~ sub-compartment walls for subcompartment pressurization is discussed in Subsection 3.8.3.3.

The results of the sub-compartment analysis demonstrate that the wall differential pressures resulting from a high energy line break within the ~~steam generator~~ sub-compartments are well within the design capability, even when a 40-percent margin is applied.

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

Mass and Energy releases are documented in this section for two different types of transients.

The first ~~type~~ section describes the methodology used to calculate the releases for the subcompartment differential pressure analysis using the TMD code (referred to as the short term analysis). These releases are used for the subcompartment response in Subsection 6.2.1.2.

The second ~~type~~ section describes the methodology used to determine the releases for the containment pressure and temperature calculations using the WGOTHIC code (Reference 1) (referred to as the long term analysis). These releases are used for the containment integrity analysis in Subsection 6.2.1.1.

The short term analysis considers only the initial stages of the blowdown transient, and takes into consideration the application of ~~L~~leak-~~B~~before-~~B~~break (LBB) methodology. LBB is discussed in Subsection 3.6.3. Since LBB is applicable to RCS piping that is four inches in diameter and greater, the mass and energy release analysis for sub-compartments postulates the complete ~~D~~double-~~E~~ended ~~G~~guillotine (DEG) severance of a three-inch pipe. The mass and energy release postulated for a ruptured steam line is for a one square foot break.

Conversely, the limiting break size for containment integrity analysis considers as its LOCA design basis the complete DEG severance of the largest reactor coolant system (RCS) pipe.

The containment system receives mass and energy releases following a postulated rupture of the RCS. The release rates are calculated for pipe failure at two locations: the hot leg and the cold leg. These break locations are analyzed for both the short-term and the long-term transients. Because the initial operating pressure of the RCS is approximately 2250 psi, the mass and energy are released extremely rapidly when the break occurs. As the water exits from the broken pipe, a portion of it flashes to steam because of the differences in pressure and temperature between the RCS and containment. The RCS depressurizes rapidly since break flow exits both sides of the pipe in a DEG severance.

6.2.1.3.1 Short Term Mass and Energy Release Data

The AP600 short term LOCA mass and energy releases are predicted for the first ten seconds of the blowdown from a postulated DEG break of a three inch line in the RCS. The density of the fluid released from a postulated pipe rupture has a direct effect on the magnitude of the differential pressures that results across subcompartment walls. A DEG rupture that is postulated in the cold leg piping is typically the most limiting scenario. This analysis provides mass and energy releases for a three inch DEG rupture in the cold leg and in the hot leg.

The modified Zaloudek correlation (Reference 3) is used to calculate the critical mass flux from a three inch double-ended cold leg guillotine (DECLG) break and a three inch double-ended hot leg guillotine (DEHLG) break. This maximum mass flux is conservatively assumed to remain constant at the initial AP600 full power steady state conditions and the enthalpy is varied to determine the energy release rates. Conservative enthalpies are obtained from the SATAN-VI blowdown transients for ruptures of the largest RCS cold leg and hot leg piping in the AP600 design. This assumption maximizes the mass released, which is conservative for the subcompartment analysis.

The initial conditions and inputs to the modified Zaloudek correlation are given in Table 6.2.1.3-1. The short term LOCA mass and energy release data is provided in Tables 6.2.1.3-2 and 6.2.1.3-3. The short-term non-LOCA mass and energy release data are provided in Table 6.2.1.3-4.

6.2.1.3.2 Long Term Mass and Energy Release Data

A long term LOCA analysis calculational model is typically divided into four phases: Blowdown, which includes the period from the accident initiation (when the reactor is in a steady-state full power operation condition) to the time that the broken loop pressure equalizes to the containment pressure; refill, which is the time from the end of the blowdown to the time when the passive core cooling system (PXS) refills the vessel lower plenum; reflood, which begins when the water starts to flood the core and continues until the core is completely quenched; and post-reflood, which is the period after the core has been quenched and energy is released to the RCS primary system by the RCS metal, core decay heat, and the steam generators.

The long-term analysis considers the blowdown, reflood, and post-reflood phases of the transient. The refill period is conservatively ~~assumed to occur immediately upon the end of blowdown~~ neglected so that the releases to the containment are conservatively maximized.

Move to end of ¶

The AP600 long-term LOCA mass and energy releases are predicted for the blowdown phase for postulated DECLG and DEHLG breaks. The releases are provided in Tables 6.2.1.3-~~4~~5 and ~~through~~ 6.2.1.3-6. The blowdown phase mass and energy releases are calculated using the NRC approved SATAN-VI computer code (Reference 4). The post blowdown phase mass and energy releases are ~~are developed to consider~~ calculated considering the energy released from the available energy sources described below. The energy release rates are ~~modelled~~

conservatively ~~high~~ modeled so that the energy is released quickly. ~~This results~~ The higher release rates result in a conservative containment pressure calculation.

6.2.1.3.2.1 Energy Sources

The following energy sources are accounted for in the long-term LOCA mass and energy calculation:

- Decay heat
- Core stored energy
- RCS fluid and metal energy
- Steam Generator fluid and metal energy
- Accumulators, core make-up tanks (CMTs), and the in-containment refueling water storage tank (IRWST).
- Zirconium-water reaction

The methods and assumptions used to release the various energy sources during the blowdown phase are given in Reference 4.

The following items are used to conservatively analyze the ~~core~~ energy release for maximum containment pressure:

- Maximum expected operating temperature
- Allowance in temperature for instrument error and dead band
- Margin in volume (+1.4 percent)
- Allowance in volume for thermal expansion (+1.6 percent)
- 100 percent full power operation
- Allowance for calorimetric error (+2.0 percent of full power)
- Conservatively modified coefficients of heat transfer
- Allowance in core stored energy for effect of fuel densification
- Margin in core stored energy (+15.0 percent)
- Allowance in pressure for instrument error and dead band
- Margin in steam generator mass inventory (+10.0 percent)
- One percent of the Zirconium surrounding the fuel is assumed to react

6.2.1.3.2.2 Description of Blowdown Model

A description of the SATAN-VI model that is used to determine the mass and energy released from the RCS during the blowdown phase of a postulated LOCA is provided in Reference 4. Significant correlations are discussed in this reference.

6.2.1.3.2.3 Description of Post-Blowdown Model

The remaining RCS and SG mass and energy inventories at the end of blowdown are used to define the initial conditions for the beginning of the reflood portion of the transient. The broken and unbroken loop SG inventories are kept separate to account for potential differences in the cooldown rate between the loops. In addition, the mass added to the RCS from the IRWST is returned to containment as break flow so that no net change in system mass occurs.

Energy addition due to decay heat is computed using the 1979 ANS standard (plus 2 sigma) decay heat table from Reference 4. The energy release rates from the RCS metal and steam generators are modelled using exponential decay rates. This modelling is consistent with analyses for current generation design analyses that are performed with the models described in Reference 4.

R

The accumulator, CMT, and IRWST mass flow rates are computed from the end of blowdown to the time the tanks empty.~~values are taken from the end of blowdown and assumed to remain constant to estimate the time the accumulators would empty. The CMT and IRWST flow rates (and duration for CMT flow) that are used are representative of the AP600 system response.~~

The rate of RCS mass accumulation is assumed to decrease exponentially during the reflood phase. More CMT and accumulator flow ~~would be~~ is spilled from the break as the system refills. The break flow rate is determined by subtracting the RCS mass addition rate from the sum of the accumulator, CMT and IRWST flow rates.

Mass which is added to, and which remains in, the vessel is assumed to be raised to saturation. Therefore, the actual amount of energy available for release to the containment for a given time period is determined from the difference between the energy required to raise the temperature of the incoming flow to saturation and the sum of the decay heat, core stored energy, RCS metal energy and SG mass and metal energy release rates. The energy release rate for the available break flow is determined from a comparison of the total energy available release rate and the energy release rate assuming that the break flow is 100-percent saturated steam. Saturated steam releases maximize the calculated containment pressurization.

6.2.1.3.2.4 Single Failure Analysis

No single failure is assumed in the mass and energy release calculations. The safety injection system for the AP600 is passive, as opposed to active pumped safety injection systems for a conventional PWR. As a result, there is no single failure postulated for the mass and energy release analysis. The effects of a single failure are taken into account in the containment analysis of Subsection 6.2.1.1.

6.2.1.3.2.5 Metal-Water Reaction

~~No additional energy source due to metal-water reaction is considered in calculating the mass and energy releases to containment, because the fuel temperatures are low enough to preclude zirconium-water reaction. This is consistent with the methodology of References 3 and 4.~~Consistent with 10CFR50, Appendix K criteria, the energy release associated with the zirconium-water exothermic reaction has been considered. The LOCA peak cladding temperature analysis, presented in Chapter 15, that demonstrates compliance with the Appendix K criteria demonstrates that no appreciable level of zirconium oxidation occurs. This level of reaction has been bounded in the containment mass and energy release analysis by incorporating the heat of reaction from 1 percent of the zirconium surrounding the fuel. This exceeds the level predicted by the LOCA analysis and results in additional conservatism in the mass and energy release calculations.

6.2.1.3.2.6 Energy Inventories

during a postulated LOCA

Inventories of the amount of mass and energy released to containment are provided in summary Tables 6.2.1.3-2 through 6.2.1.3-~~6~~ ~~and Tables 6.2.1.3-9 through 6.2.1.3-10.~~

6.2.1.3.2.7 Additional Information Required for Confirmatory Analysis

System parameters and hydraulic characteristics needed to perform confirmatory analysis are provided in Table 6.2.1.3-~~11~~ 7 and Figures 6.2.1.3-1 through 6.2.1.3-4.

6.2.1.4 Mass and Energy Release Analysis for Postulated Secondary-System Pipe Rupture Inside Containment

Steam line ruptures occurring inside a reactor containment structure may result in significant releases of high-energy fluid to the containment environment, possibly resulting in high containment temperatures and pressures. The quantitative nature of the releases following a steam line rupture is dependent upon the configuration of the plant steam system, the containment design~~s~~ as well as the plant operating conditions and the size of the rupture. ~~These variations make a reasonable determination of the single worst case for both containment pressure and temperature evaluations following a steam break difficult.~~ This section describes the methods used in determining the containment responses to a variety of postulated pipe breaks encompassing wide variations in plant operation, safety system performance, and break size. The spectrum of breaks analyzed is listed in Table 6.2.1.4-1.

6.2.1.4.1 Significant Parameters Affecting Steam Line Break Mass and Energy Releases

Four major factors influence the release of mass and energy following a steam line break: steam generator fluid inventory, primary-to-secondary heat transfer, protective system operation and the state of the secondary fluid blowdown. The following is a list of those plant variables which have significant influence on the mass and energy releases:

- Plant power level
- Main feedwater system design
- Startup feedwater system design
- Postulated break type, size, and location
- Availability of offsite power
- Safety system failures
- Steam generator reverse heat transfer and reactor coolant system metal heat capacity.

The following is a discussion of each of these variables.

6.2.1.4.1.1 Plant Power Level

Steam line breaks are postulated to occur with the plant in any operating condition ranging from hot shutdown to full power. Since steam generator mass decreases with increasing power level, breaks occurring at lower power generally result in a greater total mass release to the plant containment. However, because of increased energy storage in the primary plant, increased heat transfer in the steam generators and additional energy generation in the nuclear fuel, the energy released to the containment from breaks postulated to occur during power operation may be greater than for breaks occurring with the plant in a hot shutdown condition. Additionally, steam pressure and the dynamic conditions in the steam generators change with increasing power. They have significant influence on both the rate of blowdown and the amount of moisture entrained in the fluid leaving the break following a steam break event.

Because of the opposing effects of changing power level on steam line break releases, no single power level can be identified as a worst case initial condition for a steam line break event. Therefore, several different power levels spanning the operating range as well as the hot shutdown condition are analyzed.

6.2.1.4.1.2 Main Feedwater System Design

The rapid depressurization that occurs following a rupture may result in large amounts of water being added to the steam generators through the main feedwater system. Rapid closing isolation valves are provided in the main feedwater lines to limit this effect. The piping layout downstream of the isolation valves determine the volume in the feedwater lines that cannot be isolated from the steam generators. As the steam generator pressure decreases, some of the fluid in this volume will flash into the steam generator, providing additional secondary fluid that may exit out the rupture.

The feedwater addition that occurs prior to closing of the feedwater line isolation valves influences the steam generator blowdown in several ways. First, the rapid addition increases the amount of entrained water in large-break cases by lowering the bulk quality of the steam generator inventory. Second, because the water entering the steam generator is subcooled, it lowers the steam pressure, thereby reducing the flow rate out the break. Finally, the increased flow rate causes an increase in the heat transfer rate from the primary-to-secondary system, resulting in greater energy being released out the break. Since these are competing effects on the total mass and energy release, no worst case feedwater transient can be defined for all plant conditions. In the results presented, the worst effects of each variable have been used. For example, moisture entrainment for each break is calculated assuming conservatively small feedwater additions so that the entrained water is minimized or zero when support data are not available. Determination of total steam generator inventory, however, is based on conservatively large feedwater additions, as explained in Subsection 6.2.1.4.3.2.

The unisolated feedwater line volumes between the steam generator and the isolation valves serve as a source for additional high-energy fluid to be discharged through the pipe break. This volume is accounted for in the mass and energy release data presented in Subsection 6.2.1.4.3.2.

6.2.1.4.1.3 Startup Feedwater System Design

Within the first minute following a steam line break, the startup feedwater system may be initiated on any one of several protection system signals. The addition of startup feedwater to the steam generators increases the secondary mass available for release to the containment, as well as the heat transferred to the secondary fluid. The effects on the steam generator mass are maximized in the calculation described in Subsection 6.2.1.4.3.2 by assuming full startup feedwater flow to the faulted steam generator starting at time zero from the safeguard system(s) signal or low steam generator level reactor trip and continuing until automatically terminated.

6.2.1.4.1.4 Postulated Break Type, Size and Location

Postulated Break Type

Two types of postulated pipe ruptures are considered in evaluating steam line breaks.

First is a split rupture in which a hole opens at some point on the side of the steam pipe or steam header but does not result in a complete severance of the pipe. A single, distinct break area is fed uniformly by both steam generators until steam line isolation occurs. The blowdown flow rates from the individual steam generators are interdependent, since fluid coupling exists between the steam lines. Because flow limiting orifices are provided in each steam generator, the largest split rupture can have an effective area, prior to isolation, that is no greater than the throat area of the flow restrictor times the number of steam generators. Following isolation, the effective break area for the steam generator with the broken line can be no greater than the flow restrictor throat area.

The second break type is the double-ended guillotine rupture in which the steam pipe is completely severed and the ends of the break displace from each other. Guillotine ruptures are characterized by two distinct break locations, each of equal area, but being fed by different steam generators. The largest guillotine rupture can have an effective area per steam generator no greater than the throat area of one steam line flow restrictor.

Postulated Break Size

Break area is also important when evaluating steam line breaks. It controls the rate of releases to the containment, and exerts significant influence on the steam pressure decay and the amount of entrained water in the blowdown flow. The data presented in this section include releases for three breaks at each of four initial power levels. Included are two double-ended ruptures and one split rupture, as follows:

- A full double-ended pipe rupture downstream of the steam line flow restrictor. For this case, the actual break area equals the cross-sectional area of the steam line, but the blowdown from the steam generator with the broken line is controlled by the flow restrictor throat area (1.388 square feet). The reverse flow from the intact steam generator is controlled by the smaller of the pipe cross section, the steam stop valve seat area, or the total flow restrictor throat area in the intact steam generator. The reverse flow has been conservatively assumed to be controlled by the flow restrictor in the intact loop steam generator.

- A small double-ended rupture having an area slightly larger than the area at which water entrainment ceases. Entrainment is assumed in the forward direction only. Dry steam blowdown is assumed to occur in the reverse direction.

  ~~When data is insufficient to support a fixed fraction water entrainment model, the input assumes no water entrainment. This means that the effluent is conservatively assumed as dry saturated steam. That is the effluent quality equals to 1.0.~~

  In this case, the break areas analyzed for the small double-ended rupture are determined by two considerations. The first consideration is based on Reference (5) and the second consideration is based on the split break area that does not result in steam line isolation. The cases analyzed conservatively assume no water entrainment. This means that the effluent is assumed to be dry saturated steam~~, that is, the effluent quality equals 1.0~~. Double ended rupture areas larger and smaller than the split break area are presented.

- A split rupture representing the largest break which can neither generate a steam line isolation signal from the primary protection equipment nor result in moisture entrainment. Steam and feedwater line isolation signals are generated by high containment pressure signals for this type of break. Being a split rupture, the effective area seen by the faulted steam generator decreases by a factor of two, following steam line isolation. Moisture entrainment could occur at that time. However, since steam line isolation for these breaks generally does not occur before 20 to 60 seconds following such break, it is conservatively assumed that the pressure decreases sufficiently in the affected steam generator to preclude any moisture carryover.

Table 6.2.1.4-1 lists the spectrum of secondary system pipe ruptures analyzed.

Postulated Break Location

Break location affects steam line blowdown due to the pressure losses which occur in the length of piping between the steam generator and the break. The effect of the pressure loss is to reduce the effective break area seen by the steam generator. Although this reduces the rate of blowdown, it would not significantly change the total release of energy to the containment. Therefore, piping loss effects are conservatively ignored in the blowdown results.~~, except in the small double-ended ruptures in which moisture entrainment occurs. The effects of pipe friction are conservatively assumed to be sufficiently large in this case to prevent moisture entrainment in the reverse flow, thus minimizing water relief to the containment.~~

6.2.1.4.1.5 Availability of Offsite Power

The effects of the assumption of the availability of offsite power are enveloped in the analysis.

Offsite power is assumed to be available where it maximizes the mass and energy released from the break because of the following:

- The continued operation of the reactor coolant pumps until automatically tripped as a result of core makeup tank (CMT) actuation. This maximizes the energy transferred from the reactor coolant system to the steam generator.

- The continued operation of the feedwater pumps and actuation of the startup feedwater system until they are automatically terminated. This maximizes the steam generator inventories available for release.

  heat exchanger

- The AP600 is equipped with the passive safeguards system including the CMT and the passive residual heat removal ~~system~~ (PRHR). Following a steam line rupture, these passive systems are actuated when their setpoints are reached. This decreases the primary coolant temperatures. The actuation and operation of these passive safeguards systems do not require the availability of offsite power.

  When the PRHR is in operation, the core generated heat is dissipated to the in-containment refueling water storage tank (IRWST) via the PRHR heat exchanger. This causes a reduction of the heat transfer from the primary system to the steam generator secondary system and causes a reduction of mass and energy releases via the break.

Thus, the availability of ac power in conjunction with the passive safeguards system (CMT and PRHR) maximizes the mass and energy releases via the break. Therefore, blowdown occurring in conjunction with the availability of offsite power is more severe than cases where offsite power is not available.

6.2.1.4.1.6 Safety System Failures

In addition to assuming a loss of system pressure, the following single active failures are considered:

- Failure of one main steam isolation valve
- Failure of one main feedwater isolation valve

6.2.1.4.1.7 Steam Generator Reverse Heat Transfer and Reactor Coolant System Metal Heat Capacity

Once steam line isolation is complete, the steam generator in the intact steam loop becomes a source of energy that can be transferred to the steam generator with the broken line. This energy transfer occurs through the primary coolant. As the primary plant cools, the temperature of the coolant flowing in the steam generator tubes drops below the temperature of the secondary fluid in the intact unit, resulting in energy being returned to the primary coolant. This energy is then available to be transferred to the steam generator with the broken steam line.

Similarly, the heat stored in the metal of the reactor coolant piping, the reactor vessel, and the reactor coolant pumps is transferred to the primary coolant as the plant cooldown progresses. This energy also is available to be transferred to the steam generator with the broken line.

The effects of both the reactor coolant system metal and the reverse steam generator heat transfer are included in the results presented in this document.

6.2.1.4.2 Description of Blowdown Model

A description of the blowdown model used is provided in Reference 5.

6.2.1.4.3 Containment Response Analysis

The W̲GOTHIC Computer Code (Reference 1) is used to determine the containment responses following the steam line break. The containment response analysis is described in Subsection 6.2.1.1.

6.2.1.4.3.1 Initial Conditions

The initial containment conditions are ~~provided~~ discussed in Subsection 6.2.1.1.

6.2.1.4.3.2 Mass and Energy Release Data

Using References 5 and 6 as a basis, mass and energy release data are developed to determine the containment pressure-temperature response for the spectrum of breaks analyzed. Tables hard space 6.2.1.4-2 and 6.2.1.4-3 provide the mass and energy release data for the cases that produce the highest containment pressure and temperature in the containment response analysis. Table 6.2.1.4-4 provides plant data used for the cases used in the mass and energy releases determination.

The rate of startup feedwater addition represents the maximum runout flow rate to a fully depressurized steam generator. Actual isolation is dependent on signals generated by the ~~primary~~ protection and safety monitoring system. Feedwater isolation for the split breaks was based on the time required to reach the containment pressure setpoint that generates the isolation signal. The feedwater flow rates before automatic isolation assumed in the analyses are based on input for ~~typical~~ the AP600 steam generator and main feed system design.

6.2.1.4.3.3 Containment Pressure-Temperature Results

The results of the containment pressure-temperature analyses for the postulated secondary system pipe ruptures that produce the highest peak containment pressure and temperature are presented in Subsection 6.2.1.1.

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

The containment backpressure used for the AP600 ~~hot leg and~~ cold leg guillotine and split breaks for the emergency core cooling system (ECCS) analysis presented in Subsection 15.6.5 is ~~14.7 psia described herein~~. The containment backpressure is typically calculated using COCO (Reference 7) and the methods and assumptions described in Appendix A of WCAP-8339 (Reference 8). Input parameters, including the containment initial conditions; net free containment volume; passive sink materials, thicknesses, and surface areas; and starting time and number of containment cooling systems are used in such an analysis. Even though 10 CFR 50 Appendix K analytical bases (Reference 9) and requirements do not apply directly to a best-estimate analysis with uncertainties, they nevertheless define that a large break loss-of-coolant accident (LOCA) containment response of minimum pressurization is conservative.

~~No analysis was performed to determine~~The minimum containment backpressure for emergency core cooling system performance during a loss-of-coolant accident ~~because presuming that no pressurization occurs provides a single, bounding approach~~ has been computed using the WGOTHIC computer code. Subsection 6.2.1.1 demonstrates that the AP600 containment pressurizes significantly during large break LOCA events, and an analysis ~~could be~~ was performed to establish a containment pressure boundary condition applied to the WCOBRA/TRAC code (Reference 10) ~~which exceeds 14.7 psia~~. The AP600 WGOTHIC model for the containment backpressure used methodology similar to the methodology used in the COCO calculations. Specifically, a single-node containment model was used to assess containment pressure response. Containment internal heat sinks used heat transfer correlations of 4 times Tagami during the blowdown phase followed by 1.2 times Uchida. This analysis was performed for the first 200 seconds of the accident. The calculated containment backpressure is provided in Figure 6.2.1.5-1.

Results of the WCOBRA/TRAC analyses demonstrate that the AP600 meets 10 CFR 50.46 requirements. ~~even if the containment is assumed to remain at 14.7 psia during a loss-of-coolant accident event (see Section 15.6). Any pressurization of the containment above 14.7 psia will enhance the calculated ECCS performance of the AP600 limiting case large break LOCA presented in Subsection 15.6.5.~~

The AP600 ~~WGOTHIC model for~~ containment backpressure used methodology similar to the methodology used in the COCO calculations. Specifically, a single-node containment model was used to assess containment pressure response. Containment internal heat sinks used heat transfer correlations of four times Tagami during the blowdown phase followed by 1.2 times Uchida. This analysis was performed for the first 200 seconds of the accident. The calculated containment backpressure is provided in Figure 6.2.1.5-1.

6.2.1.5.1 Mass and Energy Release Data

The mass and energy releases to the containment during the blowdown ~~and reflood~~ portions only of the ~~limiting~~ double-ended cold-leg guillotine break (DECLG) transient ~~at a Moody~~

~~discharge coefficient of 0.8 (C_D = 0.8)~~ are presented in Table 6.2.1.5-1, as computed by the WCOBRA/TRAC code.

The mathematical models which calculate the mass and energy releases to the containment are described in Subsection 15.6.5. A break spectrum analysis is performed (see references in Subsection 15.6.5) that considers various break sizes, ~~break locations,~~ and Moody discharge coefficients for the double-ended cold leg guillotines and splits. Mixing of steam and accumulator water injected into the vessel ~~and steam~~ reduces the available energy released to the containment vapor space, thereby minimizing calculated containment pressure. Note that the mass/energy releases during the reflood phase of the subject break are not considered. This produces a conservatively low contaminant pressure result for use as a boundary condition in the W COBRA/TRAC large break LOCA analysis.

6.2.1.5.2 Initial Containment Internal Conditions

ECCS

~~Because no minimum containment pressure analysis is performed, parameters such as initial containment pressure and temperature are not specifically defined in the context of the Subsection 15.6.5 WCOBRA/TRAC analysis. The constant containment pressure condition of 14.7 psia supplied to WCOBRA/TRAC is highly conservative for the post-LOCA condition inside the AP600 containment, and its use obviates any need to perform a detailed computation.~~ Initial containment conditions were biased for the ECCS backpressure analysis to predict a conservatively low containment backpressure. Initial containment conditions included initial pressure of 14.7 psia, initial temperature of 90°F, and a relative humidity of 99 percent. An air annulus temperature of 0°F was assumed and a linear temperature profile between 0°F and 90°F was used in the containment shell, which separates the annulus from the containment volume.

6.2.1.5.3 Other Parameters

~~Because no minimum containment pressure analysis is performed, parameters such as containment volume and passive heat sinks are not specifically defined in the context of the Subsection 15.6.5 WCOBRA/TRAC analysis. A constant conservative containment pressure condition of 14.7 psia is supplied to WCOBRA/TRAC.~~ Containment parameters, such as containment volume and passive heat sinks, were biased to predict a conservative low containment backpressure. The containment volume used in the calculations was conservatively set to 1.05 times the cold volume. Passive heat sink surface areas were approximately doubled from the heat sinks, presented in Tables 6.2.1.1-~~7~~8 and 6.2.1.1-~~4~~6. Material properties were biased high (density, conductivity, and heat capacity) as indicated in CSB 6-1 (Reference 10). To further minimize containment pressure, containment purge was assumed to be in operation at time zero. Two ten-inch diameter flow paths were provided in the containment model to simulate containment purge lines. ~~These~~ The valves were closed 5 seconds after 8 psig was reached.

within these lines

6.2.1.7 Testing and Inspection

This section describes the functional testing of the containment vessel. Testing and in-service inspection of the containment vessel are described in Subsection 3.8.2.6. Isolation testing is described in Subsection 6.2.3. Leak testing is described in Subsection 6.2.5. Testing and inspection are consistent with regulatory requirements and guidelines.

The valves of the passive containment cooling system are stroke tested periodically. Subsection 6.2.2 provides a description of testing and inspection.

The baffle between the containment vessel and the shield building is equipped with removable panels and clear observation panels to allow for inspection of the containment surface. See Subsection 3.8.2 for the requirements for in-service inspection of the steel containment vessel. Subsection 6.2.2 provides a description of testing to be performed.

Testing is not required on any subcompartment vent or on the collection of condensation from the containment shell. The collection of condensate from the containment shell and its use in leakage detection are discussed in Subsection 5.2.5.

6.2.1.8 Instrumentation Requirements

Instrumentation is provided to monitor the conditions inside the containment and to actuate the appropriate engineered safety features, should those conditions exceed the predetermined levels. The instruments measure the containment pressure, containment atmosphere radioactivity, and containment hydrogen concentration. Instrumentation to monitor reactor coolant system leakage into containment is described in Subsection 5.2.5.

The containment pressure is measured by four independent pressure transmitters. The signals are fed into the engineered safety features actuation system, as described in Subsection 7.3.1. Upon detection of high pressure inside the containment, the appropriate safety actuation signals are generated to actuate the necessary safety-related systems. Low pressure is alarmed but does not actuate the safety-related systems.

The physically separated pressure transmitters are located outside the containment and connected to their sensors by filled and sealed hydraulic lines. Section 7.3 provides a description.

The containment atmosphere radiation level is monitored by four independent area monitors located above the operating deck inside the containment building. The measurements are continuously fed into the engineered safety features actuation system logic. Section 11.5 provides information on the containment area radiation monitors. The engineered safety features actuation system operation is described in Section 7.3.

The containment hydrogen concentration is measured by hydrogen monitors, as described in Subsection 6.2.4. Hydrogen concentrations are monitored by sensors distributed throughout containment to provide a representative indication of containment hydrogen concentrations.

ignitors and monitor hydrogen Concentrations

The sensors also indicate the specific areas evaluated for potential hydrogen pockets. These indications are used by the plant operators to control ~~hydrogen recombiners and igniters~~. High hydrogen concentration is alarmed in the main control room. Section 7.3 provides detailed information on the engineered safety features actuation system operation.

6.2.2 Passive Containment Cooling System

The passive containment cooling system (PCS) is an engineered safety features system. Its functional objective is to reduce the containment temperature and pressure following a loss of coolant accident (LOCA) or main steam line break (MSLB) accident inside the containment by removing thermal energy from the containment atmosphere. The passive containment cooling system also serves as the means of transferring heat to the safety-related ultimate heat sink for other events resulting in a significant increase in containment pressure and temperature.

Finally, the passive containment cooling system limits releases of radioactivity (post-accident) by reducing the pressure differential between the containment atmosphere and the external environment, thereby diminishing the driving force for leakage of fission products from the containment to the atmosphere. This subsection describes the safety design bases of the safety-related containment cooling function. Nonsafety-related containment cooling, a function of the containment recirculation cooling system, is described in Subsection 9.4.6.

6.2.2.1 Safety Design Basis

- The passive containment cooling system is designed to withstand the effects of natural phenomena such as ambient temperature extremes, earthquakes, winds, tornadoes, or floods.
- Passive containment cooling system operation is automatically initiated upon receipt of a Hi-~~1~~ 2 containment pressure signal.
- The passive containment cooling system is designed so that a single failure of an active component, assuming loss of offsite or onsite ac power sources, will not impair the capability of the system to perform its safety-related function.
- Active components of the passive containment cooling system are capable of being tested during plant operation. Provisions are made for inspection of major components in accordance with the intervals specified in the ASME Code, Section XI.
- The passive containment cooling system components required to mitigate the consequences of an accident are designed to remain functional in the accident environment and to withstand the dynamic effects of the accident.
- The passive containment cooling system is capable of removing sufficient thermal energy including subsequent decay heat from the containment atmosphere following a design basis event resulting in containment pressurization such that the containment pressure

remains below the design value with no operator action required for three days. The passive containment cooling system is designed to reduce containment pressure to less than one-half its design pressure within 24 hours following a postulated loss of coolant accident.

- The passive containment cooling system is designed and fabricated to appropriate codes consistent with Regulatory Guides 1.26 and 1.32 and seismic Category I in accordance with Regulatory Guide 1.29 as described in Section 1.9.

6.2.2.2 System Design

6.2.2.2.1 General Description

The passive containment cooling system and components are designed to the codes and standards identified in Section 3.2; flood design is described in Section 3.4; missile protection is described in Section 3.5. Protection against dynamic effects associated with the postulated rupture of piping is described in Section 3.6. Seismic and environmental design and equipment qualification are described in Sections 3.10 and 3.11. The actuation system is described in Section 7.3.

6.2.2.2.2 System Description

The passive containment cooling system is a safety-related system which is capable of transferring heat directly from the steel containment vessel to the environment. This transfer of heat prevents the containment from exceeding the design pressure and temperature following a postulated design basis accident, as identified in Chapters 6 and 15. Containment pressure is further reduced to one-half the design pressure within 24 hours following the worst postulated loss of coolant accident. The passive containment cooling system makes use of the steel containment vessel and the concrete shield building surrounding the containment. The major components of the passive containment cooling system are: the passive containment cooling water storage tank (PCCWST) which is incorporated into the shield building structure above the containment; an air baffle, located between the steel containment vessel and the concrete shield building, which defines the cooling air flowpath; an air inlet and an air exhaust, also incorporated into the shield building structure; and a water distribution system, mounted on the outside surface of the steel containment vessel, which functions to distribute water flow on the containment.

A recirculation path is provided to control the passive containment cooling water storage tank water chemistry and to provide heating for freeze protection. Passive containment cooling water storage tank filling operations and normal makeup needs are provided by the demineralized water transfer and storage system discussed in Subsection 9.2.4.

The system piping and instrumentation diagram is shown in Figure 6.2.2-1. System parameters are shown in Table 6.2.2-1. A simplified system sketch is included as Figure 6.2.2-2.

6.2.2.2.3 Component Description

The mechanical components of the passive containment cooling system are described in this subsection. Table 6.2.2-2 provides the component design parameters.

Passive Containment Cooling System Water Storage Tank – The passive containment cooling system water storage tank is incorporated into the shield building structure above the containment vessel. The inside wetted walls of the tank are lined with stainless steel plate. It is filled with demineralized water and has a useable volume of 400,000 gallons for passive containment cooling functions. The passive containment cooling system functions as the safety-related ultimate heat sink. The passive containment cooling water storage tank is seismically designed and missile protected.

The tank also has redundant level measurement channels and alarms for monitoring the tank water level and ~~with~~ redundant temperature measurement channels to monitor and alarm potential for freezing. To maintain system operability, a recirculation loop that provides chemistry and temperature control is connected to the tank.

The tank is constructed to provide sufficient thermal inertia and insulation such that draindown can be accomplished over a 72 hour period without heater operation.

In addition to its containment heat removal function, the passive containment cooling system water storage tank also serves as a seismic Category I water storage reservoir for fire protection following a safe shutdown earthquake.

The PCCWST ~~A~~ suction pipe for the fire protection system (FPS) is ~~situated~~ configured so that ~~it drains water from beneath the water surface of the storage tank at a level above~~ actuation of the FPS will not infringe on the 400,000 gallons volume allocated to the passive containment cooling function. Therefore, the fire protection system suction pipe cannot reduce the water storage tank water volume below 400,000 gallons.

Passive Containment Cooling System Water Storage Tank Isolation Valves – The passive containment cooling system water storage tank outlet piping is equipped with two sets of redundant isolation valves. The air-operated butterfly valves are normally closed and open upon receipt of a Hi-~~1~~ 2 containment pressure signal. These valves ~~are of~~ a fail-open design to provide a fail-safe position on the loss of air and/or loss of power. The normally-open motor-operated gate valves are located upstream of the butterfly valves. They are provided to allow for testing of the butterfly valves.

The storage tank isolation valves, along with the passive containment cooling water storage tank discharge piping and associated instrumentation between the passive containment cooling water storage tank and the downstream side of the isolation valves, are contained within a temperature-controlled valve room to prevent freezing. Valve room heating is provided by a locally installed electric unit heater to maintain the room temperature above 50°F.

Flow Control Orifices – Orifices are installed in each of the three passive containment cooling system water storage tank outlet pipes. They are used, along with the different elevations of the outlet pipes, to control the flow of water from the passive containment cooling system water storage tank as a function of water level. The orifices are located within the temperature-controlled valve room.

Water Distribution Bucket – A water distribution bucket is provided to uniformly deliver water to the outer surface of the containment dome. The redundant passive containment cooling water delivery pipes and auxiliary water source piping discharge into the bucket, below its operational water level, to prevent excessive splashing. A set of circumferentially-spaced distribution slots are included around the top of the bucket. The bucket is hung from the shield building roof and suspended just above the containment dome for optimum water delivery.

Water Distribution Weir System – A weir-type water delivery system is provided to uniformly wet the containment shell during passive containment cooling system operation. The system includes channeling walls and collection troughs, equipped with distribution weirs. The distribution system is capable of functioning during extreme low- or high-ambient temperature conditions.

Air Flow Path – An air flow path is provided to direct air along the outside of the containment shell to provide containment cooling. The air flow path includes a screened shield building inlet, an air baffle that divides the outer and inner flow annuli, and a chimney to increase buoyancy. Subsection 3.8.4.1.3 includes information regarding the air baffle. The general arrangement drawings provided in Section 1.2 provide layout information of the air flow path.

Chemical Addition Tank – The chemical addition tank is a small, vertical, cylindrical tank that is sized to inject a 30-percent-by-volume solution of hydrogen peroxide to maintain a passive containment cooling water storage tank concentration of 50 ppm for control of algae growth.

Recirculation Pump – The recirculation pump is a 100 percent capacity centrifugal pump with wetted components made of austenitic stainless steel. The pump is sized to recirculate the entire volume of tank water once every week.

Recirculation Heater – The recirculation heater is provided for freeze protection. The heater is sized based on heat losses from the passive containment cooling system water storage tank and recirculation piping at the minimum site temperature, as defined in Section 2.3.

6.2.2.2.4 System Operation

Operation of the passive containment cooling system is initiated upon receipt of two out of four Hi-~~1~~2 containment pressure signals. Manual actuation by the operator is also possible from either the main control room or remote shutdown workstation. System actuation consists of opening the passive containment cooling system water storage tank isolation valves. This allows the passive containment cooling system water storage tank water to be delivered to the top, external surface of the steel containment shell. The flow of water, provided entirely by the force of gravity, forms a water film over the dome and side walls of the containment structure.

The flow of water to the containment outer surface is initially established at approximately 220 gpm for short-term containment cooling following a design basis loss of coolant accident. The flow rate is gradually reduced over a period of 72 hours to a value of approximately 55 gpm. This flow provides the desired reduction in containment pressure over time and removes decay heat. The flow rate change is dependent only upon the decreasing water level in the passive containment cooling water storage tank.

To adequately wet the containment surface, the water is delivered to the distribution bucket above the center of the containment dome which subsequently delivers the water to the containment surface. A weir-type water distribution system is used on the dome surface to distribute the water for effective wetting of the dome and vertical sides of the containment shell.

The weir system contains radial arms and weirs specifically located considering the effects of tolerances of the containment vessel design and construction. In addition, a corrosion-resistant paint or coating for the containment vessel is specified to enhance surface wetability, and film formation.

The cooling water not evaporated from the vessel wall flows down to the bottom of the inner containment annulus into floor drains. The redundant floor drains route the excess water to storm drains. The drain lines are always open (without isolation valves) and each is sized to accept maximum passive containment cooling system flow. The interface with the storm drain system is an open connection such that any blockage in the storm drains would result in the annulus drains overflowing the connection.

A path for the natural circulation of air upward along the outside walls of the containment structure is always open. The natural circulation air flow path begins at the shield building inlet, where atmospheric air enters horizontally through openings in the concrete structure. Air flows past a set of fixed louvers and is forced to turn 90 degrees downward into an outer annulus. This outer shield building annulus is encompassed by the concrete shield building on the outside and a removable baffle on the inside. At the bottom of the baffle wall, curved vanes aid in turning the flow upward 180 degrees into the inner containment annulus. This inner annulus is encompassed by the baffle wall on the outside and the steel containment vessel on the inside. Air flows up through the inner annulus to the top of the containment vessel and then exhausts through the shield building chimney.

As the containment structure heats up in response to high containment temperature, heat is removed from within the containment via conduction through the steel containment structure, convection from the containment surface to the water film, convection and evaporation from the water film to the air, and radiation from the water film to the air baffle. As heat and water vapor are transferred to the air space between the containment structure and air baffle, the air becomes less dense than the air in the outer annulus. This density difference causes an increase in the natural circulation of the air upward between the containment structure and the air baffle, with the air finally exiting at the top center of the shield building.

The passive containment cooling system water storage tank provides water for containment wetting for 72 hours following system actuation. Operator action can be taken to replenish this water supply or to provide an alternate water source directly to the containment shell through installed safety-related and seismic piping connections. In addition, water sources used for normal filling operations can be used to replenish the water supply.

The arrangement of the air inlet and air exhaust in the shield building structure has been selected so that wind effects aids the natural air circulation. The air inlets are placed at the top, outside of the shield building, providing a symmetrical air inlet that reduces the effect of wind speed and direction or adjacent structures. The air/water vapor exhaust structure is elevated above the air inlet to provide additional buoyancy and reduces the potential of exhaust air being drawn into the air inlet. The air flow inlet and chimney regions are both designed to protect against ice or snow buildup and to prevent foreign objects from entering the air flow path.

Inadvertent actuation of the passive containment cooling system is terminated through operator action by closing either of the series isolation valves from the main control room. Subsection 6.2.1.1~~2~~4 provides a discussion of the effects of inadvertent system actuation.

6.2.2.3 Safety Evaluation

The safety-related portions of the passive containment cooling system are located within the shield building structure. This building (including the safety-related portions of the passive containment cooling system) is designed to withstand the effects of natural phenomena such as earthquakes, winds, tornadoes, or floods. Components of the passive containment cooling system are designed to withstand the effects of ambient temperature extremes.

Operation of the containment cooling system is initiated automatically following the receipt of a Hi-~~1~~2 containment pressure signal. The use of this signal provides for system actuation during transients, resulting in mass and energy releases to containment, while avoiding unnecessary actuations. No other actuations are required to initiate the post-accident heat removal function since the cooling air flow path is always open. Operation of the passive containment cooling system may also be initiated from the main control room and from the remote shutdown work station. A description of the actuation system is contained in Section 7.3.

The active components of the passive containment cooling system, the isolation valves, are located in two redundant pipe lines. Failure of a component in one train does not affect the operability of the other mechanical train or the overall system performance. The fail-open, air-operated valves require no power to move to their safe (open) position. The normally open motor-operated valves are powered from separate redundant Class 1E dc (battery) power sources. Table 6.2.2-3 presents a failure modes and effects analysis of the passive containment cooling system.

Capability is provided to periodically test actuation of the passive containment cooling system. Active components can be tested periodically during plant operation to verify operability. The system can be inspected during unit shutdown. Additional information is contained in Subsections 3.9.6 and 6.2.2.4, as well as in the Technical Specifications.

The passive containment cooling system components located inside containment, the containment pressure sensors, are tested and demonstrated to perform in a simulated design basis accident environment. These components are ~~located to be~~ protected from effects of postulated jet impingement and pipe whip in case of a high-energy line break.

The containment pressure analyses demonstrate that the passive containment cooling system is capable of removing sufficient heat energy, including subsequent decay heat, from the containment atmosphere so that the peak pressure following the worst postulated loss of coolant accident is below the containment design pressure with no operator action for at least three days. Analyses also show that the containment pressure is reduced to below one-half of the design pressure within 24 hours following the most limiting design basis loss of coolant accident.

The containment pressure analyses are based on an ambient air temperature of 115°F dry bulb and 80°F coincident wet bulb. The passive containment cooling system water storage tank water temperature basis is 120°F. Results of the analyses are provided in Subsection 6.2.1.

6.2.2.4 Testing and Inspection

6.2.2.4.1 Inspections

The passive containment cooling system is designed to permit periodic testing of system readiness as specified in the Technical Specifications.

The portions of the passive containment cooling system from the isolation valves to the passive containment cooling system water storage tank are accessible and can be inspected during power operation or shutdown for leaktightness. Examination and inspection of the pressure retaining piping welds is performed in accordance with ASME Code, Section XI. The design of the containment vessel and air baffle facilitates the inspection of the vessel during plant shutdowns.

6.2.2.4.2 Preoperational Testing

Preoperation testing for the passive containment cooling system is addressed in Sections 14.2.8.1.96 and 14.2.8.1.97

6.2.2.4.3 Operational Testing

Operational testing is performed to:

- Demonstrate that the sequencing of valves occurs on the initiation of Hi-~~1~~ 2 containment pressure and demonstrate the proper operation of remotely operated valves.

- Verify valve operation during plant operation. The normally open motor-operated valves, in series with each normally closed air-operated isolation valve, are temporarily closed. This closing permits isolation valve stroke testing without actuation of the passive containment cooling system.

- Verify water flow delivery, consistent with the accident analysis.

- Verify visually that the path for containment cooling air flow is not obstructed by debris or foreign objects.

- Test frequency is consistent with the plant technical specifications (Section 16.3.6) and inservice testing program (Section 3.9.6).

6.2.2.5 Instrumentation Requirements

The status of the passive containment cooling system is displayed in the main control room. ~~Using a combination of alarms and monitor lights,~~ The operator is alerted to problems with the operation of the equipment within this system during both normal and post-accident conditions.

Normal operation of the passive containment cooling system is demonstrated by monitoring the recirculation pump discharge pressure, flow rate, passive containment cooling system water storage tank level and temperature, and valve room temperature. Post-accident operation of the passive containment cooling system is demonstrated by monitoring the passive containment cooling system water storage tank level, ~~and~~ passive containment cooling system cooling water flow rate, ~~and~~ containment pressure and external cooling air discharge temperature.

The activation signal-generating equipment fully meets IEEE Standard 279 guidelines for considerations such as operation, diversity, and separation of power supplies. Details are found in Chapter 7.

The protection system providing system actuation is discussed in Chapter 7.

6.2.3 Containment Isolation System

The major function of the containment isolation system of the AP600 is to provide containment isolation to allow the normal or emergency passage of fluids through the containment boundary while preserving the integrity of the containment boundary, if required. This prevents or limits the escape of fission products that may result from postulated accidents. Containment isolation provisions are designed so that fluid lines which penetrate the primary containment boundary are isolated in the event of an accident. This minimizes the release of radioactivity to the environment.

The containment isolation system consists of the piping, valves, and actuators that isolate the containment. The design of the containment isolation system satisfies the requirements of NUREG 0737, as described in the following paragraphs.

6.2.3.1 Design Basis

6.2.3.1.1 Safety Design Basis

A. The containment isolation system is protected from the effects of natural phenomena, such as earthquakes, tornadoes, hurricanes, floods, and external missiles (General Design Criterion 2).

B. The containment isolation system is designed to remain functional after a safe shutdown earthquake (SSE) and to perform its intended function following the postulated hazards of fire, internal missiles, or pipe breaks (General Design Criteria 3 and 4).

C. The containment isolation system is designed and fabricated to codes consistent with the quality group classification, described in Section 3.2, assigned by Regulatory Guide 1.26 and the seismic category assigned by Regulatory Guide 1.29. The power supply and control functions are in accordance with Regulatory Guide 1.32.

D. The containment isolation system provides isolation of lines penetrating the containment for design basis events requiring containment integrity.

E. Upon failure of a main steam line, the containment isolation system isolates the steam generators as required to prevent excessive cooldown of the reactor coolant system or overpressurization of the containment.

F. The containment isolation system is designed in accordance with General Design Criterion 54.

G. Each line that penetrates the containment that is either a part of the reactor coolant pressure boundary or that connects directly to the containment atmosphere, and does not meet the requirements for a closed system (as defined in paragraph I below) except instrument sensing lines, is provided with containment isolation valves according to General Design Criteria 55 and 56.

H. Each line that penetrates the containment, that is neither part of the reactor coolant pressure boundary nor connected directly to the atmosphere of the containment, and that satisfies the requirements of a closed system is provided with a containment isolation valve according to General Design Criterion 57. A closed system is not a part of the reactor coolant pressure boundary and is not connected directly to the atmosphere of the containment. A closed system also meets the following additional requirements:

- The system is protected against missiles and the effects of high-energy line break.
- The system is designed to Seismic Category I requirements.
- The system is designed to ASME Code, Section III, Class 2 requirements.
- The system is designed to withstand temperatures at least equal to the containment design temperature.
- The system is designed to withstand the external pressure from the containment structural acceptance test.
- The system is designed to withstand the design basis accident transient and environment.

I. Instrument lines penetrating the containment are provided with isolation valves according to General Design Criteria 55, 56, and 57. Four containment pressure sensors are provided as sealed systems with bellow seals inside the containment, liquid filled capillaries between the seals, and the sensing element outside containment. These instrument lines are closed systems both inside and outside containment, are designed to withstand the containment pressure and temperature conditions following a loss of coolant accident, and are designed to withstand dynamic effects.

J. The containment isolation system is designed so that no single failure in the containment isolation system prevent the system from performing its intended functions.

K. Fluid penetrations supporting the engineered safety features functions have remote manual isolation valves. These valves can be closed from the main control room or from the remote shutdown workstation, if required.

L. The containment isolation system is designed according to 10 CFR 50.34, so that the resetting of an isolation signal will not cause any valve to change position.

6.2.3.1.2 Power Generation Design Basis

The containment isolation system has no power generation design basis. Power generation design bases associated with individual components of the containment isolation system are discussed in the section describing the system of which they are an integral part.

6.2.3.1.3 Additional Requirements

The AP600 containment isolation system is designed to meet the following additional requirements:

A. The containment isolation elements are designed to minimize the number of isolation valves which are subject to Type C tests of 10 CFR 50, Appendix J. Specific requirements are the following:

- The number of pipe lines which provide a direct connection between the inside and outside of primary containment during normal operation are minimized.

- Closed systems outside of containment that may be open to the containment atmosphere during an accident are designed for the same conditions as the containment itself, and are testable during Type A leak tests.

- The total number of penetrations requiring isolation valves are minimized by appropriate system design. For example:

  – In the component cooling system, a single header with branch lines inside of containment is employed instead of providing a separate penetration for each branch line.

  – Consistent with other considerations, such as containment arrangement and exposure of essential safety equipment to potentially harsh environments, the equipment is located inside and outside of containment so as to require the smallest number of penetrations.

- Consistent with current practice, Type C testing is not required for pressurized water reactor main steam, feedwater, startup feedwater, or steam generator blowdown isolation valves. The steam generator tubes are considered to be a suitable boundary to prevent release of radioactivity from the reactor coolant system following an accident. The steam generator shell and pipe lines, up to and including the first isolation valve, are considered a suitable boundary to prevent release of containment radioactivity.

B. Personnel hatches, equipment hatches, and the fuel transfer tube are sealed by closures with double gaskets.

C. Containment isolation is actuated on a two-out-of-four logic from, high-containment pressure signal, low-steamline pressure, and low T_{cold}. Provisions are provided for manual containment isolation from the main control room.

D. Penetration lines with automatic isolation valves are isolated by engineered safety features actuation signals.

E. Isolation valves are designed to provide leaktight service only against the medium to which the valves are exposed in the short and long-term course of any accident. For example, a valve is gas-tight if the valve is exposed to the containment atmosphere.

F. Isolation valves are designed to have the capacity to close against the conditions that may exist during events requiring containment isolation.

G. Isolation valve closure times are designed to limit the release of radioactivity to within regulation and are consistent with standard valve operators, except where a shorter closure time is required.

H. Deleted.

I. The position of each power-operated isolation valve (fully closed or open), whether automatic or remote manual, is indicated in the main control room and is provided as input to the plant computer. Such position indication is based on actual valve position, for example, by a limit switch which directly senses the actual valve stem position, rather than demanded valve position.

J. Normally closed manual containment isolation valves have provisions for locking the valves closed. Locking devices are designed such that the valves can be locked only in the fully closed position. Administrative control provides verification that manual isolation valves are maintained locked closed during normal operation. Position locks provide confidence that valves are placed in the correct position prior to locking.

K. Automatic containment isolation valves are powered by Class 1E dc power. Non-motor-operated valves fail in the closed position upon loss of a support system, such as instrument air or electric power.

L. Valve alignments used for fluid system testing during operation are designed so that either: containment bypass does not occur during testing, assuming a single failure; or exceptions are identified, and remotely operated valves provide timely isolation from the control room. Containment isolation provisions can be relaxed during system testing. The intent of the design is to provide confidence that operators are aware of any such condition and have the capability to restore containment integrity.

6.2.3.2 System Description

6.2.3.2.1 General Description

Piping systems penetrating the containment have containment isolation features. These features serve to minimize the release of fission products following a design basis accident. SRP Section 6.2.4 and Regulatory Guide 1.141 provide acceptable alternative arrangements to the explicit arrangements given in General Design Criteria 55, 56 and 57. Table 6.2.3-1 lists each penetration and provides a summary of the containment isolation characteristics. The Piping and Instrumentation Diagrams of the applicable systems show the functional arrangement of the containment penetration, isolation valves, test and drain connections. Section 1.7 contains a list of the Piping and Instrumentation Diagrams.

As discussed in Subsection 6.2.3.1, the AP600 containment isolation design satisfies the NRC requirements including post-Three Mile Island requirements. Two barriers are provided -- one inside containment and one outside containment. Usually these barriers are valves, but in some cases they are closed piping systems not connected to the reactor coolant system or to the containment atmosphere.

The AP600 has fewer mechanical containment penetrations (including hatches) and a higher percentage of normally closed isolation valves than current plants. The majority of the penetrations that are normally open incorporate fail closed isolation valves that close automatically with the balance of the penetrations. Table 6.2.3-1 lists the AP600 containment mechanical penetrations and the isolation valves associated with them. Provisions for leak testing are discussed in Subsection 6.2.5.

For those systems having automatic isolation valves or for those provided with remote-manual isolation, Subsection 6.2.3.5 describes the power supply and associated actuation system. Power-operated (air, motor, ~~electro-hydraulic, or solenoid~~or pneumatic) containment isolation valves have position indication in the main control room.

Two modes of valve actuation are considered in Table 6.2.3-1. The actuation signal that occurs directly as a result of the event initiating containment isolation is designated as the primary actuation signal. If a change in valve position is required at any time following primary actuation, a secondary actuation signal is generated which places the valve in an alternative position. The closure times for automatic containment isolation valves are provided in Table 6.2.3-1.

The containment air filtration system is used to purge the containment atmosphere of airborne radioactivity during normal plant operation, as described in Subsection 9.4.7. The system is designed according to Branch Technical Position CSB 6-4 using 12~~8~~-inch supply and exhaust lines and containment isolation valves. These valves close automatically on a containment isolation signal.

Section 3.6 describes dynamic effects of pipe rupture. Section 3.5 discusses missile protection, and Section 3.8 discusses the internal structures including any structure used as a protective device. Lines associated with those penetrations that are considered closed systems inside the containment are protected from the effects of a pipe rupture and missiles. The actuators for power-operated isolation valves inside the containment are either located above the maximum containment water level or in a normally nonflooded area. The actuators are designed for flooded operation or are not required to function following containment isolation and designed and qualified not to spuriously open in a flooded condition.

Other defined bases for containment isolation are provided in SRP Section 6.2.4 and Regulatory Guide 1.141. Conformance with Regulatory Guide 1.141 is provided to the extent specified in Section 1.9.1.

6.2.3.2.2 Component Description

Codes and standards applicable to the piping and valves associated with containment isolation are those for Class B components, as discussed in Section 3.2. Containment penetrations are classified as Quality Group B and Seismic Category I.

Section 3.11 provides the normal, abnormal, and post-loss-of-coolant accident environment that is used to qualify the operability of power-operated isolation valves located inside the containment.

The containment penetrations which are part of the main steam system and the feedwater system are designed to meet the stress requirements of NRC Branch Technical Position MEB 3-1, and the classification and inspection requirements of NRC Branch Technical Position ASB 3-1, as described in Section 3.6. Section 3.8 discusses the interface between the piping system and the steel containment.

As discussed in Subsection 6.2.3.5, the instrumentation and control system provides the signals which determine when containment isolation is required. Containment penetrations are either normally closed prior to the isolation signal or the valves automatically close upon receipt of the appropriate engineered safety features actuation signal.

6.2.3.2.3 System Operation

During normal system operation, approximately 25 percent of the penetrations are not isolated. These lines are automatically isolated upon receipt of isolation signals, as described in Subsections 6.2.3.3 and 6.2.3.4 and Chapter 7. Lines not in use during power operation are normally closed and remain closed under administrative control during reactor operation.

6.2.3.3 Design Evaluation

A. Engineered safeguards and containment isolation signals automatically isolate process lines which are normally open during operation. The containment isolation system uses diversity in the parameters sensed for the initiation of containment isolation. Table 6.2.3-1 identifies the signals that initiate closure of each penetration. The two redundant train-oriented containment isolation signals are generated by any of the following signals:

   - Low pressurizer pressure
   - Low steam-line pressure
   - Low ~~3~~-T_{cold}
   - High containment pressure
   - Manual containment isolation actuation

   The remainder of the containment isolation valves are closed on parameters indicative of the need to isolate.

B. Upon failure of a main steam line, the steam generators are isolated, and the main steam-line isolation valves, main steam-line isolation bypass valves, power operated relief block valves, and the main steam-line drain are closed to prevent excessive cooldown of the reactor coolant system or overpressurization of the containment.

The two redundant train-oriented steam-line isolation signals are initiated upon receipt of any of the following signals:

- Low steam-line pressure
- High steam pressure negative rate
- High containment pressure
- Manual actuation
- Low ~~3~~-T_{cold}

The main steam-line isolation valves, main steam line isolation valve bypass valves, main feedwater isolation valves, steam generator blowdown system isolation valves, and piping are designed to prevent uncontrolled blowdown from more than one steam generator. The main steam-line isolation valves and main ~~steam line~~ feedwater isolation ~~valve bypass~~ valves close fully within 5 ~~10~~ seconds after ~~steam line~~ an isolation is initiated. The blowdown rate is restricted by steam flow restrictors located within the steam generator outlet steam nozzles in each blowdown path. For main steam-line breaks upstream of an isolation valve, uncontrolled blowdown from more than one steam generator is prevented by the main steam-line isolation valves on each main steam line. ~~The startup feed line is connected to the main feed line outside of containment.~~

Failure of any one of these components relied upon to prevent uncontrolled blowdown of more than one steam generator does not permit a second steam generator blowdown to occur. No single active component failure results in the failure of more than one main steam isolation valve to operate. Redundant main steam isolation signals, described in Section 7.3, are fed to redundant parallel actuation vent valves to provide isolation valve closure in the event of a single isolation signal failure.

The effects on the reactor coolant system after a steam-line break resulting in single steam generator blowdown and the offsite radiation exposure after a steam line break outside containment are discussed in Chapter 15. The containment pressure transient following a main steam-line break inside containment is discussed in Section 6.2.

C. The containment isolation system is designed according to General Design Criterion 54. Leakage detection capabilities and leakage detection test program are discussed in Subsection 6.2.5. Valve operability tests are also discussed in Subsection 3.9.6. Redundancy of valves and reliability of the isolation system are provided by the other safety design bases stated in Section 6.2. Redundancy and reliability of the actuation system are covered in Section 7.3.

The use of motor-operated valves that fail as-is upon loss of actuating power in lines penetrating the containment is based upon the consideration of what valve position provides the plant safety. Furthermore, each of these valves, is provided with redundant backup valves to prevent a single failure from disabling the isolation function. Examples include: a check valve inside the containment and motor-operated valve outside the containment or two motor-operated valves in series, each powered from a separate engineered safety features division.

D. Lines that penetrate the containment and which are either part of the reactor coolant pressure boundary, connect directly to the containment atmosphere, or do not meet the requirements for a closed system, except instrument sensing lines, are provided with one of the following valve arrangements conforming to the requirements of General Design Criteria 55 and 56, as follows:

- One locked-closed isolation valve inside and one locked-closed isolation valve outside containment

- One automatic isolation valve inside and one locked-closed isolation valve outside containment

- One locked-closed isolation valve inside and one automatic isolation valve outside containment. (A simple check valve is not used as the automatic isolation valve outside containment.)

- One automatic isolation valve inside and one automatic isolation valve outside containment. (A simple check valve is not used as the automatic isolation valve outside containment).

Isolation valves outside containment are located as close to the containment as practical. Upon loss of actuating power, air-operated automatic isolation valves fail closed.

E. Each line penetrating the containment that is neither part of the reactor coolant pressure boundary nor connected directly to the containment atmosphere, and that satisfies the requirements of a closed system, has at least one containment isolation valve. This containment isolation valve is either automatic, locked-closed, or capable of remote-manual operation. The valve is outside the containment and located as close to the containment as practical. A simple check valve is not used as the automatic isolation valve. This design is in compliance with General Design Criterion 57.

F. Instrument lines penetrating the containment are provided with isolation valves according to General Design Criteria 55 and 56, and the containment pressure instrument lines are designed according to Regulatory Guide 1.~~11~~141.

G. The containment isolation system is designed according to seismic Category I requirements as specified in Section 3.2. The components (and supporting structures) of any system, equipment, or structure that are non-seismic Category I and whose collapse could result in loss of a required function of the containment isolation system through either impact or resultant flooding are evaluated to confirm that they will not collapse when subjected to seismic loading resulting from a safe shutdown earthquake.

Air-operated isolation valves fail in the closed position upon loss of air or power. Containment isolation system valves required to be operated after a design basis accident or safe shutdown earthquake are powered by the Class 1E dc electric power system.

6.2.3.4 Tests and Inspections

Pre-operational testing is described in Chapter 14. The containment isolation system is testable through the operational sequence that is postulated to take place following an accident, including operation of applicable portions of the protection system and the transfer between normal and standby power sources.

The piping and valves associated with the containment penetration are designed and located to permit pre-service and in-service inspection according to ASME Section XI, as discussed in Section 6.6.
s 3.9.6 and

Each line penetrating the containment is provided with testing features to allow containment leak rate tests according to 10 CFR 50, Appendix J, as discussed in Subsection 6.2.5.

6.2.3.5 Instrumentation and Control Application

Instrumentation and control necessary for containment isolation, and the sensors used to determine that containment isolation is required, are described in Section 7.3.

Containment isolation will be initiated by any of the high containment pressure signals, low-T_{cold}, low steam-line pressure, or low pressurizer pressure signal using two out of four logic. Containment isolation can also be initiated manually from the main control room. Containment isolation valves requiring isolation close automatically on a containment isolation signal.

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Containment isolation valves that are equipped with power operators and are automatically actuated may also be controlled individually ~~at~~ the control room. Also, in the case of certain valves with actuators, a manual override of an automatic isolation signal is installed to permit manual control of the associated valve. The override control function can be performed only subsequent to resetting of the actuation signal. That is, deliberate manual action is required to change the position of containment isolation valves in addition to resetting the original actuation signal. Resetting of the actuator signal does not cause any valve to change position. The design does not allow ganged reopening of the containment isolation valves. Reopening of the isolation valves is performed on a valve-by-valve basis, or on a line-by-line basis. Safety injection signals take precedence over manual overrides of other isolation signals. For example, a safety injection signal causes isolation valve closure even though the high containment signal is being overridden by the operator. Containment isolation valves with power operators are provided with open/closed indication, which is displayed in the main control room. The valve mechanism also provides a local mechanical indication of valve position.

Power supplies and control functions necessary for containment isolation are Class 1E, as described in Chapters 7 and 8.

6.2.4 Containment Hydrogen Control System

Following a loss of coolant accident (LOCA), hydrogen may be produced inside the reactor containment by reaction of the zirconium fuel cladding with water, by radiolysis of water, by corrosion of materials of construction, and by release of the hydrogen contained in the reactor coolant system. The containment hydrogen control system is provided to limit the hydrogen concentration in the containment so that containment integrity is not endangered.

Two situations are postulated, a design basis case and a severe accident case. In the design basis case there is a limited reaction of less than one percent of fuel cladding zirconium with water to form hydrogen~~, less than one percent~~. For this case there is an initial release of hydrogen due to the reaction of fuel cladding with water and the release of hydrogen contained in the reactor coolant system. This initial hydrogen release to containment is not sufficient to approach the flammability limit of four volume percent. However, hydrogen continues to evolve to the containment due to radiolysis of water and the corrosion of materials in the containment. The flammability limit ~~is~~ will eventually be reached unless corrective action is taken. The function of the containment hydrogen control system is to prevent the hydrogen concentration from reaching the flammability limit.

In the severe accident case it is assumed that 100 percent of the fuel cladding reacts with water. Although hydrogen production due to radiolysis and corrosion occurs, the cladding reaction with water dominates the production of hydrogen for this case. The hydrogen generation from the zirconium-steam reaction could be sufficiently rapid that it may not be possible to prevent the hydrogen concentration in the containment from exceeding the lower flammability limit. The function of the containment hydrogen control system for this case is to promote hydrogen burning soon after the lower flammability limit is reached ~~anywhere~~ in the containment. Initiation of hydrogen burning at the lower level of hydrogen flammability prevents accidental hydrogen burn initiation at high hydrogen concentration levels and thus provides confidence that containment integrity can be maintained during hydrogen burns and that safety-related equipment can continue to operate during and after the burns.

The containment hydrogen control system consists of the following functions:

- Hydrogen concentration monitoring
- Hydrogen control during and following a design basis LOCA (provided by ~~electric hydrogen~~ passive autocatalytic recombiners~~)~~, PARs
- Hydrogen control during and following a degraded core or core melt (provided by hydrogen igniters).

6.2.4.1 Design Basis

6.2.4.1.1 Containment Mixing

~~Containment structures are arranged to promote mixing via natural circulation.~~Containment structures are arranged to promote mixing via natural circulation. The physical mechanisms of natural circulation mixing that occur in the AP600 are discussed in WCAP-14407 (Proprietary), WCAP-14408 (Nonproprietary) Reference 16, and summarized as follows. For a postulated break low in the containment, buoyant flows develop through the lower compartments due to density head differences between the rising plume and the surrounding containment atmosphere, tending to drive mixing through lower compartments and into the region above the operating deck. There is also a degree of mixing within the region above deck, which occurs due to entrainment into the steam-rich plume as it rises from the operating deck openings. Thus, natural forces will tend to mix in the containment.

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Two general characteristics have been incorporated into the design of the AP600 to promote mixing and eliminate dead-end compartments. The compartments below deck are large open volumes with relatively large interconnections, which promote mixing throughout the below deck region. All compartments below deck are provided with openings through the top of the compartment to eliminate the potential for a dead pocket of high-hydrogen concentration. In addition, if forced containment air-circulation is deemed appropriate during post-accident recovery, then nonsafety-grade fan coolers are available for use by the operators.

In the event of a hydrogen release to the containment, passive autocatalytic recombiners (PARs), act to recombine hydrogen an oxygen on a catalytic surface (see Section 6.2.4.2.2). The enthalpy of reaction generates heat within a PAR, which drives mixing by natural circulation. Catalytic recombiners reduce hydrogen concentration at very low hydrogen concentrations (<1 percent) and very high steam concentrations, and may also promote convection to complement PCS natural circulation currents to inhibit stratification of the containment atmosphere (Reference 18). The implementation of PARs has a favorable impact on both containment mixing and hydrogen mitigation.

6.2.4.1.2 Survivability of System

The portion of the containment hydrogen control system required for the design basis LOCA is designed to withstand the dynamic effects associated with postulated accidents, the environment existing inside the containment following the postulated accident, and a safe shutdown earthquake.

The containment hydrogen control equipment provided to mitigate severe accident conditions is designed to function under the event environment including the effects of combustion of hydrogen in containment.

6.2.4.1.3 Single Failure Protection

The hydrogen monitoring function and the hydrogen recombination subsystem are designed to accommodate a single failure. The hydrogen ignition system, since it is provided only to address a low-probability severe accident, is not designed to accommodate ~~a single the more~~ probable component and system failure.

6.2.4.1.4 Validity of Hydrogen Monitoring

The hydrogen monitoring function monitors diverse locations within the containment to detect variations in hydrogen concentration.

6.2.4.1.5 Hydrogen Control for Design Basis Accident

The containment hydrogen concentration is prevented from exceeding four volume percent. This limit eliminates the potential for flammable conditions from being reached.

6.2.4.1.6 Hydrogen Control for Severe Accident

The containment hydrogen concentration is prevented from exceeding 10 volume percent. This limit, while allowing deflagration of hydrogen (burning of the hydrogen with flame front propagation at subsonic velocity), prevents the occurrence of hydrogen detonation (burning of hydrogen with supersonic flame front propagation).

6.2.4.2 System Design

6.2.4.2.1 Hydrogen Concentration Monitoring Subsystem

The hydrogen concentration monitoring subsystem is designed as Class 1E and seismic Category I. The subsystem consists of two independent trains. Each train consists of eight hydrogen sensors in various locations throughout the containment free volume including the upper dome and containment compartments.

Each of the hydrogen sensors consists of a thermal conductivity detector and amplifier powered by a Class 1E power source. Sensor parameters are provided in Table 6.2.4-1. Hydrogen concentration is continuously indicated and recorded in the main control room. Additionally, high hydrogen concentration alarms are annunciated in the main control room.

The hydrogen sensors are designed as Class 1E, seismic Category I instruments. Each sensor consists of a thermal conductivity detector and amplifier. The detector includes a block with appropriately arranged cavities and gas passages. Four electrical elements are mounted in the cavities. Two elements are exposed to a sample atmosphere and the other two are exposed to a hydrogen-free reference gas of constant composition. The atmosphere sample reaches the thermal conductivity detector by diffusion through two porous metal barriers which act as flame arrestors between the detector elements and the atmosphere. The sensors are designed to provide a rapid response detection of changes in the containment hydrogen concentration. The response time of the sensor is 90 percent in 10 seconds.

The four elements are electrically connected to form a bridge circuit through which the current is passed to heat the elements. The two elements exposed to the reference gas lose heat to the block at a constant rate and consequently have a stable temperature. The two elements exposed to the sample atmosphere dissipate heat at a rate that varies with the sample composition. Consequently, the temperature varies with variations in the sample hydrogen concentration. The element resistance changes with the temperature so that the bridge is electrically unbalanced. This unbalance is exhibited as a voltage that is proportional to the hydrogen concentration in the sample atmosphere.

6.2.4.2.2 Hydrogen Recombination Subsystem

The hydrogen recombination subsystem is designed to accommodate the relatively slow hydrogen production rate anticipated for a design-basis LOCA. The hydrogen recombination subsystem consists of two ~~electric recombiners~~ passive autocatalytic recombiners installed inside the containment above the operating deck at elevation 162′ approximately 13 feet inboard from the containment shell. The PARs are simple and passive in nature without moving parts and independent of the need for electrical power or any other support system. The subsystem will therefore operate following an accident resulting in the generation of hydrogen independent of the availability of power.

Normally, oxygen and hydrogen recombine by rapid burning only at elevated temperatures (greater than about 600°C). However, in the presence of catalytic materials such as the platinum group, this "catalytic burning" occurs even at temperatures below 0°C. Adsorption of the oxygen and hydrogen molecules occurs on the surface of the catalytic metal because with of attractive forces of the atoms or molecules on the catalyst surface. PAR devices use palladium or platinum as a catalyst to combine molecular hydrogen of oxygen gases into water vapor. The catalytic process can be summarized by the following steps (Reference 16): 1) diffusion of the reactants (oxygen and hydrogen) to the catalyst; 2) reaction of the catalyst (chemisorption); 3) reaction of intermediates to give the product (water vapor); 4) desorption of the product; and 5) diffusion of the product away from the catalyst. The reactants must get to the catalyst before they can react and subsequently the product must move away from the catalyst before more reactants will be able to react.

The PAR device consists of a stainless steel enclosure providing both the structure for the device and support for the catalyst material. The enclosure is open on the bottom and top and extends above the catalyst elevation to provide a chimney to yield additional lift to enhance the efficiency and ventilation capability of the device. The catalyst material is either constrained within screen cartridges or deposited on a substrate material and supported within the enclosure. The spaces between the cartridges or plates serve as ventilation channels for the throughflow. During operation, the air inside the recombiner is heated by the recombination process, causing it to rise by natural convection. As it rises, replacement air is drawn into the recombiner through the bottom of the PAR and heated by the exothermic reaction, forming water vapor and exhausted through the chimney where the hot gases mix with containment atmosphere. The device is a molecular diffusion filter ~~(not a fixed-bed particle filter)~~ and thus the open flow channels are not susceptible to fouling.

PARs begin the recombination of hydrogen and oxygen almost immediately upon exposure to these gases. The recombination process occurs at room temperature during the early period of accidents prior to the buildup of flammable gas concentrations. PARs are effective over a wide range of ambient temperatures, concentrations of reactants (rich and lean, oxygen/hydrogen <1%) and steam inerting (steam concentrations >50%). Although the PAR depletion rate reaches peak efficiency within a short period of time, the rate varies with hydrogen concentration and containment pressure. Reference 17 provides ~~the~~ a typical depletion rate ~~for one vendor's equipment~~. This rate is used for the analysis presented in Figure 6.2.4-~~3~~1 "Hydrogen Concentration."

Examinations have been performed to evaluate the effect of inhibitors and poisons potentially present within containment post design basis accident (DBA) on the catalytic action. The results of the testing and studies demonstrate that inhibitors and poisons introduced during DBAs will not significantly affect the recombination capacity of the PARs (References 17, 18). Further, the hydrogen concentration following an accident with only one of the two available PARs operating within containment demonstrates significant margin to maintaining hydrogen concentrations below the recommendations of Regulatory Guide 1.7, Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant Accident.

The depletion rate assumed in the analysis is based on the PAR described in Reference 17, but is expected to be representative of a number of vendor's recombiners. The calculated containment hydrogen concentration presented in Figure 6.2.4-~~3~~1 is based on the assumptions and analysis discussed is Section 6.2.4.3. The results demonstrate abundant margin for system performance.

~~Operation of the recombiners is not required until hydrogen concentration increases to 3.5 volume percent. The hydrogen concentration increases to 3.5 volume percent at six days after the design basis LOCA. The selection of this concentration to initiate recombiner operation provides margin to the flammability limit of four percent. Since operation of the recombiners is not required for six days, sufficient time is available to bring them into service before the hydrogen concentration in the containment reaches 3.5 volume percent.~~

~~The electric recombiners are resistance heating units with air flow established by convection. The air is heated to a temperature in excess of that required for the hydrogen to recombine with oxygen. Each recombiner consists of the following components:~~

- ~~A preheater section, consisting of a shroud placed around the central heaters, to take advantage of the heat conduction through the central walls for preheating the incoming air~~

- ~~An orifice plate to regulate the rate of air flow through the unit~~

- ~~A heater section, consisting of four banks of metal sheathed electric resistance heaters, to heat the air to the hydrogen oxygen recombination temperature~~

- ~~An exhaust chamber to mix the hot effluent with containment air in order to lower the temperature of the air flow leaving the recombiner~~

- ~~An outer enclosure to protect the unit.~~

The recombiners are safety-related equipment. They are seismic Category I and are qualified for the post-LOCA environment. The recombiners require no power supply and are self-actuated simply by the presence of the reactants, hydrogen and oxygen.~~are Class 1E design, but the power supplies are not Class 1E. The recombiners are actuated manually from the main control room. The control circuitry is Class 1E design with isolation provisions to protect the Class 1E electrical system from the use of non-Class 1E power by the recombiners.~~

~~The power supply cabinet for the recombiners is located outside containment and contains an isolation transformer and controller. Power is supplied either from the plant ac power system or from onsite standby diesel generators (nonsafety-related equipment). Should both the onsite and offsite power supplies be unavailable when recombiner operation is required, the capability is provided to power the recombiners from a diesel generator obtained from offsite. This generator is not part of the plant but would be obtained through normal commercial channels as temporary equipment.~~

~~During operation, the air inside the recombiner is heated, causing it to rise by natural convection. As it rises, replacement air is drawn into the recombiner through intake louvers downward through the preheater section which raises the air temperature and lowers its relative humidity. The preheated air then flows through an orifice plate, which is sized to maintain a 100 cfm flow rate, and into the heater section. In the heater section, the air is heated to a temperature above 1150°F. Above this temperature free hydrogen that is present reacts with atmospheric oxygen to form water vapor. After passing through the heater section, the air enters the mixing section which is a louvered chamber where the hot gases are mixed with containment atmosphere prior to being discharged to the containment.~~

A summary of component data for the hydrogen recombiners is provided in Table 6.2.4-2.

6.2.4.2.3 Hydrogen Ignition Subsystem

The hydrogen ignition subsystem is provided to address the possibility of an event that results in a rapid production of large amounts of hydrogen such that the containment hydrogen concentration exceed flammability limits before the hydrogen recombiners can be brought into use (and the rate of production exceeds the capacity of the recombiners even if they are available). This massive hydrogen production is postulated to occur as the result of a degraded core or core melt accident (severe accident scenario) in which up to 100 percent of the zirconium fuel cladding reacts with steam to produce hydrogen.

The hydrogen ignition subsystem consists of one train containing 58 hydrogen igniters strategically distributed throughout the containment. Since the igniters are incorporated in the design to address a low-probability severe accident, the hydrogen ignition system is not Class 1E.

The locations of the igniters are based on evaluation of hydrogen transport in the containment and the hydrogen combustion characteristics. Locations include compartmented areas in the containment and various locations throughout the free volume, including the upper dome.

For enclosed areas of the containment, at least two igniters are installed. The separation between igniter locations is selected to prevent the velocity of a flame front initiated by one igniter from becoming significant before being extinguished by a similar flame front propagating from another igniter.

The igniter assembly is a glow plug design which is designed to maintain the glow plug surface at 1700°F in the anticipated containment environment following a LOCA. A spray shield is provided to protect the igniter from falling water drops (resulting from condensation of steam on the containment shell and on nearby equipment and structures). Design parameters for the igniters are provided in Table 6.2.4-3.

6.2.4.2.4 Containment Purge

Containment purge is not part of the containment hydrogen control system. The purge capability of the containment air filtration system (see Ssubsection 9.4.7) can be used to provide containment venting prior to post-LOCA cleanup operations.

6.2.4.3 Design Evaluation (Design-Basis Accident)

6.2.4.3.1 Hydrogen Production and Accumulation

Following a LOCA, hydrogen may be added to the reactor containment atmosphere by reaction of the zirconium fuel cladding with water, by radiolysis of water, by corrosion of materials of construction, and by release of the hydrogen contained in the reactor coolant system. The assumptions used in calculating the hydrogen release to containment are listed in Table 6.2.4-4.

6.2.4.3.1.1 Zirconium-Water Reaction

Zirconium fuel cladding reacts with steam according to the following equation:

$$Zr + 2\ H_2O \rightarrow ZrO_2 + 2\ H_2 + \text{heat}$$

There is 8.5 standard cubic feet (SCF) of hydrogen produced for each pound of zirconium that is reacted.

The extent of the zirconium-water reaction is dependent on the effectiveness of the core cooling. An evaluation of the AP600 design shows that there is no zirconium-water reaction. The NRC model presented in Regulatory Guide 1.7 conservatively assumes that the cladding oxidizes to a depth of 0.00023 inch. For the 0.0225 inch cladding thickness used for AP600 fuel, this constitutes 1.09 percent of the zirconium. The hydrogen produced by the reaction of zirconium is 3000 SCF. This hydrogen is assumed to be released to the containment atmosphere at the beginning of the accident.

6.2.4.3.1.2 Radiolysis of Water

Water radiolysis is a complex process involving reactions of numerous intermediates. However, the overall radiolytic process may be described by the equation:

$$H_2O \rightleftarrows H_2 + \frac{1}{2} O_2$$

Post-accident conditions in the containment create two distinct radiolytic environments. One environment exists inside the reactor vessel where radiolysis occurs due to energy emitted by decaying fission products in the fuel and absorbed by the cooling water. The second environment exists outside the reactor vessel, in the post-accident cooling solution itself, where radiolysis occurs due to the absorption of decay energy emitted by the fission products retained in the solution. The two basic differences between the core environment and the solution environment that affect the rate of hydrogen production are the fraction of energy absorbed by ~~the basic differences between the core environment and the solution environment that affect the rate of hydrogen production are the fraction of energy absorbed by~~ the water and the type of flow regime.

The rate of hydrogen production from radiolysis depends on the rate of energy absorption by the solution. Analysis of energy deposition in the reactor core where decaying fission products are retained in the fuel shows that beta radiation constitutes roughly 50 percent of the total decay energy. Since the beta radiation is absorbed by the fuel and the fuel clad, this energy is not available to the solution to contribute to the radiolysis of water. Additionally, most of the gamma radiation energy is absorbed by the fuel, fuel cladding, and other components; or it passes through the water without being absorbed. The solution in the reactor vessel would absorb approximately seven percent of the gamma radiation energy. However, consistent with Regulatory Guide 1.7, it is assumed that 10 percent of the core gamma energy is absorbed by the water.

For the post-accident cooling solution, in which the fission products released from the core are assumed to be dissolved, energy is emitted directly into the solution. All of the beta radiation is assumed to be absorbed by the water. Since the mass of water is relatively large compared to the penetrating capability of gamma radiation, it is also assumed that 100 percent of the gamma radiation energy is absorbed by the water.

The radiolytic decomposition of water is a reversible reaction. In the reactor vessel, where the products of radiolysis are continuously flushed away by the circulation of cooling solution, there is little chance for hydrogen and oxygen to accumulate. Consequently, recombination of hydrogen and oxygen is assumed not to occur because significant quantities of the two reactants are not available.

The post-accident cooling solution in the sump, however, is a deep and relatively static environment where the products of radiolysis are lost from solution primarily by molecular diffusion. Tests simulating post-accident sump conditions demonstrate that there is significant reverse reaction in the sump. Hence, there is an apparent reduction in the quantity of hydrogen produced per unit energy absorbed by the water.

The results of Westinghouse and Oak Ridge National Laboratory studies indicate maximum hydrogen yields of 0.44 molecules per 100 eV for core radiolysis and 0.3 molecules per 100 eV for solution radiolysis. The results of these studies are published in References 11, 12, and 13.

The analysis performed for the AP600 assumes a hydrogen yield of 0.5 molecules per 100 eV for both the core and the solution radiolysis cases. This value is conservative relative to the referenced studies and is consistent with the guidance of Regulatory Guide 1.7.

In a design basis LOCA there is expected to be no damage to the core and thus no release of activity from the core to the sump solution. The source term used for determining radiolysis production of hydrogen is conservatively ~~assumes a 100 percent release of the core gap inventory of iodine cesium and noble gases. This is equivalent to three percent of the core inventory (see Appendix 15A for a discussion of the fission product gap inventory model). This source term is a deviation from the~~ based on guidance of Regulatory Guide 1.7 which states that 100 percent of noble gases, 50 percent of iodines, and ~~one~~ 1 percent of other nuclides are assumed to be released from the core even though it ~~. To achieve large releases of activity from the core, there has to be major core degradation. This~~ is inconsistent with the limited amount of fuel cladding reaction that is determined to take place.

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~~The result of this change from the source term identified in Regulatory Guide 1.7 is that the in-vessel source term is increased and the sump solution source term is decreased.~~ Appendix 15A provides the core fission product inventory at shutdown.

Table 6.2.4-4 contains a summary of the assumptions used in the analysis of hydrogen produced from radiolysis. Production of hydrogen as a function of time is shown graphically in Figure 6.2.4-~~1~~ 2 and the accumulation of hydrogen is shown in Figure 6.2.4-~~2~~ 3.

6.2.4.3.1.3 Corrosion of Metals

In the environment that would exist inside the containment following a postulated LOCA, aluminum and zinc corrode to form hydrogen gas. Table 6.2.4-5 lists the inventory of aluminum and zinc inside the containment.

Aluminum corrosion may be described by the overall reaction:

$$2\ Al + 3\ H_2O \rightarrow Al_2O_3 + 3\ H_2$$

About 21.4 SCF of hydrogen gas is produced for each pound of aluminum corroded.

The corrosion of zinc is described by the following reaction:

$$Zn + 2\ H_2O \rightarrow Zn(OH)_2 + H_2$$

About 5.9 SCF of hydrogen gas is produced for each pound of zinc corroded.

The corrosion rates for both aluminum and zinc are dependent on the post-accident temperature and pH conditions that the materials are subjected to. Table 6.2.4-5 provides the time-temperature cycle considered in the analysis of aluminum and zinc corrosion and also the corrosion rates for the metals at these temperatures.

Production of hydrogen as a function of time is shown graphically in Figure 6.2.4-~~1~~ 2 and the accumulation of hydrogen is shown in Figure 6.2.4-~~2~~ 3.

6.2.4.3.1.4 Initial Reactor Coolant Hydrogen Inventory

During normal operation of the plant, hydrogen is dissolved in the reactor coolant and is also contained in the pressurizer vapor space. Following a LOCA this hydrogen is assumed to be immediately released to the containment atmosphere. Table 6.2.4-4 lists the assumptions used for determining the amount of hydrogen from this source. The total hydrogen released to the containment as a result of this source is ~~808~~ 1171 SCF.

6.2.4.3.2 Hydrogen Mixing

The AP600 is designed to prevent the accumulation of hydrogen in compartments. If there is the possibility of accumulation in compartments, venting is provided to allow the hydrogen to escape to the larger containment volume. Mixing of the containment air mass is accomplished through natural processes as a result of the passive cooling of the containment that induces a recirculating air flow in the containment.

6.2.4.3.3 Hydrogen Recombination

Assuming no hydrogen removal, the concentration of hydrogen in the containment atmosphere increases with time as shown in Figure 6.2.4-~~3~~ 4. The curve shows that the flammability limit of four volume percent is not reached until after ~~six~~ 30 days. Hydrogen recombination is initiated prior to reaching this limit. The recombiners are ~~brought into~~ assumed to be in service ~~by the time the hydrogen concentration reaches 3.5 volume percent. From Figure 6.2.4-3, this is six days after the accident.~~ within 10 minutes of an accident initiation and the containment concentration remains well below the limit of 4.0 volume percent. Figure 6.2.4-~~3~~ 4 also shows the impact of operation of one of the two recombiners on containment hydrogen concentration. The hydrogen concentration ~~is quickly reduced~~, never exceeds one volume percent indicating ample margin in the hydrogen recombiner capacity.

6.2.4.4 Design Evaluation (Severe Accident)

Although a severe accident involving major core degradation or core melt is not within the category of design basis accidents, the containment hydrogen control system contains design features specifically to address this potential occurrence. The hydrogen monitoring subsystem has sufficient range to monitor concentrations up to 20 percent hydrogen. The hydrogen ignition subsystem is provided so that hydrogen is burned off in a controlled manner, preventing the possibility of deflagration with supersonic flame front propagation which would result in large pressure spikes in the containment.

The hydrogen released to the containment due to initial inventory of hydrogen in the coolant would be the same as for the design basis case (see ~~S~~subsection 6.2.4.3.1.4).

The hydrogen production due to corrosion of aluminum and zinc or to radiolysis of water is not of concern for evaluating the containment hydrogen control system for the severe accident since hydrogen production from these sources takes place at a relatively slow rate and over a long period of time.

It is assumed that 100 percent of the fuel cladding zirconium reacts with steam. This reaction may take several hours to complete. The igniters initiate hydrogen burns at concentrations less than 10 percent by volume and prevent the containment hydrogen concentration from exceeding this limit. The evaluation of hydrogen control by the igniters is presented in the AP600 PRA.

6.2.4.5 Tests and Inspections

6.2.4.5.1 Hydrogen Monitoring Subsystem

Functional and preoperational testing is performed after installation and prior to plant startup to verify performance. The system is normally in service. Periodic testing and calibration are performed to provide ongoing confirmation that the hydrogen monitoring function can be reliably performed.

6.2.4.5.2 Hydrogen Recombination Subsystem

Functional and preoperational testing is performed ~~after installation and~~ prior to plant startup to verify performance. Periodic inspection and testing are performed to provide ongoing confirmation that the hydrogen recombiners can ~~be reliably~~ operate~~d~~ reliably.

Each recombiner can be tested during ~~normal~~ plant ~~operation~~ shutdown to demonstrate operability. ~~To support periodic testing, a thermocouple readout is provided in the main control room to monitor temperatures in the recombiner.~~

A sample of cartridges or plates are selected and removed from each PAR and surviellance bench tests are performed on the ~~[illegible]~~ removed specimens to confirm continued satisfactory performance. The specimen is placed in a performance test apparatus and exposed to a known air/hydrogen sample. The measured increase in temperature is used to indicate degradation in catalytic action.

6.2.4.5.3 Hydrogen Ignition Subsystem

Functional and preoperational testing is performed after installation and prior to plant startup to verify performance. Periodic inspection and testing are performed to provide ongoing confirmation that the hydrogen igniters can be reliably operated.

6.2.4.6 Combined License Information

This section has no requirement to be provided in support of the Combined License application.

6.2.5 Containment Leak Rate Test System

The reactor containment, containment penetrations and isolation barriers are designed to permit periodic leak rate testing in accordance with General Design Criteria 52, 53, and 54. The containment leak rate test system is designed to verify that leakage from the containment remains within limits established in the technical specifications, Chapter 16.

6.2.5.1 Design Basis

Leak rate testing requirements are defined by 10 CFR 50 Appendix J, "Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors," which classifies leak tests as Types A, B and C.

6.2.5.1.1 Safety Design Basis

The containment leak rate test system serves no safety-related function other than containment isolation, and therefore has no nuclear safety design basis except for containment isolation. See ~~S~~subsection 6.2.3 for the containment isolation system.

6.2.5.1.2 Power Generation Design Basis

The containment leak rate test system is designed to verify the leaktightness of the reactor containment. The specified maximum allowable containment leak rate is 0.12 weight percent of the containment air mass per day at the calculated peak accident pressure, P_a, identified in ~~S~~subsection 6.2.1~~8~~. The system is specifically designed to perform the following tests in accordance with the provisions of ANSI-56.8 (Reference 14): 1

- Containment integrated leak rate testing (Type A): The containment is pressurized with clean, dry air to a pressure of P_a. Measurements of containment pressure, dry bulb temperature and dew point temperature are used to determine the decrease in the mass of air in the containment over time, and thus establish the leak rate.

- Local leak rate testing of containment penetrations whose design incorporates features such as resilient seals, gaskets, and expansion bellows (Type B): The leakage limiting boundary is pressurized with air or nitrogen to a pressure of P_a and the pressure decay or the leak flow rate is measured.

- Local leak rate testing of containment isolation valves (Type C): The piping test volume is pressurized with air or nitrogen to a pressure of P_a and pressure decay or the leak flow rate is measured. For valves sealed with a fluid such as water, the test volume is pressurized with the seal fluid to a pressure of not less than 1.1 P_a.

The containment leak rate test system piping is also designed for use during performance of the containment structural integrity test. The instrumentation used for the structural integrity test may be different than that used for the integrated leak rate test.

6.2.5.1.3 Codes and Standards

The containment leak rate test system is designed to conform to the applicable codes and standards listed in Section 3.2. Except as described in Table 6.2.5-1, the containment leak testing program satisfies Appendix J requirements.

6.2.5.2 System Description

6.2.5.2.1 General Description

The containment leak rate test system is illustrated on Figure 6.2.5-1. Unless otherwise indicated on the figure, piping and instrumentation is permanently installed. Fixed test connections used for Type C testing of piping penetrations are not shown on Figure 6.2.5-1. These connections are not part of the containment leak rate test system and are shown on the applicable system piping and instrument diagram figure.

Air compressor assemblies used for Type A testing are temporarily installed in the yard area near the Annex II building, and are connected to the permanent system piping. The number and capacity of the compressors is sufficient to pressurize the containment with air to a pressure of P_a at a maximum containment pressurization rate of about five psi/hour. The compressor assemblies include additional equipment, such as air coolers, moisture separators and air dryers to reduce the moisture content of the air entering containment.

Temperature and humidity sensors are permanently installed inside containment for Type A testing. Data acquisition hardware and instrumentation are permanently installed outside containment, in the auxiliary building. Instrumentation which is not required during plant operation for gross leak rate testing may be installed temporarily for the Type A tests.

The system is designed to permit depressurization of the containment at a maximum rate of 10 psi/hour.

Portable leak rate test panels are used to perform Type C containment isolation valve leak testing using air or nitrogen. The panels are also used for Type B testing of penetrations, for which there is no permanently installed test equipment. The panels include pressure regulators, filters, pressure gauges and flow instrumentation, as required to perform specific tests.

6.2.5.2.2 System Operation

Containment Integrated Leak Rate Test (Type A)

An integrated leak rate test of the primary reactor containment is performed prior to initial plant operation, and periodically thereafter, to confirm that the total leakage from the containment does not exceed the maximum allowable leak rate. The allowable leak rate specified in the test criteria is less than the maximum allowable containment leak rate, in accordance with Appendix J.

Following construction of the containment and satisfactory completion of the structural integrity test, described in Ssubsection 3.8.2.7, a preoperational Type A test is performed as described in Chapter 14. Additional Type A tests are conducted during the plant life, at intervals in accordance with the technical specifications, Chapter 16.

- **Pretest Requirements**

Prior to performing an integrated leak rate test, a number of pretest requirements must be satisfied as described in this subsection.

A general inspection of the accessible interior and exterior surfaces of the primary containment structure and components is performed to uncover any evidence of structural deterioration that could affect either the containment structural integrity or leaktightness. If there is evidence of structural deterioration, corrective action is taken prior to performing the Type A test. The structural deterioration and corrective action are reported in accordance with 10 CFR 50, Appendix J. Except as described above, during the period between the initiation of the containment inspection and the performance of the Type A test, no repairs or adjustments are made so that the containment can be tested in as close to the "as-is" condition as practical.

Containment isolation valves are placed in their post-accident positions, identified in Table 6.2.3-1, unless such positioning is impractical or unsafe. Test exceptions to post-accident valve positioning are identified in Table 6.2.3-1 or are discussed in the test report. Closure of containment isolation valves is accomplished by normal operation and with no preliminary exercising or adjustments (such as tightening of a valve by manual handwheel after closure by the power actuator). Valve closure malfunctions or valve leakage that requires corrective action before the test is reported in conjunction with the Type A test report.

Those portions of fluid systems that are part of the reactor coolant pressure boundary and are open directly to the containment atmosphere under post-accident conditions and become an extension of the boundary of the containment, are opened or vented to the containment atmosphere prior to and during the test.

Portions of systems inside containment that penetrate containment and could rupture as a result of a LOCA are vented to the containment atmosphere and drained of water to the extent necessary to provide exposure of the containment isolation valves to containment air test pressure and to allow them to be subjected to the full differential test pressure, except that:

- Systems that are required to maintain the plant in a safe condition during the Type A test remain operable and are not vented.

- Systems that are normally filled with water and operating under post-accident conditions are not vented.

Systems which are not required to be vented and drained for Type A testing are identified in Table 6.2.3-1. The leak rates for the containment isolation valves in these systems, measured by Type C testing, are reported in the Type A test report.

Tanks inside the containment are vented to the containment atmosphere as necessary to protect them from the effects of external test pressure and/or to preclude leakage which could affect the accuracy of the test results. Similarly, instrumentation and other components that could be adversely affected by the test pressure are vented or removed from containment.

The containment atmospheric conditions are allowed to stabilize for a period of at least four hours prior to the start of the Type A test. The containment ventilation and cooling water systems are operated as necessary prior to, and during, the test to maintain stable test conditions.

- **Test Method**

The Type A test is conducted in accordance with ANSI-56.8, using the absolute method. The test duration is at least eight hours following the stabilization period. Periodic measurements of containment pressure, dry bulb temperatures and dew point temperatures (water vapor pressure) are used to determine the decrease in the mass of air in the containment over time. A standard statistical analysis of the data is conducted using a linear least-squares-fit regression analysis to calculate the leak rate and the upper 95 percent confidence limit.

The accuracy of the Type A test results is then verified by a supplemental test. The supplemental verification test is performed using either the superimposed leak method or the mass step change method, as described in ANSI-56.8.

Test criteria for the Type A test and the supplemental verification test are given in the technical specifications. If any Type A test fails to meet the criteria, the test schedule for subsequent tests is adjusted in accordance with 10 CFR 50, Appendix J .

During the period between the completion of one Type A test and the initiation of the containment inspection for the subsequent Type A test, repairs or adjustments are made to components identified as exceeding individual leakage limits, as soon as practical after such leakage is identified.

Containment Penetration Leak Rate Tests (Type B)

The following containment penetrations receive preoperational and periodic Type B leak rate tests in accordance with ANSI-56.8:

- Penetrations whose design incorporates resilient seals, gaskets or sealant compounds
- Air locks and associated door seals
- Equipment and access hatches and associated seals
- Electrical penetrations

Containment penetrations subject to Type B tests are illustrated in Figure 6.2.5-1.

The fuel transfer tube penetration is sealed with a blind flange inside containment. The flanged joint is fitted with testable seals as shown in Figure 3.8.2-4. The two expansion bellows used on the fuel transfer tube penetration are not part of the leakage-limiting boundary of the containment.

The personnel hatches (airlocks) are designed to be tested by internal pressurization. The doors of the personnel hatches have testable seals as shown in Figure 3.8.2-3. Mechanical and electrical penetrations on the personnel hatches are also equipped with testable seals. The hatch cover flanges for the main equipment and maintenance hatches have testable seals as shown in Figure 3.8.2-2. Containment electrical penetrations have testable seals as shown in Figure 3.8.2-6.

Type B leak tests are performed by local pressurization using the test connections shown on Figure 6.2.5-1. Unless otherwise noted in Table 6.2.3-1, the test pressure is not less than the calculated containment peak accident pressure, P_a. Either the pressure decay or the flowmeter test method is used. These test methods and the test criteria are presented below for Type C tests.

Containment Isolation Valve Leak Rate Tests (Type C)

Containment isolation valves receive preoperational and periodic Type C leak rate tests in accordance with ANSI-56.8. A list of containment isolation valves subject to Type C tests is provided in Table 6.2.3-1. Containment isolation valve arrangement and test connections provided for Type C testing, are illustrated on the applicable system piping and instrument diagram figure.

Type C leak tests are performed by local pressurization. Each valve to be tested is closed by normal means without any preliminary exercising or adjustments. Piping is drained and vented as needed and a test volume is established that, when pressurized, will produce a differential pressure across the valve. Table 6.2.3-1 identifies the direction in which the differential pressure is applied.

Isolation valves whose seats may be exposed to the containment atmosphere subsequent to a LOCA are tested with air or nitrogen at a pressure not less than P_a. Valves in lines which are designed to be, or remain, filled with a liquid for at least 30 days subsequent to a LOCA are leak rate tested with that liquid at a pressure not less than 1.1 times P_a. Isolation valves tested with liquid are identified in Table 6.2.3-1.

Isolation valves are tested using either the pressure decay or flowmeter method. For the pressure decay method the test volume is pressurized with air or nitrogen. The rate of decay of pressure in the known volume is monitored to calculate the leak rate. For the flowmeter method pressure is maintained in the test volume by supplying air or nitrogen through a calibrated flowmeter. The measured makeup flow rate is the isolation valve leak rate.

The leak rates of penetrations and valves subject to Type B and C testing are combined in accordance with Appendix J. As each Type B or C test, or group of tests, is completed the combined total leak rate is revised to reflect the latest results. Thus, a reliable summary of containment leaktightness is maintained current. Leak rate limits and the criteria for the combined leakage results are described in the technical specifications.

Scheduling and Reporting of Periodic Tests

Schedules for the performance of periodic Type A, B, and C leak rate tests are in accordance with the technical specifications, Chapter 16. Provisions for reporting test results are described in the technical specifications.

Type B and C tests may be conducted at any time that plant conditions permit, provided that the time between tests for any individual penetration or valve does not exceed the maximum allowable interval specified in the technical specifications, Chapter 16.

Special Testing Requirements

AP600 does not have a subatmospheric containment or a secondary containment. There are no containment isolation valves which rely on a fluid seal system. Thus, there are no special testing requirements.

6.2.5.2.3 Component Description

The system pressurization equipment is temporarily installed for Type A testing. In addition to one or more compressors, this hardware includes components such as aftercoolers, moisture separators, filters and air dryers. Although the hardware characteristics may vary from test to test, the pressurization equipment must meet the requirements of Table 6.2.5-2.

The flow control valve in the pressurization line is a leaktight ball valve capable of throttling to a low flow rate.

6.2.5.5. Combined License Information
This section has no requirements to be provided in support of combined license application.

6.2.5.2.4 Instrumentation Applications

For Type A testing, instruments are provided to measure containment absolute pressure, dry bulb temperature, dew point temperature, air flow rate, and atmospheric pressure. Data acquisition equipment scans, processes and records data from the individual sensors. For Type B and C testing, instruments are provided to measure pressure, dry bulb temperature, and flow rate.

The quantity and location of Type A instrumentation and permanently installed Type B instrumentation, is indicated on Figure 6.2.5-1. The type, make and range of test instruments may vary from test to test. The instrument accuracy must meet the criteria of Reference 14.

6.2.5.3 Safety Evaluation

The containment leak rate test system has no safety related function, other than containment isolation and therefore requires no nuclear safety evaluation, other than containment isolation which is described in ~~S~~subsection 6.2.3.

6.2.5.4 Inservice Inspection/Inservice Testing

There are no special inspection or testing requirements for the containment leak rate test system. Test equipment is inspected and instruments are calibrated prior to testing in accordance with ANSI-56.8 criteria and the requirements of the test procedure.

6.2.6 References

1. ~~Woodcock, J., et al., "Westinghouse GOTHIC : A Computer Code for Analyses of Thermal Hydraulic Transients for Nuclear Plant Containments and Auxiliary Buildings," WCAP 13246, June 1992.~~Kennedy, M., et al., "WGOTHIC Code Description and Validation," WCAP-14382, to be issued in July.

2. "Ice Condenser Containment Pressure Transient Analysis Methods," WCAP-8077, March, 1973 (Proprietary), WCAP-8078 (Non-Proprietary), .

3. Shepard, R. M., et. al., "Westinghouse Mass and Energy Release Data for Containment Design," WCAP-8264-P-A, June 1975 (Proprietary), and WCAP-8312-A, Revision 2, August 1975 (Non-Proprietary).

4. "Westinghouse LOCA Mass and Energy Release Model for Containment Design - March 1979 Version," WCAP-10325, May 1983 (Proprietary).

5. Land, R. E., "Mass and Energy Releases Following A Steam Line Rupture," WCAP-8822 (Proprietary) and WCAP-8860 (Nonproprietary), September 1976.

6. Burnett, T. W. T., "LOFTRAN Code Description," WCAP-7907-P-A (Proprietary) and WCAP-7907-A (Nonproprietary), June 1984.

7. WCAP-8327 [Proprietary] and WCAP-8326 [Non-Proprietary], "Containment Pressure Analysis Code (COCO)~~"~~," Bordelon, F. M., and Murphy, E. T., June 1974.

8. WCAP-8339, "Westinghouse ECCS Evaluation Model - Summary," Bordelon, F. M., et al., June 1974.

9. 10 CFR 50.46~~"~~," Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Cooled Nuclear Power Reactors," and Appendix K to 10 CFR 50, "ECCS Evaluation Model."

10. Branch Technical Position CSB6-1, "Minimum Containment Pressure Model for PWR ECCS Performance Evaluation."

~~10.~~ 11. Bajorek, S.M., Hochreiter, L.E., Young, M.Y., Dederer, S.I., Nissley, M.E., Tsai, C.K., Yeh, H.C., Chow, S.K., Takeuchi, K., Cunningham, J.P. and Stucker, D.L., "Code Qualification Document for Best Estimate Analysis," Volume 1, WCAP-12945-P, Revision 1, [Proprietary], June 1992.

~~11~~ 12. Fletcher, W.D., Bell, M.J., and Picone, L.F., "Post-LOCA Hydrogen Generation in PWR Containments," Nuclear Technology 10, pp 420-427, 1971.

~~12.~~ 13. Zittel, H.E., and Row, T.H., "Radiation and Thermal Stability of Spray Solutions," Nuclear Technology 10, pp 436-443, 1971.

~~13.~~ 14. Allen, A.O., The Radiation Chemistry of Water and Aqueous Solutions, Princeton, N.J., Van Nostrand, 1961.

~~14.~~ 15. ANSI/ANS-56.8-1987, "Containment System Leakage Testing Requirements~~"~~."

~~15.~~ 16. 10 CFR 50, Appendix J (Draft Proposed Revision), "Containment Leak Rate Testing," January 10, 1992.

~~16.~~ 17. Thomas C. L. Catalytic Processes and Proven Catalysts, Academic Press, 1970.

18. J. Rohde, et al., Hydrogen Mitigation by Catalytic Recombiners and Ignition During Severe Accidents," Third International Conference on Containment Design and Operation, Canadian Nuclear Society, Toronto, Ontario, October 19-21, 1994.

~~17.~~ 19. J. C. DeVine, Jr. "Passive Autocatalytic Recombiners for Combustible Gas Control in ALWR's," to Mr. James Wilson, April 8, 1993.

~~18.~~ 20. Koroll, G. W. "Controlling Containment H_2 Levels after an Accident," Nuclear Engineering International, May 1995, pp. 26-27.

Table 6.2.1.1-~~2~~1

SUMMARY OF CALCULATED PRESSURES AND TEMPERATURES

Break	Peak Pressure (psig)	Available[1] Margin (psi)	Peak~~[2]~~ Temperature (°F)
Double-ended hot leg guillotine	~~38.6~~40.6	~~6.4~~4.4	~~353.1~~338.6
Double-ended cold leg guillotine	~~39.5~~41.0	~~5.5~~4.0	~~283.0~~282.9
1.388 ft^2, full DER, 102% power, MSIV failure	~~41.2~~40.5	~~3.8~~4.5	~~320.3~~328.1
1.388 ft^2, full DER, 30% power, MSIV failure	~~41.4~~43.6	~~3.6~~1.4	~~305.1~~320.2

1. Design Pressure is 45 psig
2. ~~Localized temperature in the break compartment~~

Table 6.2.1.1-2

COVERAGE FRACTION VS. TIME FOR AP600

Time (hr)	Dome Top	Dome Middle	Dome Bottom	Cylinder Top	Cylinder Mid-Top	Cylinder Mid-Bottom	Cylinder Bottom
0.183	40%	40%	98%	61%	31%	14%	6%
2.167	40%	40%	100%	85%	52%	28%	16%
5.167	40%	40%	100%	100%	84%	57%	40%
5.667	40%	40%	85%	48%	35%	23%	16%
9.167	40%	40%	87%	53%	40%	29%	21%
15.17	40%	40%	88%	56%	45%	34%	26%
21.17	40%	40%	87%	66%	45%	35%	28%
26.17	40%	40%	78%	46%	38%	30%	24%

Table 6.2.1.1-43

INITIAL CONDITIONS

Internal Temperature (°F)	120
Pressure (psia)	15.7
Relative Humidity (%)	100
Net Free Volume (ft^3)	1.7 E+06
External Temperature (°F)	115 dry bulb 80 wet bulb

Table 6.2.1.1-4

RESULTS OF LOCA AND MSLB POSTULATED ACCIDENTS

Criterion	Acceptance Criterion Value	Distributed DECLG LOCA VALUE	LUMPED DEHLG LOCA Value	LUMPED DECLG LOCA Value	102% ~~100%~~ Power MSLB Value	30% ~~3%~~ Power MSLB Value	EXTERNAL PRESSURIZATION VALUE
GDC 16 & GDC 50 10% Margin to Design Pressure	< ~~40.5~~ 45. psig	43	40.6	41.0	40.5	43.6	—
GDC 38 Rapidly Reduce Containment Pressure	< ~~20.25~~ 22.5 psig	—	—	10.9	—	—	—
GDC 38 & GDC 50 Containment Heat Removal Single Failure	Most Severe			Copy over to One Train of PCS Water Supply	One Train of PCS Supply Fails	One Train of PCS Supply Fails	.
GDC 38 & 50 External Pressure	< 3 psid	—	—	—	—	—	2.04

Table 6.2.1.1-~~63~~5 (Sheet 1 of 10)

HEAT SINK PROPERTIES

Metallic Description	Heat Sink Number	Exposed Area (ft^2)	Thickness (ft)	Material	Paint
Reactor Cavity					
Containment Sump Pumps	1	18.84	0.083	SS	NONE
RCDT	2	~~176~~145.3	0.083	SS	NONE
RCDT Heat Exchange	3	~~35.32~~547.35	0.083	SS	NONE
HVAC Fans (2)	4	~~95~~62.06	0.002	CS	~~IZ+E~~CZE
Platform El. 83'-0	5	~~246~~360.8	0.00756	CS	~~IZ+E~~CZE
Platform El. 107'-2	6	1500.6	0.00756	CS	~~IZ+E~~CZE
Stairs El. 83'-0 to 107'-2	7	275.5	~~0.012~~0.011	CS	~~C+E~~NONE
Landing @ El. 92'-8~~, 97'-6, 102'-4~~	8	~~235.3~~258.3	0.00756	CS	~~IZ+E~~CZE
HVAC Duct	9	~~39~~104.0	0.0087	CS	~~C+E~~NONE
Accumulator Cavity Southeast					
Accumulator (01A)	10	767.7	0.166	CS	~~IZ+E~~CZ
Platform El. ~~96'-6~~98'-0	11	~~818.11~~2304.2	~~0.031~~0.00756	CS	~~IZ+E~~CZE
Stairs El. ~~96'-6~~98'-0 to 107'-2	12	~~121.6~~104.54	~~0.012~~0.011	CS	~~G+E~~NONE
Accumulator Cavity Northeast					
Accumulator (01B)	~~14~~13	767.7	0.166	CS	~~IZ+E~~CZ
Platform El. ~~96'-6~~98'-0	~~15~~14	~~818.11~~3360.4	0.00756	CS	~~IZ+E~~CZE
Stairs El. ~~96'-6~~98'-0 to 107-2	~~16~~15	~~121.6~~104.54	~~0.012~~0.011	CS	~~G+E~~NONE
Steam Generator Room East					
SG Lower Manway Platform (El. ~~104'-7~~109'-7)	~~17~~16	~~1882.47~~2240.1	~~0.00756~~0.0225	CS	~~IZ+E~~CZE
SG Tubesheet Platform (El. 113'-9)	~~18~~17	1710.27	0.00756	CS	~~IZ+E~~CZE
Operating Deck Platform (El. 135'-3)	~~19~~18	~~1318.31~~1678.5	0.00756	CS	~~IZ+E~~CZE
Stairs El. 104'-7 to 113'-g	19	104.54	0.011	CS	NONE

Table 6.2.1.1-~~65~~ 5 (Sheet 2 of 10)

HEAT SINK PROPERTIES

Metallic Description	Heat Sink Number	Exposed Area (ft^2)	Thickness (ft)	Material	Paint
Steam Generator Room West					
SG Support Column EL 83"-0 to 105'-7 1/2	20	181.39	0.13	CS	CZE
SG Upper Support	21	281.03	0.405	CS	CZE
SG Lower Manway Platform (El. 104'-7)	~~20~~22	~~1882.47~~2240.1	~~0.00756~~0.0225	CS	~~IZ+E~~CZE
SG Tubesheet Platform (El. 113'-9)	~~21~~23	1710.27	0.00756	CS	~~IZ+E~~CZE
Operating Deck Platform (El. ~~135'-3~~132'-0)	~~22~~24	~~1318.31~~1678.5	0.00756	CS	~~IZ+E~~CZE
Stairs From El. ~~135'-3 to 148'0~~104'-7 to 113'-9	~~23~~25	~~151.05~~104.54	~~0.012~~0.011	CS	~~G+E~~NONE
SG Support Column	26	181.39	0.13	CS	CZE
SG Upper Support	27	281.03	0.405	CS	CZE
CMT And CVS Room					
Letdown Heat Exchanger	~~24~~28	~~67.37~~9.72	~~1.25~~0.75	~~CS~~SS	~~IZ+E~~ NONE
Mixed Bed & Cation ~~Demineral~~ Demineralizer (3)	~~25~~29	~~332.08~~480.86	~~0.1875~~0.75	SS	NONE
Reactor Coolant Filters (2)	~~26~~30	~~95.5~~114.67	~~0.1875~~0.75	SS	NONE
Support Steel	~~27~~31	1449.32	~~0.0362~~0.0325	CS	~~IZ+E~~CZE
5" Vertical Shield Plate	~~28~~32	1252.95	~~0.417~~0.405	CS	~~IZ+E~~CZE
1½" Vertical Shield Plate	~~29~~33	992.87	~~0.0833~~0.07	CS	~~IZ+E~~CZE
~~37~~1" Vertical Shield Plate	~~30~~34	292.88	0.25	CS	~~IZ+E~~CZE
1" Horizontal Floor Plate	~~31~~35	241	~~0.0833~~0.07	CS	~~IZ+E~~CZE
3" Horizontal Floor Plate	~~32~~36	227.94	0.25	CS	~~IZ+E~~CZE
Sump Pumps (2)	~~33~~37	28.27	0.083	SS	NONE
Platform El. 88'-~~0~~2 & El. 95'-~~2~~10	~~34~~38	1328.4	0.00756	CS	~~IZ+E~~CZE
HVAC Ducts (2)	~~43~~39	505.5	0.0087	CS	~~G+E~~NONE
Core Make-up Tanks (02A) & (02B)	~~35~~40	~~1847~~1848.8	~~0.1666~~0.405	CS	~~IZ+E~~CZE
Primary Containment Vessel	~~39~~41	11063.75	~~0.135416~~0.13	CS	~~IZ+E~~CZE
Columns (1~~1~~7)	~~37~~42	~~2010.11~~3113.0	~~0.091~~0.0325	CS	~~IZ+E~~CZE
Floor Framing Beneath El. 135'-3	~~38~~43	~~2733.88~~7563.38	~~0.0734~~0.03	CS	~~IZ+E~~CZE
Elevator Stair Tower	~~36~~44	~~837.72~~436.92	~~0.021~~0.01632	CS	~~IZ+E~~CZE

Table 6.2.1.1-~~63~~5 (Sheet 3 of 10)

HEAT SINK PROPERTIES

Metallic Description	Heat Sink Number	Exposed Area (ft^2)	Thickness (ft)	Material	Paint
Maintenance Hatch	~~44~~45	321.8	~~0.172~~0.145	CS	~~IZ+E~~CZE
Platform El. 118'-6	~~40~~46	~~20074.5~~22508.5	~~0.022~~0.012	CS	~~IZ+E~~CZE
Stairway From El. 107'-2 to 135'-3	~~41~~47	320.15	~~0.012~~0.011	CS	~~G+E~~NONE
Rail Handle Above Reactor Access	~~43~~48	43.04	~~0.01386~~0.011	CS	~~G+E~~NONE
Refueling Canal					
Lower Internal Stand	~~45~~49	386.9	0.042	SS	NONE
Upper Internal Stand	~~46~~50	546.9	0.042	SS	NONE
Upender	~~47~~51	79.481	0.3666	SS	NONE
Refueling Canal Gate	~~48~~52	2016	~~0.0583~~0.042	SS	NONE
Platform El. 130'-3	53	279.83	0.00756	CS	CZE
IRWST Room					
Metallic Wall & Stiffeners	~~49~~54	7050.96	~~0.0583~~0.042	SS	NONE
~~**Cylindrical Central Room**~~					
~~None~~					
~~South Semi-Annulus Room~~Upper East Steam Generator Compartment					
~~Bridge Polar Crane~~	~~50~~	~~2241~~	~~0.1205~~	~~CS~~	~~IZ~~
Jib Crane	~~51~~55	~~203.39~~103.67	~~0.3344~~0.405	CS	~~IZ+E~~CZE
Feedwater Nozzle Platform (El. 149'-7)	~~52~~56	~~2840.27~~2806.45	0.00756	CS	~~IZ+E~~CZE
Upper Manway Platform (El. 162'-1)	~~53~~57	~~2840.27~~2806.45	0.00756	CS	~~IZ+E~~CZE
~~Fib~~Jib Crane	58	77.39	0.405	CS	CZE
Upper West Steam Generator Compartment					
~~Fib~~Jib Crane	59	103.67	0.405	CS	CZE
Feedwater Nozzle Platform El. 149'-7	60	2806.45	0.00756	CS	CZE
Upper Manway Platform El. 162'-1	61	2806.45	0.00756	CS	CZE
~~Fib~~Jib Crane	62	77.39	0.405	CS	CZE
Integrated Head Stand (1 side)	63	491.5	0.021	SS	NONE

Table 6.2.1.1-~~6~~ 5 (Sheet 4 of 10)

HEAT SINK PROPERTIES

Metallic Description	Heat Sink Number	Exposed Area (ft^2)	Thickness (ft)	Material	Paint
Refueling Machine (1 side)	64	742.2	0.07	CS	CZE
Platform El. 147'-3	65	457.7	0.00756	CS	CZE
South Inner Hall					
Refueling Machine (1 side)	66	819.8	0.07	CS	CZE
North Inner Hall					
Stairs El. 135'-3 to El. 148'-0	67	290.7	0.011	CS	NONE
Landings Stairs El. 140'-3/16, El. 142'-5, El. 144'-9/16	68	147.6	0.00756	CS	CZE
Platforms at El. 149'-7	69	120.0	0.00756	CS	CZE
Platforms at El. 155'-10	70	54.61	0.00756	CS	CZE
Platforms at El. 160'-6	71	1748.2	0.00756	CS	CZE
Platforms at El. 162'-1	72	54.61	0.00756	CS	CZE
Platforms at El. 169'-0	73	1748.2	0.00756	CS	CZE
Stairs from El. 148'-0 to El. 162'-1 and from El. 14[illegible] -0 to El. 169'-0	74	399.95	0.011	CS	NONE
Landings at El. 149'-7, El. 154'-4 5/16, El. 165'-3 5/16	75	262.2	0.00756	CS	CZE
North Mid Quadrant					
Elevator Support Structure	76	198.39	0.01632	CS	CZE
Elevator Support Structure	77	342.32	0.01632	CS	CZE
Internal Stiffener	78	356.675	0.07	CS	CZE
Platform at El. 16.162'-1	79	798.7	0.00756	CS	CZE
Elevator Stair Tower	80	241.18	0.01632	CS	CZE
Platform at El. 178'-0	81	90.2	0.00756	CS	CZE
HVAC Ring Duct	82	788.8	0.0087	CS	NONE
Crane Girder	83	494.9	0.13	CS	CZE
West Mid Quadrant					
Integrated Head Stand (1 side)	84	491.6	0.021	CS	NONE
Platform at El. 147'-3	85	457.7	0.00756	CS	CZE

Table 6.2.1.1-~~3~~5 (Sheet 5 of 10)

HEAT SINK PROPERTIES

Metallic Description	Heat Sink Number	Exposed Area (ft^2)	Thickness (ft)	Material	Paint
Stairs at El. 135'-3 to El. 147'-3	86	136.8	0.011	CS	NONE
Hydrogen Recombiner	87	204.75	0.0325	CS	CZE
Containment Recirculation Unit	88	700.28	0.004	CS	CZE
Internal Stiffener	89	356.675	0.07	CS	CZ
Platforms at El. 149'-7	90	1095.9	0.00756	CS	CZE
Walkway El. 162'-1	91	798.7	0.00756	CS	CZE
Platforms at El. 162'-1	92	1089.7	0.00756	CS	CZE
Containment Recirculation Unit	93	265.9	0.004	CS	CZE
HVAC Ring Duct	94	788.8	0.0087	CS	NONE
Crane Girder	95	494.9	0.13	CS	CZE
South Mid Quadrant					
Internal Stiffener	96	356.675	0.07	CS	CZE
Walkway El. 162'-1	97	798.7	0.00756	CS	CZE
HVAC Ring Duct	98	788.8	0.0087	CS	NONE
Crane Girder	99	494.9	0.13	CS	CZE
East Mid Quadrant					
Hydrogen Recombiner	100	204.75	0.0325	CS	CZE
Containment Recirculation Unit	101	700.28	0.004	CS	CZE
Internal Stiffener	102	356.675	0.07	CS	CZE
Platforms at El. 149'-7	103	1095.9	0.00756	CS	CZE
Walkway El. 162'-1	104	798.7	0.00756	CS	CZE
Platforms at El. 162'-1	105	1089.7	0.00756	CS	CZE
Containment Recirculation Unit	106	265.9	0.004	CS	CZE
HVAC Ring Duct	107	788.8	0.0087	CS	NONE
Crane Girder	108	494.9	0.13	CS	CZE

Table 6.2.1.1-~~3~~5 (Sheet 6 of 10)

HEAT SINK PROPERTIES

Metallic Description	Heat Sink Number	Exposed Area (ft^2)	Thickness (ft)	Material	Paint
North Outer Quadrant					
Platform at El. 135'-3	109	183.3	0.00756	CS	CZE
Internal Stiffener	110	402.1	0.007	CS	CZE
Platform at El. 162'-1	111	824.5	0.00756	CS	CZE
HVAC Ring Duct	112	788.8	0.0087	CS	CZE
Platform at El. 178'-0	113	24.6	0.00756	CS	CZE
Crane Girder	114	1101.1	0.13	CS	CZE
West Outer Quadrant					
Platform - Condensate Return Grating	115	824.35	0.00756	CS	CZE
Internal Stiffener	116	402.1	0.07	CS	CZE
Platform at El. 162'-1	117	824.5	0.00756	CS	CZE
HVAC Ring Duct	118	788.8	0.0087	CS	NONE
Crane Girder	119	1101.1	0.13	CS	CZE
South Outer Quadrant					
Platform - Condensate Return Grating	120	274.7	0.00756	CS	CZE
Internal Stiffener	121	402.1	0.07	CS	CZE
Platform at El. 162'-1	122	824.5	0.00756	CS	CZE
HVAC Ring Duct	123	788.8	0.0087	CS	NONE
Crane Girder	124	1101.1	0.13	CS	CZE
East Outer Quadrant					
Main Equipment Hatch (1 side)	125	307.6	0.25	CS	CZE
Internal Stiffener	126	402.1	0.07	CS	CZE
Platform at El. 162'-1	127	824.5	0.00756	CS	CZE
Main Equipment Hatch (1 side)	128	307.6	0.22	CS	CZE
HVAC Ring Duct	129	788.8	0.0087	CS	NONE
Crane Girder	130	1101.1	0.13	CS	CZE
Polar Crane Bridge and Motor Trolley	131	1996.0	0.145	CS	CZE

Table 6.2.1.1-~~6~~ 5 (Sheet 7 of 10)

HEAT SINK PROPERTIES

Metallic Description	Heat Sink Number	Exposed Area (ft^2)	Thickness (ft)	Material	Paint
North Inner Quadrant					
Polar Crane Bridge and Motor Trolley	132	1996.0	0.145	CS	CZE
West Inner Quadrant Motor					
Polar Crane Bridge and Meter Trolley	133	1996.0	0.145	CS	CZE
South Quadrant Inner					
Polar Crane Bridge and Motor Trolley	134	1996.0	0.145	CS	CZE
Air Baffle/Containment Gap					
Stairs; El. 242'-6 to 256'-4	142	157.662	0.011	CS	NONE
Landings; El. 246'-4 to El. 253'-8	143	73.8	0.00756	CS	CZE
Platforms; El. 241'-0	144	5207.0	0.00756	CS	CZE
Air Baffle/Shield Building Gap					
Platform Support Structure Beams and Hangers	151	1204.8	0.01632	CS	CZ
Platform at El. 239'-0	152	6955.65	0.00756	CS	CZE
Platform Support	153	1454.14	0.01632	CS	CZE
Lower Chimney					
Support Columns	154	277.51	0.0225	CS	CZE
Stairs	155	110.24	0.011	CS	NONE
Platform at El. 261'-0	156	142.106	0.00756	CS	CZE
Top Chimney					
Top Chimney at El. 298'-6	157	78.925	0.00756	CS	CZE
~~Movable Platforms~~	~~54~~	~~264.54~~	~~0.00756~~	~~CS~~	~~IZ+E~~
~~Stairs From El. 135'-3 to 148'-0~~	~~55~~	~~145.35~~	~~0.012~~	~~CS~~	~~G+E~~
~~Stairs From El. 149'-7 to 162'-1~~	~~56~~	~~142.5~~	~~0.012~~	~~CS~~	~~G+E~~
~~Landings @ El. 155'-10 & 142'-5~~	~~57~~	~~98.4~~	~~0.00756~~	~~CS~~	~~IZ+E~~
~~**North Semi-Annulus Room**~~					
~~Bridge Polar Crane~~	~~58~~	~~2241.1~~	~~0.1205~~	~~CS~~	~~IZ~~
~~Integrated Head Stand~~	~~59~~	~~255~~	~~0.5~~	~~SS~~	~~NONE~~

Table 6.2.1.1-~~63~~ 5 (Sheet 8 of 10)

HEAT SINK PROPERTIES

Metallic Description	Heat Sink Number	Exposed Area (ft^2)	Thickness (ft)	Material	Paint
~~Refueling Machine~~	~~60~~	~~1562~~	~~0.0552~~	~~CS~~	~~IZ+E~~
~~Jib Crane~~	~~61~~	~~203.39~~	~~0.3344~~	~~CS~~	~~IZ+E~~
~~Feedwater Nozzle Platform (El. 149' 7)~~	~~62~~	~~3226.7~~	~~0.00756~~	~~CS~~	~~IZ+E~~
~~Upper Manway Platform (El. 162' 1)~~	~~63~~	~~4523.3~~	~~0.00756~~	~~CS~~	~~IZ+E~~
~~Valve Module Platform (El. 169' 9)~~	~~64~~	~~1883.95~~	~~0.00756~~	~~CS~~	~~IZ+E~~
~~Movable Platforms~~	~~65~~	~~264.45~~	~~0.00756~~	~~CS~~	~~IZ+E~~
~~Stairs~~	~~66~~	~~229.89~~	~~0.012~~	~~CS~~	~~G+E~~
~~**South Peripherical Semi Annulus Room**~~					
~~Crane Support & Bridge Polar Crane~~	~~67~~	~~3193.1~~	~~0.1338~~	~~CS~~	~~IZ~~
~~Cont. Recirculation Units~~	~~68~~	~~966.19~~	~~0.004~~	~~CS~~	~~IZ+E~~
~~Grated Access Walkway (El. 162' 1)~~	~~69~~	~~1622.6~~	~~0.00756~~	~~CS~~	~~IZ+E~~
~~Ring Duct~~	~~70~~	~~2636.06~~	~~0.01239~~	~~CS~~	~~G+E~~
~~HVAC Duct (2)~~	~~71~~	~~976.5~~	~~0.0087~~	~~CS~~	~~G+E~~
~~Primary Containment Between The South Peripherical Room And The Air Baffle And Primary Containment Gap Lower South~~	~~72~~	~~8521~~	~~0.135416~~	~~CS~~	~~IZ~~
~~Primary Containment Between The South Peripherical Room And The Air Baffle And Primary Gap Upper South~~	~~73~~	~~8521~~	~~0.135416~~	~~CS~~	~~IZ~~
~~Main Equipment Hatch~~	~~74~~	~~597.1~~	~~0.21~~	~~CS~~	~~IZ+E~~
~~**North Peripherical Semi Annulus Room**~~					-
~~Elevator~~	~~75~~	~~1211.1~~	~~0.021~~	~~CS~~	~~IZ+E~~
~~Crane Support & Bridge Polar Crane~~	~~76~~	~~4022~~	~~0.131~~	~~CS~~	~~IZ~~
~~Cont. Recirculation Units~~	~~77~~	~~966.19~~	~~0.004~~	~~CS~~	~~IZ+E~~
~~Platform (El. 162' 1)~~	~~78~~	~~2831.67~~	~~0.00756~~	~~CS~~	~~IZ+E~~
~~Platform (El. 175' 11)~~	~~79~~	~~49.2~~	~~0.00756~~	~~CS~~	~~IZ+E~~
~~Ring Duct~~	~~80~~	~~1703.8~~	~~0.01239~~	~~CS~~	~~G+E~~

Table 6.2.1.1-~~6~~5 (Sheet 9 of 10)

HEAT SINK PROPERTIES

~~Metallic Description~~	~~Heat Sink Number~~	~~Exposed Area (ft^2)~~	~~Thickness (ft)~~	~~Material~~	~~Paint~~
~~Primary Containment Between The North Peripherical Semi Room And The Air Baffle And Primary Cont. Gap Lower North~~	~~81~~	~~8521~~	~~0.135416~~	~~CS~~	~~IZ~~
~~Primary Containment Between The North Peripherical Semi Room And The Air Baffle And Primary Cont. Gap Upper North~~	~~82~~	~~8521~~	~~0.135416~~	~~CS~~	~~IZ~~
~~Central Dome~~					
~~Polar Crane Trolley~~	~~83~~	~~1844~~	~~0.2262~~	~~CS~~	~~IZ~~
~~North Peripherical Dome~~					
~~Primary Containment~~	~~84~~	~~7475~~	~~0.135416~~	~~CS~~	~~IZ~~
~~South Peripherical Dome~~					
~~Primary Containment~~	~~85~~	~~7475~~	~~0.135416~~	~~CS~~	~~IZ~~
~~Top Peripherical Dome~~					
~~Primary Containment~~	~~86~~	~~5082~~	~~0.0135416~~	~~CS~~	~~IZ~~
~~Containment Gap Lower North~~					
~~Air Baffle El. 140' 6 to 178' 0~~	~~87~~	~~7841~~	~~0.00984~~	~~CS~~	~~IZ~~
~~Containment Gap Lower South~~					
~~Air Baffle El. 149' 6 to 178' 0~~	~~88~~	~~7841~~	~~0.00984~~	~~CS~~	~~IZ~~
~~Containment Gap Upper North~~					
~~Air Baffle El. 178' 0 to 220' 9~~	~~89~~	~~8938.5~~	~~0.00984~~	~~CS~~	~~IZ~~
~~Containment Gap Upper South~~					
~~Air Baffle El. 178' 0 to 220' 9~~	~~90~~	~~8938.5~~	~~0.00984~~	~~CS~~	~~IZ~~
~~Policentric Annulus North~~					
~~Air Baffle El. 220' 9 to 236' 0~~	~~91~~	~~7346.3~~	~~0.00984~~	~~CS~~	~~IZ~~
~~Policentric Annulus South~~					
~~Air Baffle El. 220' 9 to 236' 0~~	~~92~~	~~7346.3~~	~~0.00984~~	~~CS~~	~~IZ~~
~~Stairs From El. 242' 6 to 252' 0~~	~~93~~	~~108.3~~	~~0.012~~	~~CS~~	~~IZ~~
~~Platform (El. 245' 5)~~	~~94~~	~~49.2~~	~~0.00756~~	~~CS~~	~~IZ~~

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Table 6.2.1.1-~~6~~5 (Sheet 10 of 10)

HEAT SINK PROPERTIES

~~Metallic Description~~	~~Heat Sink Number~~	~~Exposed Area (ft^2)~~	~~Thickness (ft)~~	~~Material~~	~~Paint~~
~~Lower Chimney~~					
~~Stairs From El. 252' 0 to 266' 0~~	~~95~~	~~159.6~~	~~0.012~~	~~CS~~	~~IZ~~
~~Platforms (El. 255' 11 & 266' 0)~~	~~96~~	~~270.6~~	~~0.00756~~	~~CS~~	~~IZ~~
~~Top Chimney~~					
~~Platform (El. 298' 6)~~	~~97~~	~~78.925~~	~~0.00756~~	~~CS~~	~~IZ~~
~~Secondary Containment Gap~~					
~~Stairs From El. 239' 0 to 242' 6~~	~~98~~	~~39.9~~	~~0.012~~	~~CS~~	~~IZ~~
~~Platform (El. 239' 0)~~	~~99~~	~~246~~	~~0.00756~~	~~CS~~	~~IZ~~

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Notes to Table 6.2.1.1~~-63~~

1. Two types of materials will be used for metallic structures:
   A. Carbon Steel (CS)
   B. Stainless Steel (SS)

2. Three coatings are used on metallic structures:
   A. Epoxy (E)
   B. ~~Inorganic Zinc (IZ)~~Carbo Zinc (CZ)
   C. Hot Dip Galvanizing ~~(G)~~

When ~~Inorganic~~ Carbo Zinc and Epoxy are used together, the ~~Inorganic~~ Carbo Zinc is applied as a primer then the Epoxy is applied as a topcoat. In addition, miscellaneous carbon steel items such as stairs, gratings, ladders, railings, conduit, ducting and cable trays are hot dip galvanized. In containment analysis, the galvanized structures will be treated as carbon steel ~~with a Inorganic Zinc primer and an Epoxy topcoat~~.

3. Thickness of paint:
   A. Epoxy: 4-8 Mils
   B. ~~Inorganic Zinc: 3.5-4.5~~ Carbo Zinc: 2.5-6 Mils

Table 6.2.1.1-~~7~~4 (Sheet 1 of ~~3~~4)

CONCRETE HEAT SINKS

Concrete Surface	Struct. Number	Exposed Surface Area (ft^2)	Thick (ft)	Liner Plate Interior	Liner Plate Exterior	Paint Interior	Paint Exterior
REACTOR CAVITY							
WALL 1 (2 sides)	1	219.50	~~3.26~~4.00	CS	CS	~~IZ+E~~CZE	~~IZ+E~~CZE
WALL 2 (2 sides)	2	693.00	~~8.89~~4.00	CS	CS	~~IZ+E~~CZE	~~IZ+E~~CZ
WALL 3 (2 sides)	3	218.28	4.00	CS	CS	~~IZ+E~~CZE	~~IZ+E~~CZ
ROOF 1 (1 side)	4	385.43	~~1.83~~2.00	CS	~~SS~~CS	~~IZ+E~~CZE	NONE
WALL 4 (1 side)	5	164.50	4.00	CS	~~SS~~CS	~~IZ+E~~CZE	NONE
WALL 5 (1 side)	6	661.50	4.00	CS	CS	~~IZ+E~~CZE	~~IZ+E~~CZ
WALL 6 (1 side)	7	488.35	~~6.46~~4.00	CS	CS	~~IZ+E~~CZE	~~IZ+S~~CZ
WALL 7 (1 side)	8	488.35	~~6.46~~4.00	CS	CS	~~IZ+E~~CZE	~~IZ+E~~CZ
WALL 8 (1 side)	9	214.50	~~2.50~~2.00	CS	CS	~~IZ+E~~CZE	~~IZ+E~~CZE
BULK~~RC~~	10	2429.00	~~12.52~~4.00	CS	~~—~~NONE	~~IZ+E~~CZE	~~—~~NONE
~~ACCUM. CAV. SE~~South East Accumulator Cavity							
WALL5V (1 side)	11	245.46	4.00	~~CS~~SS	~~SS~~CS	~~IZ+E~~NONE	~~NONE~~CZ
ROOF3 (1 side)	12	718.50	2.00	CS	NONE	~~IZ+E~~CZ	E
BULK~~ACW~~	13	2118.55	~~12.52~~4.00	CS	~~—~~NONE	~~IZ+E~~CZE	~~—~~NONE
~~ACCUM. CAV. NE~~ North East Accumulator Cavity							
WALL8V (1 side)	14	375.10	~~4.50~~4.00	CS	NONE	~~IZ+E~~CZ	E
ROOF4 (1 side)	15	993.00	2.00	CS	NONE	~~IZ+E~~CZ	E
BULK~~ACE~~	16	2816.80	~~12.52~~4.00	CS	~~—~~NONE	~~IZ+E~~CZE	~~—~~NONE
~~STEAM GEN. RM EAST~~East Steam Generator Room							
WALL 1 (1 side)	17	~~512.14~~519.73	~~2.50~~2.00	CS	CS	~~IZ+E~~CZE	~~IZ+E~~CZE
WALL 2 (1 side)	18	472.94	~~2.50~~2.00	CS	CS	~~IZ+E~~CZE	~~IZ+E~~CZE
WALL 3 (1 side)	19	~~1965.60~~1977.7	~~2.50~~2.00	CS	CS	~~IZ+E~~CZE	~~IZ+E~~CZE
WALL 4 5 (1 side)	20	~~1306.88~~758.16	~~2.50~~4.00	~~CS~~SS	CS	~~IZ+E~~NONE	~~IZ+E~~CZ
BULK~~SGS~~	~~22~~21	~~907.13~~941.44	~~12.52~~4.00	~~NONE~~CS	~~—~~NONE	E	~~—~~NONE

Table 6.2.1.1~~7~~4 (Sheet 2 of ~~3~~4)

CONCRETE HEAT SINKS

Concrete Surface	Struct. Number	Exposed Surface Area (ft^2)	Thick (ft)	Liner Plate Interior	Liner Plate Exterior	Paint Interior	Paint Exterior
~~STEAM GEN. RM WEST~~West Steam Generator Room							
WALL 1 (1 side)	~~23~~22	707.33	~~2.50~~2.00	CS	CS	~~IZ+E~~CZE	~~IZ+E~~CZE
WALL 2 (1 side)	~~24~~23	~~1612.50~~1626.37	~~2.50~~2.00	CS	SS	~~IZ+E~~CZ	NONE
WALL 3 (1 side)	~~25~~24	~~716.04~~758.16	~~4.00~~4.00	~~CS~~SS	~~SS~~CS	~~IZ+E~~NONE	~~NONE~~CZ
~~WALL 4 (1 side)~~	~~26~~	~~1281.38~~	~~2.50~~	~~CS~~	~~CS~~	~~IZ+E~~	~~IZ+E~~
BULK~~SGN~~	~~27~~25	~~1945.63~~1986.6	~~12.52~~4.00	CS	~~—~~NONE	~~IZ+E~~CZE	~~—~~NONE
CMT & CVS ROOM							
ROOF 1 (1 side)	~~28~~26	567.00	~~2.50~~2.00	CS	NONE	~~IZ+E~~CZE	E
WALL 1 (1 side)	~~29~~27	1721.28	~~2.50~~2.00	CS	SS	~~IZ+E~~CZ	NONE
WALL 2 (1 side)	~~30~~28	1630.00	4.00	~~CS~~SS	~~SS~~CS	~~IZ+E~~NONE	~~NONE~~CZ
ROOF 2 (1 side)	~~31~~29	~~2422.1~~4533.4	2.00	CS	NONE	~~IZ~~CZ	E
ROOF 3 (1 side)	~~32~~30	~~790.50~~2472.78	2.00	CS	NONE	~~IZ~~CZ	E
ROOF 4 (1 side)	~~33~~31	~~2162.2~~2865.62	2.00	CS	NONE	~~IZ~~CZ	E
ROOF 5 (1 side)	~~34~~32	~~348.00~~631.92	2.00	CS	NONE	~~IZ~~CZ	E
ROOF 6 (1 side)	~~35~~33	157.32	2.00	CS	CS	~~IZ+E~~CZ	~~IZ+E~~CZ
WALL 3 (1 side)	~~36~~38	262.50	~~2.50~~2.00	CS	CS	~~IZ+E~~CZE	~~IZ+E~~CZE
ROOF ~~7~~11 (2 sides)	~~37~~39	346.46	2.00	CS	CS	~~IZ+E~~CZ	~~IZ+E~~CZ
BULK~~CMT~~	~~38~~40	5161.52	~~12.52~~4.00	NONE	~~—~~NONE	E	~~—~~NONE
REFUELING ROOM							
INT~~CON~~ (2 sides)	~~39~~41	776.37	~~1.42~~2.00	SS	~~—~~NONE	NONE	~~—~~NONE
WALL22V (1 side)	~~40~~42	1032.00	4.00	SS	SS	NONE	NONE
WALL23V (1 side)	~~41~~43	673.99	4.00	SS	CS	NONE	~~IZ+E~~CZ
BULK~~RR~~	~~42~~44	1539.00	~~12.52~~4.00	SS	~~—~~NONE	NONE	~~—~~NONE

Table 6.2.1.1-~~7~~4 (Sheet 3 of 34)

CONCRETE HEAT SINKS

Concrete Surface	Struct. Number	Exposed Surface Area (ft^2)	Thick (ft)	Liner Plate Interior	Liner Plate Exterior	Paint Interior	Paint Exterior
IRWST ROOM							
ROOF6 (1 side)	~~43~~45	~~920.00~~569.78	2.00	SS	NONE	NONE	E
ROOF7 (1 side)	~~44~~46	~~1840.10~~780.6	2.00	SS	NONE	NONE	E
BULKR	~~45~~53	3585.20	~~12.5~~24.00	SS	~~—~~NONE	NONE	~~—~~NONE
~~**NORTH SEMI-ANNULUS ROOM**~~							
~~WALL 1 (2 sides)~~	~~46~~	~~2218.13~~	~~2.50~~	~~CS~~	~~CS~~	~~IZ+E~~	~~IZ+E~~
~~**LOWER CHIMNEY**~~							
~~FLOOR 1~~	~~47~~	~~2202.65~~	~~2.00~~	~~NONE~~	~~NONE~~	~~NONE~~	~~NONE~~
~~ROOM 1~~	~~48~~	~~1272.00~~	~~1.00~~	~~NONE~~	~~NONE~~	~~NONE~~	~~NONE~~
~~ROOF 1~~	~~49~~	~~11772.95~~	~~2.00~~	~~NONE~~	~~NONE~~	~~NONE~~	~~NONE~~
~~**AIR BAFFLE & 2ND CONT. GAP**~~							
~~WALL 1~~	~~50~~	~~50224.3~~	~~3.00~~	~~NONE~~	~~NONE~~	~~NONE~~	~~NONE~~
~~ROOF 1~~	~~51~~	~~5113.10~~	~~2.00~~	~~NONE~~	~~NONE~~	~~NONE~~	~~NONE~~
UPPER EAST SG COMPARTMENT							
WALL1 (1 side)	54	216.75	2.0	CS	CS	CZE	CZE
WALL2 (1 side)	55	346.48	2.0	CS	CS	CZE	CZE
WALL3 (1 side)	56	346.48	2.0	CS	CS	CZE	CZE
WALL4 (1 side)	57	261.38	2.0	CS	CS	CZE	CZE
WALL5 (1 side)	58	70.13	2.0	CS	CS	CZE	CZE
UPPER WEST SG COMPARTMENT							
WALL1 (1 side)	59	70.13	2.0	CS	CS	CZE	CZE
WALL2 (1 side)	60	346.48	2.0	CS	CS	CZE	CZE
WALL3 (1 side)	61	216.75	2.0	CS	CS	CZE	CZE
WALL4 (1 side)	62	346.48	2.0	CS	CS	CZE	CZE
WALL5 (1 side)	63	261.38	2.0	CS	CS		
WALL1 (2 sides)	64	491.66	2.0	SS	SS	CZE	CZE

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Table 6.2.1.1-~~24~~ (Sheet 34 of 34)

CONCRETE HEAT SINKS

Concrete Surface	Struct. Number	Exposed Surface Area (ft^2)	Thick (ft)	Liner Plate Interior	Liner Plate Exterior	Paint Interior	Paint Exterior
NORTH INNER HALL							
WALL1 (2 sides)	65	1281.375	2.0	CS	CS	CZE	CZE
WALL1 (2 sides)	65	1005.0	2.0	CS	CS	CZE	CZE
El. 135' - 3" to El. 148'-0"							
WEST MID QUADRANT							
WALL1 (2 sides)	67	491.66	2.0	SS	SS	NONE	NONE
AIR BAFFLE & SHIELD BUILDING UPPER GAP							
ROOF1 (1 side)	75	5227.65	3.0	CONCRETE			
LOWER CHIMNEY							
WALL1 (2 sides)	76	13357.184	3.0	CONCRETE			
FLOOR1 (2 sides)	77	2202.65	2.0	CONCRETE			
ROOM1 (2 sides)	78	1272.0	2.0	CONCRETE			
FLOOR1 (2 sides)	79	23545.8	2.0	CONCRETE			

Notes:

1. Steel liner plates are either
   A. Carbon Steel (CS)
   B. Stainless Steel (SS)

2. Paint on liner plates and concrete surfaces is either:
   A. Epoxy (E)
   B. ~~Inorganic~~Carbo Zinc (~~IZ~~CZ)

   When ~~Inorganic~~Carbo Zinc and Epoxy are used together, the ~~Inorganic~~Carbo Zinc is applied as a primer then the Epoxy is applied as a topcoat.

3. Thickness of paint is:
   A. Epoxy: 4-8 Mils.
   B. ~~Inorganic~~Carbo Zinc: ~~3.5 - 4.5~~2.5-6 Mils.

4. Floors at Elevations 107'-2 and 135'-3 have not steel liner plate.

5. Steel liner plates are assumed to be 1/2 inch thick in all places.

Table 6.2.1.1-~~56~~ 7 (Sheet 1 of 4)

CONTAINMENT SHELL AND BAFFLE METAL PROPERTIES

Metallic[4] Description	Heat Sink Number	Exposed Area (ft^2)	Thickness (ft)	Material	Paint
STACK #1					
PCS @ 240.5'	1-a-1 (1 side)~~1~~	395.63	0.13542	CS	CZ
Baffle @ 240.5'	1-b-1 (1 side)~~2~~	1284.00	0.00706	CS	CZ
PCS @ 224.75'	1-a-2 (1 side)~~3~~	644.34	0.13542	CS	CZ
Baffle @ 224.75'	1-b-2 (1 side)~~4~~	595.10	0.00706	CS	CZ
PCS @ 209'	1-a-3 (1 side)~~5~~	1653.63	0.13542	CS	CZ
Baffle @ 209'	1-b-3 (1 side)~~6~~	1804.57	0.00706	CS	CZ
PCS @ 189.5'	1-a-4 (1 side)~~7~~	980.29	0.13542	CS	CZ
Baffle @ 189.5'	1-b-4 (1 side)~~8~~	997.00	0.00706	CS	CZ
PCS @ 170'	1-a-5 (1 side)~~9~~	809.80	0.13542	CS	CZ
Baffle @ 170'	1-b-5 (1 side)~~10~~	823.61	0.00706	CS	CZ
PCS @ 148'	1-a-6 (1 side)~~11~~	639.32	0.13542	CS	CZ
Baffle @ 148'	1-b-6 (1 side)~~12~~	650.22	0.00706	CS	CZ
PCS @ 135.25'	1-a-7 (1 side)~~13~~	511.45	0.13542	CS	CZ
Baffle @ 135.25'	1-b-7 (1 side)~~14~~	520.18	0.00706	CS	CZ
STACK #2					
PCS @ 240.5'	2-a-1 (1 side)~~15~~	395.63	0.13542	CS	CZ
Baffle @ 240.5'	2-b-1 (1 side)~~16~~	1284.00	0.00706	CS	CZ
PCS @ 224.75'	2-a-2 (1 side)~~17~~	644.34	0.13542	CS	CZ
Baffle @ 224.75'	2-b-2 (1 side)~~18~~	595.10	0.00706	CS	CZ
PCS @ 209'	2-a-3 (1 side)~~19~~	1653.63	0.13542	CS	CZ
Baffle @ 209'	2-b-3 (1 side)~~20~~	1804.57	0.00706	CS	CZ
PCS @ 189.5'	2-a-4 (1 side)~~21~~	980.29	0.13542	CS	CZ
Baffle @ 189.5'	2-b-4 (1 side)~~22~~	997.00	0.00706	CS	CZ
PCS @ 170'	2-a-5 (1 side)~~23~~	809.80	0.13542	CS	CZ
Baffle @ 170'	2-b-5 (1 side)~~24~~	823.61	0.00706	CS	CZ
PCS @ 148'	2-a-6 (1 side)~~25~~	639.32	0.13542	CS	CZ
Baffle @ 148'	2-b-6 (1 side)~~26~~	650.22	0.00706	CS	CZ
PCS @ 135.25'	2-a-7 (1 side)~~27~~	511.45	0.13542	CS	CZ
Baffle @ 135.25'	2-b-7 (1 side)~~28~~	520.18	0.00706	CS	CZ

Table 6.2.1.1-~~56~~ 7 (Sheet 2 of 4)

CONTAINMENT SHELL AND BAFFLE METAL PROPERTIES

Metallic[4] Description	Heat Sink Number	Exposed Area (ft^2)	Thickness (ft)	Material	Paint
STACK #3					
PCS @ 240.5'	3-a-1 (1 side)~~29~~	395.63	0.13542	CS	CZ
Baffle @ 240.5'	3-b-1 (1 side)~~30~~	1284.00	0.00706	CS	CZ
PCS @ 224.75'	3-a-2 (1 side)~~31~~	644.34	0.13542	CS	CZ
Baffle @ 224.75'	3-b-2 (1 side)~~32~~	595.10	0.00706	CS	CZ
PCS @ 209'	3-a-3 (1 side)~~33~~	1653.63	0.13542	CS	CZ
Baffle @ 209'	3-b-3 (1 side)~~34~~	1804.57	0.00706	CS	CZ
PCS @ 189.5'	3-a-4 (1 side)~~35~~	980.29	0.13542	CS	CZ
Baffle @ 189.5'	3-b-4 (1 side)~~36~~	997.00	0.00706	CS	CZ
PCS @ 170'	3-a-5 (1 side)~~37~~	809.80	0.13542	CS	CZ
Baffle @ 170'	3-b-5 (1 side)~~38~~	823.61	0.00706	CS	CZ
PCS @ 148'	3-a-6 (1 side)~~39~~	639.32	0.13542	CS	CZ
Baffle @ 148'	3-b-6 (1 side)~~40~~	650.22	0.00706	CS	CZ
PCS @ 135.25'	3-a-7 (1 side)~~41~~	511.45	0.13542	CS	CZ
Baffle @ 135.25'	3-b-7 (1 side)~~42~~	520.18	0.00706	CS	CZ
STACK #4					
PCS @ 240.5'	4-a-1 (1 side)~~43~~	395.63	0.13542	CS	CZ
Baffle @ 240.5'	4-b-1 (1 side)~~44~~	1284.00	0.00706	CS	CZ
PCS @ 224.75'	4-a-2 (1 side)~~45~~	644.34	0.13542	CS	CZ
Baffle @ 224.75'	4-b-2 (1 side)~~46~~	595.10	0.00706	CS	CZ
PCS @ 209'	4-a-3 (1 side)~~47~~	1653.63	0.13542	CS	CZ
Baffle @ 209'	4-b-3 (1 side)~~48~~	1804.57	0.00706	CS	CZ
PCS @ 189.5'	4-a-4 (1 side)~~49~~	980.29	0.13542	CS	CZ
Baffle @ 189.5'	4-b-4 (1 side)~~50~~	997.00	0.00706	CS	CZ
PCS @ 170'	4-a-5 (1 side)~~51~~	809.80	0.13542	CS	CZ
Baffle @ 170'	4-b-5 (1 side)~~52~~	823.61	0.00706	CS	CZ
PCS @ 148'	4-a-6 (1 side)~~53~~	639.32	0.13542	CS	CZ
Baffle @ 148'	4-b-6 (1 side)~~54~~	650.22	0.00706	CS	CZ
PCS @ 135.25'	4-a-7 (1 side)~~55~~	511.45	0.13542	CS	CZ
Baffle @ 135.25'	4-b-7 (1 side)~~56~~	520.18	0.00706	CS	CZ

Table 6.2.1.1-~~58~~ (Sheet 3 of 4)

CONTAINMENT SHELL AND BAFFLE METAL PROPERTIES

Metallic[4] Description	Heat Sink Number	Exposed Area (ft^2)	Thickness (ft)	Material	Paint
STACK #5					
PCS @ 240.5'	5-a-1 (1 side)~~57~~	593.44	0.13542	CS	CZ
Baffle @ 240.5'	5-b-1 (1 side)~~58~~	1926.00	0.00706	CS	CZ
PCS @ 224.75'	5-a-2 (1 side)~~59~~	966.50	0.13542	CS	CZ
Baffle @ 224.75'	5-b-2 (1 side)~~60~~	892.66	0.00706	CS	CZ
PCS @ 209'	5-a-3 (1 side)~~61~~	466.41	0.13542	CS	CZ
Baffle @ 209'	5-b-3 (1 side)~~62~~	508.98	0.00706	CS	CZ
PCS @ 189.5'	5-a-4 (1 side)~~63~~	1150.77	0.13542	CS	CZ
Baffle @ 189.5'	5-b-4 (1 side)~~64~~	1170.40	0.00706	CS	CZ
PCS @ 170'	5-a-5 (1 side)~~65~~	1321.26	0.13542	CS	CZ
Baffle @ 170'	5-b-5 (1 side)~~66~~	1343.79	0.00706	CS	CZ
PCS @ 148'	5-a-6 (1 side)~~67~~	1491.74	0.13542	CS	CZ
Baffle @ 148'	5-b-6 (1 side)~~68~~	1517.18	0.00706	CS	CZ
PCS @ 135.25'	5-a-7 (1 side)~~69~~	1619.61	0.13542	CS	CZ
Baffle @ 135.25'	5-b-7 (1 side)~~70~~	1647.22	0.00706	CS	CZ
STACK #6					
PCS @ 240.5'	6-a-1 (1 side)~~71~~	593.44	0.13542	CS	CZ
Baffle @ 240.5'	6-b-1 (1 side)~~72~~	1926.00	0.00706	CS	CZ
PCS @ 224.75'	6-a-2 (1 side)~~73~~	966.50	0.13542	CS	CZ
Baffle @ 224.75'	6-b-2 (1 side)~~74~~	892.66	0.00706	CS	CZ
PCS @ 209'	6-a-3 (1 side)~~75~~	466.41	0.13542	CS	CZ
Baffle @ 209'	6-b-3 (1 side)~~76~~	508.98	0.00706	CS	CZ
PCS @ 189.5'	6-a-4 (1 side)~~77~~	1150.77	0.13542	CS	CZ
Baffle @ 189.5'	6-b-4 (1 side)~~78~~	1170.40	0.00706	CS	CZ
PCS @ 170'	6-a-5 (1 side)~~79~~	1321.26	0.13542	CS	CZ
Baffle @ 170'	6-b-5 (1 side)~~80~~	1343.79	0.00706	CS	CZ
PCS @ 148'	6-a-6 (1 side)~~81~~	1491.74	0.13542	CS	CZ
Baffle @ 148'	6-b-6 (1 side)~~82~~	1517.18	0.00706	CS	CZ
PCS @ 135.25'	6-a-7 (1 side)~~83~~	1619.61	0.13542	CS	CZ
Baffle @ 135.25'	6-b-7 (1 side)~~84~~	1647.22	0.00706	CS	CZ

Table 6.2.1.1-~~58~~ 7 (Sheet 4 of 4)

CONTAINMENT SHELL AND BAFFLE METAL PROPERTIES

Metallic[4] Description	Heat Sink Number	Exposed Area (ft^2)	Thickness (ft)	Material	Paint
STACK #7					
PCS @ 240.5'	7-a-1 (1 side)~~85~~	593.44	0.13542	CS	CZ
Baffle @ 240.5'	7-b-1 (1 side)~~86~~	1926.00	0.00706	CS	CZ
PCS @ 224.75'	7-a-2 (1 side)~~87~~	966.50	0.13542	CS	CZ
Baffle @ 224.75'	7-b-2 (1 side)~~88~~	892.66	0.00706	CS	CZ
PCS @ 209'	7-a-3 (1 side)~~89~~	466.41	0.13542	CS	CZ
Baffle @ 209'	7-b-3 (1 side)~~90~~	508.98	0.00706	CS	CZ
PCS @ 189.5'	7-a-4 (1 side)~~91~~	1150.77	0.13542	CS	CZ
Baffle @ 189.5'	7-b-4 (1 side)~~92~~	1170.40	0.00706	CS	CZ
PCS @ 170'	7-a-5 (1 side)~~93~~	1321.26	0.13542	CS	CZ
Baffle @ 170'	7-b-5 (1 side)~~94~~	1343.79	0.00706	CS	CZ
PCS @ 148'	7-a-6 (1 side)~~95~~	1491.74	0.13542	CS	CZ
Baffle @ 148'	7-b-6 (1 side)~~96~~	1517.18	0.00706	CS	CZ
PCS @ 135.25'	7-a-7 (1 side)~~97~~	1619.61	0.13542	CS	CZ
Baffle @ 135.25'	7-b-7 (1 side)~~98~~	1647.22	0.00706	CS	CZ
STACK #8					
PCS @ 240.5'	8-a-1 (1 side)~~99~~	593.44	0.13542	CS	CZ
Baffle @ 240.5'	8-b-1 (1 side)~~100~~	1926.00	0.00706	CS	CZ
PCS @ 224.75'	8-a-2 (1 side)~~101~~	966.50	0.13542	CS	CZ
Baffle @ 224.75'	8-b-2 (1 side)~~102~~	892.66	0.00706	CS	CZ
PCS @ 209'	8-a-3 (1 side)~~103~~	466.41	0.13542	CS	CZ
Baffle @ 209'	8-b-3 (1 side)~~104~~	508.98	0.00706	CS	CZ
PCS @ 189.5'	8-a-4 (1 side)~~105~~	1150.77	0.13542	CS	CZ
Baffle @ 189.5'	8-b-4 (1 side)~~106~~	1170.40	0.00706	CS	CZ
PCS @ 170'	8-a-5 (1 side)~~107~~	1321.26	0.13542	CS	CZ
Baffle @ 170'	8-b-5 (1 side)~~108~~	1343.79	0.00706	CS	CZ
PCS @ 148'	8-a-6 (1 side)~~109~~	1491.74	0.13542	CS	CZ
Baffle @ 148'	8-b-6 (1 side)~~110~~	1517.18	0.00706	CS	CZ
PCS @ 135.25'	8-a-7 (1 side)~~111~~	1647.22	0.13542	CS	CZ
Baffle @ 135.25'	8-b-7 (1 side)~~112~~	1728.41	0.00706	CS	CZ

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Table 6.2.1.1-~~69~~ (Sheet 1 of 3)

SHIELD BUILDING
CONCRETE HEAT SINK PROPERTIES

Concrete Surface	Struct. Number	Exposed Surface Area (ft^2)	Thick (ft)	Liner Plate Interior	Liner Plate Exterior	Paint Interior	Paint Exterior
STACK #1							
Shield @ 240.5'	1-c-1 (1 side)~~1~~	1284.0	3	CONCRETE			
Shield @ 224.75'	1-c-2 (1 side)~~2~~	1162.18	3	CONCRETE			
Shield @ 209'	1-c-3 (1 side)~~3~~	1895.06	3	CONCRETE			
Shield @ 189.5'	1-c-4 (1 side)~~4~~	1046.15	3	CONCRETE			
Shield @ 170'	1-c-5 (1 side)~~5~~	864.21	3	CONCRETE			
Shield @ 148'	1-c-6 (1 side)~~6~~	682.27	3	CONCRETE			
Shield @ 135.25'	1-c-7 (1 side)~~7~~	545.82	3	CONCRETE			
STACK #2							
Shield @ 240.5'	2-c-1 (1 side)~~8~~	1284.0	3	CONCRETE			
Shield @ 224.75'	2-c-2 (1 side)~~9~~	1162.18	3	CONCRETE			
Shield @ 209'	2-c-3 (1 side)~~10~~	1895.06	3	CONCRETE			
Shield @ 189.5'	2-c-4 (1 side)~~11~~	1046.15	3	CONCRETE			
Shield @ 170'	2-c-5 (1 side)~~12~~	864.21	3	CONCRETE			
Shield @ 148'	2-c-6 (1 side)~~13~~	682.27	3	CONCRETE			
Shield @ 135.25'	2-c-7 (1 side)~~14~~	545.82	3	CONCRETE			
STACK #3							
Shield @ 240.5'	3-c-1 (1 side)~~15~~	1284.0	3	CONCRETE			
Shield @ 224.75'	3-c-2 (1 side)~~16~~	1162.18	3	CONCRETE			
Shield @ 209'	3-c-3 (1 side)~~17~~	1895.06	3	CONCRETE			
Shield @ 189.5'	3-c-4 (1 side)~~18~~	1046.15	3	CONCRETE			
Shield @ 170'	3-c-5 (1 side)~~19~~	864.21	3	CONCRETE			
Shield @ 148'	3-c-6 (1 side)~~20~~	682.27	3	CONCRETE			
Shield @ 135.25'	3-c-7 (1 side)~~21~~	545.82	3	CONCRETE			

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Table 6.2.1.1-~~9~~ (Sheet 2 of 3)

**SHIELD BUILDING
CONCRETE HEAT SINK PROPERTIES**

Concrete Surface	Struct. Number	Exposed Surface Area (ft^2)	Thick (ft)	Liner Plate Interior	Liner Plate Exterior	Paint Interior	Paint Exterior
STACK #4							
Shield @ 240.5'	4-c-1 (1 side)~~22~~	1284.0	3	CONCRETE			
Shield @ 224.75'	4-c-2 (1 side)~~23~~	1162.18	3	CONCRETE			
Shield @ 209'	4-c-3 (1 side)~~24~~	1895.06	3	CONCRETE			
Shield @ 189.5'	4-c-4 (1 side)~~25~~	1046.15	3	CONCRETE			
Shield @ 170'	4-c-5 (1 side)~~26~~	864.21	3	CONCRETE			
Shield @ 148'	4-c-6 (1 side)~~27~~	682.27	3	CONCRETE			
Shield @ 135.25'	4-c-7 (1 side)~~28~~	545.82	3	CONCRETE			
STACK #5							
Shield @ 240.5'	5-c-1 (1 side)~~29~~	1926.0	3	CONCRETE			
Shield @ 224.75'	5-c-2 (1 side)~~30~~	1743.26	3	CONCRETE			
Shield @ 209'	5-c-3 (1 side)~~31~~	534.51	3	CONCRETE			
Shield @ 189.5'	5-c-4 (1 side)~~32~~	1228.08	3	CONCRETE			
Shield @ 170'	5-c-5 (1 side)~~33~~	1410.02	3	CONCRETE			
Shield @ 148'	5-c-6 (1 side)~~34~~	1591.96	3	CONCRETE			
Shield @ 135.25'	5-c-7 (1 side)~~35~~	1728.41	3	CONCRETE			
STACK #6							
Shield @ 240.5'	6-c-1 (1 side)~~36~~	1926.0	3	CONCRETE			
Shield @ 224.75'	6-c-2 (1 side)~~37~~	1743.26	3	CONCRETE			
Shield @ 209'	6-c-3 (1 side)~~38~~	534.51	3	CONCRETE			
Shield @ 189.5'	6-c-4 (1 side)~~39~~	1228.08	3	CONCRETE			
Shield @ 170'	6-c-5 (1 side)~~40~~	1410.02	3	CONCRETE			
Shield @ 148'	6-c-6 (1 side)~~41~~	1591.96	3	CONCRETE			
Shield @ 135.25'	6-c-7 (1 side)~~42~~	1728.41	3	CONCRETE			

Table 6.2.1.1-~~6~~8 (Sheet 3 of 3)

SHIELD BUILDING
CONCRETE HEAT SINK PROPERTIES

Concrete Surface	Struct. Number	Exposed Surface Area (ft^2)	Thick (ft)	Liner Plate Interior	Liner Plate Exterior	Paint Interior	Paint Exterior
STACK #7							
Shield @ 240.5'	7-c-1 (1 side)~~43~~	1926.0	3	CONCRETE			
Shield @ 224.75'	7-c-2 (1 side)~~44~~	1743.26	3	CONCRETE			
Shield @ 209'	7-c-3 (1 side)~~45~~	534.50	3	CONCRETE			
Shield @ 189.5'	7-c-4 (1 side)~~46~~	1228.08	3	CONCRETE			
Shield @ 170'	7-c-5 (1 side)~~47~~	1410.02	3	CONCRETE			
Shield @ 148'	7-c-6 (1 side)~~48~~	1591.96	3	CONCRETE			
Shield @ 135.25'	7-c-7 (1 side)~~49~~	1728.41	3	CONCRETE			
STACK #8							
Shield @ 240.5'	8-c-1 (1 side)~~50~~	1926.0	3	CONCRETE			
Shield @ 224.75'	8-c-2 (1 side)~~51~~	1743.26	3	CONCRETE			
Shield @ 209'	8-c-3 (1 side)~~52~~	534.50	3	CONCRETE			
Shield @ 189.5'	8-c-4 (1 side)~~53~~	1228.08	3	CONCRETE			
Shield @ 170'	8-c-5 (1 side)~~54~~	1410.02	3	CONCRETE			
Shield @ 148'	8-c-6 (1 side)~~55~~	1591.96	3	CONCRETE			
Shield @ 135.25'	8-c-7 (1 side)~~56~~	1589.69	3	CONCRETE			

Table 6.2.1.1-~~5710~~ a

PHYSICAL PROPERTIES OF PASSIVE HEAT SINKS

Material	Density (lbm/ft^3)	Thermal Conductivity (Btu/hr-ft-°F)	Specific Heat (Btu/lbm-°F)	Dry Emis.	Wet Emis.
Epoxy	105	0.1875	0.35	0.81	0.95
Carbon Steel	490.7	30	0.107	0.81	0.95
Concrete	140.	0.83	0.19	0.81	0.95
Stainless Steel	501.	9.4	0.12	0.81	0.95
~~Inorganic~~Carbo Zinc	207.5	1.21	0.15	0.81	0.95
Oxidized Carbo Zinc	207.5	0.302	0.15	0.81	0.95

Table 6.2.1.1-~~6811~~ 10

CONTAINMENT SHELL

TEMPERATURE PROFILES FOR COLD LEG BREAK

[Westinghouse Proprietary]

[Provided under separate cover]

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Table 6.2.1.2~~2~~ (Sheet 1 of 3)

FLOW PATH DATA, HOOP FLOW FOR HOT LEG BREAK

Element	K-Factor	F-Factor	Inertial	Hydr. D Length (ft.)	Flow A (ft.)	Equi. L (sq. ft.)	A/A (ft.)
1	4.1190E-01	2.2000E-02	8.3620E+00	3.7500E+00	3.8500E+01	2.5700E+00	05.0000E-01
2	4.0810E-01	2.2000E-02	8.3830E+00	5.6345E+00	6.9375E+01	2.6830E+00	5.0000E-01
3	5.4470E-01	2.2000E-02	7.1220E+00	3.1920E+00	5.3150E+0[illegible]	1.5640E+00	4.2600E-01
4	5.4460E-01	2.2000E-02	6.6890E+00	3.1920E+00	5.3150E+01	1.4950E+00	4.2600E-01
5	4.0810E-01	2.2000E-02	8.3830E+00	5.6345E+00	6.9375E+01	2.6830E+00	5.0000E-01
6	5.1290E-01	2.2000E-02	8.1590E+00	3.8800E+00	3.2215E+01	2.7450E+00	5.0000E-01
7	5.1360E-01	2.2000E-02	8.1530E+00	5.1073E+00	5.7590E+01	2.7300E+00	5.0000E-01
8	5.1630E-01	2.2000E-02	8.1260E+00	4.8350E+00	5.3950E+01	2.7090E+00	5.0000E-01
9	5.1630E-01	2.2000E-02	8.1260E+00	4.8350E+00	5.3950E+01	2.7090E+00	5.0000E-01
10	5.1360E-01	2.2000E-02	8.1530E+00	5.1073E+00	5.7590E+01	2.7300E+00	5.0000E-01
11	3.7930E-01	2.2000E-02	1.0208E+01	3.9200E+00	3.3060E+01	3.7540E+00	5.0000E-01
12	5.3690E-01	2.2000E-02	8.5560E+00	4.8090E+00	5.0445E+01	2.6560E+00	4.2620E-01
13	5.0000E0I	2.2000E02	9.3120E+00	4.9700E+00	5.5735E+01	3.0780E+00	5.0000E0I
14	5.0000E0I	2.2000E02	9.3120E+00	4.9700E+00	5.5735E+01	3.0780E+00	5.0000E0I
15	5.3690E-01	2.2000E-02	8.5560E+00	4.8090E+00	5.0445E+01	2.6560E+00	4.2620E-01
16	1.1412E+00	2.2000E-02	6.5374E+00	5.2376E+00	3.6479E+01	6.3750E+00	7.0670E01
17	1.1342E+00	2.2000E-02	6.6923E+00	6.9942E+00	7.1688E+01	6.3750E+00	7.1060E01
18	1.1833E+00	2.2000E-02	6.7260E+00	6.1880E+00	6.8308E+01	6.3750E+00	6.1280E-01
19	1.1833E+00	2.2000E-02	6.7260E+00	6.1880E+00	6.8308E+01	6.3750E+00	6.1280E-01
20	1.1342E+00	2.2000E-02	6.6923E+00	6.9942E+00	7.1688E+01	6.3750E+00	7.1060E-01
21	.0000E+00	2.2000E-02	7.0000E+00	1.0790E+01	1.4997E+02	7.0000E+00	1.0000E+00
22	1.3200E+00	2.2000E-02	2.3665E+01	1.3430E+01	2.0460E+02	2.3665E+01	1.0000E+00
23	4.1400E-01	2.2000E-02	1.1150E+01	1.6000E+01	4.0000E+02	1.0270E+01	1.000OE+00

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Table 6.2.1.2-~~2~~ (Sheet 2 of 3)

FLOW PATH DATA, HOOP FLOW FOR HOT LEG BREAK

Element	K-Factor	F-Factor	Inertial	Hydr. D Length (ft.)	Flow A (ft.)	Equi. L (sq. ft.)	A/A (ft.)
24	1.9790E+00	2.2000E-02	1.1090E+01	1.0790E+01	1.4997E+02	3.7900E+00	2.9000E-01
25	4.9380E-01	2.2000E-02	1.2814E+01	7.5456E+00	2.8032E+02	3.1736E+00	4.4960E-01
26	5.1760E-01	2.2000E-02	1.1199E+01	7.2000E+00	2.4370E+02	3.4905E+00	4.6280E-01
27	7.9770E-01	2.2000E-02	2.5879E+00	1.1152E+00	5.8391E+00	2.0118E+00	1.OOOOE+00
28	8.5900E01	2.2000E02	2.1460E+00	5.4220E01	3.4600E+00	2.0010E+00	1.0000E+00
29	7.9770E-01	2.2000E-02	2.5879E+00	1.1152E+00	5.8391E+00	2.0118E+00	1.0000E+00
30	5.6550E-01	2.2000E-02	8.1013E+00	1.8143E+00	9.7682E+00	7.5290E+00	1.0740E-01
31	5.6630E-01	2.2000E-02	8.0931E+00	1.7337E+00	6.5121E+00	7.5260E+00	1.0590E01
32	5.6550E-01	2.2000E-02	8.1013E+00	1.8143E+00	9.7682E+00	7.5290E+00	1.0740E-01
33	5.6550E-01	2.2000E-02	8.1013E+00	1.8143E+00	9.7682E+00	7.5290E+00	1.0740E-01
34	5.6630E-01	2.2000E-02	8.0931E+00	1.7337E+00	6.5121E+00	7.5260E+00	1.0590E-01
35	5.6550E-01	2.2000E-02	8.1013E+00	1.8143E+00	9.7682E+00	7.5290E+00	1.0740E-01
36	9.7500E-01	2.2000E-02	2.1509E+00	1.2830E+00	5.8391E+00	2.0001E+00	1.OOOOE+00
37	9.8500E-01	2.2000E-02	2.0890E+00	5.4220E-01	3.4600E+00	2.OOOOE+00	1.OOOOE+00
38	9.7500E-01	2.2000E-02	2.1509E+00	1.2830E+00	5.8391E+00	2.OOOIE+00	1.OOOOE+00
39	.0000E+00	.0000E+00	.OOOOE+00	1.OOOOE+00	1.OOOOE+00	.OOOOE+00	.OOOOE+00
40	9.6900E-01	2.2000E-02	5.5970E+00	9.4770E-01	2.7680E+00	5.5000E+00	1.OOOOE+00
41	9.9930E-01	2.2000E-02	2.0150E+00	2.SOOOE+00	4.9087E+00	2.OOOOE+00	1.OOOOE+00
42	9.9930E-01	2.2000E-02	2.0150E+00	2.5000E+00	4.9087E+00	2.OOOOE+00	1.OOOOE+00
43	9.9930E-01	2.2000E-02	2.OISOE+00	2.5000E+00	4.9087E+00	2.0000E+00	1.0000E+00
44	9.9930E-01	2.2000E-02	2.0150E+00	2.5000E+00	4.9087E+00	2.0000E+00	1.0000E+00
45	1.4580E+00	2.2000E-02	4.6650E+00	4.8000E+00	3.6000E+01	4.0000E+00	5.7700E-02

Table 6.2.1.2-~~2~~ 1 (Sheet 3 of 3)

FLOW PATH DATA, HOOP FLOW FOR HOT LEG BREAK

Element	K-Factor	F-Factor	Inertial	Hydr. D Length (ft.)	Flow A (ft.)	Equi. L (sq. ft.)	A/A (ft.)
46	1.4580E+00	2.2000E-02	4.6650E+00	4.8000E+00	3.6000E+01	4.0000E+00	5.7700E-02
47	8.8090E01	2.2000E02	7.8533E+00	2.7106E+00	1.4916E+01	7.5033E+00	1.0000E+00
48	9.1970E-01	2.2000E-02	7.7355E+00	2.5289E+00	9.9463E+00	7.5014E+00	1.0000E+00
49	8.8090E-01	2.2000E-02	7.8533E+00	2.7106E+00	1.4916E+01	7.5033E+00	1.0000E+0Q
50	8.8090E-01	2.2000E-02	7.8533E+00	2.7106E+00	1.4916E+01	7.5033E+00	1.0000E+00
51	9.1970E-01	2.2000E-02	7.7355E+00	2.5289E+00	9.9463E+00	7.5014E+00	1.0000E+00
52	8.8090E-01	2.2000E-02	7.8533E+00	2.7106E+00	1.4919E+01	7.5033E+00	1.0000E+00
53	1.2570E+00	2.2000E-02	4.2400E+00	4.1680E+00	2.5365E+01	1.2900E+00	1.5400E-01
54	3.0000E-02	2.2000E-02	7.1300E+00	1.2270E+01	1.6464E+02	6.0280E+00	8.2600E-01
55	9.9300E-01	2.2000E-02	5.9950E+00	6.3740E+00	6.8000E+01	2.5630E+00	3.9200E-01
56	1.4800E+00	2.2000E-02	4.5440E+00	1.0000E+01	1.0000E+02	4.0000E+00	8.1400E-02
57	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
58	1.0790E+00	2.2000E-02	7.8460E+00	9.4400E+00	3.4560E+02	6.3790E+00	7.3900E-01
59	4.2800E-01	2.2000E-02	1.1120E+01	8.2300E+00	1.6670E+02	9.2400E+00	4.3400E-01
60	1.4340E+00	2.2000E-02	3.5450E+00	1.3400E+00	1.6840E+01	2.0250E+00	1.0100E-01
61	1.0000E+00	2.2000E-02	6.1875E+00	1.3700E+00	8.3350E+01	9.7000E-01	5.0000E-01
62	2.0000E+00	2.2000E02	3.2400E+00	1.3700E+00	8.3350E+01	7.0600E-0	1.0000E+00
63	.0000E+00	2.2000E02	1.3041E+01	5.4740E+00	3.4680E+01	1.3041E+01	1.0000E+00
64	2.4360E+00	2.2000E-02	1.5179E+01	5.7670E+00	4.1332E+01	1.3665E+01	3.3700E-02
65	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
66	1.5000E+00	2.2000E02	6.8000E+00	5.7000E-02	9.3380E+01	5.2000E-01	5.0000E-01
67	1.5000E+00	2.2000E-02	5.1900E-01	8.8800E-01	3.9960E+00	4.1700E-01	1.0700E-02
68	1.7590E+00	2.2000E-02	1.4420E+01	4.9080E+00	3.1069E+01	1.3920E+01	1.1900E-01

~~Table 6.2.1.2-32 (Sheet 1 of 3)~~

~~FLOW PATH DATA, HOOP FLOW FOR HOT LEG BREAK~~

Flow Path (node-node)	Area (sq. ft)	K-Factor -	F-Factor -	L/A (ft^{-1})	Hydraulic Diameter (ft)	Equiv. Length (ft)	A/A Factor -	Flow Cond. critical/non-crit
1-6	38.5	0.4119	0.022	0.2039	3.75	2.43	0.50	non-crit
2-7	69.37	0.4081	0.022	0.1135	5.6345	2.5514	0.50	non-crit
3-8	53.15	0.5447	0.022	0.1259	3.192	1.495	0.426	non-crit
4-9	53.15	0.5447	0.022	0.1259	3.192	1.495	0.426	non-crit
5-10	69.37	0.4081	0.022	0.1135	5.6345	2.5514	0.5	non-crit
6-11	32.21	0.5129	0.022	0.2558	3.88	2.765	0.5	non-crit
7-12	57.59	0.5136	0.022	0.1430	5.1073	2.7489	0.5	non-crit
8-13	53.95	0.5163	0.022	0.1521	4.835	2.7276	0.5	non-crit
9-14	53.95	0.5163	0.022	0.1521	4.835	2.7276	0.5	non-crit
10-15	57.59	0.5136	0.022	0.1430	5.1073	2.7489	0.5	non-crit
11-16	33.06	0.3793	0.022	0.3126	3.92	3.7849	0.5	non-crit
12-17	50.44	0.5369	0.022	0.1717	4.809	2.6766	0.4262	non-crit
13-18	55.73	0.5	0.022	0.1693	4.97	3.1094	0.5	non-crit
14-19	55.73	0.5	0.022	0.1693	4.97	3.1094	0.5	non-crit
15-20	50.44	0.5369	0.022	0.1717	4.809	2.6766	0.4262	non-crit
16-57	36.479	1.1413	0.022	0.1266	5.2376	6.375	0.7067	non-crit
17-57	71.69	1.1342	0.022	0.0663	6.9942	6.375	0.7106	non-crit
18-57	68.31	1.1836	0.022	0.0602	6.188	6.375	0.6128	non-crit
19-57	68.31	1.1836	0.022	0.0602	6.188	6.375	0.6128	non-crit
20-57	71.69	1.1342	0.022	0.0663	6.9942	6.375	0.7106	non-crit

~~Table 6.2.1.2-32 (Sheet 2 of 3)~~

~~FLOW PATH DATA, HOOP FLOW FOR HOT LEG BREAK~~

~~Flow Path~~	~~Area~~	~~K-Factor~~	~~F-Factor~~	~~L/A~~	~~Hydraulic Diameter~~	~~Equiv. Length~~	~~A/A Factor~~	~~Flow Cond.~~
~~(node-node)~~	~~(sq. ft)~~	-	-	~~(ft^{-1})~~	~~(ft)~~	~~(ft)~~	-	~~critical/ non-crit~~
~~21-22~~	~~74.68~~	~~0.2778~~	~~0.022~~	~~0.0376~~	~~6.5884~~	~~1.625~~	~~0.4444~~	~~non-crit~~
~~22-23~~	~~74.68~~	~~0.36~~	~~0.022~~	~~0.0890~~	~~6.5884~~	~~2.3446~~	~~1.~~	~~non-crit~~
~~23-56~~	~~135.~~	~~1.25~~	~~0.022~~	~~0.0659~~	~~8.44~~	~~5.267~~	~~0.5~~	~~non-crit~~
~~24-25~~	~~121.35~~	~~0.5436~~	~~0.022~~	~~0.1429~~	~~9.643~~	~~14.789~~	~~1.~~	~~non-crit~~
~~25-26~~	~~280.32~~	~~0.4938~~	~~0.022~~	~~0.0457~~	~~7.5456~~	~~3.1736~~	~~0.4496~~	~~non-crit~~
~~26-58~~	~~243.7~~	~~0.5176~~	~~0.022~~	~~0.0460~~	~~7.2~~	~~3.4905~~	~~0.4628~~	~~non-crit~~
~~27-32~~	~~6.98~~	~~0.7589~~	~~0.022~~	~~0.3880~~	~~1.3331~~	~~2.0206~~	~~1.~~	~~non-crit~~
~~28-31~~	~~6.28~~	~~0.7541~~	~~0.022~~	~~0.3604~~	~~0.9995~~	~~2.0075~~	~~1.~~	~~non-crit~~
~~29-30~~	~~6.98~~	~~0.7589~~	~~0.022~~	~~0.3880~~	~~1.3331~~	~~2.0206~~	~~1.~~	~~non-crit~~
~~30-47~~	~~9.77~~	~~0.5655~~	~~0.022~~	~~0.5086~~	~~1.8143~~	~~7.0283~~	~~0.1074~~	~~non-crit~~
~~31-48~~	~~6.51~~	~~0.5663~~	~~0.022~~	~~0.7620~~	~~1.7337~~	~~7.0254~~	~~0.1059~~	~~non-crit~~
~~32-49~~	~~9.77~~	~~0.5655~~	~~0.022~~	~~0.5086~~	~~1.8143~~	~~7.0283~~	~~0.1074~~	~~non-crit~~
~~33-50~~	~~9.77~~	~~0.5655~~	~~0.022~~	~~0.5086~~	~~1.8143~~	~~7.0283~~	~~0.1074~~	~~non-crit~~
~~34-51~~	~~6.51~~	~~0.5663~~	~~0.022~~	~~0.7620~~	~~1.7337~~	~~7.0254~~	~~0.1059~~	~~non-crit~~
~~35-52~~	~~9.77~~	~~0.5655~~	~~0.022~~	~~0.5086~~	~~1.8143~~	~~7.0283~~	~~0.1074~~	~~non-crit~~
~~36-25~~	~~6.98~~	~~0.9673~~	~~0.022~~	~~0.3149~~	~~1.3331~~	~~2.0002~~	~~1.~~	~~non-crit~~
~~37-25~~	~~6.28~~	~~0.9705~~	~~0.022~~	~~0.3468~~	~~0.9995~~	~~2.~~	~~1.~~	~~non-crit~~
~~38-25~~	~~6.98~~	~~0.9673~~	~~0.022~~	~~0.3149~~	~~1.3331~~	~~2.0002~~	~~1.~~	~~non-crit~~
~~39-46~~	~~1.63~~	~~0.9948~~	~~0.022~~	~~3.3916~~	~~0.6145~~	~~5.5~~	~~1.~~	~~non-crit~~

~~Table 6.2.1.2-32 (Sheet 3 of 3)~~

~~FLOW PATH DATA, HOOP FLOW FOR HOT LEG BREAK~~

~~Flow Path~~	~~Area~~	~~K-Factor~~	~~F-Factor~~	~~L/A~~	~~Hydraulic Diameter~~	~~Equiv. Length~~	~~A/A Factor~~	~~Flow Cond.~~
~~(node-node)~~	~~(sq. ft)~~	-	-	~~(ft^{-1})~~	~~(ft)~~	~~(ft)~~	-	~~critical/ non-crit~~
~~40-45~~	~~1.63~~	~~0.9948~~	~~0.022~~	~~3.3916~~	~~0.6145~~	~~5.5~~	~~1.~~	~~non-crit~~
~~41-57~~	~~4.91~~	~~0.9993~~	~~0.022~~	~~0.4074~~	~~2.5~~	~~2.~~	~~1.~~	~~non-crit~~
~~42-57~~	~~4.91~~	~~0.9993~~	~~0.022~~	~~0.4074~~	~~2.5~~	~~2.~~	~~1.~~	~~non-crit~~
~~43-57~~	~~4.91~~	~~0.9993~~	~~0.022~~	~~0.4074~~	~~2.5~~	~~2.~~	~~1.~~	~~non-crit~~
~~44-57~~	~~4.91~~	~~0.9993~~	~~0.022~~	~~0.4074~~	~~2.5~~	~~2.~~	~~1.~~	~~non-crit~~
~~45-56~~	~~36.~~	~~1.4600~~	~~0.022~~	~~0.1293~~	~~4.8~~	~~4.~~	~~0.0577~~	~~non-crit~~
~~46-56~~	~~36.~~	~~1.4600~~	~~0.022~~	~~0.1293~~	~~4.8~~	~~4.~~	~~0.0577~~	~~non-crit~~
~~47-53~~	~~14.92~~	~~0.8809~~	~~0.022~~	~~0.4929~~	~~2.7106~~	~~7.~~	~~1.00~~	~~non-crit~~
~~48-53~~	~~9.94~~	~~0.9197~~	~~0.022~~	~~0.7294~~	~~2.5289~~	~~7.~~	~~1.~~	~~non-crit~~
~~49-53~~	~~14.92~~	~~0.8809~~	~~0.022~~	~~0.4929~~	~~2.7106~~	~~7.~~	~~1.~~	~~non-crit~~
~~50-53~~	~~14.92~~	~~0.8809~~	~~0.022~~	~~0.7294~~	~~2.7106~~	~~7.~~	~~1.~~	~~non-crit~~
~~51-53~~	~~9.94~~	~~0.9197~~	~~0.022~~	~~0.7275~~	~~2.5289~~	~~7.~~	~~1.~~	~~non-crit~~
~~52-53~~	~~14.92~~	~~0.8809~~	~~0.022~~	~~0.4929~~	~~2.7106~~	~~7.~~	~~1.~~	~~non-crit~~
~~53-54~~	~~85.~~	~~0.1476~~	~~0.022~~	~~0.1905~~	~~9.1892~~	~~15.524~~	~~0.7048~~	~~non-crit~~
~~54-55~~	~~44.~~	~~0.9868~~	~~0.022~~	~~0.0890~~	~~5.8667~~	~~2.2018~~	~~0.2256~~	~~non-crit~~
~~55-23~~	~~42.~~	~~1.0631~~	~~0.022~~	~~0.1215~~	~~4.9412~~	~~2.3123~~	~~0.300~~	~~non-crit~~
~~56-57~~	~~100.~~	~~1.5~~	~~0.022~~	~~0.04~~	~~10.~~	~~4.~~	~~0.0814~~	~~non-crit~~
~~57-0~~								
~~58-57~~	~~345.6~~	~~1.145~~	~~0.022~~	~~0.0164~~	~~9.44~~	~~6.5048~~	~~0.709~~	~~non-crit~~

Table 6.2.1.2-~~5~~ (Sheet 1 of 4)

FLOW PATH DATA, RADIAL FLOW FOR HOT LEG BREAK

Element	K-Factor	F-Factor	Inertial	Hydr. D Length (ft.)	Flow A (ft.)	Equi. L (sq. ft.)	A/A (ft.)
1	1.4980E-01	2.2000E-02	6.2581E+00	1.7535E+01	3.1650E+02	4.7392E+00	1.0000E+00
2	2.2000E-02	2.2000E-02	1.3632E+01	1.0126E+01	2.0683E+02	1.3051E+01	1.0000E+00
3	.0000E+00	.0000E+00	.0000E+00	1.000E+00	1.0000E+00	.0000E+00	.0000E+00
4	3.7800E-02	2.2000E-02	9.0000E+00	1.7535E+01	3.1650E+02	9.0000E+00	1.0000E+00
5	2.2000E-02	2.2000E-02	1.3632E+01	1.0126E+01	2.0683E+02	1.3051E+01	1.0000E+00
6	6.8100E-02	2.2000E-02	7.0000E+00	7.8606E+00	9.3030E+01	5.6729E+00	1.0000E+00
7	1.0660E-01	2.2000E-02	1.5556E+01	5.7860E+00	5.6183E+01	1.4936E+01	7.6240E-01
8	1.3952E+00	2.2000E-02	3.6450E+00	4.1706E+00	1.8580E+01	2.5419E+00	1.5310E-01
9	1.7130E-01	2.2000E-02	1.1000E+01	7.8606E+00	9.3030E+01	1.1000E+01	7.6890E-01
10	1.0660E-01	2.2000E-02	1.5556E+01	5.7860E+00	5.6183E+01	1.4936E+01	7.6240E-01
11	1.2470E-01	2.2000E-02	6.7931E+00	1.2908E+01	1.9311E+02	5.2768E+00	1.0000E+00
12	3.7750E-01	2.2000E-02	1.5556E+01	8.2534E+00	1.0592E+02	1.4856E+01	6.0790E-01
13	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
14	2.7060E01	2.2000E02	1.1000E+01	1.2908E+01	1.9311E+02	1.1000E+01	6.7290E01
15	3.7750E-01	2.2000E-02	1.5556E+01	8.2534E+00	1.0592E+02	1.4856E+01	6.0790E-01
16	2.2280E-01	2.2000E-02	6.3333E+00	8.9074E+00	9.1444E+01	4.6778E+00	9.5630E-01
17	5.0680E-01	2.2000E-02	1.4500E+01	6.3812E+00	5.6854E+01	1.4500E+01	4.9550E-01
18	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
19	3.3180E-01	2.2000E-02	1.2000E+01	1.0062E+01	1.1104E+02	1.2000E+01	6.2210E-01
20	5.0680E-01	2.2000E-02	1.4500E+01	6.3812E+00	5.6854E+01	1.4500E+01	4.9550E01
21	1.9790E+00	2.2000E-02	1.1090E+01	1.0790E+01	1.4997E+02	3.7900E+00	2.9000E01
22	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00

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Table 6.2.1.2.~~8~~ (Sheet 2 of 4)

FLOW PATH DATA, RADIAL FLOW FOR HOT LEG BREAK

Element	K-Factor	F-Factor	Inertial	Hydr. D Length (ft.)	Flow A (ft.)	Equi. L (sq. ft.)	A/A (ft.)
23	1.3400E-01	2.2000E-02	1.9300E+01	1.0790E+01	1.4997E+02	1.4381E+01	7.3300E-01
24	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
25	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
26	2.6110E+00	2.2000E-02	5.3720E+00	4.1706E+00	1.8580E+01	2.7800E+00	2.5600E-02
27	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
28	9.5470E-01	2.2000E-02	2.1070E+00	5.4220E-01	3.4600E+00	2.0000E+00	1.0000E+00
29	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
30	3.6990E01	2.2000E02	1.4000E+01	6.1747E+00	3.9098E+01	1.4000E+01	5.9240E01
31	2.5000E-01	2.2000E-02	6.9988E+00	5.9448E+00	3.6650E+01	5.0528E+00	1.0000E+00
32	3.6990E-01	2.2000E-02	1.4000E+01	6.1747E+00	3.9098E+01	1.4000E+01	5.9240E-01
33	2.5000E-01	2.2000E-02	6.9988E+00	5.9448E+00	3.6650E+01	5.0528E+00	5.0000E-01
34	4.3370E-01	2.2000E-02	2.2653E+00	9.6430E-01	6.2800E+00	2.0073E+00	1.3260E-01
35	2.5000E-01	2.2000E-02	6.9988E+00	5.9448E+00	3.6650E+01	5.0528E+00	5.0000E-01
36	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
37	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
38	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
39	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
40	9.9960E-01	2.2000E-02	5.6416E+00	9.4790E-01	2.7686E+00	5.5005E+00	1.0000E+00
41	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
42	8.9500E-01	2.2000E-02	2.1978E+00	2.5000E+00	4.9087E+00	2.0029E+00	1.0000E+00
43	8.9500E-01	2.2000E-02	2.1978E+00	2.5000E+00	4.9087E+00	2.0029E+00	1.0000E+00
44	8.9500E-01	2.2000E-02	2.1978E+00	2.5000E+00	4.9087E+00	2.0029E+00	1.0000E+00

Table 6.2.1.2-~~3~~ (Sheet 3 of 4)

FLOW PATH DATA, RADIAL FLOW FOR HOT LEG BREAK

Element	K-Factor	F-Factor	Inertial	Hydr. D Length (ft.)	Flow A (ft.)	Equl. L (sq. ft.)	A/A (ft.)
45	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
46	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
47	.0000E+00	2.2000E-02	9.4248E+00	2.8638E+00	2.3745E+01	9.4248E+00	1.0000E+00
48	.0000E+00	2.2000E-02	7.8540E+00	2.8638E+00	2.3745E+01	7.8540E+00	1.0000E+00
49	.0000E+00	2.2000E-02	9.4248E+00	2.8638E+00	2.3745E+01	9.4248E+00	1.0000E+00
50	.0000E+00	2.2000E-02	7.8540E+00	2.8638E+00	2.3745E+01	7.8540E+00	1.0000E+00
51	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
52	.0000E+00	2.2000E02	7.8540E+00	2.8638E+00	2.3745E+01	7.8540E+00	1.0000E+00
53	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
54	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
55	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
56	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
57	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
58	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
59	4.3700E-01	2.2000E-02	6.3200E+00	7.5900E+00	6.1998E+01	1.9400E+00	3.8700E-01
60	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
61	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
62	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
63	2.4360E+00	2.2000E-02	1.5179E+01	5.7670E+00	4.1332E+01	1.3665E+01	3.3700E-02
64	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
65	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
66	1.5000E+00	2.2000E-02	1.0070E+00	1.4600E+00	4.1330E+01	4.2200E-01	1.1070E-01
67	1.5000E+00	2.2000E-02	1.2360E+00	1.5300E+00	3.7334E+01	4.2800E-01	1.0000E-01

Table 6.2.1.2-~~6~~ (Sheet 4 of 4

FLOW PATH DATA, RADIAL FLOW FOR HOT LEG BREAK

Element	K-Factor	F-Factor	Inertial	Hydr. D Length (ft.)	Flow A (ft.)	Equi. L (sq. ft.)	A/A (ft.)
68	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
69	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
70	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
71	1.5000E+00	2.2000E-02	4.9700E-01	8.5700E-01	3.0030E+00	4.1680E-01	1.0000E-02
72	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
73	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00

~~Table 6.2.1.2-53 (Sheet 1 of 3)~~

~~FLOW PATH DATA, RADIAL FLOW FOR HOT LEG BREAK~~

Flow Path	Area	K-Factor	F-Factor	L/A	Hydraulic Diameter	Equiv. Length	A/A Factor	Flow Cond.
(node-node)	(sq. ft)	-	-	(ft^{-1})	(ft)	(ft)	-	critical/ non-crit
1-2	288.75	0.1497	0.022	0.0342	16.8613	4.7535	1.	non-crit
2-3	186.94	0.0162	0.022	0.0787	9.5865	13.057	1.	non-crit
3-0								
4-3	288.75	0.0377	0.022	0.0334	16.8613	9.	1.	non-crit
5-4	186.94	0.0162	0.022	0.0787	9.5865	13.057	1.	non-crit
6-7	91.5	0.0679	0.022	0.0915	7.7872	5.6762	1.	non-crit
7-8	55.38	0.1035	0.022	0.2153	5.7532	14.938	0.7638	non-crit
8-56	31.	1.3228	0.022	0.1430	5.5522	2.6632	0.2605	non-crit
9-8	91.5	0.1689	0.022	0.0924	7.7872	11.	0.7689	non-crit
10-9	55.38	0.1035	0.022	0.2153	5.7532	14.938	0.7638	non-crit
11-12	197.82	0.1247	0.022	0.0360	13.0059	5.2733	1.	non-crit
12-13	108.5	0.3774	0.022	0.0871	8.2929	14.853	0.6078	non-crit
13-56	52.6	1.1999	0.022	0.1102	7.1081	3.1016	0.4420	non-crit
14-13	197.82	0.2706	0.022	0.0556	13.0059	11.	0.6728	non-crit
15-14	108.5	0.3774	0.022	0.0871	8.2929	14.853	0.6078	non-crit
16-17	91.44	0.2228	0.022	0.0662	8.9074	4.6778	0.9563	non-crit
17-18	56.85	0.5068	0.022	0.3240	6.3812	14.5	0.4955	non-crit
18-0								
19-18	111.04	0.3318	0.022	0.0672	10.0623	12.	0.6221	non-crit
20-19	56.85	0.5068	0.022	0.3240	6.3312	14.5	0.4955	non-crit

~~Table 6.2.1.2-53 (Sheet 2 of 3)~~

~~FLOW PATH DATA, RADIAL FLOW FOR HOT LEG BREAK~~

~~Flow Path~~	~~Area~~	~~K-Factor~~	~~F-Factor~~	~~L/A~~	~~Hydraulic Diameter~~	~~Equiv. Length~~	~~A/A Factor~~	~~Flow Cond.~~
~~(node-node)~~	~~(sq. ft)~~	-	-	~~(ft^{-1})~~	~~(ft)~~	~~(ft)~~	-	~~critical/ non-crit~~
~~21-2~~	~~130.69~~	~~0.3158~~	~~0.022~~	~~0.0495~~	~~10.1823~~	~~5.0118~~	~~1.~~	~~non-crit~~
~~22-0~~								
~~23-24~~	~~121.36~~	~~0.175~~	~~0.022~~	~~0.1184~~	~~9.643~~	~~10.744~~	~~0.65~~	~~non-crit~~
~~24-0~~								
~~25-0~~								
~~26-56~~	~~24.~~	~~1.5~~	~~0.022~~	~~.2233~~	~~4.364~~	~~2.5~~	~~0.0267~~	~~non-crit~~
~~27-0~~								
~~28-1~~	~~6.28~~	~~0.9089~~	~~0.022~~	~~0.3520~~	~~0.9995~~	~~2.~~	~~1.~~	~~non-crit~~
~~29-0~~								
~~30-35~~	~~38.22~~	~~0.3696~~	~~0.022~~	~~0.2171~~	~~6.1157~~	~~14.~~	~~0.5927~~	~~non-crit~~
~~31-30~~	~~35.83~~	~~0.25~~	~~0.022~~	~~0.1954~~	~~5.8902~~	~~5.0582~~	~~1.~~	~~non-crit~~
~~32-33~~	~~38.22~~	~~0.3695~~	~~0.022~~	~~0.2171~~	~~6.1157~~	~~14.~~	~~0.5927~~	~~non-crit~~
~~33-34~~	~~35.83~~	~~0.25~~	~~0.022~~	~~0.1953~~	~~5.8902~~	~~5.0582~~	~~0.5~~	~~non-crit~~
~~34-37~~	~~6.28~~	~~0.4342~~	~~0.022~~	~~0.3604~~	~~0.9995~~	~~2.0075~~	~~0.1316~~	~~non-crit~~
~~35-34~~	~~35.83~~	~~0.25~~	~~0.022~~	~~0.1954~~	~~5.8902~~	~~5.0582~~	~~0.5~~	~~non-crit~~
~~36-0~~								
~~37-0~~								
~~38-0~~								
~~39-0~~								

~~Table 6.2.1.2-53 (Sheet 3 of 3)~~

~~FLOW PATH DATA, RADIAL FLOW FOR HOT LEG BREAK~~

Flow Path (node-node)	Area (sq. ft)	K-Factor -	F-Factor -	L/A (ft^{-1})	Hydraulic Diameter (ft)	Equiv. Length (ft)	A/A Factor -	Flow Cond. critical/non-crit
40-30	1.634	0.9623	0.022	3.4183	0.6145	5.5	1.	non-crit
41-0								
42-32	4.91	0.8950	0.022	0.4468	2.5	2.0028	1.	non-crit
43-33	4.91	0.8950	0.022	0.4468	2.5	2.0028	1.	non-crit
44-35	4.91	0.8950	0.022	0.4468	2.5	2.0028	1.	non-crit
45-0								
46-0								
47-52	22.162	0.	0.022	0.4253	2.8444	9.4248	1.	non-crit
48-47	22.162	0.	0.022	0.3544	2.8444	7.8540	1.	non-crit
49-50	22.162	0.	0.022	0.4253	2.8444	9.4248	1.	non-crit
50-51	22.162	0.	0.022	0.3544	2.8444	7.8540	1.	non-crit
51-0								
52-51	22.162	0.	0.022	0.3544	2.8444	7.8540	1.	non-crit
53-0								
54-0								
55-0								
56-0								
57-0								
58-0								

Table 6.2.1.2.~~4~~3 (Sheet 1 of 4)

FLOW PATH DATA, AXIAL FLOW FOR HOT LEG BREAK

Element	K-Factor	F-Factor	Inertial	Hydr. D Length (ft.)	Flow A (ft.)	Equi. L (sq. ft.)	A/A (ft.)
1	1.4980E-01	2.2000E-02	6.2581E+00	1.7535E+01	3.1650E+02	4.7395E+00	1.0000E+00
2	4.8460E-01	2.2000E-02	2.2614E+00	1.1152E+00	5.8391E+00	2.0007E+00	3.0700E-02
3	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
4	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5	4.8460E-01	2.2000E-02	2.2614E+00	1.1152E+00	5.8391E+00	2.0007E+00	3.0700E-02
6	6.8100E-02	2.2000E-02	7.0000E+00	7.8606E+00	9.3030E+01	5.6729E+00	1.0000E+00
7	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
8	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
9	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
10	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
11	1.2470E-01	2.2000E-02	6.7931E+00	1.2908E+01	1.9311E+02	5.2768E+00	1.0000E+00
12	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
13	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
14	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
15	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
16	2.2280E-01	2.2000E-02	6.3333E+00	8.9074E+00	9.1444E+01	4.6778E+00	9.5630E01
17	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
18	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
19	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
20	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
21	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
22	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00

Table 6.2.1.2-~~4~~3 (Sheet 2 of 4)

FLOW PATH DATA, AXIAL FLOW FOR HOT LEG BREAK

Element	K-Factor	F-Factor	Inertial	Hydr. D Length (ft.)	Flow A (ft.)	Equi. L (sq. ft.)	A/A (ft.)
23	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
24	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
25	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+	00.0000E+00
26	3.4510E+00	2.2000E-02	7.8400E+00	3.2020E+00	1.0680E+01	3.5220E+00	1.8700E02 27
27	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	3.5220E+00	1.8700E-02
28	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
29	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
[illegible]	4.7300E-01	2.2000E-02	2.1978E+00	2.5000E+00	4.9087E+00	2.0029E+00	5.3900E02
31	2.5000E-01	2.2000E-02	6.9988E+00	5.9448E+00	3.6650E+01	5.0528E+00	1.0000E+00
32	4.8430E-01	2.2000E-02	7.1416E+00	9.4790E-01	2.7686E+00	7.0005E+00	3.1500E-02
33	4.4660E-01	2.2000E-02	2.5879E+00	1.1152E+00	5.8391E+00	2.0118E+00	1.0690E-01
34	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
35	4.4660E-01	2.2000E-02	2.5879E+00	1.1152E+00	5.8391E+00	2.0118E+00	1.0690E-01
36	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
37	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
38	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
39	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
40	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
41	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
42	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
43	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
44	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00

3

Table 6.2.1.2-~~4~~ 3 (Sheet 3 of 4)

FLOW PATH DATA, AXIAL FLOW FOR HOT LEG BREAK

Element	K-Factor	F-Factor	Inertial	Hydr. D Length (ft.)	Flow A (ft.)	Equi. L (sq. ft.)	A/A (ft.)
45	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
46	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
47	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
48	.0000E+00	2.2000E02	7.8540E+00	2.8638E+00	2.3745E+01	7.8540E+00	1.0000E+00
49	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00 50
50	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
51	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
52	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
53	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
54	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
55	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
56	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
57	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
58	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
59	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
60	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
61	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
62	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
63	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
64	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
65	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
66	2.8600E-01	2.2000E-02	1.0090E+01	5.8220E+00	3.4460E+01	6.0400E+00	3.8800E-01

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Table 6.2.1.2-~~4~~ (Sheet 4 of 4)

FLOW PATH DATA, AXIAL FLOW FOR HOT LEG BREAK

Element	K-Factor	F-Factor	Inertial	Hydr. D Length (ft.)	Flow A (ft.)	Equl. L (sq. ft.)	A/A (ft.)
67	2.3100E-01	2.2000E-02	1.0090E+01	4.5090E+00	2.0668E+01	6.2060E+00	3.8800E-01
68	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
69	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
70	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00
71	1.5000E+00	2.2000E-02	6.2300E-01	9.3900E-01	7.5570E+00	4.1720E-01	2.5700E-02
72	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000E+00 73
73	.0000E+00	.0000E+00	.0000E+00	1.0000E+00	1.0000E+00	.0000E+00	.0000+00

~~Table 6.2.1.2-4~~

~~FLOW PATH DATA, HOOP FLOW, CHANGES TO TABLE 6.2.1.2-3 FOR COLD LEG BREAK~~

~~Flow Path~~	~~Area~~	~~K-Factor~~	~~F-Factor~~	~~L/A~~	~~Hydraulic Diameter~~	~~Equiv. Length~~	~~A/A Factor~~	~~Flow Cond.~~
~~(node-node)~~	~~(sq. ft)~~	-	-	~~(ft^{-1})~~	~~(ft)~~	~~(ft)~~	-	~~critical/ non-crit~~
~~1-7~~	~~69.37~~	~~0.4081~~	~~0.022~~	~~0.1135~~	~~5.6345~~	~~2.5514~~	~~0.50~~	~~non-crit~~
~~2-6~~	~~38.5~~	~~0.4119~~	~~0.022~~	~~0.2040~~	~~3.75~~	~~2.43~~	~~0.50~~	~~non-crit~~

Table 6.2.1.2-~~1~~ 2 (Sheet 1 of 3)

TMD MODEL NODE INFORMATION ~~FOR HOT LEG BREAK AND MAXIMUM DIFFERENTIAL RESULTS~~

Element Number	Volume (cu. ft.)	STEAM PRESSURE ~~P STM~~ (psi~~g~~a)	AIR PRESSURE ~~P AIR~~ (psi~~g~~a)	Temperature (F)
1	1.5557E+03	1.6930E+00	1.2607E+01	1.2000E+02
2	2.8594E+03	1.6930E+00	1.2607E+01	1.2000E+02
3	2.6862E+03	1.6930E+00	1.2607E+01	1.2000E+02
4	2.6862E+03	1.6930E+00	1.2607E+01	1.2000E+02
5	2.8594E+03	1.6930E+00	1.2607E+01	1.2000E+02
6	5.9219E+02	1.6930E+00	1.2607E+01	1.2000E+02
7	1.0616E+03	1.6930E+00	1.2607E+01	1.2000E+02
8	1.0068E+03	1.6930E+00	1.2607E+01	1.2000E+02
9	1.0068E+03	1.6930E+00	1.2607E+01	1.2000E+02
10	1.0616E+03	1.6930E+00	1.2607E+01	1.2000E+02
11	1.3554E+03	1.6930E+00	1.2607E+01	1.2000E+02
12	2.4261E+03	1.6930E+00	1.2607E+01	1.2000E+02
13	2.2853E+03	1.693E+00	1.2607E+01	1.2000E+02
14	2.2853+03	1.6930E+00	1.2607E+01	1.2000E+02
15	2.4261E+03	1.6930E+00	1.2607E+01	1.2000E+02
16	6.4581E+02	1.6930E+00	1.2607E+01	1.2000E+02
17	1.2633E+03	1.6930E+00	1.2607E+01	1.2000E+02
18	1.3951E+03	1.6930E+00	1.2607E+01	1.2000E+02
19	1.3951E+03	1.6930E+00	1.2607E+01	1.2000E+02
20	1.2633E+03	1.6930E+00	1.2607E+01	1.2000E+02
21	6.9962E+02	1.693E+00	1.2607E+01	1.2000E+02
22	1.4997E+03	1.6930E+00	1.2607E+01	1.2000E+02
23	8.1840E+03	1.6930E+00	1.2607E+01	1.2000E+02
24	6.9962E+02	1.6930E+00	1.2607E+01	1.2000E+02

Table 6.2.1.~~2~~-1 (Sheet 2 of 3) 4

TMD MODEL NODE INFORMATION ~~FOR HOT LEG BREAK~~ AND MAXIMUM DIFFERENTIAL RESULTS

Element Number	Volume ~~(cu. ft.)~~	STEAM PRESSURE ~~P STM~~ (psig) a	AIR PRESSURE ~~P AIR~~ (psig) a	Temperature (F)
25	1.2647E+04	1.6930E+00	1.2607E+01	1.2000E+02
26	1.5507E+04	1.6930E+00	1.2607E+01	1.2000E+02
27	2.3350E+01	1.6930E+00	1.2607E+01	1.2000E+02
28	1.3820E+01	1.6930E+00	1.2607E+01	1.2000E+02
29	2.3350E+01	1.6930E+00	1.2607E+01	1.2000E+02
30	6.3298E+02	1.6930E+00	1.2607E+01	1.2000E+02
31	2.4932E+02	1.6930E+00	1.2607E+01	1.2000E+02
32	6.3298E+02	1.6930E+00	1.2607E+01	1.2000E+02
33	6.3298E+02	1.6930E+00	1.2607E+01	1.2000E+02
34	2.4932+02	1.6930E+00	1.2607E+01	1.2000E+02
35	6.3298E+02	1.6930E+00	1.2607E+01	1.2000E+02
36	2.3350E+01	1.6930E+00	1.2607E+01	1.2000E+02
37	1.3820E+01	1.6930E+00	1.2607E+01	1.2000E+02
38	2.3350E+01	1.6930E+00	1.2607E+01	1.2000E+02
39	3.8760E+01	1.6930E+00	1.2607E+01	1.2000E+02
40	3.0454E+01	1.6930E+00	1.2607E+01	1.2000E+02
41	1.9630E+01	1.6930E+00	1.2607E+01	1.2000E+02
42	1.9630E+01	1.6930E+00	1.2607E+01	1.2000E+02
43	1.9630E+01	1.6930E+00	1.2607E+01	1.2000E+02
44	1.9630E+01	1.6930E+00	1.2607E+01	1.2000E+02
45	1.4443E+04	1.6930E+00	1.2607E+01	1.2000E+02
46	1.1821E+04	1.6930E+00	1.2607E+01	1.2000E+02
47	2.2385E+02	1.6930E+00	1.2607E+01	1.2000E+02
48	1.4924E+02	1.6930E+00	1.2607E+01	1.2000E+02

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Table 6.2.1.2-~~1~~ (Sheet 3 of 3)

TMD MODEL NODE INFORMATION ~~FOR HOT LEG BREAK~~ AND MAXIMUM DIFFERENTIAL RESULTS

Element Number	Volume (cu. ft.)	Steam Pressure ~~P STM~~ (psi~~g~~a)	Air Pressure ~~P AIR~~ (psi~~g~~a)	Temperature (F)
49	2.2385E+02	1.6930E+00	1.2607E+01	1.2000E+02
50	2.2385E+02	1.6930E+00	1.2607E+01	1.2000E+02
51	1.492E+02	1.6930E+00	1.2607E+01	1.2000E+02
52	2.2385E+02	1.6930E+00	1.2607E+01	1.2000E+02
53	2.0080E+03	1.6930E+00	1.2607E+01	1.2000E+02
54	1.0180E+03	1.6930E+00	1.2607E+01	1.2000E+02
55	1.7157E+03	1.6930E+00	1.2607E+01	1.2000E+02
56	1.4937E+05	1.6930E+00	1.2607E+01	1.2000E+02
57	1.1266E+06	1.6930E+00	1.2607E+01	1.2000E+02
58	5.9627E+03	1.6930E+00	1.2607E+01	1.2000E+02
59	3.6489E+03	1.6930E+00	1.2607E+01	1.2000E+02
60	2.9590E+03	1.6930E+00	1.2607E+01	1.2000E+02
61	2.1393E+03	1.6930E+00	1.2607E+01	1.2000E+02
62	1.6532E+03	1.6930E+00	1.2607E+01	1.2000E+02
63	3.5835E+02	1.6930E+00	1.2607E+01	1.2000E+02
64	4.9121E+02	1.6930E+00	1.2607E+01	1.2000E+02
65	6.0183E+02	1.6930E+00	1.2607E+01	1.2000E+02
66	2.3814E+03	1.6930E+00	1.2607E+01	1.2000E+02
67	1.4394E+03	1.6930E+00	1.2607E+01	1.2000E+02
68	2.2659E+03	1.6930E+00	1.2607E+01	1.2000E+02
69	1.8610E+03	1.6930E+00	1.2607E+01	1.2000E+02
70	1.8612E+03	1.6930E+00	1.2607E+01	1.2000E+02
71	1.195E+03	1.6930E+00	1.2607E+01	1.2000E+02
72	1.7413E+03	1.6930E+00	1.2607E+01	1.2000E+02
73	4.4269E+092	1.6930E+00	1.2607E+01	1.2000E+02

Table 6.2.1.2-95

TMD MODEL NODE MAXIMUM
DIFFERENTIAL PRESSURES RELATIVE TO NODE 1
(40% PRESSURE MARGIN NOT INCLUDED IN THESE VALUES)

	Max ΔP (psi)			Max ΔP (psi)			Max ΔP (psi)	
Node #	**Hot Leg**	**Cold Leg**	**Node #**	**Hot Leg**	**Cold Leg**	**Node #**	**Hot Leg**	**Cold Leg**
1	-	-	**21**	1.04	0.96	**41**	1.05	1.06
2	0.87	0.64	**22**	1.05	1.02	**42**	1.05	1.08
3	1.04	0.86	**23**	1.05	1.08	**43**	1.05	1.08
4	1.04	1.03	**24**	1.05	1.08	**44**	1.05	1.08
5	0.87	0.96	**25**	1.05	1.08	**45**	1.05	1.08
6	0.95	0.97	**26**	1.05	1.08	**46**	1.05	1.08
7	1.04	0.86	**27**	1.00	1.03	**47**	1.05	1.08
8	1.05	1.04	**28**	0.60	0.82	**48**	1.05	1.08
9	1.05	1.07	**29**	1.00	0.47	**49**	1.05	1.08
10	1.04	1.06	**30**	1.05	1.03	**50**	1.05	1.08
11	1.05	1.08	**31**	1.03	1.05	**51**	1.05	1.08
12	1.05	1.07	**32**	1.05	1.08	**52**	1.05	1.08
13	1.05	1.08	**33**	1.05	1.08	**53**	1.05	1.08
14	1.05	1.08	**34**	1.05	1.08	**54**	1.05	1.08
15	1.05	1.08	**35**	1.05	1.08	**55**	1.05	1.08
16	1.05	1.08	**36**	1.05	1.08	**56**	1.05	1.08
17	1.05	1.08	**37**	1.05	1.08	**57**	1.05	1.08
18	1.05	1.08	**38**	1.05	1.08	**58**	1.05	1.08
19	1.05	1.08	**39**	1.05	1.08			
20	1.05	1.08	**40**	1.05	1.08			

~~Table 6.2.1.2-6~~

~~FLOW PATH DATA, RADIAL FLOW, CHANGES TO TABLE 6.2.1.2-5 FOR COLD LEG BREAK~~

~~Flow Path~~	~~Area~~	~~K-Factor~~	~~F-Factor~~	~~L/A~~	~~Hydraulic Diameter~~	~~Equiv. Length~~	~~A/A Factor~~	~~Flow Cond.~~
~~(node-node)~~	~~(sq. ft)~~	-	-	~~(ft^{-1})~~	~~(ft)~~	~~(ft)~~	-	~~critical/ non-crit~~
~~1-3~~	~~186.94~~	~~0.0162~~	~~0.022~~	~~0.0787~~	~~9.5865~~	~~13.057~~	~~1.~~	~~non-crit~~
~~2-0~~								
~~6-0~~								
~~11-0~~								
~~16-0~~								
~~28-2~~	~~6.28~~	~~0.9082~~	~~0.022~~	~~.3520~~	~~0.9995~~	~~2.~~	~~1.~~	~~non-crit~~
~~29-1~~	~~6.98~~	~~0.9210~~	~~0.022~~	~~.3356~~	~~1.3331~~	~~2.0015~~	~~1.~~	~~non-crit~~

~~Table 6.2.1.2-8~~

~~FLOW PATH DATA, AXIAL FLOW, CHANGES TO TABLE 6.2.1.2-7 FOR COLD LEG BREAK~~

~~Flow Path~~	~~Area~~	~~K-Factor~~	~~F-Factor~~	~~L/A~~	~~Hydraulic Diameter~~	~~Equiv. Length~~	~~A/A Factor~~	~~Flow Cond.~~
~~(node-node)~~	~~(sq. ft)~~	-	-	~~(ft^{-1})~~	~~(ft)~~	~~(ft)~~	-	~~critical/ non-crit~~
~~1-2~~	~~288.75~~	~~0.1993~~	~~0.022~~	~~0.0342~~	~~16.8613~~	~~4.7535~~	~~0.9680~~	~~non-crit~~
~~2-5~~	~~288.75~~	~~0.1497~~	~~0.022~~	~~0.0342~~	~~16.8613~~	~~4.7535~~	~~1.00~~	~~non-crit~~
~~7-6~~	~~91.5~~	~~0.1833~~	~~0.022~~	~~0.0915~~	~~7.7872~~	~~5.6762~~	~~0.7974~~	~~non-crit~~
~~12-11~~	~~197.82~~	~~0.1975~~	~~0.022~~	~~0.0360~~	~~13.0059~~	~~5.2733~~	~~0.6496~~	~~non-crit~~
~~17-16~~	~~91.5~~	~~0.2261~~	~~0.022~~	~~0.0662~~	~~8.9074~~	~~4.6778~~	~~0.5517~~	~~non-crit~~

6.2.1.2-6

Table ~~6.2.1.3-5~~

Elem Time Press Diff

RESULTS FOR MSLB IN NODE 56
MAXIMUM PRESSURE DIFFERENTIALS BETWEEN
ELEMENT 56 AND ALL OTHER ELEMENTS

Elem	Time	Press	Diff	Elem	Time	Press	Diff	Elem	Time	Press	Diff
1	.243	.4606	2	.243	.4523	3	.243	.4691	4	.243	.4713
5	.243	.4660	6	.243	.4882	7	.243	.4867	8	.243	.4784
9	.243	.4904	10	.243	.4896	11	.243	.5233	12	.243	.5230
13	.243	.5217	14	.243	.5239	15	.243	.5229	16	.233	.5539
17	.233	.5548	18	.233	.5533	19	.233	.5537	20	.233	.5547
21	.229	.2682	22	.233	.2257	23	.023	.1353	24	.070	.2493
25	.244	.4563	26	.243	.5066	27	.243	.4410	28	.243	.4324
29	.243	.4323	30	.243	.4065	31	.243	.4058	32	.243	.4060
33	.243	.4072	34	.243	.4080	35	.243	.4073	36	.243	.4308
37	.243	.4200	38	.243	.4308	39	.068	.4210	40	.033	.2361
41	.243	.4600	42	.243	.4892	43	.243	.4897	44	.243	.4898
45	.049	.2821	46	.045	.2643	47	.056	.3693	48	.056	.3693
49	.056	.3698	50	.056	.3699	51	.056	.3696	52	.056	.3696
53	.278	.3395	54	.035	.2454	55	.032	.2200	56	.000	.0000
57	.201	.5916	58	.243	.5503	59	.064	.3149	60	.059	.3402
61	.229	.5593	62	.201	.5726	63	.068	.2282	64	.074	.1341
65	.085	.4306	66	.089	.4308	67	.086	.4145	68	.067	.3538
69	.068	.3628	70	.069	.3669	71	.087	.4226	72	.088	.4322
73	.045	.0654									

Table ~~6.2.1.3-6~~ 6.2.1.2-7

RESULTS FOR BREAK IN PRESSURIZER VALVE ROOM (NODE 59) MAXIMUM PRESSURE DIFFERENTIALS BETWEEN ELEMENT 59 AND ALL OTHER ELEMENTS

Elem	Time	Press Diff ~~Press~~	Elem ~~Diff~~	Time ~~Elem~~	Press Diff ~~Time~~	Elem ~~Press~~	Time ~~Diff~~	Press Diff ~~Elem~~	Elem ~~Time~~	Time ~~Press~~	Press Diff ~~Diff~~
1	.068	2.2458	2	.068	2.2438	3	.069	2.2461	4	.069	2.2472
5	.069	2.2471	6	.069	2.2480	7	.069	2.2469	8	.069	2.2389
9	.069	2.2456	10	.069	2.2486	11	.069	2.2499	12	.069	2.2496
13	.069	2.2476	14	.069	2.2485	15	.069	2.2500	16	.069	2.2484
17	.069	2.2484	18	.069	2.2480	19	.069	2.2481	20	.069	2.2484
21	.068	2.2287	22	.068	2.2181	23	.068	2.1917	24	.067	2.1230
25	.067	2.0856	26	.069	2.1184	27	.068	2.2384	28	.068	2.2383
29	.068	2.2364	30	.068	2.2278	31	.068	2.2305	32	.068	2.2284
33	.068	2.2009	34	.068	2.1944	35	.068	2.2007	36	.068	2.1416
37	.068	2.1599	38	.068	2.1415	39	.068	2.2343	40	.068	2.2198
41	.068	2.2377	42	.068	2.2380	43	.068	2.2245	44	.068	2.2244
45	.068	2.2394	46	.068	2.2367	47	.068	2.2346	48	.068	2.2357
49	.068	2.2347	50	.068	2.2295	51	.068	2.2281	52	.068	2.2295
53	.068	2.2369	54	.068	2.2201	55	.068	2.2133	56	.068	2.1926
57	.069	2.2468	58	.069	2.2072	59	.000	.0000	60	.011	1.0869
61	.079	2.0213	62	.074	2.0373	63	.008	.6942	64	.014	1.3688
65	.069	2.2519	66	.069	2.2510	67	.069	2.2497	68	.069	2.2471
69	.069	2.2484	70	.069	2.2489	71	.069	2.2511	72	.069	2.2516
73	.068	2.2024									

Table ~~6.2.1.3-7~~ 6.2.1.2-8

RESULTS FOR 3" HL BREAK IN EAST STEAM GENERATOR COMP. (NODE 1)
0 MAXIMUM PRESSURE DIFFERENTIALS BETWEEN
ELEMENT 1 AND ALL OTHER ELEMENTS

Elem	Time	~~Press~~ Press Diff	~~Diff~~ Elem	~~Elem~~ Time	~~Time~~ Press Diff	~~Press~~ Elem	~~Diff~~ Time	~~Elem~~ Press Diff	~~Time~~ Elem	~~Press~~ Time	~~Diff~~ Press Diff
1	.000	.0000	2	.004	.8679	3	.005	1.0356	4	.005	1.0354
5	.004	.8642	6	.005	.9546	7	.005	1.0297	8	.005	1.0461
9	.005	1.0461	10	.005	1.0295	11	.005	1.0451	12	.005	1.0466
13	.005	1.0468	14	.005	1.0468	15	.005	1.0466	16	.005	1.0468
17	.005	1.0468	18	.005	1.0468	19	.005	1.0468	20	.005	1.0468
21	.005	1.0199	22	.005	1.0454	23	.005	1.0468	24	.005	1.0468
25	.005	1.0468	26	.005	1.0468	27	.005	.9947	28	.003	.6293
29	.005	.995	30	.005	1.0461	31	.005	1.0335	32	.005	1.0461
33	.005	1.0468	34	.005	1.0468	35	.005	1.0468	36	.005	1.0468
37	.005	1.0468	38	.005	1.0468	39	.005	1.0468	40	.005	1.0468
41	.005	1.0467	42	.005	1.0467	43	.005	1.0468	44	.005	1.0468
45	.005	1.0468	46	.005	1.0468	47	.005	1.0468	48	.005	1.0466
49	.005	1.0468	50	.005	1.0468	51	.005	1.0468	52	.005	1.0468
53	.005	1.0468	54	.005	1.0468	55	.005	1.0468	56	.005	1.0468
57	.005	1.0468	58	.005	1.0468	59	.005	1.0468	60	.005	1.0468
61	.005	1.0468	62	.005	1.0468	63	.005	1.0468	64	.005	1.0468
65	.005	1.0468	66	.005	1.0468	67	.005	1.0468	68	.005	1.0468
69	.005	1.0468	70	.005	1.0468	71	.005	1.0468	72	.005	1.0468
73	.005	1.0468									

6.2.1.2-9
Table ~~6.2.1.3-8~~

RESULTS FOR 3" CL BREAK IN EAST STEAM GENERATOR COMP (NODE 2)
0 MAXIMUM PRESSURE DIFFERENTIALS BETWEEN
ELEMENT 2 AND ALL OTHER ELEMENTS

Elem	Time	Press Diff ~~Press~~	Elem ~~Diff~~	Time ~~Elem~~	Press Diff ~~Time~~	Elem ~~Press~~	Time ~~Diff~~	Press Diff ~~Elem~~	Elem ~~Time~~	Time ~~Press~~	Press Diff ~~Diff~~
1	.005	.5682	2	.000	.0000	3	.007	.7667	4	.008	.9032
5	.007	.8528	6	.007	.8670	7	.007	.7688	8	.008	.9136
9	.008	.9373	10	.008	.9276	11	.008	.9394	12	.008	.9344
13	.009	.9415	14	.009	.9425	15	.009	.9421	16	.009	.9425
17	.009	.9423	18	.009	.9426	19	.009	.9426	20	.009	.9426
21	.005	.6008	22	.007	.8722	23	.009	.9408	24	.009	.9424
25	.009	.9426	26	.009	.9426	27	.008	.9094	28	.006	.7522
29	.004	.4314	30	.008	.9140	31	.008	.9300	32	.009	.9415
33	.009	.9426	34	.009	.9425	35	.009	.9410	36	.009	.9426
37	.009	.9426	38	.009	.9423	39	.009	.9426	40	.008	.9328
41	.008	.9330	42	.009	.9424	43	.009	.9426	44	.009	.9422
45	.009	.9426	46	.009	.9426	47	.009	.9413	48	.009	.9421
49	.009	.9426	50	.009	.9426	51	.009	.9426	52	.009	.9425
53	.009	.9426	54	.009	.9426	55	.009	.9426	56	.009	.9426
57	.009	.9426	58	.009	.9426	59	.009	.9426	60	.009	.9426
61	.009	.9426	62	.009	.9426	63	.009	.9426	64	.009	.9426
65	.009	.9426	66	.009	.9426	67	.009	.9426	68	.009	.9426
69	.009	.9426	70	.009	.9426	71	.009	.9426	72	.009	.9426
73	.009	.9426									

~~Table 6.2.1.2-2~~

~~TMD MODEL NODE INFORMATION CHANGES TO TABLE 6.2.1.2-1 FOR COLD LEG BREAK AND MAXIMUM DIFFERENTIAL RESULTS FOR COLD LEG BREAK NODE 2~~

		~~Initial Conditions~~			~~Max. Δ Press. (psi) Relative to Node 1~~	
~~Node #~~	~~Volume (sq. ft.)~~	~~Temperature (°F)~~	~~Pressure (psig)~~	~~% Humidity~~	~~Hot Leg~~	~~Cold Leg~~
~~1~~	~~2617.5~~	~~120~~	~~14.3~~	~~0.0~~	-	-
~~2~~	~~1425.5~~	~~120~~	~~14.3~~	~~0.0~~	-	~~0.64~~

Table 6.2.1.3-1

SHORT-TERM MASS AND ENERGY INPUTS

Vessel Outlet Temperature (°F)	597.0
Vessel Inlet Temperature (°F)	528.6
Initial RCS Pressure (PSIA)	2300.0
Zaloudek Coefficient (CK1)	1.018
Zaloudek Coefficient (C1)	0.9

Table 6.2.1.3-2

SHORT-TERM 3-INCH COLD-LEG
BREAK MASS AND ENERGY RELEASES

Time (sec)	Mass (lbm/sec)	Energy (Btu/sec)
0.0	0.0	0.0
0.001	~~2897.1~~3186.8	~~1.512286 E+06~~1.7084E+6
0.05	3186.8	1.7084E+6
1.000	~~2897.1~~3186.8	~~1.506492 E+06~~1.7084E+6
5.000	~~2897.1~~3186.8	~~1.573125 E+06~~1.6591E+6
7.000	~~2897.1~~3186.8	~~1.738260 E+06~~1.6225E+6
10.00	~~2897.1~~3186.8	~~1.854144 E+06~~1.6005E+6

Table 6.2.1.3-3

SHORT-TERM 3-INCH HOT-LEG BREAK MASS AND ENERGY RELEASES

Time (sec)	Mass (lbm/sec)	Energy (Btu/sec)
0.0	0.0	0.0
0.001	~~2285.6~~2514.2	~~1.380502 E+06~~1.5623E+6
0.05	2514.2	1.5623E+6
1.000	~~2285.6~~2514.2	~~1.485640 E+06~~1.5640E+6
5.000	~~2285.6~~2514.2	~~1.405644 E+06~~1.6947E+6
7.000	~~2285.6~~2514.2	~~1.259365 E+06~~1.7966E+6
10.00	~~2285.6~~2514.2	~~1.238795 E+06~~1.8406E+6

~~Table 6.2.1.3-4 (Sheet 1 of 2)~~

~~LONG-TERM DECLG BREAK~~
~~BLOWDOWN MASS AND ENERGY RELEASES~~

~~Time (sec)~~	~~Mass (lbm/sec)~~	~~Enthalpy (btu/lbm)~~
~~0.00~~	~~0.0~~	~~0.0~~
~~0.05~~	~~40154.8~~	~~531.0~~
~~0.10~~	~~50795.1~~	~~531.1~~
~~0.20~~	~~56447.9~~	~~531.7~~
~~0.40~~	~~58132.4~~	~~532.8~~
~~0.60~~	~~56312.4~~	~~533.7~~
~~0.70~~	~~59664.7~~	~~534.2~~
~~1.00~~	~~57086.0~~	~~535.5~~
~~1.20~~	~~56496.2~~	~~537.3~~
~~1.40~~	~~54599.6~~	~~540.0~~
~~1.60~~	~~54288.6~~	~~543.8~~
~~1.80~~	~~50309.1~~	~~548.3~~
~~2.00~~	~~49126.0~~	~~553.0~~
~~2.40~~	~~41239.8~~	~~561.5~~
~~2.80~~	~~34921.0~~	~~567.1~~
~~3.50~~	~~28761.3~~	~~576.0~~
~~4.00~~	~~25635.8~~	~~574.9~~
~~5.00~~	~~17781.7~~	~~604.5~~
~~6.00~~	~~13794.1~~	~~624.2~~
~~7.00~~	~~12595.0~~	~~621.9~~
~~8.00~~	~~11064.5~~	~~668.9~~
~~9.00~~	~~10441.0~~	~~675.7~~
~~10.00~~	~~9757.7~~	~~671.6~~
~~11.00~~	~~8854.5~~	~~664.8~~
~~12.00~~	~~8326.4~~	~~652.3~~
~~13.00~~	~~8265.2~~	~~604.1~~
~~14.00~~	~~8119.5~~	~~574.3~~
~~15.00~~	~~7903.2~~	~~567.3~~
~~16.00~~	~~7606.3~~	~~561.5~~
~~17.00~~	~~7131.5~~	~~567.1~~
~~18.00~~	~~6649.4~~	~~578.6~~
~~19.00~~	~~6024.5~~	~~600.0~~
~~20.00~~	~~5422.6~~	~~625.9~~
~~21.00~~	~~4648.7~~	~~657.7~~
~~22.00~~	~~3728.9~~	~~629.3~~

~~Table 6.2.1.3-4 (Sheet 2 of 2)~~

~~LONG-TERM DECLG BREAK~~
~~BLOWDOWN MASS AND ENERGY RELEASES~~

~~Time (sec)~~	~~Mass (lbm/sec)~~	~~Enthalpy (btu/lbm)~~
~~23.00~~	~~3059.6~~	~~571.5~~
~~24.00~~	~~2402.7~~	~~508.4~~
~~25.00~~	~~1643.0~~	~~465.7~~
~~26.00~~	~~890.3~~	~~451.6~~
~~27.00~~	~~128.8~~	~~292.3~~
~~27.08~~	~~41.4~~	~~292.9~~
~~27.09~~	~~0.00~~	~~0.00~~
~~30.00~~	~~0.00~~	~~0.00~~

Table 6.2.1.3-4 (Sheet 1 of 5)

SHORT TERM 1.0 FT^2 MAIN STEAM LINE BREAK MASS AND ENERGY RELEASE (BREAK IN COMPARTMENT 56; PIPE LENGTH = 100.0 FEET; MAXIMUM TIME ASSUMPTION)

Time (sec)	Mass (lbm/sec)	Energy (Btu/sec)
0	0	531.05
0.05005	40981.47	531.05
0.10009	51582.38	531.06
0.15012	51914.07	531.26
0.20003	56324.09	531.69
0.25002	52193.14	531.8
0.30008	55751.79	532.27
0.35011	57991.96	532.5
0.40009	61908	532.92
0.45008	55661.48	532.94
0.50018	55396.21	533.19
0.5501	55799.85	533.36
0.60003	54505.29	533.57
0.65	55718.72	533.79
0.70008	55560.81	533.97
0.75003	54278.71	534.05
0.80001	54863.3	534.35
0.85013	55133.12	534.59
0.90008	54317.39	534.78
0.95008	56022.1	535.13
1.00004	57188.84	535.55
1.10023	56590.82	536.24
1.20001	56403.73	537.07
1.3	57575.72	538.06
1.4	61043.11	538.06
1.5	58777.05	541.4
1.60004	58504.03	543.5
1.70002	57207.83	545.73
1.80018	55116.98	548.22
1.90003	53416.31	550.84
2.00021	52195.53	553.49
2.10003	51119.43	556.25
2.20006	49678.89	559.07

Table 6.2.1.3-4 (Sheet 2 of 5)

SHORT TERM 1.0 FT^2 MAIN STEAM LINE BREAK MASS AND ENERGY RELEASE (BREAK IN COMPARTMENT 56; PIPE LENGTH = 100.0 FEET; MAXIMUM TIME ASSUMPTION)

Time (sec)	Mass (lbm/sec)	Energy (Btu/sec)
2.30002	48656.4	561.59
2.4000	45212.87	563.94
2.50015	43459.59	565.89
2.60001	42131.39	567.77
2.70008	39891.28	569.9
2.80006	38753.61	571.77
2.90021	36262.46	573.9
3.00042	35552.01	[illegible]5.36
3.10042	33986.79	5[illegible]85
3.20016	31634.74	578.54
3.3005	30089.11	580
3.40034	28141.72	581.74
3.50058	26615.49	583.42
3.6004	25359.76	585.02
3.70014	24380.64	586.71
3.8003	23567.09	588.57
3.90024	22809.34	590.66
4.00033	22114.21	593.01
4.10004	21455.55	595.61
4.20027	21618.21	600.19
4.30039	20594.81	605.53
4.40063	19988.71	610.29
4.50042	19239.33	611.04
4.60017	18774.63	609.97
4.70017	18237.85	610.18
4.80048	17647.82	611.74
4.90038	17122.31	614.25
5.00008	16758.34	617.67
5.25057	15536.44	631.16
5.50006	14486.32	637.3
5.75009	13807.98	650.14
6.00029	13058.56	676.9
6.25027	13165.35	652.36

Table 6.2.1.3-4 (Sheet 3 of 5)

SHORT TERM 1.0 FT^2 MAIN STEAM LINE BREAK MASS AND ENERGY RELEASE (BREAK IN COMPARTMENT 56; PIPE LENGTH = 100.0 FEET; MAXIMUM TIME ASSUMPTION)

Time (sec)	Mass (lbm/sec)	Energy (Btu/sec)
6.50012	12507.45	655.4
6.75045	12365.93	638.72
7.00013	12253.41	628.34
7.25006	12334.64	618.73
7.50039	11509.17	644.64
7.75043	11775.96	615.22
8.00008	11674.54	606.9
8.25005	11216.94	615.66
8.50037	10459.3	641.56
8.75066	9975.453	671.02
9.0001	9755.574	657.37
9.25082	9640.006	651.94
9.50066	9493.376	640.31
9.75051	9252.547	648.42
10.00003	9069.055	648.55
10.25077	9143.009	624.93
10.50064	9211.633	605.15
10.75086	9301.821	591.84
11.0009	9380.36	585.87
11.25065	9379.361	584.17
11.50016	9300.834	585.7
11.75019	9142.256	589.39
12.00102	8898.41	594.36
12.25096	8892.234	604.59
12.50004	8480.493	616.05
12.7508	8179.785	628.66
13.00034	7882.542	635.05

Table 6.2.1.3-4 (Sheet 4 of 5)

SHORT TERM 1.0 FT^2 MAIN STEAM LINE BREAK MASS AND ENERGY RELEASE (BREAK IN COMPARTMENT 56; PIPE LENGTH = 100.0 FEET; MAXIMUM TIME ASSUMPTION)

Time (sec)	Mass (lbm/sec)	Energy (Btu/sec)
13.25039	7848.445	628.99
13.50008	7647.333	613.37
13.75066	7531.402	600.61
14.00103	7529.374	585.74
14.25131	7640.976	570.52
14.50035	7690.387	560.5
15.75015	7730.5	554.89
15.00028	7893.184	551.66
15.25174	7728.983	546.99
15.50094	7695.687	542.06
15.75006	7702.621	537.44
16.00055	7721.515	533.1
16.25114	7720.754	529.93
16.50039	7845.526	528.83
16.75008	7792.656	529.28
17.00015	7569.003	529.2
17.2509	7446.876	529.81
17.50015	7348.652	530.63
17.7509	7353.587	533.2
18.00035	7167.792	534.42
18.25022	6980.346	536.27
18.50029	6856.782	538.19
18.75026	6825.789	542.1
19.00113	6642.836	544.45
19.25092	6454.637	548.59
19.50153	6314.137	552.77
19.75094	6175.254	556.79

Table 6.2.1.3-4 (Sheet 5 of 5)

SHORT TERM 1.0 FT^2 MAIN STEAM LINE BREAK MASS AND ENERGY RELEASE (BREAK IN COMPARTMENT 56; PIPE LENGTH = 100.0 FEET; MAXIMUM TIME ASSUMPTION)

Time (sec)	Mass (lbm/sec)	Energy (Btu/sec)
20.00045	6032.55	561.14
20.25099	6026.438	569.76
20.5011	5801.813	571.91
20.75082	5616.23	576.79
21.00125	5489.919	578.73
21.25023	5449.508	580.85
21.50078	5317.37	583.24
21.75106	5192.618	590.83
22.00106	5077.076	598.92
22.25069	4875.197	609.85
22.5012	4647.725	620.74
22.757068	4429.831	633.45
23.00052	4216.155	645.47
23.25065	4003.873	639.12
23.5009	3788.973	631.33
23.75058	3586.032	622.47
24.00001	3411.624	611.28
24.2506	3243.65	598.33
24.50004	3089.229	585.32
24.75027	2922.198	570.88
25.00053	2761.955	555.99
25.25037	2612.244	540.99
25.50013	2446.056	525.56
25.75087	2266.987	510.23
26.00013	2082.011	496.01
26.25065	1893.536	483.21
26.50021	1696.26	471.87
26.75015	1533.653	465.19
27.00075	1372.875	460.81
27.2509	1202.175	457.27
28.37	0	1167.4
30	0	1167.4

~~Table 6.2.1.3-5 (Sheet 1 of 3)~~

~~LONG-TERM DECLG BREAK~~
~~POST-BLOWDOWN MASS AND ENERGY RELEASES~~

~~Time (sec)~~	~~Mass (lbm/sec)~~	~~Enthalpy (btu/lbm)~~
~~30.00~~	~~0.00~~	~~0.0~~
~~40.00~~	~~47.90~~	~~1167.4~~
~~45.00~~	~~246.21~~	~~658.1~~
~~50.00~~	~~416.97~~	~~474.7~~
~~55.00~~	~~564.00~~	~~405.0~~
~~60.00~~	~~690.59~~	~~368.1~~
~~65.00~~	~~799.59~~	~~345.8~~
~~70.00~~	~~893.45~~	~~330.5~~
~~75.00~~	~~974.26~~	~~319.3~~
~~80.00~~	~~1043.85~~	~~310.8~~
~~85.00~~	~~1103.76~~	~~304.2~~
~~90.00~~	~~1155.35~~	~~298.8~~
~~95.00~~	~~1199.77~~	~~294.3~~
~~100.00~~	~~1238.02~~	~~290.4~~
~~105.00~~	~~1270.95~~	~~287.2~~
~~110.00~~	~~1299.30~~	~~284.3~~
~~115.00~~	~~1323.72~~	~~281.8~~
~~120.00~~	~~1344.74~~	~~279.5~~
~~125.00~~	~~1362.84~~	~~277.3~~
~~130.00~~	~~1378.43~~	~~275.3~~
~~133.41~~	~~1387.80~~	~~274.0~~
~~135.00~~	~~1391.85~~	~~273.4~~
~~140.00~~	~~1403.40~~	~~271.7~~
~~145.00~~	~~1413.35~~	~~270.0~~
~~150.00~~	~~1421.92~~	~~268.4~~
~~151.00~~	~~188.48~~	~~1167.4~~
~~160.00~~	~~200.65~~	~~1167.4~~
~~170.00~~	~~210.82~~	~~1167.4~~
~~180.00~~	~~218.37~~	~~1167.4~~
~~190.00~~	~~223.96~~	~~1167.4~~
~~200.00~~	~~228.11~~	~~1163.4~~
~~220.00~~	~~233.46~~	~~1116.8~~
~~240.00~~	~~236.41~~	~~1081.5~~
~~260.00~~	~~238.03~~	~~1052.4~~
~~280.00~~	~~238.91~~	~~1026.8~~
~~300.00~~	~~239.40~~	~~1003.3~~

~~Table 6.2.1.3-5 (Sheet 2 of 3)~~

~~LONG TERM DECLG BREAK~~
~~POST BLOWDOWN MASS AND ENERGY RELEASES~~

~~Time (sec)~~	~~Mass (lbm/sec)~~	~~Enthalpy (btu/lbm)~~
~~320.00~~	~~239.67~~	~~981.1~~
~~340.00~~	~~239.82~~	~~960.0~~
~~360.00~~	~~239.90~~	~~939.6~~
~~380.00~~	~~239.95~~	~~920.0~~
~~400.00~~	~~239.97~~	~~900.9~~
~~401.00~~	~~239.97~~	~~836.2~~
~~420.00~~	~~239.98~~	~~819.9~~
~~440.00~~	~~239.99~~	~~803.1~~
~~460.00~~	~~240.00~~	~~786.9~~
~~480.00~~	~~240.00~~	~~771.2~~
~~500.00~~	~~240.00~~	~~755.8~~
~~520.00~~	~~240.00~~	~~740.9~~
~~540.00~~	~~240.00~~	~~726.5~~
~~560.00~~	~~240.00~~	~~712.4~~
~~580.00~~	~~240.00~~	~~698.7~~
~~600.00~~	~~240.00~~	~~685.4~~
~~650.00~~	~~240.00~~	~~657.8~~
~~700.00~~	~~240.00~~	~~632.3~~
~~750.00~~	~~240.00~~	~~608.6~~
~~800.00~~	~~240.00~~	~~586.7~~
~~850.00~~	~~240.00~~	~~561.0~~
~~900.00~~	~~240.00~~	~~536.8~~
~~950.00~~	~~240.00~~	~~513.9~~
~~1000.00~~	~~240.00~~	~~492.3~~
~~1100.00~~	~~240.00~~	~~459.8~~
~~1200.00~~	~~240.00~~	~~431.1~~
~~1300.00~~	~~240.00~~	~~405.9~~
~~1400.00~~	~~240.00~~	~~383.4~~
~~1404.11~~	~~240.00~~	~~382.6~~
~~1405.00~~	~~48.90~~	~~1167.4~~
~~1500.00~~	~~48.48~~	~~1167.4~~
~~2000.00~~	~~46.25~~	~~1163.0~~
~~3600.00~~	~~39.11~~	~~888.4~~
~~4000.00~~	~~37.32~~	~~868.2~~
~~6000.00~~	~~28.40~~	~~951.6~~
~~8000.00~~	~~25.90~~	~~954.5~~

~~Table 6.2.1.3-5 (Sheet 3 of 3)~~

~~LONG-TERM DECLG BREAK~~
~~POST-BLOWDOWN MASS AND ENERGY RELEASES~~

~~Time (sec)~~	~~Mass (lbm/sec)~~	~~Enthalpy (btu/lbm)~~
~~10000.00~~	~~23.40~~	~~987.5~~
~~15000.00~~	~~20.40~~	~~1013.0~~
~~20000.00~~	~~18.60~~	~~1027.4~~
~~40000.00~~	~~15.00~~	~~1057.3~~
~~60000.00~~	~~13.40~~	~~1058.4~~
~~80000.00~~	~~12.30~~	~~1064.0~~
~~100000.00~~	~~11.50~~	~~1066.4~~

Table 6.2.1.3.~~9~~ 5 (Sheet 1 of 4)

LONG-TERM DECLG BREAK
POST-BLOWDOWN MASS AND ENERGY RELEASES

Time (sec)	Mass (lbm/sec)	Enthalpy (Btu/lbm)	Mass (lbm/sec)	Enthalpy (Btu/lbm)
30	0	1167.4	0	1167.4
40	0	1167.4	0	1167.4
45	0	1167.4	0	1167.4
50	0	1167.4	0	1167.4
55	0	1167.4	0	1167.4
60	0	1167.4	0	1167.4
65	0	1167.4	0	1167.4
70	0	1167.4	23.9	1167.4
75	0	1167.4	19.27	1167.4
80	0	1167.4	91.88	1167.4
85	0	1167.4	154.36	1167.4
90	4.68	1103.15	203.45	1167.4
95	52.9	302.21	201.5	1167.4
100	94.66	267.12	199.57	1167.4
105	130.61	254.41	197.88	1167.4
110	161.78	247.56	196.21	1167.4
115	89.9	294.05	200.47	1167.4
120	113.47	283.75	198.73	1167.4
125	133.99	277.32	197.01	1167.4
130	151.88	272.79	195.3	1167.4
133.41	162.75	270.34	194.14	1167.4
135	167.49	269.32	193.6	1167.4
140	181.16	266.52	191.92	1167.4
145	193.13	264.16	190.25	1167.4
150	203.66	262.1	188.59	1167.4
151	205.58	261.73	188.29	1167.4
160	220.78	258.7	185.68	1167.4
170	234.15	255.8	182.82	1167.4

Table 6.2.1.3-~~9~~5 (Sheet 2 of 4)

LONG-TERM DECLG BREAK
POST-BLOWDOWN MASS AND ENERGY RELEASES

Time (sec)	Mass (lbm/sec)	Enthalpy (Btu/lbm)	Mass (lbm/sec)	Enthalpy (Btu/lbm)
180	244.76	253.2	180.01	1167.4
190	253.29	250.81	177.24	1167.4
200	260.28	248.57	174.52	1167.4
220	108.55	335.13	183.76	1167.4
240	116.84	327.51	178.49	1167.4
260	123.57	320.72	173.41	1167.4
280	129.36	314.43	168.54	1167.4
300	134.55	308.5	163.84	1167.4
320	139.34	302.84	159.33	1167.4
340	143.84	297.41	154.97	1167.4
360	153.62	288.39	150.28	1167.4
380	57.19	391.15	158.75	1167.4
400	61.79	380.61	154.18	1167.4
401	78.13	360.2	137.84	1167.4
420	81.86	353.21	134.12	1167.4
440	130.9	300.33	125.09	1167.4
460	134.23	295.22	121.77	1167.4
480	100.69	324.07	122.3	1167.4
500	103.97	318.19	119.02	1167.4
520	77.49	347.79	119.51	1167.4
540	105.7	311.55	113.3	1167.4
541	123.58	294.37	111.42	1167.4
560	126.28	289.68	108.72	1167.4
580	38.2	418.67	117.8	1167.4
600	41.49	407.06	114.51	1167.4
650	48.02	384.45	107.98	1167.4
700	53.84	365.07	102.16	1167.4
750	59.06	347.92	96.94	1167.4

Table 6.2.1.3~~-9~~5 (Sheet 3 of 4)

LONG-TERM DECLG BREAK
POST-BLOWDOWN MASS AND ENERGY RELEASES

Time (sec)	Mass (lbm/sec)	Enthalpy (Btu/lbm)	Mass (lbm/sec)	Enthalpy (Btu/lbm)
800	63.75	332.46	92.25	1167.4
850	69.36	316.72	86.64	1167.4
900	63.35	320.28	82.65	1167.4
950	68.27	305.57	77.73	1167.4
1000	72.81	292.11	73.19	1167.4
1035	74.85	284.27	71.15	1167.4
1100	52.84	313.35	69.16	1167.4
1200	58.66	288.13	63.34	1167.4
1300	63.59	266.44	58.41	1167.4
1400	67.81	247.55	54.19	1167.4
1404.11	67.97	246.82	54.03	1167.4
1405	68	246.67	54	1167.4
1500	71.45	230.97	50.55	1167.4
2000	167.77	136.76	37.93	1167.4
3600	179.05	101.98	26.65	1167.4
4000	180.63	99.34	25.07	1167.4
6000	184.16	94.97	21.54	1167.4
7500	157.67	95.39	20.33	1167.4
8000	129.25	96.72	19.75	1167.4
10000	130.47	96.07	18.53	1167.4
15000	131.46	95.58	17.54	1167.4
16000	131.66	95.48	17.34	1167.4
20000	128.55	94.83	15.46	1167.4
25562	115.72	95.51	15.29	1167.4
30067	94.81	97.11	15.2	1167.4
36000	72.6	98.49	13.41	1167.4
40000	0	98.49	15.4	1167.4
60000	0	98.49	13.8	1167.4

5

Table 6.2.1.3-~~8~~ (Sheet 4 of 4)

LONG-TERM DECLG BREAK
POST-BLOWDOWN MASS AND ENERGY RELEASES

Time (sec)	Mass (lbm/sec)	Enthalpy (Btu/lbm)	Mass (lbm/sec)	Enthalpy (Btu/lbm)
80000	0	98.49	12.7	1167.4
100000	0	98.49	11.9	1167.4
150000	0	98.49	10.5	1167.4
200000	0	98.49	9.6	1167.4
400000	0	98.49	7.5	1167.4
600000	0	98.49	6.3	1167.4
800000	0	98.49	5.6	1167.4
1000000	0	98.49	5.1	1167.4
1500000	0	98.49	4.3	1167.4
2000000	0	98.49	3.8	1167.4
4000000	0	98.49	2.7	1167.4
4000000	0	98.49	2.7	1167.4

Table 6.2.1.3-5

Time	Mass	Enthalpy
0	0	0
0.05018	40807.8	531.04
0.10006	51415.62	531.05
0.15	53605.18	531.28
0.20011	57605.54	531.7
0.25012	56491.36	531.87
0.30008	55336.22	532.29
0.35016	52092.26	532.44
0.40003	60610.59	532.15
0.45018	64191.36	532.72
0.50003	63803.89	533.25
0.55013	62449.77	533.56
0.60012	61679.8	533.89
0.65001	61484.43	534.17
0.70003	61238	534.52
0.75004	59545.[illegible]9	534.73
0.85006	59053.1[illegible]	535.35
0.9001	59119.19	535.67
0.95001	59525.57	536.08
1.00008	59848.18	536.5
1.10016	59770.71	537.41
1.20009	59500.68	538.48
1.30016	57917.15	539.87
1.40005	57134.81	541.49
1.50018	56668.11	543.42
1.60006	56262.47	545.51
1.70012	60543.26	547.95
1.80002	54369.46	550.25
1.90006	56577.14	552.62
2.00004	53516.96	555.65
2.10002	50010.8	558.31
2.20011	48952.83	561.05
2.3	47340.82	563.69
2.40023	45043.13	565.66
2.50021	42988.27	567.51
2.60009	42921.87	568.95
2.7002	40175.77	570.82
2.8002	38195.66	572.61
2.90027	35992.53	574.28
3.00025	35135.79	575.41
3.10042	33091	576.57
3.20012	30285.49	577.93
3.30001	28275.31	579.17
3.40025	28461.7	581.32
3.50057	27581.74	583.7
3.60012	25860.66	586.19
3.70045	24041.52	587
3.80038	23092.48	585.67
3.90004	22838.94	583.67
4.00047	22839.6	581.73
4.10024	22952.33	579.68
4.20013	23328.38	577.08
4.30025	24186.82	574.68
4.40006	24673.8	574.99
4.50046	22714.09	579.43
4.60053	20355.21	584.6
4.70011	18616.09	585.43
4.80025	18906.58	581.82
4.90127	19231.26	582.52
5.00014	18868.84	587.31
5.25017	16910.84	600.57
5.50024	16723.26	607.37
5.75021	15630.08	622.46
6.00046	14927.82	619.58
6.25014	13819.42	622.69
6.50017	13146.93	625.96

Add to beginning of Table 6.2.1.3-~~4~~ 5

Columns 1, 2, 3.

Fill columns 4 & 5 w/ zeros

Table 6.2.1.3-5

6.75004	12839.71	614.37
7.00076	12718.63	606.73
7.25082	12457.77	603.1
7.50013	12436.33	615.31
7.75001	10397.57	700.28
8.00011	11225.92	628.48
8.25032	11341.57	607.45
8.50058	10746.42	624.1
8.75037	10070.86	649.75
9.00025	9625.501	668.11
9.25024	9404.611	666.98
9.50026	9258.613	672.08
9.75046	8854.105	695.43
10.00011	8632.626	650.6
10.50024	8773.043	607.2
10.75008	8730.026	603.61
11.00065	8564.724	607.36
11.25054	8463.381	613.22
11.50005	8437.24	632.16
11.75003	7997.697	638.34
12.00047	7808.395	636.14
12.25084	7712.031	629.46
12.50041	7661.505	620.78
12.75045	7589.224	613.65
13.00001	7481.231	608.13
13.25015	7395.79	602.47
13.50102	7568.571	598.98
13.75001	7355.851	590
14.00106	7316.183	577.08
14.25029	7384.659	565.58
14.50026	7487.738	555.09
14.75105	7572.562	547.96
15.00041	7614.799	544.16
15.25128	7630.574	542.93
15.501	7574.608	543.15
15.75018	7592.818	545.88
16.00036	7622.272	550.21
16.2512	7242.574	550.63
16.50058	7092.731	548.17
16.75056	7015.751	544.65
17.00022	6958.681	541.57
17.25045	6907.833	539.49
17.50005	6836.467	538.93
17.75174	6741.548	540.05
18.00049	6659.006	543.02
18.25102	6714.732	551.37
18.50013	6380.366	555.73
18.75045	6187.74	558.52
19.00098	6049.282	560.16
19.25076	5944.473	561.14
19.50057	5928.532	563.91
19.75015	5843.964	567.91
20.00187	5681.831	572.49
20.25095	5524.487	579.28
20.50135	5393.939	586.3
20.75026	5315.482	595.42
21.00026	5173.792	604.74
21.25062	5006.346	616.94
21.50157	4840.924	627.08
21.75061	4626.755	635.52
22.00119	4424.617	644.46
22.25015	4243.977	654.34
22.50057	4036.497	650.49
22.75069	3825.566	640.25
23.0005	3636.621	630.93
23.25033	3458.685	620

Table 6.2.1.3-5

23.50017	3298.128	607.33
23.75109	3149.44	593.51
24.00023	3003.599	579.53
24.25004	2863.169	565.24
24.50091	2714.185	550.05
24.75038	2562.019	534.85
25.00082	2396.898	519.28
25.25019	2224.905	503.99
25.50001	2048.04	490.1
25.75086	1864.298	477.52
26.00029	1682.812	468.21
26.25073	1532.426	463.19
26.75052	1204.403	455.84
27.00047	1021.557	453
27.25111	836.7731	455.97
27.50073	668.4349	480.86
27.75021	561.9642	588.82
28.00029	297.2754	425.97
28.25013	139.4778	291.71
28.37282	41.79308	292.48

~~Table 6.2.1.3-6 (Sheet 1 of 2)~~

~~LONG-TERM DEHLG BREAK~~
~~BLOWDOWN MASS AND ENERGY RELEASES~~

~~Time (sec)~~	~~Mass (lbm/sec)~~	~~Enthalpy (btu/lbm)~~
~~0.00~~	~~0.00~~	~~0.0~~
~~0.05~~	~~71187.39~~	~~620.0~~
~~0.15~~	~~61138.16~~	~~630.8~~
~~0.25~~	~~48959.57~~	~~636.3~~
~~0.35~~	~~48221.11~~	~~632.7~~
~~0.45~~	~~47051.36~~	~~628.6~~
~~0.65~~	~~46520.68~~	~~620.0~~
~~0.85~~	~~46564.19~~	~~614.1~~
~~1.00~~	~~45300.66~~	~~615.7~~
~~1.20~~	~~43348.84~~	~~613.9~~
~~1.40~~	~~43302.04~~	~~608.9~~
~~1.60~~	~~43547.11~~	~~604.2~~
~~1.80~~	~~42986.72~~	~~600.0~~
~~2.00~~	~~43626.67~~	~~597.3~~
~~2.50~~	~~42822.39~~	~~581.5~~
~~3.00~~	~~38951.25~~	~~610.2~~
~~3.50~~	~~36050.47~~	~~626.0~~
~~4.00~~	~~33907.89~~	~~609.4~~
~~4.50~~	~~32836.32~~	~~595.5~~
~~5.00~~	~~31265.07~~	~~584.0~~
~~5.50~~	~~29483.42~~	~~574.4~~
~~6.00~~	~~28593.41~~	~~564.5~~
~~6.50~~	~~24093.55~~	~~568.3~~
~~7.00~~	~~22387.30~~	~~563.2~~
~~7.50~~	~~16860.31~~	~~591.8~~
~~8.00~~	~~16351.14~~	~~567.5~~

~~Table 6.2.1.3-6 (Sheet 2 of 2)~~

~~LONG-TERM DEHLC BREAK~~
~~BLOWDOWN MASS AND ENERGY RELEASES~~

~~Time (sec)~~	~~Mass (lbm/sec)~~	~~Enthalpy (btu/lbm)~~
~~8.50~~	~~13244.53~~	~~593.9~~
~~9.00~~	~~11683.96~~	~~594.8~~
~~9.50~~	~~9974.33~~	~~627.5~~
~~10.00~~	~~8575.75~~	~~666.5~~
~~10.50~~	~~7441.58~~	~~716.4~~
~~11.00~~	~~6456.68~~	~~769.7~~
~~11.50~~	~~5544.79~~	~~826.1~~
~~12.00~~	~~4603.88~~	~~933.8~~
~~12.50~~	~~3525.18~~	~~1050.2~~
~~13.00~~	~~3133.21~~	~~1111.5~~
~~13.50~~	~~2797.55~~	~~1175.1~~
~~14.00~~	~~2340.22~~	~~1199.2~~
~~14.50~~	~~1864.25~~	~~1237.7~~
~~15.00~~	~~1685.68~~	~~1234.6~~
~~16.00~~	~~1271.79~~	~~1243.2~~
~~16.50~~	~~1117.78~~	~~1241.9~~
~~17.00~~	~~1005.60~~	~~1239.5~~
~~17.50~~	~~913.33~~	~~1237.0~~
~~18.00~~	~~828.11~~	~~1239.1~~
~~18.50~~	~~498.01~~	~~1270.3~~
~~19.00~~	~~576.21~~	~~1244.1~~
~~19.50~~	~~532.76~~	~~1250.5~~
~~20.50~~	~~73.00~~	~~1294.6~~
~~21.00~~	~~70.03~~	~~1293.5~~
~~21.50~~	~~49.00~~	~~1311.5~~
~~21.75~~	~~0.00~~	~~0~~

center over column

Table 6.2.1.3-~~10~~ (Sheet 1 of 2)

center over column

LONG-TERM DEHLG BREAK
BLOWDGWN MASS AND ENERGY RELEASES

Time (sec)	Mass (lbm/sec)	Enthalpy (Btu/lbm)
0.05	0	0
	74746.76	626.2
0.15	64195.07	637.108
0.25	51407.55	642.663
0.35	50632.16	639.027
0.45	49403.93	634.886
0.65	48846.71	626.2
0.85	48892.4	620.241
1	47565.69	621.857
1.2	45516.28	620.039
1.4	45467.14	614.989
1.6	45724.46	610.242
1.8	45136.05	606
2	45808	603.273
2.5	44963.51	587.315
3	40898.81	616.302
3.5	37852.99	632.26
4	35603.29	615.494
4.5	34478.13	601.455
5	32828.32	589.84
5.5	30957.59	580.144
6	30023.08	570.145
6.5	25298.23	573.983
7	23506.66	568.832
7.5	17703.33	597.718
8	17168.7	573.175
8.5	13906.76	599.839
9	12268.16	600.748

0.0

Table 6.2.1.3-~~10~~ 4 (Sheet 2 of 2)

LONG-TERM DEHLG BREAK BLOWDOWN MASS AND ENERGY RELEASES

center center

Time (sec)	Mass (lbm/sec)	Enthalpy (Btu/lbm)
9.5	10473.05	633.775
10	9004.537	673.165
10.5	7813.659	723.564
11	6779.514	777.397
11.5	5822.029	834.361
12	4834.074	943.138
12.5	3701.439	1060.702
13	3289.87	1122.615
13.5	2937.427	1186.851
14	2457.231	1211.192
14.5	1957.462	1250.077
15	1769.964	1246.946
16	1335.38	1255.632
16.5	1173.669	1254.319
17	1055.88	1251.895
17.5	958.9965	1249.37
18	869.5154	1251.491
18.5	522.9105	1283.003
19	605.0205	1256.541
19.5	559.398	1263.005
20	0	1285.276
20.5	76.64999	1307.546
21	73.53149	1306.435
21.5	51.45	1324.615
22	0	1324.615

Table 6.2.1.3-~~11~~ 7

BASIS FOR LONG-TERM ANALYSIS

Number of Loops ~~PLANT MODEL - Passive Design~~	2 ~~LOOPS~~ ~~loops~~
Active Core Length (ft)	12.0
Core Power, license application (MWt)	1933
Nominal Vessel Inlet Temperature (°F)	535.1
Nominal Vessel Outlet Temperature (°F)	600.0
Steam Pressure (psia)	821.0
Rod Array	17 x 17
Accumulator Temperature (°F)	120.0
Containment Design Pressure (psia)	59.7

Table 6.2.1.4-1

SPECTRUM OF SECONDARY SYSTEM PIPE RUPTURES ANALYZED

Power Level	102%	70%	30%	0%
Full DER, MSIV failure	Full DER	Full DER	Full DER	Full DER
Full DER, MFWIV failure	Full DER	Full DER	Full DER	Full DER
Small DER, MSIV failure (ft^2)	0.70 0.60 0.55 0.33	0.6 0.53 0.50 0.32	0.60 0.50 0.40 0.36 0.22	0.55 0.50 0.20 0.10
Split Rupture (ft^2)	0.37[a]	0.41[a]	0.44[a]	0.44~~6~~ 2[a]

[a]As total area of two loops.

DER = double ended rupture
MSIV = main steam line isolation valve
MFWIV = main feedwater isolation valve

Table 6.2.1.4-2 (Sheet 1 of 5)

MASS AND ENERGY RELEASE DATA FOR THE CASE OF MAIN STEAM LINE FULL DOUBLE ENDED RUPTURE FROM 30% POWER LEVEL WITH FAULTED LOOP MAIN STEAM LINE ISOLATION VALVE FAILURE THAT PRODUCES HIGHEST CONTAINMENT PRESSURE

Initial steam generator mass (lbm)	: ~~166100.~~ [illegible] 167750.
Mass added by feedwater flashing (lbm)	: ~~6225.~~ 9466.
Mass added by unisolatable steam (lbm)	: ~~5800.~~ 10082.
Initial steam pressure (psia)	: ~~951.9~~ 976.5
Feedwater line isolation at (sec)	: ~~7.788~~ 7.578
Steam line isolation at (sec)	: ~~7.788~~ 7.578

Replace Table

TIME SEC	MASS LBM/SEC	ENERGY BTU/SEC (E+6)	INTGR M LBM (E+3)	INTGR E BTU (E+6)	AVG ENTH BTU
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.2000	5239.	6.256	1.048	1.251	1194.
0.4000	5147.	6.148	2.077	2.481	1194.
0.6000	5115.	6.111	3.100	3.703	1195.
0.8000	5052.	6.038	4.111	4.911	1195.
1.0000	4994.	5.970	5.109	6.105	1196.
1.200	4936.	5.903	6.097	7.285	1196.
1.400	4880.	5.837	7.072	8.453	1196.
1.600	4824.	5.772	8.037	9.607	1197.
1.800	4769.	5.708	8.991	10.75	1197.
2.000	4716.	5.646	9.934	11.88	1197.
2.200	4665.	5.585	10.87	12.99	1197.
2.400	4613.	5.525	11.79	14.10	1198.
2.600	4563.	5.466	12.70	15.19	1198.
2.800	4504.	5.396	13.60	16.27	1198.
3.000	4477.	5.366	14.50	17.35	1198.
3.200	4432.	5.312	15.39	18.41	1199.
3.400	4388.	5.260	16.26	19.46	1199.
3.600	4344.	5.209	17.13	20.50	1199.
3.800	4302.	5.159	17.99	21.53	1199.
4.000	4261.	5.110	18.84	22.56	1199.
4.200	4221.	5.063	19.69	23.57	1200.
4.400	4181.	5.017	20.52	24.57	1200.
4.600	4143.	4.972	21.35	25.57	1200.
4.800	4107.	4.929	22.17	26.55	1200.
5.000	4074.	4.889	22.99	27.53	1200.
5.200	4038.	4.847	23.80	28.50	1200.
5.400	4006.	4.810	24.60	29.46	1201.
5.600	3973.	4.770	25.39	30.42	1201.
5.800	3943.	4.735	26.18	31.36	1201.
6.000	3913.	4.699	26.96	32.30	1201.
6.200	3883.	4.664	27.74	33.23	1201.
6.400	3855.	4.630	28.51	34.16	1201.
6.600	3826.	4.597	29.28	35.08	1201.
6.800	3799.	4.564	30.04	35.99	1201.
7.000	3772.	4.533	30.79	36.90	1202.
7.200	3746.	4.502	31.54	37.80	1202.

Table 6.2.1.4-2 (Sheet 2 of 5)

MASS AND ENERGY RELEASE DATA FOR THE CASE OF MAIN STEAM LINE FULL DOUBLE ENDED RUPTURE FROM 30% POWER LEVEL WITH FAULTED LOOP MAIN STEAM LINE ISOLATION VALVE FAILURE THAT PRODUCES HIGHEST CONTAINMENT PRESSURE

TIME SEC	MASS LBM/SEC	ENERGY BTU/SEC (E+6)	INTGR M LBM (E+3)	INTGR E BTU (E+6)	AVG ENTH BTU
7.400	3721.	4.472	32.28	38.69	1202.
7.600	3696.	4.442	33.02	39.58	1202.
7.800	3672.	4.414	33.76	40.47	1202.
8.000	3672.	4.414	34.49	41.35	1202.
8.200	3595.	4.321	35.21	42.21	1202.
8.400	3517.	4.227	35.92	43.06	1202.
8.600	3438.	4.133	36.60	43.88	1202.
8.800	3360.	4.039	37.27	44.69	1202.
9.000	3282.	3.945	37.93	45.48	1202.
9.200	3204.	3.851	38.57	46.25	1202.
9.400	3125.	3.757	39.20	47.00	1202.
9.600	3047.	3.664	39.81	47.74	1202.
9.800	2969.	3.570	40.40	48.45	1202.
10.000	2891.	3.476	40.98	49.14	1202.
10.20	2813.	3.382	41.54	49.82	1202.
10.40	2735.	3.289	42.09	50.48	1202.
10.60	2657.	3.195	42.62	51.12	1203.
10.80	2579.	3.102	43.14	51.74	1203.
11.00	2501.	3.008	43.64	52.34	1203.
11.20	2424.	2.915	44.12	52.92	1203.
11.40	2346.	2.821	44.59	53.49	1203.
11.60	2268.	2.728	45.04	54.03	1203.
11.80	2190.	2.635	45.48	54.56	1203.
12.00	2112.	2.541	45.90	55.07	1203.
12.20	2035.	2.448	46.31	55.56	1203.
12.40	1957.	2.354	46.70	56.03	1203.
12.60	1879.	2.261	47.08	56.48	1203.
12.80	1801.	2.168	47.44	56.91	1203.
13.00	1724.	2.074	47.78	57.33	1204.
13.20	1646.	1.981	48.11	57.73	1204.
13.40	1614.	1.942	48.43	58.11	1204.
13.60	1606.	1.933	48.76	58.50	1204.
13.80	1598.	1.924	49.08	58.89	1204.
14.00	1591.	1.915	49.39	59.27	1204.
14.20	1583.	1.906	49.71	59.65	1204.
14.40	1575.	1.897	50.03	60.03	1204.
14.60	1568.	1.887	50.34	60.41	1204.
14.80	1560.	1.878	50.65	60.78	1204.
15.00	1553.	1.869	50.96	61.16	1204.
15.20	1545.	1.861	51.27	61.53	1204.
15.40	1538.	1.852	51.58	61.90	1204.
15.60	1530.	1.843	51.88	62.27	1204.
15.80	1523.	1.834	52.19	62.63	1204.
16.00	1516.	1.825	52.49	63.00	1204.

Replace Table

Table 6.2.1.4-2 (Sheet 3 of 5)

MASS AND ENERGY RELEASE DATA FOR THE CASE OF MAIN STEAM LINE FULL DOUBLE ENDED RUPTURE FROM 30% POWER LEVEL WITH FAULTED LOOP MAIN STEAM LINE ISOLATION VALVE FAILURE THAT PRODUCES HIGHEST CONTAINMENT PRESSURE

TIME SEC	MASS LBM/SEC	ENERGY BTU/SEC (E+6)	INTGR M LBM (E+3)	INTGR E BTU (E+6)	AVG ENTH BTU
16.20	1509.	.817	52.79	63.36	1204.
16.40	1501.	1.808	53.09	63.72	1204.
16.60	1494.	1.799	53.39	64.08	1204.
16.80	1486.	1.790	53.69	64.44	1204.
17.00	1479.	1.781	53.99	64.80	1204.
17.20	1471.	1.772	54.28	65.15	1204.
17.40	1463.	1.762	54.57	65.50	1204.
17.60	1455.	1.752	54.86	65.85	1204.
17.80	1447.	1.743	55.15	66.20	1204.
18.00	1439.	1.733	55.44	66.55	1204.
18.20	1431.	1.723	55.73	66.89	1204.
18.40	1423.	1.713	56.01	67.24	1204.
18.60	1414.	1.703	56.29	67.58	1204.
18.80	1406.	1.693	56.58	67.92	1204.
19.00	1398.	1.683	56.85	68.25	1204.
19.20	1389.	1.673	57.13	68.59	1204.
19.40	1381.	1.663	57.41	68.92	1204.
19.60	1373.	1.653	57.68	69.25	1204.
19.80	1364.	1.643	57.96	69.58	1204.
20.70	1333.	1.605	59.16	71.03	1204.
21.70	1293.	1.557	60.47	72.60	1204.
22.70	1253.	1.509	61.73	74.12	1204.
23.70	1215.	1.463	62.95	75.60	1204.
24.70	1178.	1.419	64.14	77.03	1204.
25.70	1143.	1.376	65.29	78.41	1204.
26.70	1108.	1.335	66.41	79.76	1204.
27.70	1076.	1.295	67.49	81.06	1204.
28.70	1044.	1.257	68.54	82.33	1204.
29.70	1014.	1.221	69.57	83.56	1204.
30.70	985.6	1.186	70.56	84.76	1204.
31.70	958.1	1.153	71.52	85.92	1204.
32.70	931.8	1.121	72.46	87.05	1203.
33.70	906.6	1.091	73.37	88.15	1203.
34.70	882.6	1.062	74.26	89.21	1203.
35.70	859.6	1.034	75.13	90.26	1203.
36.70	837.7	1.007	75.97	91.27	1203.
37.70	816.9	0.9822	76.79	92.26	1202.
38.70	797.0	0.9582	77.60	93.22	1202.
39.70	778.1	0.9352	78.38	94.16	1202.
40.70	759.9	0.9132	79.14	95.08	1202.
41.70	742.5	0.8921	79.89	95.98	1202.
42.70	725.7	0.8718	80.62	96.86	1201.
43.70	709.7	0.8524	81.33	97.71	1201.
44.70	694.3	0.8338	82.03	98.55	1201.
45.70	679.4	0.8157	82.71	99.37	1201.

Replace

Table 6.2.1.4-2 (Sheet 4 of 5)

MASS AND ENERGY RELEASE DATA FOR THE CASE OF MAIN STEAM LINE FULL DOUBLE ENDED RUPTURE FROM 30% POWER LEVEL WITH FAULTED LOOP MAIN STEAM LINE ISOLATION VALVE FAILURE THAT PRODUCES HIGHEST CONTAINMENT PRESSURE

TIME SEC	MASS LBM/SEC	ENERGY BTU/SEC (E+6)	INTGR M LBM (E+3)	INTGR E BTU (E+6)	AVG ENTH BTU
46.70	665.2	0.7984	83.38	100.2	1200.
47.70	651.4	0.7818	84.04	101.0	1200.
48.70	638.3	0.7659	84.68	101.7	1200.
49.70	625.7	0.7505	85.31	102.5	1200.
50.70	613.5	0.7358	85.92	103.2	1199.
52.70	590.6	0.7080	87.12	104.7	1199.
54.70	569.4	0.6824	88.28	106.0	1198.
56.70	550.0	0.6588	89.39	107.4	1198.
58.70	532.0	0.6370	90.47	108.7	1197.
60.70	515.4	0.6169	91.51	109.9	1197.
62.70	500.2	0.5985	92.52	111.1	1196.
64.70	486.2	0.5815	93.51	112.3	1196.
66.70	473.1	0.5656	94.46	113.4	1196.
68.70	461.1	0.5511	95.39	114.6	1195.
70.70	449.9	0.5376	96.30	115.6	1195.
72.70	439.6	0.5251	97.19	116.7	1194.
74.70	430.1	0.5136	98.05	117.7	1194.
76.70	421.2	0.5028	98.90	118.8	1194.
78.70	413.0	0.4929	99.74	119.7	1193.
80.70	405.4	0.4836	100.6	120.7	1193.
82.70	398.3	0.4750	101.4	121.7	1193.
84.70	391.7	0.4671	102.1	122.6	1192.
86.70	385.7	0.4598	102.9	123.5	1192.
88.70	380.1	0.4531	103.7	124.5	1192.
90.70	375.0	0.4469	104.4	125.4	1192.
92.70	370.3	0.4412	105.2	126.2	1191.
94.70	366.0	0.4359	105.9	127.1	1191.
96.70	361.9	0.4310	106.6	128.0	1191.
98.70	358.1	0.4264	107.4	128.8	1191.
100.2	355.4	0.4231	107.9	129.5	1191.
105.2	347.6	0.4138	109.6	131.6	1190.
110.2	340.6	0.4053	111.4	133.6	1190.
115.2	334.5	0.3979	113.1	135.6	1190.
120.2	329.2	0.3916	114.7	137.6	1189.
125.2	324.8	0.3862	116.3	139.5	1189.
130.2	321.0	0.3816	118.0	141.4	1189.
135.2	317.9	0.3779	119.5	143.3	1189.
140.2	315.6	0.3751	121.1	145.2	1189.
145.2	313.8	0.3730	122.7	147.1	1188.
150.2	312.8	0.3718	124.3	148.9	1188.
155.2	312.5	0.3714	125.8	150.8	1188.
160.2	312.8	0.3718	127.4	152.7	1188.
165.2	313.8	0.3729	129.0	154.5	1188.
170.2	315.2	0.3747	130.5	156.4	1189.
175.2	317.2	0.3770	132.1	158.3	1189.

Replace Vol

Table 6.2.1.4-2 (Sheet 5 of 5)

MASS AND ENERGY RELEASE DATA FOR THE CASE OF MAIN STEAM LINE FULL DOUBLE ENDED RUPTURE FROM 30% POWER LEVEL WITH FAULTED LOOP MAIN STEAM LINE ISOLATION VALVE FAILURE THAT PRODUCES HIGHEST CONTAINMENT PRESSURE

TIME SEC	MASS LBM/SEC	ENERGY BTU/SEC (E+6)	INTGR M LBM (E+3)	INTGR E BTU (E+6)	AVG ENTH BTU
180.2	319.6	0.3799	133.7	160.2	1189.
185.2	322.3	0.3832	135.3	162.1	1189.
190.2	325.2	0.3867	136.9	164.0	1189.
195.2	328.3	0.3904	138.6	165.9	1189.
200.2	331.5	0.3943	140.2	167.9	1189.
210.2	337.5	0.4015	143.6	171.9	1190.
220.2	343.5	0.4088	147.0	176.0	1190.
230.2	349.0	0.4154	150.4	180.1	1190.
240.2	353.7	0.4211	154.0	184.3	1191.
250.2	357.6	0.4259	157.5	188.5	1191.
260.2	360.7	0.4296	161.1	192.8	1191.
270.2	363.0	0.4324	164.7	197.1	1191.
280.2	364.6	0.4343	168.4	201.4	1191.
290.2	365.2	0.4350	172.0	205.8	1191.
300.2	364.8	0.4346	175.7	210.1	1191.
310.2	363.8	0.4334	179.3	214.5	1191.
320.2	362.5	0.4318	183.0	218.8	1191.
330.2	361.3	0.4303	186.6	223.1	1191.
340.2	360.2	0.4289	190.2	227.4	1191.
350.2	359.3	0.4279	193.8	231.7	1191.
360.2	358.8	0.4273	197.4	236.0	1191.
370.2	358.5	0.4269	201.0	240.2	1191.
380.2	338.1	0.4045	204.5	244.4	1196.
386.2	296.7	0.3570	206.4	246.7	1203.
390.2	262.0	0.3175	207.4	248.0	1212.
392.2	245.5	0.2989	207.9	248.6	1218.
394.2	225.2	0.2758	208.4	249.1	1225.
396.2	201.5	0.2484	208.8	249.6	1233.
398.2	175.7	0.2181	209.1	250.1	1241.
400.2	150.1	0.1876	209.4	250.4	1250.
402.2	125.5	0.1581	209.7	250.8	1259.
404.2	105.3	0.1335	209.9	251.0	1267.
406.2	90.51	0.1153	210.1	251.3	1274.
408.2	11.83	0.0151	210.1	251.3	1280.
410.2	0.8582	0.0011	210.1	251.3	1285.
412.2	0.0592	0.0001	210.1	251.3	1289.
414.2	0.0041	0.0000	210.1	251.3	1292.
416.2	0.0003	0.0000	210.1	251.3	1295.
418.2	0.0000	0.0000	210.1	251.3	1297.
420.2	0.0000	0.0000	210.1	251.3	1299.
430.2	0.0000	0.0000	210.1	251.3	0.0000
440.2	0.0000	0.0000	210.1	251.3	0.0000
450.2	0.0000	0.0000	210.1	251.3	0.0000

Replace 1 ∆ b

Peak Pressure Case - 30% Power - Full DER (1.4 ft^2) - MST

Reactor Trip => 0.578 sec (SIS Low Steamline Pre
Steamline Isolati=> 10.578 sec
Feedwater Isolati=> 10.578 sec
SG Drys Out => 492.0 sec

Time (sec)	Mass Flow (lbm/s)	Energy Flow (10^6 Btu/s	Integrated Mass (10^3 lbm)	Integrated Energy (10^6 Btu)
0.0	0.0	0.0	0.0	0.000
0.1	12438.1	14.845	1.244	1.485
0.2	12412.4	14.815	2.485	2.966
0.3	12393.0	14.793	3.724	4.445
0.4	12373.6	14.770	4.962	5.922
0.5	12354.9	14.749	6.197	7.397
0.6	12336.6	14.728	7.431	8.870
0.7	12318.7	14.707	8.663	10.341
0.8	12300.6	14.686	9.893	11.809
0.9	12283.1	14.665	11.121	13.276
1.0	12265.9	14.645	12.348	14.740
1.1	12249.2	14.626	13.573	16.203
1.2	5396.4	6.443	14.112	16.847
1.3	5345.4	6.384	14.647	17.486
1.4	5305.4	6.337	15.177	18.119
1.5	5266.3	6.292	15.704	18.748
1.6	5227.9	6.247	16.227	19.373
1.7	5190.3	6.204	16.746	19.994
1.8	5153.5	6.161	17.261	20.610
1.9	5117.3	6.118	17.773	21.221
2.0	5081.8	6.077	18.281	21.829
2.1	5046.9	6.036	18.786	22.433
2.2	5012.6	5.996	19.287	23.032
2.3	4978.8	5.957	19.785	23.628
2.4	4945.6	5.918	20.279	24.220
2.5	4913.4	5.880	20.771	24.808
2.6	4881.2	5.843	21.259	25.392
2.7	4849.5	5.806	21.744	25.973
2.8	4818.3	5.769	22.226	26.550
2.9	4787.5	5.733	22.704	27.123
3.0	4757.2	5.697	23.180	27.693
3.1	4727.8	5.663	23.653	28.259
3.2	4698.4	5.628	24.123	28.822
3.3	4669.4	5.594	24.590	29.381
3.4	4640.8	5.561	25.054	29.937
3.5	4612.6	5.528	25.515	30.490
3.6	4584.8	5.495	25.974	31.040
3.7	4558.0	5.463	26.429	31.586
3.8	4537.8	5.440	26.883	32.130
3.9	4516.5	5.415	27.335	32.671
4.0	4495.2	5.389	27.784	33.210
4.1	4474.1	5.365	28.232	33.747
4.2	4453.3	5.340	28.677	34.281
4.3	4432.8	5.316	29.120	34.812
4.4	4412.6	5.292	29.562	35.342
4.5	4392.6	5.269	30.001	35.869
4.6	4372.8	5.245	30.438	36.393
4.7	4353.3	5.222	30.873	36.915
4.8	4334.0	5.200	31.307	37.435
4.9	4315.0	5.177	31.738	37.953
5.0	4296.2	5.155	32.168	38.468
5.1	4277.7	5.133	32.596	38.982

Table 6.2.1.4-2

DATA

5.2	4259.4	5.112	33.022	39.493
5.3	4241.3	5.090	33.446	40.002
5.4	4223.5	5.069	33.868	40.509

5.5	4205.9	5.048	34.289	41.014
5.6	4188.6	5.028	34.708	41.516
5.7	4171.4	5.008	35.125	42.017
5.8	4154.5	4.988	35.540	42.516
5.9	4137.9	4.968	35.954	43.013
6.0	4121.4	4.948	36.366	43.508
6.1	4105.2	4.929	36.777	44.001
6.2	4089.1	4.910	37.186	44.492
6.3	4073.3	4.892	37.593	44.981
6.4	4057.7	4.873	37.999	45.468
6.5	4042.3	4.855	38.403	45.954
6.6	4027.1	4.837	38.806	46.437
6.7	4012.1	4.819	39.207	46.919
6.8	3997.3	4.802	39.607	47.399
6.9	3982.7	4.784	40.005	47.878
7.0	3968.3	4.767	40.402	48.354
7.1	3954.0	4.750	40.797	48.829
7.2	3940.0	4.734	41.191	49.303
7.3	3926.1	4.717	41.584	49.775
7.4	3912.4	4.701	41.975	50.245
7.5	3898.9	4.685	42.365	50.713
7.6	3885.5	4.669	42.753	51.180
7.7	3872.3	4.653	43.141	51.645
7.8	3859.2	4.638	43.526	52.109
7.9	3846.3	4.623	43.911	52.571
8.0	3833.6	4.607	44.294	53.032
8.1	3821.0	4.592	44.677	53.491
8.2	3808.5	4.578	45.057	53.949
8.3	3796.2	4.563	45.437	54.405
8.4	3784.0	4.549	45.815	54.860
8.5	3771.9	4.534	46.193	55.314
8.6	3760.0	4.520	46.569	55.766
8.7	3748.2	4.506	46.943	56.216
8.8	3736.5	4.492	47.317	56.666
8.9	3724.9	4.478	47.690	57.113
9.0	3713.4	4.465	48.061	57.560
9.1	3702.0	4.451	48.431	58.005
9.2	3690.7	4.438	48.800	58.449
9.3	3679.5	4.424	49.168	58.891
9.4	3668.4	4.411	49.535	59.332
9.5	3657.4	4.398	49.901	59.772
9.6	3646.5	4.385	50.265	60.210
9.7	3635.6	4.372	50.629	60.648
9.8	3624.8	4.359	50.991	61.084
9.9	3614.1	4.346	51.353	61.518
10.0	3603.5	4.334	51.713	61.952
10.1	3592.9	4.321	52.072	62.384
10.2	3582.4	4.309	52.431	62.815
10.3	3571.9	4.296	52.788	63.244
10.4	3561.5	4.284	53.144	63.673
10.5	3551.2	4.271	53.499	64.100
10.6	3540.9	4.259	53.853	64.526
10.7	3530.8	4.247	54.206	64.950
10.8	3523.4	4.238	54.559	65.374
10.9	3515.2	4.229	54.910	65.797
11.0	3507.0	4.219	55.261	66.219
11.1	3498.7	4.209	55.611	66.640
11.2	3490.5	4.199	55.960	67.060
11.3	3482.3	4.189	56.308	67.479
11.4	3474.1	4.180	56.655	67.897
11.5	3465.9	4.170	57.002	68.314
11.6	3457.6	4.160	57.348	68.730
11.7	3449.4	4.150	57.693	69.145

11.8	1707.9	2.055	57.864	69.350
11.9	1704.7	2.051	58.034	69.555
12.0	1701.5	2.047	58.204	69.760

12.1	1698.3	2.044	58.374	69.964
12.2	1695.1	2.040	58.543	70.168
12.3	1691.9	2.036	58.713	70.372
12.4	1688.6	2.032	58.882	70.575
12.5	1685.4	2.028	59.050	70.778
12.6	1682.1	2.024	59.218	70.980
12.7	1678.8	2.020	59.386	71.182
12.8	1675.6	2.016	59.554	71.384
12.9	1672.3	2.012	59.721	71.585
13.0	1669.0	2.009	59.888	71.786
13.1	1665.7	2.005	60.054	71.987
13.2	1662.4	2.001	60.221	72.187
13.3	1659.0	1.997	60.387	72.386
13.4	1655.7	1.993	60.552	72.586
13.5	1652.4	1.989	60.717	72.784
13.6	1649.0	1.985	60.882	72.983
13.7	1645.7	1.981	61.047	73.181
13.8	1642.3	1.977	61.211	73.379
13.9	1638.9	1.973	61.375	73.576
14.0	1635.5	1.969	61.538	73.773
14.1	1632.2	1.965	61.702	73.969
14.2	1628.8	1.960	61.865	74.165
14.3	1625.4	1.956	62.027	74.361
14.4	1622.0	1.952	62.189	74.556
14.5	1618.6	1.948	62.351	74.751
14.6	1615.1	1.944	62.513	74.945
14.7	1611.7	1.940	62.674	75.139
14.8	1608.3	1.936	62.835	75.333
14.9	1604.8	1.932	62.995	75.526
15.0	1601.4	1.928	63.155	75.719
15.1	1598.0	1.924	63.315	75.911
15.2	1594.5	1.919	63.475	76.103
15.3	1591.1	1.915	63.634	76.295
15.4	1587.6	1.911	63.792	76.486
15.5	1584.2	1.907	63.951	76.677
15.6	1580.7	1.903	64.109	76.867
15.7	1577.2	1.899	64.267	77.057
15.8	1573.8	1.895	64.424	77.246
15.9	1570.3	1.890	64.581	77.435
16.0	1566.8	1.886	64.738	77.624
16.1	1563.2	1.882	64.894	77.812
16.2	1559.7	1.878	65.050	78.000
16.3	1556.0	1.873	65.206	78.187
16.4	1552.4	1.869	65.361	78.374
16.5	1548.7	1.865	65.516	78.561
16.6	1544.9	1.860	65.670	78.747
16.7	1541.1	1.856	65.824	78.932
16.8	1537.3	1.851	65.978	79.117
16.9	1533.4	1.846	66.131	79.302
17.0	1529.5	1.842	66.284	79.486
17.1	1525.5	1.837	66.437	79.670
17.2	1521.5	1.832	66.589	79.853
17.3	1517.5	1.827	66.741	80.036
17.4	1513.5	1.822	66.892	80.218
17.5	1509.4	1.817	67.043	80.400
17.6	1505.3	1.813	67.194	80.581
17.7	1501.1	1.808	67.344	80.762
17.8	1497.0	1.803	67.493	80.942
17.9	1492.8	1.798	67.643	81.122
18.0	1488.6	1.793	67.792	81.301
18.1	1484.4	1.787	67.940	81.480
18.2	1480.1	1.782	68.088	81.658
18.3	1475.9	1.777	68.236	81.836

18.4	1471.6	1.772	68.383	82.013
18.5	1467.3	1.767	68.529	82.190
18.6	1463.0	1.762	68.676	82.366

18.7	1458.6	1.757	68.822	82.541
18.8	1454.3	1.751	68.967	82.717
18.9	1449.9	1.746	69.112	82.891
19.0	1445.6	1.741	69.257	83.065
19.1	1441.2	1.736	69.401	83.239
19.2	1436.8	1.730	69.544	83.412
19.3	1432.5	1.725	69.688	83.584
19.4	1428.1	1.720	69.830	83.756
19.5	1423.7	1.715	69.973	83.928
19.6	1419.3	1.709	70.115	84.099
19.7	1415.0	1.704	70.256	84.269
19.8	1410.6	1.699	70.397	84.439
19.9	1406.2	1.694	70.538	84.608
20.0	1401.8	1.688	70.678	84.777
20.5	1388.8	1.673	71.373	85.614
21.0	1367.7	1.647	72.056	86.437
21.5	1346.3	1.622	72.730	87.248
22.0	1325.4	1.596	73.392	88.046
22.5	1304.7	1.572	74.045	88.832
23.0	1284.4	1.547	74.687	89.605
23.5	1264.4	1.523	75.319	90.367
24.0	1244.8	1.499	75.941	91.116
24.5	1225.5	1.476	76.554	91.855
25.0	1206.7	1.453	77.157	92.581
25.5	1188.2	1.431	77.752	93.297
26.0	1170.1	1.409	78.337	94.001
26.5	1152.4	1.388	78.913	94.695
27.0	1135.1	1.367	79.480	95.379
27.5	1118.1	1.347	80.039	96.052
28.0	1101.5	1.326	80.590	96.715
28.5	1085.2	1.307	81.133	97.369
29.0	1069.3	1.288	81.667	98.013
29.5	1053.8	1.269	82.194	98.647
30.0	1038.5	1.250	82.714	99.272
30.5	1023.7	1.233	83.225	99.888
31.0	1009.1	1.215	83.730	100.496
31.5	994.9	1.198	84.227	101.095
32.0	981.0	1.181	84.718	101.685
32.5	967.5	1.165	85.202	102.268
33.0	954.2	1.148	85.679	102.842
33.5	941.2	1.133	86.149	103.408
34.0	928.5	1.117	86.614	103.967
34.5	916.2	1.102	87.072	104.518
35.0	904.0	1.088	87.524	105.062
35.5	892.2	1.074	87.970	105.599
36.0	880.6	1.059	88.410	106.129
36.5	869.3	1.046	88.845	106.651
37.0	858.3	1.032	89.274	107.168
37.5	847.6	1.019	89.698	107.677
38.0	837.1	1.007	90.116	108.181
38.5	826.8	0.994	90.530	108.678
39.0	816.9	0.982	90.938	109.169
39.5	807.1	0.970	91.342	109.654
40.0	797.6	0.959	91.741	110.134
40.5	788.3	0.948	92.135	110.608
41.0	779.2	0.937	92.524	111.076
41.5	770.4	0.926	92.909	111.539
42.0	761.7	0.915	93.290	111.997
42.5	753.1	0.905	93.667	112.449
43.0	744.8	0.895	94.039	112.897
43.5	736.6	0.885	94.408	113.339
44.0	728.6	0.875	94.772	113.777
44.5	720.8	0.866	95.132	114.210

45.0	713.1	0.857	95.489	114.638
45.5	705.6	0.848	95.842	115.062
46.0	698.3	0.839	96.191	115.481

46.5	691.1	0.830	96.536	115.896
47.0	683.9	0.821	96.878	116.307
47.5	677.0	0.813	97.217	116.713
48.0	670.1	0.804	97.552	117.116
48.5	663.4	0.796	97.884	117.514
49.0	656.9	0.788	98.212	117.908
49.5	650.4	0.781	98.537	118.298
50.0	644.2	0.773	98.859	118.685
50.5	638.0	0.765	99.178	119.067
51.0	631.9	0.758	99.494	119.446
51.5	625.9	0.751	99.807	119.822
52.0	620.0	0.744	100.117	120.194
52.5	614.3	0.737	100.424	120.562
53.0	608.7	0.730	100.729	120.927
53.5	603.2	0.723	101.030	121.289
54.0	597.8	0.717	101.329	121.647
54.5	592.5	0.710	101.625	122.002
55.0	587.3	0.704	101.919	122.354
55.5	582.2	0.698	102.210	122.703
56.0	577.2	0.692	102.499	123.049
56.5	572.3	0.686	102.785	123.392
57.0	567.5	0.680	103.069	123.732
57.5	562.8	0.674	103.350	124.069
58.0	558.2	0.669	103.629	124.404
58.5	553.7	0.663	103.906	124.735
59.0	549.2	0.658	104.181	125.064
59.5	544.9	0.653	104.453	125.391
60.0	540.6	0.648	104.723	125.715
60.5	536.5	0.642	104.992	126.036
61.0	532.4	0.637	105.258	126.354
61.5	528.3	0.633	105.522	126.671
62.0	524.4	0.628	105.784	126.985
62.5	520.5	0.623	106.044	127.296
63.0	516.7	0.619	106.303	127.606
63.5	513.0	0.614	106.559	127.913
64.0	509.4	0.610	106.814	128.217
64.5	505.8	0.605	107.067	128.520
65.0	502.3	0.601	107.318	128.820
65.5	498.9	0.597	107.567	129.119
66.0	495.5	0.593	107.815	129.415
66.5	492.3	0.589	108.061	129.710
67.0	489.0	0.585	108.306	130.002
67.5	485.9	0.581	108.549	130.293
68.0	482.8	0.577	108.790	130.582
68.5	479.6	0.574	109.030	130.868
69.0	476.6	0.570	109.268	131.153
69.5	473.7	0.566	109.505	131.437
70.0	470.8	0.563	109.741	131.718
70.5	468.0	0.559	109.975	131.998
71.0	465.2	0.556	110.207	132.276
71.5	462.5	0.553	110.438	132.552
72.0	459.8	0.550	110.668	132.827
72.5	457.2	0.546	110.897	133.100
73.0	454.6	0.543	111.124	133.372
73.5	452.1	0.540	111.350	133.642
74.0	449.6	0.537	111.575	133.910
74.5	447.2	0.534	111.799	134.178
75.0	444.8	0.531	112.021	134.443
75.5	442.4	0.528	112.242	134.708
76.0	440.1	0.526	112.462	134.970
76.5	437.8	0.523	112.681	135.232
77.0	435.6	0.520	112.899	135.492
77.5	433.4	0.518	113.116	135.751

78.0	431.3	0.515	113.331	136.008
78.5	429.2	0.512	113.546	136.265
79.0	427.1	0.510	113.759	136.520

79.5	425.1	0.508	113.972	136.773
80.0	423.1	0.505	114.183	137.026
80.5	421.1	0.503	114.394	137.277
81.0	419.2	0.500	114.604	137.527
81.5	417.3	0.498	114.812	137.776
82.0	415.5	0.496	115.020	138.024
82.5	413.7	0.494	115.227	138.271
83.0	411.9	0.492	115.433	138.517
83.5	410.1	0.489	115.638	138.762
84.0	408.4	0.487	115.842	139.005
84.5	406.7	0.485	116.045	139.248
85.0	405.0	0.483	116.248	139.490
85.5	403.4	0.481	116.450	139.730
86.0	401.8	0.479	116.651	139.970
86.5	400.2	0.477	116.851	140.209
87.0	398.6	0.476	117.050	140.446
87.5	397.1	0.474	117.248	140.683
88.0	395.6	0.472	117.446	140.919
88.5	394.1	0.470	117.643	141.154
89.0	392.7	0.468	117.840	141.388
89.5	391.3	0.467	118.035	141.621
90.0	389.9	0.465	118.230	141.854
90.5	388.5	0.463	118.425	142.086
91.0	387.2	0.462	118.618	142.316
91.5	385.8	0.460	118.811	142.546
92.0	384.5	0.458	119.003	142.776
92.5	383.3	0.457	119.195	143.004
93.0	382.0	0.455	119.386	143.232
93.5	380.8	0.454	119.576	143.459
94.0	379.6	0.452	119.766	143.685
94.5	378.4	0.451	119.955	143.910
95.0	377.2	0.450	120.144	144.135
95.5	376.0	0.448	120.332	144.359
96.0	374.9	0.447	120.519	144.583
96.5	373.8	0.445	120.706	144.805
97.0	372.7	0.444	120.893	145.027
97.5	371.6	0.443	121.078	145.249
98.0	370.6	0.442	121.264	145.469
98.5	369.5	0.440	121.448	145.690
99.0	368.5	0.439	121.633	145.909
99.5	367.5	0.438	121.816	146.128
100.0	366.5	0.437	122.000	146.346
101.0	365.0	0.435	122.365	146.781
102.0	363.1	0.433	122.728	147.214
103.0	361.3	0.430	123.089	147.644
104.0	359.5	0.428	123.449	148.072
105.0	357.8	0.426	123.806	148.498
106.0	356.1	0.424	124.162	148.922
107.0	354.5	0.422	124.517	149.344
108.0	352.9	0.420	124.870	149.764
109.0	351.4	0.418	125.221	150.183
110.0	349.9	0.416	125.571	150.599
111.0	348.4	0.415	125.919	151.014
112.0	347.0	0.413	126.266	151.427
113.0	345.7	0.411	126.612	151.838
114.0	344.3	0.410	126.956	152.248
115.0	343.1	0.408	127.299	152.656
116.0	341.9	0.407	127.641	153.063
117.0	340.6	0.405	127.982	153.469
118.0	339.5	0.404	128.321	153.872
119.0	338.3	0.403	128.660	154.275
120.0	337.2	0.401	128.997	154.676
121.0	336.2	0.400	129.333	155.076

122.0	335.1	0.399	129.668	155.475
123.0	334.1	0.397	130.002	155.872
124.0	333.1	0.396	130.336	156.269

125.0	332.2	0.395	130.668	156.664
126.0	331.3	0.394	130.999	157.058
127.0	330.4	0.393	131.329	157.451
128.0	329.5	0.392	131.659	157.843
129.0	328.6	0.391	131.987	158.233
130.0	327.8	0.390	132.315	158.623
131.0	327.0	0.389	132.642	159.012
132.0	326.3	0.388	132.969	159.400
133.0	325.5	0.387	133.294	159.787
134.0	324.8	0.386	133.619	160.174
135.0	324.1	0.385	133.943	160.559
136.0	323.5	0.385	134.267	160.944
137.0	322.8	0.384	134.589	161.328
138.0	322.2	0.383	134.912	161.711
139.0	321.6	0.382	135.233	162.093
140.0	321.0	0.382	135.554	162.475
141.0	320.5	0.381	135.875	162.856
142.0	319.9	0.380	136.195	163.236
143.0	319.4	0.380	136.514	163.616
144.0	318.9	0.379	136.833	163.995
145.0	318.4	0.379	137.151	164.373
146.0	318.0	0.378	137.469	164.751
147.0	317.6	0.377	137.787	165.129
148.0	317.2	0.377	138.104	165.506
149.0	316.8	0.377	138.421	165.882
150.0	316.4	0.376	138.737	166.258
151.0	316.0	0.376	139.053	166.634
152.0	315.7	0.375	139.369	167.009
153.0	315.4	0.375	139.684	167.384
154.0	315.1	0.375	140.000	167.759
155.0	314.9	0.374	140.314	168.133
156.0	314.6	0.374	140.629	168.507
157.0	314.4	0.374	140.943	168.881
158.0	314.2	0.373	141.258	169.254
159.0	314.0	0.373	141.572	169.627
160.0	313.8	0.373	141.885	170.000
161.0	313.7	0.373	142.199	170.373
162.0	313.5	0.373	142.513	170.746
163.0	313.4	0.372	142.826	171.118
164.0	313.3	0.372	143.139	171.490
165.0	313.2	0.372	143.453	171.863
166.0	313.2	0.372	143.766	172.235
167.0	313.1	0.372	144.079	172.607
168.0	313.1	0.372	144.392	172.979
169.0	313.1	0.372	144.705	173.351
170.0	313.1	0.372	145.018	173.723
171.0	313.1	0.372	145.331	174.096
172.0	313.1	0.372	145.644	174.468
173.0	313.2	0.372	145.958	174.840
174.0	313.3	0.372	146.271	175.212
175.0	313.3	0.372	146.584	175.585
176.0	313.4	0.372	146.898	175.957
177.0	313.5	0.373	147.211	176.330
178.0	313.6	0.373	147.525	176.702
179.0	313.8	0.373	147.839	177.075
180.0	313.9	0.373	148.152	177.448
181.0	314.0	0.373	148.466	177.822
182.0	314.2	0.373	148.781	178.195
183.0	314.4	0.374	149.095	178.569
184.0	314.5	0.374	149.410	178.942
185.0	314.7	0.374	149.724	179.316
186.0	314.9	0.374	150.039	179.691
187.0	315.1	0.375	150.354	180.065

188.0	315.3	0.375	150.670	180.440
189.0	315.6	0.375	150.985	180.815
190.0	315.8	0.375	151.301	181.190

191.0	316.0	0.376	151.617	181.566
192.0	316.3	0.376	151.933	181.942
193.0	316.5	0.376	152.250	182.318
194.0	316.7	0.377	152.566	182.695
195.0	317.0	0.377	152.883	183.072
196.0	317.2	0.377	153.201	183.449
197.0	317.5	0.377	153.518	183.826
198.0	317.8	0.378	153.836	184.204
199.0	318.0	0.378	154.154	184.582
200.0	318.3	0.378	154.472	184.960
202.0	318.7	0.379	155.110	185.718
204.0	319.2	0.379	155.748	186.477
206.0	319.8	0.380	156.388	187.237
208.0	320.4	0.381	157.029	187.999
210.0	320.9	0.382	157.671	188.762
212.0	321.5	0.382	158.313	189.527
214.0	322.0	0.383	158.957	190.293
216.0	322.5	0.383	159.603	191.060
218.0	323.0	0.384	160.249	191.828
220.0	323.5	0.385	160.896	192.597
222.0	324.0	0.385	161.544	193.368
224.0	324.4	0.386	162.193	194.139
226.0	324.9	0.386	162.842	194.912
228.0	325.2	0.387	163.493	195.685
230.0	325.6	0.387	164.144	196.459
232.0	325.9	0.388	164.796	197.234
234.0	326.1	0.388	165.448	198.010
236.0	326.4	0.388	166.101	198.786
238.0	326.6	0.388	166.754	199.563
240.0	326.8	0.389	167.407	200.340
242.0	326.9	0.389	168.061	201.118
244.0	327.0	0.389	168.715	201.896
246.0	327.0	0.389	169.369	202.673
248.0	327.0	0.389	170.023	203.451
250.0	327.0	0.389	170.677	204.229
252.0	326.9	0.389	171.331	205.007
254.0	326.8	0.389	171.985	205.784
256.0	326.7	0.388	172.638	206.561
258.0	326.5	0.388	173.291	207.337
260.0	326.3	0.388	173.944	208.113
262.0	326.0	0.388	174.596	208.889
264.0	325.7	0.387	175.247	209.663
266.0	325.4	0.387	175.898	210.437
268.0	325.0	0.386	176.548	211.210
270.0	324.6	0.386	177.197	211.982
272.0	324.2	0.386	177.846	212.753
274.0	323.8	0.385	178.493	213.523
276.0	323.3	0.384	179.140	214.292
278.0	322.8	0.384	179.785	215.060
280.0	322.3	0.383	180.430	215.826
282.0	321.8	0.383	181.074	216.592
284.0	321.3	0.382	181.716	217.356
286.0	320.7	0.381	182.358	218.118
288.0	320.1	0.381	182.998	218.879
290.0	319.5	0.380	183.637	219.639
292.0	319.0	0.379	184.275	220.397
294.0	318.4	0.378	184.912	221.154
296.0	317.8	0.378	185.547	221.910
298.0	317.1	0.377	186.181	222.664
300.0	316.5	0.376	186.815	223.416
302.0	315.9	0.375	187.446	224.167
304.0	315.3	0.375	188.077	224.917
306.0	314.6	0.374	188.705	225.665

308.0	314.0	0.373	189.334	226.411
310.0	313.4	0.372	189.961	227.156
312.0	312.8	0.372	190.587	227.899

314.0	312.1	0.371	191.211	228.641
316.0	311.5	0.370	191.834	229.382
318.0	310.9	0.369	192.456	230.121
320.0	310.3	0.369	193.076	230.858
322.0	309.7	0.368	193.696	231.594
324.0	309.0	0.367	194.314	232.328
326.0	308.5	0.367	194.931	233.061
328.0	307.9	0.366	195.546	233.793
330.0	307.3	0.365	196.161	234.523
332.0	306.7	0.364	196.774	235.252
334.0	306.1	0.364	197.386	235.979
336.0	305.5	0.363	197.997	236.705
338.0	304.9	0.362	198.607	237.430
340.0	304.4	0.362	199.216	238.153
342.0	303.8	0.361	199.824	238.874
344.0	303.3	0.360	200.430	239.595
346.0	302.7	0.360	201.036	240.314
348.0	302.2	0.359	201.640	241.032
350.0	301.6	0.358	202.243	241.748
352.0	301.1	0.358	202.845	242.464
354.0	300.5	0.357	203.446	243.177
356.0	300.0	0.356	204.046	243.890
358.0	299.5	0.356	204.645	244.601
360.0	298.9	0.355	205.243	245.311
362.0	298.5	0.354	205.840	246.020
364.0	297.9	0.354	206.436	246.728
366.0	297.4	0.353	207.031	247.434
368.0	296.9	0.353	207.624	248.139
370.0	296.4	0.352	208.217	248.843
372.0	295.9	0.351	208.809	249.546
374.0	295.4	0.351	209.400	250.247
376.0	294.9	0.350	209.989	250.948
378.0	294.4	0.350	210.578	251.647
380.0	294.0	0.349	211.166	252.345
382.0	293.5	0.348	211.753	253.042
384.0	293.1	0.348	212.339	253.738
386.0	292.5	0.347	212.925	254.432
388.0	292.1	0.347	213.509	255.126
390.0	291.6	0.346	214.092	255.818
392.0	291.1	0.346	214.674	256.510
394.0	290.7	0.345	215.256	257.200
396.0	290.2	0.344	215.836	257.889
398.0	289.7	0.344	216.415	258.577
400.0	287.2	0.341	216.990	259.258
402.0	285.2	0.338	217.560	259.935
404.0	283.6	0.336	218.127	260.608
406.0	282.1	0.335	218.691	261.278
408.0	280.7	0.333	219.253	261.944
410.0	279.4	0.331	219.812	262.607
412.0	278.2	0.330	220.368	263.267
414.0	276.8	0.328	220.922	263.923
416.0	275.3	0.327	221.472	264.577
418.0	273.7	0.325	222.020	265.226
420.0	272.0	0.323	222.564	265.871
422.0	270.3	0.321	223.104	266.512
424.0	268.5	0.318	223.641	267.149
426.0	266.4	0.316	224.174	267.781
428.0	263.9	0.313	224.702	268.406
430.0	261.5	0.310	225.225	269.026
432.0	259.4	0.307	225.744	269.641
434.0	256.6	0.304	226.257	270.249
436.0	253.5	0.300	226.764	270.850
438.0	250.3	0.296	227.265	271.442

440.0	246.8	0.292	227.758	272.027
442.0	243.2	0.288	228.245	272.603
444.0	239.2	0.283	228.723	273.169

446.0	235.1	0.278	229.193	273.725
448.0	231.0	0.273	229.655	274.272
450.0	226.4	0.268	230.108	274.807
452.0	220.7	0.261	230.550	275.329
454.0	214.6	0.254	230.979	275.836
456.0	208.1	0.246	231.395	276.327
458.0	201.0	0.237	231.797	276.801
460.0	193.3	0.228	232.184	277.257
462.0	185.1	0.218	232.554	277.694
464.0	176.3	0.208	232.907	278.109
466.0	166.8	0.196	233.240	278.501
468.0	156.4	0.184	233.553	278.869
470.0	145.2	0.170	233.843	279.210
472.0	133.6	0.157	234.110	279.523
474.0	123.3	0.144	234.357	279.811
476.0	111.3	0.130	234.580	280.071
478.0	98.7	0.115	234.777	280.301
480.0	86.6	0.101	234.950	280.503
482.0	75.9	0.088	235.102	280.679
484.0	67.4	0.078	235.237	280.835
486.0	25.4	0.029	235.288	280.894
488.0	2.6	0.003	235.293	280.900
490.0	0.2	0.0003	235.293	280.901
492.0	0.0	0.0	235.293	280.901

Table 6.2.1.4-3 (Sheet 1 of 5)

MASS AND ENERGY RELEASE DATA FOR THE CASE OF MAIN STEAM LINE FULL DOUBLE ENDED RUPTURE FROM 102% POWER LEVEL WITH FAULTED LOOP MAIN STEAM LINE ISOLATION VALVE FAILURE THAT PRODUCES HIGHEST CONTAINMENT TEMPERATURE

Initial steam generator mass (lbm)	:	~~132000.~~ 133650.
Mass added by unisolatable steam (lbm)	:	~~5800.~~ 8419.
Mass added by feedwater flashing (lbm)	:	~~5824.6~~ 8726.
Initial steam pressure (psia)	:	~~803.9~~ 843.2
Feedwater line isolation at (sec)	:	~~13.106~~ 10.29
Steam line isolation at (sec)	:	~~13.106~~ 10.29

TIME SEC	MASS LBM/SEC	ENERGY BTU/SEC (E+6)	INTGR M LBM (E+3)	INTGR E BTU (E+6)	AVG ENTH BTU
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.2000	4408.	5.284	0.8817	1.057	1199.
0.4000	4385.	5.257	1.759	2.108	1199.
0.6000	4349.	5.214	2.628	3.151	1199.
0.8000	4320.	5.180	3.493	4.187	1199.
1.0000	4292.	5.147	4.351	5.216	1199.
1.200	4265.	5.115	5.204	6.240	1199.
1.400	4239.	5.084	6.052	7.256	1199.
1.600	4213.	5.054	6.894	8.267	1200.
1.800	4188.	5.024	7.732	9.272	1200.
2.000	4163.	4.995	8.564	10.27	1200.
2.200	4128.	4.954	9.390	11.26	1200.
2.400	4114.	4.937	10.21	12.25	1200.
2.600	4094.	4.913	11.03	13.23	1200.
2.800	4071.	4.886	11.85	14.21	1200.
3.000	4051.	4.863	12.66	15.18	1200.
3.200	4035.	4.844	13.46	16.15	1200.
3.400	4024.	4.831	14.27	17.12	1201.
3.600	4013.	4.818	15.07	18.08	1201.
3.800	3985.	4.785	15.87	19.04	1201.
4.000	3959.	4.754	16.66	19.99	1201.
4.200	3940.	4.731	17.45	20.93	1201.
4.400	3924.	4.712	18.23	21.88	1201.
4.600	3908.	4.693	19.01	22.81	1201.
4.800	3892.	4.674	19.79	23.75	1201.
5.000	3876.	4.656	20.57	24.68	1201.
5.200	3861.	4.638	21.34	25.61	1201.
5.400	3846.	4.620	22.11	26.53	1201.
5.600	3832.	4.603	22.88	27.45	1201.
5.800	3818.	4.587	23.64	28.37	1201.
6.000	3805.	4.571	24.40	29.28	1201.
6.200	3791.	4.555	25.16	30.20	1201.
6.400	3778.	4.540	25.91	31.10	1202.
6.600	3766.	4.525	26.67	32.01	1202.
6.800	3754.	4.511	27.42	32.91	1202.

Replace 1/1

Table 6.2.1.4-3 (Sheet 2 of 5)

**MASS AND ENERGY RELEASE DATA
FOR THE CASE OF MAIN STEAM LINE FULL
DOUBLE ENDED RUPTURE FROM 102% POWER LEVEL
WITH FAULTED LOOP MAIN STEAM LINE ISOLATION VALVE
FAILURE THAT PRODUCES HIGHEST CONTAINMENT TEMPERATURE**

TIME SEC	MASS LBM/SEC	ENERGY BTU/SEC (E+6)	INTGR M LBM (E+3)	INTGR E BTU (E+6)	AVG ENTH BTU
7.000	3742.	4.496	28.17	33.81	1202.
7.200	3730.	4.483	28.91	34.71	1202.
7.400	3719.	4.469	29.66	35.60	1202.
7.600	3708.	4.456	30.40	36.49	1202.
7.800	3697.	4.443	31.14	37.38	1202.
8.000	3686.	4.431	31.87	38.27	1202.
8.200	3676.	4.418	32.61	39.15	1202.
8.400	3667.	4.408	33.34	40.03	1202.
8.600	3656.	4.395	34.07	40.91	1202.
8.800	3646.	4.382	34.80	41.79	1202.
9.000	3635.	4.369	35.53	42.66	1202.
9.200	3626.	4.359	36.26	43.53	1202.
9.400	3615.	4.346	36.98	44.40	1202.
9.600	3604.	4.333	37.70	45.27	1202.
9.800	3593.	4.320	38.42	46.13	1202.
10.000	3582.	4.307	39.13	46.99	1202.
10.20	3571.	4.293	39.85	47.85	1202.
10.40	3559.	4.280	40.56	48.71	1202.
10.60	3548.	4.266	41.27	49.56	1202.
10.80	3536.	4.251	41.98	50.41	1202.
11.00	3523.	4.237	42.68	51.26	1202.
11.20	3511.	4.222	43.38	52.10	1203.
11.40	3498.	4.207	44.08	52.94	1203.
11.60	3485.	4.191	44.78	53.78	1203.
11.80	3472.	4.175	45.47	54.62	1203.
12.00	3458.	4.159	46.17	55.45	1203.
12.20	3444.	4.142	46.86	56.28	1203.
12.40	3428.	4.123	47.54	57.10	1203.
12.60	3414.	4.107	48.22	57.92	1203.
12.80	3398.	4.088	48.90	58.74	1203.
13.00	3384.	4.071	49.58	59.56	1203.
13.20	3368.	4.051	50.25	60.37	1203.
13.40	3368.	4.051	50.93	61.18	1203.
13.60	3298.	3.967	51.59	61.97	1203.
13.80	3227.	3.882	52.23	62.75	1203.
14.00	3156.	3.797	52.86	63.51	1203.
14.20	3085.	3.712	53.48	64.25	1203.
14.40	3015.	3.627	54.08	64.97	1203.
14.60	2944.	3.542	54.67	65.68	1203.
14.80	2873.	3.456	55.25	66.37	1203.
15.00	2802.	3.371	55.81	67.05	1203.
15.20	2731.	3.286	56.35	67.70	1203.
15.40	2660.	3.201	56.88	68.34	1203.
15.60	2589.	3.115	57.40	68.97	1203.

Replace Tbl

Table 6.2.1.4-3 (Sheet 3 of 5)

MASS AND ENERGY RELEASE DATA FOR THE CASE OF MAIN STEAM LINE FULL DOUBLE ENDED RUPTURE FROM 102% POWER LEVEL WITH FAULTED LOOP MAIN STEAM LINE ISOLATION VALVE FAILURE THAT PRODUCES HIGHEST CONTAINMENT TEMPERATURE

TIME SEC	MASS LBM/SEC	ENERGY BTU/SEC (E+6)	INTGR M LBM (E+3)	INTGR E BTU (E+6)	AVG ENTH BTU
15.80	2518.	3.030	57.91	69.57	1203.
16.00	2447.	2.945	58.40	70.16	1203.
16.20	2377.	2.860	58.87	70.73	1203.
16.40	2306.	2.775	59.33	71.29	1203.
16.60	2235.	2.690	59.78	71.83	1204.
16.80	2164.	2.605	60.21	72.35	1204.
17.00	2093.	2.519	60.63	72.85	1204.
17.20	2022.	2.434	61.04	73.34	1204.
17.40	1951.	2.348	61.43	73.81	1204.
17.60	1879.	2.262	61.80	74.26	1204.
17.80	1808.	2.176	62.16	74.70	1204.
18.00	1736.	2.090	62.51	75.11	1204.
18.20	1664.	2.004	62.84	75.52	1204.
18.40	1592.	1.917	63.16	75.90	1204.
18.60	1520.	1.830	63.47	76.26	1204.
18.80	1487.	1.790	63.76	76.62	1204.
19.00	1478.	1.780	64.06	76.98	1204.
19.20	1469.	1.769	64.35	77.33	1204.
19.40	1460.	1.758	64.64	77.68	1204.
19.60	1451.	1.747	64.93	78.03	1204.
19.80	1442.	1.737	65.22	78.38	1204.
20.70	1408.	1.696	66.50	79.92	1204.
21.70	1364.	1.643	67.87	81.57	1204.
22.70	1320.	1.590	69.20	83.18	1204.
23.70	1278.	1.539	70.49	84.73	1204.
24.70	1238.	1.491	71.74	86.23	1204.
25.70	1199.	1.444	72.95	87.69	1204.
26.70	1162.	1.399	74.12	89.10	1204.
27.70	1127.	1.357	75.26	90.46	1204.
28.70	1093.	1.316	76.36	91.79	1204.
29.70	1061.	1.277	77.42	93.08	1204.
30.70	1030.	1.240	78.46	94.33	1204.
31.70	1002.	1.206	79.47	95.54	1204.
32.70	974.5	1.173	80.45	96.72	1204.
33.70	948.6	1.142	81.41	97.87	1204.
34.70	924.0	1.112	82.34	98.99	1203.
35.70	900.5	1.083	83.24	100.1	1203.
36.70	878.0	1.056	84.13	101.1	1203.
37.70	856.5	1.030	84.99	102.2	1203.
38.70	835.9	1.005	85.83	103.2	1203.
39.70	816.3	0.9816	86.65	104.2	1202.
40.70	797.7	0.9590	87.45	105.1	1202.
41.70	779.9	0.9375	88.24	106.1	1202.

Replace Tbl

Table 6.2.1.4-3 (Sheet 4 of 5)

MASS AND ENERGY RELEASE DATA FOR THE CASE OF MAIN STEAM LINE FULL DOUBLE ENDED RUPTURE FROM 102% POWER LEVEL WITH FAULTED LOOP MAIN STEAM LINE ISOLATION VALVE FAILURE THAT PRODUCES HIGHEST CONTAINMENT TEMPERATURE

TIME SEC	MASS LBM/SEC	ENERGY BTU/SEC (E+6)	INTGR M LBM (E+3)	INTGR E BTU (E+6)	AVG ENTH BTU
42.70	762.9	0.9169	89.00	107.0	1202.
43.70	746.6	0.8972	89.76	107.9	1202.
44.70	731.1	0.8783	90.49	108.8	1201.
45.70	716.2	0.8603	91.21	109.7	1201.
46.70	701.9	0.8430	91.92	110.5	1201.
47.70	688.3	0.8264	92.61	111.3	1201.
48.70	675.1	0.8105	93.29	112.2	1201.
49.70	662.5	0.7953	93.95	113.0	1200.
50.70	650.5	0.7807	94.60	113.7	1200.
52.70	628.1	0.7535	95.88	115.3	1200.
54.70	607.5	0.7285	97.11	116.7	1199.
56.70	588.6	0.7056	98.30	118.2	1199.
58.70	571.3	0.6846	99.45	119.5	1198.
60.70	555.4	0.6654	100.6	120.9	1198.
62.70	540.9	0.6478	101.7	122.2	1198.
64.70	527.5	0.6316	102.7	123.5	1197.
66.70	515.3	0.6167	103.8	124.7	1197.
68.70	504.1	0.6032	104.8	125.9	1197.
70.70	493.8	0.5907	105.8	127.1	1196.
72.70	484.3	0.5793	106.8	128.3	1196.
74.70	475.5	0.5686	107.7	129.4	1196.
76.70	467.4	0.5588	108.7	130.6	1195.
78.70	460.0	0.5498	109.6	131.7	1195.
80.70	453.1	0.5414	110.5	132.8	1195.
82.70	446.7	0.5336	111.4	133.8	1195.
84.70	440.7	0.5264	112.3	134.9	1195.
86.70	435.1	0.5197	113.2	135.9	1194.
88.70	429.9	0.5134	114.0	137.0	1194.
90.70	425.1	0.5075	114.9	138.0	1194.
92.70	420.5	0.5020	115.7	139.0	1194.
94.70	416.2	0.4967	116.6	140.0	1194.
96.70	412.1	0.4918	117.4	141.0	1193.
98.70	408.3	0.4872	118.2	142.0	1193.
100.2	405.5	0.4838	118.8	142.7	1193.
105.2	397.5	0.4741	120.8	145.1	1193.
110.2	389.8	0.4648	122.8	147.4	1192.
115.2	383.0	0.4566	124.7	149.7	1192.
120.2	376.8	0.4491	126.6	152.0	1192.
125.2	371.2	0.4423	128.5	154.2	1191.
130.2	366.2	0.4362	130.3	156.4	1191.
135.2	361.7	0.4308	132.1	158.6	1191.
140.2	357.9	0.4261	133.9	160.7	1191.
145.2	354.6	0.4222	135.7	162.8	1191.
150.2	351.8	0.4189	137.5	164.9	1191.

Replace Tbl

Table 6.2.1.4-3 (Sheet 5 of 5)

**MASS AND ENERGY RELEASE DATA
FOR THE CASE OF MAIN STEAM LINE FULL
DOUBLE ENDED RUPTURE FROM 102% POWER LEVEL
WITH FAULTED LOOP MAIN STEAM LINE ISOLATION VALVE
FAILURE THAT PRODUCES HIGHEST CONTAINMENT TEMPERATURE**

TIME SEC	MASS LBM/SEC	ENERGY BTU/SEC (E+6)	INTGR M LBM (E+3)	INTGR E BTU (E+6)	AVG ENTH BTU
155.2	349.7	0.4163	139.2	167.0	1190.
160.2	348.1	0.4144	141.0	169.1	1190.
165.2	347.0	0.4131	142.7	171.1	1190.
170.2	346.4	0.4123	144.4	173.2	1190.
175.2	346.2	0.4121	146.2	175.3	1190.
180.2	346.4	0.4123	147.9	177.3	1190.
185.2	346.9	0.4129	149.6	179.4	1190.
190.2	347.6	0.4138	151.4	181.5	1190.
195.2	348.6	0.4149	153.1	183.5	1190.
200.2	349.7	0.4163	154.9	185.6	1190.
210.2	352.1	0.4192	158.4	189.8	1191.
220.2	354.9	0.4226	161.9	194.0	1191.
230.2	357.6	0.4259	165.5	198.3	1191.
240.2	359.7	0.4284	169.1	202.5	1191.
250.2	361.1	0.4301	172.7	206.8	1191.
260.2	361.8	0.4309	176.3	211.1	1191.
270.2	362.0	0.4311	179.9	215.4	1191.
280.2	361.9	0.4311	183.5	219.7	1191.
290.2	361.7	0.4308	187.1	224.1	1191.
300.2	361.5	0.4306	190.8	228.4	1191.
310.2	361.4	0.4305	194.4	232.7	1191.
320.2	361.6	0.4307	198.0	237.0	1191.
330.2	319.9	0.3836	201.4	241.1	1199.
332.2	304.7	0.3665	202.0	241.8	1203.
334.2	286.9	0.3461	202.6	242.5	1207.
336.2	265.8	0.3221	203.1	243.1	1212.
338.2	240.9	0.2935	203.6	243.7	1218.
340.2	211.9	0.2598	204.0	244.3	1226.
342.2	179.2	0.2214	204.4	244.7	1235.
344.2	146.4	0.1824	204.7	245.1	1246.
346.2	121.0	0.1519	204.9	245.4	1255.
348.2	80.53	0.1018	205.1	245.6	1264.
350.2	3.652	0.0046	205.1	245.6	1272.
352.2	0.1262	0.0002	205.1	245.6	1278.
354.2	0.0044	0.0000	205.1	245.6	1283.
356.2	0.0002	0.0000	205.1	245.6	1287.
358.2	0.0000	0.0000	205.1	245.6	1291.
360.2	0.0000	0.0000	205.1	245.6	1294.
366.2	0.0000	0.0000	205.1	245.6	0.0000
370.2	0.0000	0.0000	205.1	245.6	0.0000
380.2	0.0000	0.0000	205.1	245.6	0.0000

Replace Tbl

Peak Temperature Case - 102% Power - Full DER (1.4 ft^2) -

Reactor Trip => 0.291 sec (SIS Low Steamline Pre
Steamline Isolati=> 10.291 sec
Feedwater Isolati=> 10.291 sec
SG Drys Out => 362.0 sec

Time (sec)	Mass Flow (lbm/s)	Energy Flow (10^6 Btu/s	Integrated Mass (10^3 lbm)	Integrated Energy (10^6 Btu)
0.0	0.0	0.0	0.0	0.000
0.1	10767.6	12.899	1.077	1.290
0.2	10754.4	12.884	2.152	2.578
0.3	10745.0	12.873	3.227	3.866
0.4	10735.7	12.862	4.300	5.152
0.5	10726.5	12.851	5.373	6.437
0.6	10717.6	12.841	6.445	7.721
0.7	10708.8	12.830	7.516	9.004
0.8	10700.1	12.820	8.586	10.286
0.9	10691.6	12.810	9.655	11.567
1.0	10683.2	12.800	10.723	12.847
1.1	10675.0	12.791	11.791	14.126
1.2	4718.4	5.652	12.262	14.691
1.3	4665.1	5.589	12.729	15.250
1.4	4626.8	5.544	13.192	15.805
1.5	4589.6	5.501	13.651	16.355
1.6	4553.7	5.458	14.106	16.901
1.7	4518.8	5.417	14.558	17.442
1.8	4485.0	5.378	15.006	17.980
1.9	4452.3	5.339	15.452	18.514
2.0	4420.4	5.301	15.894	19.044
2.1	4389.5	5.265	16.333	19.571
2.2	4359.6	5.230	16.768	20.094
2.3	4330.3	5.195	17.202	20.613
2.4	4301.9	5.162	17.632	21.129
2.5	4274.3	5.129	18.059	21.642
2.6	4247.4	5.097	18.484	22.152
2.7	4221.2	5.066	18.906	22.658
2.8	4195.6	5.036	19.326	23.162
2.9	4170.7	5.006	19.743	23.663
3.0	4146.3	4.978	20.157	24.160
3.1	4122.6	4.949	20.570	24.655
3.2	4099.4	4.922	20.979	25.148
3.3	4076.7	4.895	21.387	25.637
3.4	4056.1	4.871	21.793	26.124
3.5	4056.3	4.871	22.198	26.611
3.6	4049.8	4.863	22.603	27.098
3.7	4043.4	4.856	23.008	27.583
3.8	4037.4	4.849	23.411	28.068
3.9	4031.7	4.842	23.815	28.552
4.0	4025.7	4.835	24.217	29.036
4.1	4019.8	4.828	24.619	29.518
4.2	4013.9	4.821	25.021	30.000
4.3	4008.0	4.814	25.421	30.482
4.4	4002.1	4.807	25.822	30.963
4.5	3996.3	4.800	26.221	31.443
4.6	3990.4	4.793	26.620	31.922
4.7	3984.6	4.786	27.019	32.400
4.8	3978.9	4.779	27.417	32.878
4.9	3973.1	4.773	27.814	33.356

Table 6.2.1.4-3 Data

5.0	3967.5	4.766	28.211	33.832
5.1	3961.8	4.759	28.607	34.308
5.2	3956.3	4.753	29.002	34.783

5.3	3950.8	4.746	29.398	35.258
5.4	3945.3	4.740	29.792	35.732
5.5	3939.9	4.733	30.186	36.205
5.6	3934.6	4.727	30.580	36.678
5.7	3929.4	4.721	30.972	37.150
5.8	3924.2	4.715	31.365	37.622
5.9	3919.0	4.709	31.757	38.092
6.0	3914.0	4.703	32.148	38.563
6.1	3908.9	4.697	32.539	39.032
6.2	3904.0	4.691	32.929	39.501
6.3	3899.1	4.685	33.319	39.970
6.4	3894.3	4.679	33.709	40.438
6.5	3889.5	4.674	34.098	40.905
6.6	3884.8	4.668	34.486	41.372
6.7	3880.1	4.662	34.874	41.838
6.8	3875.5	4.657	35.262	42.304
6.9	3870.9	4.652	35.649	42.769
7.0	3866.4	4.646	36.036	43.234
7.1	3861.9	4.641	36.422	43.698
7.2	3857.4	4.636	36.807	44.161
7.3	3852.9	4.630	37.193	44.624
7.4	3848.5	4.625	37.578	45.087
7.5	3844.1	4.620	37.962	45.549
7.6	3839.6	4.614	38.346	46.010
7.7	3835.2	4.609	38.729	46.471
7.8	3830.8	4.604	39.113	46.932
7.9	3826.3	4.599	39.495	47.392
8.0	3821.8	4.593	39.877	47.851
8.1	3817.3	4.588	40.259	48.310
8.2	3812.8	4.583	40.640	48.768
8.3	3808.2	4.577	41.021	49.226
8.4	3803.6	4.572	41.402	49.683
8.5	3798.9	4.566	41.781	50.139
8.6	3794.1	4.560	42.161	50.595
8.7	3789.2	4.555	42.540	51.051
8.8	3784.3	4.549	42.918	51.506
8.9	3779.3	4.543	43.296	51.960
9.0	3774.2	4.537	43.674	52.414
9.1	3769.0	4.531	44.050	52.867
9.2	3763.7	4.524	44.427	53.319
9.3	3758.3	4.518	44.803	53.771
9.4	3752.7	4.511	45.178	54.222
9.5	3747.1	4.505	45.553	54.673
9.6	3741.3	4.498	45.927	55.122
9.7	3735.4	4.491	46.300	55.571
9.8	3729.3	4.483	46.673	56.020
9.9	3723.2	4.476	47.046	56.467
10.0	3716.9	4.469	47.417	56.914
10.1	3710.4	4.461	47.788	57.360
10.2	3703.8	4.453	48.159	57.806
10.3	3697.1	4.445	48.528	58.250
10.4	3690.3	4.437	48.897	58.694
10.5	3684.4	4.430	49.266	59.137
10.6	3678.0	4.422	49.634	59.579
10.7	3671.4	4.415	50.001	60.021
10.8	3664.7	4.407	50.367	60.461
10.9	3657.8	4.398	50.733	60.901
11.0	3650.8	4.390	51.098	61.340
11.1	3643.6	4.381	51.462	61.778
11.2	3636.2	4.373	51.826	62.215
11.3	3628.8	4.364	52.189	62.652
11.4	3621.1	4.355	52.551	63.087
11.5	1855.2	2.231	52.737	63.310

11.6	1851.4	2.226	52.922	63.533
11.7	1847.5	2.221	53.107	63.755
11.8	1843.6	2.217	53.291	63.977

11.9	1839.6	2.212	53.475	64.198
12.0	1835.6	2.207	53.658	64.419
12.1	1831.5	2.202	53.842	64.639
12.2	1827.4	2.197	54.024	64.859
12.3	1823.2	2.192	54.207	65.078
12.4	1819.0	2.187	54.389	65.297
12.5	1814.8	2.182	54.570	65.515
12.6	1810.6	2.177	54.751	65.733
12.7	1806.3	2.172	54.932	65.950
12.8	1801.9	2.167	55.112	66.167
12.9	1797.6	2.162	55.292	66.383
13.0	1793.2	2.157	55.471	66.598
13.1	1788.8	2.151	55.650	66.814
13.2	1784.4	2.146	55.828	67.028
13.3	1779.9	2.141	56.006	67.242
13.4	1775.4	2.136	56.184	67.456
13.5	1770.9	2.130	56.361	67.669
13.6	1766.4	2.125	56.538	67.881
13.7	1761.9	2.119	56.714	68.093
13.8	1757.3	2.114	56.889	68.305
13.9	1752.8	2.109	57.065	68.516
14.0	1748.2	2.103	57.240	68.726
14.1	1743.6	2.098	57.414	68.936
14.2	1739.0	2.092	57.588	69.145
14.3	1734.4	2.087	57.761	69.354
14.4	1729.8	2.081	57.934	69.562
14.5	1725.2	2.076	58.107	69.769
14.6	1720.6	2.070	58.279	69.976
14.7	1716.0	2.065	58.450	70.183
14.8	1711.4	2.059	58.622	70.389
14.9	1706.8	2.054	58.792	70.594
15.0	1702.2	2.048	58.962	70.799
15.1	1697.6	2.043	59.132	71.003
15.2	1693.0	2.037	59.302	71.207
15.3	1688.4	2.032	59.470	71.410
15.4	1683.8	2.026	59.639	71.613
15.5	1679.3	2.021	59.807	71.815
15.6	1674.7	2.015	59.974	72.016
15.7	1670.1	2.010	60.141	72.217
15.8	1665.5	2.004	60.308	72.418
15.9	1660.8	1.999	60.474	72.618
16.0	1656.1	1.993	60.639	72.817
16.1	1651.3	1.987	60.805	73.016
16.2	1646.6	1.982	60.969	73.214
16.3	1641.7	1.976	61.133	73.411
16.4	1636.9	1.970	61.297	73.608
16.5	1632.0	1.964	61.460	73.805
16.6	1627.0	1.958	61.623	74.001
16.7	1622.0	1.952	61.785	74.196
16.8	1617.0	1.946	61.947	74.391
16.9	1612.0	1.940	62.108	74.585
17.0	1606.9	1.934	62.269	74.778
17.1	1601.9	1.928	62.429	74.971
17.2	1596.7	1.922	62.589	75.163
17.3	1591.6	1.916	62.748	75.355
17.4	1586.4	1.910	62.906	75.546
17.5	1581.3	1.904	63.065	75.736
17.6	1576.1	1.897	63.222	75.926
17.7	1570.8	1.891	63.379	76.115
17.8	1565.6	1.885	63.536	76.303
17.9	1560.4	1.879	63.692	76.491
18.0	1555.1	1.872	63.847	76.678
18.1	1549.9	1.866	64.002	76.865

18.2	1544.6	1.860	64.157	77.051
18.3	1539.3	1.853	64.311	77.236
18.4	1534.0	1.847	64.464	77.421

18.5	1528.8	1.841	64.617	77.605
18.6	1523.5	1.834	64.769	77.789
18.7	1518.2	1.828	64.921	77.971
18.8	1512.9	1.822	65.072	78.154
18.9	1507.6	1.815	65.223	78.335
19.0	1502.3	1.809	65.373	78.516
19.1	1497.0	1.803	65.523	78.696
19.2	1491.7	1.796	65.672	78.876
19.3	1486.5	1.790	65.821	79.055
19.4	1481.2	1.784	65.969	79.233
19.5	1475.9	1.777	66.117	79.411
19.6	1470.7	1.771	66.264	79.588
19.7	1465.4	1.765	66.410	79.765
19.8	1460.1	1.758	66.556	79.940
19.9	1454.9	1.752	66.702	80.116
20.0	1449.7	1.746	66.847	80.290
20.5	1434.1	1.727	67.564	81.154
21.0	1409.0	1.697	68.268	82.002
21.5	1384.2	1.667	68.960	82.836
22.0	1359.7	1.638	69.640	83.655
22.5	1335.3	1.608	70.308	84.459
23.0	1311.8	1.580	70.964	85.249
23.5	1288.8	1.552	71.608	86.025
24.0	1266.4	1.525	72.241	86.788
24.5	1244.5	1.499	72.864	87.537
25.0	1223.2	1.473	73.475	88.274
25.5	1202.4	1.448	74.076	88.998
26.0	1182.2	1.424	74.668	89.710
26.5	1162.5	1.400	75.249	90.410
27.0	1143.3	1.377	75.820	91.098
27.5	1124.5	1.354	76.383	91.775
28.0	1106.3	1.332	76.936	92.441
28.5	1088.5	1.311	77.480	93.097
29.0	1071.3	1.290	78.016	93.742
29.5	1054.8	1.270	78.543	94.377
30.0	1038.7	1.251	79.062	95.002
30.5	1023.1	1.232	79.574	95.618
31.0	1008.0	1.214	80.078	96.225
31.5	993.3	1.196	80.575	96.823
32.0	979.1	1.179	81.064	97.412
32.5	965.3	1.162	81.547	97.993
33.0	951.9	1.146	82.023	98.566
33.5	938.8	1.130	82.492	99.131
34.0	926.1	1.115	82.955	99.688
34.5	913.7	1.100	83.412	100.238
35.0	901.7	1.085	83.863	100.780
35.5	890.0	1.071	84.308	101.316
36.0	878.5	1.057	84.747	101.844
36.5	867.3	1.043	85.181	102.366
37.0	856.4	1.030	85.609	102.881
37.5	845.8	1.017	86.032	103.390
38.0	835.4	1.005	86.450	103.892
38.5	825.3	0.993	86.862	104.388
39.0	815.5	0.981	87.270	104.879
39.5	805.9	0.969	87.673	105.363
40.0	796.5	0.958	88.071	105.842
40.5	787.2	0.946	88.465	106.315
41.0	778.2	0.935	88.854	106.783
41.5	769.4	0.925	89.239	107.245
42.0	760.7	0.914	89.619	107.702
42.5	752.3	0.904	89.995	108.154
43.0	744.0	0.894	90.367	108.601
43.5	735.9	0.884	90.735	109.043

44.0	728.1	0.875	91.099	109.481
44.5	720.4	0.865	91.459	109.914
45.0	712.9	0.856	91.816	110.342

45.5	705.5	0.847	92.169	110.765
46.0	698.3	0.839	92.518	111.185
46.5	691.3	0.830	92.863	111.600
47.0	684.4	0.822	93.206	112.011
47.5	677.6	0.814	93.544	112.417
48.0	671.0	0.806	93.880	112.820
48.5	664.6	0.798	94.212	113.219
49.0	658.2	0.790	94.541	113.614
49.5	652.1	0.783	94.867	114.005
50.0	646.1	0.775	95.190	114.393
50.5	640.2	0.768	95.510	114.777
51.0	634.4	0.761	95.828	115.158
51.5	628.7	0.754	96.142	115.535
52.0	623.2	0.748	96.454	115.909
52.5	617.7	0.741	96.762	116.279
53.0	612.4	0.735	97.069	116.646
53.5	607.3	0.728	97.372	117.011
54.0	602.2	0.722	97.673	117.372
54.5	597.2	0.716	97.972	117.730
55.0	592.4	0.710	98.268	118.085
55.5	587.6	0.704	98.562	118.437
56.0	583.0	0.699	98.854	118.786
56.5	578.5	0.693	99.143	119.133
57.0	574.0	0.688	99.430	119.477
57.5	569.7	0.683	99.715	119.819
58.0	565.5	0.678	99.997	120.157
58.5	561.3	0.673	100.278	120.494
59.0	557.2	0.668	100.557	120.827
59.5	553.3	0.663	100.833	121.159
60.0	549.4	0.658	101.108	121.488
60.5	545.6	0.654	101.381	121.815
61.0	541.9	0.649	101.652	122.139
61.5	538.2	0.645	101.921	122.461
62.0	534.7	0.640	102.188	122.782
62.5	531.2	0.636	102.454	123.100
63.0	527.8	0.632	102.718	123.416
63.5	524.5	0.628	102.980	123.730
64.0	521.2	0.624	103.241	124.042
64.5	518.0	0.620	103.500	124.352
65.0	514.9	0.616	103.757	124.660
65.5	511.8	0.613	104.013	124.966
66.0	508.9	0.609	104.267	125.271
66.5	506.0	0.605	104.520	125.573
67.0	503.1	0.602	104.772	125.874
67.5	500.3	0.599	105.022	126.174
68.0	497.6	0.595	105.271	126.471
68.5	495.0	0.592	105.518	126.767
69.0	492.3	0.589	105.764	127.062
69.5	489.8	0.586	106.009	127.355
70.0	487.3	0.583	106.253	127.646
70.5	484.8	0.580	106.495	127.936
71.0	482.5	0.577	106.737	128.225
71.5	480.0	0.574	106.977	128.512
72.0	477.7	0.571	107.215	128.797
72.5	475.5	0.569	107.453	129.082
73.0	473.2	0.566	107.690	129.365
73.5	471.1	0.563	107.925	129.646
74.0	469.0	0.561	108.160	129.926
74.5	466.9	0.558	108.393	130.206
75.0	464.9	0.556	108.626	130.483
75.5	462.9	0.553	108.857	130.760
76.0	460.9	0.551	109.088	131.036
76.5	459.0	0.549	109.317	131.310

77.0	457.1	0.546	109.546	131.583
77.5	455.3	0.544	109.773	131.855
78.0	453.5	0.542	110.000	132.126

78.5	451.7	0.540	110.226	132.396
79.0	450.0	0.538	110.451	132.665
79.5	448.3	0.536	110.675	132.933
80.0	446.6	0.534	110.898	133.199
80.5	445.0	0.532	111.121	133.465
81.0	443.4	0.530	111.343	133.730
81.5	441.8	0.528	111.564	133.994
82.0	440.3	0.526	111.784	134.257
82.5	438.8	0.524	112.003	134.519
83.0	437.3	0.522	112.222	134.780
83.5	435.8	0.520	112.440	135.040
84.0	434.3	0.519	112.657	135.300
84.5	432.9	0.517	112.873	135.558
85.0	431.6	0.515	113.089	135.816
85.5	430.2	0.514	113.304	136.073
86.0	428.8	0.512	113.519	136.329
86.5	427.5	0.510	113.732	136.584
87.0	426.2	0.509	113.945	136.839
87.5	425.0	0.507	114.158	137.092
88.0	423.7	0.506	114.370	137.345
88.5	422.5	0.504	114.581	137.597
89.0	421.2	0.503	114.792	137.849
89.5	420.1	0.501	115.002	138.099
90.0	418.9	0.500	115.211	138.349
90.5	417.7	0.499	115.420	138.599
91.0	416.6	0.497	115.628	138.847
91.5	415.4	0.496	115.836	139.095
92.0	414.3	0.494	116.043	139.342
92.5	413.2	0.493	116.250	139.589
93.0	412.2	0.492	116.456	139.835
93.5	411.1	0.491	116.661	140.080
94.0	410.0	0.489	116.866	140.325
94.5	409.0	0.488	117.071	140.569
95.0	408.0	0.487	117.275	140.812
95.5	407.0	0.486	117.478	141.055
96.0	406.0	0.484	117.681	141.297
96.5	405.0	0.483	117.884	141.539
97.0	404.0	0.482	118.086	141.780
97.5	403.1	0.481	118.287	142.020
98.0	402.1	0.480	118.488	142.260
98.5	401.2	0.479	118.689	142.500
99.0	400.3	0.477	118.889	142.738
99.5	399.4	0.476	119.089	142.976
100.0	398.4	0.475	119.288	143.214
101.0	397.1	0.474	119.685	143.688
102.0	395.4	0.472	120.081	144.159
103.0	393.7	0.469	120.474	144.629
104.0	392.0	0.467	120.866	145.096
105.0	390.4	0.465	121.257	145.562
106.0	388.7	0.463	121.645	146.025
107.0	387.2	0.462	122.033	146.487
108.0	385.6	0.460	122.418	146.946
109.0	384.1	0.458	122.802	147.404
110.0	382.6	0.456	123.185	147.860
111.0	381.1	0.454	123.566	148.315
112.0	379.6	0.452	123.945	148.767
113.0	378.2	0.451	124.324	149.218
114.0	376.8	0.449	124.700	149.667
115.0	375.4	0.447	125.076	150.114
116.0	374.0	0.446	125.450	150.560
117.0	372.7	0.444	125.823	151.004
118.0	371.4	0.443	126.194	151.447
119.0	370.1	0.441	126.564	151.888

120.0	368.8	0.439	126.933	152.327
121.0	367.5	0.438	127.300	152.765
122.0	366.3	0.436	127.667	153.201

123.0	365.1	0.435	128.032	153.636
124.0	363.9	0.433	128.396	154.070
125.0	362.7	0.432	128.758	154.502
126.0	361.6	0.431	129.120	154.932
127.0	360.4	0.429	129.480	155.362
128.0	359.3	0.428	129.840	155.789
129.0	358.2	0.427	130.198	156.216
130.0	357.2	0.425	130.555	156.641
131.0	356.1	0.424	130.911	157.066
132.0	355.1	0.423	131.266	157.488
133.0	354.1	0.422	131.621	157.910
134.0	353.1	0.420	131.974	158.330
135.0	352.2	0.419	132.326	158.750
136.0	351.2	0.418	132.677	159.168
137.0	350.3	0.417	133.027	159.585
138.0	349.4	0.416	133.377	160.001
139.0	348.5	0.415	133.725	160.416
140.0	347.7	0.414	134.073	160.829
141.0	346.8	0.413	134.420	161.242
142.0	346.0	0.412	134.766	161.654
143.0	345.2	0.411	135.111	162.065
144.0	344.5	0.410	135.455	162.475
145.0	343.7	0.409	135.799	162.884
146.0	343.0	0.408	136.142	163.292
147.0	342.4	0.407	136.485	163.700
148.0	341.7	0.407	136.826	164.106
149.0	341.0	0.406	137.167	164.512
150.0	340.3	0.405	137.508	164.917
151.0	339.7	0.404	137.847	165.321
152.0	339.1	0.404	138.186	165.725
153.0	338.6	0.403	138.525	166.128
154.0	338.0	0.402	138.863	166.530
155.0	337.5	0.402	139.200	166.931
156.0	336.9	0.401	139.537	167.332
157.0	336.4	0.400	139.874	167.733
158.0	336.0	0.400	140.210	168.132
159.0	335.5	0.399	140.545	168.531
160.0	335.1	0.399	140.880	168.930
161.0	334.6	0.398	141.215	169.328
162.0	334.2	0.398	141.549	169.726
163.0	333.9	0.397	141.883	170.123
164.0	333.5	0.397	142.217	170.520
165.0	333.1	0.396	142.550	170.916
166.0	332.8	0.396	142.883	171.312
167.0	332.5	0.396	143.215	171.707
168.0	332.2	0.395	143.547	172.102
169.0	332.0	0.395	143.879	172.497
170.0	331.7	0.395	144.211	172.892
171.0	331.5	0.394	144.542	173.286
172.0	331.3	0.394	144.874	173.680
173.0	331.0	0.394	145.205	174.074
174.0	330.9	0.394	145.536	174.468
175.0	330.7	0.393	145.866	174.861
176.0	330.5	0.393	146.197	175.254
177.0	330.4	0.393	146.527	175.647
178.0	330.3	0.393	146.857	176.040
179.0	330.1	0.393	147.187	176.432
180.0	330.0	0.393	147.518	176.825
181.0	329.9	0.392	147.847	177.217
182.0	329.9	0.392	148.177	177.610
183.0	329.8	0.392	148.507	178.002
184.0	329.7	0.392	148.837	178.394
185.0	329.7	0.392	149.166	178.786

186.0	329.6	0.392	149.496	179.178
187.0	329.6	0.392	149.826	179.570
188.0	329.6	0.392	150.155	179.962

189.0	329.6	0.392	150.485	180.354
190.0	329.6	0.392	150.814	180.746
191.0	329.6	0.392	151.144	181.138
192.0	329.6	0.392	151.474	181.530
193.0	329.6	0.392	151.803	181.922
194.0	329.6	0.392	152.133	182.314
195.0	329.7	0.392	152.463	182.706
196.0	329.7	0.392	152.792	183.099
197.0	329.7	0.392	153.122	183.491
198.0	329.8	0.392	153.452	183.883
199.0	329.8	0.392	153.781	184.275
200.0	329.9	0.392	154.111	184.667
202.0	329.9	0.392	154.771	185.452
204.0	330.1	0.393	155.431	186.237
206.0	330.1	0.393	156.092	187.023
208.0	330.3	0.393	156.752	187.808
210.0	330.4	0.393	157.413	188.594
212.0	330.5	0.393	158.074	189.381
214.0	330.6	0.393	158.735	190.167
216.0	330.7	0.393	159.396	190.954
218.0	330.8	0.393	160.058	191.740
220.0	330.8	0.393	160.720	192.527
222.0	330.8	0.393	161.381	193.314
224.0	330.9	0.394	162.043	194.102
226.0	330.9	0.394	162.705	194.889
228.0	330.8	0.393	163.366	195.676
230.0	330.8	0.393	164.028	196.462
232.0	330.7	0.393	164.689	197.249
234.0	330.6	0.393	165.350	198.035
236.0	330.4	0.393	166.011	198.821
238.0	330.3	0.393	166.672	199.607
240.0	330.0	0.393	167.332	200.392
242.0	329.8	0.392	167.991	201.177
244.0	329.6	0.392	168.650	201.961
246.0	329.3	0.392	169.309	202.744
248.0	329.0	0.391	169.967	203.527
250.0	328.7	0.391	170.625	204.308
252.0	328.4	0.391	171.281	205.090
254.0	328.0	0.390	171.937	205.870
256.0	327.6	0.390	172.593	206.649
258.0	327.2	0.389	173.247	207.427
260.0	326.8	0.389	173.901	208.205
262.0	326.4	0.388	174.553	208.981
264.0	325.9	0.388	175.205	209.756
266.0	32[illegible].5	0.387	175.856	210.530
268.0	[illegible].9	0.386	176.506	211.303
270.0	324.5	0.386	177.155	212.074
272.0	324.0	0.385	177.803	212.845
274.0	323.4	0.385	178.450	213.614
276.0	322.9	0.384	179.095	214.382
278.0	322.4	0.383	179.740	215.148
280.0	321.8	0.383	180.384	215.913
282.0	321.2	0.382	181.026	216.677
284.0	320.7	0.381	181.667	217.440
286.0	320.1	0.380	182.308	218.201
288.0	319.6	0.380	182.947	218.960
290.0	318.9	0.379	183.584	219.719
292.0	318.4	0.378	184.221	220.476
294.0	317.8	0.378	184.857	221.231
296.0	317.2	0.377	185.491	221.985
298.0	316.6	0.376	186.124	222.738
300.0	316.0	0.376	186.756	223.489
302.0	315.4	0.375	187.387	224.239

304.0	314.9	0.374	188.017	224.987
306.0	314.2	0.373	188.645	225.734
308.0	312.1	0.371	189.270	226.476

310.0	307.0	0.365	189.884	227.206
312.0	303.1	0.360	190.490	227.926
314.0	298.6	0.355	191.087	228.635
316.0	293.9	0.349	191.675	229.333
318.0	288.9	0.343	192.253	230.019
320.0	283.7	0.337	192.820	230.692
322.0	278.2	0.330	193.376	231.352
324.0	272.1	0.323	193.921	231.997
326.0	265.6	0.315	194.452	232.627
328.0	258.4	0.306	194.969	233.240
330.0	250.6	0.297	195.470	233.833
332.0	241.8	0.286	195.953	234.405
334.0	232.0	0.274	196.417	234.954
336.0	221.1	0.261	196.860	235.477
338.0	209.0	0.247	197.278	235.971
340.0	195.4	0.230	197.668	236.431
342.0	180.9	0.213	198.030	236.858
344.0	165.5	0.195	198.361	237.247
346.0	148.6	0.175	198.658	237.596
348.0	131.0	0.153	198.920	237.903
350.0	115.4	0.135	199.151	238.173
352.0	97.3	0.113	199.346	238.400
354.0	84.3	0.098	199.514	238.596
356.0	26.4	0.031	199.567	238.657
358.0	1.3	0.001	199.570	238.660
360.0	0.1	0.0001	199.570	238.660
362.0	0.0	0.0	199.570	238.660

Table 6.2.1.4-4

PLANT DATA USED FOR MASS AND ENERGY RELEASES DETERMINATION

Plant data for all cases:

Power, Nominal Rating (MWt)	1940
Nominal RCS Flow (GPM)	194200
Nominal Full Load T_{avg} (°F)	~~562.80~~ 565.9
Nominal RCS Pressure (psia)	2250
Nominal Steam Temperature (°F)	~~514.9~~ 518.3
Nominal Feedwater Enthalpy (BTU/lbm)	413.8

Table 6.2.1.5-1

DOUBLE ENDED COLD LEG GUILLOTINE BREAK BLOWDOWN MASS AND ENERGY RELEASES (C_D=0.8)

Delete & use 2 sheet Version of Table on Pages 6.2-170, 171

Time (sec)	Mass Flow (lb/sec)	Energy Flow (MBtu/sec)
0.27	51,190	26.55
0.52	50,840	26.37
0.77	52,990	27.51
1.0	50,080	26.01
2.0	44,050	23.10
3.0	35,070	18.76
4.0	27,620	14.99
5.0	22,251	12.32
6.0	18,606	10.64
7.0	16,701	9.96
8.0	15,511	9.42
9.0	14,525	9.02
10.0	12,337	8.00
12.0	9,050	6.61
14.0	7,533	5.57
16.0	5,700	4.44
18.0	4,288	3.32
20.0	3,283	2.39
22.0	2,447	1.73
24.0	1,941	1.24
26.0	2,017	1.00
28.0	1,503	0.70
30.0	1,106	0.50
32.0	818	0.41

Table 6.2.1.5-1 (Sheet 1 of 2)

DECLG BREAK/MASS ENERGY RELEASES

Time (sec)	Mass Release (lbm/sec)	Energy Release (Btu/sec)
0.01125	5099.869	2670001
0.51	51055.6	26504774
1.01	51273.84	26680200
1.51	49860.99	26033554
2.01	46206.26	24306452
2.51	41412.38	22093776
3.01	35793.19	19400192
3.51	30418.92	16703766
4.01	26853.12	15011002
4.51	246904.13	13976796
5.01	22754.77	13127462
5.51	20785.91	12302017
6.01	19052.57	11643622
6.51	18187.08	11179082
7.01	17869	10899948
7.51	17087.62	10497992
8.01	15744.36	9907718
8.51	14096.94	9156074
9.01	13299.04	8703237
9.51	12671.68	8305148
10.01	11523.11	7748078
11.01	10783.73	7150337
12.01	9524.35	6427988
13.01	8396.749	5768359

Table 6.2.1.5-1 (Sheet 2 of 2)

DECLG BREAK/MASS ENERGY RELEASES ~~(Continued)~~

Time (sec)	Mass Release (lbm/sec)	Energy Release (Btu/sec)
14.01	7543.894	5163321
15.01	6243.189	4418082
16.01	5291.53	3756248
17.01	4250.511	3093208
18.01	3642.385	2505180
19.01	2792.771	2093299
20.01	2480.567	1713555
21.011	2149.12	1480193
22.01	1839.571	1264136
23.01	1799.34	1082463
24.01	1651.465	973969.9
25.01	1452.628	820180.9
26.01	1458.903	741079.4
27.01	1062.866	589754.2
28.01	813.4185	475906
29.01	826.8542	3895359.7
30.01	547.0674	303974.3
31.01	433.1182	234913.5
32.01	168.5994	132740.8
33.01	0.	0.

Table 6.2.2-1

PASSIVE CONTAINMENT COOLING SYSTEM PERFORMANCE PARAMETERS

[Westinghouse Proprietary]
[Provided under separate cover]

Table 6.2.2-2

COMPONENT DESIGN PARAMETERS

[Westinghouse Proprietary]
[Provided under separate cover]

Table 6.2.2-3

FAILURE MODE AND EFFECTS ANALYSIS - PASSIVE CONTAINMENT COOLING SYSTEM ACTIVE COMPONENTS

[Westinghouse Proprietary]
[Provided under separate cover]

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Table 6.2.3-1

CONTAINMENT MECHANICAL PENETRATIONS AND ISOLATION VALVES (SHEETS 1-4)

[Foldout]

Sheet 2

Sheet 3

Sheet 4

Table 6.2.4-1

COMPONENT DATA – HYDROGEN SENSORS (NOMINAL)

Number	16 (8 per train)
Range (% hydrogen)	0 - 20
Response time	90% in 10 seconds

Table 6.2.4-2

COMPONENT DATA – HYDROGEN RECOMBINER (NOMINAL)

Number	2
Active Inlet Area (per unit) (ft^2)	10.7 (1 m^2)
~~Heater power (kW)~~	~~90~~
~~Flow rate (SCFM)~~	~~100~~
Inlet hydrogen concentration range (volume percent)	0 - 4
~~Gas temperatures (°F)~~	
~~Heater section~~	~~1400 (maximum)~~
~~Outlet~~	~~Less than 200 above ambient~~
~~Minimum hydrogen recombination efficiency (%)~~	~~98~~
Average efficiency (percent)	85
Depletion Rate	Reference 17

Table 6.2.4-3

COMPONENT DATA – HYDROGEN IGNITER (NOMINAL)

Number	58
Glow Plug Temperature (°F)	1700
Power Consumption (w)	95

Table 6.2.4-4 (Sheet 1 of 3)

ASSUMPTIONS USED TO CALCULATE HYDROGEN PRODUCTION FOLLOWING A LOSS OF COOLANT ACCIDENT

General

Core thermal power (MWt)	1,972
Containment free volume (ft^3)	1.73×10^6

Zirconium-Water Reaction

Weight of zirconium fuel cladding (lb)	34,788
Percent zirconium-water reaction (%)	1.09

Radiolysis of Water in Reactor Vessel

Percentage of core fission product inventory in core	
Noble gases	~~97~~0
Iodines	~~97~~50
~~Cesiums~~	~~97~~
Remainder	~~100~~99
Energy absorption by core cooling solution	
Percent of gamma energy absorbed	10
Percent of beta energy absorbed	0
Molecules of hydrogen produced per 100 eV energy absorbed by solution	0.5

Radiolysis of Water in Sump

Percentage of core fission product inventory in the sump solution	
Noble gases	0
Iodines	~~3~~50
~~Cesiums~~	~~3~~
Remainder	~~0~~1
Energy absorption by core cooling solution	
Percent of gamma energy absorbed	100
Percent of beta energy absorbed	100

Table 6.2.4-4 (Sheet 2 of 3)

ASSUMPTIONS USED TO CALCULATE HYDROGEN PRODUCTION FOLLOWING A LOSS OF COOLANT ACCIDENT

Molecules of hydrogen produced per 100 eV energy absorbed by solution 0.5

Corrosion of Materials

Aluminum inventory in containment

Component	Weight (lb)	Surface (sq. ft)
Excore detectors	25	8
Flux mapping system	120	84
Miscellaneous valve parts	230	86
RCDM connectors	190	42
Paint	140	18,000
Contingency	250	85
Other non-NSSS items	500	100
Total aluminum	1,455	

Table 6.2.4-4 (Sheet 3 of 3)

ASSUMPTIONS USED TO CALCULATE HYDROGEN PRODUCTION FOLLOWING A LOSS OF COOLANT ACCIDENT

Zinc inventory in containment

Component	Weight (lb)	Surface (sq. ft)
Cable trays	310	2,100
Conduit	500	3,500
Hangers	24	170
Junction boxes	100	730
Paint	1,200	72,000
Gratings	680	41,000
HVAC ductwork	840	5,900
Stairs	13	800
Pipe supports	510	30,000
Contingency	1,050	39,000
Total zinc	5,227	

Aluminum corrosion rate	See Table 6.2.4-5
Zinc corrosion rate	See Table 6.2.4-5
Containment temperature	See Table 6.2.4-5
Solution pH	7 - 9.5

Initial Reactor Coolant Hydrogen Inventory

Hydrogen concentration in reactor coolant (cc at STP per kg)	40
Reactor coolant mass (~~kg~~lb)	~~154,000~~353,000

Table 6.2.4-5

POST-ACCIDENT CONTAINMENT TEMPERATURE AND ASSOCIATED CORROSION RATES FOR ALUMINUM AND ZINC

Interval (sec)	Temperature (°F)	Al Corrosion (lb/ft^2-hr)	Zn Corrosion (lb/ft^2-hr)
~~0 - 20~~	~~287~~	~~0.045~~	~~0.00041~~
~~20 - 388~~	~~412~~	~~1.1~~	~~0.0021~~
~~388 - 1000~~	~~328~~	~~0.14~~	~~0.00074~~
~~1000 - 10,000~~	~~271~~	~~0.027~~	~~0.00032~~
~~10,000 - 100,000~~	~~240~~	~~0.0099~~	~~0.00019~~
~~100,000 - 259,000~~	~~215~~	~~0.0041~~	~~0.00012~~
~~>259,000~~	~~260~~	~~0.019~~	~~0.00027~~
0 - 25	300	0.066	0.00050
25 - 60	270	0.027	0.00031
60 - 150	250	0.014	0.00022
150 - 4000	270	0.027	0.00031
4000 - 9000	250	0.014	0.00022
9000 - 20,000	200	0.0023	0.000090
20,000 - 40,000	175	0.00084	0.000054
>40,000	153	0.00033	0.000033

Table 6.2.5-1 (Sheet 1 of 2)

EXCEPTIONS TO 10 CFR 50 APPENDIX J LEAK TESTING REQUIREMENTS

AP600

Appendix J Requirement	Exception and Justification
Paragraph III.A.1.(a) - Type A tests are required to be terminated if excessive leak paths, which would interfere with satisfactory completion of the test, are identified.	Type A tests are to be conducted in accordance with ANSI-56.8, which permits testing to proceed provided that the leak(s) can be isolated and that subsequent local leak rate testing is performed to demonstrate that the Type A test criteria are met. This approach can potentially reduce plant outage time and is in accordance with ANSI-56.8 and industry practice.
Paragraph III.A.3.(a) - Type A tests shall be conducted in accordance with the provisions of ANSI N45.4-1972.	Type A tests are to be conducted in accordance with ANSI-56.8, which superseded ANSI N45.4. The NRC is proposing a rule change to delete the reference to any standard, and a companion Regulatory Guide that would endorse ANSI-56.8.
Paragraph III.A.3.(a) - A Type A test duration of 24 hours is required.	Type A tests are to be conducted for a minimum of 8 hours, in accordance with ANSI-56.8. Industry experience has shown that accurate test results can be achieved in less than 24 hours. The proposed NRC changes to 10 CFR 50, Appendix J (Reference 15) would reduce the minimum test duration from 24 to 8 hours.
Paragraph III.D.1.(a) - Three type A tests are to be performed at approximately equal intervals during each 10-year service period.	Type A tests are to be conducted at intervals not exceeding four years, except that, if the test interval ends while containment integrity is not required or is required solely for cold shutdown or refueling activities, the test interval may be extended indefinitely provided all deferred testing is successfully completed prior to the time containment integrity is required. This exception is consistent with the proposed NRC changes to 10 CFR 50, Appendix J (Reference 15).
Paragraph III.D.2 - Type B tests are required to be performed at intervals not greater than 2 years.	Type B tests are to be conducted at intervals not exceeding 30 months, except that, if the test interval ends while containment integrity is not required or is required solely for cold shutdown or refueling activities, the test interval may be extended indefinitely provided all deferred testing is successfully completed prior to the time containment integrity is required. This exception is consistent with the proposed NRC changes to 10 CFR 50, Appendix J (Reference 15).

Table 6.2.5-1 (Sheet 2 of 2)

EXCEPTIONS TO 10 CFR 50
APPENDIX J LEAK TESTING REQUIREMENTS

AP600

Appendix J Requirement	Exception and Justification
Paragraph III.D.2.(b)(i) - Air locks shall be tested prior to initial fuel loading and at 6-month intervals thereafter at a pressure not less than P_a.	Type B testing is to be conducted in accordance with ANSI-56.8, which permits testing of air locks which are not used during a 6-month period at a pressure of P_a after the next usage rather than at 6 months.
Paragraph III.D.3 - Type C tests are required to be performed at intervals not greater than 2 years.	Type C tests are to be conducted at intervals not exceeding 30 months, except that, if the test interval ends while containment integrity is not required or is required solely for cold shutdown or refueling activities, the test interval may be extended indefinitely provided all deferred testing is successfully completed prior to the time containment integrity is required. This exception is consistent with the proposed NRC changes to 10 CFR 50, Appendix J (Reference 15).

Table 6.2.5-2

COMPONENT DATA – CONTAINMENT LEAK RATE TEST SYSTEM (NOMINAL VALUES)

Air Compressors

Capacity (scfm, total)	10,500
Discharge pressure (psig)	100

Air Cooling and Drying Equipment

Air pressure and flow capacity	Consistent with compressor
Dew point (°F at 100 psig)	40

Air Filters (if required)

Air pressure and flow capacity	Consistent with compressor
Mist and particulate removal efficiency (minimum efficiency, in percent of particles larger than 3 microns)	99

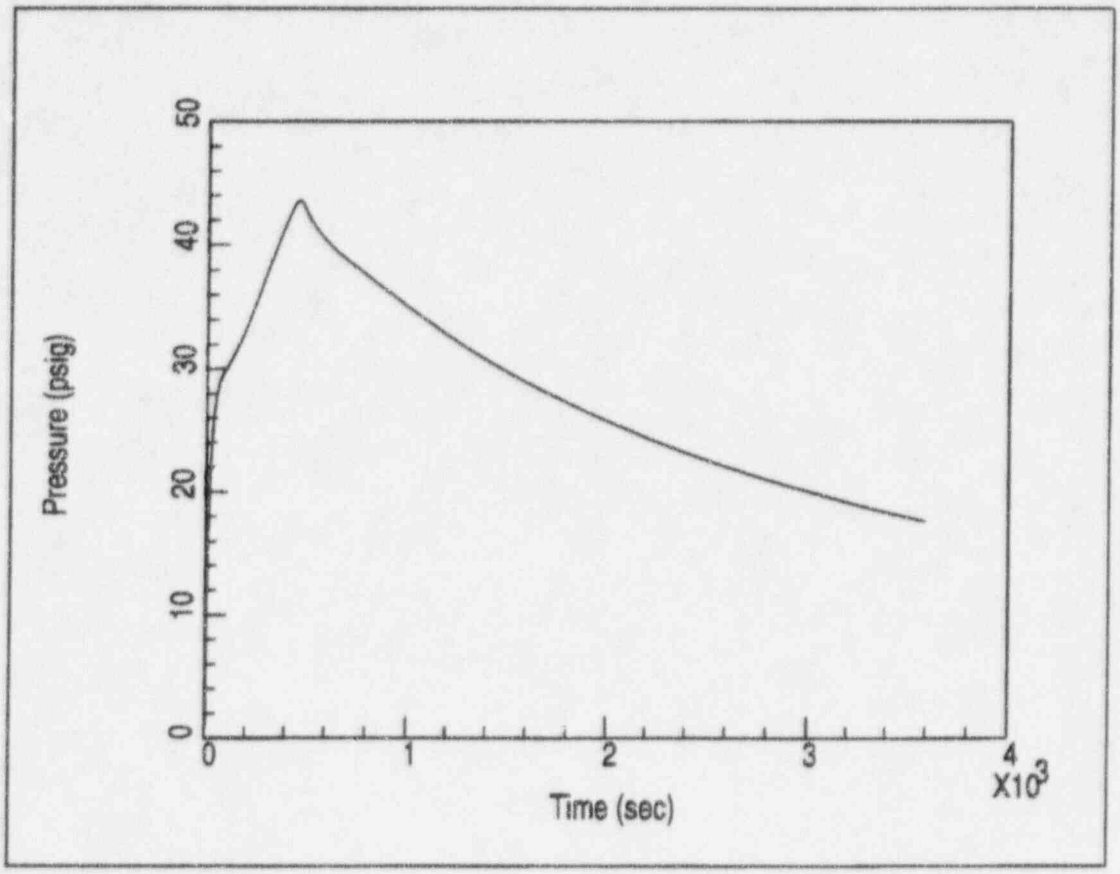


Figure 6.2.1.1-~~5~~ 1

MSLB Containment Pressure vs. Time

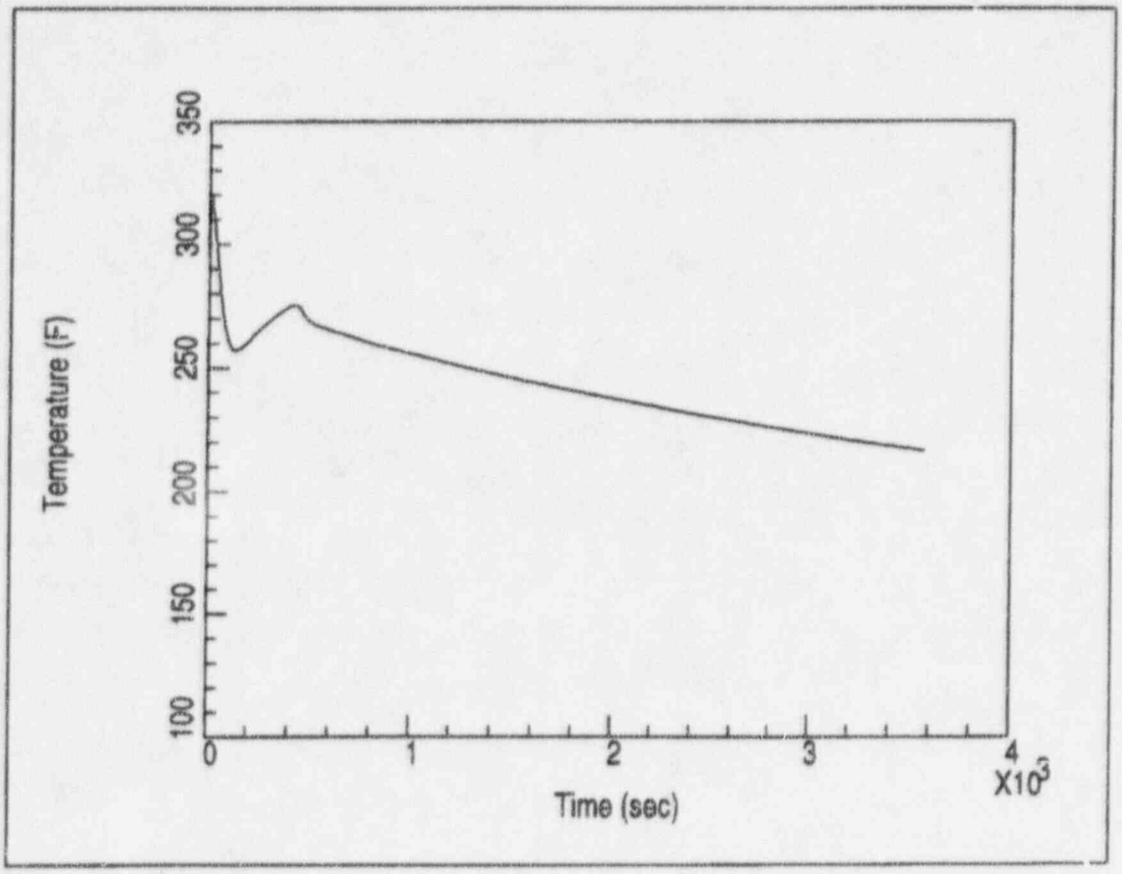


Figure 6.2.1.1-~~6~~ 2

MSLB Containment Temperature vs. Time

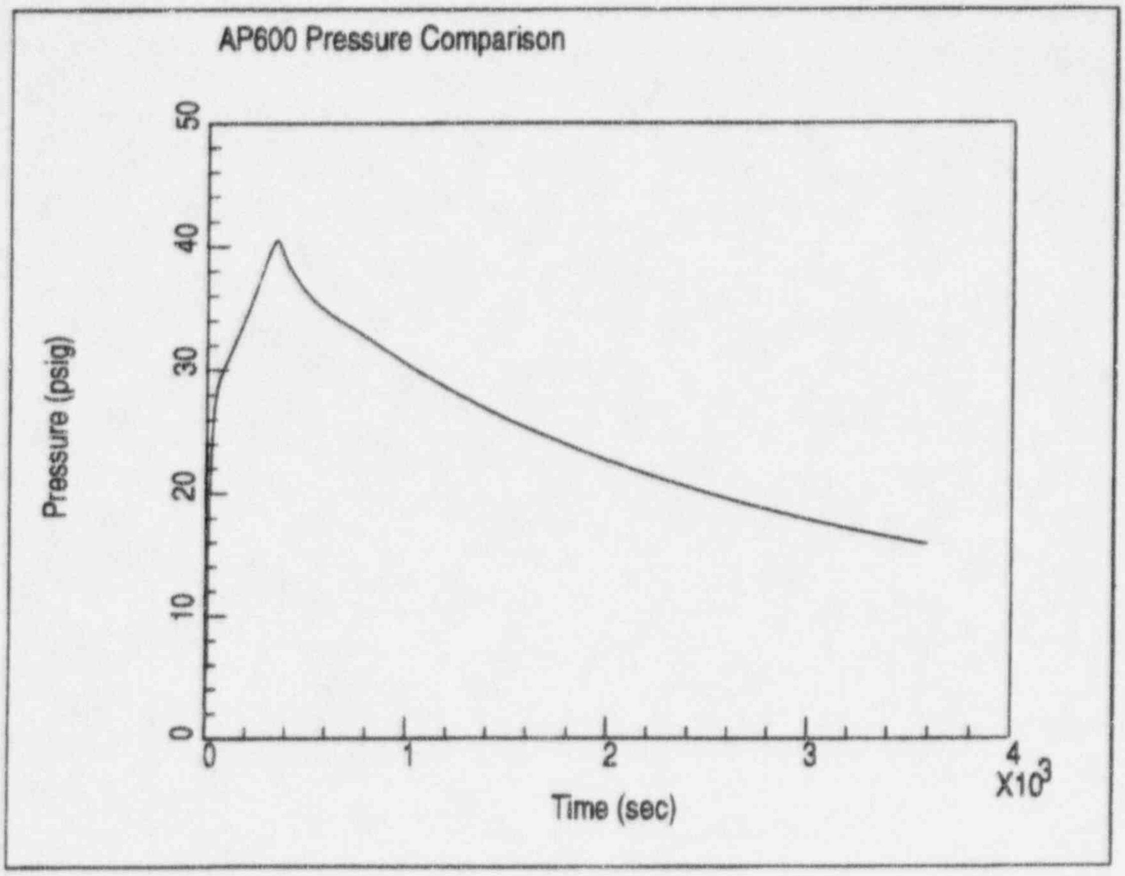


Figure 6.2.1.1-~~1~~ 3

MSLB Containment Pressure vs. Time

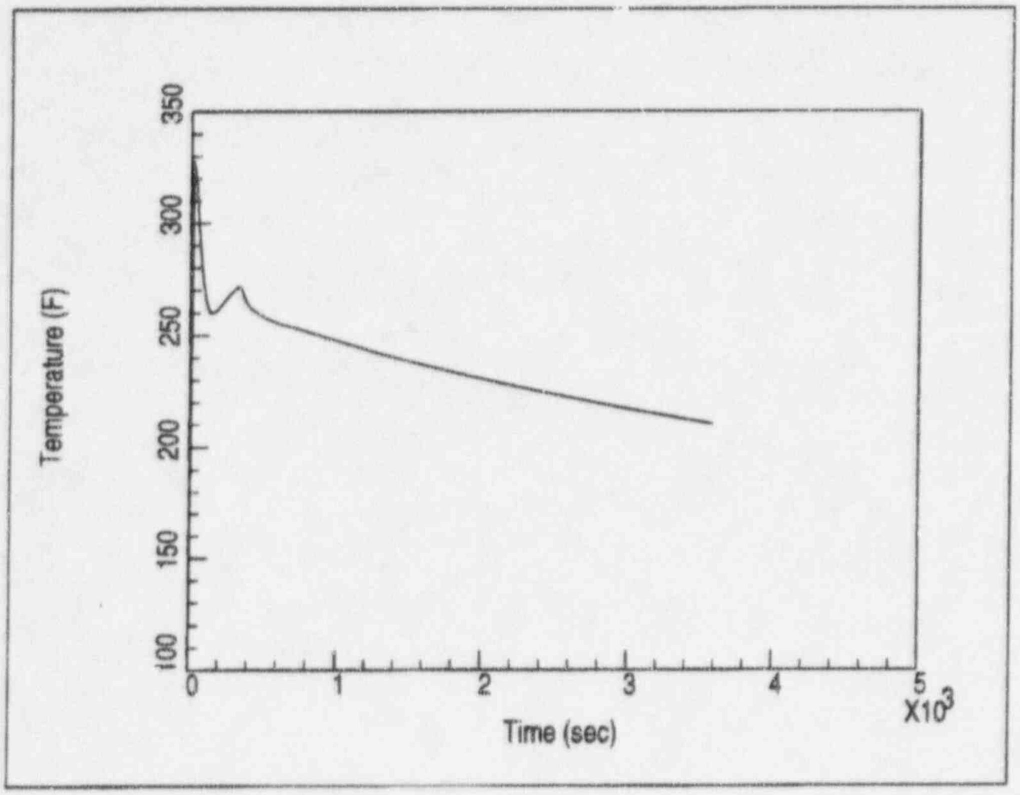


Figure 6.2.1.1-~~8~~4

MSLB Containment Temperature vs. Time

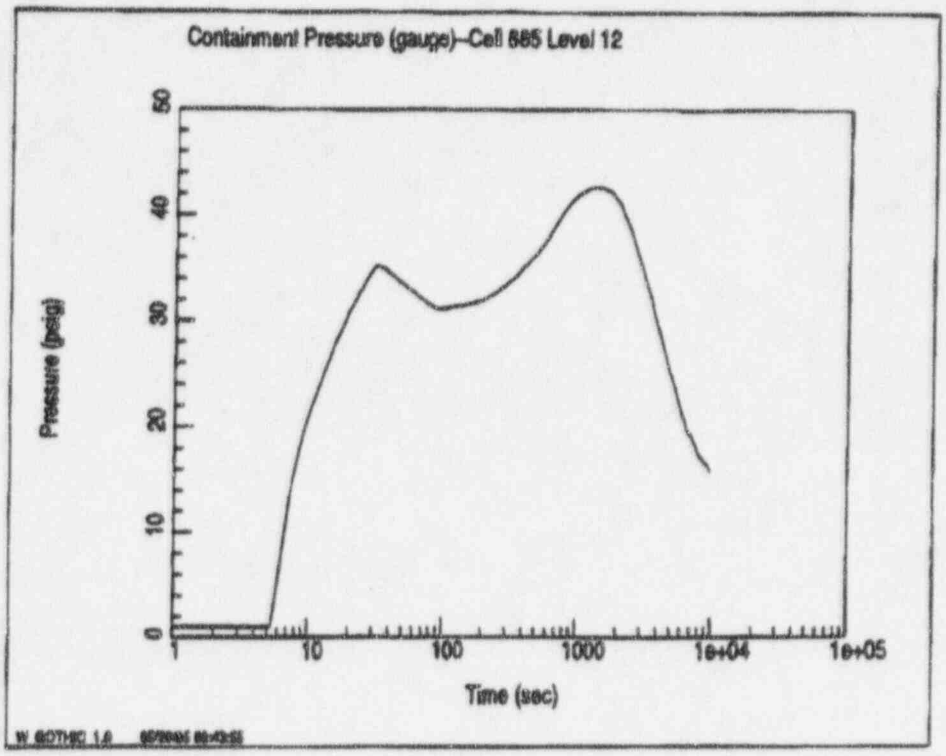


Figure 6.2.1.1-~~3~~5

Distributed Model

DECLG Containment Pressure vs. Time

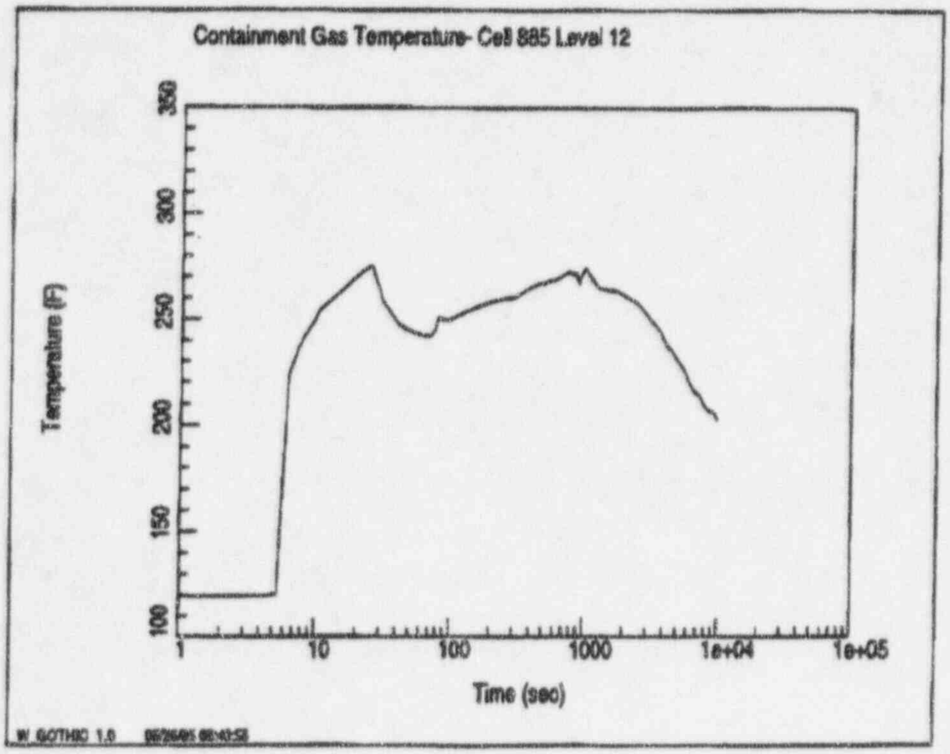


Figure 6.2.1.1-~~A~~U

Distributed Model DECLG Containment Temperature vs. Time

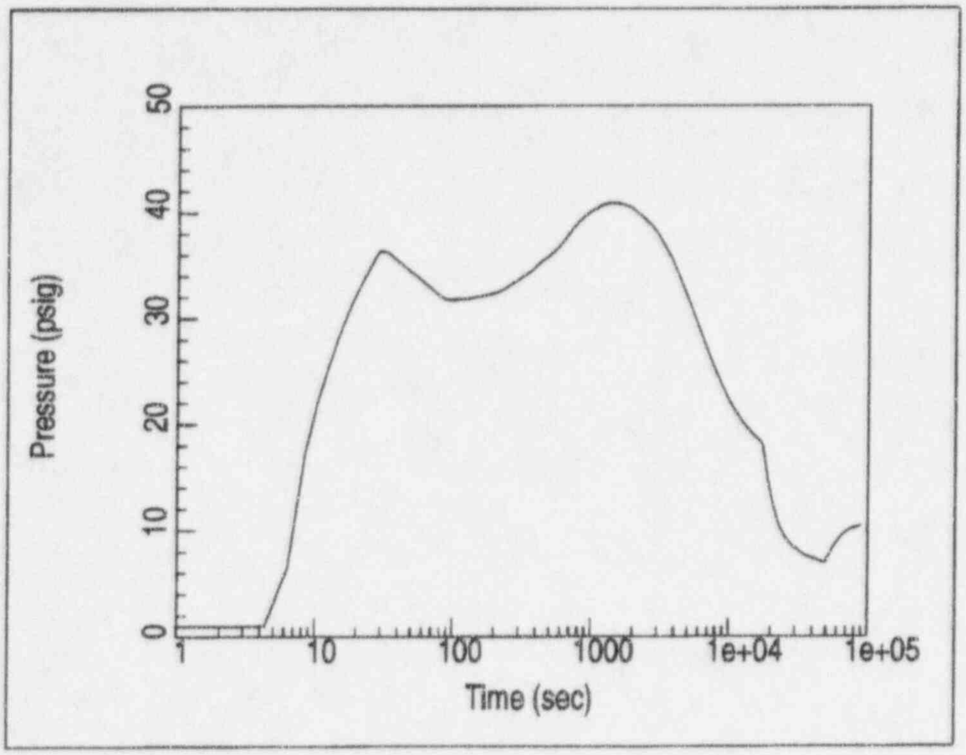


Figure 6.2.1.1-~~4a~~ 7

Lumped Model

DECLG Containment ~~Temperature~~ Pressure vs. Time

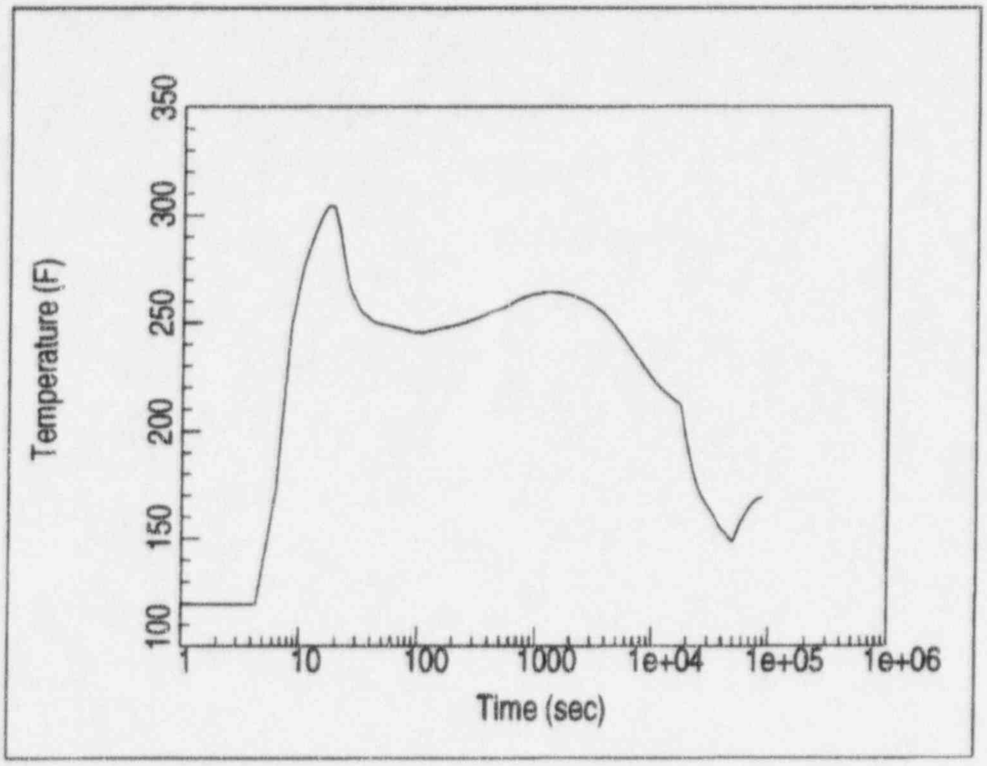


Figure 6.2.1.1-~~4a~~ 8

Lumped Model

DECLG Containment Temperature vs. Time

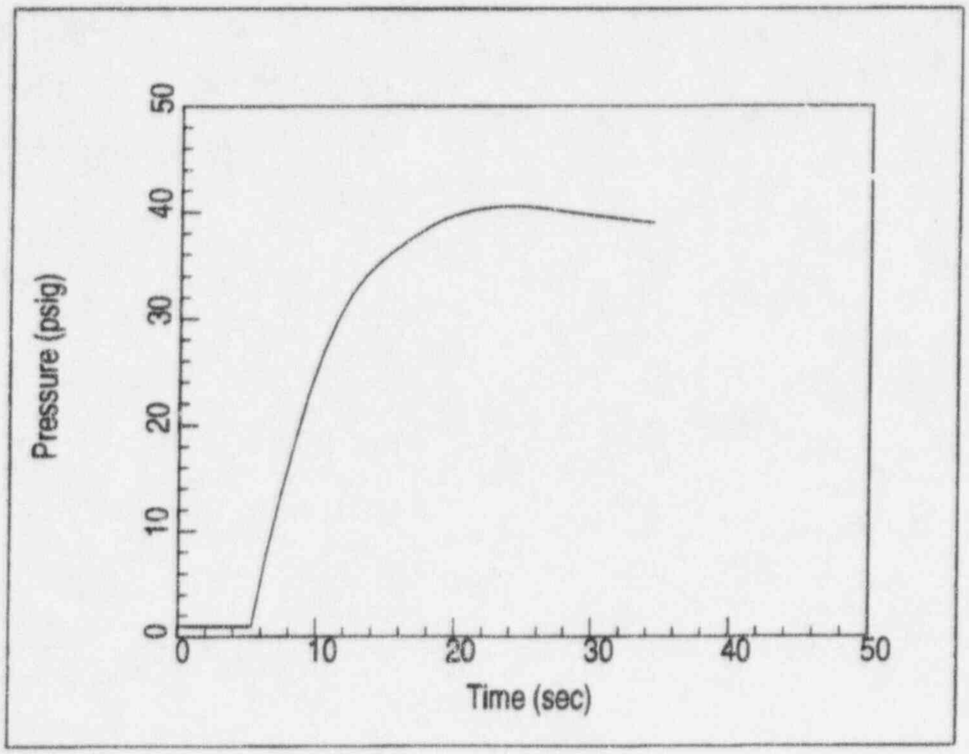


Figure 6.2.1.~~1-1~~ 9

DEHLG Containment Pressure vs. Time

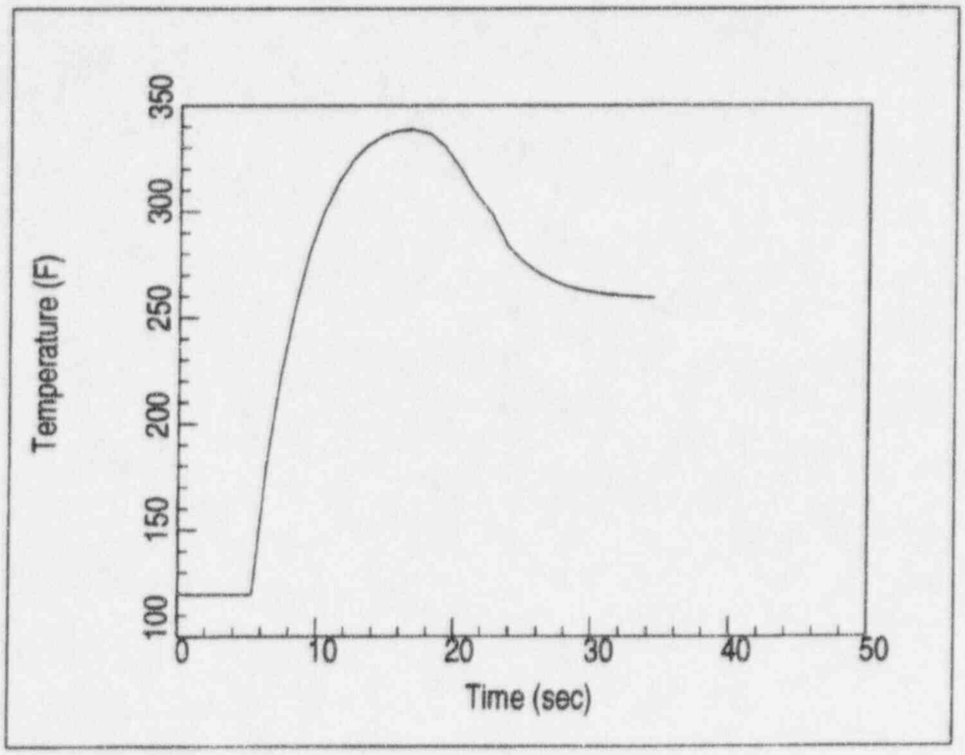
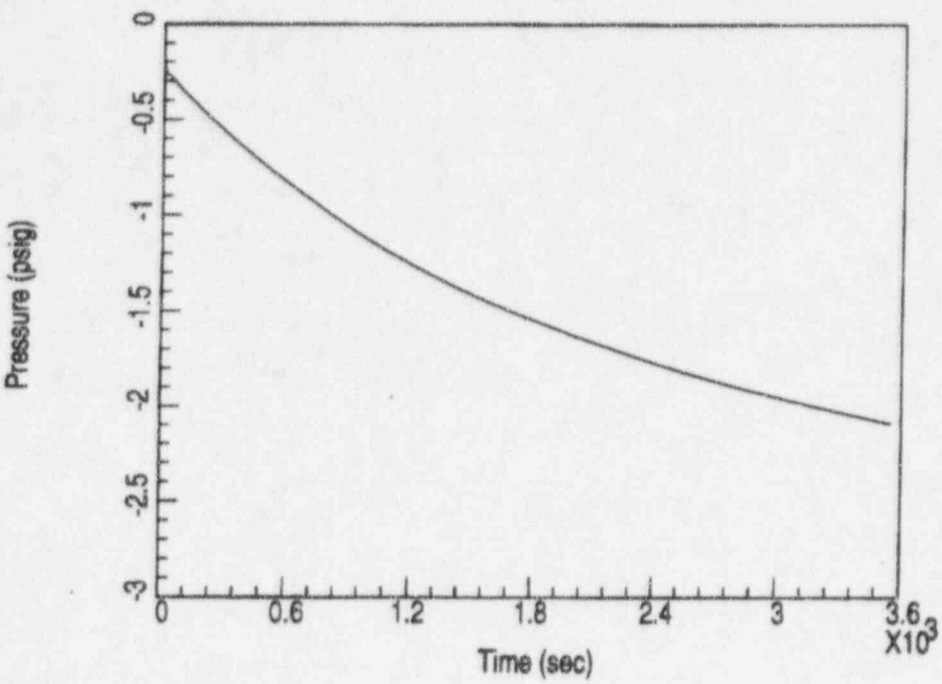


Figure 6.2.1.1-~~2~~ 10

DEHLG Containment Temperature vs. Time



11
Figure 6.2.1.1-~~9~~

External Pressure Analysis
Containment Pressure vs. Time

Figure 6.2.1.1-10

Delete

Figure 6.2.1.1-11

Delete

Figure 6.2.1.2-1 (Sheet 1 of 12)

TMD Model Noding Diagram

Figure 6.2.1.2-1 (Sheet 2 of 12)

TMD Model Noding Diagram

Figure 6.2.1.2-1 (Sheet 3 of 12)

TMD Model Noding Diagram

Figure 6.2.1.2-1 (Sheet 4 of 12)

TMD Model Noding Diagram

Figure 6.2.1.2-1 (Sheet 5 of 12)

TMD Model Noding Diagram

Figure 6.2.1.2-1 (Sheet 6 of 12)

TMD Model Noding Diagram

Figure 6.2.1.2-1 (Sheet 7 of 12)

TMD Model Noding Diagram

Figure 6.2.1.2-1 (Sheet 8 of 12)

TMD Model Noding Diagram

Figure 6.2.1.2-1 (Sheet 9 of 12)

TMD Model Noding Diagram

Figure 6.2.1.2-1 (Sheet 10 of 12)

TMD Model Noding Diagram

Figure 6.2.1.2-1 (Sheet 11 of 12)

TMD Model Noding Diagram

Figure 6.2.1.2-1 (Sheet 12 of 12)

TMD Model Noding Diagram

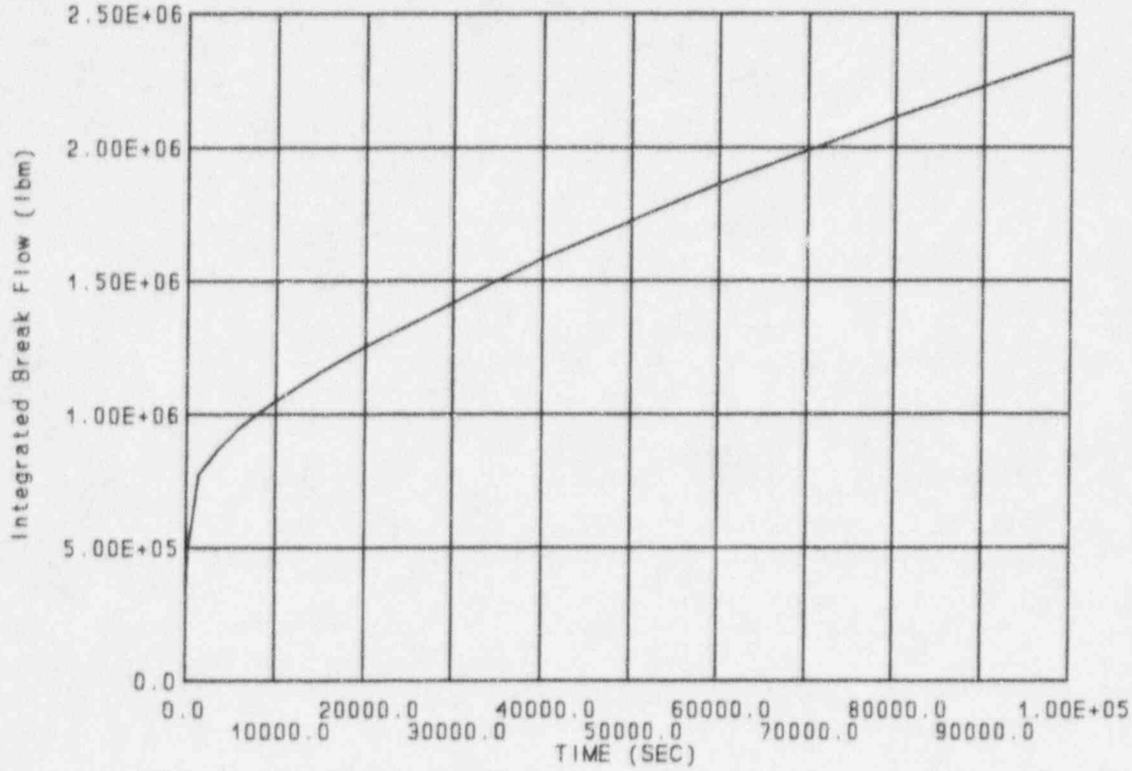


Figure 6.2.1.3-1

Integrated Mass Released for DECLG Break

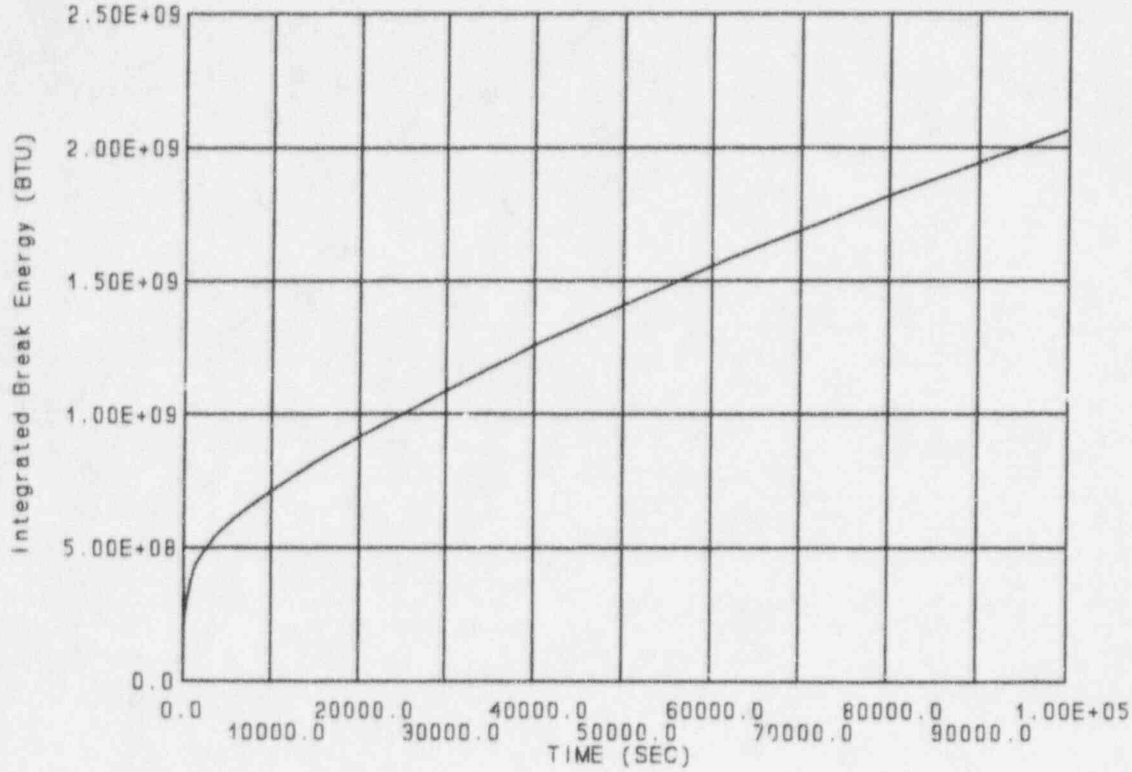


Figure 6.2.1.3-2

Integrated Energy Released for DECLG Break

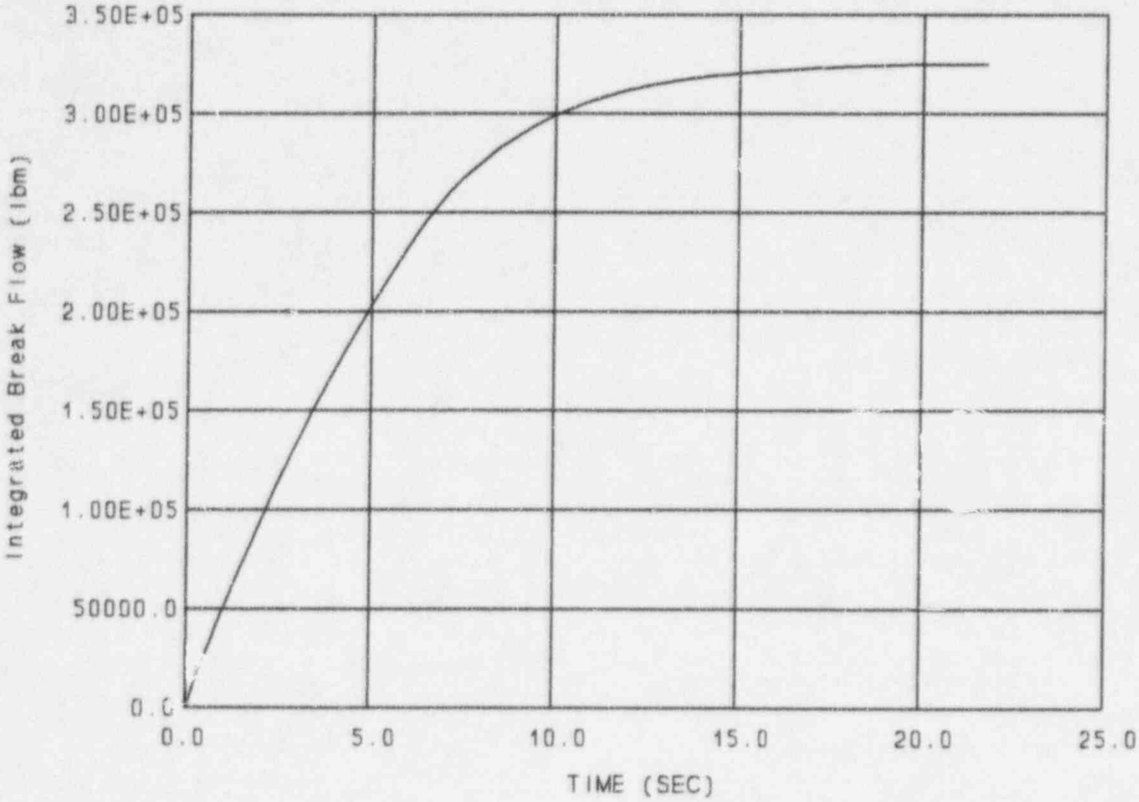


Figure 6.2.1.3-3

Integrated Mass Released for DEHLG Break

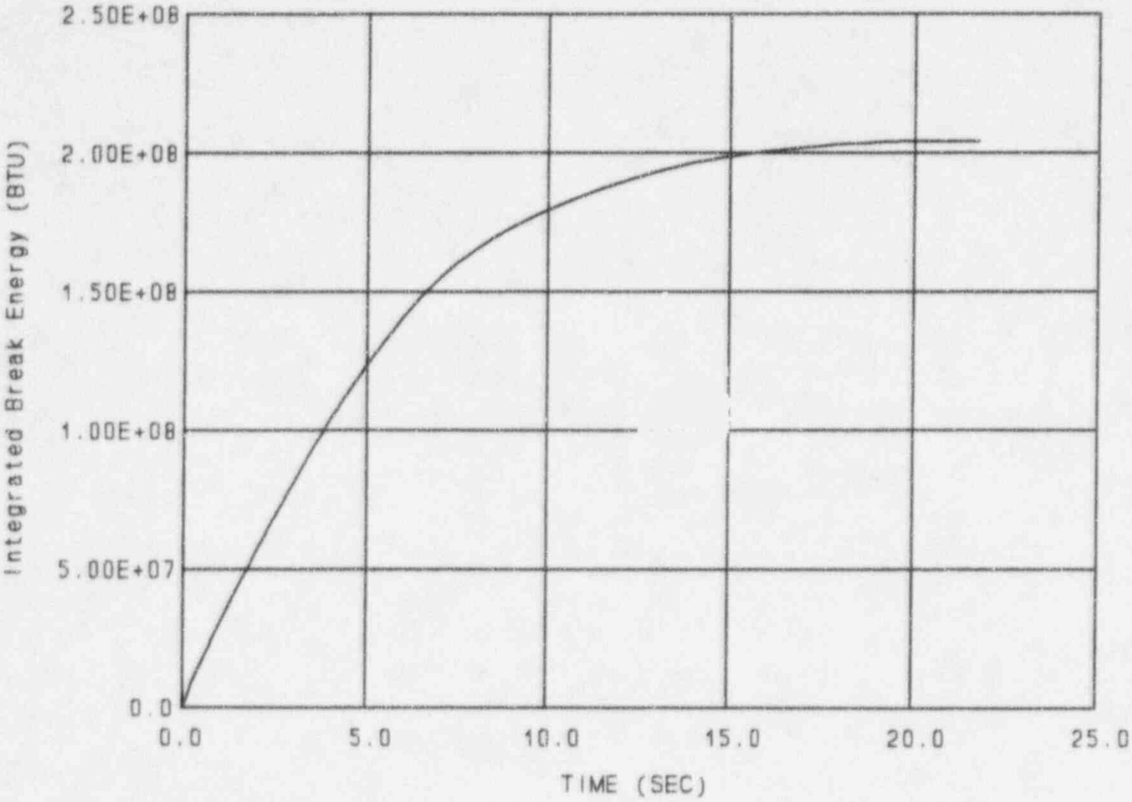


Figure 6.2.1.3-4

Integrated Energy Released for DEHLG Break

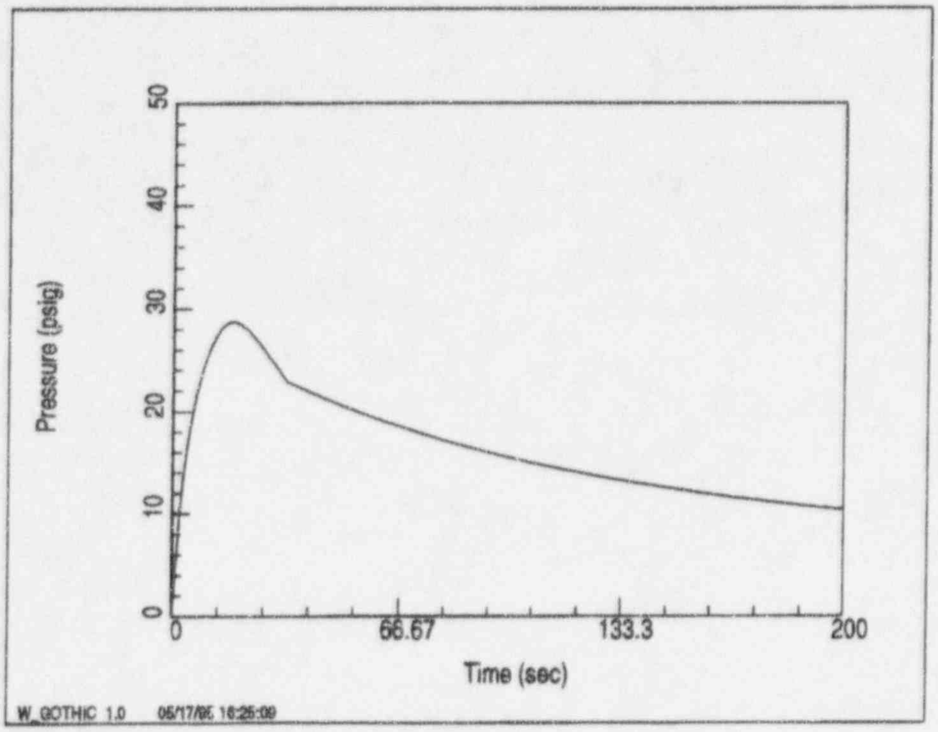


Figure 6.2.1.5-1

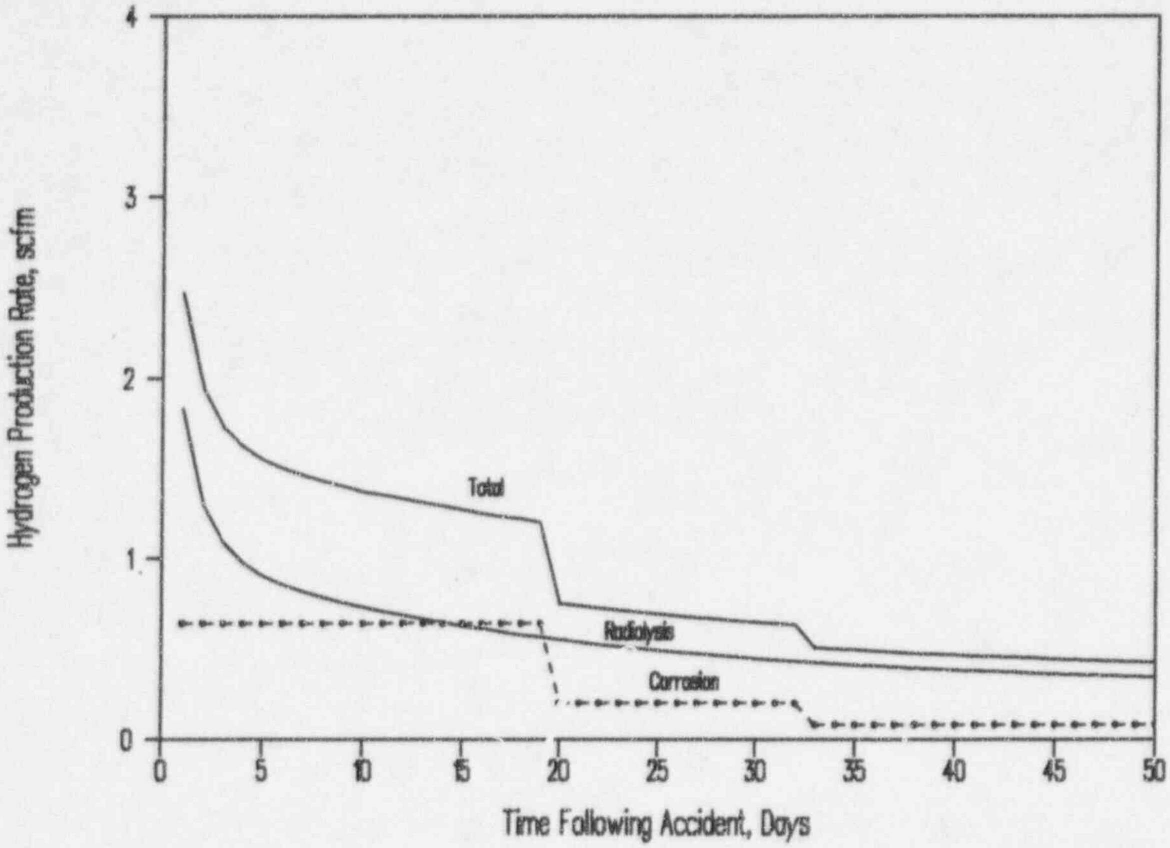


Figure 6.2.4-~~1~~ 2

Hydrogen Production Rate

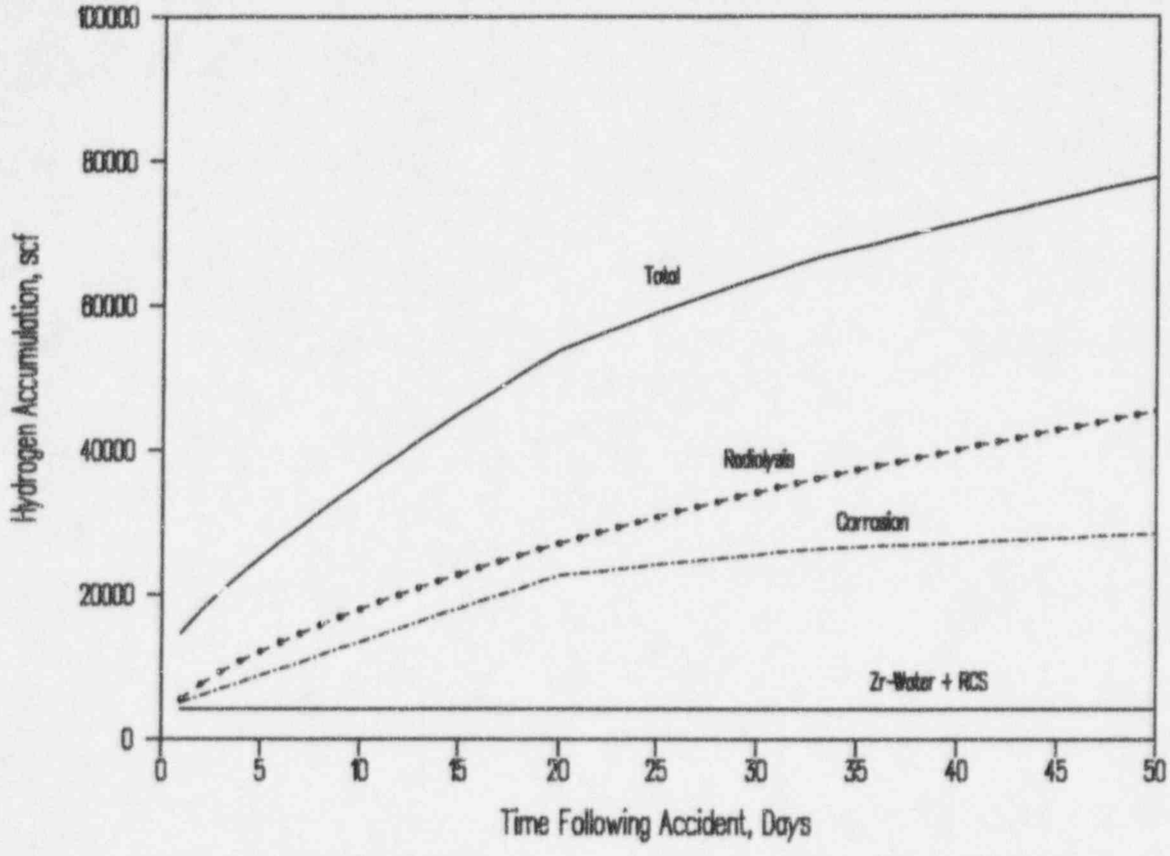


Figure 6.2.4-~~2~~ 3

Hydrogen Accumulation in Containment - No Recombiner

Figure 6.2.5-1

P&ID VUS M6 001]§ 6.2.4 Figures

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6.4 Habitability Systems

The habitability systems are a set of individual systems that collectively provide the habitability functions for the plant. The systems that make up the habitability systems are the:

- Nuclear island nonradioactive ventilation system (VBS)
- Main control room emergency habitability system (VES)
- Radiation monitoring system (RMS)
- Fire protection system (FPS)
- Plant lighting system (ELS)

When a source of ac power is available, the nuclear island nonradioactive ventilation system provides normal and abnormal HVAC service to the main control room (MCR), technical support center (TSC), instrumentation and control rooms, dc equipment rooms, battery rooms, and the nuclear island nonradioactive ventilation system equipment room.

When a source of ac power is not available to operate the nuclear island nonradioactive ventilation system, the main control room emergency habitability system is capable of providing emergency ventilation and pressurization for the main control room. The main control room emergency habitability system also provides emergency passive heat sinks for the main control room, instrumentation and control rooms, and dc equipment rooms.

Radiation monitoring of the main control room environment is provided by the radiation monitoring system. Smoke and fire detection and protection are provided by the fire protection system. Emergency lighting is provided by the plant lighting system. Storage capacity is provided in the main control room for personnel support equipment.

6.4.1 Safety Design Basis

The safety design bases discussed here apply only to the portion of the individual system providing the specified function. The range of applicability is discussed in subsection 6.4.4.

6.4.1.1 Main Control Room Design Basis

The habitability systems provide coverage for the main control room pressure boundary as defined in subsection 6.4.2.1. The following discussion summarizes the safety design bases with respect to the main control room:

- The habitability systems are capable of maintaining the main control room environment suitable for prolonged occupancy throughout the duration of any one of the postulated accidents discussed in Chapter 15 that require protection from the release of radioactivity.

Refer to Section 3.1 and subsections 6.4.4 and 15.6.5.3 for a discussion on conformance with General Design Criterion 19.

- The main control room is designed to withstand the effects of an SSE and a design-basis tornado.
- A maximum main control room occupancy of up to 11 persons can be accommodated.
- Food, water, medical supplies, and sanitary facilities are provided for a main control room occupancy of up to 11 persons for 3 days. For longer periods of occupancy, additional supplies can be brought in from offsite.
- The radiation exposure of main control room personnel throughout the duration of any of the postulated limiting faults discussed in Chapter 15 does not exceed the limits set by General Design Criterion 19.
- With both VES trains delivering, the emergency habitability system maintains CO_2 concentration to less than 0.5 percent for up to 11 main control room occupants. With one train delivering, the emergency habitability system maintains CO_2 concentration less than 0.5 percent for up to 5 main control room occupants, and maintains CO_2 concentration less than 1.0 percent for up to 11 main control room occupants.
- The habitability systems provide the capability to detect and protect main control room personnel from external fire, smoke, and airborne radioactivity. Respiratory, eye, and skin protection is provided for emergency use within the main control room pressure boundary.
- Automatic actuation of the individual systems that perform a habitability systems function is provided. Smoke detectors, radiation detectors, and associated control equipment are installed at various plant locations as necessary to provide the appropriate operation of the systems.

6.4.1.2 Instrumentation and Control Room/DC Equipment Rooms Design Basis

The habitability systems are also designed to service the instrumentation and control rooms and dc equipment rooms. The habitability systems are capable of maintaining the temperature in the instrumentation and control rooms and dc equipment rooms below the equipment qualification temperature limit throughout the duration of any of the postulated accidents discussed in Chapter 15, an SSE, or design-basis tornado.

6.4.2 System Description

Only the main control room emergency habitability system is discussed in detail in this subsection. The remaining systems listed previously are described only as necessary to define their functions in meeting the safety related design bases of the habitability systems.

Descriptions of the nuclear island nonradioactive ventilation system, fire protection system, plant lighting system, and radiation monitoring system are found in subsections 9.4.1, 9.5.1, 9.5.3, and Section 11.5, respectively.

6.4.2.1 Definition of the Main Control Room Pressure Boundary

The areas, equipment, and materials to which the main control room operator requires access during a postulated accident are shown in Figure 6.4-1. This figure is a subset of Figure 1.2-8. Areas adjacent to the main control room are shown in Figures 1.2-25 and 1.2-31.

6.4.2.2 General Description

The main control room emergency habitability system is made up of two redundant trains of emergency air storage tanks. Each train consists of 12 tanks and is sized to deliver the required air flow to the main control room to meet the ventilation and pressurization requirements for 72 hours based on the performance requirements of subsection 6.4.1.1. A connection for refilling operations is provided for each train to allow for operation beyond 72 hours for those events that involve a radiological source term present. Normal system makeup is provided by a connection to the breathable quality air compressor in the compressed and instrument air system (CAS).

The function of providing passive heat sinks for the main control room, instrumentation and control rooms, and dc equipment rooms is part of the main control room emergency habitability system. The heat sinks for each room are designed to limit the temperature rise inside each room during the 72-hour period following a loss of nuclear island nonradioactive ventilation system operation. The heat sinks consist primarily of the thermal mass of the concrete that makes up the ceilings and walls of these rooms.

To enhance the heat-absorbing capability of the ceilings, a metal form is attached to the interior surface of the concrete at selected locations. Metallic plates are attached perpendicular to the form. These plates extend into the room and act as thermal fins to enhance the heat transfer from the room air to the concrete. The specifics of the fin construction for the main control room and I&C room ceilings are described in subsection 3.8.4.1.2.

The normal operating temperatures in the main control room, instrumentation and control rooms, dc equipment rooms, and adjacent rooms are kept within a specified range by the nuclear island nonradioactive ventilation system in order to maintain a design basis initial heat sink capacity of each room.

In the unlikely event that power to the nuclear island nonradioactive ventilation system is unavailable for more than 72 hours, then cooling of the main control room is provided by portable spot cooling units brought into the main control room from offsite within 72 hours. The portable coolers are water cooled, and are connected to permanently installed piping that extends through the control room wall. The piping penetrations are designated as Class C, seismic Category I. Outside the control room wall, a temporary hose connection is made to connect temporary air cooled chilled water units. In addition to the coolers, portable free standing fans may be placed within the main control room to provide the distribution of air cooled by the portable coolers. The portable equipment is only used in the unusual circumstance in which the nonradioactive ventilation system is not available. The portable units are standard commercial units and are sized to maintain the rooms at temperatures that allow for long term occupancy of personnel in the main control room.

The main control room emergency habitability system piping and instrumentation diagram is shown in Figure 6.4-2.

6.4.2.3 Component Description

Each train of the main control room emergency habitability system compressed air supply contains a set of storage tanks, a pressure regulating valve, a flow metering orifice, and solenoid-operated isolation valve. For pressure mitigation in the main control room, redundant relief flowpaths are provided, which contain an air-operated butterfly isolation valve in combination with a pressure relief damper.

- Emergency Air Storage Tanks

  There are 12 air storage tanks in each train, for a total of 24 tanks. The 12 tanks in each set are joined together by a common header. The tanks are constructed of forged, seamless pipe, with no welds, and conform to Section VIII and Appendix 22 of the ASME Code. The design parameters are listed in Table 6.4-1.

- Pressure Regulating Valve

  Each compressed air supply line contains a pressure regulating valve located downstream of the common header. The pressure at the outlet of the valve is controlled via a self contained pressure control operator. The downstream pressure is set so that the flow rate can be controlled by an orifice downstream of the valve.

- Flow Metering Orifice

  The flow rate of air delivered to the main control room pressure boundary is limited by an orifice located downstream of the pressure regulating valve. The orifice is sized to provide the minimum required air flowrate to the main control room pressure boundary.

- Solenoid-Operated Isolation Valve

  The pressure boundary of the compressed air storage tanks is maintained by a normally closed solenoid-operated isolation valve in each supply line. This valve is located downstream of the flow metering orifice and automatically initiates air flow upon receipt of a signal to open (see subsection 6.4.3.2).

- Air-Operated Butterfly Isolation Valve

  To limit the pressure increase within the main control room, air-operated butterfly isolation valves are provided, one in each of redundant flowpaths, which open on a time delay after receipt of an emergency habitability system actuation signal. The valves provide a leak tight seal to protect the integrity of the main control room pressure boundary during normal operation, and are normally closed to prevent interference with the operation of the nonradioactive ventilation system.

- Pressure Relief Damper

  Pressure relief dampers are located downstream of the butterfly isolation valves, and are set to open on a differential pressure of 1/8-inch water gauge. The differential pressure between the control room and the relief damper exhaust location is monitored to ensure that a positive pressure is maintained in the control room with respect to its surroundings.

- Control Room Access Doors

  To restrict inleakage during emergency conditions, the main control room access doors are equipped with self-closing devices that shut the doors automatically following the passage of personnel. Two sets of doors, with a vestibule between that acts as an airlock, are provided at the access to the main control room.

- Breathing Apparatus

  Self-contained portable breathing equipment with air bottles is stored inside the main control room pressure boundary. The amount of stored air is sufficient to provide a 6-hour supply of breathable air for up to 11 main control room occupants. This is backup protection to the permanently installed habitability systems.

6.4.2.4 Leaktightness

The construction techniques used for the main control room pressure boundary are described in subsection 3.8.4.6.3.

The main control room pressure boundary is designed for low-leakage. The following features are applied as needed in order to achieve this objective:

- The outside surface of penetrations sleeves in contact with concrete are sealed with epoxy crack sealer. The piping, HVAC duct and electrical cable penetrations are sealed with qualified pressure-resistant material compatible with penetration materials and/or cable jacketing.

- The interior or exterior surfaces of the main control room envelope (walls, floor, and ceiling) are coated with low permeability paint/epoxy sealant and sealing of observable concrete stress cracking.

- Corners and wall/slab junctions are caulked and sealed with silicone sealant, as are penetrations and sleeves in contact with concrete.

- Inside surfaces of penetrations and sleeves in contact with commodities (i.e., pipes, ducts and conduits, etc.) are sealed. main control room pressure boundary ducted isolation dampers are bubble-tight and meet the design requirements of ASME N509-1989, Construction Class B, Leakage Class I.

- Penetration sealing materials are designed to withstand at least 1/4-inch water gauge pressure differential in an air pressure barrier. Penetration seals are a combination of materials, such as silicone foam, ceramic fiber, rubber boots, silicone elastomer and silicone caulk, or an approved equal assembly. The seal system is capable of withstanding a temporary pressure of 0.5 psi without losing the ability to maintain continuous pressure.

The piping, ducts, conduits, and electrical cable trays penetrating through any combination of main control room pressure boundary are sealed with qualified seal assembly compatible with the materials of penetration commodities. Penetration sealing materials are selected to meet barrier design requirements and are designed to withstand specific area environmental design requirements and remain functional and undamaged during and following an SSE.

Main control room penetration seal systems are a combination of materials such as silicone foam, ceramic fiber, rubber boots, silicone elastomer, silicone caulk assembly or an approved equal, and meet applicable requirements of ANI, UL, ASTM E-119, IEEE Std 634, NFPA7 70, and 10 CFR 50, Appendix B.

The main control room pressure boundary main entrance is designed with an airlock-type double-door vestibule, with self-closing devices that shut the doors automatically following the passage of personnel. The emergency exit door is normally closed, and remains closed under design basis source term conditions.

When the main control room pressure boundary is isolated in an accident situation, there is no direct communication with the outside atmosphere, nor is there communication with the normal ventilation system. Leakage from the main control room pressure boundary is the result of an internal pressure of 1/8-inch water gauge provided by emergency habitability system operation.

The exfiltration and infiltration analysis for nuclear island nonradioactive ventilation system operation is discussed in subsection 9.4.1.

6.4.2.5 Interaction with other Zones and Pressurized Equipment

The main control room emergency habitability system is a self-contained system. There is no interaction between other zones and pressurized equipment.

For a discussion of the nuclear island nonradioactive ventilation system, refer to subsection 9.4.1.

6.4.2.6 Shielding Design

The design basis loss-of-coolant accident (LOCA) dictates the shielding requirements for the main control room. Main control room shielding design bases are discussed in Section 12.3. Descriptions of the design basis LOCA source terms, main control room shielding parameters, and evaluation of doses to main control room personnel are presented in Section 15.6.

The main control room and its location in the plant, identifying distances and shield thicknesses, are shown in Figure 12.3-1.

6.4.3 System Operation

This subsection discusses the operation of the main control room emergency habitability system.

6.4.3.1 Normal Mode

The main control room emergency habitability system is not required to operate during normal conditions. The nuclear island nonradioactive ventilation system maintains the air temperature of a number of rooms within a predetermined temperature range. The rooms with this requirement include the rooms with a main control room emergency habitability system passive heat sink design and their adjacent rooms.

6.4.3.2 Emergency Mode

Operation of the main control room emergency habitability system is automatically initiated by the following safety-related signals:

- Hi-Hi main control room radiation
- Loss of ac power

Operation can also be initiated by manual actuation.

If radiation levels in the main control room exceed the Hi-Hi setpoint, the nuclear island nonradioactive ventilation system is isolated from the main control room pressure boundary by automatic closure of the isolation dampers located in the nuclear island nonradioactive ventilation system ductwork. At the same time, the main control room emergency habitability system begins to deliver air from the emergency air storage bottles to the main control room by automatically opening the isolation valves located in the main control room emergency habitability system supply lines. After a slight time delay, in which the main control room pressure increases slightly due to the addition of air, the air-operated butterfly isolation valves open, allowing the pressure relief dampers to function.

After the main control room emergency habitability system isolation valves are opened, the air supply pressure is regulated by a self-contained regulating valve. This valve maintains a constant downstream pressure regardless of the upstream pressure. A constant air flow rate is maintained by the flow metering orifice downstream of the pressure regulating valve. This flow rate is sufficient to maintain the main control room pressure boundary at 1/8-inch water gauge positive differential pressure with respect to the surroundings. The main control room emergency habitability system air flow rate is also sufficient to maintain the carbon dioxide levels below 0.5 percent concentration for 11 occupants assuming both trains are delivering. With one train delivering, the system maintains the carbon dioxide concentration below 0.5 percent for 5 occupants, or below 1 percent for 11 occupants.

The emergency air storage tanks are sized to provide the required air flow to the main control room pressure boundary for 72 hours. If continued operation is required after the 72-hour period, the storage tanks are refilled using compressed air from offsite.

The temperature rise in the main control room pressure boundary following a loss of the nuclear island nonradioactive ventilation system is less than 15°F over a 72-hour period. Sufficient thermal mass is provided in the walls and ceiling of the main control room to absorb the heat generated by the equipment, lights, and occupants. The temperature in the instrumentation and control rooms and dc equipment rooms following a loss of the nuclear island nonradioactive ventilation system remains below 120°F over a 72-hour period. As in the main control room, sufficient thermal mass is provided surrounding these rooms to absorb the heat generated by the equipment. If cooling is required beyond 72-hours, portable fans with flexible ducting are obtained from offsite, and are used to deliver forced convection cooling to each of the electrical equipment rooms using ambient air, as needed.

In the event of a loss of ac power sources, the nuclear island nonradioactive ventilation system isolation dampers automatically close and the main control room emergency habitability system solenoid-operated isolation valves automatically open. These actions protect the main control room occupants from a potential radiation release. In instances in which there is no radiological source term present, the compressed air storage tanks are refilled via a connection to the breathable quality air compressor in the compressed and instrument air system (CAS).

6.4.4 System Safety Evaluation

Doses to main control room personnel resulting from a postulated LOCA are presented in subsection 15.6.5.3. Since no radioactive materials are piped or stored near the main control room pressure boundary, only doses to the control room operators due to a LOCA are postulated. A discussion of the calculational models is given in subsection 15.6.5.3.

As discussed and evaluated in subsection 9.5.1, the use of noncombustible construction and heat and flame resistant materials throughout the plant reduces the likelihood of fire and consequential impact on the main control room atmosphere.

The flue gas exhaust stacks of the onsite standby power diesel generators are located in excess of 150 feet away from the fresh air intakes of the main control room. The onsite standby power system fuel oil storage tanks are located in excess of 300 feet from the main control room fresh air intakes. These separation distances reduce the possibility that combustion fumes or smoke from an oil fire would be drawn into the main control room.

The protection of the operators in the main control room from offsite toxic gas releases is discussed in Section 2.2. The sources of onsite chemicals are described in Table 6.4-2 and their locations are shown on Figure 1.2-2. Analysis of these sources are in accordance with Regulatory Guide 1.78.

A supply of protective clothing, respirators, and self-contained breathing apparatus adequate for 11 persons is stored within the main control room pressure boundary. The design basis operating shift crew size is five persons.

Food, water, medical supplies, and sanitary facilities are provided for 11 persons for 3 days. The storage locations protect the supplies from contamination as a result of postulated accidents. The supply of food and water is sufficient for a prolonged occupancy because outside supplies can be provided within the three day interval.

The main control room emergency habitability system components discussed in subsection 6.4.2.3 are arranged in redundant, safety-related ventilation trains as shown in Figure 6.4-2. The location of components and piping within the main control room pressure boundary provides the required supply of compressed air to the main control room pressure boundary, as shown in Figure 6.4-1.

During emergency operation, the main control room emergency habitability system passive heat sinks are designed to limit the temperature rise inside the main control room to 15°F, and to limit the air temperature inside the instrumentation and control rooms and dc equipment rooms to 120°F. The walls and ceilings that act as the passive heat sinks contain sufficient thermal mass to accommodate the heat sources from equipment, personnel, and lighting for 72 hours.

The main control room emergency habitability system provides 20 scfm of ventilation air to the main control room from the compressed air storage tanks if one train is delivering, or 40 scfm if both trains are delivering. Twenty scfm of ventilation flow is sufficient to pressurize the control room to 1/8-inch water gauge differential pressure in addition to limiting the carbon dioxide concentration below one-half percent by volume for five person occupancy or, alternatively, below one percent concentration for a maximum occupancy of eleven portions. Forty scfm of ventilation flow is sufficient to both pressurize the control room to water gauge differential pressure as well as maintaining the carbon dioxide concentration below 0.5 percent by volume for all 11 persons.

Automatic transfer of habitability system functions from the nuclear island nonradioactive ventilation system to the main control room emergency habitability system is accomplished by the receipt of one of two signals:

- Hi-Hi main control room radiation
- Loss of ac power sources

The airborne fission product source term in the reactor containment following the postulated LOCA is assumed to leak from the containment. The concentration of radioactivity, which is assumed to surround the main control room, after the postulated accident, is evaluated as a function of the fission product decay constants, the containment leak rate, and the meteorological conditions assumed. The assessment of the amount of radioactivity within the main control room takes into consideration the radiological decay of fission products and the infiltration/exfiltration rates to and from the main control room pressure boundary.

A single active failure of a component of the main control room emergency habitability system or nuclear island nonradioactive ventilation system does not impair the capability of the systems to accomplish their intended functions. Each train of the main control room emergency habitability system is connected to an independent Class 1E power supply. Both the main control room emergency habitability system and the portions of the nuclear island nonradioactive ventilation system which isolates the system are designed to remain functional during an SSE or design-basis tornado.

6.4.5 Inservice Inspection/Inservice Testing

A program of preoperational and postoperational testing requirements is implemented to confirm initial and continued system capability. The VES system is tested and inspected at appropriate intervals, as defined by the ASME code, Section XI, and by technical specifications. Emphasis is placed on tests and inspections of the safety-related portions of the habitability systems.

6.4.5.1 Pre-Operational Testing

Acceptance testing of the main control room emergency habitability system is performed to verify that the air flow rate of 20 scfm is sufficient to maintain pressurization of the main control room envelope of 1/8-inch water gauge with respect to the adjacent areas.

Acceptance testing of the main control room isolation dampers in the nuclear island nonradioactive ventilation system is performed to verify the leaktightness and closure times of the dampers.

Testing and inspection of the radiation monitors is discussed in Section 11.5. The other tests noted above are discussed in Chapter 14.

6.4.5.2 Inservice Testing

Inservice testing of the main control room emergency habitability system and nuclear island nonradioactive ventilation system is conducted in accordance with the surveillance requirements specified in the technical specifications in Chapter 16.

Visual inspections of the main control room pressure boundary and seals are conducted in accordance with the frequency specified in the technical specifications.

6.4.6 Instrumentation Requirements

The indications in the main control room used to monitor the main control room emergency habitability system and nuclear island nonradioactive ventilation system are listed in Table 6.4-3.

Instrumentation required for actuation of the main control room emergency habitability system and nuclear island nonradioactive ventilation system are discussed in subsection 7.3.1.

Details of the radiation monitors used to provide the main control room indication of actuation of the nuclear island nonradioactive ventilation system abnormal mode of operation and actuation of main control room emergency habitability system operation are given in Section 11.5.

The instrumentation is designed as seismic Category I. A description of initiating circuits, logic, periodic testing requirements, and redundancy of instrumentation relating to the habitability systems is provided in Section 7.3.

6.4.7 Combined License Information

Combined License applicants referencing the AP600 certified design will address procedures regarding the availability and use of equipment for conditions beyond 72 hours of the accident.

Combined License applicants referencing the AP600 certified design will address the amount and location of possible sources of toxic chemicals near the plant using the methods of Regulatory Guides 1.78 and 1.95, and will verify that the plant meets the interface requirements in Section 2.2. The Combined License applicant will also address toxic gas monitoring, as required.

The Combined License applicant will address plant-specific procedures and training that are to be consistent with the licensing basis documentation, and with the intent of Generic Issue 83, "Control Room Habitability."

Table 6.4-1

COMPONENT DATA – MAIN CONTROL ROOM EMERGENCY HABITABILITY SYSTEM (NOMINAL)

Emergency Air Storage Tanks

Quantity	24
Capacity per tank (ft^3)	51 (liquid)
Design pressure (psig)	2450
Operating pressure (psig)	2300
Construction	ASME Section VIII and Appendix 22

Table 6.4-2

ONSITE CHEMICALS

Material	State	Nominal Quantity	Location
Hydrogen	Liquid	2,000 gal.	Gas storage
Nitrogen	Liquid	1,060 gal.	Gas storage
CO_2	Liquid	275 gal.	Gas storage
Hydrazine	Liquid	1,600 gal.	Turbine bldg.
Morpholine	Liquid	1,600 gal.	Turbine bldg.
Sulfuric Acid	Liquid	20,000 gal.	Turbine bldg.
Sodium Hydroxide	Liquid	20,000 gal.	Turbine bldg.
Dispersant[a]	Liquid	9,000 gal.	Turbine bldg.
Fuel Oil	Liquid	200,000 gal.	DG fuel oil storage tank

Note:
(a) Site-specific, by Combined License applicant

Table 6.4-3

MAIN CONTROL ROOM HABITABILITY INDICATIONS AND ALARMS

VES emergency air storage tank pressure (indication and low alarm)

Main control room pressure boundary differential pressure (indication and high and low alarms)

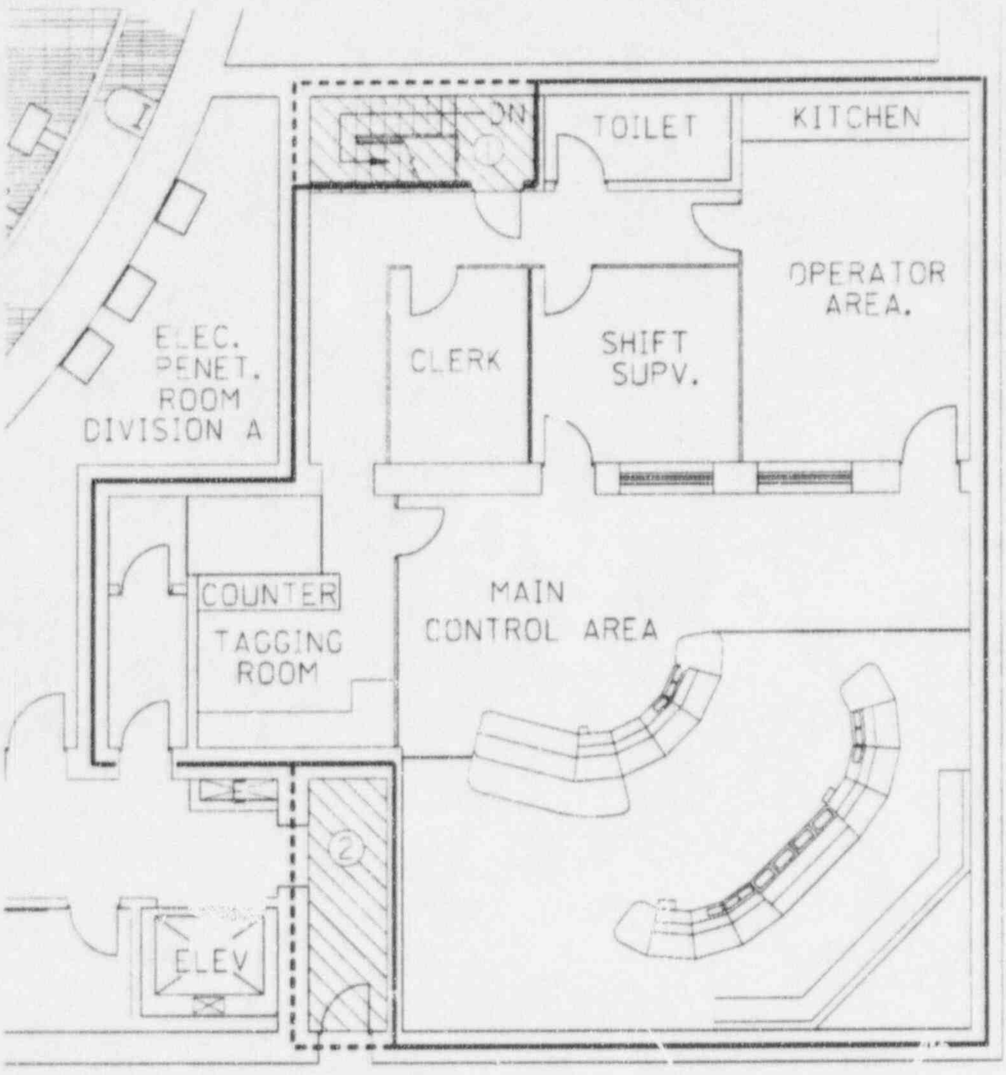
VES air delivery line flowrate (indication and low alarm)

VBS main control room supply air radiation level (high alarm)

VBS outside air intake smoke level (high alarm)

VBS isolation damper position

Note:
KEY: VES = Main control room emergency habitability system
VBS = Nuclear island nonradioactive ventilation system
MCR = Main control ᴉm



PRESSURE BOUNDARY INCLUDES:
1) SLAB COVERING EMERGENCY EGRESS AT ELEVATION 127'-0"
(DASHED LINE ABOVE 127'-0" IS BOUNDARY)
2) SLAB COVERING CORRIDOR AT ELEVATION 126'-0"
(DASHED LINE ABOVE 126'-0" IS BOUNDARY)
3) FLOOR AT ELEVATION 117'-6"
4) FLOOR AT ELEVATION 135'-3"

Figure 6.4-1

Main Control Room Pressure Boundary

[Westinghouse Proprietary]
[Provided under seperate cover]

Figure 6.4-2

Main Control Room Habitability System
Piping and Instrumentation Diagram