



GPU Nuclear, Inc.
Route 441 South
Post Office Box 480
Middletown, PA 17057-0480
Tel 717-944-7621

6710-96-2418

December 31, 1996

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Subject: Three Mile Island Nuclear Generating Station, Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
10 CFR 50 Appendix R - Exemption Request

GPU Nuclear has completed evaluation of the TMI-1 installed Thermo-Lag 1-hour rated fire barriers. As a result of this evaluation, GPU Nuclear is planning to upgrade to a 1-hour fire endurance rating those barriers which do not presently have a minimum cable qualification rating of at least 57 minutes, and request exemption from the requirements of 10 CFR 50 Appendix R Section III.G.2.c for a 1-hour rated fire barrier for those barriers evaluated to have a minimum cable qualification rating of 57 minutes. The cable qualification rating is the fire endurance rating of the barrier when considering the cable qualification temperature or the maximum temperature inside the fire barrier envelope that is considered acceptable in demonstrating cable functionality. The enclosed evaluation also provides the basis for establishing the actual fire endurance ratings and the cable qualification ratings.

Enclosure A provides the detailed request for exemption from the requirements of 10 CFR 50 Appendix R, Section III.G.2.c for identified fire areas in accordance with the provisions of 10 CFR 50.12. Modification of the identified fire barriers to achieve a 1-hour fire rating per ASTM E119 would cost approximately \$1.0 million which represents a substantial cost hardship with minimal safety enhancement. This is in addition to the approximately \$1.0 million associated with barrier upgrades or replacements. This evaluation and the associated exemption request, in conjunction with the TMI-1 Thermo-Lag 3-hour fire barrier evaluation submitted previously in GPU Nuclear letter dated August 16, 1996 (6710-96-2229), fully addresses those fire areas where Thermo-Lag is installed as electrical raceways.

As part of the TMI-1 Thermo-Lag resolution effort for 1-hour fire barriers, GPU Nuclear will modify 1-hour installed Thermo-Lag fire barriers to a 1-hour fire endurance rating for

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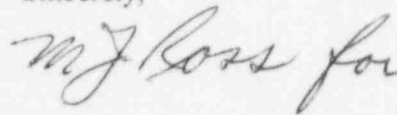
those barriers where the Enclosure B evaluation shows a cable qualification rating of less than 57 minutes presently exists.

Enclosure B provides the detailed description of the TMI-1 1-hour fire barrier evaluations including the methodology and results which support the enclosed exemption request. The actual fire ratings of the Thermo-Lag configurations or elements, as identified in Enclosure B, have been determined utilizing the Nuclear Energy Institute (NEI) "Application Guide for Evaluation of Thermo-Lag 330 Fire Barrier Systems," (NEI Report No. 0784-00001-TR-02, Revision 2).

GPU Nuclear requests approval of the enclosed exemption request by April 1, 1997 to support finalization of the scope of engineering and design required for identified barrier upgrades. As previously identified in GPU Nuclear letters dated July 7, 1995 (C311-95-2265) and August 16, 1996 (6710-96-2229), it is our intent to achieve resolution of the Thermo-Lag issue by December 31, 1999.

GPU Nuclear is available to discuss at the earliest opportunity any NRC questions or provide any additional information related to the enclosed evaluations. If any additional information is required please contact Mr. David J. Distel, Senior Regulatory Affairs Engineer at (201) 316-7955.

Sincerely,



J. Knubel

Vice President and Director, TMI

JK/DJD/tap

- Enclosure A: TMI-1 10 CFR 50.12 Thermo-Lag Fire Barrier Exemption Request
- Enclosure B: GPU Nuclear Topical Report No. 094, Revision 2, "TMI-1 Evaluation of Thermo-Lag Fire Barriers"
- Enclosure C: TMI-1 Fire Area Drawings and Data Sheets
- Enclosure D: TMI-1 Barrier Reference Report-1 Hour

cc: Administrator, Region I
NRC TMI Senior Resident Inspector
NRC Senior Project Manager, TMI

Enclosure A

**TMI-1 10 CFR 50.12 Thermo-Lag Fire Barrier
Exemption Request**

I. REQUEST

The purpose of this submittal is to request, in accordance with the provisions of Title 10 Code of Federal Regulations Section 50.12 (10CFR 50.12), "Specific exemptions," an exemption for Three Mile Island Unit 1 (TMI-1) Nuclear Generating Station from provisions of subsection III.G.2.c of Appendix R to 10 CFR Part 50. Appendix R sets forth certain fire protection features pertinent to satisfying Criterion 3 of Appendix A to Part 50. The subsection of Appendix R referenced above addresses specific requirements for the protection of safe shutdown capability against fire.

Subsection III.G.2.c requires that cables, equipment, and associated non-safety circuits of redundant trains of certain shutdown apparatus in the same fire area be enclosed in a 1-hour fire barrier and that, in addition, fire detectors and an automatic suppression system be installed. GPU Nuclear requests an exemption for TMI-1 from the requirements of subsection III.G.2.c for a one hour fire barrier in areas currently requiring a 1-hour fire barrier utilizing Thermo-Lag as a barrier material for those cable raceways detailed in this enclosure. The areas requiring 1-hour barriers are documented in GPU Nuclear Fire Hazards Analysis Report (FHAR) No. 990-1745 Revision 16. Reference Letter 6710-96-2108 dated April 15, 1996, J. Knubel to USNRC Document Control, "Final Safety Analysis Report Update 13 and Fire Hazards Analysis Report Revision 16 for TMI-1".

II. BASIS

A. BACKGROUND

Pursuant to 10 CFR 50.48(a), each operating nuclear power plant must have a plan to satisfy Criterion 3, "Fire Protection," of Appendix A to 10 CFR Part 50. Under the terms of 10 CFR 50.48(b), "Appendix R . . . establishes fire protection features required to satisfy Criterion 3 of Appendix A . . . with respect to certain generic issues. In particular, subsections III.G.2.a and III.G.2.c require the following means of ensuring that one redundant train of a system necessary to achieve and maintain hot shutdown conditions is free of fire damage where both trains of that system are located in the same fire area:

(III.G.2.a) "Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier".

(III.G.2.c) "Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area".

B. OVERVIEW

Because of issues surrounding the validity of fire testing Thermo-Lag fire barriers for cable raceways, it has become necessary to re-establish the fire endurance rating of installed 1-hour barriers. The fire endurance rating is based upon a re-evaluation of cable functionality inside a raceway protected by Thermo-Lag and is defined as the cable qualification rating. The methodology for establishing the fire endurance rating (cable qualification rating) and the results are detailed in the attached Topical Report Number 94 (Enclosure B). Those barriers which do not presently have a cable qualification rating of at least 57 minutes will be upgraded to a fire endurance rating of 60 minutes. Those barriers which have at least a 57 minute cable qualification rating, are the subject of this exemption request.

An exemption is requested from the requirement in Appendix R Section III.G.2.c for a one hour fire barrier in each of the following fire areas/zones:

AB-FZ-3, AB-FZ-4, AB-FZ-5, AB-FZ-7, CB-FA-1, FH-FZ-1, FH-FZ-2, FH-FZ-6, ISPH-FZ-1, ISPH-FZ-2

TMI-1 has administrative controls in place over transient combustibles and work in the plant in accordance with 10CFR50 Appendix R, Section III.K sections 1-8 as required by the NRC in the SER dated June 4, 1984. For example, these controls require the total insitu plus allowable transient fire load in a Fire Area/Zone (or cumulative load) to be half of that which would challenge the lowest rated barrier in the zone. These limits are documented in procedures that are both referenced in and implement the TMI Fire Protection Program under a License Condition 2.c(4). Since the cable qualification rating of these one hour barriers are based upon cable functionality for at least 57 minutes, the allowable transient limits to these fire areas/zones will be lowered in order to maintain compliance with Appendix R, Section III.K commitments as discussed above. In accordance with existing controls, temporary compensatory measures will be required when transient loads may exceed the allowable limits (i.e. fire watches, continuous manning, use of alternative materials). Transient combustible load evaluations consider the type of combustible material, the room's configuration and the location of the transient material in the room. Additional administrative controls are implemented for flammable or combustible liquids in accordance with existing fire protection program

procedures. These provisions will continue to ensure that transient loads do not affect safe shutdown capability and maintain compliance with Appendix R.

C. SUMMARY

The underlying purpose of the rule is to accomplish safe shutdown in the event of a fire and maintain the plant in a safe condition. The TMI-1 FHAR requires fire barrier protection for the circuits currently protected in order to insure safe shutdown. These fire barriers have been evaluated to demonstrate that they have a cable qualification rating of at least 57 minutes when tested in accordance with the ASTM E-119 test. In addition, fire barriers with a cable qualification rating less than 57 minutes will be upgraded to a 60 minute fire endurance rating when tested in accordance with the ASTM E-119 test. The fire hazards analysis results discussed below conclude that postulated fire severity in each of the ten fire areas/zones is less than that experienced in an ASTM E-119 test. This, combined with adequate fire protection features (fire barriers, automatic and manual suppression and area wide detection systems) in each fire area/zone, fire brigade response and control of transient combustibles assure that the protected circuits will remain functional in the event of any fire and therefore the plant will retain safe shutdown capability. Thus, the underlying purpose of the rule is satisfied. Therefore, the exemption from the requirement in 10 CFR 50 Appendix R, section III.G.2.c for a one hour fire barrier in fire areas/zones AB-FZ-3, AB-FZ-4, AB-FZ-5, AB-FZ-7, CB-FA-1, FH-FZ-1, FH-FZ-2, FH-FZ-6, ISPH-FZ-1, ISPH-FZ-2 respectively meets the special circumstances delineated in 10 CFR 50.12 (a)(2)(iii). The application of the regulation in this particular circumstance is not necessary to achieve the underlying purpose of the rule since the above analysis demonstrates that a minimum 57 minute to 60 minute Cable Qualification Rating in these fire areas/zones for installed Thermo-Lag raceway fire barriers, meets the underlying purpose of the rule. In addition, the special circumstances of 10 CFR 50.12 (a)(2)(iii) apply in that modifying the aforementioned barriers to achieve a 1-hour fire endurance rating, would not result in a significant increase in the level of protection provided and would result in undue hardship and cost significantly in excess of those incurred by others similarly situated. These costs consist of additional engineering, procurement of material, fabrication and installation costs for replacing or upgrading cable raceway fire barrier envelopes which are the subject of this exemption request.

The following is the justification for the exemption requested in this letter.

1. FIRE ZONE AB-FZ-3 (Ref. Dwg. No. AB-FZ-3)

FIRE ZONE DESCRIPTION (Information taken from the TMI-1 FIRE HAZARDS ANALYSIS REPORT)

a. FIRE ZONE FEATURES

Fire zone AB-FZ-3 is located on elevations 281' and 295' of the Auxiliary Building. Area dimensions are approximately 40 feet x 7 feet x 23 feet high. A reinforced concrete floor at elevation 295' divides this zone in half. A three hour rated fire barrier is provided on the west wall. Six penetrations for reach rods for valve operators through the west wall are not fully sealed. Each reach rod consists of a 2-1/2 inch core bore with a two inch diameter rod equipped with a steel collar covering the opening in the wall. The duct penetration in this wall adjacent to fire zone AB-FZ-2c is provided with a 3 hour rated fire damper. All other penetrations in this wall are controlled and maintained with three-hour fire rated seals. The floor is not adjacent to any other plant area. The south wall is constructed of reinforced concrete and is adjacent to fire zone AB-FZ-5. Penetrations in this wall are not sealed. The east wall is constructed of reinforced concrete and is adjacent to fire zone FH-FZ-1, which is provided with an automatic wet pipe sprinkler system. The ceiling is constructed of reinforced concrete and is adjacent to fire zone AB-FZ-6. All penetrations in the ceiling with the exception of four pipe penetrations are sealed with a non combustible material having at least a one hour fire rating. The north boundary is adjacent to fire zone AB-FZ-4. There is no wall construction separating these two zones, however, fire zone AB-FZ-4 is protected by an automatic preaction system and a fire detection system which alarms in the control room.

b. COMBUSTIBLE MATERIALS AND LOCATIONS

The principal insitu combustible, excluding Thermo-Lag, in this Fire Area is cable insulation which is spread throughout elevation 281' or the lower half of this zone below the concrete floor at elevation 295'. Most of the exposed cable insulation meets the requirements of the IEEE 383 Flame Test. The installed Thermo-Lag itself has been added to the combustible inventory in this Fire Zone and is above the concrete floor that divides this zone in half. The overall fire loading is considered low, 38,145 BTU/FT². This corresponds to a fire severity on the ASTM E-119 time-temperature curve of between 28 and 29 minutes. Note that TMI-1 has administrative controls over transient combustibles and work in the plant.

c. FIRE PROTECTION FEATURES

Fire protection for this fire area consists of ionization smoke detection on both elevation 281' and 295' which actuates alarms in the control room. Hose protection is provided outside this fire zone in zone AB-FZ-4.

The aforementioned fire protection features are maintained by the surveillance program required by the TMI-1 license condition.

Based upon actual experience, 15 minutes is estimated for the full fire brigade complement to bring manual suppression to bear on a fire in this fire area. This assumes the fire brigade is in full turnout gear with self contained breathing apparatus.

A previous exemption was granted from the requirement for an area wide fire suppression system as documented in an SER, Letter No. 5211-84-3202, John F. Stolz to Henry D. Hukill dated June 4, 1984.

d. SAFE SHUTDOWN CIRCUITS AND EQUIPMENT

The specific safe shutdown circuit and equipment protected by the existing Thermo-Lag fire barriers in this fire zone are associated with the following function:

- Make-up Supporting Function

This function requires fire barrier protection in order to insure a safe shutdown path if a fire eliminates redundant unprotected circuits and equipment in this fire zone. This assumption served as the basis for protecting the above functions in this fire area.

The following information describes the layout and function of the protected safe shutdown circuit in this fire area. Drawing AB-FZ-3 depicts the safe shutdown circuit routing for the identified function. This drawing also depicts circuit routings for redundant or alternative unprotected safe shutdown circuits. These are not exact routings but rather show the general paths of the various circuits.

ENVELOPE 1AXC-FB09

A cable for the following function is protected by this envelope which runs from the west wall to the east wall:

- Make-up Supporting Function (Minimum Recirculation Valve)

e. THERMO-LAG DESCRIPTION

The following Thermo-Lag fire barriers are the subject of this exemption request. The TMI-1 FHAR currently requires these fire barriers to have a one hour fire endurance (Actual) rating:

ENVELOPE NO.	TYPE	ACTUAL RATING	CABLE QUAL. RTG.	NEI TEST
1AXC-FB09	2" Conduit	39	60	2-1
1AXC-FB09	2" Radial bend conduit	39	60	2-1

f. EVALUATION

• FIRE HAZARDS ANALYSIS

The technical requirements of Appendix R, Section III.G.2 are not met because the above Thermo-Lag electrical raceway fire barrier envelope in this fire zone are not rated at one hour as per the requirements of NRC Generic Letter 86-10 Supplement 1. The combustible materials present in the area consist of cable insulation and Thermo-Lag which represent a fire load of 38,145 BTU/FT². A fire that exposes the fire barrier envelope is highly unlikely here as this is a high radiation area. This area is not normally occupied during plant operation and little chance for an ignition source is present due to the low occupancy. Therefore, there is no substantial ignition source for the cable other than the cable itself. Fire barrier envelope 1AXC-FB09 is not located over any insitu combustibles. This envelope is separated from the exposed cable in this zone by a reinforced concrete floor at elevation 295' of this zone. Self ignition of cable is highly unlikely. Ignition of exposed cable insulation (IEEE 383 qualified) even if it does occur either by an overload or from an external source such as a valve motor would also result in a slowly developing fire. Exposure to the Fire Barrier Envelopes from a fire on elevation 281' of this zone would be shielded by the ceiling separating the two levels of this zone.

The potential for localized fire exposure in this fire zone is judged to be less severe than the conditions experienced in the ASTM E-119 test. The overall volume of the room is substantial enough to dissipate the energy from a localized fire in a valve motor. The envelope will not be challenged by this fire as the motors and exposed cable are separated from the Fire Barrier Envelope by a reinforced concrete ceiling to prevent a fire from directly impacting them should a fire occur. Room ventilation will continue to run in the event of a fire in this fire zone. Fire preplans proceduralize

manual shutdown of the ventilation system depending upon the extent and severity of the fire.

The results of ASTM E-119 testing have been used to assign an actual rating of at least 39 minutes to the Thermo-Lag fire barrier envelope in this fire area. The conditions created by potential fires discussed above and the effects of such fires upon the fire barrier envelope in question would not exceed the severity of an ASTM E-119 exposure on the same envelope. In addition, evaluation has shown that the envelope will remain structurally intact after an ASTM exposure of one hour and that after 60 minutes of such exposure, the temperature inside the envelope will not affect the functionality of the safe shutdown circuits protected by the envelope. Therefore, the cable qualification rating of this envelope is equal to the original intent which was to protect the safe shutdown circuits from an ASTM E-119 exposure of 60 minutes. It is conservatively estimated that it will take 15 minutes upon receipt of an automatic fire detection system alarm to bring manual suppression to bear on a fire in this room. This is significantly less than the actual rating and cable qualification rating of the fire barrier envelope within this zone of 39 and 60 minutes, respectively.

This fire area lacks significant quantities of cable insulation and transient combustibles. Further, the potential localized exposure to this fire barrier envelope is not considered more severe than the exposure of an ASTM E-119 test. The fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of detection of a fire. Therefore, a cable qualification rating of 60 minutes, with existing detection, and manual suppression is adequate to protect the safe shutdown circuit inside the fire barrier envelope in this fire area.

SUMMARY-FIRE ZONE AB-FZ-3

This fire zone is enclosed on three sides, the floor and ceiling by reinforced concrete walls. The remaining boundary is not a physical boundary but it is protected by an automatic preaction system in the adjacent fire zone. Fire protection consists of an ionization smoke detection system and a manual hose station which is located outside the area. The detection system provides early warning capability for potential fires in this area and provides reasonable assurance that a fire will be discovered before it results in significant damage and exposure to the Thermo-Lag fire barrier envelope in this area.

The fire loading is low. The majority of cable insulation in this area is qualified to the IEEE 383 Flame Test. Therefore, fires would be slow to develop and spread beyond the ignition source. Fires would be quickly detected.

The cable qualification rating of 60 minutes is considered adequate to protect the safe shutdown circuit from damage in the event of a fire in this area. The cable qualification rating of 60 minutes therefore achieves the original intent of providing a one hour barrier in that the safe shutdown circuits inside the barrier will function after exposure to a 1 hour ASTM E-119 fire exposure. Further, the potential exposure to any barrier is not considered more severe than the exposure of the ASTM E-119 test. Since the severity of the exposure does not exceed that of the ASTM E-119 test, a 60 minute cable qualification rating is considered adequate since the fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of receipt of an automatic fire detection system alarm. This is significantly less than the barrier cable qualification rating of 60 minutes.

CONCLUSION-FIRE ZONE AB-FZ-3

GPU Nuclear concludes that an alternate fire protection configuration in fire zone AB-FZ-3 consisting of a cable raceway fire barrier envelope with a Thermo-Lag fire endurance rating of 39 minutes and a cable qualification rating of at least 60 minutes, and an area wide ionization smoke detection system will, provide reasonable assurance that one safe shutdown train will be free of fire damage. This configuration will achieve an acceptable level of protection equivalent to that of Appendix R, Section III.G.2. Therefore the safe shutdown circuits protected by this envelope in fire zone AB-FZ-3 will maintain the ability to perform their function in the event of a fire because the fire would not be of significant magnitude and duration to breach the protection provided by the existing envelopes before the fire self extinguished or was put out by the plant fire brigade. The control of transient combustibles, the automatic detection system and the ability of the plant fire brigade to bring manual suppression to bear on a fire in this area within 15 minutes are considered adequate fire prevention and fire fighting measures to minimize the effects of a fire in this area thus insuring the ability to achieve safe shutdown in the event of a fire in this area.

Based on this conclusion, the request for exemption from the requirement for electrical raceway fire barriers to have "ACTUAL" fire endurance rating of one hour in fire zone AB-FZ-3 should be granted since this evaluation demonstrates that the cables protected by this envelope will continue to function after being exposed to an ASTM E-119 fire of one hour.

2. FIRE ZONE AB-FZ-4 (Ref. Dwg. No. AB-FZ-4)

FIRE ZONE DESCRIPTION (Information taken from the TMI-1 FIRE HAZARDS ANALYSIS REPORT)

a. FIRE ZONE FEATURES

Fire Zone AB-FZ-4 is located on elevation 281' of the Auxiliary Building. Area dimensions are approximately 45 feet x 30 feet x 23 feet high. A three hour rated fire barrier is provided on the south boundary where adjacent to Fire Zone AB-FZ-2a. Containment penetrations do not have a specific fire rating due to overriding nuclear considerations, however, their construction is adequate to prevent the spread of fire across the penetrations. A portion of the south boundary adjacent to fire zone AB-FZ-3, the east boundary adjacent to fire zone FH-FZ-1, and the west boundary adjacent to fire zone AB-FZ-5 is not separated by wall construction. However, this fire zone (AB-FZ-4) is protected by an ionization fire detection system and an automatic preaction system. In addition, fire zone FH-FZ-1 is protected by an ionization fire detection system and an automatic wet pipe sprinkler system. The floor of this zone is a three hour rated fire barrier where adjacent to fire areas AB-FA-1, AB-FA-2 and fire zone IB-FZ-8. The wall common to fire zone IB-FZ-8 is a three hour rated fire barrier with the exception of six unsealed 3/4 inch reach rod penetrations, two 1/4 inch thick steel equipment hatches which are unrated over fire area AB-FA-2 and a steel door; however, all other penetrations where adjacent to fire areas AB-FA-1, AB-FA-2 and IB-FZ-8 are controlled and maintained with three hour fire rated seals. The reach rod penetrations are tight fitting and equipped with steel collars covering the openings. The remainder of the floor is not adjacent to any other plant area. The ceiling consists of reinforced concrete with an open stairwell adjacent to fire zone AB-FZ-6; the remainder of the ceiling consists of reinforced concrete adjacent to zone AB-FZ-7.

b. COMBUSTIBLE MATERIALS AND LOCATIONS

The principal insitu combustible in this area is cable insulation which is spread throughout the area and normally present transients. Most of the exposed cable insulation meets the requirements of the IEEE 383 Flame Test. The installed Thermo-Lag itself has been added to the combustible inventory in this Fire Area. The overall fire loading is considered low, 41,116 BTU/FT². This corresponds to a fire severity on the ASTM E-119 curve of between 30 and 31 minutes. Note that TMI-1 has administrative controls over transient combustibles and work in the plant.

c. FIRE PROTECTION FEATURES

Fire protection for this fire area consists of an automatic preaction system and a hose station. An area wide ionization detection system is provided which actuates an alarm in the control room. Additional hose protection is provided in zone AB-FZ-5. This hose protection is capable of bringing an effective hose stream to bear on any location within this Fire Zone. In addition, portable dry chemical extinguishers are provided.

The aforementioned fire protection features are maintained by the surveillance program required by the TMI-1 license condition.

Based upon actual experience, 15 minutes is estimated for the full fire brigade complement to bring manual suppression to bear on a fire in this fire area. This assumes the fire brigade is in full turnout gear with self contained breathing apparatus.

d. SAFE SHUTDOWN CIRCUITS AND EQUIPMENT

The specific safe shutdown circuits and equipment protected by the existing Thermo-Lag fire barriers in this fire zone are associated with the following functions:

- Reactor Coolant Pump Seal Injection
- Nuclear Services River Water (Reactor Coolant Pump Thermal Barrier Cooling)

These functions require fire barrier protection in order to insure a safe shutdown path. In this fire zone, circuits for both Reactor Coolant Pump Seal Injection and Thermal Barrier Cooling are protected. Seal injection can be used in conjunction with make-up if make-up valve MU-V-14A which is physically located in this fire zone is not damaged. Since make-up inventory control can be delayed if the valve is damaged, RCP thermal barrier cooling is also protected as this function is required almost immediately. There is no unprotected redundancy for the protected Nuclear Services River Water valves as both circuits run inside the same fire barrier envelope. This assumption served as the basis for protecting the above functions in this fire area.

The following information describes the layout and function of the protected safe shutdown circuits in this fire area. Drawing AB-FZ-4 depicts safe shutdown circuit routings for the various functions. This drawing also depicts circuit routings for redundant or alternative unprotected safe

shutdown circuits. These are not exact routings but rather show the general paths of the various circuits.

ENVELOPE 1AXC-FB06

Cables for Nuclear Services Closed River Water valves NR-V-15A and NR-V-15B are protected by this envelope which runs as shown on Dwg. No. AB-FZ-4.

ENVELOPE 1AXC-FB07

A cable for Make-up valve MU-V-14A (seal injection) is protected by this envelope which runs as shown on Dwg. No. AB-FZ-4.

ENVELOPE 1AXC-FB08

A cable for Make-up valve MU-V-14A (seal injection) is protected by this envelope which runs as shown on Dwg. No. AB-FZ-4.

e. THERMO-LAG DESCRIPTION

The following Thermo-Lag fire barriers are the subject of this exemption request. The TMI-1 FHAR currently requires these fire barriers to have a one hour fire endurance (Actual) rating:

ENVELOPE NO.	TYPE	ACTUAL RATING	CABLE QUAL. RTG.	NEI TEST
1AXC-FB06	2" Conduit	39	60	2-1
1AXC-FB06	2" Radial bend Conduit	39	60	2-1
1AXC-FB07	2" Conduit	39	57	2-1
1AXC-FB08	2" Conduit	39	60	2-1

f. EVALUATION

FIRE HAZARDS ANALYSIS

The technical requirements of Appendix R, Section III.G.2 are not met because the above Thermo-Lag electrical raceway fire barrier envelopes in this fire zone are not rated at one hour as per the requirements of NRC Generic Letter 86-10 Supplement 1. The combustible materials present in the area consist of cable insulation, Thermo-Lag, and normally present transients which represent a fire load of 41,116 BTU/FT². A fire would

most likely begin due to ignition of a transient combustible. A fire would not prevent entry into the zone for fire fighting because it would develop slowly. Ignition of exposed cable insulation (IEEE 383 qualified) from a fire originating from a transient would be limited as described below. Ignition of exposed cable insulation even if it does occur either by an overload or from an external source would result in a slowly developing fire.

It is reasonable to assume a fire originating as a result of transients could affect portions of these envelopes by igniting cable insulation if the preaction system fails to operate. However, a localized fire of this nature is not judged to be any more severe than the conditions experienced in the ASTM E-119 test. The overall volume of the room is substantial enough to dissipate the energy from a localized fire on the floor underneath the envelopes. Room ventilation will continue to run in the event of a fire in this fire zone. Fire preplans proceduralize manual shutdown of the ventilation system depending upon the extent and severity of the fire.

The results of ASTM E-119 testing have been used to assign an actual rating of at least 39 minutes to the Thermo-Lag fire barrier envelopes in this fire area. The conditions created by potential fires discussed above and the effects of such fires upon the fire barrier envelopes in question would not exceed the severity of an ASTM E-119 exposure on the same envelope. In addition, evaluation has shown that the envelopes will remain structurally intact after an ASTM exposure of 57 minutes and that after 57 minutes of such exposure the temperature inside the envelope will not affect the functionality of the safe shutdown circuits protected by the envelope. Note that the cable qualification rating of envelopes 1AXC-FB06 and 1AXC-FB08 (60 minutes) is equal to the original intent which was to protect the safe shutdown circuits from an ASTM E-119 exposure of one hour. Actual fire brigade drills provide a conservative estimate of 15 minutes upon detection of a fire upon receipt of an automatic fire detection system alarm to bring manual suppression to bear on a fire in this room. This is significantly less than the minimum barrier actual rating and cable qualification rating of the fire barrier envelopes within this zone of 39 and 57 minutes, respectively.

This fire zone lacks significant quantities of cable insulation and transient combustibles. Further, the potential localized exposure to these fire barrier envelopes is not considered more severe than the exposure of an ASTM E-119 test. The fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of detection of a fire. Therefore, a cable qualification rating of 57 minutes, with existing detection, the automatic preaction system and manual suppression is adequate to protect the safe shutdown circuits inside the fire barrier envelopes in this fire area.

SUMMARY-FIRE ZONE AB-FZ-4

This fire zone is enclosed on two sides, a portion of a third side, the floor and ceiling by reinforced concrete walls. The remaining boundaries are not physical boundaries but are protected by an automatic preaction system in this fire zone and where adjacent to fire zone FH-FZ-1 is protected by the automatic preaction system in this zone as well as an automatic wet pipe sprinkler system in zone FH-FZ-1. Fire protection consists of an ionization smoke detection system, an automatic preaction system as discussed above and a manual hose station located in this zone as well as additional hose protection located in an adjacent zone. The detection system provides early warning capability for potential fires in this area and the automatic preaction system provide reasonable assurance that a fire will be discovered and contained before it results in significant damage and exposure to the Thermo-Lag fire barrier envelopes in this area.

The fire loading is low. The majority of cable insulation in this area is qualified to the IEEE 383 Flame Test. Therefore, fires would be slow to develop and spread beyond the ignition source. Fires would be quickly detected.

The minimum cable qualification rating of 57 minutes is considered adequate to protect safe shutdown circuits from damage in the event of a fire in this area. The cable qualification rating of 60 minutes for envelopes 1AXC-FB06 and 1AXC-FB08 achieves the original intent of providing a one hour barrier in that the safe shutdown circuits inside the barrier will function after exposure to a 1 hour ASTM E-119 fire exposure. Further, the potential exposure to any barrier is not considered more severe than the exposure of the ASTM E-119 test. Since the severity of the exposure does not exceed that of the ASTM E-119 test, a minimum 57 minute cable qualification rating is considered adequate since the fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of receipt of an automatic fire detection system alarm. This is significantly less than the minimum barrier cable qualification rating of 57 minutes.

CONCLUSION-FIRE AB-FZ-4

GPU Nuclear concludes that an alternate fire protection configuration in fire zone AB-FZ-4 consisting of cable raceway fire barrier envelopes with a Thermo-Lag fire endurance rating of 39 minutes and a cable qualification rating of at least 57 minutes, an area wide ionization smoke detection system and an automatic preaction system will provide reasonable assurance that one safe shutdown train will be free of fire damage. This configuration

will achieve an acceptable level of protection equivalent to that of Appendix R, Section III.G.2. Therefore the safe shutdown circuits protected by these envelopes in fire zone AB-FZ-4 will maintain the ability to perform their function in the event of a fire because the fire would not be of significant magnitude and duration to breach the protection provided by the existing envelopes before the fire self extinguished, was extinguished by the automatic preaction system or was put out by the plant fire brigade. The control of transient combustibles, the automatic detection and suppression systems and the ability of the plant fire brigade to bring manual suppression to bear on a fire in this area within 15 minutes are considered adequate fire prevention and fire fighting measures to minimize the effects of a fire in this area thus insuring the ability to achieve safe shutdown in the event of a fire in this area.

Based on this conclusion, the request for exemption from the requirement for electrical raceway fire barriers to have "ACTUAL" fire endurance rating of one hour in fire zone AB-FZ-4 should be granted since this evaluation demonstrates that the cables protected by these envelopes will continue to function after being exposed to an ASTM E-119 fire of at least 57 minutes.

3. FIRE ZONE AB-FZ-5 (Ref. Dwg. No. AB-FZ-5)

FIRE ZONE DESCRIPTION (Information taken from the TMI-1 FIRE HAZARDS ANALYSIS REPORT)

a. FIRE ZONE FEATURES

Fire Zone AB-FZ-5 is located on elevation 281' of the Auxiliary Building. Area dimensions are approximately 110 feet x 160 feet x 23 feet high. A three hour rated fire barrier is provided on the south wall of this zone adjacent to fire zone AIT-FZ-1. The duct penetrating this barrier is fire sealed but the duct is not provided with a fire damper. The north boundary is not adjacent to any other plant area. The east boundary adjacent to fire zone FH-FZ-1 is constructed of reinforced concrete. Note passages to fire zone FH-FZ-1 through this boundary are openings through the boundary, however, an automatic wet pipe sprinkler system is provided in FH-FZ-1. The boundary adjacent to zone AB-FZ-2c (south wall) is three hour fire rated. Note that two duct penetrations in this boundary are not provided with fire dampers. The east boundary of this zone adjacent to fire zones AB-FZ-2a, AB-FZ-2b and AB-FZ-2c is constructed of reinforced concrete around each door section. The remainder of the boundary is solid concrete block. The doors are Class B rated with a fusible link actuated damper protecting the ventilation grill within the door. The portion of the east boundary adjacent to fire zone AB-FZ-4 does not consist of wall construction; however, this portion of the boundary is protected by an ionization fire detection system and an automatic sprinkler system in fire zone AB-FZ-4. The west boundary of this zone consists of reinforced concrete, a portion of which is not adjacent to any other plant area and a portion of which is adjacent to fire zone AB-FZ-1. The floor of this zone is not adjacent to any other plant area except over fire area AB-FA-1 where the floor is a three hour rated fire barrier with the exception of two 1/4 inch thick steel equipment access hatches which are unrated. The ceiling of this zone consists of reinforced concrete and is adjacent to fire zones AB-FZ-6, AB-FZ-6a, AB-FZ-7, AB-FZ-8 and AB-FZ-9. Any penetrations in AB-FZ-5 where adjacent to fire zone AB-FZ-6 between the south wall of AB-FZ-6a and column line 7d as well as between column lines K and L are sealed with non-combustible material having at least a one hour fire rating. The ceiling penetrations of this zone between column lines 9A and 11A, and J and K are sealed with non combustibile material having at least a one hour fire rating (except for four pipe penetrations that open into cubicles on the 306' level). The duct penetrating the ceiling is not provided with a fire damper. Also,

the ceiling penetrations of this fire zone where adjacent to fire zone AB-FZ-7 are sealed with a non-combustible material.

b. COMBUSTIBLE MATERIALS AND LOCATIONS

The principal insitu combustible in this area is cable insulation which is spread throughout the area. Other combustibles are pump lube oil and transients. Most of the exposed cable insulation meets the requirements of the IEEE 383 Flame Test. The installed Thermo-Lag itself has been added to the combustible inventory in this Fire Area. The overall fire loading is considered low, 16,955 BTU/FT². This corresponds to a fire severity on the ASTM E-119 curve of between 12 and 13 minutes. Note that TMI-1 has administrative controls over transient combustibles and work in the plant.

c. FIRE PROTECTION FEATURES

Fire protection for this fire zone consists of a dry chemical extinguisher and a hose station. Additional hose protection is provided in fire zones AB-FZ-4 and FH-FZ-1 as well as additional portable dry chemical extinguishers located in fire zone FH-FZ-1. Ionization smoke detection which actuates an alarm in the control room is provided in the area where the Thermo-lag fire barrier envelopes are provided up to an area 20 feet south and west from the envelopes as well as the hallway that provides entrance to fire zone AB-FZ-1.

The aforementioned fire protection features are maintained by the surveillance program required by the TMI-1 license condition.

Based upon actual experience, 15 minutes is estimated for the full fire brigade complement to bring manual suppression to bear on a fire in this fire area. This assumes the fire brigade is in full turnout gear with self contained breathing apparatus.

A previous exemption was granted from the requirement for an automatic fire suppression system and an area wide fire detection system as documented in an SER, Letter No. 5211-84-3202, John F. Stolz to Henry D. Hukill dated June 4, 1984.

d. SAFE SHUTDOWN CIRCUITS AND EQUIPMENT

The specific safe shutdown circuits and equipment protected by the existing Thermo-Lag fire barriers in this fire zone are associated with the following functions:

- Make-up Supporting Function
- Make-up (Inventory)

These functions require fire barrier protection in order to insure letdown cooling, adequate minimum recirculation flow for make-up, and a controllable valve to prevent contents of the Borated Water Storage Tank (BWST) from draining to the Reactor Building Sump during hot shutdown. There are no redundant circuits in this area as makeup minimum recirculation and draindown of the BWST involves multiple valves in series, all of which must be controllable for operation of these functions for a fire in this fire zone. This assumption served as the basis for protecting the above functions in this fire area.

The following information describes the layout and function of the protected safe shutdown circuits in this fire area. Drawing AB-FZ-5 depicts safe shutdown circuit routings for the various functions. These are not exact routings but rather show the general paths of the various circuits.

ENVELOPE 1AXC-FB01

Cables for the following function are protected by this envelope which runs as shown on Dwg. No. AB-FZ-5.

- Make-up Supporting Function (Letdown Cooling)

The function of this circuit is to provide letdown cooling.

ENVELOPE 1AXC-FB03

Cables for the following functions are protected by this envelope which is located as shown on Dwg. No. AB-FZ-5.

- Make-up Supporting Function (Minimum Recirculation)
- Make-up (Inventory)

The function of these circuits is to insure make-up pump minimum recirculation is functional during make-up pump operation for pump

protection and to prevent the contents of the BWST from draining down to the Reactor Building Sump during hot shutdown as the BWST is the supply for make-up. There is no redundant or alternative circuit located in this room.

e. THERMO-LAG DESCRIPTION

The following Thermo-Lag fire barriers are the subject of this exemption request. The TMI-1 FHAR currently requires these fire barriers to have a one hour fire endurance (Actual) rating:

ENVELOPE NO.	TYPE	ACTUAL RATING	CABLE QUAL. RTG.	NEI TEST
1AXC-FB01	2.5" Conduit	39	60	2-1
1AXC-FB01	2.5" Radial bend conduit	39	60	2-1
1AXC-FB03	2" Conduit	39	60	2-1
1AXC-FB03	2" Radial bend conduit	39	60	2-1
1AXC-FB03	2" Condulet	39	60	2-1

f. EVALUATION

FIRE HAZARDS ANALYSIS

The technical requirements of Appendix R, Section III.G.2 are not met because the above Thermo-Lag electrical raceway fire barrier envelopes in this fire zone are not rated at one hour as per the requirements of NRC Generic Letter 86-10 Supplement 1. The combustible materials present in the area consist of cable insulation, transients and Thermo-Lag which represent a fire load of 16,955 BTU/FT². A fire would most likely begin due to ignition of a transient combustible. A fire would not prevent entry into the zone for fire fighting because it would develop slowly. Ignition of exposed cable insulation (IEEE 383 qualified) from a fire originating from a transient would be limited as described below. Ignition of exposed cable insulation even if it does occur either by an overload or from an external source would result in a slowly developing fire.

It is reasonable to assume a fire originating as a result of transients could affect portions of these envelopes. However, a localized fire of this nature is not judged to be any more severe than the conditions experienced in the ASTM E-119 test. The overall volume of the room is substantial enough to dissipate the energy from a localized fire on the floor underneath the envelopes. Room ventilation will continue to run in the event of a fire in

this fire zone. Fire preplans proceduralize manual shutdown of the ventilation system depending upon the extent and severity of the fire.

The results of ASTM E-119 testing have been used to assign an actual rating of at least 39 minutes to the Thermo-Lag fire barrier envelopes in this fire area. The conditions created by potential fires discussed above and the effects of such fires upon the fire barrier envelopes in question would not exceed the severity of an ASTM E-119 exposure on the same envelope. In addition, evaluation has shown that the envelopes will remain structurally intact after an ASTM exposure of one hour and that after at least 60 minutes of such exposure, the temperature inside the envelope will not affect the functionality of the safe shutdown circuits protected by the envelope. Note that where the cable qualification rating of envelope 1AXC-FB03 is 60 minutes, it is equal to the original intent which was to protect the safe shutdown circuits from an ASTM E-119 exposure of one hour. It is conservatively estimated that it will take 15 minutes upon receipt of an automatic fire detection system alarm to bring manual suppression to bear on a fire in this room. This is significantly less than the minimum actual rating and cable qualification rating of the fire barrier envelopes within this zone of 39 and 60 minutes, respectively. This provides sufficient passive fire protection until the fire is extinguished.

This fire area lacks significant quantities of cable insulation and transient combustibles. Further, the potential localized exposure to these fire barrier envelopes is not considered more severe than the exposure of an ASTM E-119 test. The fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of detection of a fire. Therefore, a cable qualification rating of 60 minutes, with existing detection, and manual suppression is adequate to protect the safe shutdown circuits inside the fire barrier envelopes in this fire area.

SUMMARY-FIRE ZONE AB-FZ-5

This fire zone is bounded on three sides, the majority of the fourth side, the floor and ceiling by reinforced concrete walls. The remaining boundaries are not physical boundaries but are protected by an automatic preaction system where adjacent to fire zone AB-FZ-4. Where adjacent to fire zone FH-FZ-1, the boundary is protected by the automatic wet pipe sprinkler system in zone FH-FZ-1. Fire protection consists of an ionization smoke detection system, a manual hose station located in this zone as well as additional hose protection located in an adjacent zone. The detection system provides early warning capability for potential fires in this area. This provides reasonable assurance that a fire will be discovered at an early stage before it results in significant damage and exposure to the Thermo-Lag fire barrier envelopes in this area.

The fire loading is low. The majority of cable insulation in this area is qualified to the IEEE 383 Flame Test. Therefore, fires would be slow to develop and spread beyond the ignition source. Fires would be quickly detected.

The minimum cable qualification rating of 60 minutes is considered adequate to protect safe shutdown circuits from damage in the event of a fire in this area. Where the cable qualification rating for envelopes 1AXC-FB01 and 1AXC-FB03 is 60 minutes, this achieves the original intent of providing a one hour barrier in that the safe shutdown circuits inside the barrier will function after exposure to a 1 hour ASTM E-119 fire exposure. Further, the potential exposure to any barrier is not considered more severe than the exposure of the ASTM E-119 test. Since the severity of the exposure does not exceed that of the ASTM E-119 test, a minimum 60 minute cable qualification rating is considered adequate since the fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of receipt of an automatic fire detection system alarm. This is significantly less than the minimum barrier actual rating of 39 minutes and cable qualification rating of 60 minutes and is sufficient passive fire protection for the safe shutdown circuits in question until the fire is extinguished.

CONCLUSION-FIRE ZONE AB-FZ-5

GPU Nuclear concludes that an alternate fire protection configuration in fire zone AB-FZ-5 consisting of cable raceway fire barrier envelopes with a Thermo-Lag fire endurance rating of 39 minutes and a cable qualification rating of at least 60 minutes and an area wide ionization smoke detection system will provide reasonable assurance that one safe shutdown train will be free of fire damage. This configuration will achieve an acceptable level of protection equivalent to that of Appendix R, Section III.G.2. Therefore the safe shutdown circuits protected by these envelopes in fire zone AB-FZ-5 will maintain the ability to perform their function in the event of a fire because the fire would not be of significant magnitude and duration to breach the protection provided by the existing envelopes before the fire self extinguished or was put out by the plant fire brigade. The control of transient combustibles, the automatic detection system and the ability of the plant fire brigade to bring manual suppression to bear on a fire in this area within 15 minutes are considered adequate fire prevention and fire fighting measures to minimize the effects of a fire in this area thus insuring the ability to achieve safe shutdown in the event of a fire in this area.

Based on this conclusion, the request for exemption from the requirement for electrical raceway fire barriers to have "ACTUAL" fire endurance rating of one hour in fire zone AB-FZ-5 should be granted since this evaluation demonstrates that the cables protected by these envelopes will continue to function after being exposed to an ASTM E-119 fire of at least 60 minutes.

4. FIRE ZONE AB-FZ-7 (Ref. Dwg. No. AB-FZ-7)

FIRE ZONE DESCRIPTION (Information taken from TMI-1 FIRE HAZARDS ANALYSIS REPORT)

a. FIRE ZONE FEATURES

Fire Zone AB-FZ-7 is located on elevation 305' of the Auxiliary Building. Area dimensions are approximately 64 feet x 20 feet x 21 feet high. Area boundaries consist of reinforced concrete walls, floor and ceiling with an open passage in the south boundary between this zone and zone AB-FZ-6. In addition, the south boundary is adjacent to fire zones AB-FZ-6, AB-FZ-6a, and AB-FZ-9. The open passage is provided with an automatic preaction type water curtain actuated by a cross zoned smoke detection system. A rated fire damper is provided in the duct penetration in the zone boundary wall between this zone and fire zone AB-FZ-6a. All other openings in the south boundary wall between AB-FZ-7 and AB-FZ-6 are sealed with non-combustible material having at least a one hour fire rating. The north boundary is not adjacent to any other plant area. The east boundary is adjacent to the Reactor Building which is a three hour rated fire barrier. Containment penetrations do not have a specific fire rating due to overriding nuclear considerations, however their construction is adequate to prevent the spread of fire across the boundary. The west boundary is adjacent to fire zone AB-FZ-9. The floor is adjacent to fire zones AB-FZ-4 and AB-FZ-5. An automatic preaction system is located where the floor of this zone is adjacent to fire zone AB-FZ-4. All openings in penetrations in the boundary adjacent to fire zone AB-FZ-5 are sealed with a non-combustible material having a least a one hour fire rating. A portion of the ceiling is not adjacent to any other plant areas. The remainder of the ceiling adjacent to the ESF Ventilation Room is a three hour fire barrier.

b. COMBUSTIBLE MATERIALS AND LOCATIONS

The combustibles in this fire zone consist of pump lube oil and cable insulation which is spread throughout the area. Each pump is located in a reinforced concrete cubicle with front wall and ceiling openings to a common area. Most of the exposed cable insulation meets the requirements of the IEEE 383 Flame Test. The installed Thermo-Lag itself has been added to the combustible inventory in this Fire Area. The overall fire loading is considered low, 13,209 BTU/FT². This corresponds to a fire severity on the ASTM E-119 curve of between 9 and 10 minutes. Note that TMI-1 has administrative controls over transient combustibles and work in the plant.

c. FIRE PROTECTION FEATURES

Fire protection for this Fire Zone consists of ionization smoke detection which actuates an alarm in the control room and cross zoned ionization smoke detection which actuates an automatic preaction sprinkler system to provide a water curtain for the open passageway to AB-FZ-6 (alarms in the control room upon actuation). Hose protection is provided outside this fire zone in fire zone AB-FZ-6. Portable dry chemical and CO2 fire extinguishers are located in both fire zones AB-FZ-6 and AB-FZ-9. With the exception of the Intermediate Closed Cooling Water Pumps, all pumps in this fire zone are located in individual bays separated from each other by partial height barriers approximately 10 feet high.

The aforementioned fire protection features are maintained by the surveillance program required by the TMI-1 license condition.

Based upon actual experience, 15 minutes is estimated for the full fire brigade complement to bring manual suppression to bear on a fire in this fire area. This assumes the fire brigade is in full turnout gear with self contained breathing apparatus.

A previous exemption was granted from the requirement for an area wide fire suppression system and complete one hour barriers to separate safety related pumps as documented in an SER, Letter No. 5211-84-3202, John F. Stolz to Henry D. Hukill dated June 4, 1984.

d. SAFE SHUTDOWN CIRCUITS AND EQUIPMENT

The specific safe shutdown circuits and equipment protected by the existing Thermo-Lag fire barriers in this fire area are associated with the following function:

- Make-up Supporting Function (Nuclear Services Closed Cooling Water)

This function requires fire barrier protection in order to insure availability of at least one Nuclear Services Closed Cooling Water pump by protecting 2 of 3 circuits. The pumps are separated by partial height walls only. The circuits are protected because the circuits are not confined to the bays in which the pumps are located.

The following information describes the layout and function of the protected safe shutdown circuits in this fire zone. Drawing AB-FZ-7 depicts safe shutdown circuit routings for the function. This is not an exact routing but rather shows the general paths of the circuit.

ENVELOPE 1AXD-FB01

A cable for Nuclear Services Closed Cooling Water pump NS-P-1C is protected by this envelope which runs as shown on Dwg. No. AB-FZ-7.

ENVELOPE 1AXD-FB02

A cable for Nuclear Services Closed Cooling Water pump NS-P-1A is protected by this envelope which runs as shown on Dwg. No. AB-FZ-7.

e. THERMO-LAG DESCRIPTION

The following Thermo-Lag fire barriers are the subject of this exemption request. The TMI-1 FHAR currently requires these fire barriers to have a one hour fire endurance (Actual) rating:

ENVELOPE NO.	TYPE	ACTUAL RATING	CABLE QUAL. RTG.	NEI TEST
1AXD-FB01	2" radial bend armor cable	39	60	2-1
1AXD-FB01	3" Conduit	39	60	2-1
1AXD-FB01	3" Radial bend conduit	39	60	2-1
1AXD-FB01	3" Condulet	39	60	2-1
1AXD-FB02	4" Condulet	50	60	2-1
1AXD-FB02	2" Radial bend conduit	39	60	2-1
1AXD-FB02	2" armor cable	39	60	2-1
1AXD-FB02	2" radial bend armor cable	39	60	2-1
1AXD-FB02	4" Conduit	50	60	2-1
1AXD-FB02	4" Radial bend conduit	50	60	2-1

f. EVALUATION

FIRE HAZARDS ANALYSIS

The technical requirements of Appendix R, Section III G 2 are not met because the above Thermo-Lag electrical raceway fire barrier envelopes in this fire area are not rated at one hour as per the requirements of NRC Generic Letter 86-10 Supplement 1. The combustible materials present in the area consist of cable insulation, Thermo-Lag and minor amounts of pump lube oil which represent a fire load of 13,209 BTU/FT². There is no substantial ignition source for the cable other than the cable itself. Fire

barrier envelopes 1AXD-FB01 and 1AXD-FB02 are not located over any insitu combustibles; hence there is no insitu combustible source to provide a sustained fire exposure to the envelopes. Self ignition of cable is highly unlikely. Ignition of exposed cable insulation (IEEE 383 qualified) even if it does occur either by an overload or from an external source such as a pump lube oil fire would also result in a slowly developing fire. A fire would not prevent entry into the zone for fire fighting because it would develop slowly.

It is reasonable to assume a lube oil fire due to lube oil leaking from a pump motor could affect portions of these envelopes. However, a localized fire of this nature is not judged to be any more severe than the conditions experienced in the ASTM E-119 test. In addition, since each pump is in a bay separated by partial height walls, there is little likelihood of a fire which initiates on one pump to affect adjacent pumps. The overall volume of the room is substantial enough to dissipate the energy from a localized fire on the floor underneath the envelopes. Room ventilation will continue to run in the event of a fire in this fire zone. Fire preplans proceduralize manual shutdown of the ventilation system depending upon the extent and severity of the fire.

The results of ASTM E-119 testing have been used to assign a minimum actual rating of at least 39 minutes to the Thermo-Lag fire barrier envelopes in this fire area. The conditions created by potential fires discussed above and the effects of such fires upon the fire barrier envelopes in question would not exceed the severity of an ASTM E-119 exposure on the same envelope. In addition, evaluation has shown that the envelopes will remain structurally intact after an ASTM exposure of at least 60 minutes and that after 60 minutes of such exposure, the temperature inside the envelope will not affect the functionality of the safe shutdown circuits protected by the envelope. Note that a cable qualification rating of 60 minutes achieves the original intent of providing a one hour barrier in that the safe shutdown circuits inside the barrier will function after exposure to a 1 hour ASTM E-119 fire exposure. Actual fire brigade drills provide a conservative estimate of 15 minutes upon detection of a fire upon receipt of an automatic fire detection system alarm to bring manual suppression to bear on a fire in this room. This is significantly less than the minimum barrier actual rating and cable qualification rating of the fire barrier envelopes within this zone of 39 and 60 minutes, respectively.

This fire zone lacks significant quantities of cable insulation and transient combustibles. Further, the potential localized exposure to these fire barrier envelopes is not considered more severe than the exposure of an ASTM E-119 test. The fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of detection of a fire. Therefore, a cable qualification rating of 60 minutes, with existing detection

and manual suppression is adequate to protect the safe shutdown circuits inside the fire barrier envelopes in this fire area.

SUMMARY-FIRE ZONE AB-FZ-7

This fire zone is enclosed on three sides, the floor and ceiling by reinforced concrete walls with an open passage in the south boundary between this zone and zone AB-FZ-6. The open passage is provided with an automatic preaction type water curtain actuated by a cross zoned smoke detection system. With the exception of the ceiling adjacent to the ESF Ventilation Room, there is no specific fire rating maintained for these boundaries. Fire protection consists of an ionization smoke detection system. Portable extinguishers and a hose protection are located in adjacent fire zones and are available for fire fighting in this zone. The detection system provides early warning capability for potential fires in this area and provides reasonable assurance that a fire will be discovered before it results in significant damage and exposure to the Thermo-Lag fire barrier envelopes in this area.

The fire loading is low. The majority of cable insulation in this area is qualified to the IEEE 383 Flame Test. Small amounts of lube oil and transients could result in localized fires which would not spread beyond the ignition source and therefore minimize exposure to the fire barrier envelopes.

The cable qualification rating of 60 minutes is considered adequate to protect safe shutdown circuits from damage in the event of a fire in this zone. The potential exposure to any barrier is not considered more severe than the exposure of the ASTM E-119 test. Since the severity of the exposure does not exceed that of the ASTM E-119 test, a 60 minute cable qualification rating is considered adequate since the fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of receipt of an automatic fire detection system alarm. This is significantly less than the barrier cable qualification rating of 60 minutes.

CONCLUSION-FIRE ZONE AB-FZ-7

GPU Nuclear concludes that an alternate fire protection configuration in fire zone AB-FZ-7 consisting of cable raceway fire barrier envelopes with Thermo-Lag fire endurance ratings of 39 minutes and 50 minutes and a cable qualification rating of at least 60 minutes, an area wide ionization smoke detection system and an automatic preaction sprinkler system which provides a water curtain for the open passageway to fire zone AB-FZ-6 will provide reasonable assurance that one safe shutdown train will be free of fire damage. This configuration will achieve an acceptable level of

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protection equivalent to that of Appendix R, Section III.G.2. Therefore the safe shutdown circuits protected by these envelopes in fire zone AB-FZ-7 will maintain the ability to perform their function in the event of a fire because the fire would not be of significant magnitude and duration to breach the protection provided by the existing envelopes before the fire self extinguished or was put out by the plant fire brigade. The control of transient combustibles, the automatic detection system and the ability of the plant fire brigade to bring manual suppression to bear on a fire in this area within 15 minutes are considered adequate fire prevention and fire fighting measures to minimize the effects of a fire in this area thus insuring the ability to achieve safe shutdown in the event of a fire in this area.

Based on this conclusion, the request for exemption from the requirement for electrical raceway fire barriers to have "ACTUAL" fire endurance rating of one hour in fire zone AB-FZ-7 should be granted since this evaluation demonstrates that the cables protected by these envelopes will continue to function after being exposed to an ASTM E-119 fire of at least 60 minutes.

5. FIRE AREA CB-FA-1 (Ref. Dwg. No. CB-FA-1)

FIRE AREA DESCRIPTION (Information taken from TMI-1 FIRE HAZARDS ANALYSIS REPORT)

a. FIRE AREA FEATURES

Fire Area CB-FA-1 is located on elevation 306' of the Control Building. Area dimensions are approximately 100 feet x 60 feet x 15 feet high. Area boundaries consist of reinforced concrete, and reinforced concrete floor and ceiling. All area boundaries are 3-hour rated fire barriers. The north boundary is adjacent to the Turbine Building and the stairwell. The south boundary is not adjacent to any other plant areas. The east boundary is adjacent to the Turbine Building. The west boundary is adjacent to Fire Zone FH-FZ-2. The floor is not adjacent to any other plant area. The ceiling is adjacent to fire areas CB-FA-2a, CB-FA-2b, CB-FA-2c, CB-FA-2d, CB-FA-2e, CB-FA-2f, and CB-FA-2g. A suspended ceiling is located over most of this area.

b. COMBUSTIBLE MATERIALS AND LOCATIONS

The principal insitu combustibles in this area are cable insulation and transients which are spread throughout the area. Cable raceways and exposed cable are located above the suspended ceiling and in the northeast corner of this fire area. Transients are located in the offices and labs below the suspended ceiling. Most of the exposed cable insulation meets the requirements of the IEEE 383 Flame Test. The installed Thermo-Lag itself has been added to the combustible inventory in this Fire Area. The overall fire loading is considered low, 66,226 BTU/FT². This corresponds to a fire severity on the ASTM E-119 curve of between 49 and 50 minutes. Note that TMI-1 has administrative controls over transient combustibles and work in the plant.

c. FIRE PROTECTION FEATURES

Fire protection for this Fire Area consists of an automatic wet pipe sprinkler system and a portable dry chemical extinguisher which is located outside this area in fire zone FH-FZ-2. The wet pipe sprinkler system is located below the suspended ceiling in the area except for the small Health Physics Control Point Corridor and does not cover the cable tray and conduit above the suspended ceiling. There is no suspended ceiling in the northeast corner

of the area. Area wide ionization smoke detection which actuates an alarm in the control room is provided above the suspended ceiling.

The aforementioned fire protection features are maintained by the surveillance program required by the TMI-1 license condition.

Based upon actual experience, 15 minutes is estimated for the full fire brigade complement to bring manual suppression to bear on a fire in this fire area. This assumes the fire brigade is in full turnout gear with self contained breathing apparatus. Note there is no radiological hazard in this area that could impede fire fighting operations or fire brigade response.

A previous exemption was granted from the requirement for an area wide fire suppression system above the suspended ceiling as documented in an SER, Letter No. 5211-84-3202, John F. Stolz to Henry D. Hukill dated June 4, 1984.

d. **SAFE SHUTDOWN CIRCUITS AND EQUIPMENT**

The specific safe shutdown circuits and equipment protected by the existing Thermo-Lag fire barrier in this fire area are associated with the following functions:

- Make-up and Supporting Functions
- RCS Pressure
- Reactor Coolant Pump Thermal Barrier Cooling
- Nuclear Services Closed Cycle Cooling
- Decay Heat Closed Cycle Cooling
- Electrical Power System

These functions require fire barrier protection in order to insure a safe shutdown path if a fire eliminates all other unprotected circuits and equipment in this fire area. This assumption served as the basis for protecting the above functions in this fire area.

The following information describes the layout and function of the protected safe shutdown circuits in this fire area. Drawing CB-FA-1 depicts safe shutdown circuit routings for the various functions. This drawing also depicts circuit routings for redundant or alternative unprotected safe shutdown circuits. These are not exact routings but rather show the general paths of the various circuits.

ENVELOPE 1CCD-FB01

Cables for the following functions are protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

- Reactor Coolant Pump Thermal Barrier Cooling
- Nuclear Services Closed Cycle Cooling
- Electrical Power System

ENVELOPE 1CCD-FB02

Cables for the Electrical Power System are protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB03

Cables for the following functions are protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

- Make-up Supporting Function
- RCS Pressure
- Reactor Coolant Pump Thermal Barrier Cooling

The Make-up Supporting Function is required to insure adequate minimum recirculation flow for make-up. There is no redundant circuit for this function as make-up minimum recirculation is provided with a single line that must be available for make-up pump operation.

ENVELOPE 1CCD-FB04

Cables for the following functions are protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

- RCS Pressure
- Reactor Coolant Pump Thermal Barrier Cooling

ENVELOPE 1CCD-FB06

A cable for Reactor Coolant Pump Thermal Barrier Cooling is protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB08

Cables for the Electrical Power System are protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB09

Cables for the Electrical Power System are protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB10

A cable for the Electrical Power System is protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB12

A cable for the Electrical Power System is protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB13

A cable for the Electrical Power System is protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB15

Cables for the Electrical Power System are protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB17

A cable for the Electrical Power System is protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB18

A cable for the Electrical Power System is protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB19

A cable for the Electrical Power System is protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB20

A cable for the Electrical Power System is protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB21

Cables for the Electrical Power System are protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB22

Cables for the Electrical Power System are protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

ENVELOPE 1CCD-FB24

A cable for the Decay Heat Closed Cycle Cooling System is protected by this envelope which is located as shown on Dwg. No. CB-FA-1.

e THERMO-LAG DESCRIPTION

The following Thermo-Lag fire barriers are the subject of this exemption request. The TMI-1 FHAR currently requires these fire barriers to have a one hour fire endurance (Actual) rating:

ENVELOPE NO.	TYPE	ACTUAL RATING	CABLE QUAL. RTG.	NEI TEST
1CCD-FB01	2" Conduit	39	57	2-1
1CCD-FB01	2" Radial bend conduit	39	57	2-1
1CCD-FB01	2" armor cable	39	60	2-1
1CCD-FB01	2" radial bend armor cable	39	60	2-1
1CCD-FB01	2.5" armor cable	39	60	2-1
1CCD-FB01	2.5" Radial bend armor cable	39	60	2-1
1CCD-FB01	3" Conduit	39	60	2-1

1CCD- FB01	3" radial bend armor cable	39	60	2-1
1CCD-FB01	3" Radial bend conduit	39	60	2-1
1CCD-FB01	4" Conduit	50	60	2-1
1CCD-FB01	4" Radial bend conduit	50	60	2-1
1CCD-FB02	2" armor cable	39	60	2-1
1CCD-FB02	2" radial bend armor cable	39	60	2-1
1CCD-FB02	3.5" Conduit	39	60	2-1
1CCD-FB02	3.5" Radial bend conduit	39	60	2-1
1CCD-FB03	2" Conduit	39	60	2-1
1CCD-FB03	2" Condulet	39	60	2-1
1CCD-FB03	2" Radial bend conduit	39	60	2-1
1CCD-FB03	3" Conduit	39	60	2-1
1CCD-FB03	3" Condulet	39	60	2-1
1CCD-FB03	3" Radial bend conduit	39	60	2-1
1CCD-FB04	2" conduit	39	60	2-1
1CCD-FB04	2" Condulet	39	60	2-1
1CCD-FB04	2" Radial bend conduit	39	60	2-1
1CCD-FB06	2.5" Conduit	39	60	2-1
1CCD-FB06	2.5" Radial bend conduit	39	60	2-1
1CCD- FB08	2" Conduit	39	57	2-1
1CCD-FB08	2" Radial bend conduit	39	57	2-1
1CCD-FB08	3.5" armor cable	39	60	2-1
1CCD-FB08	3.5" radial bend armor cable	39	60	2-1
1CCD-FB08	4" Conduit	50	60	2-1
1CCD-FB08	4" Radial bend conduit	50	60	2-1
1CCD-FB08	4" Condulet	50	60	2-1
1CCD-FB09	2" radial bend armor cable	39	60	2-1
1CCD-FB09	4" Conduit	50	60	2-1
1CCD-FB09	4" Radial bend conduit	50	60	2-1
1CCD-FB09	4" Condulet	50	60	2-1
1CCD-FB10	3" Conduit	39	57	2-1
1CCD-FB10	3" Radial bend conduit	39	57	2-1
1CCD-FB10	3" Condulet	39	57	2-1
1CCD-FB12	2" Conduit	39	60	2-1
1CCD-FB12	2" Radial bend conduit	39	60	2-1
1CCD-FB12	2" Condulet	39	60	2-1
1CCD-FB13	2" Conduit	39	60	2-1
1CCD-FB13	2" Radial bend conduit	39	60	2-1
1CCD-FB15	2" radial bend armor cable	39	57	2-1

1CCD-FB15	5" Conduit	50	60	2-1
1CCD-FB17	2" armor cable	39	60	2-1
1CCD-FB17	2" radial bend armor cable	39	60	2-1
1CCD-FB17	4" Conduit	50	60	2-1
1CCD-FB17	4" Radial bend conduit	50	60	2-1
1CCD-FB18	2" armor cable	39	60	2-1
1CCD-FB18	2" radial bend armor cable	39	60	2-1
1CCD-FB18	4" Conduit	50	60	2-1
1CCD-FB19	2" radial bend armor cable	39	60	2-1
1CCD-FB19	4" Conduit	50	60	2-1
1CCD-FB19	4" Radial bend conduit	50	60	2-1
1CCD-FB20	2" armor cable	39	60	2-1
1CCD-FB20	2" radial bend armor cable	39	60	2-1
1CCD-FB20	4" Conduit	50	60	2-1
1CCD-FB21	3" armor cable	39	60	2-1
1CCD-FB21	3" radial bend armor cable	39	60	2-1
1CCD-FB21	3" Radial bend conduit	39	60	2-1
1CCD-FB21	5" Conduit	50	60	2-1
1CCD-FB21	5" Radial bend conduit	50	60	2-1
1CCD-FB22	2" armor cable	39	60	2-1
1CCD-FB22	2" radial bend armor cable	39	60	2-1
1CCD-FB22	3.5" Conduit	39	60	2-1
1CCD-FB22	3.5" Radial bend conduit	39	60	2-1
1CCD-FB22	3.5" Conduit	39	60	2-1
1CCD-FB22	3.5" Radial Bend Conduit	39	60	2-1
1CCD-FB24	2" Conduit	39	60	2-1
1CCD-FB24	2" Radial Bend Conduit	39	60	2-1
1CCD-FB24	2" armor cable	39	60	2-1
1CCD-FB24	2" Radial bend armor cable	39	60	2-1

f. EVALUATION

FIRE HAZARDS ANALYSIS

The technical requirements of Appendix R, Section III G.2 are not met because the above Thermo-Lag electrical raceway fire barrier envelopes in this fire area are not rated at one hour as per the requirements of NRC Generic Letter 86-10 Supplement 1. The combustible materials present in the area consist of transients below the suspended ceiling, and cable

insulation and Thermo-Lag above the suspended ceiling which represent a fire load of 66,226 BTU/FT². A fire that exposes the fire barrier envelopes due to a transient fire located below the suspended ceiling is highly unlikely here due to the automatic wet pipe sprinkler system below the ceiling. There is no substantial ignition source for the cable above the suspended ceiling other than the cable itself. Self ignition of cable is highly unlikely. Ignition of exposed cable insulation (IEEE 383 qualified) even if it does occur by an overload would result in a slowly developing fire which would be detected quickly because of the ionization smoke detection system provided above the suspended ceiling.

The potential for localized fire exposure due to transients below the suspended ceiling in this fire zone is credible. Since this area is typically occupied continuously, the most likely fire would be a trash fire which would be promptly extinguished by a portable extinguisher. Even if a more severe fire were to develop, the wet pipe sprinkler system below the suspended ceiling would extinguish it before it challenged the Thermo-Lag barriers above the ceiling. If a fire were to occur above the suspended ceiling, it would be slow to develop and is judged to be less severe than the conditions experienced in the ASTM E-119 test. Fire Emergency Procedures require commencement of plant shutdown for a fire that spreads to the area above the ceiling. Room ventilation will continue to run in the event of a fire in this fire zone. Fire preplans proceduralize manual shutdown of the ventilation system depending upon the extent and severity of the fire.

The results of ASTM E-119 testing have been used to assign an actual rating of at least 39 minutes to the Thermo-Lag fire barrier envelopes in this fire area. The conditions created by potential fires discussed above and the effects of such fires upon the fire barrier envelopes in question would not exceed the severity of an ASTM E-119 exposure on the same envelope. In addition, evaluation has shown that the envelopes will remain structurally intact after an ASTM exposure of one hour and that after 57 minutes of such exposure, the temperature inside the envelope will not affect the functionality of the safe shutdown circuits protected by the envelope. Note that most of the envelopes have been evaluated to have a cable qualification rating of 60 minutes, therefore, the cable qualification rating of these envelopes is equal to the original intent which was to protect the safe shutdown circuits from an ASTM E-119 exposure of one hour. It is conservatively estimated that it will take 15 minutes upon receipt of an automatic fire detection system alarm or a wet pipe sprinkler system actuation alarm to bring manual suppression to bear on a fire in this room by the fire brigade. This is significantly less than the minimum barrier actual rating and cable qualification rating of the fire barrier envelopes within this zone of 39 and 57 minutes, respectively.

This fire area lacks significant quantities of cable insulation and transient combustibles sufficient to challenge the Thermo-Lag fire barrier envelopes above the suspended ceiling. Further, the potential localized exposure to these fire barrier envelopes is not considered more severe than the exposure of an ASTM E-119 test. The fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of detection of a fire. Therefore, a minimum cable qualification rating of 57 minutes, with existing detection above the false ceiling, automatic wet pipe sprinkler protection below the suspended ceiling and manual suppression is adequate to protect the safe shutdown circuits inside the fire barrier envelopes in this fire area.

SUMMARY-FIRE AREA CB-FA-1

This fire zone is enclosed by walls, the floor and ceiling of reinforced concrete walls. Combustible materials present in the zone consist of cable insulation and Thermo-Lag above the suspended ceiling and transients below the suspended ceiling. Fire protection consists of an ionization smoke detection system above the suspended ceiling and an automatic wet pipe sprinkler system and portable extinguishers below the suspended. The detection system provides early warning capability for potential fires or smoke infiltration above the ceiling in this area and provides reasonable assurance that a fire will be discovered before it results in significant damage and exposure to the Thermo-Lag fire barrier envelopes in this area. Early commencement of plant shutdown for fires in this area enhances the plant's ability to ensure safe shutdown in the event of a fire.

The fire loading is low. The majority of cable insulation in this area is qualified to the IEEE 383 Flame Test. Therefore, fires would be slow to develop and spread beyond the ignition source. Fires would be quickly detected.

The minimum cable qualification rating of 57 minutes is considered adequate to protect safe shutdown circuits from damage in the event of a fire in this area. The cable qualification rating of those envelopes which is 60 minutes achieves the original intent of providing a one hour barrier in that the safe shutdown circuits inside these barriers will function after exposure to a 1 hour ASTM E-119 fire exposure. Further, the potential exposure to any barrier is not considered more severe than the exposure of the ASTM E-119 test. Since the severity of the exposure does not exceed that of the ASTM E-119 test, a minimum 57 minute cable qualification rating is considered adequate since the fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of receipt of an automatic fire detection system or automatic wet pipe sprinkler system actuation alarm. This is significantly less than the barrier cable qualification rating of 57 minutes.

CONCLUSION-FIRE AREA CB-FA-1

GPU Nuclear concludes that an alternate fire protection configuration in fire area CB-FA-1 consisting of cable raceway fire barrier envelopes above the false ceiling with fire endurance ratings of 39 minutes and 50 minutes and a Thermo-Lag cable qualification rating of at least 57 minutes, a wet pipe sprinkler system located below suspended ceiling in the area except for the small Health Physics Control Point Corridor and area wide ionization smoke detection above the suspended ceiling which actuates an alarm in the control room will provide reasonable assurance that one safe shutdown train will be free of fire damage. This configuration will achieve an acceptable level of protection equivalent to that of Appendix R, Section III.G.2. Therefore the safe shutdown circuits protected by these envelopes in fire area CB-FA-1 will maintain the ability to perform their function in the event of a fire because the fire would not be of significant magnitude and duration to breach the protection provided by the existing envelopes before the fire self extinguished, was extinguished by the automatic preaction system or was put out by the plant fire brigade. The control of transient combustibles, the proceduralized shutdown requirements in the event of fire, the automatic detection system above the suspended ceiling, the automatic suppression system below the suspended ceiling and the ability of the plant fire brigade to bring manual suppression to bear on a fire in this area within 15 minutes are considered adequate fire prevention and fire fighting measures to minimize the effects of a fire in this area thus insuring the ability to achieve safe shutdown in the event of a fire in this area.

Based on this conclusion, the request for exemption from the requirement for electrical raceway fire barriers to have an "ACTUAL" fire endurance rating of one hour in fire CB-FA-1 should be granted since this evaluation demonstrates that the cables protected by these envelopes will continue to function after being exposed to an ASTM E-119 fire of at least 57 minutes.

6. FIRE ZONE FH-FZ-1 (Ref. Dwg. No. FH-FZ-1)

FIRE ZONE DESCRIPTION (Information taken from TMI-1 FIRE HAZARDS ANALYSIS REPORT)

a. FIRE AREA FEATURES

Fire Zone FH-FZ-1 is located on elevation 281' of the Fuel Handling Building. Area dimensions are approximately 54 feet x 144 feet x 23 feet high. Zone boundaries consist of reinforced concrete walls, floor and ceiling. Most of the east boundary is not adjacent to any other plant area except for a three hour rated fire barrier where adjacent to fire zone IB-FZ-8 which contains a non rated steel door, and a non-fire rated boundary where adjacent to fire zone FH-FZ-6. The north boundary is adjacent to the Reactor Building which is a three-hour rated fire barrier. Containment penetrations do not have a specific fire rating due to overriding nuclear considerations, however, their construction is adequate to prevent the spread of fire across the penetration. The south and west boundary is adjacent to fire zones AIT-FZ-1, AIT-FZ-1a, AB-FZ-3, AB-FZ-4 and AB-FZ-5. An open passage exists between this zone and zone AB-FZ-5. An open passage exists between this zone and zone AB-FZ-5 and the boundary between this zone and zone AB-FZ-4 does not consist of wall construction; the boundaries adjacent to zones AB-FZ-3 and AIT-FZ-1 also contain unprotected openings, however, this zone (FH-FZ-1) is equipped with an automatic wet pipe sprinkler system. The north and south boundary of the ventilating duct chase, which extends vertically, is penetrated where adjacent to zone FH-FZ-2 on elevation 305'. The south boundary of the ventilating duct chase is penetrated where adjacent to zone FH-FZ-3 on elevation 329'. The floor of this fire zone is not adjacent to any other plant area. The ceiling of this fire zone is adjacent to fire zones FH-FZ-2 and FH-FZ-4. Note that zone FH-FZ-4 is the fuel pool. Due to the nature of this boundary, it is not fire rated.

b. COMBUSTIBLE MATERIALS AND LOCATIONS

The principal insitu combustibles in this area are cable insulation and transients. Most of the exposed cable insulation meets the requirements of the IEEE 383 Flame Test. The installed Thermo-Lag itself has been added to the combustible inventory in this Fire Area. The overall fire loading is considered low, 37,424 BTU/FT². This corresponds to a fire severity on the ASTM E-119 curve of between 28 and 29 minutes. Note that TMI-1 has administrative controls over transient combustibles and work in the plant.

c. FIRE PROTECTION FEATURES

Fire protection for this Fire Area consists of an automatic wet pipe sprinkler system which protects the entire floor with sprinkler heads located above, below and in between cable trays on elevation 281', a fire hose station and ionization smoke detection which actuates alarms in the control room. Portable dry chemical fire extinguishers and additional hose protection is provided in fire zones AB-FZ-1 and 5.

The aforementioned fire protection features are maintained by the surveillance program required by the TMI-1 license condition.

Based upon actual experience, 15 minutes is estimated for the full fire brigade complement to bring manual suppression to bear on a fire in this fire area. This assumes the fire brigade is in full turnout gear with self contained breathing apparatus.

d. SAFE SHUTDOWN CIRCUITS AND EQUIPMENT

The specific safe shutdown circuits and equipment protected by the existing Thermo-Lag fire barriers in this fire area are associated with the following function:

- Make-up and Supporting Functions
- RCS Pressure
- Reactor Coolant Pump Thermal Barrier Cooling
- Nuclear Services River Water
- Decay Heat River Water
- Electrical Power System

These functions require fire barrier protection in order to insure a safe shutdown path if a fire eliminates all other unprotected circuits and equipment in this fire zone. This assumption served as the basis for protecting the above functions in this fire zone.

The following information describes the layout and function of the protected safe shutdown circuits in this fire zone. Drawing FH-FZ-1 depicts safe shutdown circuit routings for the functions. These are not exact routings but rather show the general path of the circuits.

ENVELOPE 1FHC-FB01

Cables for Make-up are protected by this envelope which runs as shown on Dwg. No. FH-FZ-1.

ENVELOPE 1FHC-FB02

Cables for the following functions are protected by this envelope which runs as shown on Dwg. No. FH-FZ-1.

- Nuclear Services River Water
- Decay Heat River Water
- Electrical Power System

ENVELOPE 1FHC-FB04

Cables for the Electrical Power System are protected by this envelope which runs as shown on Dwg. No. FH-FZ-1.

ENVELOPE 1FHC-FB05

Cables for the Electrical Power System are protected by this envelope which runs as shown on Dwg. No. FH-FZ-1.

ENVELOPE 1FHC-FB07

Cables for the following functions are protected by this envelope which runs as shown on Dwg. No. FH-FZ-1.

- Make-up Supporting Function
- RCS Pressure
- Reactor Coolant Pump Thermal Barrier Cooling

The Make-up Supporting Function is required to insure adequate minimum recirculation flow for make-up. There is no redundant circuit for this function as make-up minimum recirculation is provided with a single line that must be available for make-up pump operation.

ENVELOPE 1FHC-FB13

Cables for the following functions are protected by this envelope which runs as shown on Dwg. No. FH-FZ-1.

- Make-up and Supporting Functions
- Reactor Coolant Pump Thermal Barrier Cooling

e. THERMO-LAG DESCRIPTION

The following Thermo-Lag fire barriers are the subject of this exemption request. The TMI-1 FHAR currently requires these fire barriers to have a one hour fire endurance (Actual) rating:

ENVELOPE NO.	TYPE	ACTUAL RATING	CABLE QUAL. RTG.	NEI TEST
1FHC-FB01	2.5" armor cable	39	60	2-1
1FHC-FB01	2.5" radial bend armor cable	39	60	2-1
1FHC-FB02	4" Radial bend armor cable	50	60	2-1
1FHC-FB04	3" Radial bend armor cable	39	60	2-1
1FHC-FB05	4" Conduit	50	60	2-1
1FHC-FB05	4" Radial bend conduit	50	60	2-1
1FHC-FB07	3" Condulet	39	60	2-1
1FHC-FB07	3" Conduit	39	60	2-1
1FHC-FB07	3" Radial bend conduit	39	60	2-1
1FHC-FB13	4" Conduit	50	60	2-1

f. EVALUATION

FIRE HAZARDS ANALYSIS

The technical requirements of Appendix R, Section III.G.2 are not met because the above Thermo-Lag electrical raceway fire barrier envelopes in this fire area are not rated at one hour as per the requirements of NRC Generic Letter 86-10 Supplement 1. The combustible materials present in the area consist of cable insulation, Thermo-Lag, and normally present transients which represent a fire load of 37,424 BTU/FT². A fire would most likely begin due to ignition of a transient combustible. A fire would not prevent entry into the zone for fire fighting because it would develop slowly. Ignition of exposed cable insulation (IEEE 383 qualified) from a fire originating from a transient would be limited as described below.

Ignition of exposed cable insulation if it does occur either by an overload or from an external source would result in a slowly developing fire even if the automatic wet pipe sprinkler system in this zone failed to function.

It is reasonable to assume a fire originating as a result of transients could affect portions of these envelopes. However, a localized fire of this nature is not judged to be any more severe than the conditions experienced in the ASTM E-119 test. The overall volume of the room is substantial enough to dissipate the energy from a localized fire on the floor underneath the envelopes. Room ventilation will continue to run in the event of a fire in this fire zone. Fire preplans proceduralize manual shutdown of the ventilation system depending upon the extent and severity of the fire.

The results of ASTM E-119 testing have been used to assign an actual rating of at least 39 minutes to the Thermo-Lag fire barrier envelopes in this fire area. The conditions created by potential fires discussed above and the effects of such fires upon the fire barrier envelopes in question would not exceed the severity of an ASTM E-119 exposure on the same envelope. In addition, evaluation has shown that the envelopes will remain structurally intact after an ASTM exposure of 60 minutes and that after 60 minutes of such exposure, the temperature inside the envelope will not affect the functionality of the safe shutdown circuits protected by the envelope. Note that the cable qualification rating of envelopes 1FHC-FB01, 1FHC-FB04, 1FHC-FB05 and 1FHC-FB13 (60 minutes) is equal to the original intent which was to protect the safe shutdown circuits from an ASTM E-119 exposure of one hour. Actual fire brigade drills provide a conservative estimate of 15 minutes upon detection of a fire upon receipt of an automatic fire detection system alarm to bring manual suppression to bear on a fire in this room. This is significantly less than the minimum barrier actual rating and cable qualification rating of the fire barrier envelopes within this zone of 39 and 60 minutes, respectively.

This fire zone lacks significant quantities of cable insulation and transient combustibles. Further, the potential localized exposure to these fire barrier envelopes is not considered more severe than the exposure of an ASTM E-119 test. The fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of detection of a fire. Therefore, a cable qualification rating of 60 minutes, with existing detection, the automatic wet pipe sprinkler system and manual suppression is adequate to protect the safe shutdown circuits inside the fire barrier envelopes in this fire area.

SUMMARY-FIRE ZONE FH-FZ-1

This fire area is enclosed reinforced concrete walls, floor and ceiling as described previously. Fire protection consists of portable extinguishers, an area wide ionization smoke detection system, an area wide automatic wet pipe sprinkler system and a manual hose station which is located outside the area. The detection system provides early warning capability for potential fires in this area and the automatic wet pipe sprinkler system provides reasonable assurance that a fire will be discovered and contained before it results in significant damage and exposure to the Thermo-Lag fire barrier envelopes in this area.

The fire loading is low. The majority of cable insulation in this area is qualified to the IEEE 383 Flame Test. Therefore, fires would be slow to develop and spread beyond the ignition source. Fires would be quickly detected.

The minimum cable qualification rating of 60 minutes is considered adequate to protect safe shutdown circuits from damage in the event of a fire in this area. The cable qualification rating of 60 minutes achieves the original intent of providing a one hour barrier in that the safe shutdown circuits inside these barriers will function after exposure to a 1 hour ASTM E-119 fire exposure. Further, the potential exposure to any barrier is not considered more severe than the exposure of the ASTM E-119 test. Since the severity of the exposure does not exceed that of the ASTM E-119 test, a minimum 60 minute cable qualification rating is considered adequate since the fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of receipt of an automatic fire detection system alarm. This is significantly less than the minimum barrier cable qualification rating of 60 minutes.

CONCLUSION-FIRE ZONE FH-FZ-1

GPU Nuclear concludes that an alternate fire protection configuration in fire zone FH-FZ-1 consisting of cable raceway fire barrier envelopes with Thermo-Lag fire endurance ratings of 39 minutes and 50 minutes and a cable qualification rating of at least 60 minutes, an area wide ionization smoke detection system and an area wide automatic wet pipe sprinkler system will provide reasonable assurance that one safe shutdown train will be free of fire damage. This configuration will achieve an acceptable level of protection equivalent to that of Appendix R, Section III.G.2. Therefore the safe shutdown circuits protected by these envelopes in fire zone FH-FZ-1 will maintain the ability to perform their function in the event of a fire because the fire would not be of significant magnitude and duration to breach the protection provided by the existing envelopes before the fire self

extinguished, was extinguished by the automatic wet pipe sprinkler system or was put out by the plant fire brigade. The control of transient combustibles, the automatic detection and suppression system and the ability of the plant fire brigade to bring manual suppression to bear on a fire in this area within 15 minutes are considered adequate fire prevention and fire fighting measures to minimize the effects of a fire in this area thus insuring the ability to achieve safe shutdown in the event of a fire in this area.

Based on this conclusion, the request for exemption from the requirement for electrical raceway fire barriers to have an "ACTUAL" fire endurance rating of one hour in fire zone FH-FZ-1 should be granted since this evaluation demonstrates that the cables protected by these envelopes will continue to function after being exposed to an ASTM E-119 fire of at least 60 minutes.

7. FIRE ZONE FH-FZ-2 (Ref. Dwg. No. FH-FZ-2)

FIRE ZONE DESCRIPTION (Information taken from TMI-1 FIRE HAZARDS ANALYSIS REPORT)

a. FIRE ZONE FEATURES

Fire Zone FH-FZ-2 is located on elevations 305' and 306' of the Fuel Handling Building. Area dimensions are approximately 150 feet x 50 feet x 21 feet high. Zone boundaries consist of reinforced concrete walls, floor and ceiling. The south boundary of this zone is three hour fire rated except on the operating floor which is common between TMI-1 and TMI-2. The rated portion of this boundary includes a class A fire door on elevation 305' which is not maintained. The west boundary is adjacent to fire zone AB-FZ-6, with two open passages between the zones. The boundaries between FH-FZ-2 and FH-FZ-4 (fuel pool) are reinforced concrete (no penetrations) except on the operating floor where no boundaries exist. The boundaries between FH-FZ-2 and FH-FZ-3 are reinforced concrete. The east boundary of FH-FZ-2 in the Control Building patio (Hot Machine Shop) is a three hour rated fire barrier except where adjacent to fire zone FH-FZ-4 (concrete wall with no penetrations). The north boundary for the Reactor and Turbine Buildings is a three hour rated fire barrier. Containment penetrations do not have a specific fire rating due to overriding nuclear considerations, however, their construction is adequate to prevent the spread of fire across the penetration. The floor of this zone is adjacent to fire zone FH-FZ-1 (protected by an automatic wet pipe sprinkler system) and FH-FZ-2 is sprinklered above fire zone FH-FZ-6 and the Air Intake Tunnel. The remainder is not adjacent to any other plant area. The ceiling of this zone is adjacent to zones FH-FZ-3 and FH-FZ-5. Note that the Control Building patio portion of FH-FZ-2 is provided with an automatic wet pipe sprinkler system where adjacent to zones FH-FZ-4, FH-FZ-5 and FH-FZ-6. The remainder of the ceiling is not adjacent to any other plant area.

b. COMBUSTIBLE MATERIALS AND LOCATIONS

The principal insitu combustibles in this area are cable insulation and transients. Most of the exposed cable insulation meets the requirements of the IEEE 383 Flame Test. The installed Thermo-Lag itself has been added to the combustible inventory in this Fire Area. The overall fire loading is considered low, 23,777 BTU/FT². This corresponds to a fire severity on the ASTM E-119 curve of between 17 and 18 minutes. Note that TMI-1

has administrative controls over transient combustibles and work in the plant.

c. FIRE PROTECTION FEATURES

Fire protection for this Fire Zone consists of an automatic wet pipe sprinkler system on elevation 306' of this zone adjacent to the Control Building, a carbon dioxide fire extinguisher and a dry chemical fire extinguisher. Hose protection for the 306' elevation area of this fire zone is available in the Turbine Building outside the north wall of the zone. Additional hose protection is available near the open stairwell in zones FH-FZ-1 (elev. 281') and zone FH-FZ-3 (elev. 329'). Also, portable dry chemical and CO2 extinguishers are available in fire zone AB-FZ-6.

The aforementioned fire protection features are maintained by the surveillance program required by the TMI-1 license condition.

Based upon actual experience, 15 minutes is estimated for the full fire brigade complement to bring manual suppression to bear on a fire in this fire area. This assumes the fire brigade is in full turnout gear with self contained breathing apparatus.

A previous exemption was granted from the requirement for an automatic detection system as documented in an SER, John F. Stolz to Henry D. Hukill dated December 30, 1986.

d. SAFE SHUTDOWN CIRCUITS AND EQUIPMENT

The specific safe shutdown circuits and equipment protected by the existing Thermo-Lag fire barriers in this fire zone are associated with the following functions:

- Make-up Supporting Function
- Decay Heat
- Reactor Coolant Pump Thermal Barrier Cooling

These functions require fire barrier protection in order to insure adequate minimum recirculation flow for make-up, and a controllable valve to prevent contents of the Borated Water Storage Tank (BWST) from draining to the Reactor Building Sump during hot shutdown. There are no redundant circuits in this area as makeup minimum recirculation and draindown of the BWST involves multiple valves in series, all of which must be controllable for operation of these functions for a fire in this fire zone. In addition, protection is provided for Reactor Coolant Pump thermal barrier cooling in lieu of redundant circuits in the fire zone for Reactor Coolant Pump seal

injection. This assumption served as the basis for protecting the above functions in this fire zone.

The following information describes the layout and function of the protected safe shutdown circuits in this fire area. Drawing FH-FZ-2 depicts safe shutdown circuit routings for the various functions. These are not exact routings but rather show the general paths of the various circuits.

ENVELOPE 1CCD-FB23

Cables for the following functions are protected by this envelope which is located as shown on Dwg. No. FH-FZ-2.

- Make-up Supporting Function
- Decay Heat
- Reactor Coolant Pump Thermal Barrier Cooling

e. THERMO-LAG DESCRIPTION

The following Thermo-Lag fire barriers are the subject of this exemption request. The TMI-1 FHAR currently requires these fire barriers to have a one hour fire endurance (Actual) rating:

ENVELOPE NO.	TYPE	ACTUAL RATING	CABLE QUAL. RTG.	NEI TEST
1CCD-FB23	2.5" Conduit	39	60	2-1
1CCD-FB23	2.5" Radial bend conduit	39	60	2-1
1CCD-FB23	2.5" Condulet	39	60	2-1

f. EVALUATION

FIRE HAZARDS ANALYSIS

The technical requirements of Appendix R, Section III G 2 are not met because the above Thermo-Lag electrical raceway fire barrier envelopes in this fire area are not rated at one hour as per the requirements of NRC Generic Letter 86-10 Supplement 1. The combustible materials present in the area consist of cable insulation and transients which represent a fire load of 23,777 BTU/FT². A fire would most likely begin in the area which contains the most cable insulation and where transients would most likely be found. This part of the fire zone is protected by an automatic wet pipe

sprinkler system. A fire would not prevent entry into the compartment for fire fighting. Ignition of exposed cable insulation (IEEE 383 qualified) from a fire originating below it would also be limited. If a fire of significant magnitude were to occur, the automatic wet pipe sprinkler system would actuate. This would cause an alarm to be visually and audibly annunciated in the control room. The fire brigade would be subsequently dispatched and would complete extinguishing the fire using manual fire fighting equipment. Pending actuation of the automatic wet pipe sprinkler system and the arrival of the fire brigade, the above referenced fire barrier envelope would provide adequate passive protection for the required safe shutdown circuits. Room ventilation will continue to run in the event of a fire in this fire zone. Fire preplans proceduralize manual shutdown of the ventilation system depending upon the extent and severity of the fire.

The results of ASTM E-119 testing have been used to assign an actual rating of at least 39 minutes to the Thermo-Lag fire barrier envelopes in this fire area. The conditions created by potential fires discussed above and the effects of such fires upon the fire barrier envelopes in question would not exceed the severity of an ASTM E-119 exposure on the same envelope. In addition, evaluation has shown that the envelopes will remain structurally intact after an ASTM exposure of 60 minutes and that after 60 minutes of such exposure, the temperature inside the envelope will not affect the functionality of the safe shutdown circuits protected by the envelope. Note that the cable qualification rating of 60 minutes is equal to the original intent which was to protect the safe shutdown circuits from an ASTM E-119 exposure of one hour. Actual fire brigade drills provide a conservative estimate of 15 minutes upon detection of a fire upon receipt of an automatic fire detection system alarm to bring manual suppression to bear on a fire in this room. This is significantly less than the minimum barrier actual rating and cable qualification rating of the fire barrier envelopes within this zone of 39 and 60 minutes, respectively.

This fire zone lacks significant quantities of cable insulation and transient combustibles. Further, the potential localized exposure to these fire barrier envelopes is not considered more severe than the exposure of an ASTM E-119 test. The fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of detection of a fire. Therefore, a cable qualification rating of 60 minutes, with the automatic wet pipe sprinkler system and manual suppression is adequate to protect the safe shutdown circuits inside the fire barrier envelopes in this fire area.

SUMMARY-FIRE ZONE FH-FZ-2

This fire area is enclosed by reinforced concrete walls, floor and ceiling as described previously. Fire protection consists of an automatic wet pipe

sprinkler system covering a portion of the zone, portable extinguishers and manual hose stations located in adjacent fire zones.

The fire loading is low. The majority of cable insulation in this area is qualified to the IEEE 383 Flame Test. A fire would most likely begin in the portion of this fire zone where most of the cable insulation and transients are located. This portion of the zone is protected by an automatic wet pipe sprinkler system.

The cable qualification rating of 60 minutes is considered adequate to protect safe shutdown circuits from damage in the event of a fire in this area. The cable qualification rating of 60 minutes achieves the original intent of providing a one hour barrier in that the safe shutdown circuits inside the barrier will function after exposure to a 1 hour ASTM E-119 fire exposure. Further, the potential exposure to any barrier is not considered more severe than the exposure of the ASTM E-119 test. Since the severity of the exposure does not exceed that of the ASTM E-119 test, a 60 minute cable qualification rating is considered adequate since the fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of receipt of an automatic fire suppression system alarm. This is significantly less than the barrier cable qualification rating of 60 minutes.

CONCLUSION-FIRE ZONE FH-FZ-2

GPU Nuclear concludes that an alternate fire protection configuration in fire zone FH-FZ-2 consisting of cable raceway fire barrier envelopes with a Thermo-Lag fire endurance rating of 39 minutes and a cable qualification rating of 60 minutes and an area wide automatic wet pipe sprinkler system will provide reasonable assurance that one safe shutdown train will be free of fire damage. This configuration will achieve an acceptable level of protection equivalent to that of Appendix R, Section III.G.2. Therefore the safe shutdown circuits protected by these envelopes in fire zone FH-FZ-2 will maintain the ability to perform their function in the event of a fire because the fire would not be of significant magnitude and duration to breach the protection provided by the existing envelopes before the fire self extinguished, was extinguished by the automatic suppression system or was put out by the plant fire brigade. The control of transient combustibles, the automatic suppression system and the ability of the plant fire brigade to bring manual suppression to bear on a fire in this area within 15 minutes are considered adequate fire prevention and fire fighting measures to minimize the effects of a fire in this area thus insuring the ability to achieve safe shutdown in the event of a fire in this area.

Based on this conclusion, the request for exemption from the requirement for electrical raceway fire barriers to have an "ACTUAL" fire endurance rating of one hour in fire zone FH-FZ-2 should be granted since this evaluation demonstrates that the cables protected by these envelopes will continue to function after being exposed to an ASTM E-119 fire of 60 minutes.

8. FIRE ZONE FH-FZ-6 (Ref Dwg. No. FH-FZ-6)

FIRE ZONE DESCRIPTION (Information taken from TMI-1 FIRE HAZARDS ANALYSIS REPORT)

a. FIRE ZONE FEATURES

Fire Zone FH-FZ-6 is located on elevation 285' of the Fuel Handling Building. Area dimensions are approximately 45 feet x 20 feet x 20 feet high. Zone boundaries consist of reinforced concrete walls, floor and ceiling. The east boundary is a three hour rated boundary. The north and south boundaries are not adjacent to any other plant areas. The west boundary is adjacent to fire zone FH-FZ-1 which is provided with an automatic wet pipe sprinkler system. The floor is not adjacent to any other plant areas. The ceiling is adjacent to zone FH-FZ-2 which is provided with an automatic wet pipe sprinkler system.

b. COMBUSTIBLE MATERIALS AND LOCATIONS

The principal insitu combustibles in this area, excluding Thermo-Lag, is minor amounts of lube oil which is contained in the two chilled water compressors and instrument air compressors. There is a negligible amount of exposed cable insulation in this zone. The installed Thermo-Lag itself has been added to the combustible inventory in this Fire Area. The overall fire loading is considered low, 11,695 BTU/FT². Thermo-Lag constitutes approximately 70% of this load. This total fire loading corresponds to a fire severity on the ASTM E-119 curve of between 8 and 9 minutes. Note that TMI-1 has administrative controls over transient combustibles and work in the plant.

c. FIRE PROTECTION FEATURES

Fire protection for this Fire Area consists of ionization smoke detection which actuates an alarm in the control room. A 2" drain connection from the fire protection system is located in the stairwell outside this fire zone. Fire pre-plans call for a hose to be connected to this drain for fire fighting in this zone. A portable dry chemical extinguisher is also located outside this fire zone in the stairwell.

The aforementioned fire protection features are maintained by the surveillance program required by the TMI-1 license condition.

Based upon actual experience, 15 minutes is estimated for the full fire brigade complement to bring manual suppression to bear on a fire in this fire area. This assumes the fire brigade is in full turnout gear with self contained breathing apparatus. Note there is no radiological hazard in this area that could impede fire fighting operations or fire brigade response.

A previous exemption was granted for the requirement for an area-wide fire suppression system as documented in an SER, Letter No. 5211-87-3066, John F. Stolz to Henry D. Hukill dated March 19, 1987.

d. **SAFE SHUTDOWN CIRCUITS AND EQUIPMENT**

The specific safe shutdown circuits and equipment protected by the existing Thermo-Lag fire barriers in this fire zone are associated with the following functions:

- Make-up Supporting Function
- RCS Pressure
- Reactor Coolant Pump Thermal Barrier Cooling
- Steam Generator Pressure and Level
- Source Range Monitoring
- Electrical Power System

These functions require fire barrier protection in order to insure a safe shutdown path if a fire eliminates all other unprotected circuits and equipment in this fire zone. This assumption served as the basis for protecting the above functions in this fire zone.

The following information describes the layout and function of the protected safe shutdown circuits in this fire zone. Drawing FH-FZ-6 depicts safe shutdown circuit routings for the various functions. This drawing also depicts circuit routings for redundant or alternative unprotected safe shutdown circuits. These are not exact routings but rather show the general paths of the various circuits. As noted below the protected circuits are routed in rigid steel conduit and are protected by envelopes which have a fire endurance rating (ACTUAL) of at least 50 minutes and a cable qualification rating of at least 60 minutes.

ENVELOPE 1CCC-FB01

Cables for the following functions are protected by this envelope which runs west to east and passes approximately 10 feet over the Control Building chilled water units:

- Make-up and Supporting Functions
- RCS Pressure
- Reactor Coolant Pump Thermal Barrier Cooling

ENVELOPE 1CCC-FB02

A cable for Reactor Coolant Pump Thermal Barrier Cooling is protected by this envelope which runs west to east and passes approximately 10 feet over the Control Building chilled water units.

ENVELOPE 1CCC-FB04

Cables for the Electrical Power System are protected by this envelope which runs west to east and passes approximately 10 feet over the Control Building chilled water units.

ENVELOPE 1CCC-FB05

A cable for the Electrical Power System is protected by this envelope which runs west to east and passes approximately 10 feet over the Control Building chilled water units.

ENVELOPE 1CCC-FB07

A cable for Source Range Monitoring is protected by this envelope which runs west to east and passes approximately 10 feet over the Control Building chilled water units.

THERMO-LAG DESCRIPTION

The following Thermo-Lag fire barriers are the subject of this exemption request. The TMI-1 FHAR currently requires these fire barriers to have a one hour fire endurance (Actual) rating:

ENVELOPE NO.	TYPE	ACTUAL RATING	CABLE QUAL RTG.	NEI TEST
1CCC-FB01	4" Conduit	50	60	2-1
1CCC-FB02	4" Conduit	50	60	2-1
1CCC-FB04	4" Conduit	50	60	2-1
1CCC-FB05	4" Conduit	50	60	2-1
1CCC-FB07	4" Condulet	50	60	2-1
1CCC-FB07	4" Conduit	50	60	2-1

f. EVALUATION

FIRE HAZARDS ANALYSIS

The technical requirements of Appendix R, Section III G.2 are not met because the above Thermo-Lag electrical raceway fire barrier envelopes in this fire zone are not rated as one hour as per the requirements of NRC Generic Letter 86-10 Supplement 1. The combustible materials present in the area consist of lube oil contained in the chilled water units, minor amounts of piping insulation with a low flame spread rating and Thermo-Lag which represent a fire load of 11,695 BTU/FT². A fire that directly impinges on the fire barrier envelopes is unlikely here as the envelopes are located at the ceiling while the lube oil in the chilled water units and compressors is about 10 feet below the envelopes. The compressors are located about 20 feet north of the envelopes.

The potential for fire exposure in this fire zone to the Thermo-Lag envelopes is judged to be less severe than the conditions experienced in the ASTM E-119 test. The overall volume of the room is substantial enough to dissipate the energy from a localized fire. The envelopes will not be challenged by direct flame impingement by this fire as the chilled water units and air compressors are not close enough to directly impact them should a fire occur. Note that envelope 1CCC-FB07 is shielded from below by conduits. Room ventilation will continue to run in the event of a fire in this fire zone. Fire preplans proceduralize manual shutdown of the ventilation system depending upon the extent and severity of the fire.

The results of ASTM E-119 testing have been used to assign an actual rating of at least 50 minutes to the Thermo-Lag fire barrier envelopes in this fire area. The conditions created by potential fires discussed above and the effects of such fires upon the fire barrier envelopes in question would not exceed the severity of an ASTM E-119 exposure on the same envelope. In

addition, evaluation has shown that the envelopes will remain structurally intact after an ASTM exposure of one hour and that after 60 minutes of such exposure, the temperature inside the envelopes will not affect the functionality of the safe shutdown circuits protected by the envelope. Therefore, the cable qualification rating of these envelopes is equal to the original intent which was to protect the safe shutdown circuits from an ASTM E-119 exposure of one hour. It is conservatively estimated that it will take 15 minutes upon receipt of an automatic fire detection system alarm to bring manual suppression to bear on a fire in this room. This is significantly less than the barrier actual rating and cable qualification rating of the fire barrier envelopes within this zone of 50 and 60 minutes, respectively.

This fire zone lacks significant quantities of lube oil. Further, the potential localized exposure to these fire barrier envelopes is not considered more severe than the exposure of an ASTM E-119 test. The fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of detection of a fire. Therefore, a cable qualification rating of 60 minutes, with existing detection, and manual suppression is adequate to protect the safe shutdown circuits inside the fire barrier envelopes in this fire zone.

SUMMARY-FIRE ZONE FH-FZ-6

This fire zone is enclosed by reinforced concrete walls, floor and ceiling. The east boundary is a 3-hour rated boundary. The west boundary is not maintained as a rated fire boundary but the boundary is protected by an automatic wet pipe sprinkler system in the adjacent fire zone. Fire protection consists of an ionization smoke detection system and a portable extinguisher is located outside the area. While a hose station is not provided in the stairwell directly outside this fire zone, fire preplans call for hook-up of a hose to a 2" drain connection on the fire protection system which is located directly outside this zone. The detection system provides early warning capability for potential fires in this area and provides reasonable assurance that a fire will be discovered early on. A fire in this zone is not expected to be severe enough to result in significant damage and exposure to the Thermo-Lag fire barrier envelopes in this area.

The cable qualification rating of 60 minutes is considered adequate to protect safe shutdown circuits from damage in the event of a fire in this area. The cable qualification rating of 60 minutes achieves the original intent of providing a one hour barrier in that the safe shutdown circuits inside the barrier will function after exposure to a 1 hour ASTM E-119 fire exposure. Further, the potential exposure to any barrier is not considered more severe than the exposure of the ASTM E-119 test. Since the severity

of the exposure does not exceed that of the ASTM E-119 test, a 60 minute cable qualification rating is considered adequate since the fire brigade can be expected to reach the area and commence suppression activities within 15 minutes of receipt of an automatic fire detection system alarm. This is significantly less than the barrier cable qualification rating of 60 minutes.

CONCLUSION-FIRE ZONE FH-FZ-6

GPU Nuclear concludes that an alternate fire protection configuration in fire zone FH-FZ-6 consisting of cable raceway fire barrier envelopes with a Thermo-Lag fire endurance rating of 50 minutes and a cable qualification rating of 60 minutes and an area wide ionization smoke detection system will provide reasonable assurance that one safe shutdown train will be free of fire damage. This configuration will achieve an acceptable level of protection equivalent to that of Appendix R, Section III.G.2. Therefore the safe shutdown circuits protected by these envelopes in fire zone FH-FZ-6 will maintain the ability to perform their function in the event of a fire because the fire would not be of significant magnitude and duration to breach the protection provided by the existing envelopes before the fire self extinguished or was put out by the plant fire brigade. The control of transient combustibles, the automatic detection system and the ability of the plant fire brigade to bring manual suppression to bear on a fire in this area within 15 minutes are considered adequate fire prevention and fire fighting measures to minimize the effects of a fire in this area thus insuring the ability to achieve safe shutdown in the event of a fire in this area.

Based on this conclusion, the request for exemption from the requirement for electrical raceway fire barriers to have "ACTUAL" fire endurance rating of one hour in fire zone FH-FZ-6 should be granted since this evaluation demonstrates that the cables protected by these envelopes will continue to function after being exposed to an ASTM E-119 fire of at least 60 minutes.

9. FIRE ZONE ISPH-FZ-1 (Ref. Dwg. No. ISPH-FZ-1)

FIRE ZONE DESCRIPTION (Information taken from TMI-1 Fire Hazards Analysis Report)

a. FIRE ZONE FEATURES

Fire zone ISPH-FZ-1 is located in the Intake Screen and Pumphouse, elevation 308'. Area dimensions are approximately 48 feet x 42 feet x 21 feet high. Zone boundaries consist of reinforced concrete walls, floor and ceiling. The north boundary is adjacent fire zone ISPH-FZ-2 and is a three-hour fire rated barrier with the exception of ventilated (passive) bus duct internals penetrating the barrier. All other penetrations in this wall are controlled and maintained with three hour fire rated seals. The rollup door in this barrier is maintained closed. The east and south boundaries and the ceiling are not adjacent to any other plant areas. The floor is adjacent to the intake pit. The intake pit is not considered a fire zone or area. The west boundary is adjacent to fire zone ISPH-FZ-3. Doorways are provided with "A" labeled doors, however these doors are not maintained as fire rated.

b. COMBUSTIBLE MATERIALS AND LOCATIONS

The principal insitu combustible in this Fire Zone is cable insulation which is spread throughout the zone and electrical switchgear. Minor amounts of lube oil located in the area of the pumps, plastics and normally present combustibles classified as transients as documented in the FHAR (i.e. trash container in area is always assumed full). The Thermo-Lag itself has been added to the combustible inventory in this Fire Zone. The overall fire loading is considered low, 15,711 BTU/FT². This corresponds to a fire severity on the ASTM E-119 curve of between 11 and 12 minutes. Note that TMI-1 has administrative controls over transient combustibles and work in the plant.

c. FIRE PROTECTION FEATURES

Fire protection for this fire zone consists of an area wide automatic wet pipe sprinkler system and portable extinguishers (dry chemical and CO₂). In addition, a portable water extinguisher is located in adjacent fire zone ISPH-FZ-3. Hose protection is available from a yard hydrant located outside the building. An ionization smoke detection system will actuate alarms in the Main Control Room.

The aforementioned fire protection features are maintained by the surveillance program required by the TMI-1 license condition.

Actual fire brigade drills allow a conservative estimate of 25 minutes for the brigade to bring manual suppression to bear on a fire in this fire zone. Note there is no radiological hazard in this area that could impede fire fighting operations or fire brigade response.

d. SAFE SHUTDOWN CIRCUITS AND EQUIPMENT

The specific safe shutdown circuits and equipment protected by the existing Thermo-Lag fire barriers in this fire area are associated with the following functions:

- Nuclear Services River Water
- Electrical Power System

These functions require fire barrier protection in order to insure a safe shutdown path if a fire eliminates all other unprotected circuits and equipment in this fire area. This assumption served as the basis for protecting the above functions in this fire area.

The following information describes the layout and function of the protected safe shutdown circuits in this fire area. Drawing ISPH-FZ-1 depicts safe shutdown circuit routings for the various functions. This drawing also depicts circuit routings for redundant or alternative unprotected safe shutdown circuits. These are not exact routings but rather show the general paths of the various circuits.

ENVELOPE 1SHD-FB01

Cables for the following functions are protected by this envelope which runs as shown on Dwg. No. ISPH-FZ-1.

- Nuclear Services River Water
- Electrical Power System

ENVELOPE 1SHD-FB05

Cables for the following functions are protected by this envelope which runs as shown on Dwg. No. ISPH-FZ-1.

- Electrical Power System

e. THERMO-LAG DESCRIPTION

The following Thermo-Lag fire barriers are the subject of this exemption request. The TMI-1 FHAR currently requires these fire barriers to have a one hour fire endurance (Actual) rating:

ENVELOPE NO.	TYPE	ACTUAL RATING	CABLE QUAL RTG.	NEI TEST
1SHD-FB01	4" Conduit	50	60	2-1
1SHD-FB01	4" Radial bend conduit	50	60	2-1
1SHD-FB05	3" armored cable	39	60	2-1
1SHD-FB05	3" armored cable radial bend	39	60	2-1

f. EVALUATION

FIRE HAZARDS ANALYSIS

The technical requirements of Appendix R, Section III.G.2 are not met because the above Thermo-Lag electrical raceway fire barrier envelopes in this fire area are not rated at one hour as per the requirements of NRC Generic Letter 86-10 Supplement 1. The combustible materials present in the area consist of electrical switchgear, cable insulation, Thermo-Lag, minor amounts of lube oil, plastics and normally present transients which represent a fire load of 15,711 BTU/FT². A fire would most likely begin in a section of electrical switchgear. A fire would not prevent entry into the zone for fire fighting because it would develop slowly. Ignition of exposed cable insulation (IEEE 383 qualified) from a fire originating in the switchgear would be limited as described below. Fire barrier envelopes 1SHD-FB01 and 1SHD-FB05 are not located directly over the switchgear. Envelope 1SHD-FB05 passes approximately 2 feet over a loaded cable tray in one location. Ignition of exposed cable insulation even if it does occur either by an overload or from an external source such as the switchgear would result in a slowly developing fire even if the wet pipe sprinkler system in this fire zone failed to function.

It is reasonable to assume a lube oil fire due to lube oil leaking from a river water pump motor or a fire originating as a result of transients could affect portions of these envelopes. However, a localized fire of this nature is not judged to be any more severe than the conditions experienced in the ASTM E-119 test. The overall volume of the room is substantial enough to dissipate the energy from a localized fire on the floor underneath the envelopes. Room ventilation will continue to run in the event of a fire in

this fire zone. Fire preplans proceduralize manual shutdown of the ventilation system depending upon the extent and severity of the fire.

The results of ASTM E-119 testing have been used to assign an actual rating of at least 39 minutes to the Thermo-Lag fire barrier envelopes in this fire area. The conditions created by potential fires discussed above and the effects of such fires upon the fire barrier envelopes in question would not exceed the severity of an ASTM E-119 exposure on the same envelope. In addition, evaluation has shown that the envelopes will remain structurally intact after an ASTM exposure of one hour and that after 60 minutes of such exposure, the temperature inside the envelope will not affect the functionality of the safe shutdown circuits protected by the envelope. Therefore, the cable qualification rating of these envelopes is equal to the original intent which was to protect the safe shutdown circuits from an ASTM E-119 exposure of one hour. Actual fire brigade drills provide a conservative estimate of 25 minutes upon detection of a fire upon receipt of an automatic fire detection system alarm to bring manual suppression to bear on a fire in this room. This is significantly less than the minimum barrier actual rating and cable qualification rating of the fire barrier envelopes within this zone of 39 and 60 minutes, respectively.

This fire zone lacks significant quantities of cable insulation and transient combustibles. Further, the potential localized exposure to these fire barrier envelopes is not considered more severe than the exposure of an ASTM E-119 test. The fire brigade can be expected to reach the area and commence suppression activities within 25 minutes of detection of a fire. Therefore, a cable qualification rating of 60 minutes, with existing detection, the automatic wet pipe sprinkler system and manual suppression is adequate to protect the safe shutdown circuits inside the fire barrier envelopes in this fire area.

SUMMARY-FIRE ZONE ISPH-FZ-1

This fire zone is enclosed on all sides, the floor and ceiling by reinforced concrete walls. The north boundary is a 3-hour rated boundary with the exception of ventilated (passive) bus duct internals penetrating the boundary. The west boundary is not maintained as a rated fire boundary but the boundary is protected by an automatic wet pipe sprinkler system in this fire zone. Fire protection consists of an ionization smoke detection system and an area wide automatic wet pipe sprinkler system. A portable extinguisher and a yard hydrant are located outside the area and are available for fire fighting in this zone. The detection system provides early warning capability for potential fires in this area and provides reasonable assurance that a fire will be discovered before it results in significant damage and exposure to the Thermo-Lag fire barrier envelopes in this area. The wet

pipe sprinkler system will act to suppress a fire to prevent its spread and minimize fire damage.

The fire loading is low. The majority of cable insulation in this area is qualified to the IEEE 383 Flame Test. Small amounts of lube oil and transients could result in localized fires, however, the automatic wet pipe sprinkler system should act to confine the effects of these fires as stated above.

The cable qualification rating of 60 minutes is considered adequate to protect safe shutdown circuits from damage in the event of a fire in this zone. The cable qualification rating of 60 minutes therefore achieves the original intent of providing a one hour barrier in that the safe shutdown circuits inside the barrier will function after exposure to a 1 hour ASTM E-119 fire exposure. Further, the potential exposure to any barrier is not considered more severe than the exposure of the ASTM E-119 test. Since the severity of the exposure does not exceed that of the ASTM E-119 test, a 60 minute cable qualification rating is considered adequate since the fire brigade can be expected to reach the area and commence suppression activities within 25 minutes of receipt of an automatic fire detection system alarm. This is significantly less than the barrier cable qualification rating of 60 minutes.

CONCLUSION-FIRE ZONE ISPH-FZ-1

GPU Nuclear concludes that an alternate fire protection configuration in fire zone ISPH-FZ-1 consisting of cable raceway fire barrier envelopes with Thermo-Lag cable fire endurance ratings of 39 minutes and 50 minutes and a cable qualification rating of at least 60 minutes, an area wide ionization smoke detection system and an area wide automatic wet pipe sprinkler system will provide reasonable assurance that one safe shutdown train will be free of fire damage. This configuration will achieve an acceptable level of protection equivalent to that of Appendix R, Section III.G.2. Therefore the safe shutdown circuits protected by these envelopes in fire zone ISPH-FZ-1 will maintain the ability to perform their function in the event of a fire because the fire would not be of significant magnitude and duration to breach the protection provided by the existing envelopes before the fire self extinguished, was extinguished by the automatic wet pipe sprinkler system or was put out by the plant fire brigade. The control of transient combustibles, the automatic detection and suppression system and the ability of the plant fire brigade to bring manual suppression to bear on a fire in this area within 25 minutes are considered adequate fire prevention and fire fighting measures to minimize the effects of a fire in this area thus insuring the ability to achieve safe shutdown in the event of a fire in this area.

Based on this conclusion, the request for exemption from the requirement for electrical raceway fire barriers to have an "ACTUAL" fire endurance rating of one hour in fire zone ISPH-FZ-1 should be granted since this evaluation demonstrates that the cables protected by these envelopes will continue to function after being exposed to an ASTM E-119 fire of at least 60 minutes.

10. FIRE ZONE ISPH-FZ-2 (Ref. Dwg. No. ISPH-FZ-2)

FIRE ZONE DESCRIPTION (Information taken from TMI-1 Fire Hazards Analysis Report)

a. FIRE ZONE FEATURES

Fire zone ISPH-FZ-2 is located in the Intake Screen and Pumphouse, elevation 308'. Area dimensions are approximately 48 feet x 42 feet x 21 feet high. Zone boundaries consist of reinforced concrete walls, floor and ceiling. The north boundary is a three hour fire rated barrier where adjacent fire area ISPH-FA-2; the remainder is not adjacent to any other plant area. The south boundary is a three-hour fire rated barrier with the exception of ventilated (passive) bus duct internals penetrating the barrier. All other penetrations in this wall are controlled and maintained with three hour fire rated seals. The rollup door in this barrier is maintained closed. The east boundary and the ceiling are not adjacent to any other plant areas. The floor is adjacent to the intake pit. The intake pit is not considered a fire zone or area. The west boundary is adjacent to fire zone ISPH-FZ-3 with two open passageways.

b. COMBUSTIBLE MATERIALS AND LOCATIONS

The principal insitu combustible in this Fire Zone is cable insulation which is spread throughout the zone. Minor amounts of lube oil located in the area of the pumps, plastics and normally present combustibles classified as transients. The Thermo-Lag itself has been added to the combustible inventory in this Fire Zone. The overall fire loading is considered low, 14,322 BTU/FT². This corresponds to a fire severity on the ASTM E-119 curve of between 10 and 11 minutes. Note that TMI-1 has administrative controls over transient combustibles and work in the plant.

c. FIRE PROTECTION FEATURES

Fire protection for this fire zone consists of an area wide automatic wet pipe sprinkler system and a portable CO₂ extinguishers. In addition, a portable water extinguisher is located in adjacent fire zone ISPH-FZ-3 and additional extinguishers are located in adjacent fire zone ISPH-FZ-2. Hose protection is available from a yard hydrant located outside the building. An ionization smoke detection system will actuate alarms in the Main Control Room.

The aforementioned fire protection features are maintained by the surveillance program required by the TMI-1 license condition.

Actual fire brigade drills allow a conservative estimate of 25 minutes for the brigade to bring manual suppression to bear on a fire in this fire zone. Note there is no radiological hazard in this area that could impede fire fighting operations or fire brigade response.

d. **SAFE SHUTDOWN CIRCUITS AND EQUIPMENT**

The specific safe shutdown circuits and equipment protected by the existing Thermo-Lag fire barriers in this fire area are associated with the following functions:

- Nuclear Services River Water
- Electrical Power System

These functions require fire barrier protection in order to insure a safe shutdown path if a fire eliminates all other unprotected circuits and equipment in this fire area. This assumption served as the basis for protecting the above functions in this fire area.

The following information describes the layout and function of the protected safe shutdown circuits in this fire area. Drawing ISPH-FZ-2 depicts safe shutdown circuit routings for the various functions. This drawing also depicts circuit routings for redundant or alternative unprotected safe shutdown circuits. These are not exact routings but rather show the general paths of the various circuits.

ENVELOPE 1SHD-FB03

Cables for the following functions are protected by this envelope which runs as shown on Dwg. No. ISPH-FZ-2.

- Nuclear Services River Water
- Electrical Power System

ENVELOPE 1SHD-FB06

Cables for the following functions are protected by this envelope which runs as shown on Dwg. No. ISPH-FZ-2.

- Electrical Power System

e. THERMO-LAG DESCRIPTION

The following Thermo-Lag fire barriers are the subject of this exemption request. The TMI-1 FHAR currently requires these fire barriers to have a one hour fire endurance (Actual) rating:

ENVELOPE NO.	TYPE	ACTUAL RATING	CABLE QUAL RTG.	NEI TEST
1SHD-FB03	4" Conduit	50	60	2-1
1SHD-FB03	4" Condulet	50	60	2-1
1SHD-FB06	3" armored cable	39	60	2-1
1SHD-FB06	3" armored cable radial bend	39	60	2-1

f. EVALUATION

FIRE HAZARDS ANALYSIS

The technical requirements of Appendix R, Section III.G.2 are not met because the above Thermo-Lag electrical raceway fire barrier envelopes in this fire area are not rated at one hour as per the requirements of NRC Generic Letter 86-10 Supplement 1. The combustible materials present in the area consist of electrical switchgear, cable insulation, Thermo-Lag, minor amounts of lube oil, plastics and normally present transients which represent a fire load of 14,322 BTU/FT². A fire would most likely begin in a section of electrical switchgear. A fire would not prevent entry into the zone for fire fighting because it would develop slowly. Ignition of exposed cable insulation (IEEE 383 qualified) from a fire originating in the switchgear would be limited as described below. Fire barrier envelopes 1SHD-FB03 and 1SHD-FB06 are not located directly over the switchgear. The envelopes pass approximately 2 feet over a loaded cable tray in two locations. Ignition of exposed cable insulation even if it does occur either by an overload or from an external source such as the switchgear would result in a slowly developing fire even if the wet pipe sprinkler system in this fire zone failed to function.

It is reasonable to assume a lube oil fire due to lube oil leaking from a river water pump motor or a fire originating as a result of transients could affect portions of these envelopes. However, a localized fire of this nature is not judged to be any more severe than the conditions experienced in the ASTM E-119 test. The overall volume of the room is substantial enough to dissipate the energy from a localized fire on the floor underneath the envelopes. Room ventilation will continue to run in the event of a fire in

this fire zone. Fire preplans proceduralize manual shutdown of the ventilation system depending upon the extent and severity of the fire.

The results of ASTM E-119 testing have been used to assign an actual rating of at least 39 minutes to the Thermo-Lag fire barrier envelopes in this fire area. The conditions created by potential fires discussed above and the effects of such fires upon the fire barrier envelopes in question would not exceed the severity of an ASTM E-119 exposure on the same envelope. In addition, evaluation has shown that the envelopes will remain structurally intact after an ASTM exposure of one hour and that after 60 minutes of such exposure, the temperature inside the envelope will not affect the functionality of the safe shutdown circuits protected by the envelope. Therefore, the cable qualification rating of these envelopes is equal to the original intent which was to protect the safe shutdown circuits from an ASTM E-119 exposure of one hour. Actual fire brigade drills provide a conservative estimate of 25 minutes upon detection of a fire upon receipt of an automatic fire detection system alarm to bring manual suppression to bear on a fire in this room. This is significantly less than the minimum barrier actual rating and cable qualification rating of the fire barrier envelopes within this zone of 39 and 60 minutes, respectively.

This fire zone lacks significant quantities of cable insulation and transient combustibles. Further, the potential localized exposure to these fire barrier envelopes is not considered more severe than the exposure of an ASTM E-119 test. The fire brigade can be expected to reach the area and commence suppression activities within 25 minutes of detection of a fire. Therefore, a cable qualification rating of 60 minutes, with existing detection, the automatic wet pipe sprinkler system and manual suppression is adequate to protect the safe shutdown circuits inside the fire barrier envelopes in this fire area.

SUMMARY-FIRE ZONE ISPH-FZ-2

This fire zone is enclosed on all sides, the floor and ceiling by reinforced concrete walls. The north boundary is a 3-hour rated boundary where adjacent to fire area ISPH-FA-2. The south boundary is a 3-hour rated boundary with the exception of ventilated (passive) bus duct internals penetrating the boundary. The west boundary is not maintained as a rated fire boundary but the boundary is protected by an automatic wet pipe sprinkler system in this fire zone. Fire protection consists of an ionization smoke detection system and an area wide automatic wet pipe sprinkler system. A portable extinguisher and a yard hydrant are located outside the area and are available for fire fighting in this area. The detection system provides early warning capability for potential fires in this area and provides reasonable assurance that a fire will be discovered before it results in

significant damage and exposure to the Thermo-Lag fire barrier envelopes in this area. The wet pipe sprinkler system will act to suppress a fire to prevent its spread and minimize fire damage.

The fire loading is low. The majority of cable insulation in this area is qualified to the IEEE 383 Flame Test. Small amounts of lube oil and transients could result in localized fires, however, the automatic wet pipe sprinkler system should act to confine the effects of these fires as stated above.

The cable qualification rating of 60 minutes is considered adequate to protect safe shutdown circuits from damage in the event of a fire in this zone. The cable qualification rating of 60 minutes therefore achieves the original intent of providing a one hour barrier in that the safe shutdown circuits inside the barrier will function after exposure to a 1 hour ASTM E-119 fire exposure. Further, the potential exposure to any barrier is not considered more severe than the exposure of the ASTM E-119 test. Since the severity of the exposure does not exceed that of the ASTM E-119 test, a 60 minute cable qualification rating is considered adequate since the fire brigade can be expected to reach the area and commence suppression activities within 25 minutes of receipt of an automatic fire detection system alarm. This is significantly less than the barrier cable qualification rating of 60 minutes.

CONCLUSION-FIRE ZONE ISPH-FZ-2

GPU Nuclear concludes that an alternate fire protection configuration in fire zone ISPH-FZ-2 consisting of cable raceway fire barrier envelopes with Thermo-Lag fire endurance ratings of 39 minutes and 50 minutes and a cable qualification rating of at least 60 minutes, an area wide ionization smoke detection system and an area wide automatic wet pipe sprinkler system will provide reasonable assurance that one safe shutdown train will be free of fire damage. This configuration will achieve an acceptable level of protection equivalent to that of Appendix R, Section III.G.2. Therefore the safe shutdown circuits protected by these envelopes in fire zone ISPH-FZ-2 will maintain the ability to perform their function in the event of a fire because the fire would not be of significant magnitude and duration to breach the protection provided by the existing envelopes before the fire self extinguished, was extinguished by the automatic wet pipe sprinkler system or was put out by the plant fire brigade. The control of transient combustibles, the automatic detection and suppression system and the ability of the plant fire brigade to bring manual suppression to bear on a fire in this area within 25 minutes are considered adequate fire prevention and fire fighting measures to minimize the effects of a fire in this area thus insuring the ability to achieve safe shutdown in the event of a fire in this area.

Based on this conclusion, the request for exemption from the requirement for electrical raceway fire barriers to have an "ACTUAL" fire endurance rating of one hour in fire zone ISPH-FZ-2 should be granted since this evaluation demonstrates that the cables protected by these envelopes will continue to function after being exposed to an ASTM E-119 fire of at least 60 minutes