TECHNICAL EVALUATION REPORT INTERNAL CONDUIT FIRE SEAL PROGRAM DONALD C. COOK NUCLEAR PLANT UNIT NOS. 1 AND 2 TAC Nos. 61686/7



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FOREWORD

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This Technical Evaluation Report was prepared by Science Applications International Corporation (SAIC) under a contract with the U.S. Nuclear Regulatory Commission (Office of Nuclear Reactor Regulation) for technical assistance in support of NRC operating reactor licensing actions. The technical evaluation was conducted in accordance with criteria established by the NRC.

TECHNICAL EVALUATION REPORT

INTERNAL CONDUIT FIRE SEAL PROGRAM

DONALD C. COOK NUCLEAR PLANT UNIT NOS. 1 AND 2

INTRODUCTION

By letter dated October 20, 1988 Indiana Michigan Power, the Licensee, submitted to the NRC, a discussion of the internal conduit seal program for D.C. Cook Nuclear Plant Units 1 and 2. This submittal addresses Open Item 2.r from NRC Inspection Report 85013 dated August 23, 1985.

This Technical Evaluation Report (TER) documents an independent review of the information submitted by the Licensee and an assessment of whether closure of the open item is warranted.

DISCUSSION

The fire protection licensing basis for D.C. Cook is Appendix A to BTP APCSB 9.5-1. Section D.1.J of this document states "Floors, walls and ceilings enclosing separate fire areas should have minimum fire ratings of three hours. Penetrations in these fire barriers, including conduits and piping, should be sealed or closed to provide a fire resistance rating at least equal to that of the fire barrier itself...." This guideline does not specifically call for sealing inside of conduits. Subsequent NRC fire protection guidelines included in BTP CMEB 9.5-1 specifically identify criteria for installing internal conduit seals.

The Safety Evaluation of the Licensee's fire protection program dated July 31, 1979 states "The penetration fire stops are provided to prevent the movement of fire from one area to another along the electrical cables which run through these fire areas. Silicone foam poured in and around the cable trays and conduits where they penetrate fire barriers make up the penetration fire stops." The NRC Safety Evaluation was based on the Licensee's response to Appendix A to BTP APCSB 9.5-1 dated July 31, 1977 and the plant Fire Hazards Analysis dated March 31, 1977. During an NRC Region III inspection of the plant, conducted April 29 through May 3, June 21, and August 5 through 9, 1985 the inspector reviewed the licensee's penetration sealing program. This review included a discussion of a licensee internal memo dated May 3, 1984. This memo identified a program to provide internal conduit seals on all newly installed conduit; however, the program was not retroactive and, therefore, did not address previously installed conduits. Based on the review, the inspector concluded that the reference to fire seal. "in and around the cable trays and conduits" in the 1979 SER constituted a commitment by the Licensee to provide internal conduit seals and therefore, all conduits should have internal seals contrary to the memo. The Licensee took the position that no commitment was made for internal conduit seals and that the wording in the SER was misinterpreted. The Licensee maintained that "in and around" was intended to apply to cable trays and that only "around" was intended to apply to conduits. The NRC inspection report left this as Open Item 2.r.

Subsequent to the inspection, the NRC Chemical Engineering Branch of the Office of Nuclear Reactor Regulation (NRR) reviewed this issue by request of NRC Region III. NRR informed the Region on May 16, 1985 that the intent of the July 31, 1979 SER statement on fire seals was for the Licensee to seal the inside of conduits. NRR further stated that if the Licensee could provide justification for not sealing the inside of conduits, this justification would be reviewed and dispositioned accordingly. This clarification of the SER was provided to the Licensee by Region III on May 17, 1985 and also included in the August 23, 1985 inspection report.

The Licensee submittal of October 20, 1988, with which this TER is primarily concerned, provides a reiteration by the Licensee of its original position, that it was in compliance with Appendix A to BTP APCSB 9.5-1; however, it also provides a commitment to provide seals based on criteria in the submittal. The submittal states that the criteria is based on information included in a report entitled "Conduit Fire Protection Research Program" which was submitted to the NRC by Wisconsin Electric Power Company on November 4, 1987. The criteria proposed for internal conduit sealing at D.C. Cook, as included in the October 20, 1988 submittal is as follows:

- An open-ended conduit is one in which the contained cables exit the conduit into an open air space rather than into an enclosure attached to the conduit.
- The distance specified for conduit terminations, in Items 4, 5, and 6 below, represent the linear length of the conduit as measured from the point of exit from the penetration.
- 3. When both ends of any size double open-ended conduit terminate at the wall, it will be treated as a sleeve and sealed in accordance with the fire barrier penetration seal program.
- Double open-ended conduits smaller than 2 inches in diameter will be sealed on at least one end when either end of the conduit terminates less than one foot from the barrier.

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- Double open-ended conduits 2 inches in diameter will be sealed on at least one end when either end of the conduit terminates less than 3 feet from the barrier.
- 6. Double open-ended conduits greater than 2 inches in diameter will be sealed on at least one end when either end of the conduit terminates less than 3 feet from the barrier or has a cable fill of less than 40 percent.
- The seal inside of conduits will, as a minimum, be as described in the research program report.

The Licensee states that all new installations or resealed conduit will be sealed to this criteria and that existing conduits are already sealed, as a minimum, to this criteria. The Licensee states that the conduit sealing program is based on a conservative approach and exceeds its licensing requirements and therefore, Item 2.r from Inspection Report NRC 85013 should be closed.

EVALUATION

The staff initially reviewed the report "Conduit Fire Protection Research Program" which was used as the basis for the proposed sealing criteria at D.C. Cook. As a result of this review, several concerns were raised regarding the parameters used to support test conclusions.

The NRC staff was concerned with use of the term "closed" to define an acceptable termination of conduit. It is agreed that the reported test results support the conclusion that termination of conduit in a junction box provides reasonable assurance that fire and smoke will not propagate beyond the junction box. However, there was concern that also including the term "noncombustible closure" under the definition for "closed" may allow for misinterpretation of the test findings. Test sponsors indicated during a meeting on July 12, 1988, that noncombustible closure is intended to be limited to conduits which are sealed with an approved noncombustible material. Therefore, "closed" is to be defined as a conduit terminating in a junction box or sealed with a noncombustible material. Based on this, it would not be acceptable for a licensee to define noncombustible closure as an equipment cabinet, metal cabinet or some other type of enclosure other than a junction box unless an analysis is performed which demonstrated that enclosure would prevent the passage of fire and smoke to the unexposed area at least equivalent to that protection provided by a junction box. It should also be noted that any conduits, cables and components also being iocated within the terminating enclosure of concern must be evaluated as associated circuits under 10 CFR 50 Appendix R.

The D.C. Cook submittal defines open-ended conduit as one in which the contained cables exit the conduit into an open air space rather than into an enclosure attached to the conduit. Since the Licensee uses the term "enclosure" in its definition of "open" conduit, it must therefore ensure

that its enclosures are at least equivalent to the protection provided by a junction box.

The staff was concerned that the application of the proposed sealing criteria in the research program report may not be applied to both sides of a barrier, potentially allowing for an untested configuration to be installed. This is of concern since the conclusions drawn from the test data can only be substantiated for the configurations on the unexposed side of the test slab. Therefore, this concern is eliminated if a licensee ensures that the sealing criteria is implemented in all fire areas regardless of the configuration on the opposite side of the barrier.

The proposed criteria for D.C. Cook does differ in that it uses the phrase "double open-ended" and establishes that this type of conduit will be provided with a seal on at least one side. The research program report criteria are concerned with the sealing requirements within a fire area, and therefore seals may be required at both ends of a "double open-ended" conduit if the specified criteria in the research program report are not This may allow for variation in required seals between the D.C. Cook met. criteria and the research program criteria. However, the sealing program proposed for D.C. Cook is considered to be more conservative than that required by Appendix A to BTP APCSB 9.5-1 and therefore, as a minimum, complies with regulatory guidelines. It must also be noted that the Licensee did initiate a conduit sealing program in 1984 which provided internal seals in a number of conduits in compliance with BTP CMEB 9.5-1. While the Licensee has stated that this program should not be construed has a commitment to the more recent NRC guidelines, it does mean that many internal seals, installed to current NRC criteria, are in the plant and would serve the purpose of preventing fire propagation it necessary. This provides additional conservatism in the Licensee's fire protection program.

The research program report has incorporated the parameter of percent cable fill into the sealing criteria. The staff was concerned over the use of 40% cable fill as a cutoff point for no sealing and that use of cable fill in sealing criteria could be a difficult program to implement and also to enforce.

The specific concern for the 40% level or greater as a level requiring no seals for certain size diameter conduits is whether this would be a conservative value. The level of 40% is generally considered to be maximum fill and a majority of conduits are filled to this level. Therefore, if the level requiring no seals was 41%, a large number of conduits not requiring seals would now require seals. This was discussed with test sponsors during the July meeting. The test sponsors were able to demonstrate that the test results supported cable fill as a contributing factor to eliminate seals and additionally that cable fill helped to prevent the passage of flames and smoke at levels far less than 40%. Therefore, it is concluded that the use of cable fill is a legitimate parameter and the establishment of 40% or greater as the level not requiring seals for certain conditions is corsidered to be a conservative value.

The staff was also concerned that using cable fill as a parameter would present implementation problems for licensees and would be difficult to verify both by plant personnel during periodic inspections and by NRC This issue was discussed at length among the NRC and test inspectors. sponsors. The sponsors indicated that cable fill is the least controlling parameter and therefore the last one to be considered when determining the need for conduit seals. It was indicated that if plants do have a detailed tracking system for conduits which includes percent of cable fill in addition to other parameters of concern, these systems would be the basis for determining the need for seals and could be readily accessible by both plant inspection personnel and NRC inspectors. The staff agrees that there is sound technical justification to use percent cable fill as one of the sealing parameters. However, licensees choosing to use this parameter must accept the burden of providing a tracking program that is functional and can be readily demonstrated to satisfy the accepted criteria.

The proposed D.C. Cook criteria incorporates the 40% cable fill criteria as one of the determining parameters. The review of the research program demonstrated that use of cable fill was a valid parameter; however, since D.C. Cook chose to use this parameter, they accept the burden of maintaining a program to adequately track cable fill.

Based on the submittal by D.C. Cook dated October 20, 1988 and the report "Conduit Fire Protection Research Program" dated November 4, 1987 for which it was based, it is concluded that the proposed internal conduit sealing method for D.C. Cook is in compliance with the licensing basis of the plant and provides reasonable assurance that fire and significant smoke and hot gases would not propagate from one fire area to another. Therefore, the Licensee has provided adequate justification for their conduit sealing program and Open Item 2.r from Inspection Report 85013 should be closed.

CONCLUSION

Based on a review of the Licensee submittal dated October 20, 1988 and evaluation of a report entitled "Conduit Fire Protection Research Program," the internal conduit sealing program proposed by the Licensee for D.C. Cook has been found to be in compliance with Appendix A to BTP APCSB 9.5-1. In addition, the Licensee has provided adequate justification for its internal conduit sealing program and therefore, Open Item 2.r from NRC Inspection Report 85013 should be closed.