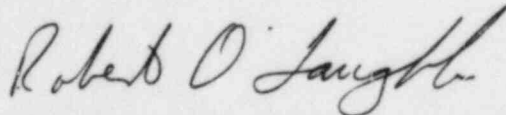


PROFESSIONAL LOSS CONTROL, INC.

EVALUATION  
OF  
FIRE DETECTION PLACEMENT  
AT  
FERMI 2  
DETROIT EDISON CO.

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## 1.0 Introduction

This report reviews the fire detectors placement in three specific nuclear safety related areas:

Control Room Complex

Torus ~~Area~~

Reactor

~~Area of the Auxiliary~~ Building Refueling Floor - 5th floor

The following sections will evaluate the need for fire detection in these three areas with specific emphasis on:

The fire area

Fire hazards

Safety related equipment

Fire protection

## 2.0 Control Room Complex

### 2.1 Fire Area

The control room is separated from the reactor building and turbine building by 3 hour fire resistance wall and floor/ceiling assemblies. The control room has a drop ceiling approximately 22 ft above the floor. The main ceiling is approximately 32 ft above this floor. The stairwell in the northeast corner of the room is enclosed by two hour fire resistive construction.

The ventilation air is supplied by the control center HVAC system. Supply and return ducts are provided with fire dampers at the three hour barriers.

The exterior finish material within the control room has a maximum flame spread of 25, smoke developed of 50 and fuel contribution of 50. The control room contains no carpet.

### 2.2 Fire Hazards

Combustibles in this area consist of electrical cable insulation, paper and plastics. The combustible loading within the room is less than 10 lb/ft<sup>2</sup>. No flammable or combustible liquids are used in this area except very small quantities permitted by procedures.

The amount of combustible material above the drop ceiling is negligible. The combustible loading is less than 1 lb/ft<sup>2</sup>.

### 2.3 Safe Shutdown Equipment

The control room contains the control and instruments necessary for safe shutdown.

### 2.4 Fire Protection

The control room is manned all of the time. The computer room (a peripheral room) is protected by an automated Halon 1301 fire suppression system. This system protects the computer room and the computer room underfloor area. A manual hose station is located just outside the south wall of the control room. Portable fire extinguishers (Halon and CO<sub>2</sub>) are located within the control room.

Ionization smoke detectors are located inside each of the control board panels. Smoke detectors are provided above the drop ceiling but do not conform to the spacing requirements of NFPA 72E (beam pocket criteria).

The kitchen room is provided with a spot thermal detector.

### 2.5 Conclusion

The fire detection capability within the control room complex is adequate to detect incipient smoldering and flaming mode fires. This is based upon:

The control room is manned all of the time.

The control room panels are provided with smoke detectors.

The amount of combustibles above the drop ceiling is negligible (<1 lb/ft<sup>2</sup>)

Therefore, placing additional detectors above the drop ceiling to conform with the spacing requirements in NFPA 72E will not significantly enhance the fire protection for the control room.

### 3.0 Torus

#### 3.1 Fire Area

The torus area is an octagonally shape room in the reactor building which extends from Elev. 540'-0" up to Elev. 583'-6". The room contains piping, cabling and the suppression pool (torus). The walls and floor are constructed of reinforced concrete. The ceiling assembly is constructed of reinforced concrete over steel beams.

The ventilation in the torus area is provided by conditioned air from the four basement corner rooms. The exhaust air is ducted to the main exhaust system.

#### 3.2 Fire Hazards

The combustible material in this area consists of electrical cable insulation. The total combustible loading for the torus area is 19,000 BTU/ft<sup>2</sup>. No in-situ flammable or combustible liquids are located in the torus area.

EPRI tests have demonstrated that electrical shorts will not propagate a fire in this type of insulation material. The EPR/Hypalon jacketed cable has a high degree of fire retardance.

#### 3.3 Safe Shutdown Equipment

The torus area contains Division I and II shutdown cables. The torus room conforms to the requirements of Appendix R except for filed deviations.

#### 3.4 Fire Protection

The torus area has an automatic sprinkler system that protects the entire area. This system will protect any exposed structure steel from thermal degradation during any fire condition. The water flow alarm for the sprinkler system transmits signals to the control room upon actuation.

Fire detection in the torus area consists of 8 ionization smoke detectors which are located adjacent to the exhaust duct grills. These detectors do not conform to the spacing requirements of NFPA 72E (beam pocket criteria).

### 3.5 Conclusion

The fire protection in the torus area is adequate to protect the safe shutdown capability of this area. The automatic sprinkler system will protect at least one of the functionally redundant systems which is needed for safe shutdown.

Additional fire detectors will not enhance to a sufficient degree the fire protection provided by the current configuration based upon:

Light combustible load (19,000 BTU/ft<sup>2</sup>)

Complete automatic sprinkler protection

High ceiling height (approximately 43 ft - will not detect a smoldering fire due to the lack of a thermal plume).

Spatial separation of functionally redundant equipment.

EPR/Hypalon cable insulation.

No in-situ flammable or combustible liquids in the area.

## 4.0 Refueling Floor - 5th Floor of Reactor Building

### 4.1 Fire Area

The refueling floor (El. 684'-6") of the reactor building is enclosed by outside walls on the north, south and west sides; the east wall separates the reactor building from the auxiliary building. The east wall is constructed of reinforced concrete up to Elev. 701' and provides a three hour fire resistance barrier between this area and the auxiliary building.

The roof consists of steel frame and built-up roof deck conforming to Factory Mutual Class 1 roof construction. The ceiling height is approximately 51 ft. The total volume of the room is 911,000 ft<sup>3</sup>.

The refueling floor contains the fuel storage pool, the dryer/separator pool, and the decontamination area.

The HVAC system supplies air directly thorough ducts to the floor area. Air is exhausted from these areas through ducts to the reactor/auxiliary building ventilation system.

#### 4.2 Fire Hazards

The types of combustibles on the refueling floor primarily consists of lubricating oil for the gear box in the fuel handling crane. The estimated total heat of combustion is 12,000,000 BTU with a combustible loading of 600 BTU/ft<sup>2</sup>.

Transit combustibles will be in the area during refueling periods.

#### 4.3 Safe Shutdown Equipment

The refueling floor contains no safe shutdown equipment.

#### 4.4 Fire Protection

Fire suppression equipment consists of four (4) manual hose stations and portable fire extinguishers (dry chemical and water types).

Ionization smoke detectors (8) are located at ceiling level but do not conform to the spacing requirements of NFPA 72E (beam pocket criteria).

#### 4.5 Conclusion

The fire protection provided on the refueling floor is capable of preventing the spread of fire from the refueling floor to areas containing safe shutdown equipment.

Additional detectors will not enhance the fire protection to a significant degree based upon:

A low combustible loading ( $<1 \text{ lb/ft}^2$ )

No in-situ flammable liquids in the area

A high ceiling height (51 ft) - smoldering fires will not be detected at this height. A significant thermal fire plume would have to be developed in a fire to cause the fire by-products to rise to the detectors on the ceiling.



DEVIATION REQUEST FOR  
FIRE DETECTOR REPLACEMENT

FOR  
REACTOR BUILDING BASEMENT CORNER ROOMS

PERFORMED BY DETROIT EDISON

## 1.0 Basement Corner Rooms

### 1.1 Fire Zones

The basement Corner Rooms consist of four unconnected triangular shaped rooms, one of which is located in each corner of the Reactor Building. Each room is comprised of two floors, one at elevation 540', the other at elevation 562'. An open stairwell in each room connects each floor. Walls and floors are reinforced concrete with unprotected openings. Specifically this evaluation is for the 562' elevations.

### 1.2 Fire Hazards

At the 562' elevation, combustibles consist of electrical cable insulation. Each room has 2 or 3 trays which run along the wall separating the Corner Room from the Torus Room. The trays are lightly loaded (less than 50% visual) and are located approximately 15 ft. off the floor. Each room has instrument racks located in it. No other fixed combustibles are present.

### 1.3 Safe Shutdown Equipment

Each room contains only one functionally redundant division of Appendix R shutdown equipment and cables.

### 1.4 Fire Protection

Fire detection is provided at each level. The basement level (562' elevation) detector does not meet the spacing requirements of NFPA 72E when evaluated against the beam pocket criteria contained within this standard. Additionally, the detector is located on the beam approximately 24 inches from the ceiling.

Manual hose stations and portable fire extinguishers are available in the zones.

### 1.5 Conclusion

The fire protection in the Corner Rooms is adequate to protect the safe shutdown capability of these areas. Placement of additional fire detectors does not enhance to a significant degree the fire protection provided by the current configuration based upon:

Light Combustible Loading  
EPR/Hypalon Cable Insulation  
Physical Separation of Functionally Redundant  
Equipment  
No Insitu Flammable or Combustible Liquids at the  
562' elevation

In addition, stratification of smoke is a distinct possibility due to the small fire loading. If a small delay of fire detection is postulated, the safe shutdown capability of the plant will not be jeopardized.

