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May 31, 1985

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Ms. E. G. Adensam, Chief
Licensing Branch No. 4

Re: Catawba Nuclear Station
Docket Nos. 50-413 and 50-414

Dear Mr. Denton:

The fire protection program for Catawba is discussed in Section 9.5.1 of the FSAR. This program was reviewed by the NRC Staff in accordance with the Standard Review Plan (SRP) (NUREG-0800) as discussed in Section 9.5.1 of the Catawba SER including Supplements 2 and 3. The Staff's review included a site audit on November 1-4, 1983.

On April 15-19, 1985, NRC/Region II personnel conducted an on-site inspection of fire protection features including implementation of the plant safe shutdown guidance provided in position C.5.b and C.5.c of Section 9.5.1 of the SRP. The results of this inspection are detailed in Inspection Report No. 50-413/85-15.

It was noted during this inspection that the structural supporting steel which supports protected cables in the auxiliary feedwater pump room area were not fire-protected with a one-hour fire resistive material (UI 413/85-15-01). It was agreed during the inspection that Duke's technical justification for not wrapping the cable tray supports would be submitted to NRR for review.

As discussed in the attached evaluation, the maximum potential fire load in the auxiliary feedwater pump room area is very low. As this evaluation demonstrates, it is not possible for sufficient heat to be developed for the duration needed to result in failure of any unprotected cable tray supports. Therefore, it is our conclusion that the addition of fire-resistive material to the subject cable tray supports is not necessary.

Very truly yours,

H.B. Tucker /BS

Hal B. Tucker

ROS:slb

Attachment

A006
1/1

cc: Dr. J. Nelson Grace, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

NRC Resident Inspector
Catawba Nuclear Station

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April 26, 1985

Memo to File

Re: Catawba Nuclear Station
Calculation of Unit 1 Auxiliary Feedwater Pump
Room Maximum Potential Fire Severity
File No: CN-1435.03

The maximum potential fire severity for a postulated fire with the Unit 1 Auxiliary Feedwater Pump Room is calculated below. This task was performed to show that the worst case ambient ceiling temperature under fire conditions would not result in failure of cable tray support members. A minimum time interval of 5 minutes with ambient ceiling temperature in excess of 1100°F is considered necessary to heat cable tray support members internally to the point of failure.

The calculations are performed considering the actual fixed fire load within the room. For conservatism, a transient fire load consisting of 100 lb. of cellulose based material and 10 gallons of flammable liquid has been included.

The calculations are based on use of non-jacketed armor interlocked cable with a heat of combustion of 12,800 Btu per pound of combustible cable material. All cable trays are assumed to be 67% filled.

The following heats of combustion are assumed:

Flammable Liquid - 20,000 Btu/lb.
Lubricating Oil - 20,000 Btu/lb.
Cellulose Based Materials - 8,000 Btu/lb.

Fixed Fire Load

6" Cable Tray
total length = 54 ft.
heat of combustion = 17,792 Btu/ft.
total heat of combustion = 960,768 Btu

12" Cable Tray
total length = 42 ft.
heat of combustion = 35,584 Btu/ft.
total heat of combustion = 1,494,528 Btu

24" Cable Tray
total length = 193 ft.
heat of combustion = 71,168 Btu/ft.
total heat of combustion = 13,735,424 Btu

Miscellaneous conduit and cable drops (1% of total cable tray heat of combustion) = 161,907 Btu

Lubricating Oil
1.5 gallons in each motor driven CA pump = 3 gallons total X 10 lb./gal. = 30 lb.
30 lb. X 20,000 Btu/lb. = 600,000 Btu

Total Fixed Combustible Load = 16,952,627 Btu

Transient Fire Load

Cellulose Based Material
100 lb. X 8,000 Btu/lb. = 800,000 Btu

Flammable Liquid
10 gal. X 10 lb./gal. = 100 lb.
100 lb. X 20,000 Btu/lb. = 2,000,000 Btu

Total Transient Combustible Load = 2,800,000 Btu

Total Fixed and Transient Combustible Load = 19,752,627 Btu

Room Floor Area = 3,500 sq. ft.

Combustible Load = 5,644 Btu/sq. ft.

Interpreting from Table 5-9B on page 5-90 of the NFPA Handbook[1] 1,334 Btu/sq. ft. results in a severity equivalent to a fire of one minute duration. (Standard Time-Temperature Curve)

Therefore, 5,644 Btu/sq. ft. results in a severity equivalent to a fire of 4.23 minutes duration. (Standard Time-Temperature Curve)

Proof

Converting the total heat of combustion to pounds of cellulose material

$$\frac{19,752,627 \text{ Btu}}{8,000 \text{ Btu/lb.}} = 2469.08 \text{ lb.}$$

$$\frac{2469.08 \text{ lb.}}{3500 \text{ sq. ft.}} = .705 \text{ lb./sq. ft.}$$

ASTM E119[2] indicates that a 10 lb./sq. ft. load of combustible material will produce a fire of one hour duration.

Therefore, a combustible load of .705 lb./sq. ft. would produce a fire of 4.23 minutes in duration.

Comments

While the temperature of the postulated fire may ideally rise faster than the standard time-temperature curve (1000°F at 5 minutes) due to the high heat content of the materials, the resulting fire severity is minimal due to the lack of significant combustible loading.

These calculations, while not considering factors such as ventilation, load geometry, distribution, and thermal characteristics of the boundaries, must be considered highly conservative for two reasons.

1. Cabling in the room constitutes the vast majority of the combustible load (approximately 80%). The calculations do not consider that approximately one third of these cables are wrapped with a one-hour barrier.

2. The non-jacketed armor interlock cable, while higher in potential heat content than cellulose based materials, is non-propagating. Therefore, it is highly unlikely that cabling beyond the origin of the fire would become involved.

Conclusions

Based on the maximum potential fire load included in these calculations, it is not possible for sufficient heat to be developed for the duration needed to result in failure of any unprotected cable tray supports.

J. M. Rucci
Design Engineer I

JMR/mdc

[1]NFPA Fire Protection Handbook, 15th Edition. Section 5, Chapter 9, Subsections A and B.

[2]ASTM E119-81, Standard Method of Fire Tests of Building Construction and Materials, Appendix Section X6.3.