TOLEDO EDISON
A Centerior Energy Company

DONALD C. SHELTON
Vice President—Nuclear
(419) 249-2300

Docket Number 50-346

License Number NPF-3

Serial Number 1719

September 30, 1989

United States Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Subject: Fire Protection, Appendix R Exemption Request Involving Conduits Embedded in Concrete.

Gentleman:

In letter dated July 31, 1989 (Serial Number 1694), Toledo Edison requested three additional exemptions from the requirements of 10CFR50, Appendix R. Subsequently, Toledo Edison determined the exemption request on embedded conduits required additional clarifying information and that the scope of the exemption requested should be limited to a specific set of fire areas containing embedded conduits. The revised exemption request on embedded conduits is presented in Attachment 1.

If you have any questions concerning this matter, please contact Mr. R. W. Schrauder, Nuclear Licensing Manager at (419) 249-2366.

Very truly yours,

KAS/ssg

Attachment

cc: P. M. Byron, DB-1 NRC Senior Resident Inspector
A. B. Davis, Regional Administrator, NRC Region III
D. J. Kubicki, NRC/NRR Staff Reviewer
T. V. Wambach, DB-1 NRC Senior Project Manager

A006
1/1

EMBEDDED CONDUITS

Exemption Requested

Certain circuits, required to achieve and maintain safe shutdown in the event of a fire, are enclosed in conduit and embedded in concrete walls, floors, duct banks or ceilings of the Davis-Besse Nuclear Power Plant. These circuits were evaluated in the safe shutdown analysis for a fire. It was identified that the existing fire protection features for the safe shutdown embedded circuits in Rooms 252, 314, 323, 324, 334, 427, 428, 430, 431, 501, 515, and 602 are not in accordance with the requirements of Section III.G of Appendix R to 10CFR50. However, as discussed below the fire protection features are sufficient to ensure one train of these circuits would be free of fire damage. An exemption is requested from Section III.G of Appendix R to 10CFR50, pursuant to 10CFR50.12, to obviate the need for modifying the existing fire protection features for these circuits embedded in concrete in Rooms 252, 314, 323, 324, 334, 427, 428, 430, 431, 501, 515, and 602.

Discussion

The circuits that are embedded in concrete and required for safe shutdown in the event of a fire are presently listed under Fire Area EMB in Appendix B-2 of the Davis-Besse Appendix R Compliance Assessment Report (CAR). The circuits are enclosed in conduits. These circuits were evaluated in the fire area(s) on either side of the wall, ceiling, or floor containing the embedded conduits. The analysis showed that there was no impact on safe shutdown capability for the circuits in embedded conduits except for the circuits in Rooms 252, 314, 323, 324, 334, 427, 428, 430, 431, 501, 515, and 602. Rooms 252, 314, 323, 324, 334, 427, 430, 431, 501, and 602 either have a combustible loading of 30 minutes or less or are protected by an automatic sprinkler system. Rooms 428 and 515 have a combustible loading of greater than 30 minutes and are not protected by automatic sprinkler systems.

Although the conduit embedment depth at Davis-Besse is not specifically dimensioned on design drawings, it is known that a minimum of 1 1/2 inches (2 inches nominal with a 1/2 inch tolerance) of concrete cover over the rebar for structures including those containing conduit was required. Two rebar mats are used in reinforced concrete walls at Davis-Besse, each may consist of two layers of rebar running perpendicular to each other. The minimum size of the rebar used in the subject walls, ceilings, duct banks or floors is a combination of number 5 and 6 rebar resulting in a 1 3/8 inch thickness. This configuration of the reinforced concrete walls provides a minimum conduit embedment of 2 7/8 inches (1 3/8 inches of rebar covered by 1 1/2 inches of concrete). This assumes the conduit is located directly behind the rebar mat. Based on the length of conduit runs that enter and exit each of these rooms it is highly improbable that the conduit is placed on only one layer of rebar.

Toledo Edison has also analyzed the potential impact of anchor bolts on the fire resistance of the concrete walls, floors, duct banks or ceilings. The

worst case anchor bolt conduit configuration has been analyzed. This analysis was based on the configuration of the minimum conduit embedment, an anchor bolt aligned directly with the conduit and the standard heat input specified by ASTM E-119 time-temperature curve. The analysis determined that the circuits' temperatures would not exceed 310°F in 30 minutes. Once the heat source is removed or extinguished, the hottest temperature in the conduit will continue to rise to approximately 370°F and then drop off. These temperatures are enveloped by the environmental qualification data for the cable used in the circuits embedded in these rooms/and thus the circuits will remain operable.

Evaluation

Toledo Edison has evaluated the existing fire protection measures provided for embedded conduits in Rooms 252, 314, 323, 324, 334, 427, 428, 430, 431, 501, 515, and 602 and has determined that these measures provide a level of protection equivalent to Section III.G of 10CFR50, Appendix R. These measures are:

1. An analysis of the worst case configuration (i.e., a minimum conduit embedment of 2 7/8 inches and anchor bolts in the concrete) was performed. The circuits' temperatures would not exceed 310°F in 30 minutes. Once the heat source is removed or extinguished, the hottest temperature in the conduit will continue to rise to approximatelyl 370°F and then drop off. These temperatures are enveloped by the environmental qualification data for the cable used in the circuits embedded in these rooms/and thus the circuits will remain operable.

2. Rooms 252, 314, 323, 324, 334, 427, 430, 431, 501, and 602 either have a combustible loading of 30 minutes or less or are protected by an automatic sprinkler system. In those rooms with a combustible loading of 30 minutes or less, the passive protection of the concrete will maintain the circuits at an acceptable temperature and thus they will remain operable. In those rooms with a combustible loading of greater than 30 minutes and an automatic sprinkler system, the passive protection of the concrete and the active protection provided by the automatic sprinkler system will maintain the circuits at an acceptable temperature and thus they will remain operable.

3. Room 428 has a combustible loading greater than 30 minutes and is not protected by automatic sprinkler systems. In this room the passive protection of the concrete will maintain the circuits at an acceptable temperature and thus they will remain operable. Room 428 is provided with fire detection zones which would alert Control Room personnel to a fire and they would initiate the response of the Fire Brigade. Within 30 minutes, the fire brigade would respond to extinguish the fire and the circuit temperature will remain at an acceptable temperature and thus they will remain operable.

4. Room 515 has a combustible loading greater than 30 minutes and is not protected by an automatic sprinkler system. However, ninety-five percent of the total combustible load is charcoal which is contained in three charcoal filters that are within heavy metal plenum boxes as part of the ventilation system. The charcoal has an extremely slow burn rate. Also it is

reasonable to assume that only one of the charcoal filter plenums would be on fire at a time. Even though the combustible loading exceeds 30 minutes, the effect of any potential fire is very limited and the passive protection of the concrete will maintain the circuits at an acceptable temperature and thus remain operable.

5. The Davis-Besse Fire Brigade has a minimum shift size of five members and is onsite at all times in accordance with Technical Specification 6.2.2.f. The Fire Brigade does not include the members of the minimum shift crew necessary for safe shutdown of Davis-Besse during a fire emergency. The Fire Brigade has established training programs and fire drills under existing administrative controls. Normal fire brigade response at Davis-Besse has been timed in drills at less than 15 minutes from alarm initiation to providing water on the fire.

6. Figure 7-8E of the NFPA Handbook, 16th Edition, indicates that 2 7/8 inches of concrete provides over 45 minutes of fire resistance. The analysis considered the impact of the anchor bolts which could reduce the fire resistance of the concrete. The analysis has a number of conservatisms that if removed from the calculation, would cause the fire resistance to approach the equivalent fire resistance of the concrete without considering the anchor bolts. The analysis is conservative for the following reasons:

   a. The heat input to the calculation was the ASTM E-119 time-temperature curve. The actual combustible loading in the rooms would not result in the assumed heatup rate.

   b. The calculation assumed the anchor bolt is in direct alignment with the conduit and is the largest size normally allowed with a embedment of 2 7/8" or less. Actually, it is highly improbable that the anchor bolt is in direct alignment with the conduits or is near the conduits due to the small surface area of the conduit relative to the large surface area of the wall, floor, duct banks, or ceiling. Also the minimum conduit embedment is based on combining the minimum concrete cover and rebar sizes which are both not likely to occur where an anchor bolt is located.

Consequently, Toledo Edison has determined that the existing fire protection features provided for the embedded conduits would ensure one train of equipment necessary to achieve and maintain safe shutdown in the event of a fire is free of fire damage and, thereby, provide an equivalent level of fire protection as required by Section III.G of Appendix R. Additionally, the imposition of additional modifications simply to satisfy the methods specified by Appendix R of 10CFR50 for the embedded conduit would not significantly enhance the level of fire protection currently provided.

Applicable Special Circumstance

Toledo Edison has determined that the requested exemption conforms to the applicable exemption criteria of 10CFR50.12(a). There are no prohibitions of law to preclude the activities that would be authorized by the requested exemption, and the requested exemption, if granted, would have no impact on the

common defense and security. Additionally, the requested exemption does not present an undue risk to the public health and safety since an equivalent level of fire protection as required by Section III.G of Appendix R is provided as described above.

Special circumstances are applicable to the requested exemption in accordance with 10CFR50.12(a)(ii) in that application of the regulation for these particular circumstances is not necessary to achieve and maintain hot standby. The underlying purpose of the rule is satisfied by the requested exemption since the existing fire protection features described above provide an equivalent level of fire protection as required by Section III.G of Appendix R and the installation of modifications simply to satisfy the methods specified by Appendix R is not necessary.

Additional special circumstances are applicable to the requested exemption in accordance with 10CFR50.12(a)(iii) in that the application of the regulation would represent an unwarranted burden on Toledo Edison resources. The modification of the current fire protection features for the embedded conduits would result in the considerable expenditure of engineering, construction and plant staff resources for its design and installation. Modification of the existing walls, ceilings, and floors with the installed equipment present is extremely impractical and would require an extended outage. Also rerouting of the circuits would to be extremely difficult and would require an extended outage. The associate costs would include:

- Engineering, construction, and installation of additional fire barriers on walls, ceilings, and floors or increase the concrete embedment to achieve a three hour fire rating through many rooms of the plant or to provide circuit reroutes.

- Additional fire barriers on walls, ceilings, and floors or the increase in the concrete embedment would significantly increase congestion in the plant, complicating future plant modifications and operation. Similarly, rerouting embedded circuits outside the fire areas would increase congestion and complicate future plant modifications and operations.

The high costs associated with modification of the existing fire protection features for embedded conduits would represent an unwarranted burden on Toledo Edison resources considering the resulting negligible safety benefit and the alternative means of fire protection described above.

In conclusion, Toledo Edison considers that special circumstances in accordance with 10CFR50.12(a)(2)(ii) and 50.12(a)(2)(iii) are present to justify the requested exemption. The imposition of additional modifications simply to satisfy the methods specified by Appendix R of 10CFR50 is not necessary to satisfy the underlying purpose of the rule since the existing fire protection features provided for embedded conduits would ensure one train of systems necessary to achieve and maintain hot standby is free of fire damage and, thereby, provide an equivalent level of fire protection as required by Section III.G of Appendix R. Additionally, the imposition of additional modifications

simply to satisfy the methods specified by Appendix R of 10CFR50 represents an unwarranted burden on Toledo Edison resources considering the resulting negligible safety benefit.