

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

December 13, 1984

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of the Application of) Docket Nos. 50-390
Tennessee Valley Authority) 50-391

Enclosed for NRC review is justification and a request for deviation from 10 CFR 50 Appendix R Section III.G.2b, concerning intervening combustibles at Watts Bar Nuclear Plant. This request and justification is based on utilization of sprinkler criteria described by TVA to the NRC during appeal meetings on this subject on August 29 and November 14, 1984.

If you have any questions concerning this matter, please get in touch with D. P. Ormsby at FTS 858-2682.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. A. Domer
J. A. Domer
Nuclear Engineer

Sworn to and subscribed before me
this 13th day of Dec. 1984

Bryant M. Lomery
Notary Public
My Commission Expires 4/8/86

Enclosure

cc: U.S. Nuclear Regulatory Commission (Enclosure)
Region II
Attn: Mr. James P. O'Reilly Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30303

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WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
APPENDIX R SECTION III.G.2.b

15. Deviation - Section III.G.2.b. of 10 CFR 50 Appendix R requires separation of redundant paths of safe shutdown cables and equipment by a horizontal distance of more than 20 feet with no intervening combustibles. In addition, the section requires fire detectors and an automatic fire suppression system to be installed in the fire area containing the redundant cables and equipment. Contrary to these requirements, the Auxiliary Building has open ladder-type cable trays located between redundant cables and equipment that will be separated by more than 20 feet. The insulation on cables in these trays is considered an intervening combustible material.

Justification - The locations in the Auxiliary Building where redundant cables and equipment are spacially separated have no significant in-situ fire hazards present except for cable insulation in the cable trays. The presence of these intervening combustibles between redundant cables and equipment is a concern for two reasons. First, they could add to the fire's thermal plume. Secondly, they could provide a path for the fire to propagate between redundant cables and equipment. TVA proposes to address these concerns by relying upon existing ceiling level sprinkler systems coupled with supplemental sprinkler protection, where required, to compensate for the intervening combustibles.

Sprinkler coverage has been provided at the ceiling level in rooms containing redundant safe shutdown circuits and equipment. Due to the presence of obstructions such as HVAC ducts, cable trays, pipes, and supports, these systems have been upgraded in accordance with the criteria in Attachment 1. This criteria application has resulted in the addition of a significant number of sprinkler heads to provide full coverage at the ceiling level and to compensate for large intermediate level obstructions. Thus the modified systems will release large quantities of water in well developed patterns at the ceiling during a fire, and the water will cascade down through the cable trays and intermediate obstructions. The cooling effect of this water will prevent the formation of a high temperature heat plume and will control room temperatures. The cascading effect of the water will stop the propagation of fire along cable trays between redundant cables and equipment. Therefore, transient combustibles at the floor level present the only significant fire exposure to the redundant cables and equipment.

To mitigate the effects of an exposure fire from transient combustibles at the floor level, TVA will ensure that floor level sprinkler coverage is provided under intermediate obstructions for up to a 30-foot wide path for spacially separated redundant cables and equipment. The criteria in Attachment 2 will be utilized to ensure this floor coverage. By coupling the ensured floor level coverage

with the full listing level protection, an exposed fire located in the protected path between redundant cables and equipment will be quickly extinguished. In addition, a fire originating outside the protected path will not propagate between the redundant cables or equipment due to the effective water barrier that will be formed from floor to ceiling between the redundant cables or equipment.

The use of the sprinklers below intermediate level obstructions to compensate for intervening combustibles has been recommended by the staff in meetings on August 29, 1984, and September 13, 1984, and in a letter from Thomas M. Novak to H. G. Parris dated November 6, 1984.

It is TVA's position that existing sprinkler systems which meet the criteria in Attachment 1 coupled with the sprinkler coverage resulting from the criteria application in Attachment 2 will provide a level of protection that adequately compensates for the presence of intervening combustibles located between spacially separated redundant safe shutdown cables and equipment and the intent of Section III.G.2.b will be satisfied. We, therefore, request approval of this deviation.

ATTACHMENT 1
CRITERIA FOR RESOLVING OBSTRUCTION TO SPRINKLER SYSTEM
SPRAY PATTERNS AT WATTS BAR NUCLEAR PLANT

1.0 Objective

The object of this criteria is to document the process being utilized by TVA to evaluate obstructions located in the spray patterns of sprinkler heads in the fire protection systems at Watts Bar Nuclear Plant.

2.0 Areas of Criteria Application

This criteria shall be applied to each sprinkler head in the fire protection systems located in structures containing safety-related equipment.

3.0 Acceptance Criteria for Existing Sprinkler Heads

3.1 Each sprinkler head shall be evaluated individually to determine its ability to develop a full 360-degree spray pattern projected over a 130-square-foot area at the ceiling level.

3.2 Obstructions, such as structural members, cable trays, conduits, HVAC ducts, pipes, hangers, and light fixtures, shall be evaluated when they are located in the projected area of coverage of a sprinkler head.

a. The required clearance between the obstructions and heads is dependent upon the size of the obstructions and shall be evaluated per the guidelines in NFPA 13-1983, sections 4-2.3, 4-2.4, 4-2.5, B-4-2.3, and 4-4.13.

b. The cumulative vertical effects of obstructions that prevent development of the spray pattern shall also be evaluated. For example, a stack of cable trays or a bank of conduits or pipes should be considered single obstructions in applying the NFPA 13 guidelines.

c. The effects of obstructions less than 48 inches in width which are located below the developed spray patterns shall not be evaluated.

3.3 If the NFPA 13 guidelines cannot be satisfied for individual heads, adjacent sprinkler heads shall be further evaluated to determine if their combined discharge will provide full coverage at the ceiling level.

4.0 Corrective Action

4.1 If individual or cumulative obstructions are determined to be unacceptable, one of the following options shall be utilized to provide full ceiling level sprinkler protection:

a. Relocate existing heads to clear the obstructions, or

- b. Add new heads to compensate for the obstructions. System adequacy shall be demonstrated using NFPA 13 pipe schedules or hydraulic calculations. If necessary, pipe sizes and supply header arrangements shall be changed to satisfy this requirement.
- 4.2 The maximum floor area that can be protected by a single sprinkler head shall be 130 square feet.
- 4.3 When more than one head must be located below obstructions, the distance between heads shall not exceed 15 feet.
- 4.4 When hydraulic calculations are used to verify sprinkler system adequacy, the calculations shall be based upon the hydraulically most remote 1500 ft² area or the area of the largest room whichever is smaller. The systems shall be capable of discharging a density of 0.16 gpm/ft² assuming all sprinkler heads in the analyzed area are open.
- 4.5 If a system designed in accordance with the NFPA 13 pipe schedules supplies sprinkler heads in two or more rooms that are separated by 1-1/2-hour fire-rated construction, the maximum number of heads in each room must satisfy the pipe schedule limits for pipe size with each room considered separately. If this condition is satisfied, the maximum number of heads per pipe size may be exceeded for all the rooms taken together.

ATTACHMENT 2

SPRINKLER SYSTEM CRITERIA FOR RESOLVING INTERVENING COMBUSTIBLE CONCERNS AT WATT'S BAR NUCLEAR PLANT

1.0 Objective

The objective of this criteria is to provide compensation for the lack of a horizontal distance of more than 20 feet free of intervening combustibles between redundant divisions being protected in accordance with 10 CFR 50 Appendix R, Section III.G.2.b. Compensation is provided by installing, in the defined areas, supplemental sprinkler protection for floor level combustibles when adequate coverage by ceiling level sprinklers is not verified by this criteria.

2.0 Areas of Criteria Application

This criteria shall be applied as follows when redundant divisions are separated by horizontal space and more than 20 continuous feet of the space is not free of intervening combustibles.

- 2.1 If the redundant divisions are greater than 30 feet apart, the criteria shall be applied to any continuous 30-foot-wide path located between the redundant divisions.
- 2.2 If the redundant divisions are greater than 20 feet but less than 30 feet apart, the criteria shall be applied to the entire horizontal space between divisions.

3.0 Acceptance Criteria for Existing Sprinkler Heads

- 3.1 Existing sprinkler heads, which have been located to produce fully developed spray patterns at the ceiling, will provide acceptable floor coverage if there are no intermediate obstructions in their patterns which are greater than 48-inches wide. When individual obstructions overlap or have less than a 4-inch flue space between them when viewed from immediately below, they shall be considered a single obstruction for determining their cumulative horizontal width. No combination of obstructions may traverse the 4-inch flue space and block more than 2 feet of any 8 feet of flue space.
- 3.2 Lateral discharge from existing sprinkler heads may be utilized for floor coverage if the portion of their discharge pattern that is being relied on has no significant obstructions. Significance shall be evaluated considering the typical shape of a sprinkler spray pattern and the obstruction guidelines of NFPA 13.
- 3.3 Acceptance of existing heads shall be based on visual observations in the plant.

4.0 Correction Actions

- 4.1 When section 3.0 is not satisfied, sprinkler heads shall be provided under the obstructions utilizing one of the following options:
 - a. Relocate existing heads below intermediate level obstructions if adequate coverage can be maintained at the ceiling level, or
 - b. Add new heads below intermediate level obstructions. System adequacy shall be demonstrated using NFPA 13 pipe schedules or hydraulic calculations. If necessary, pipe sizes and supply header arrangements shall be changed to satisfy this requirement.
- 4.2 The maximum floor area that can be protected by a single sprinkler head shall be 130 square feet.
- 4.3 When more than one head must be located below obstructions, the distance between heads shall not exceed 15 feet.
- 4.4 When hydraulic calculations are used to verify sprinkler system adequacy, the calculations shall be based upon the hydraulically most remote 1500 ft² area or the area of the largest room, whichever is smaller. The systems shall be capable of discharging a density of 0.16 gpm/ft² assuming all sprinkler heads in the analyzed area are open.
- 4.5 If a system designed in accordance with the NFPA 13 pipe schedules supplies sprinkler heads in two or more rooms that are separated by 1-1/2-hour fire-rated construction, the maximum number of heads in each room must satisfy the pipe schedule limits for pipe size with each room considered separately. If this condition is satisfied, the maximum number of heads per pipe size may be exceeded for all the rooms taken together.