MAINE YANKEE ATOMIC POWER COMPANY
ENGINEERING OFFICE
TURNPIKE ROAD (RT. 9)
WESTBORO, MASSACHUSETTS 01581
617-366-9011

B3.2.1
WMY 79- 98
September 20, 1979

United States Nuclear Regulatory Commission
Washington, D.C. 20555

POOR ORIGINAL

Attention: Office of Nuclear Reactor Regulation
Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

References: (a) License No. DPR-36 (Docket No. 50-309)
(b) USNRC letter from R.W. Reid to R.H. Groce dated February 2, 1978; Subject: Amendment No. 35 to Facility Operating License
(c) MYAPC letter (WMY 78-52) from R.H. Groce to R.W. Reid dated May 31, 1978; Subject: Maine Yankee Fire Protection Program Information
(d) USNRC letter from R.W. Reid to R.H. Groce dated July 19, 1979; Subject: Request for Additional Information on Fire Protection SER Items.

Dear Sir:

Subject: Submittal of Additional Information on Fire Protection Items

Reference (d) above requested that Maine Yankee re-address the subject of Safe Shutdown Capability, SER Item 3.2.1. It indicated that more information was required by your staff, and enclosed a generic staff position on the subject. We have reviewed the staff position and our previous submittal on this subject [Reference (c)], and find that very little new information is required.

The problem appears to be that the original staff concern and our original response do not follow the format requested by the subsequent generic position. Therefore, we have taken the original staff concern and responded to it using the criteria listed in the generic staff position. This response is attached as Enclosure A.

We trust that this approach is acceptable to you. If you have further questions or comments, please contact us.

Very truly yours,

Roy E.M. Reid for
D. E. Moody
Manager of Operations

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LJD/kaf

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Enclosure A

SER Section 3.2.1, Safe Shutdown Capability

The Maine Yankee Atomic Power Plant was designed and constructed to meet the requirement of Criterion Number 3 concerning Fire Protection of Nuclear Power Plants. With the later release of BTP 9.5-1 and Regulatory Guide 1.120, the NRC requested a survey of the plant to ascertain to what degree it meets the specific, and more detailed, requirements of these document.

After an inspection and review of the plant fire protection systems, Maine Yankee was requested to further evaluate the separation of redundant components required for safe shutdown, including power supplies and cables; and to analyze the results of fires in areas where this separation was not in conformance with the requirements of BTP 9.5-1.

The areas chosen for further analysis by the NRC were:

1. Control Room Cable Chase
2. Protected Cable Vault
3. Protected Cable Tray Room
4. Turbine Building
5. Circulating Water Pumphouse
6. Primary Auxiliary Building
7. Containment
8. Containment Spray Pump Building
9. Ventilation Equipment and Personnel Air Lock Area
10. Steam and Feedwater Valve House
11. The Containment Penetration Area

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Criteria for safe shutdown had been detailed in the Maine Yankee Fire Hazards Analysis previously submitted to the NRC. The NRC request indicated that more specific requirements for safe shutdown were preferred by the NRC reviewing teams, namely:

1. the ability to reach hot shutdown immediately, and
2. the ability to reach cold shutdown in 72 hours.

All areas above were analyzed in accordance with these specific requirements. In addition, Maine Yankee considered it prudent to maintain the ability to borate the reactor coolant system so the area analyses considered this.

The recent staff request for additional information, complete with generic staff position, has caused Maine Yankee to re-analyze the eleven areas and submit the information required for staff review using the criteria listed in the staff position.

I. Describe the systems or portions thereof used to provide shutdown capability and modifications required to achieve any alternate shutdown capability, if required.

Safe shutdown of the reactor plant requires the following functions be accomplished:

A. Insert negative reactivity into the reactor core

B. Control primary system overpressure

C. Control primary plant water inventory

D. Remove decay heat and cooldown the reactor core

To ensure shutdown capability, the cable associated with the equipment or systems which accomplish the four functions described above have been examined for their vulnerability to a fire in eleven locations of concern to the Commission. The equipment required to reach hot standby and cold shutdown are described in Figure 1 or 2, respectively.

A. Reactivity Control

Reactivity control at Maine Yankee is accomplished by insertion of control rods and by boration.

Negative reactivity is initially inserted into the reactor core by control rods. These control rods fail safe. They are inserted by removing power to their holding coils. This may be accomplished by pushing the trip buttons on the main control board, or by opening the scram breakers in the protected switchgear room.

Control and power cables for the control rods pass through the following areas of concern:

Protected Cable Tray Room
Control Room Cable Chase
Protected Cable Vault
Containment Penetration Area
Containment

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Should a fire occur in any of the areas of concern causing either an open or short circuit in the power supply cables, the holding coils would be de-energized and the control rods would fall into the reactor core. Immediate boration after shutdown is not essential for keeping the reactor subcritical. With the control rods inserted and xenon building up, the reactor core will remain conservatively subcritical for some time.

Boration is normally accomplished with the use of any one of three charging pumps located in the Primary Auxiliary Building. These pumps are not required to achieve a hot shutdown condition. However, to achieve a cold shutdown condition, boration would be required. Control and power cables for these pumps pass through the following areas:

Protected Cable Tray Room
Control Room Cable Chase
Protected Cable Vault
Primary Auxiliary Building

In the event that a fire in any of the above areas of concern incapacitates all three main charging pumps, one alternative means of boration is to use the auxiliary charging pump located in the lower level of the Primary Auxiliary Building. This pump's power supply cables have been rerouted to avoid the Control Room Cable Chase and Protected Cable Vault. They do, however, pass through the Protected Cable Tray Room and Primary Auxiliary Building.

In the Protected Cable Tray Room, the auxiliary charging pump power cable was rerouted to avoid the south end of the room, providing spatial separation from the main charging pump power cables. While the power cables to the main charging pumps as well as the 4160 volt power feeder to the 480 volt switchgear supplying the motor control center for the auxiliary charging pump are all in the Protected Cable Tray Room, the cables for the main charging pumps are routed immediately to the south wall, and then down into the Protected Cable Vault. Those for the auxiliary charging pump are routed to the north wall, and then into the unprotected cable tray room through a 3-hour fire barrier. This routing and the spatial separation that exists is shown on drawing FM-3A.

As noted in Section 5.6 of the Fire Protection SER, the combustibles in the area consist of moderate amounts of plastic and rubber cable insulation. The trays connecting the north and south ends of the room contain very little cable, and much of that cable is armored, 4160 volt cable. The SER section lists many modifications to and improvements in the fire protection systems available in the room. These modifications, the ease of access to the room, and the spatial separation which exists makes it unlikely that a fire would incapacitate the three main charging pumps as well as the auxiliary charging pump. Therefore, Maine Yankee feels that a charging pump will always be available for boration in spite of a fire in this room.

However, as explained earlier, conservative estimates show that power cables to either the auxiliary charging pump or to a main charging pump could be rerun in eight hours, after which cooldown to cold shutdown could begin. The plant can be maintained in a safe hot shutdown condition until such repairs are made.

In the Primary Auxiliary Building, the power cables for the main charging pumps are in conduit, embedded in concrete. The power cables for the auxiliary charging pump are routed in conduit such that a minimum 15 foot separation exists between them and the concrete-embedded main charging pump cables. As stated in Section 5.14.3 of the Fire Protection SER, the main charging pumps are separated from the auxiliary charging pump by distance and by the concrete floor at the 21 foot elevation. A fire at the auxiliary charging pump would not affect any of the main charging pumps or their power cables. In addition, separation, curbing and drains prevent a fire in one main charging pump cubicle from damaging any other main charging pump.

It is possible that a cable fire on the 11-foot or 21-foot elevation could incapacitate the lube oil pumps for all three main charging pumps. However, as stated in Reference (c), the pump manufacturer has verified that the main charging pumps can be operated without their lube oil pumps. Ring oiling of the bearings is provided, which will adequately lubricate the bearings without the lube oil pumps. Therefore, the possibility of a fire in the Primary Auxiliary Building destroying the ability to borate is not considered credible.

In the extremely unlikely event that a fire in the Primary Auxiliary Building did somehow destroy the power cables to the auxiliary charging pumps and the three main charging pumps, conservative estimates show that power cables to the auxiliary charging pump (480V) or to a main charging pump (4160V) could be re-run in 8 hours, after which cooldown could begin. It is important to note that the plant can be maintained in a saf hot shutdown condition until such rerouting is accomplished.

B. Primary System Overpressure Control

The plant can be safely shutdown and cooled down without the loss of system overpressure should all pressurizer heaters be unavailable or out of service. The pressurizer, because of its static nature, must be force-cooled using steam phase spray. During a cooldown the reactor coolant systems cools down more rapidly than does the pressurizer, and therefore, the pressurizer heaters normally would be secured during a cooldown.

The pressurizer heater cables have been specially insulated with silicone rubber with an overall jacket of silicone impregnated glass braid. This insulation is a high temperature insulation which is flame resistant, non-propagating and superior to the types of insulation normally used.

However, if a fire were to destroy the heater cables there are other alternatives that could be used for maintaining system overpressure. These include establishing a nitrogen bubble in the pressurizer, compression of the steam bubble, and solid operation with the centrifugal charging pumps. Based on the above plant characteristics and alternatives available to maintain system overpressure, the loss of pressurizer heater cables as a consequence of a fire in any of the areas of concern will not prevent a safe reactor plant shutdown.

C. Primary Plant Water Make-Up or Inventory

The charging pumps are normally used to provide primary system make-up. Their control and power cables pass through the following areas:

Protected Cable Tray Room
Control Room Cable Chase
Protected Cable Vault
Primary Auxiliary Building

In the event that a fire in any of the above areas of concern incapacitates all three main charging pumps, one alternative available to

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provide make-up to the reactor coolant system is the auxiliary charging pump located in the lower level of the Primary Auxiliary Building. This pump's power supply cables have been re-routed to avoid the Control Room Cable Chase and Protected Cable Vault. As previously noted, they do pass through the Protected Cable Tray Room and Primary Auxiliary Building. The routing of the cables and the consequences of a fire in these areas together with its affect on the four pumps have been discussed in Section I A of this response, and will not be reiterated here.

D. Decay Heat Removal

Decay heat removal is accomplished by venting steam to the atmosphere through the steam generator safety valves and the atmospheric steam dump valve. Feedwater inventory is normally maintained in the steam generators with the use of either one (1) of two (2) electric driven auxiliary feed pumps, P-25A or P-25C. Both of these pumps are located in a tornado protected room adjacent to the containment. Cable for these pumps pass through the following common areas:

Protected Cable Tray Room
Control Room Cable Chase
Protected Cable Vault

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Thereafter, the cables for the two pumps are routed through separate areas. Those for P-25A pass through the Containment Penetration Area, and those for P-25C pass through the Primary Auxiliary Building.

In the event the cables for P-25C were destroyed by a fire in the Primary Auxiliary Building but all other areas of concern listed above remained undamaged, P-25A would be available for maintaining feedwater inventory because its power supply cables are routed through the Containment Penetration Area. Similarly, if the cables for P-25A were destroyed by a fire in the Containment Penetration Area but all other areas of concern listed above remained undamaged, P-25C would still be available for maintaining feedwater inventory because its power supply cables are routed through the Primary Auxiliary Building.

In the event both electric driven auxiliary feedwater pumps are incapacitated as a result of a fire in any or all of the remaining areas of concern, decay heat removal can still be achieved. As before, steam would be vented to the atmosphere through the steam generator safety valves and the atmospheric steam dump valve. The atmospheric steam dump valve may be controlled from the emergency panel in the emergency feed pump room or locally at the valve. Feedwater inventory would be maintained in the steam generators with the use of the steam driven auxiliary feed pump which is located in the Steam and Feedwater Valve House.

The plant can be cooled to approximately 212 to 250°F by the above method and is considered safely shutdown by Maine Yankee. However, to reduce the reactor coolant temperature to cold shutdown as defined in the plant Technical Specifications, an additional heat removal method is required. This is provided by the Residual Heat Removal System, Primary or Secondary Component Cooling Water Systems, and Service Water System.

Power supply cables to the residual heat removal system pump motors are routed through the following areas:

Protected Cable Tray Room
Control Room Cable Chase
Protected Cable Vault
Steam and Feedwater Valve House
Containment Spray Pump Building

POOR ORIGINAL

In the event that a fire in the Protected Cable Tray Room, Control Room Cable Chase, or Protected Cable Vault disabled the power supply cables to the residual heat removal system pump motors; the time required to run temporary cables is conservatively estimated to be less than 48 hours and considers obtaining the cables, installing them, and making the required cable terminations. Experience shows five (5) hours would be a conservative estimate to place the residual heat removal system in service. Once in service, the residual heat removal system is capable of cooling the reactor coolant system at a rate of 65°F per hour at the start. Cold shutdown can be reached in the time available proposed by the NRC.

Power supply cables for the residual heat removal system pump motors are routed through the Steam and Feedwater Valve House. Since the power supply cables are run through conduit embedded in concrete, it is not credible that a fire of any magnitude in this area would eliminate the residual heat removal system pumps from service. If this were to happen, the casualty procedure described above would be used.

A fire in the Containment Spray Pump Building could render all residual heat removal system pump motors unavailable for service. Maine Yankee thinks this is extremely unlikely given the lack of combustibles, and the commitment to install additional detection and suppression equipment in this area. Nonetheless, if a fire were to occur, it would not affect cooldown to 250°F. The plant could remain safely in this condition, but if a continuation of cooldown to cold shutdown were mandatory, it could be achieved as follows:

1. Using house boiler steam for main turbine shaft sealing and for operation of the air ejectors, a vacuum would be drawn in the condenser.

2. Steam from one steam generator would be directed to the condenser through one of several available paths.

3. The primary system would remain pressurized above the NPSH requirements for the reactor coolant pumps so that one could be operated.

4. Makeup water to the steam generator would be supplied by one main condensate pump taking suction from the condenser hotwell and pumping through the normal feedwater system to the steam generator.

By throttling the flow from the steam generator to the condenser, cooldown could proceed below the cold shutdown temperature requirement.

Holding the reactor coolant system temperature at 250°F until repairs could be effected is a more desirable situation because considerably less equipment is required; however, the second method is available.

The cooling water that is normally supplied to the residual heat removal system heat exchangers (E-3A and B) is circulated by the component cooling water system. The component cooling water system transfers its heat to the service water system via the component cooling water heat exchangers located in the Turbine Hall. The power and control cabling for the component cooling water system passes through the following areas:

Protected Cable Tray Room
Control Room Cable Chase
Protected Cable Vault
Turbine Building

POOR ORIGINAL

In the event that a fire in either the Control Room Cable Chase or Protected Cable Vault damaged control cable for the component cooling water system, they can be repaired within the time proposed by the NRC. Control of the pump motors is available at the breaker cubicle.

In the Protected Cable Tray Room, the component cooling water pump power cables are 4160 volt armored cables that are located in cable trays in the northeast corner of the room. Each set of component cooling water pumps (primary or secondary) is in a separate tray, separated from each other by approximately 15 feet of horizontal distance. To reach cold shutdown, only one component cooling pump is required.

The potential for a fire in this room was discussed in Section I (A) of this submittal. If a fire occurs in the south end of the room, the sixty foot separation, light cable loading and good access to the room should prevent damage to the component cooling pump power supply cables in the northeast corner.

If either the north end or the entire Protected Cable Tray Room were lost due to fire, there remain two available options for achieving plant cooldown:

1. Cabling could be rerouted around the Protected Cable Tray Room to repower one of the component cooling water pumps. This could be accomplished in time to achieve plant cooldown within 72 hours.

2. Ultimate cooling water for the residual heat removal system heat exchangers could be provided from the fire main by connecting hoses to fittings provided on the component cooling water lines to the residual heat removal system heat exchangers and removing the heated water by similar hose connections. Analyses have proven sufficient water would be available by this method for several months of operation.

The primary and secondary component cooling water pumps and heat exchangers are located in the northwest corner of the Turbine Building. In the event of a fire in this area that resulted in the loss of all equipment including the cables, cooldown to cold shutdown could continue using water from the fire pond for cooling.

The residual heat removal system heat exchangers, one residual heat removal system pump, and the diesel driven fire pump could be used since they would remain undamaged by a Turbine Building fire. Hose connections are available on the shell side of both heat exchangers which permit fire pond water to be used to remove heat. Less than 400 gpm per heat exchanger would be required. This flow rate can be continued for at least 2 months using the minimum amount of available water from the fire pond and the Montsweag Brook Reservoir. This cooldown path assures the ability to cool to a cold shutdown condition with reactor coolant system temperature well below the Technical Specifications requirement of 210°F. Damage control measures as extensive as replacing/rewinding a damaged primary component cooling water/secondary component cooling water pump motor could be completed in this time frame. Following the necessary damage control measures, the service water/primary component cooling water/residual heat removal system's heat removal path already described would be restored.

As discussed earlier, the service water system serves as the ultimate heat sink for plant cooldown by removing heat from the component cooling water system via the component cooling water system heat exchangers located in the Turbine Hall. The cabling for the service water system passes through the following areas:

Protected Cable Tray Room
Control Room Cable Chase
Turbine Building
Circulating Water Pump House

POOR ORIGINAL

In the event there is a fire in the Control Room Cable Chase that resulted in damage to the control cables for the service water system, they can be repaired in the time available proposed by the NRC. Control of the service water pump motors is available at the breaker cubicle.

In the Protected Cable Tray Room, the service water pump power supply cables are 480 volt cables that are routed in cable trays along the northeast corner. To reach cold shutdown only one (1) of four (4) service water pumps is required, and the power supply cables to each of the pumps are routed in separate cable trays. As previously discussed, if a fire occurs in the south end of the Protected Cable Tray Room, there is satisfactory separation to prevent damage to the service water pump motor cables.

If either the north end or the entire Protected Cable Tray Room were lost due to fire, there remain two available options for achieving plant cooldown:

(1) Cabling could be rerouted around the Protected Cable Tray Room to repower one of the service water pumps. This could be accomplished in time to achieve plant cooldown within 72 hours.

(2) Ultimate cooling for the residual heat removal system heat exchangers would be provided from the fire main by connecting hoses to fittings provided on the component cooling water lines to the residual heat removal system heat exchangers and removing the heated water by similar hose connections. Analyses have proven sufficient water would be available by this method for several months of operation.

The control and power cables for the service water pumps are located along the north wall of the Turbine Building. In the event of a fire in this area that resulted in the loss of the service water pumps cooldown to cold shutdown could continue using water from the fire pond for cooling.

As previously discussed, the residual heat removal system heat exchangers, one residual heat removal system pump, and the diesel driven fire pump, could be used since they would remain undamaged by a Turbine Building fire. Hose connections are available on the shell side of both heat exchangers which permit fire pond water to be used to remove heat. Less than 400 gpm per heat exchanger would be required. This flow rate can be continued for at least 2 months using the minimum amount of available water from the fire pond and the Montsweag Brook Reservoir. This cooldown path assures the ability to cool to a cold shutdown condition with reactor coolant system temperature well below the Technical Specifications requirement of 210°F. Damage control measures as extensive as replacing/rewinding a damaged primary component cooling water/secondary component cooling water pump motor could be completed in this lengthy time frame. Following the necessary damage control measures, the service water/primary component cooling water/residual heat removal system's heat removal path already described would be restored.

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The four service water pumps which provide the cooling water for the ultimate heat sink required to bring the plant to a cold shutdown condition are located in the Circulating Water Pump House. With the minimal amount of combustibles in the building, early fire detection capability, and additional fire fighting apparatus, the possibility of a fire eliminating all four (4) service water pumps is remote. However, cooldown to cold shutdown could continue using water from the fire pond.

As previously discussed, the residual heat removal system heat exchangers, one residual heat removal system pump, and the diesel driven fire pump could be used since they would remain undamaged by a pumphouse fire. Hose connections are available on the shell side of both heat exchangers which permit fire pond water to be used to remove heat. Less than 400 gpm per heat exchanger would be required. This flow rate can be continued for at least 2 months using the minimum amount of water available from the fire pond and the Montsweag Brook Reservoir. This cooldown path assures the ability to cool to a cold shutdown condition with reactor coolant system temperature well below the Technical Specifications requirement of 210°F.

It should be noted that if all 4 service water pumps were lost as a result of a fire which damaged their power cables, new cables could be run within hours and the normal service water/primary component cooling water/residual heat removal systems restored. Cold shutdown could be achieved within the time proposed by the NRC fire team. With the physical separation between the pumps, damage to all the motors is difficult to postulate. However, the alternate cooling mode noted above is available.

FIGURE 1

HOT STANDBY

Function	Equipment Required	Alternatives
A. Negative Reactivity Insertion	1. Control Rods	1. None. Rods fail safe under all circumstances
B. Primary System Overpressure Control	1. None Required	1. None
C. Primary Plant Water Inventory	1. One Charging Pump (3 pumps available) (See Note)	1. Auxiliary Charging Pump (See Note)
D. Decay Heat Removal	1. Steam Generator (a) Steam to Atomsphere Safety and Steam Dump valves (b) One Auxiliary Feed Pump for makeup (3 pumps available)	1. Steam Generator (a) Steam to Condenser-Circ. Water Pump (1 of 4 pumps req'd) plus cond. pump (1 of 3 pumps req'd) (b) Makeup from main feed, cond. pump (1 of 3 pumps req'd) plus main feed pump (1 of 2 pumps req'd)

NOTE: Charging Pump includes 2 lube oil pumps
Aux. Charging Pump includes 1 packing pump

FIGURE 2

COLD SHUTDOWN

Function	Equipment Required	Alternatives
A. Negative Reactivity Insertion	1. One Charging Pump (3 pumps available)	1. Auxiliary Charging Pump
B. Primary System Pressure Control	1. Decrease (a) Spray - One Charging Pump (3 available)	1. Increase (a) N_2 Blanket 2. Decrease (a) Spray-Auxiliary Charging pump (b) Vent thru solenoid reliefs
C. Primary Plant Water Inventory	1. One Charging Pump (3 pumps available)	1. Auxiliary Charging Pump
D. Decay Heat Removal	1. Steam Generator (a) Steam to Atmosphere Safety and Steam Dump Valves (b) One Auxiliary Feed Pump for makeup (3 pumps available) 2. RHR (Below 400 psig) (1 of 3 pumps req'd) plus PCCW (1 of 2 pumps req'd) or SCCW (1 of 2 pumps req'd plus service water (1 of 4 pumps req'd)	1. Steam Generator (a) Steam to Condenser circ. water pump (1 of 4 pumps req'd) plus cond. pump (1 of 3 pumps req'd) (b) Makeup from main feed - cond. pump (1 of 3 pumps req'd) plus main feed pump (1 of 2 pumps req'd) 2. RHR (below 400 psig) (1 of 3 pumps req'd) plus fire pump (1 of 2 pumps req'd)

II. System design by drawings which show normal and alternate shutdown control and power circuits, location of components, and that wiring which is in the area and the wiring which is out of the area that required the alternate system.

Control Cable

The loss, due to fire, of control cables and/or circuits is of no consequence. All breakers for any of the equipment required for safe shutdown can always be manually operated at the switchgear without the need for control circuits.

Power Cable

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Boration and primary system make-up is normally achieved with the use of one (1) of three (3) main charging pumps or as an alternative with the auxiliary charging pump. The power supply cables to the motors for all four of these pumps originally passed through the same fire areas. Therefore, the power supply cables to the motor for the auxiliary charging pump were rerouted to avoid, to the extent possible, the areas through which the power supply cables to the motors for the main charging pumps were routed. The routing for the power supply cables for both the main and auxiliary charging pump motors, as it now exists, is shown on the attached drawings FM-2A and 3K.

The electrical distribution system at Maine Yankee is such that the 480 volt power comes from 4160/480 volt transformers. As indicated on FM-3K the 4160 volt power feeder to the 480 volt switchgear for the auxiliary charging pump is routed through the Protected Cable Tray Room, as are the 4160 volt power cables to the main charging pumps. At the points of entry into the room, they are separated by 15 feet and run in opposite directions. The power feeder for the auxiliary charging pump is then routed in a cable tray which ultimately travels along the north wall of the Protected Cable Tray Room into the unprotected cable tray room through a 3-hour fire wall. The power cables to the main charging pumps are routed through trays adjacent to the south wall of the Protected Cable Tray Room. The north and south walls of the Protected Cable Tray Room are separated by a distance of 60 feet. As is noted in Section 5.6 of the Fire Protection SER, the combustibles in the area consist of moderate amounts of plastic and rubber cable insulation. The trays connecting the north end and south ends of the room contain very little cable; and much of it is armored 4160 volt cable. The SER section lists many modifications to, and improvements in the fire protection systems available in the room. These modifications, the ease of access to the room and the 60 feet of spatial separation which exist makes it unlikely that a fire would incapacitate the three main charging pumps as well as the auxiliary charging pump. Therefore, Maine Yankee feels that a charging pump will always be available for boration and makeup.

In addition, as explained earlier, conservative estimates show that power cables to either the auxiliary charging pump or to a main charging pump can be re-run in eight hours, after which cooldown to cold shutdown can begin. The plant can be maintained in a safe hot shutdown condition until such repairs can be made.

From the unprotected cable tray room the 4160 volt power feeder for the auxiliary charging pump is run up to the 4160/480 volt transformers in the unprotected switchgear room. From the 480 volt switchgear in this room, a 480 volt power feeder cable is run back down into the unprotected cable tray room and finally into the Primary Auxiliary Building through the wall between these two areas. In contrast the power supply cables to the main charging pump motors originate from the 4160 volt switchgear in the protected switchgear room. The routing for these cables is through the Protected Cable Tray Room, Control Room Cable Chase and Protected Cable Vault before entering the Primary Auxiliary Building. The power cables for the auxiliary and main charging pump motors originate from and are routed to the Primary Auxiliary Building through different areas and are completely separated by one or more three (3) hour fire rated barriers.

The power feeder cable for the auxiliary charging pump after entering the Primary Auxiliary Building is routed in a generally downward direction to MCC-9B. Specifically, the feeder penetrates the Primary Auxiliary Building in sleeves through the east wall above the 36 foot floor elevation. From here it enters a vertical riser adjacent to the wall and is routed down to just below the ceiling of the 21 foot floor elevation. From this point, the feeder is run in conduit to MCC-9B and enters from the top. The motor leads for the auxiliary charging pump exit MCC-9B from the bottom and are run in conduit directly to the pump located on the 11 foot floor elevation.

In contrast after entering the Primary Auxiliary Building directly from the Protected Cable Vault, the power supply cables to the main charging pump motors are routed through separate, four (4) inch conduit embedded in the concrete floor of the 21 foot floor elevation in the Primary Auxiliary Building. Because these power supply cables are routed in conduit embedded in concrete, it is not credible that they would be damaged by a fire which disabled either MCC-9B or the power feeder to this MCC for the auxiliary charging pump.

Marker Definitions

for

Power Supply Cable Routing

to

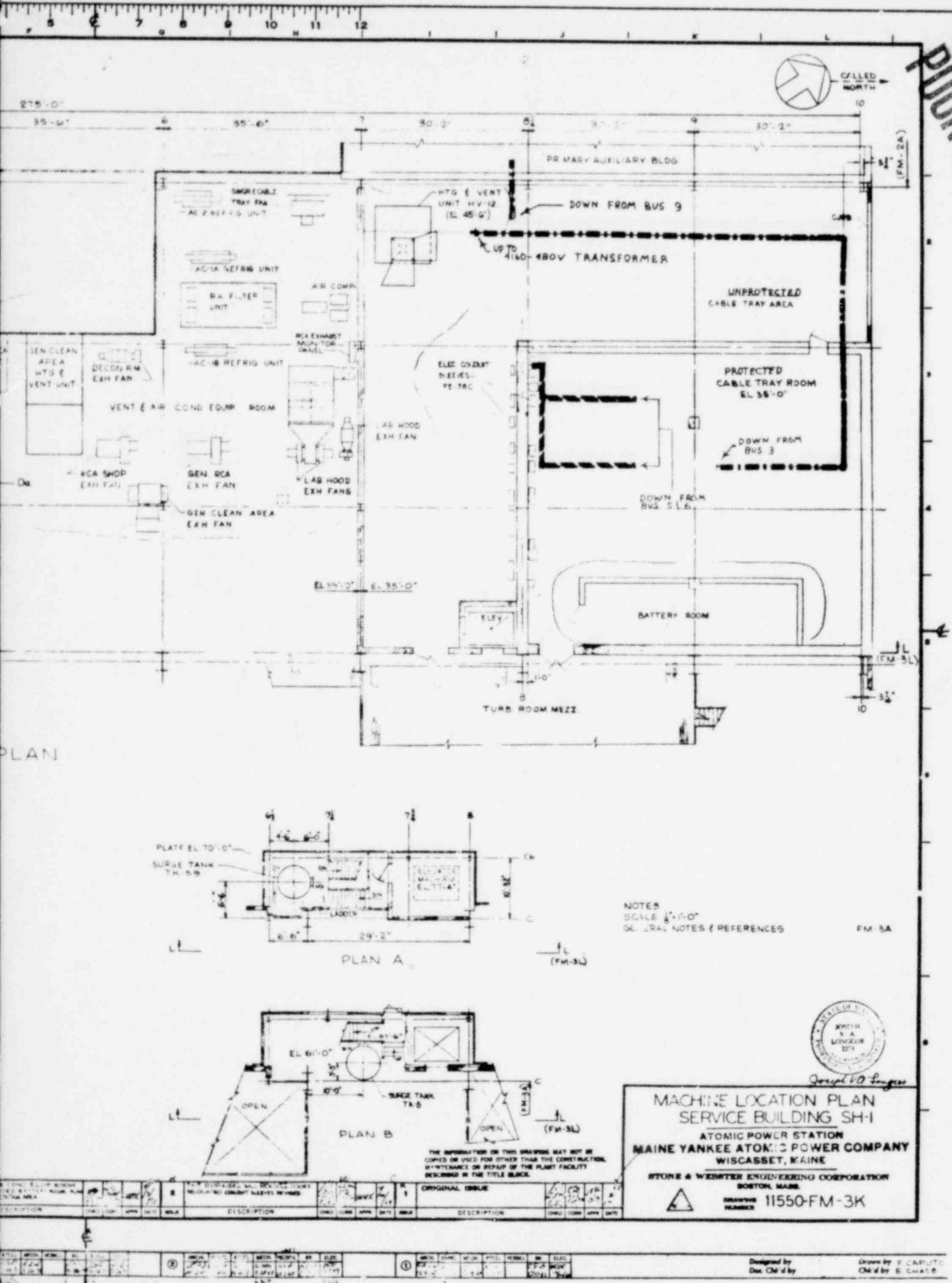
Main and Auxiliary Charging Pumps

shown on

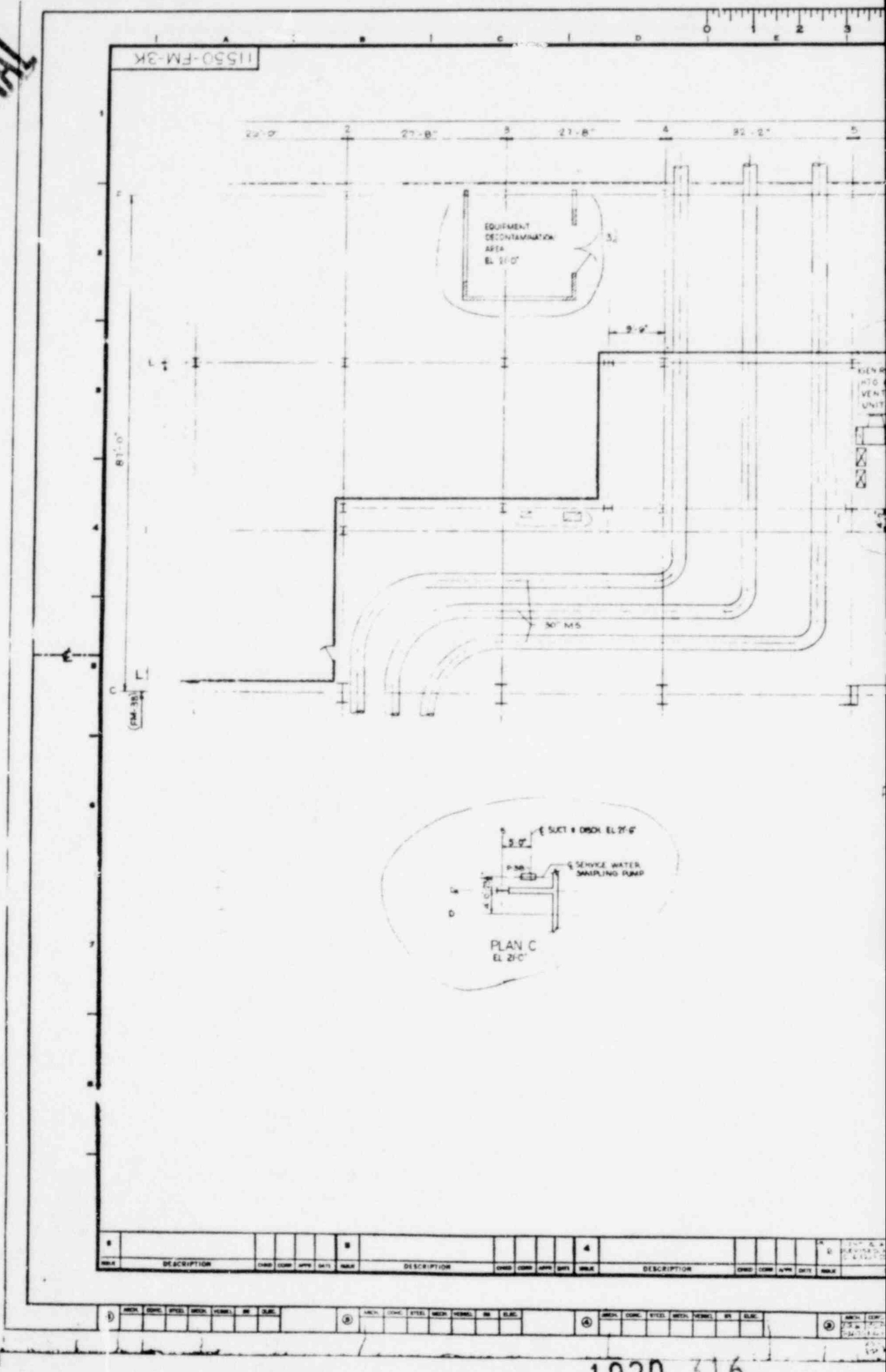
FM-2A & 3K

Routing for the power supply cables to each of the main charging pump motors through the Protected Cable Tray Room and Primary Auxiliary Building.

Routing for the power supply cables for the auxiliary charging pump motor through the Protected and Unprotected Cable Tray Rooms and the Primary Auxiliary Building.


CALLED NORTH
PRIMARY AUXILIARY BLDG
HTG & VENT UNIT HV-12 (EL 45'-6")
DOWN FROM BUS 9
UP TO 4160-480V TRANSFORMER
UNPROTECTED CABLE TRAY AREA
PROTECTED CABLE TRAY ROOM EL 35'-0"
DOWN FROM BUS 3
DOWN FROM BUS 5 & 6
BATTERY ROOM
TURB. ROOM MEZZ
AC-1A REFRIG UNIT
RA FILTER UNIT
AIR COMP
AC-1B REFRIG UNIT
VENT & AIR COND EQUIP ROOM
GEN CLEAN AREA HTG & VENT UNIT
DECON RM EXH FAN
RCA SHOP EXH FAN
GEN RCA EXH FAN
LAB HOOD EXH FANS
LAB HOOD EXH FAN
GEN CLEAN AREA EXH FAN
ELEC CONDUIT SLEEVES
ELEV
EL 35'-0"
PLAN
PLATE EL 70'-0"
SURGE TANK TK-59
LADDER
29'-2"
PLAN A
NOTES
SCALE 1/4"=1'-0"
GENERAL NOTES & REFERENCES FM-3A
EL 61'-0"
SURGE TANK TK-8
OPEN
PLAN B
THE INFORMATION ON THIS DRAWING MAY NOT BE COPIED OR USED FOR OTHER THAN THE CONSTRUCTION, MAINTENANCE OR REPAIR OF THE PLANT FACILITY DESCRIBED IN THE TITLE BLOCK.
ORIGINAL ISSUE
DESCRIPTION
MACHINE LOCATION PLAN
SERVICE BUILDING SH-1
ATOMIC POWER STATION
MAINE YANKEE ATOMIC POWER COMPANY
WISCASSET, MAINE
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.
11550-FM-3K
Designed by
Dsn. Chk'd by
Drawn by F. CAPUTO
Chk'd by E. CHASE

POOR ORIGINAL



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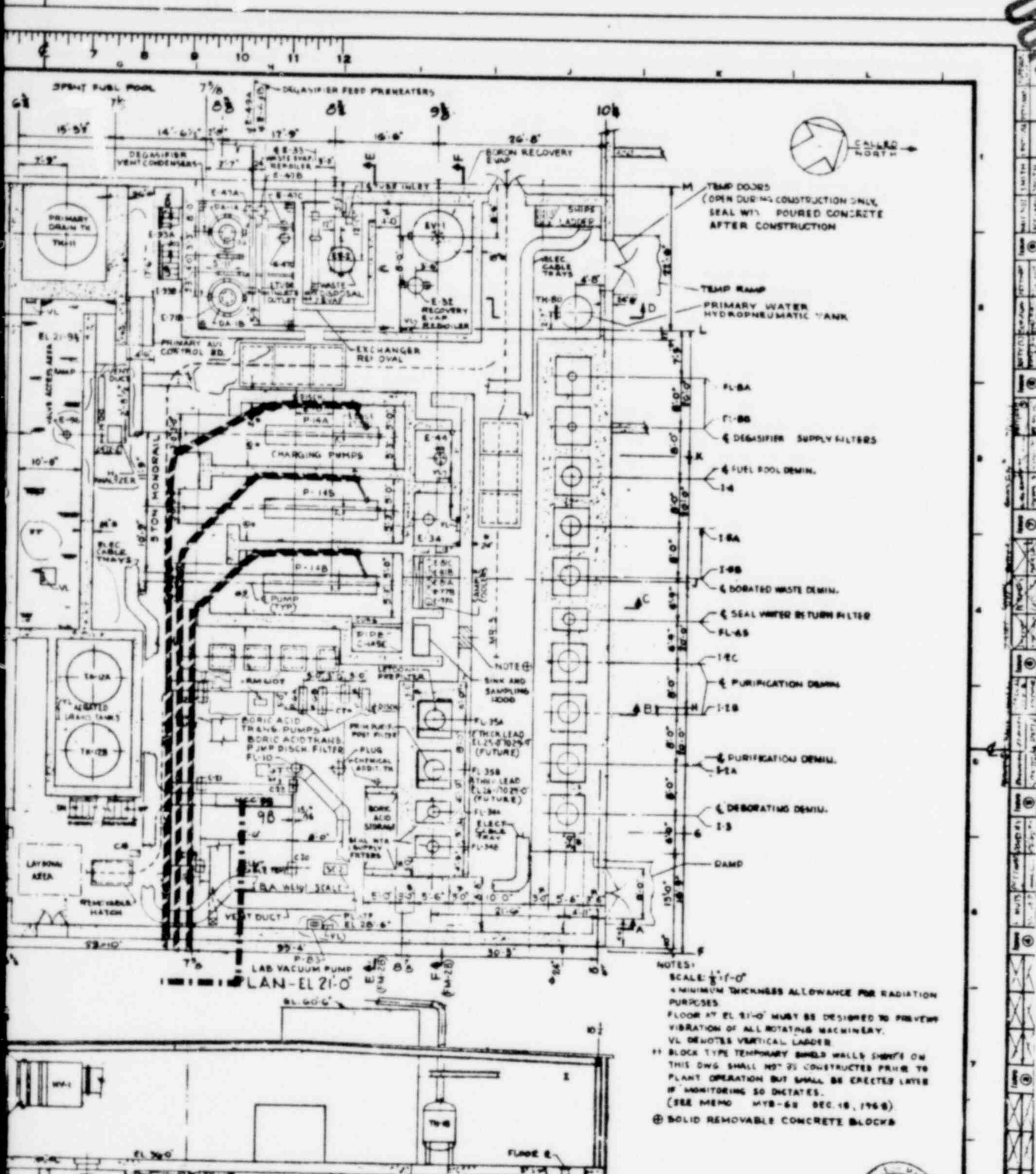
POOR ORIGINAL



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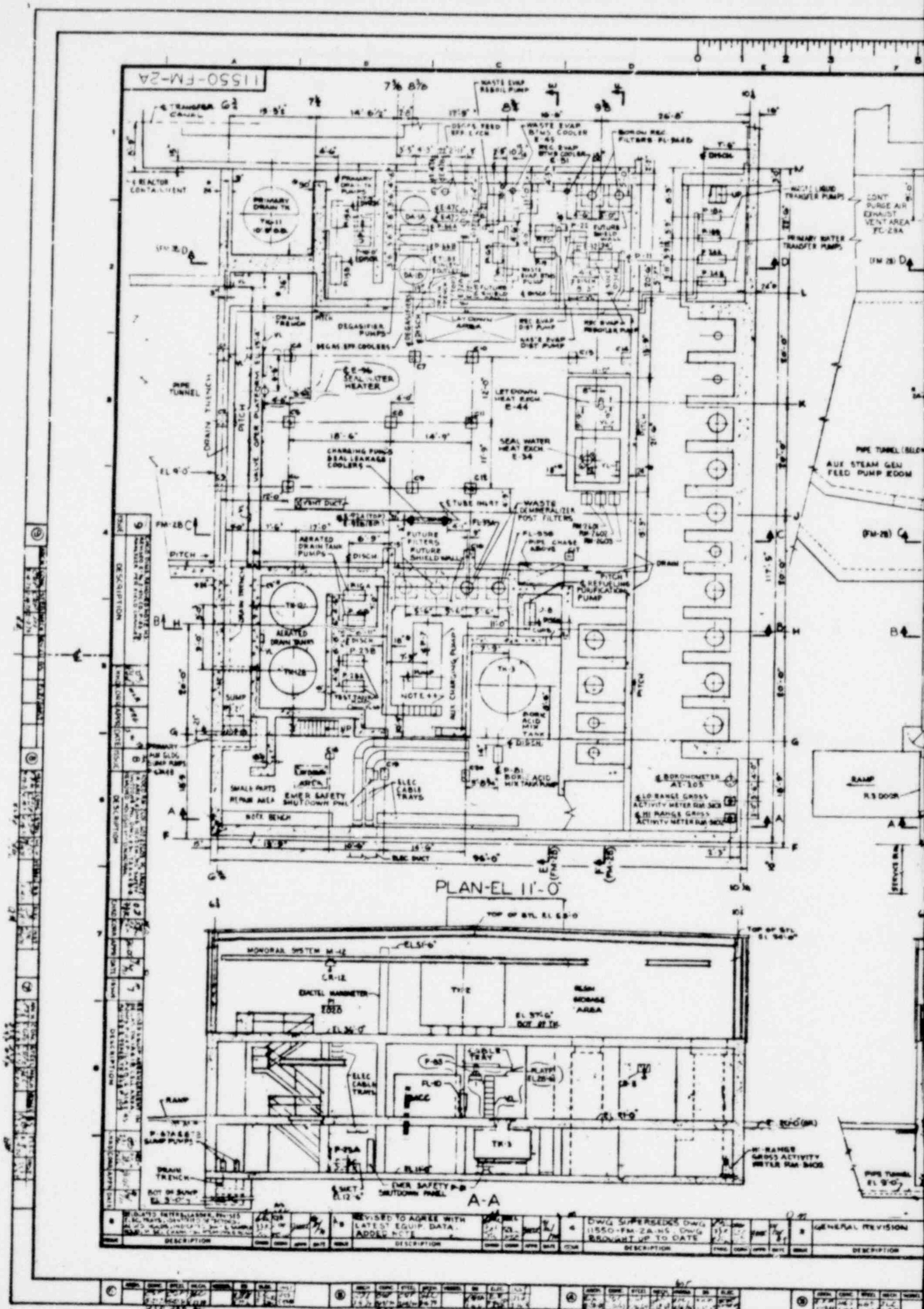

1020 318

III. Verification that changes to safety systems will not degrade safety systems. (e.g., new isolation switches and control switches should meet design criteria and standards in FSAR for electrical equipment in the system that the switch is to be installed; cabinets that the switches are to be mounted in should also meet the same criteria (FSAR) as other safety related cabinets and panels; to avoid inadvertent isolation from the control room, the isolation switches should be keylocked or alarmed in the control room if in the "local" or "isolated" position; periodic checks should be made to verify switch is in the proper position for normal operation; and a single transfer switch or other new device should not be a source for a single failure to cause loss of redundant safety systems).

Maine Yankee has not made any changes which degrade safety systems. In particular there have been no isolation switches, control switches, panels, or cabinets added.

IV. Verification that wiring, including power sources for the control circuit and equipment operation for the alternate shutdown method, is independent of equipment wiring in the area to be avoided.

The only permanent rerouting of cables for equipment that could be used as an alternative means to complete a safe shutdown involved those for the auxiliary charging pump motor and is fully described in I and II. Alternative methods which can be used but would be of a temporary nature (for example, repairing or routing new temporary cable around areas damaged by fire) have, to the extent possible, been described in I. As the exact details of any temporary recabling is solely dependent on the circumstances existing at the time, additional descriptive material is not considered necessary.

V. Verification that alternate shutdown power sources, including all breakers, have isolation devices on control circuits that are routed through the area to be avoided, even if the breaker is to be operated manually.

Maine Yankee has verified that alternative shutdown power sources, including all breakers, have isolation devices on control circuits that are routed through the fire areas to be avoided. To amplify our earlier comment in II concerning control cable and circuits, all breakers can be manually operated without the eed for control circuits.

POOR ORIGINAL

1020 321

VI. Verification that licensee procedure(s) have been developed which describe the tasks to be performed to effect the shutdown method. A summary of these procedures should be reviewed by the staff.

The safe shutdown method has been developed for the 11 specific areas of concern to the staff and in accomplishing that shutdown for these areas, several different emergency procedures are used. The following information consists of a summary of those procedures and then a list of the areas showing the applicable procedures to be used.

A. Emergency Shutdown Procedure EP 2-1

An emergency shutdown may be the result of automatic action initiated by the reactor protective system or by manual initiation by the operator in response to conditions which require the plant to be shutdown immediately. Accompanying a plant trip, automatic functions are initiated to safely bring the plant to a hot shutdown condition. Verification that these automatic functions occur properly are an important part of this procedure.

Once the automatic actions have been verified, there are specific subsequent actions that are to be conducted. One such action states: maintain reactor coolant system temperature by dumping steam to the condenser or by using the atmospheric dump valve if the condenser is not available.

Plant conditions are evaluated to determine cause of the plant trip and if cause cannot be corrected without a plant cooldown then the plant cooldown procedure must be initiated.

The final conditions of the procedure are: the plant is in a hot shutdown condition. Cooldown has commenced if necessary.

B. Loss of Condenser Vacuum EP 2-2

A loss of condenser vacuum may result from a failure in the condenser air removal system, or from a failure in the circulating water system. For a plant trip, with the steam dump and bypass valves prevented from opening, system temperatures and pressures are limited by the action of the steam generator code safety valves and the pressurizer relief valves and code safety valves. The atmospheric decay heat release valve and the steam driven auxiliary feed pump may also be used for decay heat removal under these conditions.

The procedure goes on to detail the opening of the atmospheric steam dump valve and the starting of an auxiliary feed pump.

The final conditions of the procedure have the plant in a hot shutdown condition. Investigation into the cause for loosing condenser vacuum and necessary correction action is underway.

C. Evacuation of Control Room EP 2-4

A condition may exist whereby the control room would become uninhabitable. Under these conditions, a means of shutting down the reactor and secondary plant from remote locations is necessary. Emergency remote stations are manual and detailed actions for each station are given to accomplish the plant shutdown.

The final conditions of the procedure will have the plant in a hot shutdown condition or a plant cooldown will be in progress from outside the control room.

D. Emergency Boration EP 2-5

Emergency boration of the reactor coolant system may become necessary to provide additional assurance of adequate shutdown margin in the unlikely event of an uncontrollable cooldown coupled with failures of multiple system components. The method of boration shall be selected based on the severity of the condition. The procedure goes on to detail the different methods, pumps, and valve lineups, available to accomplish emergency boration. The final condition of the procedure requires that the reactor is borated to a shutdown boron concentration.

E. Service Water Header Rupture EP 2-31

A service water header rupture is capable of causing a complete loss of service water. The objective of the procedure is to prevent a complete loss of service water. The procedure details steps to take to accomplish that. If the service water system reliability is in jeopardy, a plant shutdown and cooldown is started.

F. Loss of Secondary or Primary Component Cooling EP 2-32 or 33, respectively

The various plant components that require cooling water are cooled by either secondary component cooling or primary component cooling system. Each procedure sets forth the actions required to place the plant in a safe condition following a total loss of component cooling water.

If component cooling water cannot be restored, the plant is cooled down. The procedure indicates the use of temporary hoses. The final conditions are that the plant is either in a hot shutdown condition or (depending on the severity of the incident) in a cooled down condition.

G. Loss of Residual Heat Removal EP 2-34

The residual heat removal system utilizes either of the low pressure safety injection pumps and one or both of the residual heat removal system heat exchangers. The redundancy of system components and power supplies make the possibility of losing the entire system extremely remote. However, should complete loss of the residual heat removal system occurs during a plant cooldown or during refueling operations, alternate cooling paths can and will be provided.

The procedure details the steps to be taken when a loss of the residual heat removal system occurs during cooldown and during refueling. To cooldown without the residual heat removal system procedure OP 1-7-1 is used.

H. Plant Cooldown by Abnormal Methods OP1-7-1

This procedu will supply alternate means of continuing plant cooldown without the residual heat removal system. Specific plant conditions will dictate the step-by-step alignments which will have to be performed. The procedure specifies two alternate methods of cooldown. One method is used if electrical supply is lost but piping is intact. The other method is used if piping or heat exchangers are not available.

The final conditions of the procedure are that alternate plant cooldown is in progress removing decay heat.

J. Plant Procedures Which Apply to the Eleven Areas of Concern

Area #1	Control Room Cable Chase Evacuation of Control Room EP 2-4
Area #2	Protected Cable Vault Evacuation of Control Room EP 2-4
Area #3	Protected Cable Tray Room Evacuation of Control Room EP 2-4 Loss of Secondary Component Cooling EP 2-32 Loss of Primary Component Cooling EP 2-33 Loss of Residual Heat Removal EP 2-34
Area #4	Turbine Building Loss of Condenser Vacuum EP 2-2 Loss of Service Water EP 2-31 Loss of Secondary Component Cooling EP 2-32 Loss of Primary Component Cooling EP 2-33
Area #5	Circulating Water Pump House Loss of Condenser Vacuum EP 2-2 Loss of Service Water EP 2-31 Loss of Secondary Component Cooling EP 2-32 Loss of Primary Component Cooling EP 2-33
Area #6	Primary Auxiliary Building Emergency Shutdown Procedure EP 2-1 Emergency Boration EP 2-5

POOR ORIGINAL

1020 324

Area #7	Containment Emergency Shudown Procedure EP 2-1 Sections of Evacuation of Control Room EP 2-4
Area #8	Containment Spray Pump Building Emergency Shutdown Procedure EP 2-1 Loss of Residual Heat Removal EP 2-34 Plant Cooldown by Abnormal Methods OP 1-7-1
Area #9	Ventilation Equipment and Personnel Air Lock Area Emergency Shutdown Procedure EP 2-1
Area #10	Steam and Feedwater Valve House Emergency Shutdown Procedure EP 2-1
Area #11	Containment Penetration Area Emergency Shutdown Procedure EP 2-1 Sections of Evacuation of Control Room EP 2-4

VII. Verification that spare fuses are available for control circuits where these fuses may be required in supplying power to control circuits used for the shutdown method and may be blown by the effects of a cable spreading room fire. The spare fuses should be located convenient to the existing fuses. The shutdown procedure should inform the operator to check these fuses.

Maine Yankee has verified that spare fuses are available for control circuits where these fuses are required in supplying power to control circuits for the shutdown method, and could fail as a result of a fire in the cable tray room. However, as Maine Yankee noted in II, all breakers can be manually operated without the need for control circuits.

VIII. Verification that the manpower required to perform the shutdown functions using the procedures of (f) as well as to provide fire brigade members to fight the fire is available as required by the fire brigade technical specifications.

Emergency Shutdown Procedure EP 2-1 is required immediately and can be accomplished by two control room operators, thus allowing the fire brigade time to fight the fire.

Loss of Condenser Vacuum EP 2-2 is required immediately and can be accomplished by two control room operators, thus allowing the fire brigade time to fight the fire. Evacuation of Control Room EP 2-4 is required at some point before cooldown of the plant. Some activities are done prior to leaving the control room but most are required in the interval of time from leaving the control room and start of cooldown. In this particular case, the fire brigade members have conflicting duties, i.e. to fight the fire and to shutdown the plant. It is in a situation such as this that the local fire department would be called to render assistance. It is important to note that the three areas requiring the use of this procedure, Protected Cable Tray Room, Control Room Cable Chase, Protected Cable Vault are areas that will have smoke detection and automatic suppression systems. Based on the above, it is our contention that there will be sufficient manpower available for this contingency.

Emergency Boration EP 2-5 is not immediately required but is conducted by the control room operator on the reactivity section of the control board.

Service Water Header Rupture EP 2-31 is not required until the plant is ready to begin removing decay heat with the residual heat removal system so the manpower requirement can be met.

Loss of Secondary Component Cooling EP 2-32 and Loss of Primary Component Cooling EP 2-33 are not required until the plant is ready to begin removing decay heat with the residual heat removal system so the manpower requirement can be met.

Loss of Residual Heat Removal EP 2-34 and Plant Cooldown by Abnormal Methods OP 1-7-1 are not required until after plant shutdown and initial cooldown has been accomplished so there is no problem meeting the manpower requirement.

IX. Verification that adequate acceptance tests are performed. These should verify that: equipment operates from the local control station when the transfer or isolation switch is placed in the "local" position and that the equipment cannot be operated from the control room; and that equipment operates from the control room but cannot be operated at the local control station when the transfer or isolation switch is in the "remote" position.

The equipment required for safe shutdown can be controlled from emergency (local) panels. The control switches used at these emergency (local) panels are key lock switches with Normal and Emergency positions indicated. These switches are used to isolate the equipment control circuits originating from the control room so that local (emergency) operation is independent of the position or state of the control room circuits. All the locks in the key-lock switches are operable with a common key, the key is freed in both the Normal and the Emergency positions.

When a control switch located on an emergency panel is positioned to the Emergency (local) position, the associated control circuits originating from the main control room are not functional. Conversely, when the control switch is in the Normal (remote) position, all applicable control circuits from the emergency (local) location are not functional except a few that have been specifically designated to be functional from both locations.

X. Technical Specifications of the surveillance requirements and limiting conditions for operation for that equipmen not already covered by existing Tech. Specs. For example, if new isolation and control switches are added to a service water system, the existing Tech. Spec. surveillance requirements on the service water system should add a statement similar to the following:

"Every third pump test should also verify that the pump starts from the alternate shutdown station after moving all service water system isolation switches to the local control position."

Maine Yankee does not foresee the need or requirement to modify any of its existing Technical Specifications.

XI. Verification that the systems available are adequate to perform the necessary shutdown functions. The functions required should be based on previous analyses, if possible (e.g., in the FSAR), such as a loss of normal a.c. power or shutdown on a Group I isolation (BWR). The equipment required for the alternate capability should be the same or equivalent to that relied on in the above analysis.

The methods and equipment discussed in I is believed adequate to demonstrate safe shutdown capability in the event of various fire scenarios.

XII. Verification that repair procedures for cold shutdown systems are developed and material for repairs is maintained on site.

The only repair committed to in the analysis is the running of power cables to 480 and 4160 volt motors in various systems of the plant.

Instructions for cable handling and installation, including splicing, are contained in a Stone & Webster Instruction Manual located in the Maintenance Department titled Electrical Standards.

The equipment required to route and splice cables is available on site. There is no requirement or commitment to have cables on site.