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US Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Three Mile Island Nuclear Station, Unit 2 (TMI-2
Operating License No. DPR-73
Docket No. 50-320
TMI-2 Fire Protection Program Evaluation

Dear Sir:

Attached is a proposed revision to the TMI-2 Fire Protection Program Evaluation (FPPE) reflecting modifications that are consistent with the forthcoming condition of TMI-2, i.e., Post-Defueling Monitored Storage (PDMS). This revision will be in effect upon entry into PDMS.

The conclusion of Part I Section 3.2.2 of the FPPE is that an offsite release greater than the limits specified in 10 CFR Part 100 would not result from any postulated fire scenario. This document further concludes (Part I Section 3.2.3) that this change is not an Unreviewed Safety Question as defined by 10 CFR 50.59 and, thus, it will not require NRC approval prior to its implementation when TMI-2 transitions into PDMS.

Sincerely,

Robert L Long

R. L. Long
Director, Services Division/TMI-2

250113

EDS/dlb
Attachment
cc: See Page 2

A206
1/1

cc: M. G. Evans - Senior Resident Inspector, TMI
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FIRE PROTECTION PROGRAM EVALUATION

THREE MILE ISLAND NUCLEAR STATION

UNIT 2

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December 1993
Revision 4

PART I GENERAL INFORMATION

1.0 INTRODUCTION

This report, prepared by General Public Utilities (GPU) Nuclear Corporation, presents the scope of work, methods of analysis and results of the Fire Protection Program Evaluation (FPPE) of the Three Mile Island Nuclear Plant Unit 2 (TMI-2). This report also compares the fire protection provisions at TMI-2 to the provisions of Appendix A of Branch Technical Position (BTP) APCSB 9.5-1 (Reference 1). Specifically, this evaluation was conducted to:

a. Identify the guidelines in Appendix A which are presently met and will continue to be met and discuss how this is done.

b. Identify the guidelines for which modifications, procedural changes, or enhanced training of personnel are underway or planned, such that the guidelines will be met, and for meeting Part B of the Appendix A requirements.

c. Indicate which of the guidelines are not now met or are not intended to be met in the future. For such items, a basis for the position is provided.

The criteria used in the program evaluation are set forth in Section 2.0 and include the applicable General Design Criteria (GDCs) as well as other criteria. The analytical method and results of this analysis are described in Section 3.0.

The TMI-2 fire protection program requirements (training, administrative, inspection, testing and maintenance) were incorporated in the TMI Fire Protection Program upon entry into PDMS.

2.0 EVALUATION CRITERIA

The TMI-2 nuclear plant has been evaluated with regard to fire protection to determine that the total fire protection program provides reasonable assurance that a fire will not cause an undue risk to the health and safety of the public, will not prevent maintaining the safe shutdown condition of the plant, and will not significantly increase the risk of radioactive release to the environment.

The evaluation for this report is based on the following criteria:

a. General Design Criterion 3 (10 CFR 50, Appendix A) - Fire Protection - "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room. Fire detection and fighting systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety. Firefighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components."

b. General Design Criterion 19 (10 CFR 50, Appendix A) - Control Room - "A control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents.....

Equipment at appropriate locations outside the control room shall be provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary

instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures."

c. Fires shall not be considered to occur simultaneously with other accidents, events or phenomena such as a design-basis accident. Capability shall be provided (consistent with General Design Criterion 19) to safely shut down the plant in the event of any single fire which may credibly occur.

d. The fire analysis considers the total heat energy which can be released through complete combustion of all combustible and flammable materials determined to be available for ignition within the fire area. The initial evaluations did not take credit for fire detection or suppression systems.

e. The contribution of electrical cable insulation to the total heat energy for a designated area is based on ignition from an external source and considers complete combustion with no credit for fire extinguishing capability. The fire loading also includes oil contained in enclosed sumps in order to remain conservative.

f. The criteria identified in 10 CFR 100 was used to assess the consequences of a release from a postulated fire involving radioactive material.

Although specific guidelines may indicate particular provisions for fire protection, the overall adequacy of the fire protection program and potential modifications to it shall be based upon evaluation of the effects of potential fire hazards throughout the plant consistent with the above criteria.

3.0 METHOD OF EVALUATION

This section describes the assumptions and methodology used to perform the FPPE for TMI-2. The evaluation was conducted in two parts. In the first part, described in Section 3.1, the existing fire protection program was compared to the requirements of Appendix A to BTP APCSB 9.5-1. In the second part, described in Section 3.2, a fire hazards analysis was performed to determine the effects of the postulated fire relative to maintaining safe shutdown and minimizing radioactive releases to the environment.

The following assumptions were used during the performance of the fire hazards analysis. These assumptions have been verified by the appropriate design organizations associated with and responsible for each specific item.

a. **Single Failure Criterion**

For the purposes of this analysis, single failures were not considered coincident with fires with the exception that single failures in the fire suppression systems were considered.

b. **Concurrent Events**

Fires were not considered concurrent with other plant accidents or severe natural phenomena.

c. **Simultaneous Fires**

Simultaneous fires were not considered except for those facilities shared between units.

d. **Loss of Offsite Power**

Loss of offsite power has no affect on the ability to maintain the present safe

shutdown condition or minimize radioactive releases.

e. **Cable and Conduit**

Armored cable and conduit are noncombustible and are unaffected by fires.

f. **Combustibles**

Oil contained in sumps and reservoirs is considered available for combustion.

3.1 COMPARISON OF THE TMI UNIT 2 FIRE PROTECTION PROGRAM TO APPENDIX A OF THE BRANCH TECHNICAL POSITION APCSB 9.5-1

The existing fire protection program was compared to the requirements of Appendix A to BTP APCSB 9.5-1. Each Appendix A requirement was stated followed by a conformance description. The results of this comparison are documented in Part II, NRC BTP APCSB 9.5-1 Appendix A Comparison, of this report. Note that no plant fire protection feature appears in the PDMS Technical Specifications (Tech. Specs.). The fire scenario of concern would be one occurring in the Reactor Building (Reference 30, Section 8.2). Therefore, the BTP comparison in Part II only addresses those fire protection features associated with the Reactor Building.

3.2 FIRE HAZARDS ANALYSIS

3.2.1 Purpose and Scope

The fire hazards analysis provides an evaluation of the consequences of a fire in each fire zone at TMI-2 (as defined in Part III of this report) and demonstrates that the radionuclide releases that could occur as a result of any fire are less than the limits of applicable NRC standards. Section 3.2.2

describes the analytical approach used in the analysis. Section 3.2.3 provides the conclusions of the analysis.

3.2.2 Analysis

The consequences of a fire must neither result in a loss of capability to maintain safe shutdown nor cause an unacceptable radioactive release to the public (Reference 1). The various structures that contain sources of radioactivity (e.g., Reactor Building, Auxiliary and Fuel Handling Buildings) were analyzed to determine releases to the environment from potential fires.

Section 3.2.2.1 discusses the impact on safe shutdown; Section 3.2.2.2 presents the analysis of radioactive release from the various structures; Section 3.2.2.3 summarizes the results of the calculated dose to the maximally exposed individual (MEI); and Section 3.2.2.4 contains the major assumptions of the analysis.

3.2.2.1 **Safe Shutdown**

Safe shutdown of the TMI-2 plant requires the core region to remain subcritical. The TMI-2 Defueling Completion Report (Reference 2) and the criticality safety analyses contained in GPU Nuclear letter, C312-92-2080, dated December 18, 1992 (Reference 29), demonstrated that the residual fuel at TMI-2 will remain subcritical even considering accidental relocation of core debris and/or flooding the Reactor Vessel (RV) with unborated water. Therefore, safe shutdown of the TMI-2 plant is assured regardless of any postulated fire; no monitoring of the safe shutdown condition

is necessary.

3.2.2.2 Radioactive Releases

Sources of radionuclides exists throughout the TMI-2 plant. These sources are located by structure. In the following analysis, the source term is generated, an appropriate airborne release fraction is assigned, and the activity is released (either filtered or unfiltered, as applicable) to the environment. The resulting dose comparisons with applicable Regulatory Guides are discussed in Section 3.2.2.3.

3.2.2.2.1 Reactor Building

The Reactor Building (RB) is divided into four fire zones: 1) RB 305' and 347' elevations (OP); 2) "A" and "B" D-rings (ABD); 3) Fuel Transfer Canal (FTC); and 4) RB Basement (BAS). This division is based on significant structural assemblies and separation within the building. The divisions are logical from a fire standpoint and are supported by the characterization, configuration, and quantity of combustibles, the separation of ignition sources, and the controls on those ignition sources. The various Post-Defueling Survey Reports submitted to the NRC documented the quantity of residual fuel in the TMI-2 RB. These reports were compiled into the GPU Nuclear controlled document, "TMI-2 Post-Defueling Survey Reports" (Reference 3). The Reference 4

calculation assigned the residual fuel in the RB to one of the above four fire zones and further categorized the residual fuel as being in a non-fire area, contained, or relatively open to the RB atmosphere.

The first category of residual fuel is that contained in a non-fire area. For example, the RV is covered by an essentially watertight cover that greatly reduces the free air exchange and fuel movement. (It was assumed that no water exists in the RV or the FTC.) Residual fuel in this category is not normally considered in fire analyses; however, it is conceivable that a slight amount of fuel could become airborne as a result of the warming metal, induced air currents, etc. The total amount of fuel in this category was reduced by a factor of 100 prior to the application of a release fraction to account for the contained, non-fire area nature of this fuel.

Category 2 fuel is trapped or contained in receptacles that are in fire areas. For example, the Temporary Reactor Vessel Filtration System (TRVFS) filters are enclosed in non-combustible containers and the fuel in the RB drain system is trapped within long, relatively small diameter piping.

Category 3 fuel is in areas relatively open to the RB atmosphere. Conservatively included in this category

is the residual fuel in the RB sump, which should remain wet or be in a nonflammable area. This category also includes the defueling tools that are currently bagged and staged in the ABD and OP areas, and amounts to a total of 0.6 kg. To be conservative, the entire quantity of residual fuel (i.e., 0.6 kg) was assumed to be affixed to the defueling tools in the OP area. Based on the number of tools in the "A" and "B" D-rings, 0.52 kg of residual fuel was assigned to the ABD area.

References 6 and 7 provide test data for determining the release fractions for fuel involved in fires. The Reference 6 tests used a more representative physical configuration than the Reference 7 tests, but burned a relatively constant mix of combustible material. The Reference 7 tests varied the combustible material, but did so in a less representative configuration (i.e., in a test tube arrangement). In the Reference 6 tests, release fractions calculated from measured airborne concentrations ranged from 3E-5 to 5.3E-4. The test results from Reference 7 showed a higher range of release values for some contaminated combustible material, but a similar range of release values for the material used in the Reference 6 tests. A conservative release fraction of over 50% more than the Reference 6 upper value was used (i.e., 0.8 E-3) in the Reference 4 calculation for most of the fuel (i.e., Categories 1

and 3). Fuel that is contained, trapped, or bonded (i.e., Category 2) was assigned a release fraction that is a factor of ten less than that for Categories 1 and 3 fuel (i.e., 0.8 E-4).

The isotopes of interest from a radiological dose assessment standpoint are Sr-90, Cs-137, Pu-238, Pu-239, Pu-240, Pu-241 and Am-241 (Reference 5). Therefore, this analysis included only fuel, Cs-137, and Sr-90 in the curie inventory available to become airborne. Thus, added to the airborne fuel quantities (in kg) are the airborne Cs and Sr contamination.

Table 1 provides Cs-137 and Sr-90 inventories in the RB basement and the D-rings.

According to Reference 4, approximately 1% of this contamination is available for release to the RB atmosphere during a fire with an airborne release fraction of 1E-3.

Reference 4 provides the airborne source terms for a fire involving the RV head and a fire involving the loose contamination in higher elevations in the RB (i.e., elevations 305', 347', and above). This data is replicated in Table 2.

Note that the transuranic source terms were deleted since they are accounted for in the fuel discussion above.

It is assumed that all equipment in a fire area fails due to the fire. The RB purge filters and fans which are not in the fire area (i.e., located in the Auxiliary Building) are assumed not to be damaged and are available for filtering any release from the RB. The purge train is assumed unavailable however, due to closure of the air-operated purge dampers (which close on loss of air) as all air hoses in the RB are assumed to be destroyed by fire. No credit is taken for recovery of the RB purge train after the fire is extinguished.

The airborne activity in the RB can be released to the environment via one of the following pathways: the RB Breather HEPA filter, the RB Purge HEPA filters, or unfiltered leakage from the RB. An automatic isolation valve in the breather line upstream of the HEPA filter is designed to close at ¼ psi RB overpressure. If the fire does not result in an RB overpressure greater than ¼ psi, the release would be through the 99% efficient HEPA filter in the RB Breather line.

If the RB Purge System is operating and fails to isolate on detection of smoke from the fire, the release would be through the 99% efficient HEPA filters in the RB

Purge System exhaust line. If the RB Purge System is not operating and the automatic isolation valve in the RB Breather line closes, the RB would be effectively isolated with any release being through an unfiltered leakage path. Per the PDMS Technical Specifications, the mass flowrate of unfiltered leakage must be less than 1/100 of the mass flowrate through the RB Breather.

Therefore, in all the above scenarios, only 1% or less of the RB airborne activity would be released to the environment. It is noteworthy that all RB penetrations have been designed and tested to withstand a pressure increase greater than the calculated maximum Containment overpressure of approximately 5 psid. In this analysis, no credit is taken for plateout and a release rate of 1% of the RB airborne activity is assumed.

The resulting releases to the environment (in curies) for the four fire zones are in Table 3.

3.2.2.2.2 **Auxiliary and Fuel Handling Buildings**

As discussed in the previous section, a release of radioactive material from TMI-2 into the environment would have significant offsite dose consequences only if it involves a location which contains a significant

quantity of fuel and/or Sr-90 or Cs-137. A summary of the residual fuel inventory for the AFHB is contained in Reference 3.

In the quantities extant in the AFHB, the dose incurred from loose contamination released during a fire is a small percentage of that due to fuel. Therefore, a fire in the AFHB must involve a contaminated area which contains a significant quantity (kilogram or more) of fuel in order to have any significant offsite dose consequences.

Most cubicles do not contain significant quantities of fuel (Reference 3). In selecting a fire scenario for analysis, three areas in the AFHB were evaluated: The Fuel Handling Building Spent Fuel Pool (SFP); the Reactor Coolant Bleed Tank Room, AX020, which contains the "B" and "C" bleed tanks; and the Makeup Demineralizer System cubicle, AX114. All other cubicles and areas in the AFHB were considered to pose significantly less risk because of a much lower fuel content than these three areas.

All three areas have residual fuel inventory equal to or greater than 1 kg. Two of these areas, SFP "A" (3.8 kg) and the Reactor Coolant Bleed Tank Room, AX020, (3.5 kg) do not contain a likely ignition source such as an electrical motor or a pump. (It was

assumed that no water exists in the spent fuel pool.) Further, SFP "A" is adequately separated from surrounding cubicles by distance, concrete walls, and fire doors. The Reactor Coolant Bleed Tank Room is isolated from surrounding cubicles by fire doors and concrete walls which contain fire barriers in penetrations. Therefore, it was concluded that the occurrence of a fire in either of these two areas was not credible.

The third area, the Makeup Demineralizer System cubicle (AX114), contains 1.06 kg. This cubicle is isolated from surrounding cubicles by a fire door and concrete walls.

All fuel contained in the fire area is present in pipes, resin tanks, and other components. Therefore, consistent with the assumptions made in the RB fire analysis, 1% of the total 1.06 kg was assumed to be available to go airborne with a release fraction of 1E-3. No credit was taken for plateout or filtration prior to release from the AFHB.

The resulting release to the environment (in curies) is in Table 4.

3.2.2.3 Dose Assessment

In this section, the dose methodology is summarized and the resulting dose is estimated. The consequences from the release of the various source terms have been estimated using the methods and dose conversion factors specified in Regulatory Guide (RG) 1.109, NUREG-0172 and RG 1.4 (References 20, 21, and 22).

Offsite consequences have been conservatively calculated for a spectrum of postulated fires (References 17, 30, and 31); the resulting dose associated with each fire is listed in Table 5. The consequences were modeled in terms of dose at the site boundary, as specified in 10 CFR Part 100. 10 CFR Part 100 specifies a limitation of 25 rem external dose to the whole body and 300 rem dose to the thyroid. Doses from fires at TMI-2 would be negligible compared to these limits. However, due to the isotopic mix (e.g., negligible amounts of iodine) and the nature of potential releases (i.e., particulate matter), a more restrictive basis (i.e., the critical organ) for comparison was selected.

Doses to the critical organ (i.e., the bone) would not exceed the thyroid limitation specified in 10 CFR Part 100. More restrictive criteria for certain accident sequences have been promulgated in Chapter 15 of the NRC Standard Review Plan. Specifically, the consequences of any accident must be "well within" (i.e., less than 25%) or a "small fraction" (i.e., less than 10%) of 10 CFR Part 100. This analysis indicates that the releases resulting from the postulated fires would not exceed even these more restrictive

guidelines.

The offsite dose criteria of 10 CFR 50 Appendix I have been administratively established as the PDMS standard. The potential offsite radiological dose resulting from postulated off-normal conditions, including a fire, is required by GPU Nuclear to be within the 10 CFR 50 Appendix I guidelines. Therefore, the administrative limit for offsite gaseous dose during PDMS is 15 mrem to any organ of the MEI. This very conservative administrative application of 10 CFR 50 Appendix I ensures that TMI-2 is demonstrably safe with respect to radiological implications.

3.2.2.4 Assumptions

The major assumptions used in this analysis are summarized below.

1. All fires are deterministic and non-mechanistic. It is assumed that fires in an area are all consuming and fail all equipment except metal enclosures (e.g., piping, tanks [except fuel oil], heat exchanger, and conduit). For this analysis, it was conservatively assumed that no water exists in the reactor vessel, fuel transfer canal and fuel pools.

2. Structures (e.g., buildings) more than 50 ft. from other structures or structures less than 50 ft. from other structures that possess fire protection are considered separate structures

and are included in Section 3.2.2.2.3.

3. It is assumed that the activity released from the fire is not in elemental vapor form but rather particulate in nature. In the unlikely event that any elemental forms are vaporized, the activity would likely attach to airborne particles, (with the possible exception of Cs, which is water soluble and may be entrapped and condensed out with water vapor) thereby behaving as particulates.

4. Credit is not taken for plateout of activity in any fire sequence.

5. Given a fire in the RB, it is assumed that 1% of the RB airborne activity is released to the environment. This assumption is conservative since both the RB Purge and RB Breather HEPA filters are better than 99% efficient. Moreover, the unfiltered leakage from the RB is much less than 1% of that through the RB Breather.

6. The automatic isolation valve in the RB Breather line upstream of the HEPA filter closes upon receipt of a Containment pressure increase of ¼ psi.

7. The airborne release fraction for contaminated combustibles is assumed to be 1E-2 for all surface activity except for the surface activity in the RB basement, which is 1E-3. The particulate airborne release fraction from sources not directly involved in the combustion process is 0.8E-4 for particulates

trapped on filters and enclosed in containers and 0.8E-3 for particulates not trapped on filters and in areas open to the atmosphere.

8. Particles larger than about 10μm are predominantly deposited in the nasopharyngeal region and have much less radiological significance than smaller particles which are preferentially deposited in the bronchial system and lung (Reference 23). Furthermore, particles larger than 10μm deposit rapidly by aerosol deposition mechanisms such as gravitational settling and inertial impaction. A characterization of the particle size distribution (45 - 4000μm) in a core sample found that only about 1.5% of core particles were less than the smallest size range analyzed, 45μm (Reference 24). Notwithstanding the above distribution, it was conservatively assumed that 100% of the source term consists of particles less than 10 μm, i.e., those having relatively greater radiological significance.

9. The list of radionuclides in the core inventory and the activity for these radionuclides was obtained from Reference 4. A power peaking factor of 1.9 was applied to core power to arrive at the radionuclide inventory of the peak assembly.

10. Doses at the site boundary were calculated for potential airborne releases. To conservatively estimate the offsite dose, the 0-1 hour fifth percentile χ/Q of 7.67E-4 sec/m^3 was used (Reference 16).

11. Organ dose conversion factors were utilized in accordance with RG 1.109 (Reference 20). For radionuclides not considered in RG 1.109, NUREG-0172 (Reference 21) dose conversion factors were used. Dose to all seven organs were calculated using RG 1.109 methodology with the bone being the critical organ. The dose to this organ was calculated and presented in Table 7. The breathing rate of 1.25 m^3/hr was used as specified in RG 1.4 (Reference 22).

12. Insights from NUREG/CR-3535 (Reference 25) and ICRP 26 (Reference 26) were used to assess the significance of the calculated bone doses. Specifically, NUREG/CR-3535 reports significantly higher dose conversion factors for the bone surface than other organs, including bone marrow; ICRP 26 provides equivalent risk weighting factors for bone surface and thyroid. Thus, the 10 CFR Part 100 organ (thyroid) dose limitations is assumed to be applicable for situations in which the bone is the critical organ.

3.2.3 10 CFR 50.59 Evaluation

10 CFR 50, Paragraph 50.59, permits the holder of an operating license to make changes to the facility or perform a test or experiment, provided the change, test, or experiment is determined not to be an unreviewed safety question and does not involve a modification of the plant technical specifications.

10 CFR 50, Paragraph 50.59 states that a proposed change involves an

unreviewed safety question if:

a. The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased; or

b. The possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report may be created; or

c. The margin of safety, as defined in the basis for any technical specification, is reduced.

Each of the above criteria is addressed below:

Has the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report been increased?

The accident scenarios in Chapter 15 of the TMI-2 FSAR and in Chapter 8 of the PDMS SAR do not take credit for the Fire Protection System to either prevent or mitigate the consequences of an accident or malfunction of equipment important to safety.

The revised FPPE reflects the status of TMI-2 during PDMS. This is primarily an administrative change in that this revision reflects a mode change (i.e., from Facility Mode 3 to PDMS) and release of certain facilities to site use. This revision is consistent with the

criteria established in 10 CFR 50 Appendix A, GDC 3, and Branch Technical Position 9.5-1. Therefore, the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report has not been increased.

Has the possibility of an accident or malfunction of a different type than any evaluated previously in the safety analysis report been created?

This is primarily an administrative change in that this revision reflects a mode change (i.e., from Facility Mode 3 to PDMS) and release of certain facilities to site use. Thus, the proposed revision does not create the possibility of an accident or malfunction of a different type than any evaluated previously either in the FSAR or any other License Basis Document.

Has the margin of safety as defined in the basis for any technical specification been reduced?

The PDMS Technical Specifications do not contain a Limiting Condition for PDMS pertaining to fire protection. Therefore, there is no margin of safety as defined in the basis for any Technical Specification related to fire protection. Accordingly, this proposal does not reduce the margin of safety as currently defined in the bases for any technical specification.

TABLE 1

RB BASEMENT AND D-RING CONTAMINATION

	Cs-137 (Ci)	Sr-90 (Ci)	SOURCE OF DATA
RB Basement			
Block wall	19,060	747	Ref. 8, Table 3-4
3000# wall	5,807	278	Ref. 8, Table 3-4
3000# floor	573	28	Ref. 8, Table 3-4
5000# wall	621	10	Ref. 8, Table 3-4
RB liner	70	--	Ref. 8, Table 3-4
Overheads	55	--	Ref. 8, Table 3-4
Sediment	459	446	Ref. 9 modified by Ref. 10*
Totals	26,645	1,509	
"A" D-ring	1,663	83	Cs value from Ref. 8, Section 3.6; Sr value from Ref. 11
"B" D-ring	15,000	750	Cs value from Ref. 8, Section 3.6; Sr value from Ref. 11

* Per Reference 9, the quantities of Cs-137 and Sr-90 were 690 and 670 Ci, respectively. Reference 10 Table 1 estimated that desludging removed 4.89E+6 gms out of 1.46E+7 total gms of sediment. Therefore, the cesium and strontium values were reduced by 4.89E+6/1.46E+7 = .335.

TABLE 2

LOOSE CONTAMINATION IN RB HIGHER ELEVATIONS

ISOTOPE	AIRBORNE SOURCE TERM (Ci) FOR OP FIRE		
	RV HEAD	HIGHER ELEVATIONS	TOTAL
Sr-90	7.80E-2	4.07E-3	8.21E-2
Cs-137	2.40E-1	4.97E-2	2.90E-1

TABLE 3

RB SOURCE TERM

ISOTOPE	TOTAL CURIES RELEASED TO THE ENVIRONMENT			
	OPERATING DECK (OP)	"A" & "B" D-RINGS (ABD)	FUEL TRANSFER CANAL (FTC)	RB BASEMENT (BAS)
Sr-90	9.1 E-4	1.5 E-4	3.7 E-5	2.5 E-4
Cs-137	3.0 E-3	1.8 E-3	4.5 E-5	2.8 E-3
Pu-238	3.5 E-7	2.7 E-7	1.5 E-7	3.7 E-7
Pu-239	2.2 E-6	1.7 E-6	8.8 E-7	2.3 E-6
Pu-240	1.1 E-6	8.2 E-7	4.3 E-7	1.1 E-6
Pu-241	2.5 E-5	1.9 E-5	1.0 E-5	2.6 E-5
Am-241	3.6 E-6	2.8 E-6	1.5 E-6	3.8 E-6

TABLE 4

AFHB SOURCE TERM

ISOTOPE	TOTAL CURIES RELEASED TO THE ENVIRONMENT
Sr-90	6.5 E-5
Cs-137	7.8 E-5
Pu-238	2.6 E-7
Pu-239	1.6 E-6
Pu-240	7.6 E-7
Pu-241	1.8 E-5
Am-241	2.6 E-6

TABLE 5

CALCULATED DOSE FROM POSTULATED FIRES

FIRE AREA	BONE DOSE	PART 100 CRITICAL ORGAN (thyroid) LIMITS*
RB (OP Area)	13.5 mrem	300 rem
AFHB	9.2 mrem	300 rem
CACE	10.9 mrem	300 rem

* The PDMS administrative limit is 15 mrem.

REFERENCES

1. Appendix A to Branch Technical Position APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed prior to July 1, 1976," USNRC, 1977.

2. GPU Nuclear letter, 4410-90-L-0012, "Defueling Completion Report, Final Submittal," dated February 22,1990.

3. TMI-2 Post-Defueling Survey Reports

4. GPU Nuclear calculation, 4440-7380-90-017, Revision 2, April, 1993.

5. GPU Nuclear memorandum, 6615-92-0024, "Radionuclides of Concern for TMI-2 PDMS Dose Calculations Involving Fuel," dated February 6, 1992.

6. BNWL-1730, "Fractional Airborne Release of Uranium (Representing Plutonium) During the Burning of Contaminated Wastes," dated April 1973.

7. NUREG/CR-4736, PNL-5999, "Combustion Aerosols Formed During Burning of Radioactively Contaminated Materials - Experimental Results," dated March 1987.

8. TPO/TMI-125, "Reactor Building Radiological Characterization," Revision 2, December, 1989.

9. Technical Bulletin 86-36, "Characterization of Sediment on the Reactor Building Basement Floor," Revision 1, dated February 25, 1987.

10. RB Basement Post Defueling Survey Report

11. GPU Nuclear calculation, 4440-7370-87-006, Revision 0, July 1987.

12. Deleted.

13. Deleted.

14. TMI-2 PDMS Technical Specifications.

15. Deleted.

16. GPU Nuclear Environmental Controls calculation, 87-008, Revision 0, January 1988.

17. Deleted.

18. Deleted.

19. Deleted.

20. Regulatory Guide 1.109, "Calculation of Annual Doses to Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50," Appendix I.

21. NUREG-0712, "Age Specific Radiation Dose Commitment Factors for a One-year Chronic Intake," Battelle Pacific Northwest Laboratories for the NRC, November 1977.

22. Regulatory Guide 1.4, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors," Revision 2, June 1974.

23. NUREG/CR-2139, "Aerosols Generated by Free Fall Spills of Powders and Solutions in Static Air, "S.L. Sutter, J.W. Johnston and J. Mishima, December 1981.

24. B&W Report RDD: 85: 5097-01:01, "TMI-2 H8A Core Debris Sample Examination," G.O. Haynes, July 1984.

25. NUREG/CR-3535, "Age Dependent Dose - Conversions Factors for Selected Bone Seeking Radionuclides," M. Christy et. al., prepared for U.S. Nuclear Regulatory Commission by Oak Ridge National Laboratory, May 1984.

26. Annals of the ICRP, Publication 26, "Recommendations of the International Commission or Radiological Protection.

27. Deleted.

28. Deleted.

29. GPU Nuclear letter, C312-92-2080, "TMI-2 Reactor Vessel Criticality Safety Analysis," dated December 18, 1992.

30. TMI-2 PDMS SAR Amendment 17, dated May 1993.

31. GPU Nuclear memorandum, 6510-93-0136, "AFHB Dose Calculation (Revised Source Term)," dated October 8, 1993.

Part II NRC BTP APCSB 9.5-1 APPENDIX A COMPARISON

REQUIREMENT

A.1 Personnel

Responsibility for the overall fire protection program should be assigned to a designated person in the upper level of management. This person should retain ultimate responsibility even though formulation and assurance of program implementation is delegated. Such delegation of authority should be to staff personnel prepared by training and experience in fire protection and nuclear plant safety to provide a balanced approach in directing the fire protection programs for nuclear power plants. The qualification requirements for the fire protection engineer or consultant who will assist in the design and selection of equipment, inspect and test the completed physical aspects of the system, develop the fire protection program, and assist in the fire fighting training for the operating plant should be stated. Subsequently, the Final Safety Analysis Report (FSAR) should discuss the training and the updating provisions such as fire drills provided for maintaining the competence of the station fire fighting and operating crew, including personnel responsible for maintaining and inspecting the fire protection equipment.

The fire protection staff should be responsible for:

(a) coordination of building layout and systems design with fire area requirements, including consideration of potential hazards associated with postulated design basis fires.

(b) design and maintenance of fire detection, suppression, and extinguishing systems.

(c) fire prevention activities.

(d) training and manual fire fighting activities of plant personnel and the fire brigade.

CONFORMANCE

Responsibility for the overall fire protection program is assigned to the Office of the President, GPU Nuclear Corporation (GPUNC).

Delegation of authority for fire protection program formulation, implementation and day to day activity is delineated in the Fire Protection Program Plan. The qualification requirement for the Fire Protection Program Coordinator is Member status in the Society of Fire Protection Engineers or the equivalent. The Fire Protection Program Coordinator is the GPUNC position responsible for assisting in:

1. the design and selection of equipment,

2. the inspection and testing of the completed physical aspects of the system,

3. the development and maintenance of the fire protection program,

4. the fire fighting training.

The TMI-2 PDMS SAR does not address the training and updating provisions associated with fire protection.

The fire protection staff is responsible for:

1. coordination of building layout and systems design with fire area requirements, including consideration of potential hazards associated with postulated fires.

2. design and maintenance of fire detection, suppression and extinguishing systems.

The Training Department is responsible for:

1. training plant personnel and the fire brigade.

The Operations and Maintenance and Radiological Controls Departments are responsible to the Director, TMI, for:

1. manual fire fighting activities.

2. plant housekeeping inspections

REQUIREMENT

A.2 Design Basis

The overall fire protection program should be based upon evaluation of potential fire hazards throughout the plant and the effect of postulated design basis fires relative to maintaining ability to perform safety shutdown functions and minimize radioactive releases to the environment.

CONFORMANCE

The TMI-2 fire protection program is based upon the evaluation of potential fire hazards

throughout the plant and the effect of postulated fires on safe shutdown and minimizing radiation releases.

REQUIREMENT

A.3 Backup

Total reliance should not be placed on a single automatic fire suppression system. Appropriate backup fire suppression capability should be provided.

CONFORMANCE

There are no automatic suppression systems required to be operable during PDMS. The plant configuration during PDMS presents very low risk which does not warrant automatic fire suppression systems.

REQUIREMENT

A.4 Single Failure Criterion

A single failure in the fire suppression system should not impair both the primary and backup fire suppression capability. For example, redundant fire water pumps with independent power supplies and controls should be provided. Postulated fires or fire protection system failures need not be considered concurrent with other plant accidents or the most severe natural phenomena.

The effects of lightning strikes should be included in the overall plant fire protection program.

CONFORMANCE

Note: Also see "Note" in Section E.2.b.

The fire service water system consists of a yard loop system around TMI-2. This system is supplied by three independent fire pumps with independent suctions and an altitude tank as a reserve. The loop system supplies yard hydrants around the plant. The fire service water system headers within the plant will be isolated and drained during PDMS for freeze protection.

Redundancy is achieved through the use of three independently powered fire water pumps which are connected to the main yard loop in such a manner that no single failure will impair primary and backup suppression capability.

More specific information regarding the fire suppression system is provided in response to requirement E.2, "Fire Protection Water Supply Systems."

All buildings are protected against lightning strikes such that there will be no adverse consequences to systems, structures or components. Lighting protection systems have been inspected and will be maintained during PDMS.

REQUIREMENT

A.5 Fire Suppression Systems

Failure or inadvertent operation of the fire suppression system should not incapacitate safety related systems or components. Fire suppression systems that are pressurized during normal plant operation should meet the guidelines specified in APCSB Branch

Technical Position 3-1 "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment".

CONFORMANCE

Not applicable to TMI-2 in PDMS.

REQUIREMENT

A.6 Fuel Storage Areas

The fire protection program (plans, personnel and equipment) for buildings storing reactor fuel and adjacent fire zones which could affect the fuel storage zone should be fully operational before fuel is received at the site. Schedule for implementation of modifications, if any, will be established on a case by case basis.

CONFORMANCE

Not applicable to TMI-2 in PDMS.

REQUIREMENT

A.7 Fuel Loading

The fire protection program for an entire reactor unit should be fully operational prior to initial fuel loading in that reactor unit. Schedule for implementation of modifications, if any, will be established on a case by case basis.

CONFORMANCE

Not applicable to TMI-2 in PDMS.

REQUIREMENT

A.8 Multiple Reactor Sites

On multiple reactor sites where there are operating reactors and construction of remaining units is being completed, the fire protection program should provide continuing evaluation and include additional fire barriers, fire protection capability, and administrative controls necessary to protect the operating units from construction fire hazards. The superintendent of the operating plant should have the lead responsibility for site protection.

CONFORMANCE

Neither of the two Three Mile Island Nuclear Units is under construction, however, the number of systems shared by the units is minimal. An environmental barrier separates the units at the shared fuel receiving bay. During PDMS, the TMI Division is responsible for TMI-2 fire protection systems and administration. The TMI Fire Protection Program covers all testing, inspection, training and administrative TMI-2 Fire Protection Program documents. The TMI Fire Protection Program procedure AP-1038, "Administrative Controls - Fire Protection Program," is maintained by a TMI-1 license condition.

REQUIREMENT

A.9 Simultaneous Fires

Simultaneous fires in more than one reactor need not be postulated, where separation requirements are met. A fire involving more than one reactor unit need not be postulated except for facilities shared between units.

CONFORMANCE

Since adequate separation is provided between the two Three Mile Island Units, simultaneous fires in both units need not be postulated. Fires were postulated in all shared safety related facilities during the fire hazards analysis.

REQUIREMENT

B.1 Administrative Procedures, Control and Fire Brigade

Administrative procedures consistent with the need for maintaining the performance of the fire protection system and personnel in nuclear power plants should be provided.

Guidance is contained in the following publications:

NFPA 4	-	Organization for Fire Services
NFPA 4A	-	Organization for Fire Department
NFPA 6	-	Industrial Fire Loss Prevention
NFPA 7	-	Management of Fire Emergencies
NFPA 8	-	Management Responsibility for Effects of Fire on Operations
NFPA 27	-	Private Fire Brigades

CONFORMANCE

TMI-2 administrative procedures are in effect covering the applicable guidance in the listed publications. The general topics covered are: fire protection and fire brigade organization, fire brigade training, fire service surveillance, testing and repair, and plant housekeeping. These requirements were transferred intact to the TMI Fire Protection Program upon entry into PDMS.

REQUIREMENT

B.2 Administrative Procedures, Control and Fire Brigade

Effective administrative measures should be implemented to prohibit bulk storage of combustible materials inside or adjacent to safety related buildings or systems during operation or maintenance periods. Regulatory Guide 1.39, "Housekeeping Requirements for Water-Cooled Nuclear Power Plants", provides guidance on housekeeping, including the disposal of combustible materials.

CONFORMANCE

Administrative procedures controlling plant housekeeping and storage of combustible material are in effect. In addition, periodic fire hazards inspections are performed as per the TMI-2 Fire Protection Program Plan. These inspections include follow up on open items. These requirements were transferred to the TMI Fire Protection Program upon entry into PDMS.

REQUIREMENT

B.3 Administrative Procedures, Control and Fire Brigade

Normal and abnormal conditions or other anticipated operations such as modifications (e.g., breaking fire stops, impairment of fire detection and suppression systems) and refueling activities should be reviewed by appropriate levels of management and appropriate special actions and procedures such as fire watches or temporary fire barriers implemented to assure adequate fire protection and reactor safety. In particular:

(a) Work involving ignition sources such as welding and flame cutting should be done under closely controlled conditions. Procedures governing such work should be reviewed and approved by persons trained and equipped to prevent and combat fires. If this is not possible, a person qualified in fire protection should directly monitor the work and function as a fire watch.

(b) Leak testing, and similar procedures such as air flow determination, should use one of the commercially available aerosol techniques. Open flames or combustion generated smoke should not be permitted.

(c) Use of combustible material, e.g. HEPA and charcoal filters, dry ion exchange resins or other combustible supplies, in safety related areas should be controlled. Use of wood inside buildings containing safety related systems or equipment should be permitted only when suitable non-combustible substitutes are not available. If wood must be used, only fire retardant treated wood (scaffolding, lay down blocks) should be permitted.

Such materials should be allowed into safety related areas only when they are to be used immediately. Their possible and probable use should be considered in the fire hazard analysis to determine the installed fire protection system.

CONFORMANCE

Conditions associated with maintenance and operations that could affect nuclear safety are reviewed by the Director, Operations and Maintenance, TMI. Modifications that could affect nuclear safety are reviewed by the appropriate Engineering supervision and by appropriate management. The appropriate fire protection requirements, either additional or special, are implemented per approved procedures. These requirements were transferred to the TMI Fire Protection Program upon entry into PDMS.

REQUIREMENT

B.4 Administrative Procedures, Control and Fire Brigade

Nuclear power plants are frequently located in remote areas, at some distance from public fire departments. Also, first response fire departments are often volunteer. Public fire department response should be considered in the overall fire protection program. However, the plant should be designed to be self-sufficient with respect to fire fighting activities and rely on the public response only for supplemental or backup capability.

CONFORMANCE

TMI is self-sufficient with respect to fire fighting activities. Public fire departments are utilized for support and agreements are maintained with them.

REQUIREMENT

B.5 Administrative Procedures, Control and Fire Brigade

(a) The need for good organization, training and equipping of fire brigades at nuclear power plant sites requires effective measures be implemented to assure proper discharge of these functions. The guidance in Regulatory Guide 1.101, "Emergency Planning for Nuclear Power Plants", should be followed as applicable.

Successful fire fighting requires testing and maintenance of the fire protection equipment, emergency lighting and communication, as well as practice as brigades for the people who must utilize the equipment. A test plan that lists the individuals and their responsibilities in connection with routine tests and inspections of the fire detection and protection systems should be developed. The test plan should contain the types, frequency and detailed procedures for testing. Procedures should also contain instructions on maintaining fire protection during these periods when the fire protection system is impaired or during periods of plant maintenance e.g., fire watches or temporary hose connections to water systems.

CONFORMANCE

A test plan has been developed for TMI-2. The test plan lists those fire protection testing requirements applicable to TMI-2 versus the TMI-2 procedure and department that performs the test.

The instructions for alternate fire protection during system impairments or maintenance are in place.

The requirements outlining conformance in this area were transferred to the TMI Fire Protection Program upon entry into PDMS.

REQUIREMENT

B.5 Administrative Procedures, Control and Fire Brigade

(b) Basic training is a necessary element in effective fire fighting operation. In order for a fire brigade to operate effectively, it must operate as a team. All members must know what their individual duties are. They must be familiar with the layout of the plant and equipment location and operation in order to permit effective fire fighting operations during times when a particular area is filled with smoke or is insufficiently lighted. Such training can only be accomplished by conducting drills several times a year (at least quarterly) so that all members of the fire brigade have had the opportunity to train as a team, testing itself in the major areas of the plant. The drills should include the simulated use of equipment in each area and should be pre-planned and post-critiqued to establish the training objective of drills and determine how well these objectives have been met. These drills should periodically (at least annually) include local fire department participation where possible. Such drills also permit supervising personnel to evaluate the effectiveness of communications within the fire brigade and with the onscene fire team leader, the reactor operator in the control room, and the offsite command post.

CONFORMANCE

Each TMI site fire brigade shift participates in preplanned and post critiqued drills at least once per quarter. The drills use minimum simulation and brigade teamwork is emphasized.

Once per year the off-site fire department(s) are invited to participate in an on-site fire drill.

REQUIREMENT

B.5 Administrative Procedures, Control and Fire Brigade

(c) To have proper coverage during all phases of operation, members of each shift crew should be trained in fire protection. Training of the plant fire brigade should be coordinated with the local fire departments so that responsibilities and duties are delineated in advance. This coordination should be part of the training course and implemented into the training of the local fire department staff. Local fire departments should be educated in the operational precautions when fighting fires on nuclear power plant sites. Local fire departments should be made aware of the need for radioactive protection of personnel and the special hazards associated with a nuclear power plant site.

CONFORMANCE

Members of the shift crews are trained and a minimum 5 man fire brigade is on shift at all times.

Training the local fire department(s) is coordinated with the fire brigade. The local fire departments are offered site specific training and radiological controls training on an annual basis.

REQUIREMENT

B.5 Administrative Procedures, Control and Fire Brigade

(d) NFPA 27, "Private Fire Brigade" should be followed in organization, training, and fire drills. This standard also is applicable for the inspection and maintenance of fire fighting equipment. Among the standards referenced in this document, the following should be utilized: NFPA 194, "Standard for Screw Threads and Gaskets for Fire Hose Couplings", NFPA 197, "Training Standard on Initial Fire Attacks", NFPA 601, "Recommended Manual of Instructions and Duties for the Plant Watchman on Guard." NFPA booklets and pamphlets listed on page 27-11 of Volume 8, 1971-72 are also applicable for good training references. In addition, courses in fire prevention and fire suppression which are recognized and/or sponsored by the fire protection industry should be utilized.

CONFORMANCE

NFPA-27-1975 was followed in establishing TMI site fire brigade organization, training and fire drill requirements. Other NFPA Codes and Standards including 10 CFR 50 Appendix R were considered during other phases of fire brigade training and equipment procurement. These Codes and Standards were incorporated into the TMI-2 program. The requirements of the program are fully addressed in the TMI Fire Protection Program.

REQUIREMENT

C. Quality Assurance Program

Quality Assurance (QA) programs of applicants and contractors should be developed and implemented to assure that the requirements for design, procurement, installation, and testing and administrative controls for the fire protection program for safety related areas as defined in this Branch Position are satisfied. The program should be under the management control of the QA organization. The QA program criteria that apply to the fire protection program should include the following:

CONFORMANCE

Ten of the eighteen Quality Assurance criteria established in 10 CFR 50 Appendix B are identified in BTP APCSB 9.5-1 Appendix A and are applicable to the TMI Fire Protection Program. These ten criteria are fully addressed in the TMI-1 Fire Hazards Analysis Report which is applicable to the TMI site with regards to administrative controls.

REQUIREMENT

D.1 Building Design

(a) Plant layouts should be arranged to:

(1) Isolate safety related systems from unacceptable fire hazards.

(2) Separate redundant safety related systems from each other so that both are not subject to damage from a single fire hazard.

Alternatives

- Redundant safety related systems that are subject to damage from a single fire hazard should be protected by a combination of fire retardant coatings and fire detection and suppression systems, or
- A separate system to perform the safety function should be provided.

CONFORMANCE

Part III, Fire Zone Evaluation, and Part I, General Information, Section 3.2.2.1 of this report provides further information on this requirement. Essentially, plant layout fire protection considerations are maintained in PDMS to separate TMI-2 from TMI-1 (facilities turned over to TMI-1 will be evaluated in support of turnover) and to minimize radiation release to the environment in the event of fire.

REQUIREMENT

D.1 Building Design

(b) In order to accomplish 1.(a) above, safety related systems and fire hazards should be identified throughout the plant. Therefore, a detailed fire hazard analysis should be made. The fire hazards analysis should be reviewed and updated as necessary.

CONFORMANCE

A detailed fire hazards analysis has been performed; the results of which are contained in this document. The fire hazards analysis is reviewed and updated as necessary.

REQUIREMENT

D.1 Building Design

(c) For multiple reactor sites, cable spreading rooms should not be shared between reactors. Each cable spreading room should be separated from other areas of the plant by barriers (walls and floors) having a minimum fire resistance of three hours. Cabling for redundant safety divisions should be separated by walls having three-hour fire barriers.

CONFORMANCE

The cable spreading rooms are separated for TMI-1 and TMI-2. The TMI-2 cable spreading room does not contain any equipment or circuits considered safety related for PDMS.

REQUIREMENT

D.1 Building Design

(d) Interior wall and structural components, thermal insulation materials and radiation shielding materials and soundproofing should be non-combustible. Interior finishes should be non-combustible or listed by a nationally recognized testing laboratory, such as Factory Mutual or Underwriters Laboratory, Inc. for flame spread, smoke and fuel contribution of 25 or less in its use configuration (ASTM E-84 Test, "Surface Burning Characteristics of Building Materials").

CONFORMANCE

Interior wall and structural components, thermal insulation materials, radiation shielding materials and soundproofing are non-combustible. The pipe and duct insulating materials fully met the requirements set forth in NELPIA (now ANI) when installed with a maximum rating of 25 for flame spread and 50 for smoke generation.

REQUIREMENT

D.1 Building Design

(e) Metal deck roof construction should be non-combustible (see the building materials directory of the Underwriters Laboratory, Inc.) or listed as Class I by Factory Mutual System Approval Guide.

Where combustible material is used in metal deck roofing design, acceptable alternatives are:

- Replace combustibles with non-combustible materials,
- Provide an automatic sprinkler system, or
- Provide ability to cover roof exterior and interior with adequate water volume and pressure.

CONFORMANCE

Metal deck roof construction for TMI-2 is made from non-combustible materials.

REQUIREMENT

D.1 Building Design

(f) Suspended ceilings and their supports should be of non-combustible construction. Concealed spaces should be devoid of combustibles. Adequate fire detection and suppression systems should be provided where full implementation is not practicable.

CONFORMANCE

There are no suspended ceilings located in the RB. Therefore, this requirement is not applicable.

REQUIREMENT

D.1 Building Design

(g) High voltage-high amperage transformers installed inside buildings containing safety related systems should be of the dry type or insulated and cooled with non-combustible liquid.

Safety related systems that are exposed to flammable oil filled transformers should be protected from the effects of a fire by:

(1) Replacing with dry transformers that are insulated and cooled with non-combustible liquid

(2) Enclosing the transformer with a three-hour fire barrier and installing automatic water spray protection.

CONFORMANCE

This does not apply to TMI-2 during PDMS.

REQUIREMENT

D.1 Building Design

(h) Buildings containing safety related systems should be protected from exposure or spill fires involving oil filled transformers by:

- Locating such transformers at least 50 feet distant

- Ensuring that such building walls within 50 feet of oil filled transformers are without openings and have a fire resistance rating of at least three hours.

Buildings containing safety related systems, having openings in exterior walls closer than 50 feet to flammable oil filled transformers should be protected from the effects of a fire by:

- Closing of the opening to have fire resistance equal to three hours

- Constructing a three-hour fire barrier between the transformer and the wall openings

- Closing the opening and providing the capability to maintain a water curtain in case of a fire.

CONFORMANCE

The main (out-of-service) and auxiliary transformers are located greater than 50 ft. from the RB. For PDMS, these transformers are being replaced with dry encapsulated type transformers sized for PDMS loads. Further, there are no safety related systems at TMI-2 during PDMS.

REQUIREMENT

D.1 Building Design

(i) Floor drains, sized to remove expected fire fighting water flow should be provided in those areas where fixed water fire suppression systems are installed. Drains should also be provided in other areas where hand hose lines may be used if such fire fighting water could cause unacceptable damage to equipment in the area. Equipment should be installed on pedestals, or curbs should be provided as required to contain water and direct it to floor drains. (See NFPA 94M, "Waterproofing and Draining of Floors"). Drains in areas containing combustible liquids should have provisions for preventing the spread of the fire throughout the drain system. Water drainage from areas which may contain radioactivity should be sampled and analyzed before discharge to the environment.

In operating plants or plants under construction, if accumulation of water from the operation of new fire suppression systems does not create unacceptable consequences, drains need not be installed.

CONFORMANCE

Where water from manual hose streams may be introduced, floor drains are provided. Further, the possibility of water damage is insignificant due to the absence of safety related equipment. In PDMS, the only fire fighting activities expected within the Reactor Building would be with portable extinguishers.

REQUIREMENT

D.1 Building Design

(j) Floors, walls and ceilings enclosing separate fire areas should have minimum fire rating of three hours. Penetrations in these fire barriers, including conduits and piping, should be sealed or closed to provide a fire resistance rating at least equal to that of the fire barrier itself. Door openings should be protected with equivalent rated doors, frames and hardware that have been tested and approved by a nationally recognized laboratory. Such doors should be normally closed and locked or alarmed with alarm and annunciation in the control room. Penetrations for ventilation system should be protected by a standard "fire door damper" where required. (Refer to NFPA 80, "Fire Doors and Windows".)

The fire hazard in each area should be evaluated to determine barrier requirements. If barrier fire resistance cannot be made adequate, fire detection and suppression should be provided, such as:

- Water curtain in case of fire

- Flame retardant coatings

- Additional fire barriers

CONFORMANCE

The RB exterior walls, penetration seals, and access hatches are not fire rated due to overriding nuclear considerations. However, they are of substantial construction and are considered to provide an adequate level of protection.

REQUIREMENT

D.2 Control of Combustibles

(a) Safety related systems should be isolated or separated from combustible materials. When this is not possible because of the nature of the safety system or the combustible material, special protection should be provided to prevent a fire from defeating the safety system function. Such protection may involve a combination of automatic fire suppression, and construction capable of withstanding and containing a fire that consumes all combustibles present. Examples of such combustible materials that may not be separable from the remainder of its system are:

- Emergency diesel generator fuel oil day tanks
- Turbine generator oil and hydraulic control fluid systems
- Reactor coolant pump lube oil system.

CONFORMANCE

Compliance with this requirement is no longer needed to maintain safe shutdown or to minimize radioactive releases.

REQUIREMENT

D.2 Control of Combustibles

(b) Bulk gas storage (either compressed or cryogenic), should not be permitted inside structures housing safety related equipment. Storage of flammable gas such as hydrogen should be located outdoors or in separate detached buildings so that a fire or explosion will not adversely affect any safety related system or equipment. (Refer to NFPA 50A, "Gaseous Hydrogen Systems".)

Care should be taken to locate high pressure gas storage containers with the long axis parallel to building walls. This will minimize the possibility of wall penetration in the event of a container failure. Use of compressed gases (especially flammable and fuel gases) inside buildings should be controlled. (Refer to NFPA 6, "Industrial Fire Loss Prevention".)

CONFORMANCE

Bulk gas is not stored at TMI-2.

Use of compressed gases to support PDMS activities is brought onsite and controlled under the fire protection program and safety regulations.

REQUIREMENT

D.2 Control of Combustibles

(c) The use of plastic materials should be minimized. In particular, halogenated plastics such as polyvinyl chloride (PVC) and neoprene should be used only when substitute non-combustible materials are not available. All plastic materials, including flame and fire retardant materials, will burn with an intensity and BTU production in a range similar to that of ordinary hydrocarbons. When burning, they produce heavy smoke that obscures visibility and can plug air filters, especially charcoal and HEPA. The halogenated plastics also release free chlorine and hydrogen chloride when burning which are toxic to humans and corrosive to equipment.

CONFORMANCE

The use of plastics for TMI-2 such as polyvinyl chloride is minimal and is administratively controlled.

REQUIREMENT

D.2 Control of Combustibles

(d) Storage of flammable liquids should, as a minimum, comply with the requirements of NFPA 30, "Flammable and Combustible Liquids Code".

CONFORMANCE

Flammable liquid storage in TMI-2 complies with the requirements of NFPA 30. The storage of flammable liquids is administratively controlled.

REQUIREMENT

D.3 Electric Cable Construction, Cable Trays and Cable Penetrations

(a) Only non-combustible materials should be used for cable tray construction.

CONFORMANCE

Cable trays are constructed from non-combustible galvanized steel.

REQUIREMENT

D.3 Electric Cable Construction, Cable Trays and Cable Penetrations

(b) See Section F.3 for fire protection guidelines for cable spreading rooms.

CONFORMANCE

Refer to Section F.3 for conformance.

REQUIREMENT

D.3 Electric Cable Construction, Cable Trays and Cable Penetrations

(c) Automatic water sprinkler systems should be provided for cable trays outside the cable spreading room. Cables should be designed to allow wetting down with deluge water without electrical faulting. Manual hose stations and portable hand extinguishers should be provided as backup. Safety related equipment in the vicinity of such cable trays, that does not itself require water fire protection, but is subject to unacceptable damage from sprinkler water discharge, should be protected from sprinkler system operation or malfunction.

When safety related cables do not satisfy the provisions of Regulatory Guide 1.75, all exposed cables should be covered with an approved fire retardant coating and a fixed automatic water fire suppression system should be provided.

CONFORMANCE

Compliance with this requirement is no longer needed to maintain safe shutdown or to minimize radioactive releases.

REQUIREMENT

D.3 Electric Cable Construction, Cable Trays and Cable Penetrations

(d) Cable and cable tray penetration of fire barriers (vertical and horizontal) should be sealed to give protection at least equivalent to that fire barrier. The design of fire barriers for horizontal and vertical cable trays should, as a minimum, meet

the requirements of ASTM E-119, "Fire Test of Building Construction and Materials", including the hose stream test.

Where installed penetration seals are deficient with respect to fire resistance, the seals may be protected by covering both sides with an approved fire retardant material. The adequacy of using such material should be demonstrated by suitable testing.

CONFORMANCE

Penetration seals in the RB wall are not fire rated due to overriding nuclear considerations. However, these seals are of substantial construction and are considered to provide an equivalent level of protection.

REQUIREMENT

D.3 Electric Cable Construction, Cable Trays and Cable Penetrations

(e) Fire breaks should be provided as deemed necessary by the fire hazards analysis. Flame or flame retardant coatings may be used as a fire break for grouped electrical cables to limit spread of fire in cable ventings. (Possible cable derating owing to use of such coating materials must be considered during design.)

CONFORMANCE

Compliance with this requirement is not needed to maintain safe shutdown or to minimize radioactive releases.

REQUIREMENT

D.3 Electric Cable Construction, Cable Trays and Cable Penetrations

(f) Electric cable constructions should, as a minimum, pass the current IEEE-383 flame test. (This does not imply that cables passing this test will not require additional fire protection.)

For cable installation in operating plants under construction that do not meet the IEEE-383 flame test requirements, all cables must be covered with an approved flame retardant coating and properly derated.

CONFORMANCE

Most of the cables installed meet the intent of IEEE-383-1974. However, a small percentage of specialty cables for TV cameras, monitors, and annunciators may not be flame retardant. This amount of cable is small, considered insignificant, and has been evaluated under modification controls.

REQUIREMENT

D.3 Electric Cable Construction, Cable Trays and Cable Penetrations

(g) To the extent practical, cable construction that does not give off corrosive gases while burning should be used.

Applicable to new cable installations.

CONFORMANCE

The material properties of most cables installed meet this criteria, however, some specialty cables, as identified in section D.3(f), may not meet the existing cable material criteria.

REQUIREMENT

D.3 Electrical Cable Construction, Cable Trays and Cable Penetrations

(h) Cable trays, raceways, conduit, trenches, or culverts, should be used only for cables. Miscellaneous storage should not be permitted, nor should piping for flammable or combustible liquids or gases be installed in these areas.

Installed equipment in cable tunnels or culverts need not be removed if they present no hazard to the cable runs as determined by the fire hazards analysis.

CONFORMANCE

Cable trays, raceways, conduit, trenches or culverts are only used for cables. Miscellaneous storage or piping for flammables is not permitted.

REQUIREMENT

D.3 Electric Cable Construction, Cable Trays and Cable Penetrations

(i) The design of cable tunnels, culverts and spreading rooms should provide for automatic or manual smoke venting as required to facilitate manual fire fighting

capability.

CONFORMANCE

The HVAC system can be manually activated to provide smoke venting as required to facilitate manual fire fighting capability. Manual actuation is necessary since fire dampers close and fans shut down upon detection of a fire.

REQUIREMENT

D.3 Electric Cable Construction, Cable Trays and Cable Penetrations

(j) Cables in the control room should be kept to the minimum necessary for operation of the control room. All cables entering the control room should terminate there. Cables should not be installed in floor trenches or culverts in the control room.

Existing cabling installed in concealed floor and ceiling spaces should be protected with an automatic total flooding Halon system.

CONFORMANCE

Cables in the control room are kept to a minimum and most terminate within the control room. The cable installed above the ceiling is not protected with a halon system. Future compliance with this requirement is not needed to maintain safe shutdown or to minimize radioactive releases.

REQUIREMENT

D.4 Ventilation

(a) The products of combustion which need to be removed from a specific fire area should be evaluated to determine how they will be controlled. Smoke and corrosive gases should generally be automatically discharged directly outside to a safe location. Smoke and gases containing radioactive materials should be monitored in the fire area to determine if release to the environment is within the permissible limits of the Plant Technical Specification.

CONFORMANCE

See Section D.4 (b).

REQUIREMENT

D.4 Ventilation

(b) Any ventilation system designed to exhaust smoke or corrosive gases should be evaluated to insure that inadvertent operation or single failures will not violate the controlled areas of the plant design. This requirement includes containment functions for plant protection of the public and maintaining habitability for operations personnel.

CONFORMANCE

Inadvertent operation or single failure of ventilation systems designed to exhaust smoke

or corrosive gases will not violate the controlled areas of the plant. Further, there are no ventilation systems necessary to maintain the safe shutdown condition of the plant or to prevent offsite releases greater than 10 CFR 100 limits.

REQUIREMENT

D.4 Ventilation

(c) The power supply and controls for mechanical ventilation systems should be run outside the fire area served by the system.

CONFORMANCE

There are no ventilation systems in TMI-2 necessary to maintain the safe shutdown condition of the plant or to prevent offsite doses greater than 10 CFR 100 limits.

REQUIREMENT

D.4 Ventilation

(d) Fire suppression systems should be installed to protect charcoal filters in accordance with Regulatory Guide 1.52, "Design Testing and Maintenance Criteria for Atmospheric Cleanup Air Filtration."

CONFORMANCE

There are no charcoal filters in TMI-2 Ventilation Systems.

REQUIREMENT

D.4 Ventilation

(e) The fresh air supply intakes to areas containing safety related equipment or systems should be located remote from the exhaust air outlets and smoke vents of other fire areas to minimize the possibility of contaminating the intake air with the products of combustion.

CONFORMANCE

This requirement does not apply to TMI-2 in PDMS.

REQUIREMENT

D.4 Ventilation

(f) Stairwells should be designed to minimize smoke infiltration during a fire. Staircases should serve as escape routes and access routes for fire fighting. Fire exit routes should be clearly marked. Stairwells, elevators and chutes should be enclosed in masonry towers with minimum fire rating of three hours and automatic fire doors at least equal to the enclosure construction, at each opening into the building. Elevators should not be used during fire emergencies.

Where stairwells or elevators cannot be enclosed in three-hour fire rated barriers with equivalent fire doors, escape and access routes should be established by pre-fire plan and practiced in drills by operating and fire brigade personnel.

CONFORMANCE

The RB is one fire area with two separate entrances. Fire pre-plans are in place for the RB. Elevators are not to be used during fires. Stairwells in the plant and exit routes for PDMS are marked.

REQUIREMENT

D.4 Ventilation

(g) Smoke and heat vents may be useful in specific areas such as cable spreading rooms and diesel fuel oil storage areas and switchgear rooms. When natural-convection ventilation is used, a minimum ratio of 1 square foot of venting area per 200 square feet of floor area should be provided. If forced-convection ventilation is used, 300 cfm should be provided for every 200 square feet of floor area. See NFPA 204 for additional guidance on smoke control.

CONFORMANCE

Compliance with this requirement is no longer needed since these areas do not contain equipment necessary to maintain safe shutdown or to minimize radioactive releases.

REQUIREMENT

D.4 Ventilation

(h) Self-contained breathing apparatus, using full face positive pressure masks,

approved by NIOSH (National Institute for Occupational Safety and Health - approval formerly given by the U. S. Bureau of Mines) should be provided for fire brigade, damage control and control room personnel. Control Room personnel may be furnished breathing air by a manifold system piped from a storage reservoir if practical. Service or operating life should be a minimum of one half hour for the self-contained units.

At least two extra air bottles should be located onsite for each self-contained breathing unit. In addition, an onsite 6-hour supply of reserve air should be provided and arranged to permit quick and complete replenishment of exhausted supply air bottles as they are returned. If compressors are used as a source of breathing air, only units approved for breathing air should be used. Special care must be taken to locate the compressor in areas free of dust and contaminants.

CONFORMANCE

Self Contained Breathing Apparatus (SCBA) are provided at TMI. Each SCBA has two spare cylinders. The quantity of these spares is being reduced since TMI recently upgraded from a 30 minute SCBA cylinder to a 60 minute unit. There is a breathing air qualified compressor at TMI to provide an unlimited air supply. The air compressor location is free of dust and contaminants and the air quality is checked.

REQUIREMENT

D.4 Ventilation

(i) Where total flooding as extinguishing systems are used, area intake and exhaust ventilation dampers should close upon initiation of gas flow to maintain necessary

gas concentration. (See NFPA 12, "Carbon Dioxide Systems" and NFPA 12A, "Halon 1301 Systems".)

CONFORMANCE

The cable room and air intake tunnel do not contain equipment necessary to maintain safe shutdown or to minimize radioactive releases. Therefore, compliance with this requirement is no longer needed.

REQUIREMENT

D.5 Lighting and Communication

Lighting and two-way voice communication are vital to shutdown and emergency response in the event of fire. Suitable fixed and portable emergency lighting and communication devices should be provided to satisfy the following requirements:

(a) Fixed emergency lighting should consist of sealed beam units with individual 8-hour minimum battery power supplies.

CONFORMANCE

Emergency lighting consists of sealed beam lamps powered by batteries which initiate operation upon loss of the normal lighting system. Their duration in hours depends on the number of lights per battery (2 or 4) and is provided to ensure safe egress for personnel. In addition, portable handlights are available for emergency response. The fire brigade has been provided with 8 hour portable lighting units.

REQUIREMENT

D.5 Lighting and Communication

(b) Suitable sealed beam battery powered portable hand lights should be provided for emergency use.

CONFORMANCE

Suitable sealed beam battery powered portable hand lights are provided. The fire brigade has been provided with 8 hour portable lighting units.

REQUIREMENT

D.5 Lighting and Communication

(c) Fixed emergency communication should use voice powered head sets at preselected stations.

CONFORMANCE

Three emergency communication systems, namely the page party, emergency page party and maintenance communication jack systems are provided. Radios are also available.

REQUIREMENT

D.5 Lighting and Communication

(d) Fixed repeaters installed to permit use of portable radio communication units should be protected from exposure fire damage.

CONFORMANCE

Fixed repeaters are located in TMI-1. Repeater stations are being installed in TMI-2 for PDMS to better enable radio communications to TMI-1.

REQUIREMENT

E.1 Fire Detection

(a) Fire detection systems should, as a minimum, comply with NFPA 72D, "Standard for the Installation, Maintenance and Use of Proprietary Protective Signaling Systems". Deviations from the requirements of NFPA 72D should be identified and justified.

CONFORMANCE

The TMI-2 Fire Detection System does not meet all the requirements of NFPA 72D-1975, however, deviations are considered minor (e.g., no automatic recorders).

REQUIREMENT

E.1 Fire Detection

(b) Fire Detection system should give audible and visual alarm and annunciation in the control room. Local audible alarms should also sound at the location of the fire.

CONFORMANCE

The TMI-2 fire detection system fully complies with the requirement of having both local and control room annunciation except as noted below.

A main fire protection panel is located in the TMI-2 Control Room and gives audible and visual alarm indication whenever a particular area detector annunciates or whenever a particular water suppression system actuates. Local fire control panels with fire bells and trouble horns are located throughout the plant in the location of the respective systems they serve. Modifications have been made to route alarm monitoring to the TMI-1 Control Room for PDMS.

REQUIREMENT

E.1 Fire Detection

(c) Fire alarms should be distinctive and unique. They should not be capable of being confused with any other plant system alarms.

CONFORMANCE

All fire alarms are distinctive and unique to prevent confusion with any other plant alarm signal.

REQUIREMENT

E.1 Fire Detection

(d) Fire detection and actuation systems should be connected to the plant emergency power supply.

CONFORMANCE

TMI-2 Fire Detection Systems have had the battery units removed to simplify maintenance. The power supply to these systems is backed by the 1B 480 VAC SBO MCC and the SBO diesel through AC & DC power distribution panels. Loss of power incidents therefore should be infrequent and will be handled in accordance with the administrative limiting condition for operation of the Fire Detection Systems. There are no automatic suppression systems associated with TMI-2 safe shutdown for PDMS.

REQUIREMENT

E.2 Fire Protection Water Supply Systems

(a) An underground main yard loop should be installed to furnish anticipated fire water requirements. NFPA 24, "Standard for Outside Protection" gives necessary guidance for such installation. It references other such design codes and standards developed by such organizations as the American National Standard Institute (ANSI) and the American Water Works Association (AWWA).

Lined steel or cast iron pipe should be used to reduce internal tuberculation. Such tuberculation deposits in an unlined pipe over a period of years can significantly reduce water flow through the combination of increased friction and reduced pipe diameter. Means for treating and flushing the systems should be provided. Approved visually indication section control valves, such as Post Indicator Valves, should be provided to isolate portions of the main for the maintenance or repair without shutting off the entire system. Visible location marking signs for underground valves is acceptable. Alternative valve position indicators should also be provided.

The fire main system piping should be capable of being isolated from service or sanitary water system piping.

CONFORMANCE

The equipment meets the requirements as stated in NFPA 24, "Standard for Outside Protection" with the exception that the yard loop is constructed of carbon steel extra strong unlined seamless pipe. Post indicator valves are provided to allow for the

isolation of various parts of the suppression system. The system is capable of being flushed and is capable of being separated from the service or sanitary water system.

REQUIREMENT

E.2 Fire Protection Water Supply Systems

(b) A common yard fire main loop may serve multi-unit nuclear plant sites, if cross-connected between units. Sectional control valves should permit maintaining independence of the individual loop around each unit. For such installations, common water supplies may also be utilized. The water supply should be sized for the largest single expected flow. Sectionalized systems are also acceptable.

CONFORMANCE

Note: The Conformance paragraphs in sections E.2.b,c,d and e detail how the use of 3 fire pumps and 3 water supplies are available at TMI-2 to satisfy the water system supply requirements identified in this BTP. Only 2 operable fire pumps are required to provide minimum design flow of 3575 gpm as identified in the TMI-1 FSAR and TMI-2 PDMS SAR.

A common yard fire main loop serves TMI-1 and TMI-2. The fire main loop is cross-connected between TMI-1 and TMI-2. Post indicator valves are installed to permit independence of the individual loops around TMI-1 and TMI-2.

Two TMI-1 fire pumps use the Susquehanna River as a water supply.

A third TMI-1 fire pump uses the TMI-1 cooling tower flume for a supply. A 100,000 gallon altitude tank connected to the underground fire main provides an additional water supply.

REQUIREMENT

E.2 Fire Protection Water Supply Systems

(c) If pumps are required to meet system pressure or flow requirements, a sufficient number of pumps should be provided so that 100% capacity will be available with one pump inactive, (e.g.: three 50% pumps or two 100% pumps). The connection to the yard fire main loop from each fire pump should be widely separated, preferably located on opposite sides of the plant. Each pump should have its own driver with independent power supplies and control. At least one pump (if not powered from the emergency diesels) should be driven by nonelectrical means, preferably diesel engine. Pumps and drivers should be located in rooms separated from the remaining pumps and equipment by a minimum three-hour fire wall. Alarms indicating pump running, driver availability, or failure to start should be provided in the control room. Details of the fire pump installations should, as a minimum, conform to NFPA 20, "Standard for the Installation of Centrifugal Fire Pumps".

CONFORMANCE

The TMI-2 FSAR requires a minimum flow of 3575 gpm from the yard fire main loop.

The capacities of the TMI-1 fire pumps are (at 125 psig):

TMI-1 Fire Pump FS-P1 - 2500 gpm

TMI-1 Fire Pump FS-P2 - 2500 gpm

TMI-1 Fire Pump FS-P3 - 2500 gpm

The required flow of 3575 gpm can be provided by any two operable fire pumps.

Each pump has its own driver with independent power supplies and controls. Two fire pumps are diesel driven.

The fire pumps are in widely separated buildings or separated by seismic and fire rated cut-off walls.

The TMI-1 fire pumps have failure to start and fire pump trouble alarms and fire pump running and driver availability indication in the TMI-1 Control Room.

REQUIREMENT

E.2 Fire Protection Water Supply Systems

(d) Two separate reliable water supplies should be provided. If tanks are used, two 100% (minimum of 300,000 gallons each) system capacity tanks should be installed. They should be so inter-connected that pumps can take suction from either or both. However, a leak in one tank or its piping should not cause both tanks to drain. The main plant fire water supply capacity should be capable of refilling either tank in a minimum of eight hours.

Common tanks are permitted for fire and sanitary or service water storage. When this is done, however, minimum fire water storage requirements should be

dedicated by means of a vertical standpipe for other water services.

CONFORMANCE

There are three reliable water supplies for the TMI-1 and TMI-2 fire pumps.

1. Two pumps draw through separate suctions from the Susquehanna River.

2. One pump draws from the TMI-1 Circulating Water Flume.

3. A 100,000 gallon altitude tank is connected to the fire main yard loop. The tank is piped so that 90,000 gallons is reserved for fire fighting.

REQUIREMENT

E.2 Fire Protection Water Supply Systems

(e) The fire water supply (total capacity and flow rate) should be calculated on the basis of the largest expected flow rate for a period of two hours, but not less than 300,000 gallons. This flow rate should be based (conservatively) on 1,000 gpm for manual hose streams plus the greater of:

(1) All sprinkler heads opened and flowing in the largest designed fire area, or

(2) The largest open head deluge system(s) operating.

CONFORMANCE

The design fire water supply flow rate capacity is 2575 gpm to the largest open head deluge (also most remote) plus 1000 gpm for hose streams. As indicated in requirement E.2.c this flow rate is met. The design basis event is a TMI-1 Natural Draft Cooling Tower fire.

The fire water supply total capacity is drawn from the Susquehanna River which will supply the 429,000 gallons (3575 gpm x 120 min.) required.

REQUIREMENT

E.2 Fire Protection Water Supply Systems

(f) Lakes or fresh water ponds of sufficient size may qualify as sole sources of water for fire protection, but require at least two intakes to the pump supply. When a common water supply is permitted for fire protection and the ultimate heat sink, the following conditions should also be satisfied.

(1) The additional fire protection water requirements are designed into the total storage capacity, and

(2) Failure of the fire protection system should not degrade the function of the ultimate heat sink.

CONFORMANCE

TMI does not use lakes or ponds for fire protection water supply.

REQUIREMENT

E.2 Fire Protection Water Supply Systems

(g) Outside manual hose installation should be sufficient to reach any location with an effective hose stream. To accomplish this, hydrants should be installed approximately every 250 feet on the yard main system. The lateral to each hydrant from the yard main should be controlled by a visually indicating or key operated (curb) valve. A hose house, equipped with hose and combination nozzle, and other auxiliary equipment recommended in NFPA 24, "Outside Protection" should be provided as needed but at least every 1,000 feet. Threads compatible with those used by local fire departments should be provided on all hydrants, hose couplings, and standpipe risers.

CONFORMANCE

Fire hydrants are located approximately 250 ft. apart around the perimeter of TMI-1 and TMI-2.

The lateral to each hydrant is controlled by a key operated (curb) valve.

The hose houses, where used, have an inventory meeting NFPA 24 including hose and combination nozzles.

Threads are compatible with local fire companies.

REQUIREMENT

E.3 Water Sprinklers and Hose Standpipe Systems

(a) Each automatic sprinkler system and manual hose station standpipe should have an independent connection to the plant underground water main. Headers fed from each end are permitted inside buildings to supply multiple sprinkler and standpipe systems. When provided, such headers are considered an extension of the yard main system. The header arrangement should be such that no single failure can impair both the primary and backup fire protection systems.

Each sprinkler and standpipe system should be equipped with OS&Y (outside screw and yoke) gate valve, or other approved shutoff valve, and water flow alarm. Safety related equipment that does not itself require sprinkler water fire protection, but is subject to unacceptable damage if wetted by sprinkler water discharge should be protected by water shields or baffles.

CONFORMANCE

This requirement does not apply to TMI-2 in PDMS.

REQUIREMENT

E.3 Water Sprinklers and Hose Standpipe Systems

(b) All valves in the fire water systems should be electrically supervised. The

electrical supervision signal should be indicated in the control room and other appropriate command locations in the plant. (See NFPA 26, "Supervision of Valves".)

When electrical supervision of fire protection valves is not practicable, an adequate management supervision program should be provided. Such a program should include locking valves open with strict key control; tamper proof seals; and periodic, visual check of all valves.

CONFORMANCE

This requirement does not apply to TMI-2 in PDMS.

REQUIREMENT

E.3 Water Sprinklers and Hose Standpipe Systems

(c) Automatic sprinkler systems should, as a minimum, conform to requirements of appropriate standards such as NFPA 13, "Standard for the Installation of Sprinkler Systems", and NFPA 15, "Standard for Water Spray Fixed Systems".

CONFORMANCE

This requirement does not apply to TMI-2 in PDMS.

REQUIREMENT

E.3 Water Sprinklers and Hose Standpipe Systems

(d) Interior manual hose installation should be able to reach any location with at least one effective hose stream. To accomplish this, standpipes with hose connection equipped with a maximum of 75 feet of 1-1/2-inch woven jacket lined fire hose and suitable nozzles should be provided in all buildings, including containment, on all floors and should be spaced at not more than 100-foot intervals. Individual standpipes should be of at least 4-inch diameter for single hose connections. These systems should follow the requirements of NFPA 14 for sizing, spacing and pipe support requirements (NELPIA). Hose stations should be located outside entrances to normally unoccupied areas. Standpipes serving hose stations in areas housing safety related equipment should have shutoff valves and pressure reducing devices (if applicable) outside the area.

CONFORMANCE

This requirement does not apply to TMI-2 in PDMS.

REQUIREMENT

E.3 Water Sprinkler and Hose Standpipe Systems

(e) The proper type of hose nozzles to be supplied to each area should be based on the fire hazard analysis. The usual combination spray/straight-stream nozzle may cause unacceptable mechanical damage (for example, the delicate electronic equipment in the control room) and be unsuitable. Electrically safe nozzles

should be provided at locations where electrical equipment or cabling is located.

CONFORMANCE

This requirement does not apply to TMI-2 in PDMS.

REQUIREMENT

E.3 Water Sprinklers and Hose Standpipe Systems

(f) Certain fires such as those involving flammable liquids respond well to foam suppression. Consideration should be given to use of any of the available foams for such specialized protection application. These include the more common chemical and mechanical low expansion foams, high expansion foam and the relatively new aqueous film forming foam (AFFF).

CONFORMANCE

TMI-2 does not utilize any foam systems.

REQUIREMENT

E.4 Halon Suppression Systems

The use of Halon fire extinguishing agents should, as a minimum, comply with the requirements of NFPA 12A and 12B, "Halogenated Fire Extinguishing Agent Systems - Halon 1301 and Halon 1211". Only UL or FM approved agents should be used.

In addition to the guidelines of NFPA 12A and 12B, preventative maintenance and testing of the systems, including check weighing of the Halon cylinders should be done at least quarterly.

Particular considerations should also be given to:

- Minimum required Halon concentration and soak time
- Toxicity of Halon
- Toxicity and corrosive characteristics of thermal decomposition products

CONFORMANCE

TMI-2 has no halon systems in service.

REQUIREMENT

E.5 Carbon Dioxide Suppression Systems

The use of carbon dioxide extinguishing systems should, as a minimum, comply with the requirements of NFPA 12, "Carbon Dioxide Extinguishing Systems".

Particular consideration should also be given to:

- Minimum required CO_2 concentration and soak time
- Toxicity of CO_2
- Possibility of secondary thermal shock (cooling) damage
- Offsetting requirements for venting during CO_2 injection to prevent overpressurization versus sealing to prevent loss of agent
- Design requirements for overpressurization

- Possibility and probability of CO_2 systems being out of service because of personnel safety considerations. CO_2 systems are disarmed whenever people are present in an area so protected. Areas entered frequently (even though duration time for any visit is short) have often been found with CO_2 systems shut off.

CONFORMANCE

TMI-2 does not use any carbon dioxide systems.

REQUIREMENT

E.6 Portable Extinguishers

Fire extinguishers should be provided in accordance with guidelines of NFPA 10 and 10A, "Portable Fire Extinguishers, Maintenance and Use." Dry chemical extinguishers should be installed with due consideration given to cleanup problems after the use and possible adverse effects on equipment installed in the area.

CONFORMANCE

All portable fire extinguishers meet the requirements set in NFPA 10.

REQUIREMENT

F.1 Primary and Secondary Containment

(a) Normal Operation

Fire protection requirements for the primary and secondary containment areas should be provided on the basis of specific identified hazards. For example:

- Lubricating oil or hydraulic fluid system for the primary coolant pumps.
- Cable tray arrangements and cable penetrations
- Charcoal filters

Fire suppression systems should be provided based on the fire hazards analysis.

Fixed fire suppression capability should be provided for hazards that could jeopardize safe plant shutdown. Automatic sprinklers are preferred. An acceptable alternate is automatic gas (Halon or CO_2) for hazards identified as requiring fixed suppression protection.

An enclosure may be required to confine the agent if a gas system is used. Such enclosures should not adversely affect safe shutdown, or other operating equipment in containment.

Automatic fire suppression capability need not be provided in the primary containment atmospheres that are inverted during normal operation. However, special fire protection requirements during refueling and maintenance operations

should be satisfied as provided in (b).

Fire detection systems should alarm and annunciate in the control room. The type of detection used and the location of the detectors should be most suitable to the particular type of fire that could be expected from the identified hazard. A primary containment general area fire detection capability should be provided as backup for the above described hazard detection. To accomplish this, suitable smoke detection (e.g.: visual obscuration, light scattering and particle counting) should be installed in the air recirculation system ahead of any filters.

CONFORMANCE

Fire protection requirements for the TMI-2 primary and secondary containment areas are provided on the basis of the specific identified hazards in PDMS.

The hazards considered in developing the requirements are:

1. the Reactor Coolant Pump lubricating oil
2. the installed and transient combustibles
3. the possibility of electrical faults

A fire detection system which alarms and annunciates in a manned location is provided for containment.

There are no fixed suppression systems (gas or water) installed in containment. The hazards in containment are considered low because of:

1. The lack of heat sources

2. The minimal energized equipment

3. Combustibles are being controlled through the formal engineering change system and the control of combustibles procedure.

4. Precautions are taken during evolutions which could cause electrical faulting or heat generation, to minimize the risk of occurrence of those hazards. For example, during water washdown certain equipment is designated as items that should not be wetted, when welding, cutting or burning is required the appropriate hot work precautions are used. The precautions taken are on a case by case basis since the unique problems of TMI-2 preclude programmatic solutions to all hazards.

In addition to the installed fire detection system, the plant Fire Brigade is trained on containment entries and procedures for fire fighting.

REQUIREMENT

F.1 Primary and Secondary Containment

(b) Refueling and Maintenance

Refueling and maintenance operations in containment may introduce additional hazards such as contamination control materials, decontamination supplies, wood planking, temporary wiring, welding and flame cutting (with portable compressed fuel gas supply). Possible fires would not necessarily be in the vicinity of fixed detection and suppression systems.

Management procedures and controls necessary to assure adequate fire protection are discussed in Section 3a.

In addition, manual fire fighting capability should be permanently installed in containment. Standpipes with hose stations, and portable fire extinguishers, should be installed at strategic locations throughout containment for any required manual fire fighting operations.

Adequate self-contained breathing apparatus should be provided near the containment entrances for fire fighting and damage control personnel. These units should be independent of any breathing apparatus or air supply systems provided for general plant activities.

CONFORMANCE

The self-contained breathing apparatus supplied for the fire fighting activities meets the requirements of the Branch Technical Position.

The other requirements of this section are answered in the response to F.1(a).

REQUIREMENT

F.2 Control Room

The control room is essential to safe reactor operation. It must be protected against disabling fire damage and should be separated from other areas of the plant by floors, walls and roofs having minimum fire resistance ratings of three hours.

Control room cabinets and consoles are subject to damage from two distinct fire hazards:

- Fire originating within a cabinet or console
- Exposure fire involving combustibles in the general room area.

Manual fire fighting capability should be provided for both hazards. Hose stations and portable water and Halon extinguishers should be located in the control room to eliminate the need for operators to leave the control rooms. An additional hose piping shutoff valve and pressure reducing device should be installed outside the control room.

Hose stations adjacent to the control room with portable extinguishers in the control room are acceptable.

Nozzles that are compatible with the hazards and equipment in the control room should be provided for the manual hose station. The nozzles chosen should satisfy actual fire fighting needs, satisfy electrical safety and minimize physical damage to electrical equipment from hose stream impingement.

Fire detection in the control room cabinets, and consoles should be provided by smoke and heat detectors in each fire area. Alarm and annunciation should be provided in the control room. Fire alarms in other parts of the plant should also be alarmed and annunciated in the control room.

Breathing apparatus for control room operators should be readily available.

The control room ventilation intake should be provided with smoke detection capability to automatically alarm locally and isolate the control room ventilation system to protect operators by preventing smoke from entering the control room. Manually operated

venting of the control room should be available so that operators have the option of venting for visibility.

Manually operated ventilation systems are acceptable.

Cables should not be located in concealed floor and ceiling spaces. All cables that enter the control room should terminate in the control room. That is, no cabling should be simply routed through the control room from one area to another.

If such concealed spaces are used, however, they should have fixed automatic total flooding halon protection.

CONFORMANCE

The control room does not contain any equipment necessary to maintain safe shutdown or to minimize radioactive releases. Therefore, this requirement is not applicable to TMI-2.

REQUIREMENT

F.3 Cable Spreading Room

(a) The preferred acceptable methods are:

(1) Automatic water system such as closed head sprinklers, open head deluge, or open directional spray nozzles. Deluge and open spray systems should have provisions for manual operation at a remote station, however, there should also be provisions to preclude inadvertent

operation. Location of sprinkler heads or spray nozzles should consider cable tray sizing and arrangements to assure adequate water coverage. Cables should be designed to allow wetting down with deluge water without electrical faulting. Open head deluge and open directional spray systems should be zoned so that a single failure will not deprive the entire area of automatic fire suppression capability. The use of foam is acceptable, provided it is of a type capable of being delivered by a sprinkler or deluge system, such as an Aqueous Film Forming Foam (AFFF).

(2) Manual hoses and portable extinguishers should be provided as backup.

(3) Each cable spreading room of each unit should have divisional cable separation, and be separated from the other and the rest of the plant by minimum three-hour rated fire wall (refer to NFPA 251 or ASTM E-119 for fire test resistance rating).

(4) At least two remote and separate entrances are provided to the room for access by fire brigade personnel.

(5) Aisle separation provided between tray stacks should be at least three feet wide and eight feet high.

(b) For cable spreading rooms that do not provide divisional cable separation of a.3, in addition to meeting 1, 2, 4 and 5 above, the following should also be provided:

(1) Divisional cable separation should meet the guidelines of Regulatory Guide 1.75, "Physical Independence of Electric Systems".

(2) All cabling should be covered with a suitable fire retardant coating.

(3) As an alternate to a 1 above, automatically initiated gas systems (Halon or CO_2) may be used for primary fire suppression, provided a fixed water system is used as a backup.

(4) Plants that cannot meet the guidelines of Regulatory Guide 1.75, in addition to meeting a 1, 2, 4 and 5 above, an auxiliary shutdown system with all cabling independent of the cable spreading room should be provided.

The ventilation system to the cable spreading room should be designed to isolate the area. In addition, smoke venting of the cable spreading room may be desirable. Such smoke venting systems should be controlled automatically by the fire detection or suppression system as appropriate. Capability for remote manual control should also be provided.

CONFORMANCE

The cable room does not contain any equipment necessary to maintain safe shutdown or to minimize radioactive releases. Therefore, this requirement is not applicable to TMI-2.

REQUIREMENT

F.4 Plant Computer Room

Safety related computers should be separated from other areas of the plant by barriers

having a minimum three-hour fire resistant rating. Automatic fire detection should be provided to alarm and annunciate in the control room and alarm locally. Manual hose stations and portable water and halon fire extinguishers should be provided.

CONFORMANCE

The computers are turned off and are not necessary to maintain safe shutdown or to minimize radioactive releases. Therefore, this requirement is not applicable to TMI-2.

REQUIREMENT

F.5 Switchgear Rooms

Switchgear rooms should be separated from the remainder of the plant by minimum three-hour rated fire barriers to the extent practicable. Automatic fire detection should alarm and annunciate in the control room and alarm locally. Fire hose stations and portable extinguishers should be readily available.

Acceptable protection for cables that pass through the switchgear room is automatic water or gas agent suppression. Such automatic suppression must consider preventing unacceptable damage to electrical equipment and possible necessary containment of agent following discharge.

CONFORMANCE

The switchgear rooms do not contain any equipment necessary to maintain safe shutdown or to minimize radioactive releases. Therefore, this requirement is not applicable to TMI-2.

REQUIREMENT

F.6 Remote Safety Related Panels

The general area housing remote safety related panels should be provided with automatic fire detectors that alarm locally and alarm and annunciate in the control room. Combustible materials should be controlled and limited to those required for operation. Portable extinguishers and manual hose stations should be provided.

CONFORMANCE

There are no remote safety related panels in TMI-2.

REQUIREMENT

F.7 Station Battery Rooms

Battery rooms should be protected against fire explosions. Battery rooms should be separated from each other and other areas of the plant by barriers having a minimum fire rating of three hours inclusive of all penetrations and openings. (See NFPA 69, "Standard on Explosion Prevention Systems".) Ventilation systems in the battery rooms should be capable of maintaining the hydrogen concentration well below 2 vol. % hydrogen concentration. Standpipe and hose and portable extinguishers should be provided.

Alternatives

- Provide a total fire rated barrier enclosure of the battery room complex that exceeds the fire load contained in the room.

- Reduce the fire load to be within the fire barrier capability for 1 1/2 hours.

- Provide a remote manual actuated sprinkler system in each room and provide the 1 1/2 hour fire barrier separation.

CONFORMANCE

The station batteries have been removed for PDMS. Therefore, this requirement is not applicable to TMI-2.

REQUIREMENT

F.8 Turbine Lubrication and Control Oil Storage and Use Areas

A blank fire wall having a minimum resistance rating of three hours should separate all areas containing safety related systems and equipment from the turbine oil system.

When a blank wall is not present, open head deluge protection should be provided for the turbine oil hazards and automatic open head water curtain protection should be provided for wall openings.

CONFORMANCE

These areas are not required to maintain safe shutdown or to minimize radioactive releases.

REQUIREMENT

F.9 Diesel Generator Areas

Diesel generators should be separated from each other and other areas of the plant by fire barriers having a minimum fire resistance rating of three hours.

Automatic fire suppression such as AFFF foam, or sprinklers should be installed to combat any diesel generator or lubricating oil fires. Automatic fire detection should be provided to alarm and annunciate in the control room and alarm locally. Drainage for fire fighting water and means for local manual venting of smoke should be provided.

Day tanks with total capacity up to 1100 gallons are permitted in the diesel generator area under the following conditions:

(a) The day tank is located in a separate enclosure, with a minimum fire resistance rating of three hours, including doors or penetrations. These enclosures should be capable of containing the entire contents of the day tanks. The enclosure should be ventilated to avoid accumulation of oil fumes.

(b) The enclosure should be protected by automatic fire suppression systems such as AFFF or sprinklers.

When day tanks cannot be separated from the diesel generator one of the following should be provided for the diesel generator area:

(a) Automatic open head deluge or open head spray nozzle system

(b) Automatic closed head sprinklers

(c) Automatic AFFF that is delivered by a sprinkler deluge or spray system

(d) Automatic gas system (Halon or CO_2) may be used in lieu of foam or sprinklers to combat diesel generator and/or lubricating oil fires.

CONFORMANCE

The TMI-2 Diesel Generator Building and equipment has been turned over to TMI-1. Therefore, this requirement is not applicable to TMI-2.

REQUIREMENT

F.10 Diesel Fuel Oil Storage Areas

Diesel fuel oil tanks with a capacity greater than 1100 gallons should not be located inside the buildings containing safety related equipment. They should be located at least 50 feet from any building containing safety related equipment, or if located within 50 feet, they should be housed in a separate building with construction having a minimum fire resistance rating of three hours. Buried tanks are considered as meeting the three hour fire resistance requirements. (See NFPA 30, "Flammable and Combustible Liquids Code" for additional guidance.)

When located in a separate building, the tank should be protected by an automatic fire suppression system such as AFFF or sprinklers.

Tanks, unless buried, should not be located directly above or below safety related systems or equipment regardless of the fire rating or separating floors or ceilings.

In operating plants where tanks are located directly above or below the diesel generators and cannot reasonably be moved, separating floors and main structural members should, as a minimum, have fire resistance rating of three hours. Floors should be liquid tight to prevent leaking of possible oil spills from one level to another. Drains should be provided to remove possible oil spills and fire fighting water to a safe location.

One of the following acceptable methods of fire protection should also be provided:

- Automatic open head deluge or open head spray nozzle system(s)

- Automatic closed head sprinklers

- Automatic AFFF that is delivered by a sprinkler system or spray system

CONFORMANCE

The TMI-2 diesel fuel oil storage area has been turned over to TMI-1. Therefore, this requirement is not applicable to TMI-2.

REQUIREMENT

F.11 Safety Related Pumps

Pump houses and rooms housing safety related pumps or other safety related equipment should be separated from other areas of the plant by fire barriers having at least three hour ratings. These rooms should be protected by automatic sprinkler protection unless a fire hazards analysis can demonstrate that a fire will not endanger other safety related equipment required for safe plant shutdown. Early warning fire detection should be installed with alarm and annunciation locally and in the control room. Local hose stations and portable extinguishers should also be provided.

Provisions should be made for manual control of the ventilation systems to facilitate smoke removal if required for manual fire fighting operation.

CONFORMANCE

There are no pumps at TMI-2 which are necessary to maintain safe shutdown or to minimize radioactive releases. Therefore, this requirement is not applicable to TMI-2.

REQUIREMENT

F.12 New Fuel Area

Hand portable extinguishers should be located within this area. Also, local hose stations should be located outside, but within hose reach of this area. Automatic fire detection should alarm and annunciate in the control room and alarm locally. Combustibles should be limited to a minimum in the new fuel area. The storage area should be provided with

a drainage system to preclude accumulation of water.

The storage configuration of new fuel should always be so maintained as to preclude criticality for any water density that might occur during fire water application.

CONFORMANCE

TMI-2 does not store any new fuel. Therefore, this requirement is not applicable to TMI-2.

REQUIREMENT

F.13 Spent Fuel Pool Area

Protection for the spent fuel pool area should be provided by local hose stations and portable extinguishers. Automatic fire detection should be provided to alarm and annunciate in the control room and to alarm locally.

CONFORMANCE

There is no spent fuel stored at TMI-2. Therefore, this requirement is not applicable to TMI-2.

REQUIREMENT

F.14 Radwaste Building

The Radwaste Building should be separated from other areas of the plant by fire barriers

having at least three hour ratings. Automatic sprinklers should be used in all areas where combustible materials are located. Automatic fire detection should be provided to annunciate and alarm in the Control Room and alarm locally. During a fire, the ventilation systems in these areas should be capable of being isolated. Water should drain to liquid radwaste building sumps.

Acceptable alternative fire protection is automatic fire detection to alarm and annunciate in the Control Room, in addition to manual hose stations and portable extinguishers consisting of hand held and large wheeled units.

CONFORMANCE

The radwaste processing systems are located as follows:

1. Liquid Waste Disposal

    a. Auxiliary Building
    b. Fuel Handling Building

2. Gaseous Waste Disposal

    a. Auxiliary Building

3. Solid Waste Disposal

    a. Auxiliary Building
    b. Fuel Handling Building

Since neither the above listed systems nor the buildings in which they are located are considered safety related, the following information is provided for information purposes only.

All the areas above are provided with fire detection that alarms locally and in a manned location.

The ventilation systems in the Auxiliary and Fuel Handling Buildings isolate automatically in the event of a fire.

Fire fighting water in all areas listed above will go to controlled sumps.

REQUIREMENT

F.15 Decontamination Areas

The decontamination areas should be protected by automatic sprinklers if flammable liquids are stored. Automatic fire detection should be provided to annunciate and alarm in the control room and alarm locally. The ventilation system should be capable of being isolated. Local hose stations and hand portable extinguishers should be provided as backup to the sprinkler system.

CONFORMANCE

The decontamination areas are located in the Service Building and in the Auxiliary Building, neither of which contain any safety related equipment or circuits. Since almost no flammable liquids are stored in these areas, a sprinkler system is not necessary. For fire protection, detection is provided to alarm and annunciate in a manned location and

alarm locally and the areas are equipped with hose reel stations and various portable fire extinguishers. The ventilation systems can be isolated. These areas are considered non-safety related per the evaluation in Part I, Section 3.2.

REQUIREMENT

F.16 Safety Related Water Tanks

Storage tanks that supply water for safe shutdown should be protected from the effects of fire. Local hose stations and portable extinguishers should be provided. Portable extinguishers should be located in nearby hose houses. Combustible materials should not be stored next to outdoor tanks. A minimum of 50 feet of separation should be provided between outdoor tanks and combustible materials where feasible.

CONFORMANCE

There are no safety-related water tanks at TMI-2. Therefore, this requirement is not applicable to TMI-2.

REQUIREMENT

F.17 Cooling Towers

Cooling towers should be of non-combustible construction or so located that a fire will not adversely affect any safety related systems or equipment. Cooling towers should be of non-combustible construction when the basins are used for the ultimate heat sink or for the fire protection water supply.

Cooling towers of combustible construction, so located that a fire in them could adversely affect safety related systems or equipment should be protected with an open head deluge system installation with hydrants and hose houses strategically located.

CONFORMANCE

The combustible construction portions of the TMI-2 cooling towers have been removed for PDMS.

REQUIREMENT

F.18 Miscellaneous Areas

Miscellaneous areas such as records storage areas, shops, warehouses, and auxiliary boiler rooms should be so located that a fire or effect of a fire, including smoke, will not adversely affect any safety related systems or equipment. Fuel oil tanks for auxiliary boilers should be buried or provided with dikes to contain the entire tank contents.

CONFORMANCE

Miscellaneous areas are located so as not to affect the RB in the event of a fire.

REQUIREMENT

G.1 Welding and Cutting, Acetylene-Oxygen Fuel Gas Systems

This equipment is used in various areas throughout the plant. Storage locations should be chosen to permit fire protection by automatic sprinkler systems. Local hose stations

and portable equipment should be provided as backup. The requirements of NFPA 51 and 51B are applicable to these hazards. A permit system should be required to utilize this equipment.

CONFORMANCE

When acetylene-oxygen fuel gas systems are used, the requirements of NFPA 51 and 51B will be followed.

A permit system is established and used to control this area. The permit system is based on NFPA 51B.

REQUIREMENT

G.2 Storage Areas for Dry Ion Exchange Resins

Dry ion exchange resin should not be stored near essential safety related systems. Dry unused resins should be protected by automatic wet sprinkler installations. Detection by smoke and heat detectors should alarm and annunciate in the control room and alarm locally. Local hose stations and portable extinguishers should provide backup for these areas. Storage areas of dry resin should have curbs and drain. (Refer to NFPA 92M, "Waterproofing and Draining of Floors".)

CONFORMANCE

Dry ion exchange resin is not stored in safety related areas. The usual storage area is separated from safety related areas.

Storage in the plant is in areas provided with automatic detection that alarms and annunciates in a manned location and alarms locally.

REQUIREMENT

G.3 Hazardous Chemicals

Hazardous chemicals should be stored and protected in accordance with NFPA 49, "Hazardous Chemicals Data". Chemical storage areas should be well ventilated and protected against flooding conditions since some chemicals may react with water to produce ignition.

CONFORMANCE

Hazardous chemicals are stored in a building remote from the RB.

REQUIREMENT

G.4 Materials Containing Radioactivity

Materials that collect and contain radioactivity, such as spent ion exchange resins, charcoal filters and HEPA filters should be stored in closed metal tanks or containers that are located in areas free from ignition sources or combustibles. These materials should be protected from exposure to fires in adjacent areas as well. Consideration should be given to requirements for removal of isotopic decay heat from entrained radioactive materials.

CONFORMANCE

The spent resin storage tanks are located in the Auxiliary Building at elevation 280'. Each of the two tanks are located in separate rooms. Isotopic decay heat is removed by the ventilation system. Compressible solid wastes are compressed into approved containers then stored until shipped for permanent disposal.

Incompressible solid wastes are packed into approved containers and stored until shipped for permanent disposal.

Liquid wastes are stored in approved containers, processed for shipment and stored on site or shipped for permanent disposal.

Exposure to fires and decay heat removal were considered in selecting storage areas.

Part III FIRE ZONE EVALUATION

1.0 INTRODUCTION

This part of the Fire Protection Program Evaluation provides the definition of the TMI-2 fire areas and further divides these areas into the fire zones that were analyzed in the Part I Section 3.2, fire hazards analysis. The justifications necessary to ensure the integrity of these fire zones is also included.

2.0 FIRE AREA DEFINITION AND EVALUATION

Three Mile Island - Unit 2 was originally divided into 60 fire areas as indicated on Burns & Roe General Arrangement drawings 2060, 2061, and 2062. A fire barrier evaluation was performed for each fire area to determine the resistance of the fire barriers to postulated fires within the area. This evaluation was conducted as follows:

a. For each fire area, a list of the components located in that area as well as the type and quantity of combustibles associated with each component in the area was identified.

b. The energy release per unit quantity for each type of combustible was determined from reference sources.

c. The energy release per unit quantity multiplied by the quantity of combustibles yielded the energy release of each combustible.

d. The fire loading is expressed in terms of BTU/ft^2 for all combustibles in the area.

e. The resultant fire loading was compared to the fire endurance curve E of Figure 7-9 B and Table 7-9 B (NFPA Fire Protection Handbook, 16th Edition, Section 7, Chapter 9 and the Time Temperature Curve of ASTM E119) to define the fire duration.

f. The fire duration was compared with the fire barrier rating to determine the resistance of the fire barriers to the design basis fires within the area. (A fire loading of 240,000 BTU/ft^2 or less is resisted by a 3-hour rated barrier; a fire loading of 160,000 BTU/ft^2 or less is resisted by a 2-hour rated barrier.) Note: The Reactor Building (RB) walls are non-fire rated due to overriding nuclear considerations. However, they are sufficient construction to provide protection equivalent to a 3-hour rated barrier.

The following subsections provide the results of specific analysis performed for each fire area including:

- Description of the Fire Area
- Equipment and Combustibles in the Fire Area
- Heat Value of the Combustibles in the Fire Area
- Discussion of the Fire Loading in the Fire Area
- Fire Detection Available

2.1 FA-001 - TURBINE BUILDING

Deleted

2.2 FA-002 - OIL DRUM STORAGE ROOM

Deleted

2.3 FA-003 - ELEVATOR

Deleted

2.4 FA-004 - STAIR TOWER

Deleted

2.5 FA-006 - ELECTRICAL EQUIPMENT ROOM

Deleted

2.6 FA-007 - FUEL HANDLING BUILDING (ZONES 1 & 2)

The vertical and horizontal limits of this area are shown on Burns & Roe general arrangement drawings 2065, 2066, 2067, and 2068. This area is subdivided into two fire zones as described below. Fire detection is maintained, exterior fire walls are maintained and the combustible loading is controlled to ensure radiation releases as the result of fire are minimized.

2.6.1 Zone 1 - Elevation 280'-6"

2.6.1.1 **Description of the Fire Zone**

The zone consists of Elevation 280'-6" of the Fuel Handling Building.

2.6.1.2 **Equipment and Combustibles in the Fire Zone**

The equipment located in this zone is shown on Burns & Roe general arrangement drawing 2065.

2.6.1.3 **Heat Value of Combustibles in the Fire Zone**

Summation of the combustible inventory is 1.8×10^8 BTU for this zone.

2.6.1.4 **Discussion of the Fire Loading in the Fire Zone**

Dividing the heat value from the previous section by the floor area (9720 sq. ft.) of this fire zone resulted in a fire loading of approximately 19,000 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 15 minutes. Therefore, existing fire barriers are adequate in this building and the worst-case fire poses no threat to the RB.

2.6.1.5 **Fire Detection Available**

Elevation 280'-6" is covered by Zone 16 of the Zoned Fire Detection System.

2.6.2 Zone 2 Elevation 305'-0" to Elevation 404'-6"

2.6.2.1 **Description of the Fire Zone**

The zone consists of Elevations 305'-0", 328'-0", and 347'-6" of the Fuel Handling Building.

2.6.2.2 **Equipment and Combustibles in the Fire Zone**

The equipment located in this zone is shown on Burns & Roe general arrangement drawings 2066, 2067, and 2068.

2.6.2.3 **Heat Value of Combustibles in the Fire Zone**

Summation of the combustible inventory is 3.4×10^8 BTU for this zone.

2.6.2.4 **Discussion of the Fire Loading in the Fire Zone**

Dividing the heat value from the previous section by the floor area (22,385 sq. ft.) of this fire zone resulted in a fire loading of approximately 15,000 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 15 minutes. Therefore, existing fire barriers are adequate in this building and the worst-case fire poses no threat to the RB.

2.6.2.5 **Fire Detection Available**

Elevation 305' is covered by Zone 17 of the Zoned Fire Detection System. Elevation 347'-6" is covered by Zone 19.

2.7 FA-008 - OIL DRUM STORAGE ROOM

Deleted

2.8 FA-009 - AUXILIARY BUILDING (ZONES 1, 2, 3, 4, & 5)

The vertical and horizontal limits of this area are shown on Burns & Roe general arrangement drawings 2065, 2066, 2067, and 2068. This area is subdivided into five fire zones as described below. Fire detection is maintained, exterior fire walls are maintained and the combustible loading is controlled to ensure radiation releases as the result of fire are minimized.

2.8.1 Zone 1 - Elevation 258'-6"

2.8.1.1 Description of the Fire Zone

This zone consists of Elevation 258'-6" of the Auxiliary Building.

2.8.1.2 Equipment and Combustibles in the Fire Zone

The equipment located in this zone is shown on Burns & Roe general arrangement drawing 2065.

2.8.1.3 Heat Value of Combustibles in the Fire Zone

Summation of the combustible inventory is 2.3×10^7 BTU for this zone.

2.8.1.4 **Discussion of the Fire Loading in the Fire Zone**

Dividing the heat value from the previous section by the floor area (3402 sq. ft.) of this fire zone resulted in a fire loading of approximately 6,800 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 10 minutes. Therefore, existing fire barriers are adequate in this building and the worst-case fire poses no threat to the RB.

2.8.1.5 **Fire Detection Available**

Elevation 258'-6" of the Auxiliary Building is covered by Zone 2 of the Zoned Fire Detection System.

2.8.2 Zone 2 - Elevation 280'-6"

2.8.2.1 **Description of the Fire Zone**

This zone consists of Elevation 280'-6" of the Auxiliary Building.

2.8.2.2 **Equipment and Combustibles in the Fire Zone**

The equipment located in this zone is shown on Burns & Roe general arrangement drawing 2065.

2.8.2.3 **Heat Value of Combustibles in the Fire Zone**

Summation of the combustible inventory is 5.4×10^5 BTU for this zone.

2.8.2.4 **Discussion of the Fire Loading in the Fire Zone**

Dividing the heat value from the previous section by the floor area (23,455 sq. ft.) of this fire zone resulted in a fire loading of approximately 23,000 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 20 minutes. Therefore, existing fire barriers are adequate in this building and the worst-case fire poses no threat to the RB.

2.8.2.5 **Fire Detection Available**

Elevation 280'-6" of the Auxiliary Building is also covered by Zone 2 of the Zoned Fire Detection System.

2.8.3 Zone 3 - Elevation 305'-0"

2.8.3.1 **Description of the Fire Zone**

This zone consists of Elevation 305'-0" of the Auxiliary Building.

2.8.3.2 **Equipment and Combustibles in the Fire Zone**

The equipment located in this zone is shown on Burns & Roe general arrangement drawing 2066.

2.8.3.3 **Heat Value of Combustibles in the Fire Zone**

Summation of the combustible inventory is 8.7×10^8 BTU for this zone.

2.8.3.4 **Discussion of the Fire Loading in the Fire Zone**

Dividing the heat value from the previous section by the floor area (26,589 sq. ft.) of this fire zone resulted in a fire loading of approximately 33,000 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 25 minutes. Therefore, existing fire barriers are adequate in this building and the worst-case fire poses no threat to the RB.

2.8.3.5 **Fire Detection Available**

Elevation 305'-0" of the Auxiliary Building is covered by Zone 3 of the Zoned Fire Detection System.

2.8.4 Zone 4 - Elevation 328'-0"

2.8.4.1 Description of the Fire Zone

This zone consists of Elevation 328'-0" of the Auxiliary Building.

2.8.4.2 Equipment and Combustibles in the Fire Zone

The equipment located in this zone is shown on Burns & Roe general arrangement drawing 2067.

2.8.4.3 Heat Value of Combustibles in the Fire Zone

Summation of the combustible inventory is 3.8×10^8 BTU for this zone.

2.8.4.4 Discussion of the Fire Loading in the Fire Zone

Dividing the heat value from the previous section by the floor area (25,693 sq. ft.) of this fire zone resulted in a fire loading of approximately 15,000 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 15 minutes. Therefore, existing fire barriers are adequate in this building and the worst-case fire poses no threat to the RB.

2.8.4.5 **Fire Detection Available**

Elevation 328' is covered by Zone 4A of the Zoned Fire Detection System.

2.8.5 Zone 5 - Elevation 347'-6"

2.8.5.1 **Description of the Fire Zone**

This zone consists of Elevation 347'-6" of the Auxiliary Building.

2.8.5.2 **Equipment and Combustibles in the Fire Zone**

The equipment located in this zone is shown in Burns & Roe general arrangement drawing 2068.

2.8.5.3 **Heat Value of Combustibles in the Fire Zone**

Summation of the combustible inventory is 2.1×10^7 BTU for this zone.

2.8.5.4 **Discussion of the Fire Loading in the Fire Zone**

Dividing the heat value from the previous section by the floor area (1024 sq. ft.) of this fire zone resulted in a fire loading of approximately 21,000 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 20

minutes. Therefore, existing fire barriers are adequate in this building and the worst-case fire poses no threat to the RB.

2.8.5.5 **Fire Detection Available**

Elevation 347'-6" is covered by Zone 4D of the Zoned Fire Detection System.

2.9 FA-010 - STAIR TOWER

Deleted

2.10 FA-011 - ELEVATOR

Deleted

2.11 FA-012 - MOTOR CONTROL CENTER 2-11EB

Deleted

2.12 FA-013 - MOTOR CONTROL CENTER 2-21EB

Deleted

2.13 FA-014 - UNIT SUBSTATION 2-11E

Deleted

2.14 FA-015 - UNIT SUBSTATION 2-21E

Deleted

2.15 FA-016 - MOTOR CONTROL CENTER 2-11EA

Deleted

2.16 FA-017 - MOTOR CONTROL CENTER 2-21EA

Deleted

2.17 FA-018 - SWITCHGEAR 2-1E

Deleted

2.18 FA-019 - SWITCHGEAR 2-2E

Deleted

2.19 FA-020 - RIVER WATER PUMP HOUSE

Deleted

2.20 FA-021 - SWITCHGEAR 2-4E

Deleted

2.21 FA-022 - UNIT SUBSTATION 2-41E

Deleted

2.22 FA-023 - UNIT SUBSTATION 2-31E

Deleted

2.23 FA-024 - SWITCHGEAR 2-3E

Deleted

2.24 FA-025 - DIESEL FIRE PUMP HOUSE

Deleted

2.25 FA-026 - EMERGENCY DIESEL GENERATOR NO. 2 BUILDING (ZONES 1 & 2)

Deleted

2.26 FA-027 - EMERGENCY DIESEL GENERATOR NO. 1 BUILDING (ZONES 1 & 2)

Deleted

2.27 FA-028 - MOTOR CONTROL CENTER 2-21EC

Deleted

2.28 FA-029 - SWITCHGEAR DG-2

Deleted

2.29 FA-030 - MOTOR CONTROL CENTER 2-11EC

Deleted

2.30 FA-031 - SWITCHGEAR DG-1

Deleted

2.31 FA-032 - DIESEL OIL STORAGE TANKS

Deleted

2.32 FA-033 - CONTROL BUILDING

Deleted

2.33 FA-034 - STAIR TOWER

Deleted

2.34 FA-035 - CABLE CHASE

Deleted

2.35 FA-036 - TRANSFORMER ROOM

Deleted

2.36 FA-037 - BATTERY ROOM NO. 2

Deleted

2.37 FA-038 - BATTERY ROOM NO. 1

Deleted

2.38 FA-039 - DC SWITCHGEAR ROOM NO. 2

Deleted

2.39 FA-040 - DC SWITCHGEAR ROOM NO. 1

Deleted

2.40 FA-041 - H & V DUCT AND CABLE TRAY AREA

Deleted

2.41 FA-043 - UNIT SUBSTATION 2-22E

Deleted

2.42 FA-044 - UNIT SUBSTATION 2-12E

Deleted

2.43 FA-045 - CABLE ROOM

Deleted

2.44 FA-045 - CONTROL ROOM

Deleted

2.45 FA-047 - SERVICE BUILDING AND CONTROL BUILDING AREA (ZONES 1, 2, AND 3)

The vertical and horizontal limits of this area are shown on Burns & Roe general arrangement drawings 2060, 2061, 2380, and 2381. This area is subdivided into three fire zones as described below.

2.45.1 Zone 1 - Elevation 280'-6"

2.45.1.1 **Description of the Fire Zone**

The zone consists of Elevation 280'-6" of the Service Building and the Control Building Area.

2.45.1.2 **Equipment and Combustibles in the Fire Zone**

The equipment located in this zone is shown on Burns & Roe general arrangement drawings 2060 and 2380.

2.45.1.3 **Heat Value of Combustibles in the Fire Zone**

Summation of the combustible inventory is 2.6×10^8 BTU for this zone.

2.45.1.4 **Discussion of the Fire Loading in the Fire Zone**

Dividing the heat value from the previous section by the floor area (5,344 sq. ft.) of this fire zone resulted in a fire loading of approximately 49,000 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 40 minutes. Therefore, existing fire barriers are adequate in this building and the worst-case fire poses no threat to the RB.

2.45.1.5 **Fire Detection Available**

Elevation 280'-6" of the Service Building and the Control Building Area is covered by Zones 12A, 12B, and 24 of the Zoned Fire Detection System.

2.45.2 Zone 2 - Elevation 305'-0" and 322'-0"

2.45.2.1 **Description of the Fire Zone**

The zone consists of Elevations 305'-0" and 322'-0" of the Service Building.

2.45.2.2 **Equipment and Combustibles in the Fire Zone**

The equipment located in this zone is shown on Burns & Roe general arrangement drawings 2061 and 2380.

2.45.2.3 **Heat Value of Combustibles in the Fire Zone**

Summation of the combustible inventory is 5.1×10^8 BTU for this zone.

2.45.2.4 **Discussion of the Fire Loading in the Fire Zone**

Dividing the heat value from the previous section by the floor area (7,966 sq. ft.) of this fire zone resulted in a fire loading of approximately 64,000 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 50 minutes. Therefore, existing fire barriers are adequate in this building and the worst-case fire poses no threat to the RB.

2.45.2.5 **Fire Detection Available**

Elevation 305' of the Service Building is covered by Zone 25 of the Zoned Fire Detection System. Elevation 322' of the Service Building is covered by Zone 26B of the Zoned Fire Detection System.

2.45.3 Zone 3 - Elevation 331'-6"

2.45.3.1 Description of the Fire Zone

The zone consists of Elevation 331'-6" of the Service Building.

2.45.3.2 Equipment and Combustibles in the Fire Zone

The equipment located in this zone is shown on Burns & Roe general arrangement drawing 2381.

2.45.3.3 Heat Value of Combustibles in the Fire Zone

Summation of the combustible inventory is 6.0×10^8 BTU for this zone.

2.45.3.4 Discussion of the Fire Loading in the Fire Zone

Dividing the heat value from the previous section by the floor area (5,256 sq. ft.) of this fire zone resulted in a fire loading of approximately 114,000 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 1½ hours. Therefore, existing fire barriers are adequate in this building and the worst-case fire poses no threat to the RB.

2.45.3.5 **Fire Detection Available**

Elevation 331'-6" of the Service Building Area is covered by Zone 26B of the Zoned Fire Detection System.

2.46 FA-048 - STAIR TOWER

Deleted

2.47 FA-049 - REACTOR BUILDING (ZONES 1, 2, 3, AND 4)

The vertical and horizontal limits of this area and the barrier ratings are shown on Burns & Roe general arrangement drawings 2060, 2061, and 2062.

This area is subdivided into four fire zones as described below.

2.47.1 Zone 1 - Fuel Transfer Canal

2.47.1.1 **Description of the Fire Zone**

The zone consists of the fuel transfer canal in the RB, which has been separated from the rest of the building by the installation of shielding and steel covers.

2.47.1.2 **Equipment and Combustibles in the Fire Zone**

There is no equipment in this zone. The combustibles consist of approximately 3000 ft. of various size rubber hose.

2.47.1.3 Heat Value of Combustibles in the Fire Zone

Summation of the combustible inventory is 9.3×10^7 BTU for this zone.

2.47.1.4 Discussion of the Fire Loading in the Fire Zone

Dividing the heat value from the previous section by the floor area (1634 sq. ft.) of this fire zone resulted in a fire loading of approximately 57,000 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 45 minutes. This fire loading consists of stored combustibles and essentially no transient material. Although this is a relatively small area and the combustibles are all located at the deep end of the canal, the probability and subsequent risk of fire is insignificant. There are no ignition sources in the canal and the only work activities foreseen in this area are radiation surveys. Any work involving the reactor vessel (e.g., hot work cuts of samples) may be done safely due to the separation from the stored combustibles and application of administrative controls. The cover over the canal provides separation from other combustibles in the RB and any work activities that may occur adjacent to or above the canal.

2.47.1.5 Fire Detection Available

There is no fire detection system installed or planned within the covered canal. This is acceptable since, although there

are combustibles, the area is separated from any possible ignition sources. If a fire did occur in the canal, it is expected to be contained within the deep end. Based on the type of combustibles stored, smoke escaping from the cover would result in actuation of the RB's Fire Detection System.

2.47.2 Zone 2 - Reactor Building Basement

2.47.2.1 **Description of the Fire Zone**

The zone consists of the entire RB basement outside the D-rings or secondary shield on Elevation 282'-6".

2.47.2.2 **Equipment and Combustibles in the Fire Zone**

The equipment located in this zone is shown on Burns & Roe general arrangement drawing 2060.

2.47.2.3 **Heat Value of Combustibles in the Fire Zone**

Summation of the combustible inventory is 6.1×10^7 BTU for this zone.

2.47.2.4 **Discussion of the Fire Loading in the Fire Zone**

Dividing the heat value from the previous section by the floor area (8427 sq. ft.) of this fire zone resulted in a fire loading of approximately 7,200 BTU/ft^2. Using the fire

loading curve, the fire duration would be less than 10 minutes. This fire loading is light and due to the nature of the combustibles (i.e., cable and concrete coatings) is well spread throughout the area with no significant concentrations in any one location. A fire in the basement is not likely to communicate to the 305' Elevation or into the D-rings unless the fire travels along a cable tray. Since most circuits are de-energized, this is also very improbable. The only significant opening between the basement and the 305' Elevation is the open west stairway. There are no significant accumulations of combustibles near this opening in the basement. The east stair does not present a probable fire path since although modified by dose rate reduction work,it was previously a fire-rated stair tower. There are no significant openings from the basement to the D-rings.

2.47.2.5 **Fire Detection Available**

Elevation 282'-6" of the RB is covered by Zone 22F of the Zoned Fire Detection System. A fire in the basement would most likely be the result of work activities, e.g., hot work above an uncovered opening in the 305' Elevation. If a fire did occur in the basement, it would be slow to develop and spread due to the nature of the combustibles. Prevention of this type of fire is by administrative control of work activities.

2.47.3 Zone 3 - Within the D-rings

2.47.3.1 **Description of the Fire Zone**

The zone consists of the area within the secondary shield walls, i.e., the D-rings.

2.47.3.2 **Equipment and Combustibles in the Fire Zone**

The equipment located in this zone is shown on Burns & Roe general arrangement drawing 2060. The fire loading consists of the original plant combustible materials, i.e., cable insulation and reactor coolant pump (RCP) lube oil, with some contribution as the result of post-accident work. Originally, there was 138 gallons of oil in each of four RCPs; 120 gallons in an upper reservoir and 18 gallons in a lower reservoir. Approximately 120 gallons of oil was removed from the two RCPs in the "A" D-ring, i.e., RC-P-1A and RC-P-2A. These pumps still contain an estimated 18 gallons each in their lower reservoirs. The two RCPs in the "B" D-ring (i.e., RC-P-1B and RC-P-2B) contain the full volume of approximately 138 gallons of oil each.

2.47.3.3 **Heat Value of Combustibles in the Fire Zone**

Summation of the combustible inventory is 1.0×10^8 BTU for this zone.

2.47.3.4 Discussion of the Fire Loading in the Fire Zone

Dividing the heat value from the previous section by the floor area (2986 sq. ft.) of this fire zone resulted in a fire loading of approximately 34,000 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 30 minutes. The RCPs are equipped with an oil collection facility which would meet the requirements of 10 CFR 50 Appendix R Section III.0 for an operating facility. Since these pumps are inoperable, there is virtually no risk of an oil line rupture. Any leakage would be minor and should be directed to the collection tanks at the 282'-6" Elevation. These collection tanks meet NFPA-30 and 10 CFR 50 App. R Sect. III.0.

If the oil contained in these pumps is considered unavailable, the fire loading would be significantly reduced. Accordingly, if the 312 gallons of remaining lube oil were ignored, the fire load in this area would be approximately 5.6 x 10^7 BTU (18,786 BTU/ft^2), which is low.

The other combustibles located within the D-rings are cable insulation and some post-accident plastic and rubber materials. The fire retardant cable insulation is the principle contributor to the fire load. However, in TMI-2's present condition, most of these circuits are deenergized.

2.47.3.5 Fire Detection Available

This fire zone is enclosed within the secondary shield walls that extend from Elevation 282'-6" to Elevation 347'-6" of the RB. Therefore, fire detection would result from smoke emanating from the D-rings at the 347'-6" Elevation. This elevation is covered by Zone 22E of the Zoned Fire Detection System. Access to the area is severely restricted due to the high dose rates. From a fire protection standpoint, this is beneficial since it helps ensure very stringent control of work activity, which was considered to be the only probable ignition source. Work crews are briefed and should be prepared to extinguish an incipient fire with portable equipment should one occur.

Therefore, considering the inoperable condition of the systems in the D-rings (e.g., no hot surfaces, deenergized circuits, no pressurized oil systems), the ability to collect oil leakage, and the low fire loading, a large fire in this area is very unlikely. Any fires that do occur would most likely be the result of work activity with a failure of administrative controls. In any event, the fire would be slow to develop due to the nature of the combustibles (principally cables) and should be quickly extinguished by the personnel in the area.

2.47.4 Zone 4 - Operating Level

2.47.4.1 Description of the Fire Zone

The zone consists of the area on Elevations 305' and 347'-6" of the RB external to the D-rings. These two elevations are considered together due to several communicating openings and a fairly even distribution of combustible materials throughout.

2.47.4.2 Equipment and Combustibles in the Fire Zone

The equipment located in this zone is shown on Burns & Roe general arrangement drawings 2061 and 2062. Over half of the present fire load consists of post-accident hoses and cable. The inventory includes an estimated 30 ft^3 of compactible radwaste assumed to be constantly in the building.

2.47.4.3 Heat Value of Combustibles in the Fire Zone

Summation of the combustible inventory is 2.8×10^6 BTU for this zone.

2.47.4.4 Discussion of the Fire Loading in the Fire Zone

Dividing the heat value from the previous section by the floor area (22,573 sq. ft.) of this fire zone resulted in a fire

loading of approximately 13,000 BTU/ft^2. Using the fire loading curve, the fire duration would be less than 10 minutes. With the plant in PDMS, the transient fire load has been reduced. Personnel involved in work activities should be able to immediately extinguish a fire should one occur. A large fire is not likely because:

1. Most of the fire loading is deenergized cable that has been qualified per IEEE-383.

2. Fire retardant plastics, such as Herculite and Griffolyn, have been used as much as possible to reduce the risk of fire. This material may still burn if exposed to flame. However, the resultant fire would not be as serious as that involving non-fire retardant plastics and may not be sufficient to ignite other combustibles, such as IEEE-383 qualified, deenergized cable.

2.47.4.5 Fire Detection Available

Elevations 305' and 347'-6" of the RB are covered by Zones 22D and 22E of the Zoned Fire Detection System.

2.48 FA-050 - STAIR TOWER

Deleted

2.49 FA-051 - ELEVATOR

Deleted

2.50 FA-052 - CIRCULATING WATER PUMP HOUSE

Deleted

2.51 FA-053 - COAGULATOR BUILDING

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2.52 FA-054 - CIRCULATING WATER CHLORINATOR HOUSE

Deleted

2.53 FA-055 - MECHANICAL DRAFT COOLING TOWER PUMP HOUSE

Deleted

2.54 FA-056 - AUXILIARY TRANSFORMER

Deleted

2.55 FA-057 - AIR INTAKE TUNNEL

Deleted

2.56 FA-058 - CHEMICAL CLEANING BUILDING

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2.57 FA-059 - CHEMICAL CLEANING BUILDING AIR FILTRATION ROOM

Deleted

2.58 FA-060 - TV MONITOR CONTROL BUILDING

Deleted

2.59 FA-061 - CONTAINMENT AIR CONTROL ENVELOPE (CACE)

Deleted