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Subject: Fire Protection - Interpretation of Technical Specification
3/4.7.10, Fire Barriers

Gentlemen:

On August 1, 1990 and August 2, 1990, Toledo Edison (TE) discussed an interpretation of Davis-Besse Nuclear Power Station, Unit 1 Technical Specification 3/4.7.10, Fire Barriers, with Staff personnel of the Nuclear Regulatory Commission (NRC) Office of Nuclear Reactor Regulation and Region III. Toledo Edison also discussed the technical justification for performing one-sided fire barrier inspections which supported the interpretation.

Attached for NRC Staff review are both the interpretation and the technical justification. NRC Staff concurrence is requested in an expeditious manner as Toledo Edison is retaining the in-place compensatory measures until verbal concurrence is provided by the Staff.

Should you have any questions or require additional information, please contact Mr. R. W. Schrauder, Manager - Nuclear Licensing, at (419) 249-2366.

Very truly yours,

KBR/mmb

cc: P. M. Byron, DB-1 NRC Senior Resident Inspector
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Technical Specification Interpretation for Technical Specification
Surveillance Requirements 4.7.10a and 4.7.10c

I. Background Information:

The Limiting Condition for Operation for Technical Specification (TS) 3.7.10 states:

"All fire barriers separating portions of redundant safe shutdown systems required in the event of a fire shall be OPERABLE."

The Surveillance Requirements (SR) for barriers (TS 4.7.10a) and seals (SR 4.7.10c) state that:

Each of the above required fire barriers, including sealing devices, shall be verified OPERABLE by:

- a. Performing a visual inspection of the exposed surfaces of each fire-rated wall, floor and ceiling, electrical raceway fire enclosure and structural steel fire-proofing at least once per 18 months.
- b. ...
- c. Performing a visual inspection of at least ten percent of each type of sealed penetration at least once per 18 months..." (Additional action is further cited if the first ten percent is unsatisfactory).

SR 4.7.10a has an asterisked footnote that states: "Barrier 102 West/210 East and a portion of barriers 206 East/210 West and 205 North/206 South behind the filter bank are not subject to the requirements for visual inspection due to ALARA considerations."

During a recent review of the fire barrier 18-month surveillance implementing procedure "18 Month Rated Barrier Visual Inspection" (DB-FP-03023), it was identified that the procedure, to meet the requirements for inspection of "exposed surfaces", allowed for one-sided inspections of barriers with "unresolvable inaccessibilities". A similar situation exists with SR 4.7.10c (penetration seals) in that the inaccessible side of some seals has not been inspected.

II. Statement of Requested Interpretation:

Does a one-sided inspection of barriers and penetration seals that are inaccessible due to physical constraints or ALARA considerations, regardless of plant operational status, meet SR 4.7.10a and SR 4.7.10c requirements for exposed barrier surface and sealed penetration inspection?

III. Investigation:

On June 27, 1986, Surveillance Test Procedure ST 5016.11, Revision 5, "Fire Barrier Penetration Seal Surveillance Test" was issued. This procedure required barrier seal inspections to be performed per IP-M-008, "Fire and Associated Barrier Penetration As-Built Verification Data Collection". Step 6.8 of IP-M-008, Revision 2, dated July 7, 1986, states: "For those barriers where inspection of the opposite sides of the penetration seals is not possible due to ALARA considerations or unresolvable inaccessibility, the Engineering Team Leader shall indicate so in the comments column ...".

On December 7, 1987, Toledo Edison submitted a License Amendment Request (LAR) (Letter Serial Number 1446) to "Revise Technical Specifications related to Fire Protection Barriers in order to reflect the current plant design, testing and compensatory measures considered to be adequate and practical [emphasis added]." This LAR also proposed new Surveillance Requirements that addressed the following fire barriers: fire-rated walls, floors and ceilings, electrical raceway fire enclosures, and structural steel fire-proofing. This submittal requested replacement of the SR 4.7.10a wording from "At least once per 18 months by a visual inspection" for fire barrier penetration seals to "Performing a visual inspection of the exposed surfaces of each fire-rated wall, floor and ceiling, electrical raceway fire enclosure and structural steel fire-proofing at least once per 18 months." The LAR also requested addition of a footnote to SR 4.7.10a that exempted both sides of certain barriers from the visual inspection requirements due to ALARA considerations and a separate surveillance requirement for penetration seals penetrations was retained.

On February 25, 1988, Amendment Number 106 was issued by the NRC which approved the requested changes.

On March 24, 1988, surveillance procedures DB-FP-03023, "18 Month Rated Barrier Visual Inspection", and DB-FP-03025, "18 Month Ten Percent Penetration Seal Visual Inspection", were issued to implement the new SR 4.7.10a and SR 4.7.10c requirements, respectively. Both of these procedures allowed one-sided inspections like the previous procedure (ST 5016.11 as implemented by IP-M-008).

A review of the LAR which had been submitted in December 1987 was performed. Although the LAR does not explicitly state that one-sided inspections are considered as an acceptable method of meeting the surveillance requirements, it does state that the intent was to revise TS 3/4.7.10 to reflect current plant testing. As established by a review of the surveillance procedures for fire barrier penetration seals, the plant practice since at least 1986 was to allow one-sided inspections.

A technical justification was prepared to document the acceptability of a one-sided barrier or barrier seal inspection (Reference 3).

A review of the Fire Hazards Analysis Report, the Updated Safety Analysis Report (USAR) (Section 9.5.1), and relevant fire protection correspondence was conducted. No additional information pertinent to this interpretation was identified.

Based on the above review and further supported by the technical justification, it was concluded that it has previously been the intent and is still correct to interpret SR 4.7.10a for the exposed surfaces inspection and SR 4.7.10c for the penetration seals inspection as allowing one-sided inspections of those barriers where inspection of the opposite side is prevented due to physical constraints or ALARA considerations.

IV. Interpretation:

It has been determined that SR 4.7.10a and SR 4.7.10c permit the one-sided inspection of barriers when physical constraints or ALARA considerations (defined as the barrier being inside a high radiation area (>100 mrem/hour exposure to personnel) regardless of plant operational status) render the opposite side inaccessible. For these barriers the inaccessible side is considered to be unexposed for inspection.

The following definition of the term "unresolvable inaccessibility", used in IP-M-008, is provided for clarity in implementing SR 4.7.10a and SR 4.7.10c:

Any barrier that requires equipment to be unbolted or dismantled, destruction of a covering surface, or use of cranes or hoists to remove plugs to gain access are considered to be unexposed.

Following the relocation of the Fire Protection Technical Specifications to the USAR in accordance with Generic Letter 86-10, the content of this Technical Specification Interpretation Request (TSIR) will be incorporated into the USAR and this TSIR canceled.

V. References:

1. Toledo Edison Letter Serial Number 1446, dated December 7, 1987.
2. Amendment 106, dated February 25, 1983.
3. Technical Justification for One-Sided Fire Barrier and Seal Inspections to Determine As-Designed Configuration to Meet SR 4.7.10a and 4.7.10c Requirements.
4. ST 5016.11, Revision 5, Fire Barrier Penetration Seal Surveillance Test.
5. IP-M-008, Revision 2, Fire and Associated Barrier Penetration As-Built Verification Data Collection.
6. Licensee Event Report 90-13.

TECHNICAL JUSTIFICATION FOR ONE-SIDED FIRE BARRIER AND SEAL INSPECTIONS
TO DETERMINE AS-DESIGNED CONFIGURATION TO MEET
SR 4.7.10a AND 4.7.10c REQUIREMENTS

I. Introduction

The function of Technical Specification-related fire barriers and fire seals within the barriers is to confine or adequately retard the spread of a fire such that redundant safe shutdown equipment will not be affected. This function would then ensure that safe plant shutdown can be achieved in the event of a single exposure fire. Periodic inspections are dictated by the surveillance requirements of the Technical Specifications to maintain the fire barriers, including fire seals, within the as-designed configuration. The designed configuration is based upon either fire tests or an engineering evaluation of the suitability of deviations from the tested configuration. This document justifies that, under certain conditions, a visual inspection of one side of the barrier or seal will adequately confirm that the entire barrier or seal is maintained within the design configuration.

II. Discussion

Prior to the Amendment Number 106 change to Technical Specification Surveillance Requirement (SR) 4.7.10a, the only inspection required was for the fire barrier seals. The implementing procedure for SR 4.7.10a was ST 5016.11, "Fire Barrier Penetration Seal Surveillance Test", which provided general guidance on inspection and referenced a detailed inspection plan (IP-M-008, "Fire and Associated Barrier Penetration As-Built Verification Data Collection"). This inspection plan, dated July 7, 1986, stated in Step 6.8, "For those barriers where inspection of the opposite sides of the penetration seals is not possible due to ALARA considerations or unresolvable inaccessibility, the Engineering Team Leader shall indicate so in the comments column...". The end result of this plan was that the inspection package was approved without an inspection of the opposite side by Engineering and Quality Control. The scope of inspection plan, IP-M-008, addressed fire barriers as well as barrier seals because all parts of the fire barriers were inspected to develop as-built drawings for any penetrations.

On February 25, 1988, the NRC issued Amendment Number 106 to the Technical Specifications. In this amendment, SR 4.7.10a states that fire barriers, including sealing devices, shall be verified OPERABLE by, "Performing a visual inspection of the exposed surfaces of each fire-rated wall, floor and ceiling, ... at least once per 18 months." In addition a visual inspection of at least ten percent of each type of

sealed penetration at least once per 18 months is specified in SR 4.7.10c. The exposed surface inspection of fire barriers and visual inspection of fire seals was intended to ensure that the part of the seal that was subject to damaging exposure would be inspected to determine the suitability of the entire barrier or seal.

The fire barrier penetration seal material is the weak link in the overall boundary construction (excluding doors and dampers from the discussion). The barriers for which only a one-sided inspection was performed contained either grout, silicone foam (low density) or elastomer (high density) seals. Toledo Edison has established, through a review of construction records, that there is a reasonable assurance that these seals were properly installed. Toledo Edison has reviewed the radiation, temperature, and physical damage characteristics of these materials and determined that the limiting seal materials are silicone foam and elastomer. The properties of silicone foam and elastomer are such that the radiation resistance and temperature performance characteristics are significantly greater than the plant design conditions for these parameters. Physical damage is of concern only for the silicone foam seals. Humidity is not a concern as all three of these seals are also used for sealing penetrations in flood barriers.

Toledo Edison reviewed the group of seals that had been inspected on one side only and determined that the silicone foam seal used in high radiation areas was the most susceptible to damage. This is because the non-inspected sides of other seals in the one-sided inspection group are either physically protected from damage (e.g. they are covered by plaster, concrete block walls constructed in front of the fire barrier but not part of the fire barrier, steel liner plate, fire wrap material covering a conduit that has a penetration seal at the barrier, or equipment that is permanently placed over the seal) or are elastomer seals. The radiation resistance characteristics of both the silicone foam and elastomer ensure a wide margin of protection when used in the high radiation areas. The highest continuous radiation levels at Davis-Besse, when conservatively estimated, result in an expected seal life of over 100 years. Because the uninspected sides of the silicone foam and elastomer seals are located in high radiation areas that require cranes and/or hoists to remove access plugs, personnel access is restricted and thus physical degradation is not expected. Therefore, a one-sided inspection would reflect the as-designed condition for either side of the seal with respect to radiation effects.

The remaining factor for degradation would be the temperature of the penetrating pipe that is surrounded by the elastomer seal. With the symmetrical configuration of the pipe penetrating through a barrier any degradation to the elastomer seal caused by a hot pipe is expected to be equally apparent on either side of the barrier. The temperature characteristics of the elastomer provide a 200F° margin of protection between the highest expected normal operating room temperatures and onset of seal degradation. Thus, a one-sided inspection would reflect the as-designed condition for either side of the seal with respect to temperature effects.

Internal conduit seals warrant a separate discussion due to their unique configuration. Fire-rated internal conduit seals are inspected on only one side due to the installation practice of providing a junction box or access point on only one side with a continuous conduit extending out from the other side. This condition represents a physical covering on one side that does not expose the seal to degrading elements. The other classification of internal conduit seal is the smoke and hot gas seal that is not considered part of the fire rated barrier. These seals are inspected upon installation but are not periodically reinspected due to the protective covering provided by the conduit/junction box. The fire rating of the barrier is maintained even if the smoke and hot gas seal is degraded, but installation of these seals is provided to prevent the spread of smoke and hot gases that may affect sensitive electrical equipment. The criteria for installation of smoke and hot gas seals is discussed in TE letter dated May 27, 1987 (Serial Number 1361).

For the barriers/seals that are inspected on both sides a population exists that would bound all possible detrimental elements, excluding radiation levels, for the barriers/seals that receive one-sided inspections. These inspection results are evaluated by Engineering to ensure that if degradation is found where there is a general concern that may apply to the seals inspected on only one side, appropriate actions can be taken to inspect or replace suspect seals.

III. Conclusion

The practice of inspecting one side of fire barriers or fire seals that are unexposed or not accessible due to long term ALARA reasons or unresolvable inaccessibility is appropriate to ensure the as-designed condition is maintained.