Environmental Qualification of Electrical Equipment

R. E. Ginna Nuclear Power Plant
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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Environmental Qualification of Safety-Related Electrical Equipment

I. INTRODUCTION

The electrical equipment described in this report is that safety-related equipment required to mitigate the effects of high or moderate energy line breaks (HELB) inside or outside containment, and to effect eventual cold shutdown of the reactor. The environmental qualification requirements are described in the "DOR Guidelines", transmitted to RG&E on February 15, 1980. Although the DOR Guidelines address all electrical equipment, the emphasis in this report will be on that equipment exposed to an adverse HELB environment. This is defined as that equipment located in the containment, Intermediate Building, Turbine Building, and Auxiliary Building basement (radiation only). This revised scope is consistent with the Commission Order of September 19, 1980. Equipment in other "mild" environments will be addressed at a later time.

This submittal revises and supersedes our previous reports concerning environmental qualification of electrical equipment, dated February 24, 1978, December 1, 1978, and April 25, 1980. It also consolidates and updates all information submitted on June 10, 1980 and September 24, 1980. Section IV of this report presents an item-by-item response to the Draft Interim Technical Evaluation Report FRC Project C5257, concerning the review of the Ginna electrical equipment

environmental qualification, dated August 20, 1980. New references are included with this report. However, references previously submitted are not being resubmitted. In Section IV, it is either shown that each item is adequately qualified to perform its required safety function in its post-accident operating environment, or a commitment for additional testing or replacement is made. In all cases, sufficient justification for continued operation is given.

Table 3 summarizes the equipment qualification in the format requested for SEP by the NRC in a September 6, 1978 letter. Table 4 provides the definition of environmental parameters throughout the Ginna plant. This table is comparable to Appendix A of F-C5257, and tabulates the explanatory basis given in Section III of this report.

Supplement No. 3 to IE Bulletin 79-01B provides the timing for submittal of qualification information for equipment installed to meet the TMI Short Term Lessons Learned. RG&E intends to follow the guidance given in this supplement. In a number of cases, it is possible that additional documentation or testing results may become available after November 1, 1980. Since this additional information will be of use in documenting the status of the Ginna environmental qualification, it will be submitted when received. Every effort has been made to ensure that all documentation was obtained for use with this submittal.

II. IDENTIFICATION OF NECESSARY SAFETY RELATED EQUIPMENT

This section of the report identifies the necessary safety related equipment for each of the Design Basis Events (DBE) of concern and a brief description of why the equipment is needed. This identification includes all electrical equipment required by the Ginna emergency procedures for accomplishing the necessary safety functions. It must be recognized that not all electrical equipment referenced in the procedures is required to function (as opposed to being useful if available), and is therefore not required to be qualified.

The emergency operating procedures were not developed by considering safety-related components to the exclusion of all others. While such procedures are written with priority attention given to safety-related equipment, other systems and components are justifiably mentioned. A realistic evaluation of plant incidents might result in situations and hostile environments significantly less severe than those assumed for the purposes of conducting the environmental qualification program. The absence of full qualification for certain components which fall into this category is not, by itself, a sufficient motive to classify the equipment inoperable or to remove these components from the procedures.

A. Events Accompanying a Loss Of Coolant Accident

Analyses of the course and consequences of loss of coolant accidents have been submitted previously (LOCA 1-4). A discussion of equipment required to function to mitigate the consequences of a loss of coolant

accident is presented in the FSAR Chapters 6, 7 and 14. Post-LOCA operator actions are included in the Ginna Emergency Procedures. These procedures are consistent with the generic Westinghouse guidelines, which have been approved by the NRC. Additional descriptive material is presented in this report to provide summary information as to the sequence of events and the equipment involved at each stage. Figure 1 illustrates the sequence of events following a loss of coolant accident. Table 1 provides a specific equipment list for each numbered block in Figure 1. Also provided in Table 1 is the safety function which is required and the period of time that operability must be ensured. It should be noted that Table 1 includes all redundant equipment, not the minimum safeguards equipment assumed in the safety analysis. In the "required" column it should be noted that equipment listed as "signal initiation" is required to be operable only until its required safety function, the initiation of a safety signal, is performed. It is important to note that the arbitrary requirement of the DOR Guidelines to qualify equipment to function for at least one hour, even if its only function is completed within seconds, is not well reasoned. In many cases, the environment would not exist unless the equipment safety function had been completed (e.g., flooding to a seven foot level in containment by necessity means that SI was initiated). RG&E does not agree with

this one-hour requirement, and it is therefore not applied as an environmental qualification requirement.

Equipment listed as "long term" is required to provide long term decay heat removal, post-accident monitoring and sampling, or maintaining a safe shutdown condition. Equipment listed as "short term" is required only for a short period of time (hours).

Table 3 provides the environmental qualification requirements and documentation references for the Ginna Class IE equipment.

1. The first event in the loss of coolant accident following the rupture is the detection of the rupture. Any 2/3 low pressurizer pressure or 2/3 high containment pressure will initiate "safety injection" (SI).

1a. Instrumentation is available to the operator to distinguish between a LOCA and the other accidents, such as a steam line break or feed line break. It is important to note that the automatic actions and immediate operator actions (first 10 minutes) are identical in the mitigation of these accidents.

2. Upon "safety injection" signal generation, safeguards sequencing is initiated (see FSAR Table 8.2-4). The diesel generators start and energize the safeguards buses assuming there is a loss of offsite power. With the safeguards buses energized, either by off-site power or the diesels, the three safety injection pumps,

the two residual heat removal pumps, two of the four service water pumps, the two motor driven auxiliary feedwater pumps, and the four containment fan coolers will be loaded sequentially onto the buses. The two containment spray pumps are automatically loaded onto the buses when the 30 psig containment pressure setpoint is reached.

3. A break in the reactor coolant system piping actuates the passive accumulator injection system when the reactor coolant system pressure is reduced to 700 psig.

The flow path of the borated water from each accumulator is through a series of check valves and a normally locked open (with AC control power removed) motor operated valve. The motor operated valves, MOV 841 and MOV 865, are not required to function to mitigate the consequences of the accident [Flood-1].

4. The main steam isolation valves 3516 and 3517 close upon receiving a high containment pressure signal and the main and bypass feedwater control valves 4269, 4270, 4271 and 4272 close upon receiving a safety injection signal. The SI signal also causes a trip of the main feedwater pumps (which in turn causes the closing of the feedwater discharge valves). All of this equipment will fail in its safety position on loss of electrical power.

5. "Containment Isolation" and "Containment Ventilation Isolation" (referred to collectively as simply "Containment Isolation") is initiated by the safety injection signal. Containment isolation is discussed in detail in Section 5.2 of the FSAR. Most of the containment isolation valves are air operated valves. All air operated containment isolation valves close with safety injection signal with the exception of valves 4561 and 4562 which open full to insure service water supply to the containment recirculation fans. The fail safe position of the valves is the desired safeguard position as described above.

Six motor operated valves (313, 813, 814, ATV-1, ATV-2, ATV-3) receive a containment isolation signal. All of these valves are located outside of containment and only valves 313, 813, and 814 are fed from the safeguards buses.

During normal operation ATV-1, ATV-2, and ATV-3 are closed with blank flanges installed on their respective penetrations inside containment. The use of the process lines associated with these valves occurs only during the containment building integrated leak rate tests.

Valve 313, the reactor coolant pumps seal water return line, and valves 813 and 814, reactor coolant support inlet and outlet lines, are closed by the containment isolation signal.

6. The SI signal trips the reactor and turbine. Other reactor trips are discussed in the FSAR, Section 7.

7. The reactor coolant pumps are tripped by manual operator action when low pressurizer pressure (1715 psig) is reached, and SI flow is initiated.

8. Selected valves throughout the plant provide flow paths for the required safeguards equipment with the advent of the SI signal.

During normal operation all required valves in the flow paths for high head safety injection are normally open with the exception of valves 826A and 826C, the discharge valves from the boric acid storage tank to the suction of the safety injection pumps.

Valves 826A, B, C and D receive the safety injection signal and valves 826A and C open providing borated water to the reactor coolant loop cold legs.

When the level in the boric acid storage tank decreases to the 10% level, suction for the high head safety injection pumps is automatically switched from the boric acid storage tanks to the refueling water storage tank by the automatic opening of valves 825A and B and closing of valves 826A, B, C and D.

During normal operation, all valves in the flow paths for low head safety injection are normally open except

for MOV 852A and MOV 852B, the valves in the vessel upper plenum injection lines. These valves open upon receipt of a safety injection signal and remain open thereafter.

The containment spray pumps will automatically start and the discharge valves 860A, B, C and D automatically open, receiving power from the safeguards buses when containment pressure reaches 30 psig. If containment pressure does not reach 30 psig, the operator may manually start the spray pumps after all other safeguards are loaded on the safeguards buses. Automatic NaOH addition via opening of valves HCV 836A, B takes place two minutes after containment spray pump start unless defeated manually.

The containment spray pumps are normally aligned to the refueling water storage tank with all suction valves open.

SI system actuation will automatically align the two post accident charcoal filters to the containment recirculation system by opening inlet dampers 5871 and 5872, and outlet dampers 5873 and 5874. Loop entry dampers 5875 and 5876 will close. These dampers will fail to their safeguards position upon loss of electric power.

9. The control room ventilation is automatically placed in the 100% recirculation mode (with about 25% flow through charcoal filters), when SI is initiated.

10. After the safety injection pumps are automatically switched from the boric acid storage tanks to the refueling water storage tanks, the operator resets safety injection, starts the component cooling water pumps and aligns flow to the RHR heat exchangers, and initiates SW flow to the CCW heat exchangers. At the 31% RWST alarm, the operator shuts off one CS and one SI pump (if more than one are running). When the refueling water storage tank level is reduced to 10%, the plant operator stops the remaining residual heat removal, containment spray and high head safety injection pumps and establishes flow paths to the reactor vessel for both high (if required) and low head safety injection from containment sump B.

The normal (non-safety grade) auxiliary feedwater supply source is from the condensate storage tanks. If this supply is exhausted the operator opens the motor operated valves 4027 and 4028 and manual operated valves 4344 and 4345 to provide service water to the suction of the auxiliary feedwater pumps. If the AFW system is not functioning properly, the operator can align from the control room the Standby AFW system to the steam generators (using service water suction).

11. In the recirculation phase, the operator aligns the RHR pumps to containment sump B by opening valve 850A for pump A and valve 850B for pump B, and closing

valve 704A, 704B, 856, and 896A or 896B. For low head recirculation, injection is through the vessel nozzles. For high head recirculation, the RHR pumps discharge to the safety injection pumps through alignment of valve 857A (for RHR pump B) and/or valves 857B and 857C (for RHR pump A). Valves AOV 897, 898 are closed. The high head safety injection pumps then provide water to the cold leg injection points. This alignment also allows CS pump operation, if desired.

Long term recirculation to compensate for the possible effects of boron precipitation has been described in Ref [Flood-1] and includes the use of RHR pumped flow to the vessel nozzles and through a high head safety injection pump into either cold leg.

Post-accident reactor coolant and containment atmosphere sampling modifications are presently being undertaken, in accordance with the implementation schedule for the TMI Lessons Learned commitments. See [Ref TMI-3].

B. Events Accompanying a Main Steam Line Break or a Main Feed Line Break

The analyses of a main steam line break or a main feed line break and the consequences thereof have been discussed in Chapters 6 and 14 of the FSAR and in References [SLB/FLB 2-4]. The High Energy Line Break analyses [HELB 1-7] provide additional information regarding steam line breaks outside of containment, as

well as feedwater line breaks inside and outside containment.

Figure 2 illustrates the sequence of events required to mitigate the consequences of a main steam line break. The same initial sequence of events would occur for a feedwater line break. Since the same equipment is required to operate and the same emergency procedure is used following a feedline break as a steam line break, but a steam line break is a more severe accident in terms of RCS cooldown (return to criticality) and mass and energy release to containment, the subsequent discussion will address the main steam line break only. Table 2 lists the required equipment for each numbered block in Figure 2.

1. A large main steam line break (greater than approximately one square foot) would first be detected by the low steam line pressure sensors. Low steam line pressure sensed by two out of the three steam line pressure transmitters initiates safety injection accompanied by reactor and turbine trip.

1a. Diagnostic instrumentation is available to the operator to distinguish among accidents, as described in the LOCA discussion.

2. Two out of three low pressurizer pressure signals would provide additional protection for a larger steam line break and also provides the initial safety injec-

tion signal for smaller breaks. Also, high containment pressure (6 psig) will initiate safety injection.

3. The Ginna design includes non-return check valves in each steam line just upstream of the main steam header in the intermediate building. Thus for any break upstream of the check valves, which includes all breaks inside containment, the check valves will preclude blowdown of the intact generator. Reactor trip will result in closing the turbine stop valves. As redundant protection in the event of a steam line break upstream of the check valves, and for all breaks downstream of the check valves, the main steam line isolation valves are closed by several signals. These signals include 2/3 high containment pressure (20 psig); 1/2 high steam flow in either steam line plus 2/4 low Tave plus safety injection; and 1/2 high-high steam flow in either steam line plus safety injection.

4. The safety injection signal closes the main and bypass feedwater control valves, trips the feedwater pumps and closes their respective discharge valves.

5. The safety injection signal initiates containment isolation and containment ventilation isolation as described in the sequence of events in the loss of coolant accident.

6. The safeguards sequence as described in the loss of coolant accident is initiated by the safety injection signal. (For steam breaks outside containment, the spray pumps are not required.)

7. The safety injection signal trips the reactor and turbine. Other reactor trips are discussed in the FSAR, Section 7.

8. The reactor coolant pumps are tripped by manual operator action when low pressurizer pressure (1715 psig) is reached, and SI flow is initiated.

9. All valves associated with the safety injection systems are aligned and automatically function as described in the loss of coolant accident discussion. If high containment pressure of 30 psig is reached, the containment spray system operates as described in the LOCA discussion.

10. When the boric acid storage tanks are drained to the 10% level and safety injection pump suction has automatically been aligned to the refueling water storage tank, the operator will reset safety injection and if reactor coolant pressure is above the shut-off head of the RHR pumps, will stop the RHR pumps and place them in the standby mode.

A high steam line flow and/or low steam line pressure will indicate to the operator which steam generator has the steam line break. When this has been determined,

the operator will terminate AFW flow to the faulted steam generator, and align/maintain flow to the intact steam generator.

The inventory of the reactor coolant will be maintained by the remote manual operation of the high head safety injection pumps in combination with use of the charging pumps.

At least two hours after the start of the accident, supply water for the auxiliary feedwater pumps can be manually transferred from the condensate storage tanks to the service water system, by the method described in the LOCA discussion [See Ref. SLB/FLB-6]. If the auxiliary feedwater system is not operating properly, the operator can initiate operation from the control room of the Standby AFW system (using service water suction).

11. If conditions and equipment availability permit, the operator can begin a gradual cooldown and depressurization to cold shutdown conditions. However, the primary safety function is to maintain the RCS in a safe condition at all times, removing decay heat at a rate comparable to the generation rate. Maintenance of this safe shutdown condition is accomplished by a combination of steam dump (to the condenser or atmosphere) with primary and secondary inventory makeup, accomplished by use of the safety injection and/or the charging

pumps, and the auxiliary feedwater system. It is expected that RCS temperature can be lowered to near 212°F by using the steam generators. The safe shutdown conditions can be maintained until a final cooldown and depressurization to ambient conditions can be effected.

C. <u>High Energy Line Breaks Outside Containment</u>

An analysis has been provided describing the effects of pipe breaks outside containment [HELB-1]. The report proposed a program of augmented inservice inspection of certain piping welds in order to preclude the necessity to address further full diameter high energy piping breaks. Credible breaks of main steam lines outside containment, that is, those not included in the inspection program, are bounded by a 6 inch main steam line branch connection in the Intermediate Building and a 12 inch main steam line branch connection in the Turbine Building. Credible breaks in the feedwater lines outside containment are bounded by a break in the 20 inch feedwater line in the Turbine Building. The accident environment created by these breaks, and other postulated breaks are provided in References [HELB 8-11]. The program has been accepted by the NRC [Ref. HELB 7,8]. Several modifications have been performed at the Ginna Nuclear Plant as a result of high energy line break analyses. Reference [HELB-1] discusses the various modifications, but of particular note is the Standby Auxiliary Feedwater system modification. A

remote-manual controlled standby auxiliary feedwater system, identical to the auxiliary feedwater system in cooling capability, has been installed. The pumps are housed in a seismically designed structure (area 6 Figure 3) remote from the auxiliary feedwater and any high energy lines. Any portion of this system required to operate in an emergency is not subjected to an adverse environment. Ref [HELB-8] includes the NRC's Safety Evaluation Report concerning the RG&E modifications resultant from the review of Ref. [HELB-1]. It includes a discussion of the acceptability of the instrumentation relocation and cable re-routing performed to insure that sufficient equipment will be protected from the environmental effects of a HELB outside containment.

The failure of steam heating lines in the Auxiliary Building was identified and discussed in Ref. [HELB-1]. It has been determined that steam heating lines also traverse other areas in the vicinity of safety related equipment [Ref. HELB-15]. Modifications are planned which will isolate the steam heating line to the affected areas in the event of a failure and therefore preclude an adverse environment. The commitment to perform analyses/modifications for those pipe breaks outside containment are given in Reference [HELB-13]. Prior to its installation, regular inspections are being performed to reduce the likelihood of a failure creating an adverse environment. These inspections, performed

during each plant operating shift, would detect any leakage. Plant procedures (T-35F, "Steam to Auxiliary Building, Screen House, or Diesel Generators and Oil Room") call for isolation of the affected piping promptly upon detection of the leakage.

III. IDENTIFICATION OF THE LIMITING SERVICE ENVIRONMENTAL CONDITIONS FOR EQUIPMENT WHICH IS REQUIRED TO FUNCTION TO MITIGATE THE CONSEQUENCES OF DESIGN BASIS EVENTS

This Section of the report defines the bases for and references to the environmental conditions encountered throughout the plant. A tabular summary is provided in Table 4.

A. Inside Containment

Post accident containment environmental conditions are discussed in Appendix 6E of the Ginna FSAR. These conditions result from a loss of coolant accident. The temperature and pressure profiles are given in Figures 1 and 2 of Appendix 6E with peak values being 286°F and 60 psig respectively. The radiation profile is presented in Figures 4 and 5 of Appendix 6E and it is seen, for example, that the doses at 30 minutes and one year following a LOCA are 1.7×10^6 and 1.6×10^8 rads, respectively. (These figures are repeated as Figures 4,5,and 6 of this report.) Materials compatibility with post-accident chemical environment is discussed in detail in Appendix 6E. 100% humidity is assumed.

Design parameters for environmental conditions have been conservatively selected for Ginna. As seen in FSAR Figure 14.3.4-2, the calculated peak pressure is less than 53 psig while the design value is 60 psig. The duration of the peak, similarly, bounds the calculated values.

Another example of the conservatism employed is seen in the accident radiation environment used for design purposes. As noted in WCAP 7744, a release of 100% of the noble gases, 50% of the halogens, and 1% of all remaining fission products is assumed. In addition, no credit is taken for removal of radioactivity from the containment atmosphere by sprays, filters and fission product plateout. Finally, the specific activity in containment was roughly doubled by assuming a containment free volume associated with an ice condenser containment. Thus the radiation environment clearly overstates that which would be present even in a minimum safeguards case. This conservation is apparent from a comparison to the DOR Guidelines, which suggest a post-LOCA integrated dose of 2×10^7 rads gamma.

Submergence of valves inside containment has previously been discussed in Reference [Flood-4] and it has been shown that operation following submergence is not required. Submergence of instrumentation has been discussed in Ref [Flood-5]. Since the instrumentation is not required to function while flooded, no qualification for submergence is specified (see e.g., Section IV.19 of this report).

The peak pressure following a MSLB is given in Section 14.2.5 of the FSAR as 52 psig, assuming no credit for containment pressure reducing equipment. Recent analyses

for other facilities indicate that the containment vapor temperature following a MSLB in contaiment may briefly exceed those derived for a LOCA. These higher temperatures should not be limiting, however, for qualification of equipment required following a MSLB, because:

1) the fact that the high temperature transient is very brief and there is superheated steam (with its lower heat transfer capability) as opposed to saturated steam,
2) the equipment is protected from the direct effects of the steam line break by concrete floors and shields, and
3) the sensitive portions of the electrical equipment are not directly exposed to the environment, but are protected by housing, cable jackets, and the like.

For these reasons, the humidity and steam environment following a LOCA remains limiting. This is consistent with the NRC's position 4.2 of the "Guidelines for Evaluating Environmental Qualification of Class IE Electrical Equipment in Operating Reactors." Radiation levels in containment following a MSLB are not limiting since fuel failures are not projected to result from a MSLB. Chemical environment and submergence are bounded by the LOCA conditions.

B. <u>Auxiliary Building</u>

The auxiliary building has a HVAC system which provides clean, filtered and tempered air to the operating floor of the auxiliary building, and to the surface of the decontamination and spent fuel storage pits. The system exhausts air from the equipment rooms and open areas of the auxiliary building, and from the decontamination and spent fuel storage pits, through a closed exhaust system. The exhaust system includes a 100 percent capacity bank of high efficiency particulate air (HEPA) filters, and redundant 100 percent capacity fans discharging to the atmosphere via the plant vent. This arrangement insures the proper direction of air flow for removal of airborne radioactivity from the auxiliary building.

Included in the auxiliary building exhaust system is a separate charcoal filter circuit, which exhausts from rooms where fission product activity may accumulate, during normal plant operation, in concentrations exceeding the average levels expected in the rest of the building. Following a loss-of-coolant accident, this circuit is capable of providing exhaust ventilation from the areas containing pumps and related piping and valving which are used to recirculate containment sump liquid.

A full flow charcoal filter bank is provided in the circuit, along with two 50 percent capacity exhaust

fans. The air operated suction and discharge dampers associated with each fan are interlocked with the fan such that they are fully open when the fan is operating and fully closed when the fan is stopped. These dampers fail to the open position on loss of control signal or control air. The fans discharge to the main auxiliary building exhaust system, containing the HEPA filter bank. To assure a path for the charcoal (and HEPA) filtered exhaust to the plant vent if the main exhaust fans are not operating, a fail open damper is installed in a bypass circuit around the two main exhaust fans.

The residual heat removal, safety injection, containment spray and charging pump motors are provided with additional cooling provisions to maintain ambient temperatures within acceptable limits when the pumps are operating. The charging pumps and RHR pumps are located in their own rooms, each room being provided with two cooling units consisting of redundant fans, water-cooled heat exchangers, and ductwork for circulating the cooled air. The capacity of each unit is sufficient to maintain acceptable room ambient temperatures with the minimum number of pumps required for system operation in service. The safety injection and containment spray pumps are provided with cooling units providing cool air directly to the motor. There is a separate fan for each of the motors.

In the event of a loss of offsite power, the auxiliary building ventilation system main supply and exhaust fans would be inoperable. However, all other fans in the auxiliary building ventilation system are supplied by emergency diesel power including the charcoal filter circuit and the pump cooling circuits for safety related pump motors, as described above. Since the auxiliary building is a very large volume building, it is not expected that there would be a post-accident temperature increase except in some local areas near hot piping and large motors. This situation exists only in the basement of the auxiliary building where the safety-related pumps and recirculated sump fluid piping are located. As shown in Reference [HELB-14] the ventilation system for these areas is expected to be adequate to maintain the post-accident temperature with normal "ambient" levels. Further detailed evaluation of the environment in these areas is being addressed with the final resolution of the "mild" environment qualification requirements.

The radiation levels in the auxiliary building will increase in the event of a LOCA. Using very conservative post-accident fission product activity levels, the post-accident environment in the auxiliary building was calculated in Appendix A to Reference [TMI-3]. It is apparent from Table 5-1 of this reference that the only major radiation field in terms of equipment qualification

will be in the vicinity of the recirculated fluid. The required qualification doses are addressed for all the affected equipment in Table 3. The RG&E commitments to ensure that a HELB in the auxiliary building will not affect the capability of effecting and maintaining a safe shutdown condition is provided in Reference [HELB-13].

Flooding is not a concern in the Auxiliary Building. Even in the event of leakage, two 50 gpm sump pumps are provided in the low point of the building. This is described in Section 9.3 of the FSAR, and has been evaluated by the NRC in Reference [HELB-15].

C. <u>Intermediate Building</u>

Implementation of an augmented inservice inspection program for high energy piping outside containment has reduced the probability of pipe breaks in these systems to acceptably low levels [Ref. HELB-7, 8]. A six inch main steam line branch connection is the intermediate building DBE. Based on the failure capacity of portions of the exterior walls, the limiting pressure is established in Ref. [HELB-1] as being a pressure of 0.80 psig. Assuming saturation conditions, one obtains a limiting temperature of approximately 215°F. A 100% humidity steam-air mixture is assumed. If the pipe crack or branch line break were in a portion of the steam or feed line that could be isolated, the isolation would immediately halt the mass and energy addition to the intermediate building. A pipe crack or branch line

which could not be isolated is the limiting DBE for intermediate building environment. Mass and energy release in this case would be limited by the dryout of the steam generators with the duration of the environment dependent on the size of the leak or break. Based on flow through a main steam safety valve (a 6 inch line) of 247 lbs/sec at a steam line pressure of 1100 psia and the inventory available for release from a main steam break of 165,500 lbs (FSAR Section 14.2.5), the mass and energy flow will continue for at least 11 minutes. Smaller leaks may continue substantially longer. It is expected that within 30 minutes to an hour, action could be taken to provide added ventilation to the building by opening doors. Within several hours, return to near ambient could be accomplished. Table 4 provides an estimate of the duration of the environmental transient expected. The exact duration is not critical in terms of affected equipment qualification; therefore, no explicit calculations have been performed. Chemical spray is not a design consideration in this building. The effects of submergence need not be considered, as described in References [HELB-1], [HELB-4], and [FLOOD-11]. This latter reference presents the result of an analysis performed to ensure that safety-related equipment would not be flooded in the event of an feed line break in the intermediate building.

The radiation environment was reviewed in response to the TMI Lessons Learned commitments [see Ref. TMI-3]. It can be seen from Table 5-1 that the radiation environment is not significant in terms of equipment qualification.

D. Cable Tunnel

Since the cable tunnel is open to the Intermediate Building, the limiting environmental conditions for the cable tunnel are identical to the Intermediate Building conditions.

E. Control Building

The limiting environment of the Control Building which includes the control room, relay room, and battery rooms, is normal ambient conditions. Protection against high energy line breaks and circulating water line breaks which could occur outside the Control Building and affect the Control Building environment are identified and discussed in References [HELB-1, HELB-6, HELB-7, HELB-13, HELB-15, FLOOD-1, and FLOOD-5].

The air conditioning system for the control room is described in Section 9.9 of the FSAR. The main air handling unit and circulation fans for the control room are powered from a single Class IE motor control center (MCC-1K), which receives power from a diesel-backed emergency bus (diesel 1A). If there were a failure of this train during the post accident period, it would be possible to crosstie to the 1B diesel. The operator, after assuring that any faults are cleared, would close

the bus tie between buses 14 and 16 to energize the inoperable Control Room air handling unit from the 1B diesel, while making sure that the operational diesel does not become overloaded. This emergency bus cross-ties procedure has previously been included in the Ginna Emergency Procedures.

The control room HVAC system has been out of service several times in the last 11 years for maintenance. A satisfactory environment has been maintained by opening the two control room doors and two relay room doors, connecting the two rooms together and with outside air, to provide natural circulation. Equipment failure has never been experienced during these events because of a temperature increase due to lack of HVAC.

It is also possible, of course, to provide for the use of portable air-conditioning units or fans to maintain environmental conditions within proper specifications. Further evaluation of the long-term effects of the loss of ventilation will be made at a later time, when safety-related equipment not exposed to a "harsh" accident environment is addressed in terms of environmental qualification.

The relay room is normally cooled by two non-safety-related air conditioning systems, which can be manually aligned to the emergency buses by closing the proper bus-tie breakers.

Natural circulation with the control room, and the use of portable air-conditioning units and fans, are options available to maintain environmental conditions within the required specifications. Further evaluation concerning loss of ventilation will be made at a later time, together with the control room study.

To further assure that a loss of ventilation to the control and relay rooms is not expected to be a concern, RG&E conducted an 8-hour test on September 15, 1980. It was demonstrated that, for a loss of all HVAC, no significant temperature increase occurred in the control room or relay room. Only the plant computer, located in its own room within the relay room, and not required for accident mitigation or safe shutdown, appeared to be susceptible to overheating.

The battery rooms have a set of inlet and exhaust fans, as well as an air-conditioning system. Additional fans are to be installed in the near future. These fans will be d.c.-powered directly from the batteries. While this modification is in progress, the present Emergency Procedures provide for manual alignment to the emergency buses by closing of bus-tie breakers. If necessary, portable fans could be used to provide sufficient air handling capacity to maintain the battery rooms at acceptable ambient conditions.

F. Diesel Generator Rooms

The emergency diesel generator rooms each have their own HVAC system, powered from the diesels. As soon as the diesels are brought up to speed, stabilized, and their respective circuit breakers closed to their emergency buses, the HVAC systems (ventilating fans) are energized. Protection against failure of steam heating lines in the rooms is described in Section II.C above. Failure of a steam heating line would affect only one diesel. The other diesel, as well as offsite power, would still be available. This configuration has been reviewed by the NRC in Reference [HELB-15], and found acceptable. Protection agains events outside the rooms is described in References [HELB-1, HELB-6, HELB-7, FLOOD-1, and FLOOD-5]. The limiting environment in the diesel generator rooms therefore is normal ambient conditions.

G. Turbine Building

The turbine building does not require an HVAC system per se, but rather utilizes roof vent fans, wall vent vans, windows and unit heaters for control of the environs. In the event of loss of power to fans in this building there would be no significant temperature rise, since it is a large volume building with sufficient openings (windows and access doors) to adequately circulate outside air.

Analyses have shown that the limiting pressure are caused by an instantaneous break in the 20 inch feed line in the turbine building. See Reference [HELB-1]. Peak pressures are 1.14 psig on the lower two levels of the building and 0.70 psig on the operating floor. Failure of portions of the exterior wall limit the duration of the pressure pulse to a few seconds. Pressure and temperature is limited by the failure capacity of the exterior walls. Assuming saturation conditions, one obtains a limiting temperature of approximately 220°F. A 100% humidity steam-air mixture is assumed. Isolation of the main steam and feed system will isolate the source of energy to the turbine building. Temperature and pressure reduction will be accomplished by opening exterior doors and windows and as a result of leakage through known openings to the outside. For conservatism, it has been assumed that the peak temperature condition persists for 30 minutes with return to ambient being accomplished in a total of 3 hours. For conservatism, peak pressures are assumed to persist for 1 minute with return to ambient being accomplished in a total of 3 hours. (This is tabulated in Table 4). The exact duration of high environmental

conditions is not critical in terms of affected equipment qualification; therefore, no explicit calculations have been performed.

Limiting flood conditions are the result of a circulating water system pipe break and is a water level of 18 inches in the basement [FLOOD-5].

H. Auxiliary Building Annex

This structure, which houses the Standby Auxiliary Feedwater System, is described in References [HELB-1] and [HELB-6]. The limiting environment in this structure is normal ambient conditions. The cooling system for this building is redundant and seismically qualified.

Flooding is not a concern since all safety-related equipment associated with the Standby AFW System is elevated so that a complete failure of the Condensate Tank would not cause submergence.

I. Screen House

The screen house, like the turbine building, does not require an HVAC per se, but utilizes roof vent fans, wall vent fans, windows, and unit heaters for control of the environs. In the event of a loss of power to the fans, there would be no significant temperature rise, since it is a large volume building with sufficient openings to adequately circulate outside air.

RG&E's commitment to resolve the HELB environment is provided in Section II.C. Protection against flooding is described in References [FLOOD-1] and [FLOOD-5].

The limiting environment in the screenhouse is thus normal ambient conditions.

IV. EQUIPMENT QUALIFICATION INFORMATION

Table 3 summarizes the qualification information of required electrical equipment. This section provides the detailed background information, with emphasis on a response to the August 20, 1980 FRC Draft Interim Technical Evaluation Report, Project C5257. For this reason, the paragraphs are ordered consistent with Section 3 of that report.

1. TER Paragraph 3.2.1 - Table 3 Item No. 23. Main Steam-line Pressure Transmitter in the Intermediate Building.

   - TER C5257 noted that this instrumentation meets the DOR Guidelines. In order to provide instrumentation with all of the proper qualification documentation, there are plans to replace these transmitters by June 1982. Qualification documentation will be made available when received.

2. TER Paragraph 3.2.2 - Table 3 Item Nos. 31, 41. Medium Voltage Switchgear Located Outside Containment (Models DB-50A and DH-350E).

   - TER C5257 found these acceptable, since the breakers are exposed only to a relatively mild (1 psig, 220°F) environment, must function within a short time (generally seconds) and fail-safe on loss of power. No additional information is considered necessary to show proper operational capability under the required accident conditions.

3. TER Paragraph 3.2.3 - Table 3 Item No. 21A. Containment Pressure Transmitters located outside containment.

- TER C5257 found that these transmitters satisfied the DOR Guidelines. In light of TMI Lessons Learned, five of the seven transmitters, which could see a high radiation field following a LOCA, are being replaced with new transmitters (three will have a 10-200 psig span and provide post-accident monitoring). These transmitters will be qualified for the post-LOCA environment and will therefore be qualified for a HELB outside containment environment. All 5 will be replaced by June 1982. Qualification documentation will be made available when received. The two transmitters not being replaced are not exposed to a harsh environment as the result of a LOCA. For a high energy line break outside containment, these two transmitters are not required to function.

4. TER Paragraph 3.2.4 - Table 3 Item No. 25 BAST Level Transmitter in the Auxiliary Building.

- TER C5257 found that these transmitters met the intent of the DOR Guidelines. It is important to note that this instrumentation performs its safety function following a LOCA or steam line break prior to the time any accident environment is encountered in the Auxiliary Building. For a HELB

in the Auxiliary Building, there is no need for the BAST level transmitters to function. No additional information is required for this equipment.

5. TER Paragraph 3.2.5 - Table 3 Item No. 18. RWST Level Transmitter in the Auxiliary Building.

   - TER C5257 notes that this item satisfies the intent of the DOR Guidelines. For further assurance, this transmitter will be replaced by June 1982 with a fully-qualified transmitter. Qualification documentation will be made available when received.

6. TER Paragraph 3.2.6 - Table 3 Item No. 19. RWST Level Switch in Auxiliary Building.

   - TER C5257 notes that this item does not require environmental qualification, since the safety function is performed prior to the onset of an adverse environment. This is correct; for added assurance of post-accident monitoring, however, this item is being replaced by June 1982. Qualification documentation will be made available when received.

7. TER Paragraph 3.3.1.1 - Table 3 Item No. 8A. Valve Operators for Valves MOV 841, 865.

   - TER C5257 concludes that, since these valve actuators are locked in the "open" position with power removed with no need to function, lack of valid

qualification documentation is a moot point. Thus, no qualification information is required for this item.

8. TER Paragraph 3.3.1.2 - Table 3 Item Nos. 8F, 8G. Valve Operator for MOVs 851A, B; 878 B, D.

- TER C5257 concludes that, since these valve actuators are locked in the "safety" position, with no need to function, environmental qualification is a moot point. Thus, no qualification information is required for this item.

9. TER Paragraph 3.3.1.3 - Table 3 Item No. 8C. Valve Operators for MOVs 825 A, B.

- As noted in TER C5257, these valves perform their safety function (open to allow RWST fluid to the suction of the SI pumps) prior to the time an adverse environment would exist in the Auxiliary Building due to sump recirculation. No "harsh" environmental qualification is required for these items.

10. TER Paragraph 3.3.1.4 - Table 3 Item No. 8D. Valve Operators for MOVs 4027, 4028, 4007, 4008, 4000A, 4000B.

- As noted in TER C5257, these valves would not be used in the event of a HELB in the Intermediate Building. RG&E Emergency Procedures specifically call for actuating the Standby Auxiliary Feedwater

System in the event the AFW system is inoperable. Since none of the Standby AFW system components will be exposed to a HELB, it is concluded that this system will be sufficient to provide the needed safety function. No "harsh" environmental qualification for the AFW valves is needed.

11. TER Paragraph 3.3.1.6 - Tables 3 Item No. 11. Auxiliary Feedwater Pump Motors.

- As noted in TER C5257, these pumps are not required to function in the event of a HELB in the Intermediate Building. The Standby AFW System performs the required safety function. Procedures call for removing the AFW pumps from the safety-related bus, prior to connecting the standby system. Mechanical interlocks ensure that both sets of pumps cannot be powered from the diesels concurrently. No "harsh" environmental qualification for the auxiliary feedwater pumps is required.

12. TER Paragraph 3.3.2.1 - Table 3 Item No. 8E. Valve operators for MOVs 850 A, B; 856; 857 A, B, C; 860 A, B, C, D.

- Documentation Reference 53, submitted to the NRC on September 24, 1980, provides a reference to Limitorque Report B0003. This reference provides assurance that these valves will perform their safety function. Additional information from

Limitorque Report B0058 has been added to Reference 53, documenting Limitorque's use of generic qualification to qualify multiple size actuators by one type test.

13. TER Paragraph 3.3.2.2 - Table 3 Item No. 8H Valve Operators for MOVs 852A, B.

- TER C5257 notes that these valve actuators are not acceptable for long-term service in an accident environment, and are not qualified for submerged operation. Qualification for short-term post-LOCA operation is shown in Reference 18, however. The function of these valves is to open upon receipt of an SI signal, and then to remain open. Qualification for submerged operation is not required. Submergence could occur unless the safety function of the valves has already occurred. Specifically, to submerge these valve operators, the entire contents of the primary system, the entire contents of both accumulators, and a portion of the water in the refueling water storage tank must be discharged to the containment. For this to occur, however, a safety injection signal must have occurred and the valves must have opened.

  RG&E has incorporated modifications to these valve operators to prevent undesired operation in the event of submergence. The details of these

modifications were provided in References [FLOOD-2, FLOOD-3], transmitted to FRC on May 29, 1980. It is thus considered that these valves are qualified to perform their required safety function.

14. TER Paragraph 3.3.2.3 - Table 3 Item No. 8I. Valve Operators for MOV's 9703A,B; 9704A,B; 9710A,B in the SAFW System.

- All of these valve operators are located in the Auxiliary Building Addition, which is a "mild" environment. Environmental qualification is provided under paragraph 4.3.3 of the "DOR Guidelines", Areas Normally Maintained at Room Conditions. The Auxiliary Building Addition is maintained at room conditions by redundant air conditioning systems served by the onsite emergency electrical power system. The room conditions specified in Reference 43 are 60-120°F. The valve specification (Reference 54) states that "the valve actuator shall be designed for a 40 year plant life under ambient conditions of 40F to 120F..." Since there is no change in the environmental conditions between normal and accident conditions, "...no special consideration need be given to the environmental qualification of Class IE equipment in these areas provided the aging requirements discussed in Section 7.0 are satisfied and the areas are maintained at room conditions by redundant air

conditioning or ventilation systems served by the onsite emergency electrical power system". Reference 47 describes the program developed at R. E. Ginna for detecting age-related failures. This program was developed to conform to the provisions of Section 7.0 of the "DOR Guidelines" for the "ongoing programs...to review surveillance and maintenance records to assure that equipment which is exhibiting age-related degradation will be identified and replaced as necessary".

15. TER Paragraph 3.3.2.4 - Table 3 Item No. 13A. Crouse-Hinds Electrical Penetrations.

- TER C5257 notes that the Brunswick tests could not be substantiated, since no test description was provided. Reference 45 provides this description. Reference 58 is a letter from Westinghouse stating that the Brunswick data is applicable to qualify the seal, canister, and internal connections. Reference 54 is an evaluation of the capability of the Ginna penetrations to perform their function under elevated and short-circuit electrical loading conditions.

  Further, an evaluation (Reference 59) of the functions of the various materials in the penetrations disclosed that the organic compounds, which are possibly subject to aging or radiation effects,

do not perform any critical insulating or sealing functions. These functions are performed by ceramic and metallic components. This evaluation augments the qualification testing performed on these penetrations, confirming that they are qualified to perform their safety function.

16. TER Paragraph 3.3.2.5 - Table 3 Item No. 13B. Westinghouse Electrical Penetrations.

- It is noted in TER C5257 that additional information concerning the "similar resin", aging characteristics of the insulation on the cable leads, and qualified life should be provided. Reference 61, Research Report 75-7B5-BIGAL-122, shows that the lower 95% confidence band on qualified life at 105°C is greater than 40 years. Also, the author of this report, Mr. J. F. Quirk, has stated that the word "similar" had been used only in the respect that test results of this epoxy were close to the results of other epoxies also being tested. The epoxy in the Ginna penetrations is identical to that tested. Cable lead insulation aging data is also included in Reference 61.

  It can be concluded that these penetrations are suitable to perform their required safety functions.

17. TER Paragraph 3.3.2.6 - Table 3 Item No. 14. Westinghouse Terminal Blocks Inside Containment.

- TER C5257 found that, although qualification for pressure, temperature, and humidity is acceptable, additional information is needed concerning thermal aging and radiation. Reference 60 is a Proprietary Westinghouse R&D Report (#77-7B7-CBSEL-R3) dated July 13, 1977. It shows that for a criteria of failure of 50% of the original flexure strength and impact strength, the 40 year life extrapolation is approximately 120°C. This report is not yet in our possession, but may be audited at the Westinghouse facility.

  Additional information concerning radiation susceptibility of the terminal blocks is also provided in Reference 60. It is shown that the qualification level is 2×10^7 rads. Although not meeting the long-term conservatively calculated radiation dose for Ginna of 1.6×10^8 rads, the DOR Guideline values are met. Based on the protected location of these terminal blocks, 2×10^7 rads is considered adequate. A detailed evaluation of this post-LOCA radiation dose will be made. If the required dose for the long-term monitoring function is greater, replacement or additional protection will be provided.

As presently installed, the terminal blocks for pressurizer pressure and level instrumentation would become submerged after a LOCA. When qualified long-term monitoring instrumentation for these functions is installed at Ginna, and elevated above the submergence level, the terminal blocks will also be elevated. Submergence and direct spray impingement will thus be precluded. See paragraphs 19 and 20 for a discussion of the pressurizer pressure and level instrumentation.

18. TER Paragraph 3.3.2.7 - Table 3 Item Nos. 15A, B, C. Kerite Cable Inside Containment.

- Reference 51 is the "Cable Identification and Qualification Supplement". This document can be used to determine the identity of cable in use throughout the plant. It is shown that all power cable inside containment is Kerite. The most recent and comprehensive qualification testing of Kerite cable was performed in conjunction with the testing of Raychem sleeves (Reference 38). Reference 55 is a letter from Kerite verifying that the cable supplied for the qualification testing in Reference 38 is identical to that originally supplied and installed in the Ginna containment. The pre-aging done for the Kerite cable during the Raychem sleeve test established a 93.3 year life

at 140°F mean surface temperature. The Arrhenius data is confidential to the manufacturer, but is available at RG&E as Reference 63.

RG&E believes that this recent testing definitively demonstrates the adequacy of the Kerite cable for performing its required safety function.

There are no safety-related cables inside containment subject to flooding, which are required to perform a safety function during submergence. Qualification for submergence is thus not required.

19. TER Paragraph 3.3.2.8 - Table 3 Item No. 22. Pressurizer Pressure Transmitters.

- The deficiencies noted in TER C5257 included lack of radiation and submergence qualification. RG&E does not claim credit for the use of this instrumentation at the time it would receive excessive radiation exposure, or become submerged. Ginna Emergency Procedures specify that, unless pressurizer pressure, level, and other parameters appear stable and are returning to prescribed levels, safety injection flow is not to be terminated. Failure to terminate safety injection is not a safety concern. Therefore, lack of qualification for this instrumentation is not considered of immediate safety significance.

It is recognized, however, that accurate primary system information would be extremely useful to the operator for diagnosing the status of the plant during accident conditions. RG&E, therefore, plans to replace the present instrumentation by June 1982 with fully-qualified transmitters, located above any possible submergence level. Qualification documentation will be made available when received.

20. TER Paragraph 3.3.2.9 - Table 3 Item No. 24. Pressurizer Level Instrumentation.

- The same information as described in 19 above for the pressurizer pressure instrumentation applies to this instrumentation.

21. TER Paragraph 3.3.2.10 - Table 3 Item No. 30. Fan Cooler Motors Inside Containment.

- TER C5257 concluded that in addition to the information provided in References 18 and 20, information needed for complete qualification of the fan cooler motors is a) documentation regarding qualification of motor-lead and lead-to-cable splices, and (b) determination of a qualified life for the motor. Information regarding the splices is given in Reference 64.

Aging information for the insulating material of these motors, as well as the bearing lubricants, is given in Reference 18, Section 4. Aging to demonstrate 40 year continuous operation at 120°C was performed. This is consistent with the data given in Reference 67, and is considered sufficient to qualify the fan cooler motors for continued operation. A program at RG&E to maintain motor bearings and lubricants is given in Reference 65. This program will ensure that the lubricants used are compatible with the environmental conditions which could occur during a DBE.

Additional information regarding qualification testing of the same type of motors is given in WCAP 7829, "Fan Cooler Motor Unit Test" (Reference 70).

22. TER Paragraph 3.3.2.11 - Table 3 Item No. 34. Raychem Cable Splice Sleeves.

- TER C5257 states that RG&E should present evidence of similarity between the tested and installed equipment. This is documented in the detailed evaluation and observation of the splice sleeve replacement program, given in IE Inspection Reports 78-20 and 78-21 (Reference 56).

  It is also stated that a determination of qualified life should be made for the sleeves. The actual

test in Reference 38 established a 12.1 year life at 60°C ambient. This pre-aging was constrained by the concurrent aging of the Kerite cable, which was pre-aged for 93.3 years at 60°C by the same test. Based on proprietary Raychem information (included in Reference 63 and available for audit at RG&E) a 40 year life at 91°C can be expected. Therefore, these sleeves are considered fully qualified.

23. TER Paragraph 3.3.2.12 - Table 3 Item No. 20. Steam Flow Transmitters Inside Containment.

- RG&E has stated that these transmitters are not required to perform a safety function at a time they could be exposed to a high energy line break environment. Thus, the lack of complete qualification documentation is a moot point for these transmitters. For a steam line break inside containment, the steam line non-return check valves will assure that the intact steam generator will not blow down. Steam line isolation would be provided by the high containment pressure signal.

  For added assurance of steam line isolation in the event of a steam break inside containment, these transmitters will be replaced by June 1982 with fully-qualified equipment. Qualification documentation will be made available when received.

24. TER Paragraph 3.3.2.13 - Table 3 Item No. 21B. Containment Pressure Transmitters in the Intermediate Building.

- As noted in Section IV.3 of this report, five of the seven containment pressure transmitters, which could be exposed to high post-LOCA radiation levels, are being replaced with LOCA-qualified units by June 1982, in response to TMI Lessons Learned. Qualification documentation will be made available when received.

25. TER Paragraph 3.3.2.14 - Table 3, Item No. 37, Hydrogen Recombiner Igniter Exciter

- TER C5257 requested that the effects of containment spray and thermal aging be addressed. This information has not yet been received. If proper documentation is not found concerning these environmental parameters, RG&E will commit to replace the necessary equipment. It is important to note that the present licensing basis for Ginna does not include the hydrogen recombiner as a means necessary for post-LOCA hydrogen control (see the RG&E "Technical Supplement Accompanying Application for a Full Term Operating License," August 1972, Section III.B.7).

26. TER Paragraph 3.3.2.15 - Table 3, Item No. 38, Hydrogen Recombiner Blower Motor.

- The only deficiency noted in TER C5257 is that no analysis exists comparing the impact of deviations between the test specimen specific design features, materials, and production procedure and those of the installed equipment. The only evidence at this time is contained in Section 5.2 of Reference 18, WCAP 7410-L, Vol. II. It is stated that "the 2 hp motor used in the test program is constructed in the same manner as is the actual 15 hp motor used in the recombiner." Further, it has been verified that the Ginna 15 hp motor has Class H insulation, the same as the 2 hp motor tested.

  Based on the available information, RG&E believes that there is reasonable assurance that the Ginna recombiner motor will perform its safety function. Further, as stated in 25 above, the hydrogen recombiner is not required by the present Ginna design basis. Based on the TMI Lessons Learned, however, RG&E will commit to replace the motor if proper environmental qualification documentation is not established.

27. TER Paragraph 3.3.3.1 - Table 3 Item No. 8B. Valve Operators for MOVs 826 A,B,C,D; 896 A,B.

- The MOVs 826 A,B,C,D are located at the discharge of the Boric Acid Storage Tanks, and provide suction to the SI pumps in the event of a Safety

Injection signal. Upon low BAST level, these valves close after the 825 A,B valves open. The valves are located in the auxiliary building, and will have completed their function prior to the presence of an adverse environment caused by sump recirculation fluid.

MOVs 896 A,B are normally locked-open valves, located at the suction of the SI and CS pumps from the RWST. The valves are closed prior to the time sump recirculation is initiated. Therefore, these valves will have completed their function prior to the time an adverse environment would occur.

In the case of all six valves, environmental qualification for an adverse environment is not required.

28. TER Paragraph 3.3.3.2 - Table 3 Item Nos. 1A, 1B, 1C, 5. ASCO solenoid valves.

- The feedwater control and bypass valves (items 1A, 1B) fail closed on loss of air. This is supported by Reference 23. In order to further ensure that these valves will perform their safety function when exposed to a HELB in the Turbine Building, the solenoids will be replaced with valves having proper qualification documentation. It is expected that this can be accomplished by June 1982. The fail-safe closure of the valves ensures that the

required safety function can be performed until replacement can be effected.

Item 1C, the solenoid controlling LCV112B, will not experience an adverse environment during an accident. Further, an accessible manual bypass valve, valve 358, is used to provide alternative suction for the charging pumps from the RWST. Since this function would not be required for many hours following an event requiring the maintenance of a safe shutdown condition, the use of this manual valve is considered acceptable. Item 1C will thus be deleted from Table 3.

Item 5A, the RHR discharge valves, are normally open. They need only remain open in the event of an accident. The I/P controller (rather than a solenoid valve) controlling their position is fail-open. Since no function must be performed by these valves, they have been deleted from Table 3.

Item 5B, the solenoid valves for AOVs 897 and 898, are required to close prior to sump recirculation. They will not experience an adverse environment prior to the time they must perform their safety function. Environmental qualification of these valves will be addressed in a later submittal, concerning electrical equipment located in a "mild" environment.

29. TER Paragraph 3.3.3.3 - Table 3 Item No. 2. Copes-Vulcan Solenoid Valves.

- The valves were purchased from ASCO (Series 8300). Therefore, all information from Reference 23 applies to the valves. Further, since these valves are located in a "mild" environment, qualification of these valves will be discussed at a later time.

30. TER Paragraph 3.3.3.4 - Table 3 Item Nos. 3A, 3B. Lawrence Solenoid Valves in Intermediate Building.

- Based on the design principle of these valves, they will perform their safety function by failing in a closed position upon loss of power. However, if power qualification documentation is not established, RG&E will initiate a replacement for these solenoid valves. Qualification documentation will be made available when received. The fail-safe mode of operation ensures no loss of safety function in the interim.

31. TER Paragraph 3.3.3.5 - Table 3 Item No. 4. Versa Solenoid Valves inside containment.

- The safety function of the solenoid valves controlling the containment air recirculation dampers is accomplished through fail-safe operation. This is accomplished immediately with the SI signal following an accident, before environmental conditions would

become very severe. In order to have this safety function accomplished with equipment having the proper qualification testing and documentation, replacement of these solenoid valves will be initiated. It is expected that this can be accomplished by June 1982. Qualification documentation will be made available when received.

32. TER Paragraph 3.3.3.6 - Table 3 Item Nos. 6A, 6B. Versa Solenoid Valves.

- The safety function of these containment purge and depressurization valves immediately following an accident is to close for containment isolation. This is accomplished by the fail-close design of these valves. In order to have this safety function accomplished with equipment having the proper qualification testing and documentation, replacement of these solenoid valves will be initiated. It is expected that this can be accomplished by June 1982. Qualification documentation will be made available when received.

33. TER Paragraph 3.3.3.7 - Table 3 Item No. 7. Control Room Dampers.

- This equipment item is not electrical, and therefore is not addressed in this report. The solenoid valves operating these dampers are addressed under paragraph TER 3.3.3.24 (Table 3, Item No. 40).

34. TER Paragraph 3.3.3.8 - Table 3 Item No. 9. Standby AFW Pump Motors.

- Although this item is not located in a harsh environment, and therefore does not need to be addressed at this time, RG&E considers the environmental qualification of this item to be complete and acceptable. As stated in Section 4.3.3 of the DOR Guidelines, "No special consideration need be given to the environmental qualification of Class IE equipment in these [non-harsh] areas provided the aging requirements discussed in Section 7.0 are satisfied and the areas are maintained at room conditions by redundant air conditioning or ventilation systems served by the onsite emergency electrical power system." This is the case with these motors. The equipment specification for these motors (Reference 3) states "Motors shall be rated for operation in an <u>ambient temperature</u> of 50°C [122°F]". This is consistent with the ambient operating conditions for the Auxiliary Building Addition of 60-120°F (Reference 43). Furthermore, the ongoing program described in Reference 47 to detect age-related failures includes these motors. RG&E therefore considers these motors to have met all necessary environmental requirements.

35. TER Paragraph 3.3.3.9 - Table 3 Item Nos. 10A, 10B, 10C, 12A. Motors for the Containment Spray Pumps, Component Cooling Water Pumps, Residual Heat Removal Pumps, and Safety Injection Pumps.

- The first three of these Ginna motors have Class B insulation made of "Thermalastic Epoxy". The SI pump motor insulation is "PMR" (Premimum Moisture Resistant). This is shown in Reference 67. Qualfication of these systems is given in WCAP 8754, (Reference 68), for the "Thermalastic Epoxy" motors, and the Westinghouse Research Report 71-1C2-RADMC-R1, "The Effect of Radiation on Insulating Materials Used in Westinghouse Medium Motors," December 31, 1970 (Revised April 10, 1971) (Reference 69) for the "PMR" motors. These reports are proprietary, but are available for audit at RG&E and at Westinghouse. Testing does indicate that these motors can withstand an accumulated dose of 10^7 rads during their operating life, with an operating life of 20 years. Since these motors are not used at all times (only the CCW pump is used during normal operation, and even then only one of the two pumps is normally in use), the operational capability is at least 40 years. Also, RG&E has a program of insulation inspection once per year (M45.1A, Inspection of Safeguard Motor) and replacement (if needed) every five years.

Since the only adverse environment anticipated for any of these motors is a post-LOCA radiation dose (conservatively estimated in Reference [TMI-3] as 2.8×10^6 rads) these motors are considered properly qualified both for "life" and radiation.

36. TER Paragraph 3.3.3.10 - Table 3 Item No. 12B. Service Water Pump Motor.

- As stated in Reference [Flood-15], the effects of jet impingement and water spray on these motors were evaluated by the NRC during the review of SEP Topic III-5.B, "Pipe Break Outside Containment". RG&E committed to supplement the NRC recommendation in Reference [FLOOD-13]. Thus, the Service Water Pump Motors have been removed from the HELB environment considerations. Further review for operation is a "mild" environment will be conducted at a later time.

37. TER Paragraph 3.3.3.11 - Table 3 Item No. 16. Coleman Cable Inside Containment.

- Reference 51 is the "Cable Identification and Qualification Supplement". This reference allows traceability of all cable used in the Ginna plant, by referencing back to the original purchase order specifications. It can be seen that, in addition to the Kerite safeguards cable, the only other cable inside containment used to perform a required

post-accident safety function is the silicone-rubber insulated cable, which is used for all required safety-related instrumentation and control cable. Reference 46 identifies this as Coleman cable. In addition to the testing stated in Reference 46, a section of this cable was taken from the Ginna plant, and environmentally qualified with the Raychem splice sleeves (documentation of the testing is given in FRC Final Report Supplement, F-C5074 (Supplement), April 1979, which is included in Reference 51). The cable is specimen number C5074-7 of Table 1 of F-C5074 Supplement.

This testing shows that the Coleman silicone-rubber insulated cable will perform its required safety functions inside containment.

Reference 46 states that this cable is aged at 200°C for 168 hours. Although no specific Arrhenius plot is available, the application of the "10°C rule" shows an operating life of 40 years at 60°C. This is considered a reasonable estimate of the expected life of this cable.

38. TER Paragraph 3.3.3.12 - Table 3 Items 17A, 17B, 17C. Coleman, Rome, and General Cables Used Outside Containment.

- Reference 51 is the "Cable Identification and Qualification Supplement". From this reference, the type of cable used throughout the Ginna plant

can be traced by reference back to the original purchase order specification. It is shown that all of the safety-related cable outside containment which is not Kerite cable is PVC-insulated cable. The specifications included in Reference 51 refer to GAI Specs SP-5324 and SP-5315. Both of these specifications in turn specify the requirements of IPCEA S-61-402 for PVC-Cable. Information from this standard is provided in Reference 10. Additional information for Coleman and Rome cable is provided in Reference 46.

The IPCEA testing of this cable, including insulation aging at 121°C (250°F) for 168 hours (jacket at 212°F), oil immersion, heat shock, and cold shock, shows the ability to operate under conditions more severe than those anticipated outside containment. Although no specific qualification testing was performed, the standard testing of these cable types gives reasonable assurance that they are suitable for outside-containment use.

39. TER Paragraph 3.3.3.13 - Table 3 Item No. 27. RTDs Inside Containment.

Reference 35 is a specification sheet and drawing of the Ginna RTD (Rosemount 176JA model).

The reactor coolant system temperature detectors (RTD) are not required for a loss of coolant

accident. In a steam line break accident, low Tave plus high steam flow plus a safety injection signal will close the main steam line isolation valves. Also, high-high steam flow will perform this function. As described in Section II.B above, for a break upstream of the non-return check valves, which includes all breaks inside containment, closure of the main steam isolation valves is not required.

For breaks downstream of the check valves, closure of the main steam isolation valves is desirable, however, in this case the RTDs are not subjected to an adverse environment. Therefore, the RTDs do not require environmental qualification to provide their required safety function. However, the RTDs would be useful for post-accident monitoring. Since the RTDs are not qualified for post-accident use, the present Ginna Emergency Procedures specify that, if a 50°F subcooling margin cannot be established or maintained, safety injection flow shall not be terminated. Failure of the RTDs would require that SI flow be maintained. Since the Ginna high head safety injection pumps do not have a high enough shutoff head to open the pressurizer PORVs, continued SI pump operation is not a safety concern. However, to avoid the possibility of operator confusion, RG&E will initiate a program to provide

qualified RTDs for post-accident monitoring. These will be procured and installed by June 1982, subject to equipment availability and procurement/ delivery schedules.

40. TER Paragraph 3.3.3.14 - Table 3 Item No. 28. Batteries in the Control Building.

- As noted in TER C5257, the ventilation system is being modified, such that the battery rooms can be considered a "mild" environment. Reference [HELB-13] committed to a resolution of the potential flooding problem. The batteries will thus be further discussed at a later time, together with other equipment located in a "mild" environment.

41. TER Paragraph 3.3.3.15 - Table 3 Item No. 26. Steam Generator Level Transmitter.

- The steam generator level transmitters, although useful for confirming secondary system heat removal capability, are not necessary for performing this function. For an accident inside containment, which could degrade the performance of the SG level transmitters, the main steam pressure transmitters, located outside containment, provide information regarding steam generator status. Auxiliary feedwater flow instrumentation for each steam generator, also located outside containment, provides the primary indication of the steam generator heat

removal capability. Based on the latest information provided at the Westinghouse Emergency Operating Instructions seminar, the Ginna Emergency Procedures will be revised to reflect AFW flow indications as being of prime value as the main indication of secondary heat removal capability.

Nevertheless, in order to remove the possibility of operator confusion due to misleading instrument indications, the steam generator Level transmitters will be replaced by June 1982. Qualification documentation will be made available when received.

42. TER Paragraph 3.3.3.16 - Table 3 Item Nos. 29A, 29B, 29C. Diesel Generator Electrical Equipment.

- This equipment is located in a "mild" environment. Its qualification will reviewed at a later date.

43. TER Paragraph 3.3.3.17 - Table 3 Item No. 35. Valcor Solenoid Valves for the Pressurizer PORVs.

- Additional information has been added to Reference 48, consisting of the test results and testing methodology. This was provided to the NRC and FRC on September 24, 1980. The entire test report is also available for audit and review at RG&E.

  These valves are fully qualified to IEEE-323-1974 to perform their post-accident safety function.

44. TER Paragraph 3.3.3.18 - Table 3 Item No. 36. Sump B Wide Range Level Switch.

- Reference 52, the specification sheet for this item, was provided to the NRC and FRC on September 24, 1980. There is evidence that these level switches can perform their function in a containment post-accident environment. However, not all of the requirements of the DOR Guidelines are met for this instrumentation. It is important to note, however, that these instruments are not used to perform any post-accident safety-related functions, and are not specified for use in the Ginna Emergency Procedures except as confirmatory information. The safety-related function of determining the timing of the "sump switchover" procedure is performed by the RWST level instrumentation, located outside containment.

  The TMI Lessons Learned determined that a wide-range sump level indication was to be provided for operator information. Fully-qualified equipment will be purchased to meet this requirement. The qualification documentation for this instrumentation will be made available when received.

45. TER Paragraph 3.3.3.19 - Table 3 Item Nos. 42, 43. Motors for Cooling Fans for RHR, CS, SI, and Charging Pumps in Auxiliary Building.

- Reference 69 provides information concerning the life and radiation characteristics of these motors. These motors are capable of operation after a radiation exposure of 1×10^7 rads and 20 years. Since these motors are run only intermittently, operational capability for 40 years is shown. Since the only harsh environment experienced by these motors is post-LOCA radiation (estimated at 2.8×10^6 rads), operation under required accident conditions is shown.

46. TER Paragraph 3.3.3.20 - Table 3 Item Nos. 32, 44. I&C Cabinets and Relay Racks in Relay Room.

    - This equipment is located in a mild environment. Its qualification will be considered at a later time.

47. TER Paragraph 3.3.3.21 - Table 3 Item No. 33A. Control Room HVAC Air Handling Units.

    - This equipment is located in a mild environment. Its qualification will be considered at a later time.

48. TER Paragraph 3.3.3.22 - Table 3 Item No. 33B. Control Room HVAC Fans.

    - This item is not an electrical piece of equipment. It has thus been deleted from Table 3, and from consideration in this report.

49. TER Paragraph 3.3.3.23 - Table 3, Item No. 39, Charging Pump Motors.

- This equipment is located in a mild environment. Its qualification will be considered at a later time.

50. TER Paragraph 3.3.3.24 - Table 3 Item No. 40. Control Room HVAC Damper Solenoids.

- This equipment is located in a mild environment. Its qualification will be considered at a later time.

LOSS OF COOLANT ACCIDENT

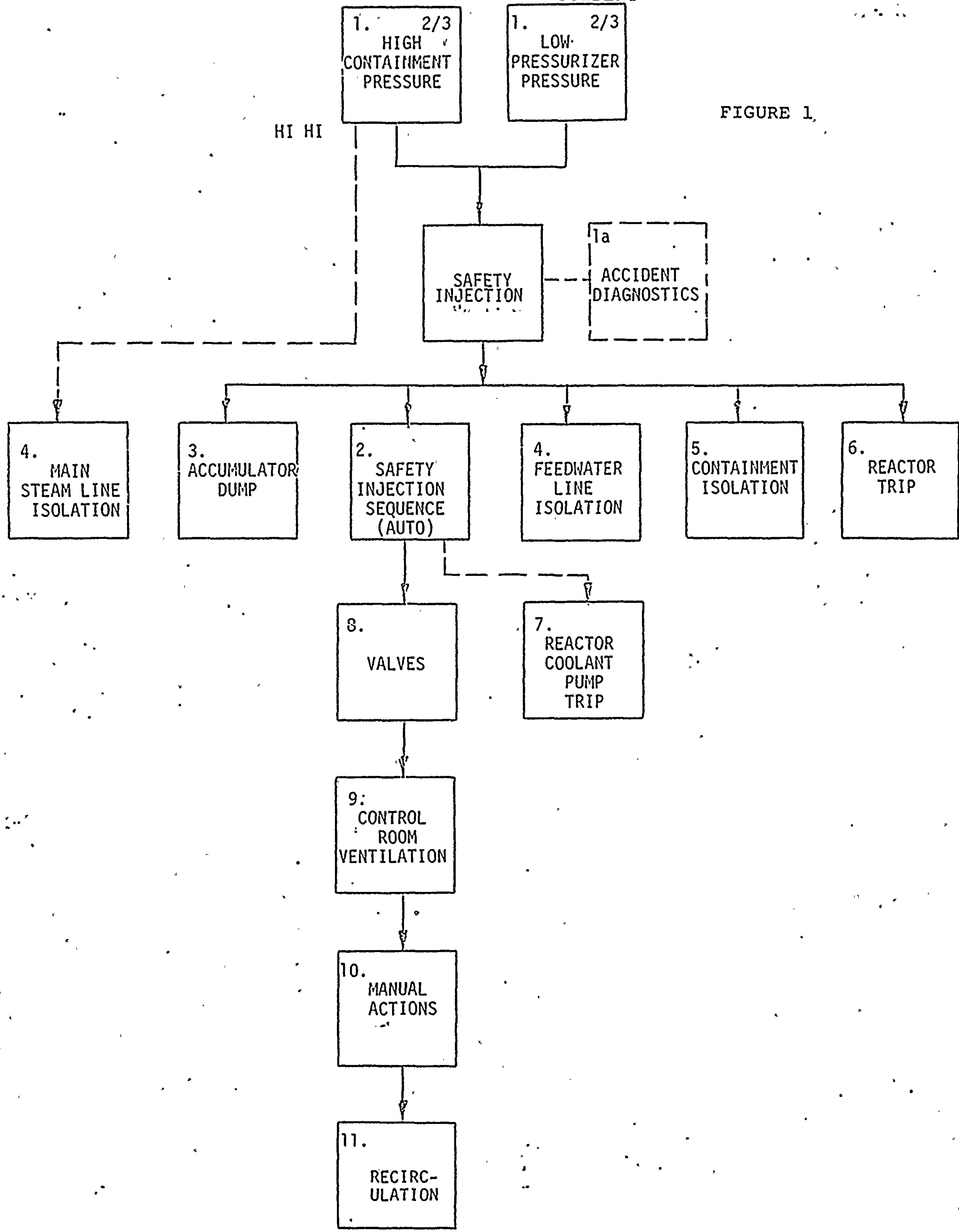


FIGURE 1

BLOCK NO./EQUIPMENT	SAFETY FUNCTION	REQUIRED OPERATION TIME
1. High Containment Pressure Low Pressurizer Pressure		
PT 945, 946, 947 PT 948, 949, 950	Provide signals for Containment Spray, Safety Injection, Containment Isolation, and Main Steam and Feedwater Line Isolation	Signal Initiation
	Accident Diagnostics	Short term
PT 429, 430, 431, 449	Provide Reactor trip and Safety Injection signals	Signal Initiation
	Accident Diagnostics	Short term
Splice Sleeves, Terminal Blocks, Electrical Penetrations, Electrical Cable	Control and Power Signal Transmission	Long term
1a. Steam Line Pressure PT 468, 469, 482 PT 478, 479, 483	Accident Diagnostics	Short term
Containment Radiation [Being provided per TMI STLL]	Accident Diagnostics	Short term
Containment sump level LT 942, LT 943	Accident Diagnostics	Short term
2. Safety Injection Sequence (Auto) Batteries	D. C. Power	Long Term
1A, 1B Diesel Generator and Auxiliaries	Power supply to safeguards busses during loss of outside AC Power	Long term
480 Volt Safeguards busses 14, 16, 17, 18	Provide the distribution of power to safeguards equipment	Long term
1A, 1B, 1C Safety Injection Pumps	High head injection of borated water to Reactor Coolant System	Long term
1A, 1B Containment Spray Pumps (only on hi-hi Cont. pressure)	Containment Pressure, Temperature, and Iodine control	Long term

BLOCK NO./EQUIPMENT		SAFETY FUNCTION	REQUIRED OPERATION TIME
	1A, 1B Residual Heat Removal Pumps	Low head injection of borated water to Reactor Vessel	Long term
	1A, 1B, 1C, 1D Service Water Pumps	Cooling water to RHR and CCW Heat Exchangers	Long term
	1A, 1B, 1C, 1D Containment Recirc. Units	Containment Pressure, Temperature, and Iodine control	Long term
	Cooling Units for pump motors (SI, RHR, CS, and Charging)	Maintain motors within proper ambient temperature limits	Long Term
	1A, 1B Motor Driven Aux. Feedwater Pumps	Cooling water to Steam Generators	Long term
	480 Volt Safeguards MCC's	Provide the distribution of power to safeguards equipment	Long term
3.	Accumulator Dump		
	MOV 841 (N.O.)* MOV 865 (N.O.)	Provide path to Reactor Vessel from Accumulators for injection of borated water	Not required to function
4.	Main Steam Line Isolation Feedwater Line Isolation		
	AOV 3516 AOV 3517	Isolate 1A, 1B Steam Generators	5 Seconds after signal
	AOV 4269 AOV 4270 AOV 4271 AOV 4272	Isolate Main Feedwater System	5 Seconds after signal
5.	Containment Isolation	See Text, Section II.A.5	
6.	Reactor Trip		
	Reactor trip breakers	Provide means to trip the reactor	Required for Reactor Trip
	Reactor protection and instrumentation cabinets	Provide the instrumentation and protection circuits for the control and tripping of the Reactor	Required for Reactor Trip
7.	RCP Trip RCP Trip Breakers	Provide means to trip RCP's	Short term

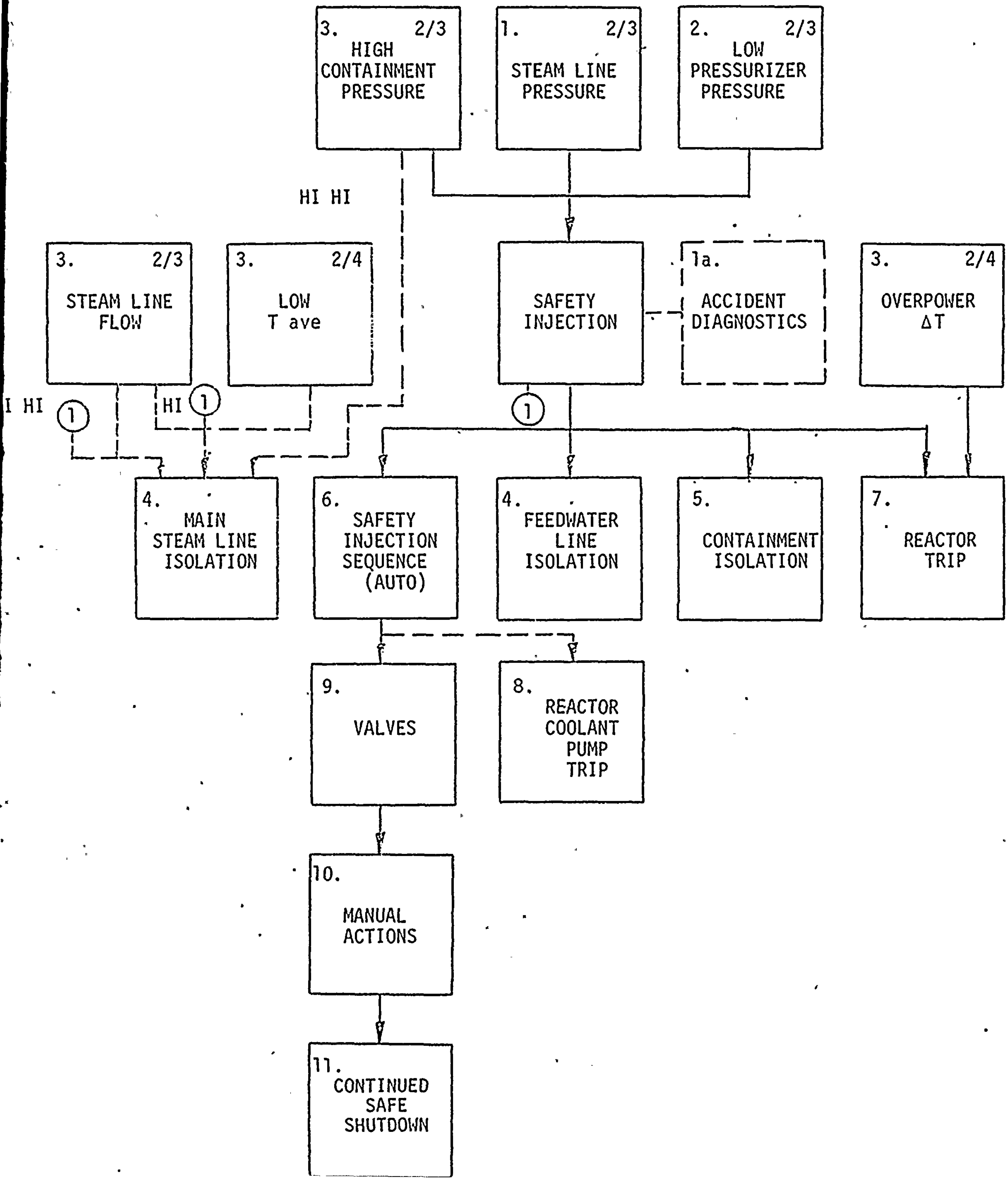
*N.O. = Normally Open

...CK NO./EQUIPMENT	SAFETY FUNCTION	REQUIRED OPERATION TIME
...alves		
MOV 825 A,B MOV 826 A,B,C,D (B&D N.O.)	Provide path to SI Pumps for borated water to high head safety injection	10% BAST Level or~1/2 hour
AOV 836 A;B	Provide controlled addition of NaOH to Containment Spray for Iodine control	Short term
MOV 852 A,B	Provide path to Reactor Vessel of borated water for low head safety injection	SI initiation
MOV 860 A,B,C,D	Provide path to Containment Spray headers for CS Pumps	Long term
BAST Level LT 102, 106, 171, 172	Indicate BAST Level for automatic transfer of SI Pump suction from BAST to RWST	10% BAST Level or~1/2 hour
MOV 878 B,D (N.O.)	Provide path to cold legs of RCS from high head safety injection	not required to function
MOV 4007, 4008 1A, 1B Steam Generators	Provide path for Aux. Feedwater to	Short term
AOV 5871, 5872, 5873 AOV 5874, 5875, 5876	Provide path for cleaning of cont. atmosphere by fan coolers	signal initiation
9. Control Room Ventilation Dampers and AHU	Provide cleaning of Control Room atmosphere	Short term
10. Manual		
Safety Injection Reset Button	Reset Safety Injection signal after automatic S.I. Sequencing is complete	less than 24 hours
1A, 1B Component Cooling Water Pumps	Cooling water for safeguards equipment	Long term
1A, 1B Containment Spray Pumps (if Cont. Pressure <30 psig)	Containment Pressure, Temperature and Iodine control	Long term
RWST Level LT 920, LIC 921	Indicate RWST Level for operator transfer from S.I. phase to Recirculation phase	less than 24 hours

BLOCK NO./EQUIPMENT	SAFETY FUNCTION	REQUIRED OPERATION TIME
MOV 4027, 4028	Provide Service Water to Motor Driven Aux. Feedwater Pumps suction	within~2 hours
MOV 4000A, 4000B	Provide AFW Cross-Connect	Short term
MOV 4734, 4735, 4615, 4616 MOV 738 A,B	Direct SW Flow to CCW HX's Direct CCW Flow to RHR HX's	less than 24 hours less than 24 hours
Standby AFW Pumps	AFW Flow to SG's if normal AFW System inoperable	Long term
MOV 9629 A,B	Provide SW to suction of standby AFW Pumps	Long term
MOV 9710 A,B; 9703 A,B; 9704 A,B	Standby AFW Discharge Valves to provide flow to SG's	Long term
Steam Generator Level LT 460, 461, 462, 463 LT 470, 471, 472, 473	Monitoring	Long term
Sampling (being provided per TMI)	Sample containment atmosphere and reactor coolant	Long term
Hydrogen Recombiners	Maintain hydrogen control	Long term
Pressurizer PORVs	RC Pressure Control	Long term
11. Recirculation		
MOV 850 A,B outside cont. MOV 851 A,B (N.O.) inside cont.	Provide path to RHR suction from B sump for low head safety injection	Long term
MOV 856 (N.O.)	RWST isolation valve to RHR pumps suction, must close after RWST is drained	required to function to switch to recirc phase
MOV 896 A,B (N.O.)	RWST isolation valve, must close after RWST is drained	required to function to switch to recirc phase
MOV 857 A,B,C	Provide path to suction of SI and CS Pumps from RHR pumps discharge	required to function to switch to recirc phase
AOV 897, 898	Isolate high head recirculation flow to RWST during sump recirculation	Short term
MOV 704 A,B recirculation	Close during switch to sump	less than 24 hours

MAIN STEAM OR FEED LINE BREAK

FIGURE 2



MAIN STEAM LINE BREAK

SAFETY FUNCTION/BREAK LOCATION

	BLOCK NO./EQUIPMENT	SAFETY FUNCTION INSIDE CV	SAFETY FUNCTION OUTSIDE CV	REQUIRED OPERATION TIME
1.	Steam Line Pressure PT 468, 469, 482 PT 478, 479, 483	Provide signal for SI on low steam line pressure	same	signal initiation
1a.	Steam Line Pressure (see 1 above)	Accident Diagnostics	same	short term
	Containment Radiation	Accident Diagnostics	NA	short term
	Containment Sump Level	Accident Diagnostics	NA	short term
	High Containment Pressure (see 3 below)	Accident Diagnostics	NA	short term
2.	Low Pressurizer Pressure			
	PT 429, 430, 431, 449	Provide Reactor trip and Safety Injection signals	same	signal initiation
3.	Electrical Penetrations, Cable, Sleeves, and Terminal Blocks	Provide control and Power Signal Transmission	same	long term
	High Containment Pressure			
	PT 945, 946, 947 PT 948, 949, 950	Provide signals for Containment Spray, Safety Injection, Containment Isolation, and Main Steam Line Isolation	NA	signal initiation
	Steam Line Flow			
	FT 464, 465 FT 474, 475	Provide signals for Reactor trip and Main Steam Line Isolation	same	signal initiation
	Reactor Coolant Temperature			
	Loop A Hot Leg TE 401A, 402A, 405A, 406A, 409A	Provide Low Tave & Δ signals for Reactor trip, Safety Injection and Main Steam Line Isolation	same	signal initiation

SAFETY FUNCTION/BREAK LOCATION

BLOCK NO./EQUIPMENT	SAFETY FUNCTION INSIDE CV	SAFETY FUNCTION OUTSIDE CV	REQUIRED OPERATION TIME
Loop A Cold Leg TE 401B, 404A, 407A, 408A, 410A			
Loop B Hot Leg TE 403B, 404B, 407B, 408B, 410B			
Loop B Cold Leg TE 403B, 404B, 407B, 408B, 410B			
4. Main Steam Isolation			
AOV 3516 AOV 3517	Isolate 1A, B Steam Generators	same	5 seconds after signal
Feedwater Line Isolation			
AOV 4269 AOV 4270 AOV 4271 AOV 4272	Isolate Main Feed-water system	same	5 seconds after signal
5. Containment Isolation	See Text, Section II.B.5	same	
6. Safety Injection Sequence (Auto) Batteries	D.C. Power	same	Long term
1A, 1B Diesel Generators and auxiliaries	Power supply to safe-guards busses during loss of outside AC Power	same	Long term
480 Volt Safeguards busses 14, 16, 17, 18	Provide distribution of power to safe-guards equipment	same	Long term
1A, 1B, 1C Safety In-jection Pumps	High head injection of borated water to Reactor Coolant System	same	Long term
1A, B Containment Spray Pumps (only on hi-hi cont. Pressure)	Containment Pressure and Temperature control	N/A	Long term
1A, 1B, 1C, 1D Service Water Pumps	Cooling Water to CCW Heat Exchanger	same	Long term

MAIN STEAM LINE BREAK

SAFETY FUNCTION/BREAK LOCATION

BLOCK NO./EQUIPMENT	SAFETY FUNCTION INSIDE CV	SAFETY FUNCTION OUTSIDE CV	REQUIRED OPERATION TIME
1A, 1B, 1C, 1D Containment Recirc Units	Containment Pressure and Temperature control	N/A	Long term
1A, 1B Motor Driven Aux. Feedwater Pumps	Cooling water supply to Steam Generators	same	Long term
Cooling Units for SI, CS, RHR, and Charging Pump	Maintain motors within proper ambient temperature limits	same	Long term
480 Volt Safeguards MCCs	Provide the distribution of power to safeguards equipment	same	Long term
7. Reactor Trip			
Reactor trip breakers	Provide means to trip the reactor	same	Required for Reactor Trip
Reactor Protection and Instrumentation Cabinets	Provide the instrumentation and protion circuits for the control and tripping of the reactor	same	Required for Reactor Trip
8. Reactor Coolant Pump Trip RCP Trip Breakers	Provide means to trip RCPs	NA	Short term
9. Valves			
MOV 825A, B MOV 826A, B, C, D (B&D N.O.)	Provide path to SI Pumps for borated water to high head safety injection	same	10% BAST Level or~1/2 hour
AOV 836A, B	Provide NaOH to CS if needed		Short term
MOV 860A, B, C, D	Provide path to Containment Spray headers for CS Pumps	N/A	Long term
MOV 878, B, D (N.O.)	Provide path to cold legs of RCS from high head safety injection	same	not required to function

MAIN STEAM LINE BREAK

SAFETY FUNCTION/BREAK LOCATION

BLOCK NO./EQUIPMENT	SAFETY FUNCTION INSIDE CV	OUTSIDE CV	REQUIRED OPERATION TIME
MOV 896, A, B, (N.O.)	Provide path from RWST of borated water for SI and CS pumps suction	same	short-term (to close if need sump recirculaton)
MOV 4007, 4008	Provide path for Aux. Feedwater to Steam Generators	same	Short term
AOV 5871, 5872, 5873 AOV 5874, 5875, 5876	Provide path for cleaning by fan coolers, cooling of cont. Atmosphere	N/A	signal initiation
BAST Level LT 102, 106, 171, 172	Indicate BAST Level for automatic transfer of SI Pump suction from BAST to RWST	same	10% BAST Level or~1/2 hour
MOV 852A, B	Provide path for low head SI to Reactor Vessel	same	Signal Initiation
10. Manual			
SG Level Instrumentation LT 470, 471, 472, 473 LT 460, 461, 462, 463	Determine affected SG	same	Short term
Safety Injection Reset Button	Reset SI signal after Automatic SI sequencing is complete	same	less than 24 hours
1A, 1B Component Cooling Water Pumps	Cooling Water for safeguards equipment	same	Long term
1A, 1B Containment Spray Pump (If cont. Pressure < 30 psig)	Containment Pressure and Temperature control	N/A	Long term
MOV 4027, 4028	Provide Service Water to Motor Driven Aux. Feedwater Pumps Suction	same	within ~2 hours
Charging pumps	Inventory control to RCS	same	Long term

MAIN STEAM LINE BREAK

SAFETY FUNCTION/BREAK LOCATION

BLOCK NO./EQUIPMENT	SAFETY FUNCTION INSIDE CV	SAFETY FUNCTION OUTSIDE CV	REQUIRED OPERATION TIME
Standby AFW pumps	Provide flow to SGs if AFW system inoperable	same	Long term
MOV 9629A, B	Provide SW to suction of Standby AFW Pumps	same	Long term
MOV 9710A, B; 9703A, B; 9704A, B	Standby AFW discharge valves to provide AFW flow to SGs	same	Long term
MOV 4000A, B	AFW Cross-Connect Valves	same	Short term
11. Continued Safe Shutdown			
Sampling (per TMI)	Sample Containment Atmosphere and Reactor Coolant	same	Long term
Pressurizer PORVs	RC Pressure Control	same	Long term

Accident References

LOCA analysis [LOCA]

1. FSAR

2. "ECCS Analysis for the R. E. Ginna Reactor with ENC WREM-2 PWR Evaluation Model" dated December 1977 submitted with Application for Amendement to Operating License, on January 6, 1978.

3. ECCS Analysis submitted by letter dated April 7, 1977 from L. D. White, Jr., RG&E to A. Schwencer, Chief, Operating Reactors Branch #1, USNRC.

4. ECCS Analysis for the R. E. Ginna Reactor with ENC WREM-2 PWR Evaluation Model. Exxon Nuclear Co. Report XN-NF-77-58.

5. Ginna Emergency Procedures E1.1 and E1.2, submitted by letter dated February 26, 1980 from L. D. White, Jr. RG&E, to D. L. Ziemann, USNRC.

Steam Line Break and Feedwater Line Break [SLB/FLB]

1. FSAR

2. Steam line break analyses submitted with Application for Amendment to Operating License on September 22, 1975.

3. Plant Transient Analysis for the R. E. Ginna Unit 1 Nuclear Power Plant, Exxon Report XN-NF-77-40 (11/77 and updated 12/15/78 and March, 1980.

4. Letter dated May 24, 1977 from K. W. Amish, RG&E to J. F. O'Leary, NRC.

5. Ginna Emergency Procedures E1.1 and E1.3, submitted by letter dated February 26, 1980 from L. D. White, Jr., RG&E to D. L. Ziemann, USNRC.

6. Letter from L. D. White, Jr., RG&E, to D. L. Ziemann, NRC, March 28, 1980.

High Energy Line Break [HELB]

1. "Effects of Postulated Pipe Breaks Outside the Containment Building", GAI Report No. 1815, submitted by letter dated November 1, 1973 from K. W. Amish, RG&E, to A, Giambuso, Deputy Director for Reactor Projects, USNRC.

2. Letter dated May 24, 1974 from K. W. Amish, RG&E, to J. F. O'Leary, Director, Directorate of Licensing, USNRC.

3. Letter dated September 4, 1974 for R. R. Koprowski, RG&E to Edson Case, Acting Director, Directorate of Licensing, USNRC.

4. Letter dated November 1, 1974 from K. W. Amish, RG&E, to Edson Case, Acting Director, Directorate of Licensing, USNRC.

5. Letter dated May 20, 1977 from L. D. White, Jr., RG&E, to A. Schwencer, Chief Operating Reactors Branch #1, USNRC.

6. Letter dated February 6, 1978 from L. D. White, Jr., RG&E, to A. Schwencer, Chief, Operating Reactors Branch #1, USNRC.

7. Amendment No. 7 to Provisional Operating License DPR-18, transmitted, by letter dated May 14, 1975 from Robert A. Purple, Chief, Operating Reactors Branch #1, USNRC, to L. D. White, Jr., RG&E.

8. Amendment No. 29 to Provisional Operating License DPR-18, transmitted by letter dated August 24, 1979 from Dennis L. Ziemann, Chief, ORB #2, to L. D. White, Jr., RG&E.

9. Letter, L. D. White, Jr., RG&E, to D. L. Ziemann, May 17, 1979.

10. Letter, L. D. White, Jr., RG&E, to D. L. Ziemann, USNRC, June 27, 1979.

11. Letter, L. D. White, Jr., RG&E, to D. L. Ziemann, USNRC July 6, 1979.

12. Letter, R. E. Anderson, Gilbert/Commonwealth to James J. Shea, USNRC, June 11, 1979.

13. Letter, L. D. White, Jr., RG&E, to D. M. Crutchfield, NRC, SEP Topic III-5.B, "Pipe Break Outside Containment," August 7, 1980.

14. Letter, J. Wenclawiak and T. Snyder, Catalytic, to G. Wrobel, RG&E, "Equipment Environmental Qualification," October 27, 1980.

15. Letter from D. M. Crutchfield, NRC, to L. D. White, Jr. RG&E, SEP Topic III-5.B, "Pipe Break Outside Containment," June 24, 1980.

Effects of Flooding [Flood]

1. Letter dated May 13, 1975 from L. D. White, Jr., RG&E, to Benard C. Rusche, Director, Office of Nuclear Reactor Regulation, USNRC.

2. Letter dated May 20, 1975 from L. D. White, Jr., RG&E, to Robert A. Purple, Chief, Operating Reactors Branch #1, Division of Reactor Licensing.

3. Letter dated May 30, 1975 from L. D. White, Jr., RG&E, to Robert A. Purple.

4. Letter dated June 16, 1975 from L. D. White, Jr., RG&E, to Robert A. Purple.

5. Letter dated July 3, 1975 from Robert A. Purple to L. D. White, Jr., RG&E.

6. Letter dated August 8, 1972 from Donald J. Skovholt, Assistant Director for Operating Reactors, USAEC, to Edward J. Nelson, RG&E.

7. Letter dated October 3, 1972 from K. W. Amish, RG&E, to Donald J. Skovholt, Assistant Director for Operating Reactors, USAEC.

8. Letter dated May 31, 1973 from K. W. Amish, RG&E, to Donald J. Skovholt, Assistant Director for Operating Reactors, USAEC.

9. Application for Amendment to Operating License, submitted March 10, 1975.

10. Amendment No. 14 to Provisional Operating License DPR-18, transmitted by letter dated June 1, 1977 from A. Schwencer, Chief, Operating Reactors Branch #1, USNRC.

11. Letter, L. D. White, Jr. RG&E, to Dennis L. Ziemann, USNRC, High Energy Line Breaks Outside Containment," June 27, 1979.

TMI Lessons Learned [TMI]

1. RG&E letter of October 17, 1979, L. D. White, Jr., RG&E, to D. L. Ziemann, USNRC, "TMI Short Term Lessons Learned Requirements."

2. RG&E letter of November 19, 1979, L. D. White, Jr. to D. L. Ziemann, USNRC, "TMI Short Term Lessons Learned."

3. RG&E letter of December 28, 1979, L. D. White, Jr. to D. L. Ziemann, USNRC, "TMI Short Term Lessons Learned."

Reactor: GINNA

SYSTEMATIC EVALUATION PROGRAM

Equipment Type	Location	Time Needed	ENVIRONMENT Parameter	Required	Qual.	Qual. Method	Document Reference	Comments
1. Solenoid Valve ASCO/ V-4269, V-4270 LB 8300 B 61 U (FW Control Valves) V-4271, V-4272 LB 8300 B 64 RU (FW Bypass Valves)	Area #7	SI Signal	Temp (°F) Pr (psia) RH (%) Chem Rad. Sub.	See Comments	Amb. Atm. Amb. - - -	Experience Experience Experience - - -	23	DBE - Main SLB in Turbine Bldg. Fail-Safe (closed)
2. Solenoid Valve Copes-Vulcan AOV 836 A,B (NaOH to CS)	Area #2	Minutes	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	See Comments	Amb. Atm. Amb. - - -	Experience Experience Experience - - -	23	These valves were purchased from ASCO. 8200 series. They are fail safe (open).
3. Solenoid Valve Lawrence/ 110114W - Supply 125434W - Vent V-3516, V-3517 (Main Steam Isolation)	Area #3	Seconds	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	See Comments	250 Atm. Amb. - - -	Vendor Data Experience Experience - - -	25	Enclosed in NEMA-2 drip-proof enclosure which is subjected to salt water spray qualification test. Fail safe (closed)
4. Solenoid Valve Versa/VSG V-5871, V-5872, V-5873, V-5874, V-5875, V-5876 (Containment Recirculation System Dampers)	Area #1	Seconds	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	See Comments	200 Atm. Amb. Yes No -	Vendor Data Experience Experience - - -	26	Fail safe. Performs safety function within seconds of start of DBE. Not required to operate when accident conditions are reached.

Reactor: GINNA SYSTEMATIC EVALUATION PROGRAM

Equipment Type	Location	Time Needed	ENVIRONMENT Parameter	Required	Qual.	Qual. Method	Document Reference	Comments
5. Solenoid Valve ASCO AOV-897, AOV-898 (SI Recirculation)	Area #2	Short-Term (Before Sump Recirculation)	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	See Comments	Amb. Atm. Amb. - - -	Experience Experience Experience - - -	23	"Mild" Envt. to be addressed later
6. Solenoid Valve Versa/ VSG-3731 (Cont. Purge Valves) VSG-3421 (Cont. Depressurization)	Area #1 Area #3	Seconds	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	See Comments	200 Atm. Amb. - - -	Vendor data Experience Experience - - -	26	Fail-close to perform containment isolation function
7. Control Room Dampers D-81 → D-87								Not Electrical. Deleted from Report
8a. Limitorque SMB-2 Reliance Motor MOV 841, 865 (Accumulator Discharge)	Area #1	Not required to operate	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	See Comments	320 105 100 Yes 2×10^8 No	Test Test Test Test Test -	18,19 18,19 18,19 18,19 18,19 37	Valves are locked-open with power removed. No need to function
8b. Limitorque SMB-00, Peerless MOV 826 A,B,C,D (BAST to SI Pumps) MOV 896 A,B (RWST to SI Pumps)	Area #2	Short-Term (Before Sump recirculation)	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	Amb. Atm. Amb. No No No	Amb. Atm. Amb. - - -	Experience Experience Experience - - -	13	Not exposed to DBE environment

Reactor: GINNA SYSTEMATIC EVALUATION PROGRAM

Equipment Type	Location	Time Needed	ENVIRONMENT Parameter	Required	Qual.	Qual. Method	Document Reference	Comments
8c. Limitorque SMB-00 Reliance Motor MOV 825 A,B (RWST to SI Pumps)	Area #2	Short-Term (Before Sump Recirculation)	Temp (°F)	Amb.	Amb.	Experience	13	No exposed to DBE environment
			Pr (psia)	Atm.	Atm.	Experience		
			RH (%)	Amb.	Amb.	Experience		
			Chem.	No	-	-		
			Rad.	No	-	-		
			Sub.	No	-	-		
8d. Limitorque SMB-00 Reliance Motor MOV 4007, 4008 (AFW Discharge) MOV 4027, 4028 (AFW Suction) 4000 A,B (AFW Cross-Connect)	Area #3	Short-Term. Only for DBEs not in area #3. See Comment.	Temp (°F)	See Comment	Amb.	Experience		Not required to operate in harsh DBE envt. Alternative SAFW system available.
			Pr (psia)		Atm.	Experience		
			RH (%)		Amb.	Experience		
			Chem.		-	-		
			Rad.		-	-		
			Sub.		-	-		
8e. Limitorque SMB-00 Reliance V-850 A,B (Sump Valves) MOV 856 (RWST to RHR) V-857 A,B,C (RHR to SI) V-860 A,B,C,D (CS Valves)	Area #2	Long	Temp (°F)	Amb.	320	Test	18,19,53	Not exposed to DBE environment except post-LOCA sump water recirculation
			Pr (psia)	Atm.	105	Test	18,19,53	
			RH (%)	Amb.	100	Test	18,19,53	
			Chem.	No	Yes	Test	18,19,53	
			Rad.	3×10^6	2×10^8	Test	18,19,53	
			Sub.	No	-	-		
8f. Limitorque SMB-00 MOV-851 A,B	Area #1	Not required to operate	Temp (°F)	See Comment	Amb.	Experience	13	Not required to function for DBE. Valves are in locked-open position as required for SI.
			Pr (psia)		Atm.	Experience		
			RH (%)		Amb.	Experience		
			Chem.		No	-		
			Rad.		No	-		
			Sub.		No	-		

Reactor: GINNA SYSTEMATIC EVALUATION PROGRAM

Equipment Type	Location	Time Needed	ENVIRONMENT Parameter	Required	Qual.	Qual. Method	Document Reference	Comments
8g. Limitorque SMB-00 Peerless Motor MOV 878 B,D (SI to cold legs)	Area #1	Not required to operate	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	Amb. Atm. Amb. - - -	Amb. Atm. Amb. - - -	Experience Experience Experience - - -	13	Not required to function for DBE. Valves are locked in open position, as needed for SI.
8h. Limitorque SMB-1 Reliance Motor MOV 852 A,B (core deluge)	Area #1	SI Signal	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	286 75 100 Yes 1.6×10^8 No	320 105 100 Yes 2×10^8 No	Test Test Test Test Test -	18,19 18,19 18,19 18,19 18,19 37	Valve completes safety function (to open) early into accident
8i. Limitorque SMB-00 Reliance Motor MOV 9703 A,B; 9704 A,B; 9710 A,B (Standby AFW System)	Area #6	Long Term	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	120 Atm. Amb. No No No	120 Atm. Amb. - - -	Vendor Data Experience Experience - - -	43,47,54	Standby AFW System located in controlled envt.
9. Motor, Pump General Electric (Standby AFW)	Area #6	Long Term	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	120 Atm. Amb. No No No	122 Atm. Amb. - - -	Vendor Data Experience Experience - - -	2,3,43,47	Standby AFW pumps located in aux. bldg. annex which has controlled envt.
10. Motor, Pump Westinghouse 444 TS TBDP 445 TS TBDP (Containment Spray, RHR, Component Cooling)	Area #2	Long	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	Amb. Atm. Amb. No 3×10^6 No	104°F Atm. Amb. - 1×10^7 -	Spec Experience Experience - Test -	15,16,67 69	Only DBE environment is post-accident radiation

Reactor: GINNA

SYSTEMATIC EVALUATION PROGRAM

Equipment Type	Location	Time Needed	ENVIRONMENT Parameter	Required	Qual.	Qual. Method	Document Reference	Comments
11. Motor, Pump Westinghouse 505 US ABDP (Auxiliary Feed-water)	Area #3	Long	Temp (°F)	See Comment	104°F	Spec	8,16,67	Have installed totally redundant system not exposed to DBE (standby AFW)
			Pr (psia)		Atm.	Experience		
			RH (%)		Amb.	Experience		
			Chem.		-	-		
			Rad.		2×10^8	Test	68	
			Sub.		-	-		
12a. Motor, Pump Westinghouse 509 US AFDP (Safety Injection)	Area #3	Long	Temp (°F)	Amb.	104°F	Spec	15,16,67	Only DBE environment is post-accident radiation
			Pr (psia)	Atm.	Atm.	Experience		
			RH (%)	Amb.	Amb.	Experience		
			Chem.	No	-	-		
			Rad.	3×10^6	2×10^8	Test	68	
			Sub.	No	-	-		
12b. Motor, Pump 509 UPH ABDP (Service Water)	Area #5	Long	Temp (°F)	Amb.	See Comment	Experience	67	This item is in a "mild" environment. It will be addressed later.
			Pr (psia)	Atm.		Experience		
			RH (%)	Amb.		Experience		
			Chem.	No		-		
			Rad.	No		-		
			Sub.	No		-		
13a. Penetrations, Electrical Crouse-Hinds	Area #1	Long	Temp (°F)	286°F	340°F	Test	1,45,54,58	Radiation level at location of penetrations < 1.6×10^8 rads. Qualification test is greater than DOR guidelines value of 2×10^7 rads.
			Pr (psia)	75	105	Test	1,45,54,58	
			RH (%)	100%	100%	Test	1,45,54,58	
			Chem.	Yes	Yes	Test	58	
			Rad.	1.6×10^8	1.17×10^8	Test	45,64	
			Sub.	No	-	-		
13b. Penetrations, Electrical Westinghouse	Area #1	Long	Temp (°F)	286°F	340°F	Test	29,30,59	
			Pr (psia)	75	75	Test	29,30,59	
			RH (%)	100%	100%	Test	29,30,59	
			Chem.	Yes	Yes	Test	29,30,59	
			Rad.	1.6×10^8	2.1×10^8	-		
			Sub.	No	-	-		

Reactor: GINNA

SYSTEMATIC EVALUATION PROGRAM

Equipment Type	Location	Time Needed	ENVIRONMENT Parameter	Required	Qual.	Qual. Method	Document Reference	Comments
14. Terminal Block Westinghouse 542247	Area #1	Long	Temp (°F)	286°F	340°F	Test	50	Location of blocks is such that 2 x 10^7 rads, a value equal to the DOR guidelines value, should be acceptable. Also, terminal blocks will be elevated.
			Pr (psia)	75	121	Test	50	
			RH (%)	100%	100%	Test	50	
			Chem.	Yes	Yes	Test	50	
			Rad.	$1.6x10^8$	$2x10^7$	Test	60	
			Sub.	No	-	-	-	
15a. Cable Kerite HT	Area #1	Long	Temp (°F)	286°F	340°F	Test	11,38,51, 55,63	
			Pr (psia)	75	118	Test	"	
			RH (%)	100%	100%	Test	"	
			Chem.	Yes	Yes	Test	"	
			Rad.	$1.6x10^8$	$2x10^8$	Test	"	
			Sub.	No	-	-		
15b. Cable Kerite HT	All	Long	Temp (°F)	220°F	340°F	Test	11,38,51, 55,63	
			Pr (psia)	15.8	118	Test	"	
			RH (%)	100	100	Test	"	
			Chem.	No	Yes	Test	"	
			Rad.	No	$2x10^8$	Test	"	
			Sub.	No	-	-	-	
16. Cable Coleman Cable	Area #1	Long	Temp (°F)	286	340	Test	46,51	
			Pr (psia)	75	118	Test	46,51	
			RH (%)	100	100	Test	46,51	
			Chem.	Yes	Yes	Test	46,51	
			Rad.	$1.6x10^8$	$2x10^8$	Test	46,51	
			Sub.	No	-	-	-	

Reactor: GINNA

SYSTEMATIC EVALUATION PROGRAM

Equipment Type	Location	Time Needed	ENVIRONMENT Parameter	Required	Qual.	Qual. Method	Document Reference	Comments
17. Cable	All	Long	Temp (°F)	220	250	Test	5,10,46	In lieu of 100% RH,
Coleman Cable			Pr (psia)	15.8	Atm.	Experience		an oil immersion
Rome Cable			RH (%)	100	Amb.	Experience		test performed per
General Cable			Chem.	No	-	-		IPCEA S-61-402
			Rad.	No	-	-		
			Sub.	No	-	-		
18. Transmitter, Level	Area #2	Short Term	Temp (°F)	Amb.	Amb.	Experience		Not exposed to DBE
Foxboro		(Before Sump	Pr (psia)	Atm.	Atm.	Experience		when required to
(RWST Level)		Recirculation)	RH (%)	Amb.	Amb.	Experience		to function
			Chem.	No	-	-		
			Rad.	No	-	-		
			Sub.	No	-	-		
19. Transmitter, Level	Area #2	Short Term	Temp (°F)	Amb.	200	Vendor Data	34	Not exposed to
Barton 289		(Before Sump	Pr (psia)	Atm.	Atm.	Experience		DBE envt. when
(RWST Level)		Recirculation)	RH (%)	Amb.	Amb.	Experience		required to
			Chem.	No	-	-		function.
			Rad.	No	-	-		
			Sub.	No	-	-		
20. Transmitter, Flow	Area #1	Seconds	Temp (°F)	286	See	See	31	Not exposed to
Barton 332			Pr (psia)	75	Comments	Comments		to DBE when
(Steam Flow)			RH (%)	100				required to
			Chem.	Yes				function.
			Rad.	1.6×10^{8}				
			Sub.	No				
21. Transmitter, Pres.	Areas 2,3	Long	Temp (°F)	Amb.	See	See	31	Not exposed to
Barton 332			Pr (psia)	Atm.	Comments	Comments		DBE when required
(Cont. Pressure)			RH (%)	Amb.				to function.
			Chem.	No				
			Rad.	No				
			Sub.	No				

Reactor: GINNA

SYSTEMATIC EVALUATION PROGRAM

Equipment Type	Location	Time Needed	ENVIRONMENT Parameter	Required	Qual.	Qual. Method	Document Reference	Comments
22. Transmitter, Pressure Foxboro 611 GM-DSI (PRZR Pressure)	Area #1	Short	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	286 75 100 Yes 1.7×10^6 No	286 75 100 Yes 3×10^4 -	Test Test Test Test Evaluation -	18,19,33 18,19,33 18,19,33 18,19,33 18,19	Adequate for short-term function. Will be replaced and elevated to perform post-accident monitoring function
23. Transmitter, Pressure Foxboro 611 GM-DSI (Steam Pressure)	Area #3	Short	Temp (°F) Pr (psia) RH(%) Chem. Rad. Sub.	See Comments	See Comments	See Comments	18,19 18,19 18,19 18,19 18,19	Not exposed to DBE when required to function
24. Transmitter, Level Foxboro 613 M-MDL Modified (Przr Level)	Area #1	-	Temp (°F) Pr (psia) RH (%) Chem. Sub.	See Comments	See Comments	See Comments		Not required for a short-term safety function. Will be replaced for long-term monitoring
25. Transmitter, Level Foxboro 613 DM-MSI (BAST Level)	Area #2	Sort	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	Amb. Atm. Amb. No No No	Amb. Atm. Amb. - - -	Experience Experience Experience - - -		Not exposed to DBE
26. Transmitter, Level Foxboro 613 (SG Level)	Area #1	-	Temp (°F) Pr (psia) RH (%) Chem. Rad. Sub.	See Comments	See Comments	See Comments		Alternative instrumentation available to perform safety function. Will be replaced for long-term monitoring.

Reactor: GINNA SYSTEMATIC EVALUATION PROGRAM

Equipment Type	Location	Time Needed	ENVIRONMENT Parameter	Required	Qual.	Qual. Method	Document Reference	Comments
27. Temp Element Rosemount / 176JA (RTDs)	Area #1	-	Temp (°F)	See Comments	200	Spec	35	Not required to function for short-term DBE. Will be replaced for long-term monitoring
			Pr (psia)		Atm.	Experience		
			RH (%)		Amb.	Experience		
			Chem.		-	-		
			Rad.		200 R/hr	Spec	35	
			Sub.		-	-		
28. Battery Gould/FTA-19	Area #8	Long	Temp (°F)	Amb.	110	Vendor Data	9,32	Not exposed to DBE
			Pr (psia)	Atm.	Atm.	Experience		
			RH (%)	Amb.	Amb.	Experience		
			Chem.	No	-	-		
			Rad.	No	-	-		
			Sub.	No	-	-		
29a. Diesel Generator ALCO Diesel 251F b. Westinghouse 1900 KW Generator c. Westinghouse fuel oil transfer pump - 1 HP - model TEFC Class PMF Insulation	Area #4	Long	Temp (°F)	Amb.	Amb.	Experience	7	Not exposed to DBE
			Pr (psia)	Atm.	Atm.	Experience		
			RH (%)	Amb.	Amb.	Experience		
			Chem.	No	-	-		
			Rad.	No	-	-		
			Sub.	No	-	-		
30. Motor, Containment Fan Coolers Westinghouse 588.5-CSP	Area #1	Long	Temp (°F)	286	320	Test	18,19,20, 64,65, 67,70	
			Pr (psia)	75	95	Test		
			RH (%)	100	100	Test		
			Chem.	Yes	Yes	Test		
			Rad.	1.6×10^8	2×10^8	Test		
			Sub.	No	-	-		
31. Circuit Breaker Westinghouse DB-50A 1600A	Area #3	Seconds	Temp (°F)	See Comments	Amb.	Experience		Equipment will fail-safe on loss of power
			Pr (psia)		Atm.	Experience		
			RH (%)		Amb.	Experience		
			Chem.		-	-		
			Rad.		-	-		
			Sub.		-	-		

Reactor: GINNA SYSTEMATIC EVALUATION PROGRAM

Equipment Type	Location	Time Needed	Parameter	Required	Qual.	Qual. Method	Document Reference	Comments
32. I&C Cabinets Foxboro	Area #8	Long	Temp (°F)	Amb.	Amb.	Experience		Not exposed to DBE
			Pr (psia)	Atm.	Atm.	Experience		
			RH (%)	Amb.	Amb.	Experience		
			Chem.	No	-	-		
			Rad.	No	-	-		
			Sub.	No	-	-		
33. HVAC Westinghouse Z162 (Control Room AHU)	Area #8	Long	Temp (°F)	Amb.	122	Spec	4,6	Not exposed to DBE
			Pr (psia)	Atm.	Atm.	Experience		
			RH (%)	Amb.	Amb.	Experience		
			Chem.	No	-	-		
			Rad.	No	-	-		
			Sub.	No	-	-		
34. Splice Sleeves Raychem WCSF-N	Area #1	Long	Temp (°F)	286	340	Test	36,38,51 56,62	
			Pr (psia)	75	118	Test	"	
			RH (%)	100	100	Test	"	
			Chem.	Yes	Yes	Test	"	
			Rad.	1.6×10^8	2×10^8	-	"	
			Sub.	No	-	-	-	
35. Solenoids/ Valcor V57300 (Pressurizer PORVs)	Area #1	Long	Temp (°F)	286	346	Test	48	
			Pr (psia)	75	128	Test		
			RH (%)	100	100	Test		
			Chem.	Yes	Yes	Test		
			Rad.	1.6×10^8	2×10^8	Test		
			Sub.	No	-	-		
36. Level Switches GEM Corp. Model:Special-Similar to LS-1900 (Containment Sump "B" Level)	Area #1		Temp (°F)	See Comments	See Comments		52	Not required to perform safety function. How-will be replaced for TMI-STLL
			Pr (psia)					
			RH (%)					
			Chem.					
			Rad.					
			Sub.					

Reactor: GINNA

SYSTEMATIC EVALUATION PROGRAM

Equipment Type	Location	Time Needed	ENVIRONMENT Parameter	Required	Qual.	Qual. Method	Document Reference	Comments
37. H2 Recombiner Igniter Exciter Unit GLA Part No. 43737, Rev. A, Serial 001	Area #1	Long	Temp (°F)	286	315	Test	18,19,49	
			Pr (psia)	75	105	Test	18,19,49	
			RH (%)	100	100	Test	18,19,49	
			Chem.	Yes	Yes	Test	18,19,49	
			Rad.	$1.6x10^8$	$1.73x10^8$	Test	18,19,49	
			Sub.	No	-	-		
38. H2 Recombiner Blower Motor (2/15 Scale) W 2 HP, Class H Ins., Model TBFC S# 68C24196	Area #1	Long	Temp (°F)	286	286	Test	18,19,49	
			Pr (psia)	75	75	Test	18,19,49	
			RH (%)	100	100	Test	18,19,49	
			Chem.	Yes	Yes	Test	18,19,49	
			Rad.	$1.6x10^8$	$2.0x10^8$	Test	18,19,49	
			Sub.	No	No	-	-	
39. Pump Motor U.S. Electrical Motors Model VEU, 100 HP Frame 84-445 U Insulation Class B (Charging Pump)	Area #2	Long	Temp (°F)	Amb.	Amb.	Experience		Not exposed to DBE environment
			Pr (psia)	Atm.	Atm.	Experience		
			RH (%)	Amb.	Amb.	Experience		
			Chem.	No	-	-		
			Rad.	No	-	-		
			Sub.	No	-	-		
40. Solenoids/ Johnson Controls Model D251 (Control Room Air Handling Unit Dampers)	Area #8	Short	Temp (°F)	Amb.	Amb.	Experience		Not exposed to DBE environment
			Pr (psia)	Atm.	Atm.	Experience		
			RH (%)	Amb.	Amb.	Experience		
			Chem.	No	-	-		
			Rad.	No	-	-		
			Sub.	No	-	-		
41. Medium Voltage Switchgear Westinghouse DH - 350E 1200 A Breakers (RCP Trip Breakers)	Area #7	Short	Temp (°F)	Amb.	Amb.	Experience		Breakers need only open for LOCA inside containment to stop RC pumps. Not exposed to DBE when needed to function.
			Pr (psia)	Atm.	Atm.	Experience		
			RH (%)	Amb.	Amb.	Experience		
			Chem.	No	-	-		
			Rad.	No	-	-		
			Sub.	No	-	-		

Reactor: GINNA SYSTEMATIC EVALUATION PROGRAM

Equipment Type	Location	Time Needed	ENVIRONMENT Parameter	Required	Qual.	Qual. Method	Document Reference	Comments
42. RHR Pump Cooling System Fan Motors Westinghouse Model SBDP Class B Insulation - 2HP	Area #2	Long	Temp (°F)	Amb.	Amb.	Experience		Only exposed to DBE radiation environment
			Pr (psia)	Atm.	Atm.	Experience		
			RH (%)	Amb.	Amb.	Experience		
			Chem.	$3x10^6$	$1x10^7$	Test	69	
			Rad.	No	-	-		
			Sub.	No	-	-		
43. Cont Spray/SI Pump and Charging Pump Cooling Systems Fan Motors Westinghouse Model SBDP Class B Insulation - 3HP	Area #2	Long	Temp (°F)	Amb.	Amb.	Experience		Only exposed to DBE radiation environment
			Pr (psia)	Atm.	Atm.	Experience		
			RH (%)	Amb.	Amb.	Experience		
			Chem.	$3x10^6$	$1x10^7$	Test	69	
			Rad.	No	-	-		
			Sub.	No	-	-		
44. Main Control Board Reactor Trip Racks Relay Logic and Test Racks Miscellaneous Racks Auxiliary Relay Racks Safeguard Racks Reactor Coolant System Racks CVCS Racks Feedwater Control Racks SI Sequence Racks	Area #2	Long	See Comments	-	-	-		"Mild" Environment be addressed at a later time

Table 4

Environmental Service Conditions

A. Inside Containment

Normal Operation

Temperature:	60-120°F
Pressure:	0 psig
Humidity:	50% (nominal)
Radiation:	< 1 Rad/hr general. Can be higher or lower near specific components.

Accident (LOCA)

Temperature:	Figure 5 (286°F max)
Pressure:	Figure 4 (60 psig design)
Humidity:	100%
Radiation:	Figure 6 (1.6×10^8 total)
Chem. Spray:	Solution of boric acid (2000 to 3000 ppm boron) plus NaOH in water. Solution pH between 8 and 10.
Flooding:	7 ft (approx)

B. Auxiliary Building

Normal Operation

Temperature:	50-104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	< 10 mr/hr general, with areas near RHR piping < 100 mr/hr during shutdown operation

Accident Conditions (including sump recirculation)

Temperature:	50-104°F (122°F near motors)
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Operating Floor (271' elev.): Near Bus 14 and MCC 1C & 1L: 100 rad Other Areas: less than 50 rad Intermediate Floor (253' elev.): Near Bus 16 and MCC 1D & 1M: 900 rad Other Areas: less than 500 rad Basement Floor (236' elev.): Near CS, RHR, and SI Pumps: 2.8×10^6 rads Other areas: < 10^4 rads
Spray:	N/A
Flooding:	N/A

C. Intermediate Building

Normal Operation

Temperature:	50-104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	< 1 mr/hr (higher near reactor coolant sampling lines)

Accident Condition

Based upon HELB or MELB

Temperature:	215°F for 30 minutes; then reducing to 104 within 3 hrs
Pressure:	0.8 psig for 30 minutes; then reducing to 0 psig within 3 hrs
Humidity:	100% indefinitely
Radiation:	N/A
Spray:	N/A
Flooding:	0 ft

Based upon LOCA conditions

Temperature:	115°F indefinitely* near large motors and FW and SL piping. 104°F in open areas
Pressure:	0 psig
Humidity:	100%
Radiation:	Negligible
Spray:	N/A
Flooding:	0 ft

D. Cable Tunnel

Same as Intermediate Building

E. Control Building

Control Room

Normal Operation

Temperature:	50-104°F (usually 70-78°F)
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible

Accident Conditions

Temperature:	< 104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible
Spray:	N/A
Flooding:	N/A

*Estimated (no explicit calculations performed)

Relay Room

Normal Operation

Temperature:	50-104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible

Accident Conditions

Temperature:	< 104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible
Spray:	N/A
Flooding:	N/A

Battery Rooms

Normal Operation

Temperature:	50-104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible

Accident Conditions

Temperature:	< 104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible
Spray:	N/A
Flooding:	N/A

Mechanical Equipment Room

Normal Operation

Temperature:	50-104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible

Accident Conditions

Temperature:	< 104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible
Spray:	None
Flooding:	3 ft. (estimated for a service water line leak)

F. Diesel Generator Rooms

Normal Operation

Temperature:	60-104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible

Accident Conditions

Temperature:	< 104°F
Pressure:	0 psig
Humidity:	90% (estimated)
Radiation:	Negligible
Spray:	N/A
Flooding:	0 ft.**

G. Turbine Building

Normal Operation

Temperature:	50-104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible

Accident Conditions (HELB)

Temperature:	220°F for 30 minutes, reduce to 100°F within 3 hrs.
Pressure:	1.14 psig on mezzanine and basement levels, 0.7 psig on operating floor
Humidity:	100%
Radiation:	Negligible
Spray:	N/A
Flooding:	18" in basement (Circ. Water Break)

H. Auxiliary Building Annex

Normal Operation

Temperature:	60-120°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible

Accident Conditions

Temperature:	60-120°F
Pressure:	0 psig
Humidity:	60% (normal)
Radiation:	Negligible
Spray:	N/A
Flooding:	∿ 2 ft.

**Service water line crack would affect only one room (see FLOOD-15)

I. Screenhouse

Normal Operation

Temperature:	50-104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible

Accident Conditions:

Temperature:	< 104°F
Pressure:	0 psig
Humidity:	60% (nominal)
Radiation:	Negligible
Spray:	N/A
Flooding:	18" (Circ. Water Break)

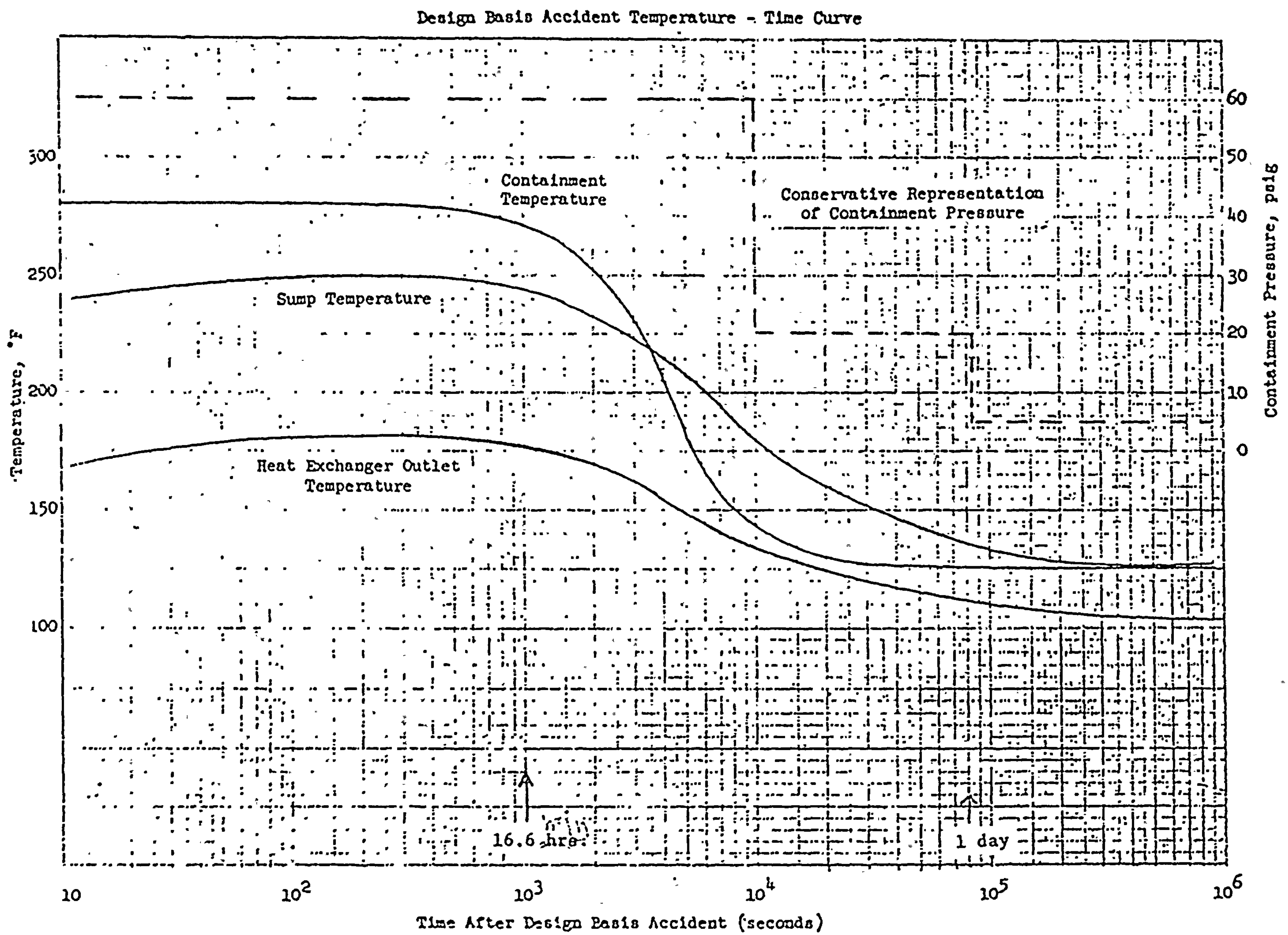

Design Basis Accident Temperature - Time Curve
Containment Temperature
Conservative Representation of Containment Pressure
Sump Temperature
Heat Exchanger Outlet Temperature
16.6 hrs.
1 day
Temperature, °F
300
250
200
150
100
Containment Pressure, psig
60
50
40
30
20
10
0
10
10^2
10^3
10^4
10^5
10^6
Time After Design Basis Accident (seconds)

Figure 4

Post-Accident Containment Materials Design Conditions

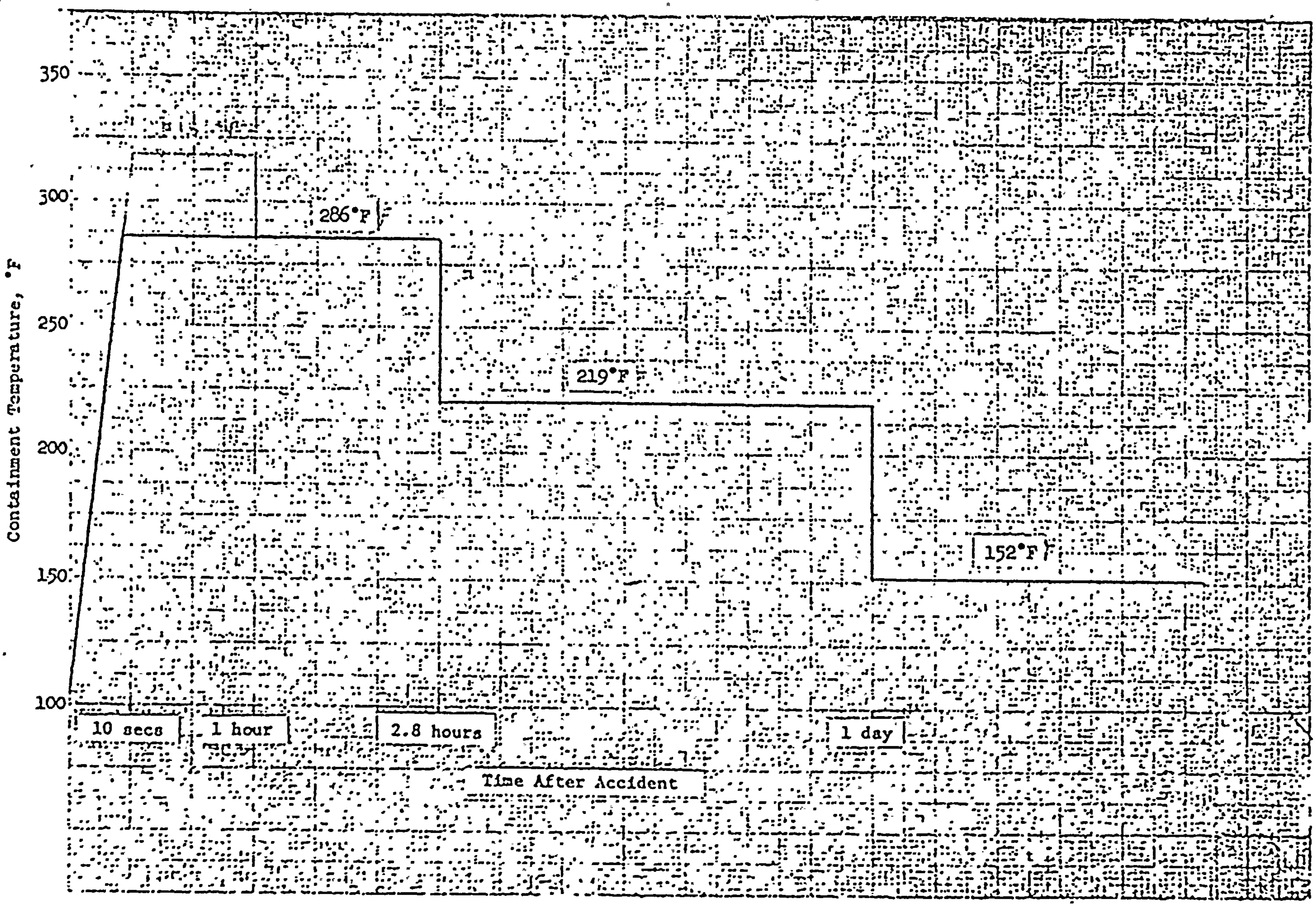


Figure 5

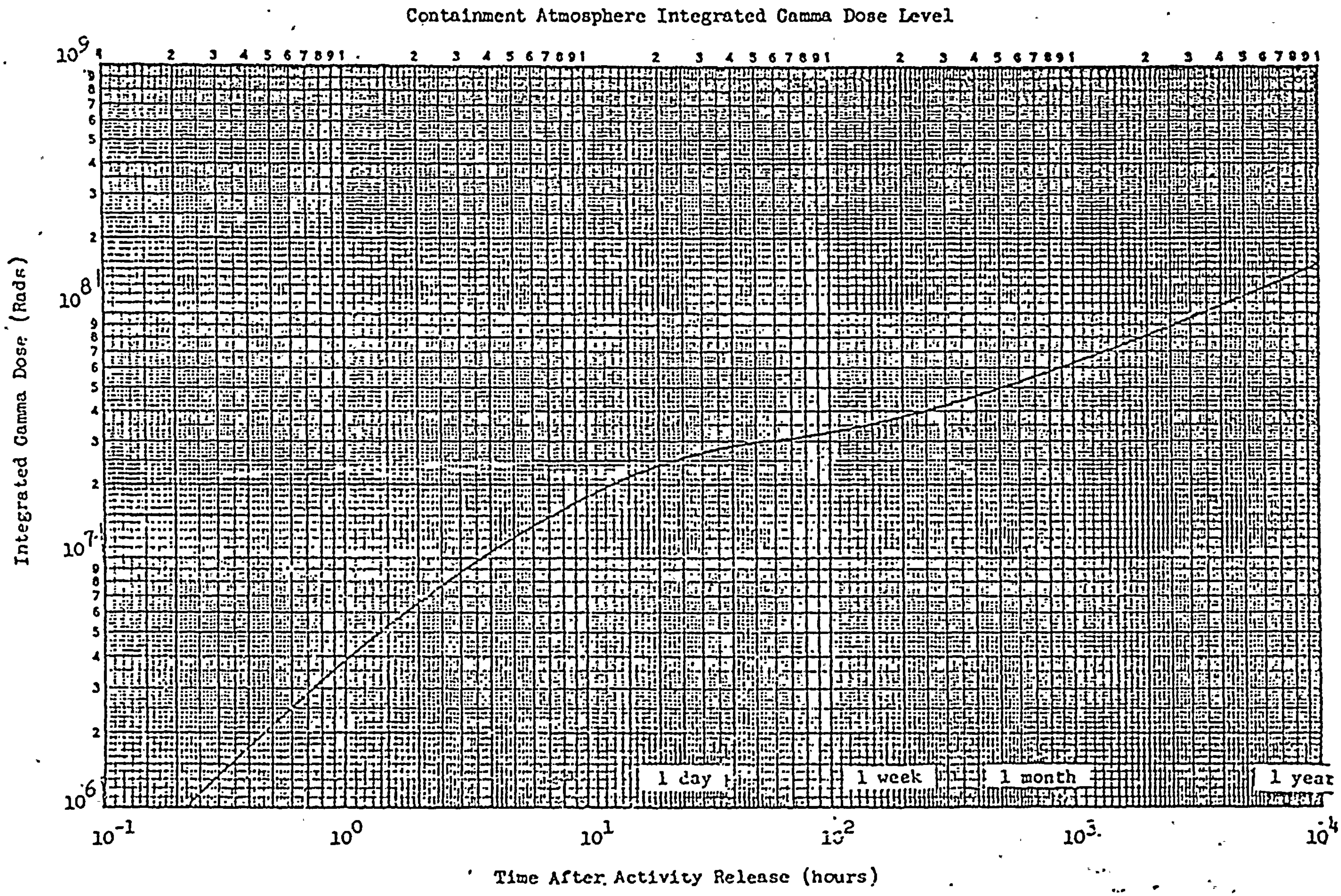

Containment Atmosphere Integrated Gamma Dose Level
Integrated Gamma Dose (Rads)
Time After Activity Release (hours)
1 day
1 week
1 month
1 year

Figure 6

GINNA STATION

(DOCUMENTATION REFERENCE)

1. Crouse-Hinds Penetration Test Report
2. Gilbert Spec. 520 - Standby AFW Pumps
3. Gilbert Spec. 711 - Standby AFW Pump Motors
4. Gilbert Spec. 5201 - Large Motors
5. Deleted. Included in Reference 51
6. Gilbert Spec. 5342 - HVAC Throughout Ginna
7. Gilbert Spec. RO-2239 - Diesel Generators
8. Gilbert Spec. RO-2267 - Auxiliary Feedwater Pumps
9. Gilbert Spec. RO-2400 - Batteries
10. IPCEA Std. S-61-402, Sect. 3.8 and 4.3.1
11. Kerite Memo 7/22/68
12. NEMA Std. SG-3, Low Voltage Circuit Breakers
13. Westinghouse Spec. 676258 - Motor Operated Valves
14. Westinghouse Spec. 676270 - Control Valves
15. Westinghouse Spec. 676370 - Auxiliary Pumps
16. Westinghouse Spec. 676427 - Auxiliary Pump Motors
17. WCAP 7343 June, 1969
18. WCAP 7410-L, Vol. I & II
19. WCAP 7744, Vol. I & II
20. WCAP 9003, January, 1969
21. Deleted. Included in Reference 45
22. Deleted
23. Report NS-CE-775, Fail-Safe Operation of ASCO Solenoids
24. Copes-Vulcan Solenoid Valves
25. Vendor Data on Laurence Solenoid
26. Vendor Data on Versa Solenoid
27. WCAP 7153
28. Deleted. Included in Reference 45
29. Gilbert Spec. 504 - Westinghouse Electrical Penetrations
30. Technical Proposal for Electric Penetration for Ginna Containment Structure by Westinghouse - September 4, 1974
31. WCAP 7354-L
32. Vendor Data on Gould Batteries
33. Westinghouse Spec. Sheet for Foxboro Transmitters
34. Vendor Data on Barton 289 Transmitter
35. Rosemont RTD Spec.
36. Vendor Data on Raychem Splice Sleeves
37. June 16, 1975 Letter to R.A. Purple from L.D. White on Containment Flooding
38. April 4, 1979 FRC Final Report F-C5074, Splice Sleeves and Cable
39. Deleted
40. Deleted

41. Deleted
42. Deleted
43. Design Criteria - Standby Aux. Feedwater System - October 24, 1974
44. Limit Switches
45. Design Approval Test on Material Used in Westinghouse Penetrations for the Brunswick Station of Carolina Power and Light Company - August 11, 1972
46. Test Data for Coleman and Rome Cable
47. Aging Failure Detection Program
48. Valcor Solenoid Valve: Vendor Data and Test Report Extracts
49: WCAP-9001
50. Westinghouse Terminal Blocks
51. Cable Identification and Qualification Supplement, Including F-C5074 (Supplement) Concerning Silicone-Rubber-Insulated Cable Qualification
52. Wide-Range Sump Level Switch Specification
53. Limitorque Valve Operator Data, Including Limitorque Report B0003 and Section 4.1.4 of B0058.
54. Containment Electrical Penetrations
55. Kerite Letter, June 26, 1980
56. IE Inspections 78-20 and 78-21 - Reports Concerning Installation of Splice Sleeves
57. Control Valve Specification SP-513-044666-000, September 27, 1974, Concerning Standby AFW Valves
58. Westinghouse 10/10/80 Letter Concerning Crouse-Hinds Electrical Penetrations
59. Evaluation of Organic Materials on Crouse-Hinds Electrical Penetrations
60. Westinghouse Terminal Block Information on Aging and Radiation
61. Aging Evaluation of Westinghouse Electrical Penetrations
62. Raychem Splice Sleeve Aging Information
63. Kerite Cable Aging Information
64. Containment Fan Cooler Motor Splices
65. Safety-Related Motor Bearings - Maintenance and Lubrication
66.
67. Safety-Related Motor Characteristics (Insulation)
68. WCAP-8754
69. Westinghouse Research Report 71-1C2-RADMC-R1, December 31, 1970 (Revised April 10, 1971), Concerning "The Effect of Radiation on Insulating Materials Used in Westinghouse Medium Motors"
70. WCAP-7829, "Fan Cooler Motor Unit Test"