

6.0 PROTECTION AGAINST WATER SPRAY TO CONFORM WITH 10CFR50 APPENDIX R

The Appendix R evaluation provides a reasonable assurance that at least one safe shutdown division is free of fire damage after a postulated fire in any fire area/zone. A safe shutdown component is free of fire damage if it can perform its intended functions before, during, and after the postulated fire without repair. Since the fire has to be extinguished by a fire fighting suppressant, the equipment located in the fire area/zone must be protected against not only the fire but also the fire suppressant if that equipment is required for the shutdown. The fire suppressant damage should not prevent the operation of the equipment for shutdown. The required equipment, located in the adjacent fire zones that do not have physical boundaries with the fire area/zones in question, must also be checked for possible fire suppressant damage.

A review of potential water damage was made to assure that the water damage to the shutdown system would not jeopardize the safe shutdown.

Mechanical components such as pipes and valves are not subject to fire suppressant damage. Electrical and electronic components are susceptible to water damage. Some electric cables, which are only suitable for use in dry locations, are prone to insulation failure under wet conditions. To guard against the water damage, all electrical and electronic equipment used outdoors are enclosed in some type of water (rain) proof enclosure (NEMA 3, 4, and 6 enclosure). Indoor electrical equipment in nonhazardous areas are normally provided with a NEMA 12 enclosure which protects the enclosed equipment against dust and light-splashing seepage or dripping liquid. The types of industrial enclosures provided for the electrical equipment at TMI-1 were reviewed and the extent of water damage was established for the redundant equipment located in the same fire area/zone. The building discussion provides a description of drainage capability and a listing of equipment reviewed for water damage. Vulnerability of shutdown equipment to water damage and the disposition to limit the water damage is discussed in detail. The following general discussion is for other electrical components and cables, which are not listed in the building discussion.

a. Pumps

Water damage to the makeup pumps, decay heat removal pumps, nuclear service river water pumps, and decay heat river water pumps, would not prevent safe shutdown because redundant pumps are located in the different fire zones. The physical boundaries existing between the adjacent fire zones provide reasonable assurance that the limit of fire damage will be contained to one train only. A discussion of other pumps is contained in Table 6-1.

b. Motor Operated Valves and Solenoid Valves

Water damage to electrical operation of the valves is no concern because valves will be manually operated. Moreover, the motor is totally enclosed and is unaffected by water spray.

c. Electrical Cables

All electrical cables used at TMI-1 are moisture and heat resistant cables suitable for use in dry and wet locations.

Moreover, the required cables in the fire area/zone will be either protected with fire barrier wraps or will be replaced with fire-rated Rockbestos Firezone R cables. Both the fire barrier wraps and Rockbestos Firezone R cables pass water hose stream tests and will withstand the water damage. The fire barrier material will be applied in such a manner to provide sealing of any paths which could allow water to enter electrical termination areas, such as conduits-to-tray interfaces and conduit or interlocked armored cable interface with electrical equipment. Splicing of the Rockbestos Firezone R cables will be made outside the fire area/zone where they are needed. Splicing made within the firezone will be enclosed in the watertight fire barrier.

d. Terminal Boxes

The terminal boxes that enclose the protected cables will also be protected with fire barrier wraps. No fire damage to the terminal boxes is expected.

e. Electrical Distribution Equipment

Electrical distribution equipment is located in different fire areas/zones. Fire suppressant damage to both trains of redundant electrical switchgears, control centers, and distribution panels is not expected.

f. Control Panels, Relay Cabinets, and ES Cabinets

Water damage to control panels, relay cabinets, ES actuation cabinets and HSPS cabinets is expected. No modification is required because the remote shutdown system is available for shutdown.