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ASSOCIATED UNIVERSITIES, INC.

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Department of Nuclear Energy

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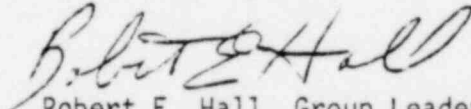
Mr. Robert L. Ferguson
Plant Systems Branch
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Bob:

Attached is the Brookhaven National Laboratory (BNL) input to the Maine Yankee Nuclear Power Plant Design Review and Supplement Items.

If you have any questions, please do not hesitate to contact me.

Respectfully yours,


Robert E. Hall, Group Leader
Reactor Engineering Analysis

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MAINE YANKEE

Fire Protection Review

SER Item 3.1.1 Fire Detection Systems

Section 3.1.1 of the Maine Yankee SER identifies fifteen areas of the plant where ionization type fire detection systems were considered necessary. The need for detection systems in these areas was based on observations made during the site visit which identified areas containing safety related equipment which could be damaged by a potential fire not immediately detected and extinguished.

The licensee has agreed to provide detection systems in all of these areas and has listed the areas in his letter dated October 16, 1979. The licensee has also listed eight additional areas which will be provided with ionization type fire detectors. Also indicated in this letter is the intention to provide duct type ionization detectors at four locations, heat detectors at two locations and a photo-electric type fire detector above the steam driven emergency feed water pump. On November 21, 1979 shop drawings were received, reviewed, and found acceptable. We recommend that the licensee's proposed installation of fire detectors in conformance with SER Item 3.1.1 be accepted.

In Maine Yankee's letter of October 16, 1979 it was stated that after discussion with the detection system supplier, it was decided that a more effective method of detecting a fire in the concentrations of cable in the containment would be to install ionization detectors over the cable trays. This is a change from the original intention to install detectors on the suction side of the six containment recirculation fans. The proposal to install the detectors above the cable trays within containment as shown on the drawings is also satisfactory and we recommend that it be accepted by the staff.

SER Item 3.1.4 Water Suppression Systems

Maine Yankee in their letter dated October 16, 1979 has provided information on their proposed modification of providing water suppression systems at various areas of the plant. These systems consist of:

- a. A manually actuated water spray system to protect cables in the protected cable vault.
- b. An automatic sprinkler system to protect the component cooling water pumps.
- c. A preaction sprinkler system at each pump motor cubicle in the containment spray pump building.

The licensee also provided a drawing of the proposed system for the protected cable vault. The other two systems were described in detail in the submittal.

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The information submitted by the licensee on this item provides sufficient detail to evaluate the adequacy of the proposed installation including placement of heads and discharge water density. Based on this review, we recommend that the staff accept the proposed installation of water suppression systems identified in Section 3.1.4 of the SER.

SER Item 3.1.5 Gas Suppression System

Item 3.1.5 of the Maine Yankee SER describes the licensee's proposal to provide an automatically actuated Halon suppression in the control room cable chase. This modification also calls for a gas suppression system to be provided at the turbine generator bearings area and to modify the existing CO₂ suppression system in the protected cable tray room to provide automatic actuation.

By letter dated October 16, 1979 Maine Yankee has provided a description of the automatic Halon 1301 suppression system they propose to install. This system will consist of a 30 lb. Halon cylinder with two discharge nozzles in the cable chase. Four ionization detectors in the cable chase will be cross zoned to activate the system and alarm at the central fire alarm panel. The submittal also indicates that the access panels covering the cable chase will be removed, caulked and replaced to prevent loss of Halon. The submittal does not indicate, however, the Halon concentration that the system will produce in the enclosure and the anticipated "soak time" at which this concentration will be maintained. (The licensee's submittal on this item does not contain enough information to evaluate the adequacy of the proposed installation). An acceptable design criteria for protection of cables is a 7% concentration for a duration of 10 minutes.

The other portions of Item 3.1.5 which is the provision of gas suppression system for the turbine generator bearings, and the conversion of the existing CO₂ system in the protected cable tray room have not been addressed in the Maine Yankee submittal.

Based on our review of this submittal, the material submitted by the licensee is considered unacceptable. The licensee should indicate the design concentration and soak time of the proposed Halon system for the control room cable chase. The licensee should also indicate if the installation will meet the applicable provisions of NFPA 12A. The licensee should also provide the necessary information on the design of the generator bearing gas suppression system and the modification of the existing CO₂ system in the protected cable tray room from manual to automatic actuation. Upon receipt of this additional information the adequacy of the proposed systems will be reviewed.

SER Item 3.1.8 Fire Dampers

Item 3.1.8 of the Maine Yankee SER indicates the licensee's proposed installation of 3-hour fire dampers in the ventilation duct penetration at the control room, protected switchgear/battery room and protected cable tray room.

In Maine Yankee's letter dated October 16, 1979, the licensee indicates that they will provide fire dampers at these locations. The units they propose to install are self-contained units, UL or FM listed and automatically heat actuated by fusible links.

The licensee's description of the proposed installation meets our concern. Based on this, we recommend that the Maine Yankee's proposed implementation of SER modification 3.1.8 be accepted.

SER Item 3.1.9 Penetration Seals

Item 3.1.9 of the Maine Yankee SER indicates the licensee's proposal to seal cable and ventilation duct penetrations at various areas of the plant. The materials and construction of the seals will be demonstrated by tests to provide a barrier with a fire rating commensurate with the fire loading on either side of the fire barrier or three hours, whichever is less. This item also calls for the provision of water tight seals for the floor penetrations of the protected cable tray room, as well as upgrading of the isolated phase bus duct penetrations in the turbine building wall.

On August 16, 1979 Maine Yankee transmitted a letter to the Nuclear Regulatory Commission which contained the licensee's intention to provide fire barrier penetration seals based on the tests conducted by the Construction Technology Laboratories, a division of the Portland Cement Association. This report, dated May 29, 1979 describes the test results of nine 5-inch diameter steel conduits containing approximately 20% fill of cabling and sealed with various combinations of asbestos rope packing, Flamastic 71A coatings and silicone foam seals. The samples were embedded in a 48" x 48" x 12" concrete panel and subjected to a standard ASTM E-119 fire test including the hose stream application. Because the tests did not include cable trays and ventilation duct penetrations and the tests did not include the provision of positive pressure on the fire side, the acceptance was limited to only conduit penetrations.

In their August 16, 1979 letter the licensee also indicated that they intended to upgrade and provide additional fire barrier seals constructed similarly to tested configuration 5, 6, and 9 described in their report for all types of fire barrier penetrations including conduits, cable trays and ventilation ducts.

The licensee's proposed method of sealing fire barrier penetrations is for the most part unacceptable. All the tested seals except conduit no. 9, constructed of silicone foam, failed at least one requirement of the test. None of the tray tests included cabling nor did the tests consider penetrations of ventilation ducts. Therefore, only fire barrier penetration seals for conduit using silicone foam as described in the tests as sample no. 9 would be considered acceptable if a delta p was used. Sealing conduits utilizing the other tested configurations of asbestos rope and flamastic is not acceptable. Sealing fire barrier penetrations of cable trays and ventilation ducts using any of the tested conduit penetration seals is also unacceptable because these types of penetrations were not tested.

In order for the licensee to meet their commitment to seal cable and duct penetrations, we recommend that the staff require that they provide fire barrier penetrations seals which meet the provisions of ASTM E-119 for fire resistance; this will include tests or an analysis which compares the licensee's penetrations with previous tests; the tests should simulate the types of penetrations existing in the plant and the fire resistance should be 3-hour or commensurate with the fire loading on either side of the fire barrier whichever is less.

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Further, none of the test reports indicate that the fire tests were conducted with a pressure differential across the penetration seals (higher pressure on the exposed side). We recommend that the staff require the licensee to verify that the maximum pressure differential which may exist across the penetration seal during a fire will have no affect on its performance, or to provide the results of fire tests conducted with such pressure differential. We recommend that until an acceptable pressure differential requirement is developed that the pressure differential to be considered is the actual maximum pressure differential found in the plant during normal operations plus 2" of water based on our present conservative evaluations. When the specific values are known they should be utilized to replace this interim generic approach.

We recommend further, that the staff review the penetration requirements again in the future when present research is completed in regard to establishing pressure differential requirements for penetrations testing.

SER Item 3.1.12 Control of Combustibles

a. Ventilation Fan Shutdown

One of the items listed under 3.1.12 of the Maine Yankee SER indicates that the licensee will provide an arrangement to automatically trip the supply ventilation fans serving the protected cable vault and the protected cable tray room upon detection of smoke or hot gases from a fire.

In their letter dated October 16, 1979, Maine Yankee described their proposed method of implementing this modification. They propose to install duct detectors in the air supply to the protected cable vault and to protected cable tray room. The detectors will be wired to shutdown and supply fans to those areas to prevent the introduction of products of combustion from a fire in some other area of the plant. The drawings of the detection systems prepared for Maine Yankee by the installer indicates the location of these detectors. By telephone it was confirmed by Mr. Ed Sawyer of Maine Yankee that the detectors would be of the ionization type.

Based on our evaluation, the proposed method of automatically tripping the supply fans to prevent introduction of hot gases into the protected cable vault and cable tray room from a fire in another area is satisfactory and we recommend that the staff accept this item.

b. Diesel Fire Pump Day Tank Modifications (3.2.8)

Item 3.1.12 of the Maine Yankee SER listed the licensee's proposed modifications for fire protection in the fire pumphouse consisting of relocation of the fuel tank and fuel line valve for the diesel fire pump engine outside the building, along with other measures to prevent a fire in this room from damaging both fire pumps. Item 3.2.8 outlines the evaluation required from the licensee to demonstrate the adequacy of the proposed modification.

This item is satisfactory and we recommend that it be accepted by the staff.

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3.1.16 Fire Stops in Vertical Cable Trays

The Maine Yankee SER Item 3.1.16 describes the licensee's proposal of providing fire stops in the vertical cable runs between the floors of the outside containment penetration area. It also states their intention to modify the tray covers on the vertical cable trays to assure that they can be removed quickly during a fire.

The licensee's submittal on this item dated October 16, 1979 discusses the fire stops currently in place for these cable penetrations which is described as asbestos rope covered with flamastic. The submittal references their August 16, 1979 submittal which summarizes the results of their conduit penetration fire tests. This submittal would be found acceptable for conduit penetrations, provided the correct pressure differential was used.

The concern which prompted this modification was to prevent a fire in the vertical cable runs from rapidly traveling upward and causing widespread damage. The provision of fire stops was proposed to limit the spread of a potential fire and making it easier for the fixed CO₂ extinguishing system and manual firefighters to extinguish the fire. Fire rated penetration seals were not required by this modification.

The methods described by the licensee, therefore are considered acceptable both for providing fire stops in the vertical cable runs and for modifying the tray covers for quick removal.

3.2.2 Emergency Lighting

Item number 3.2.2 of the Maine Yankee SER describes the licensee's requirement to determine if there are areas of the plant where a single fire could disable both normal and emergency lighting systems in safety related areas not involved in the fire or areas providing access to safety related areas.

In their letter dated July 3, 1978 Maine Yankee provided their response to this requirement which included the following evaluation:

Those areas where it would be necessary to station personnel in the event of an emergency shutdown from outside the control room will be provided with battery-powered wall mounted emergency lights with sufficient intensity to allow operations on the shutdown panel located in the area. These areas are the areas containing the Remote Shutdown Panel in the lower level of the PAB, the Remote Shutdown Panel in the Auxiliary Feed Pump Room, and the Switchgear Room. In addition, the same type of emergency lights will be provided in the Control Room.

There are no other areas where personnel will be stationed during an emergency shutdown of the plant. However, there are a sufficient number of battery-operated hand-held sealed beam emergency lights provided (see Section 4.6 of SER) if they are needed for short inspections of other plant areas.

If, after the plant is brought to hot shutdown condition, it is necessary to provide long term emergency lights to other areas of the plant, strings of temporary lights are available and can be connected up as needed.

The licensee's response to this concern has identified the areas which contain safe shutdown equipment which may require manual operation during an emergency. They have also indicated that they will provide battery-powered emergency lights in these areas. The licensee did not, however, indicate if the proposed lights will be of the 8-hour duration type as required by Appendix A. The response from Maine Yankee, also did not indicate that emergency lighting would be provided in the access routes leading to safety-related areas as required by the staff and stated as a requirement in the SER Item 3.2.2.

The licensee's response does not meet all the requirements of this and therefore we recommend that this item not be accepted. To comply with this item, we recommend that the staff require that the licensee install proposed battery-powered emergency lights of the fixed type and have a minimum operating duration of 8 hours and that emergency lighting be provided in areas providing access to safety related areas as well as safety related areas.

3.2.3 Fire Barrier Penetration Seals - See 3.1.9

3.2.4 Fire Mains

The Safety Evaluation Report (SER) dated April 24, 1978 states that the licensee will provide information relative to the failure of both fire mains simultaneously. The mains are 12" ductile cast iron with bell and spigot joints; they run approximately 400 feet in a common trench and are set about 3 feet apart.

The licensee responded to the SER provision on May 31, 1979 by stating that no modifications are required based on various installation features. However, we suggest that the two mains could be lost at the same time thereby endangering all fire protection water supply.

In order to support at our position, we recently contacted the Suffolk County Water Authority, the American Iron and Steel Institute, the Cast Iron and Pipe Research Association and the American Water Works Association. The consensus of opinion that we got from these contacts was that good water main separation was essential so that one bad leak and wash-out wouldn't disable the other main; good separation was considered to be 20-30 feet and not the few feet of separation normally found in a trench.

We recommend that the staff require a minimum fire main separation of 25 feet as specified in the ANSI/ANSI standard 59.4.

SER 3.2.5 Hydrant Block Valves

The item referenced above identifies the requirement in the Maine Yankee SER for the licensee to provide verification that the lack of block valves in the hydrant laterals will not cause the complete loss of water suppression capability to safety-related areas, or to areas that pose a hazard to safety-related areas, or to areas when hydrants must be isolated. This verification will be based on considerations such as the design of additional hose stations and of fixed water suppression that will be provided.

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Maine Yankee responded to this requirement in their letter dated May 10, 1978. They state in this submittal that they will provide verification that the lack of hydrant block valves will not cause the complete loss of water suppression capability to safety-related areas or to areas that pose a hazard to safety-related areas when hydrants must be isolated.

A literal reading of the original position as stated in the SER item 3.2.5 tends to indicate that the verification called for in relation to the lack of hydrant block will apply only to new systems that may be installed. This, however, was not the intent of this requirement which was made to insure that the isolation of a portion of the fire water system to replace or service a hydrant would not result in the complete loss of water to systems protecting safety related areas or areas that pose a hazard to safety-related areas. We recommend that the staff does not accept the licensee's intention of not providing the verification for the existing systems.

The licensee should provide an evaluation of the plant including areas presently provided with fire protection systems as well as those where additional systems will be provided. This study should evaluate the effects of isolating each hydrant by closing appropriate valves in the underground fire loop and determine if this action would result in depriving water to fire protection systems in areas containing safety-related equipment or to areas posing a threat to safety-related systems. Where this hazard is identified, the licensee should provide hydrant block valves.

Protected Cable Vault Penetrations 3.2.6

Item 3.2.6 of the Maine Yankee SER indicates the requirement of the licensee to justify the lack of cable penetration fire seals for cables running between the protected cable vault and the control room. In addition, it also requires that the licensee describe all other penetrations in the protected cable vault's barriers and justify the lack of fire rated seals in these penetrations.

This requirement was written in the form: "the licensee will....", which appears that the licensee had committed to provide this modification. In the Maine Yankee letter dated May 10, 1978 the licensee denies making this commitment. They indicate that the review team was told that all conduits leaving the cable vault are sealed at one end or the other and all are in concrete.

In the Maine Yankee Fire Hazard Survey, (Fire Hazard Analysis), it states under section 8, Protected Cable Vault, that their own survey team recommended to: "Seal any inadequately sealed penetrations into and out of the vault with flame retardant material." It was assumed, therefore, that the recommendations made by Maine Yankee's own survey would be implemented.

Appendix A requires that cable penetrations through fire barriers be sealed to give protection at least equivalent to that fire barrier. The licensee has stated that all conduit penetrations leaving the cable vault are sealed at one end. They have not indicated, however, if only conduits penetrate the fire barrier surrounding the cable vault and if the existing seals are equivalent to a 3-hour fire rating. SER item 3.2.3 of the Maine Yankee Evaluation requires the licensee to provide test data which demonstrates the adequacy of

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the existing fire barrier penetration seals throughout the plant. The licensee's letter dated January 29, 1979 responds to this item indicating that this information will be provided. On August 16, 1979 Maine Yankee presented their fire barrier penetration seal test data which describe the results of fire tests of conduit cable penetrations. Based on this test data, the licensee stated they would upgrade the existing penetrations they previously agreed to improve.

It was anticipated that upgrading the fire barrier penetrations would include the conduits leaving the cable vault which would satisfy SER item 3.2.6. This assumption may not be the intent of the licensee.

Based on our review of all the information pertaining to this matter, and our observations of the cable vault during the site visit, we recommend that the staff require the licensee to upgrade all the penetrations through the fire barrier enclosing the cable vault. The fire barrier penetration seals should be of the type demonstrated to provide a minimum of 3-hour fire resistance when tested to the requirements of ASTM E-119. We recommend that the staff consider the conduit penetration seal construction identified as conduit No. 9 in the licensee's letter dated August 16, 1979 which utilizes silicon foam as acceptable, provided the licensee accounts for pressure differential.

Further, none of the test reports indicate that the fire tests were conducted with a pressure differential across the penetration seals (higher pressure on the exposed side). We recommend that the staff require the licensee to verify that the maximum pressure differential which may exist across the penetration seal during a fire will have no affect on its performance, or to provide the results of fire tests conducted with such pressure differential. We recommend that until an acceptable pressure differential requirement is developed that the pressure differential to be considered is the actual maximum pressure differential found in the plant during normal operations plus 2" of water based on our present conservative evaluations. When the specific values are known they should be utilized to replace this interim generic approach.

We recommend further, that the staff review the penetration requirements again in the future when present research is completed in regard to establishing pressure differential requirements for penetrations testing.

3.2.7 Reactor Coolant Pump Lube Oil

Item 3.2.7 of the Maine Yankee SER requires the licensee to evaluate the potential for lube oil leakage from the reactor coolant pump lube oil system and to determine the modifications necessary to effectively collect and contain lube oil leakage from any portion of the RCP lube oil system. The licensee was also required to submit design details and criteria to NRC for review.

In their letter dated October 23, 1979 Maine Yankee responded to this item. Their analysis included a brief description of the reactor coolant pump oil system, their conclusions indicating the need for containing a potential oil leak, and a description of their proposed modification along with a drawing.

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The submittal describes the coolant pump motor as having 3 bearings; a lower journal bearing, an upper journal bearing and a thrust bearing. The lower bearing is not considered as potential for leakage as the oil reservoir is completely enclosed and therefore, no oil collection system is proposed.

The upper journal bearing and thrust bearing are located at the top of the motor, called the top hat portion, with its associated oil reservoir all of which is enclosed in a steel cylinder. The oil lift and backstop pumps, coolers and associated piping are located around the outside of the cylinder. The licensee concludes that there is some probability that oil leakage will occur at one or more of the mechanical connections of the oil system causing an oil loss. The licensee therefore, proposes to collect the oil by welding a 2-inch steel curb around the base of the R.C.P. motor top hat area thus preventing any oil leakage from running down the side of the motor and eventually coming into contact with hot R.C. system piping. As proposed, the steel curb will be drilled to provide a flow path and a gravity flow piping system to conduct the oil from the "top hat" area to a 55 gallon drum located on the 2' elevation of the containment. The barrel will be covered and a vent will be provided. Each R.C.P. will be provided with this system.

The licensee proposed modification concerning the reactor coolant pump lube oil system, addresses the possibility of a leak in this system but does not appear to meet all of our requirements for an oil collection system. We require the modification to contain a pressurized or non pressurized leak at any pump, piping, reservoir, cooler or connection, and the collection tank must be capable of holding the entire lube oil inventory. We also require that the lube oil system be qualified to withstand an SSE without leakage or that the oil collection system be designed to withstand an SSE and continue to be able to collect oil leakage that may occur during an SSE.

The licensee proposed modification does not indicate if it will contain both pressurized and non pressurized leaks from any portion of the R.C.P. lube oil system. It does not indicate if the proposed 55 gallon drum can hold the entire lube oil inventory, and if the systems conform to our requirements noted above. Therefore, we recommend that the staff require Maine Yankee to re-evaluate their proposed modification for a R.C.P. oil collection and upgrade it where necessary to meet the requirements outlined above. If they meet the above requirements, we recommend that this item be accepted by the staff.

3.2.8 Fire Pumphouse Protection (3.1.12b)

Item 3.2.8 of the SER states that an analysis will be provided supported by test data and operating experience to demonstrate that:

1. The proposed automatic shutoff valve for the diesel fire pumps fuel oil system is reliable enough and fast enough to prevent a fuel oil spill from damaging both fire pumps.
2. The diesel fire pump will not be degraded by storage outside the building.
3. A fire involving the maximum amount of crank case filter bed oil present and distilled fuel oil assuming the automatic shutoff function as designed will not damage both fire pumps.

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This analysis will also assume that the entire content of the day tank will drain from a ruptured fuel line prior to the introduction of an ignition source.

During the site visit at Maine Yankee, the review team identified several fire protection deficiencies associated with the fire pumphouse. In order to correct these, the licensee agreed to the review team's recommendations which consisted of: enclosing the diesel fuel tank within a 3 hour barrier, and re-routing of the fuel oil lines so they do not pass over or near the electric motor driven fire pump. The review team also recommended that a fixed suppression system be provided within the building. The licensee however, did not agree to this recommendation. In lieu of these modifications the licensee suggested that the diesel fuel tank be relocated outside the fire pumphouse along with a manual shutoff valve. They also proposed an automatic shutoff valve actuated by a heat or smoke detector would be provided, and a trough installed along the length of the fuel line to divert any leakage from a ruptured fuel line to the building floor drain. The trench around the diesel engine would be modified to contain the entire volume of the crankcase and filter bath oil. These proposed modifications were accepted by the NRC review team staff and listed under item number 3.1.12 of the Maine Yankee SER.

We, therefore, recommend that the NRC accept this item.

The BNL consultant's report dated April 4, 1978 took exception to the proposed modifications outlined in SER item 3.1.12 expressing concern for the effects of cold outside temperatures on the diesel fuel, the possibility of the manual shutoff valve being inadvertently left closed, and the lack of physical separation between the electric motor driven fire pump and the diesel engine driven fire pump and fuel supply lines. As a supplement item the licensee was required to address these concerns as indicated in SER item 3.2.8.

In Maine Yankee's submittal dated January 29, 1979 they addressed these concerns and retreated from their originally proposed method of improving the fire protection in the fire pumphouse as outlined in SER item 3.1.12. As an alternate they proposed the following modifications: A three hour rated enclosure around the electric fire pump and its controller, liquid tight at floor level with a sill at the door to prevent oil from entering the enclosure will be provided in the pump house. The floor drain arrangements will be modified to prevent oil or fire from entering the enclosure through the drains. The diesel fuel return line will be rerouted so that it does not enter the enclosure, and detection will be provided to insure prompt notification of a fire in the fire pumphouse.

These modifications are similar to the original recommendations for upgrading the fire protection of the fire pumphouse and they are satisfactory and satisfy SER items 3.1.12(b) and 3.2.8.

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3.2.9 Protected Switchgear Room Floor Penetrations

Item 3.2.9 of the Maine Yankee SER describes the licensee's requirement of providing the results of an analysis which demonstrates that fires in the protected cable tray room would not result in damage to equipment located in

the protected switchgear room that is required for safe shutdown. As an alternative, unsealed penetrations in the floor of the protected switchgear room will be sealed to provide a fire resistance equal to the fire severity on both sides of the barrier.

In their letter dated January 29, 1979 Maine Yankee responded to this item. The licensee retained the services of a fire protection consultant who performed an analysis on the adequacy of the present arrangement of cabling entering the protected switchgear room through the floor. Based on his analysis, the consultant recommended that all cable penetrations in the floor of the protected switchgear room be provided with one-hour fire rated barriers.

The licensee's letter states they will seal the cable penetrations up to the switchgear room as recommended by the consultant. This letter also states, however, that the floor penetrations are now protected with Flamastic and although the fire seals were not tested they feel it provides sufficient fire retarding to prevent a fire from spreading before manual firefighting is provided.

Apparently, the licensee has covered the existing cable penetrations in the protected switchgear room with flamastic which is a fire retardant coating. They feel that this coating meets the one hour fire rated barrier cable penetration seal as recommended by their consultant.

The licensee's response to this item does not meet the requirements of the staff or the recommendation of their own consultant. The licensee indicated that they would comply with the consultant's recommendation which was to provide a 1-hour seal was provided.

It is our opinion that the licensee's provision of coating the cable penetrations in the floor of protected switchgear room is not satisfactory. To meet the requirements of this item, we recommend that the licensee provide the cable penetrations in the floor of the protected switchgear room with fire barrier seals demonstrated to give a minimum fire rating of one hour when tested to the requirements of ASTM E-119.

Further, none of the test reports indicate that the fire tests were conducted with a pressure differential across the penetration seals (higher pressure on the exposed side). We recommend that the staff require the licensee to verify that the maximum pressure differential which may exist across the penetration seal during a fire will have no affect on its performance, or to provide the results of fire tests conducted with such pressure differential. We recommend that until an acceptable pressure differential requirement is developed that the pressure differential to be considered is the actual maximum pressure differential found in the plant during normal operations plus 2" of water based on our present conservative evaluations. When the specific values are known they should be utilized to replace this interim generic approach.

We recommend further, that the staff review the penetration requirements again in the future when present research is completed in regard to establishing pressure differential requirements for penetrations testing.

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