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April 11, 1990

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Quad Cities Units 1 and 2
Request for Revision to Appendix R
Exemption Approval
NRC Docket 50-254/50-265

Reference: (a) Letter from J.R. Wojnarowski to H.R. Denton
dated June 25, 1986

(b) Letter from T. Ross to H. Bliss dated July 21, 1988

Dr. Murley:

Reference (a) transmitted a request for approval of exemptions to Appendix R requirements. The exemption requests were presented in sections for clarity of review. Reference (b) transmitted the Safety Evaluation Report (SER) for granting the exemption request.

As a result of a Quality Assurance Audit and the initiation of a computer tracking program for combustible materials at Quad Cities, Commonwealth Edison identified that insufficient flexibility is contained in the combustible loading limits submitted in reference (a). Additional details are contained in Attachment A. Commonwealth Edison, therefore, is requesting revision to the combustible load limits contained in reference (a). Justification for these revised limits is contained in Attachment B.

If there are any further questions or comments, please direct them to this office.

Very truly yours,

Rita Stols
Nuclear Licensing Administrator

cc: L. Olshan, NRR Project Manager
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A. Bert Davis, Regional Administrator, NRC
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ATTACHMENT A

Background

On March 21, 1990, a Quality Assurance Auditor identified that the combustible load in a Fire Zone had exceeded the value contained in an Appendix R exemption request. An investigation of all fire zones was initiated to identify areas in which Appendix R exemption limits were exceeded. Compensatory measures, in the form of fire watches, were immediately instituted for Fire Zones where values were exceeded. Commonwealth Edison is reviewing this event to identify the root cause for exceeding combustible load values and that the values were not properly controlled.

The reasons why Appendix R exemption combustible loadings were exceeded fall into three categories:

1. Combustible loads were recalculated due to revisions in the heat of combustion values for various combustibles. No change in physical combustible loads was made.
2. Approved combustible load limits were exceeded due to increases in the fixed combustibles (e.g. Anti-contamination clothing hamper) in the area.
3. Approved combustible load limits were exceeded due to the introduction of transient combustibles in the area.

These categories were discussed with NRR Staff and the following conclusions were achieved:

1. No revision to the exemption approval or compensatory measures are required for those fire zones in which the limit was exceeded solely due to revised calculations performed to accommodate revisions to the heat of combustion values.
2. If the Safety Evaluation Report (SER) provides a limit associated with the exemption request approval (e.g. fire severity does not exceed 23 minutes for any zone), the individual zone may exceed the submitted combustible loading up to the limit defined in the SER. A technical review must be performed for the individual zone to demonstrate the acceptability for adopting the higher limit contained in the SER. The justification is not required to be submitted to the NRC; however, the justification must be maintained in an auditable file. Compensatory measures can be removed.
3. Request for exemption approval revision is required for areas for which the above discussion does not apply. Attachment 'B' contains the justification for the revised combustible loading for such areas.

Commonwealth Edison is currently reviewing the limits defined in the Appendix R exemption requests to assure sufficient flexibility exists in the defined exemption values to accommodate future, expected, operating and maintenance activities. Following this review, additional requests for exemption revision will be submitted as needed.

ATTACHMENT B

REQUEST FOR REVISION TO PREVIOUS
NRC EXEMPTION APPROVAL

13.0 APPENDIX R EXEMPTION REQUEST TO REVISE COMBUSTIBLE LOAD VALUES CONTAINED IN APPROVED EXEMPTION REQUESTS.

Per the provisions of 10 CFR 50.12, Commonwealth Edison Company (CECo) had requested exemption from the requirements of Sections III.G.2, III.G.3 and III.L of Appendix R to 10 CFR 50. In justifying exemptions from the requirements of these sections, an evaluation was performed to demonstrate that adequate fire protection measures exist for the fire zones that do not meet the Appendix R requirements and a combustible load limit was established to demonstrate that the amount of combustible materials in these fire zones was low.

A review of these combustible load values has shown that sufficient flexibility is not provided to perform routine operation and maintenance activities, particularly during an outage. Therefore, CECo is submitting this request to revise exemptions previously approved in the Safety Evaluation Report (SER) dated July 21, 1988, to reflect higher combustible load values. Table 13.0-1 lists each fire zone, the original combustible load value and the new combustible load value.

To determine the new combustible load, a reevaluation of each fire zone was performed based on the fire barriers in the fire zone, the type of combustibles, and sound fire protection judgment. The following conservative approach was used to establish the new limits:

1. The evaluation was performed assuming outage activities when transient combustible loads should be at their highest point.
2. A fire severity limit was set for the fire zone based on whether fire detection or automatic fire suppression existed in the zone. For fire zones without fire detection or suppression, a fire severity limit of 15 minutes was established and for those with fire detection or suppression, a 30 minute limit was established. Using these fire severity limits, the new combustible load limit was derived. These limits were conservatively set well below the NFPA test data for fire severity by assuming the combustibles are flammable liquids.
3. For areas with extremely low limits, the existing values for each fire zone were increased to the expected combustible loadings required and reviewed against the individual characteristics of each fire zone. For most of the fire zones, this proved to be an adequate solution since original limits were extremely low to begin with and the increase on fire severity was negligible.
4. The additional loading would not increase the probability of initiating a fire since ignition sources, if any, in the fire zones are not being changed.

The justification for increasing the combustibile load value for each of the previously approved exemptions are presented in the following sections.

<u>SECTION</u>	<u>JUSTIFICATION FOR</u>	<u>Affected Fire Zone</u>
13.1	Lack of complete 3-hour fire barrier between Southern and Central Zone Groups.	8.2.10 8.2.1.A 14.1.1 11.1.1.B
13.2	Lack of complete 3-hour barrier between Northern and Southern Zone Groups.	8.2.1.A 8.2.7.D 11.1.1.B
13.3	Lack of complete suppression and detection for enclosure of cable in fire barrier having a 1-hour rating.	8.2.7.D
13.4	Lack of complete 3-hour fire barrier between Fire Zone 11.1.1.B and Southern Zone Group.	11.1.1.B 8.2.1.A
13.5	Lack of complete 3-hour fire barrier between equivalent Fire Area 8.2.8.D and Northern Zone Group.	8.2.7.D

TABLE 13.0-1

Summary For Exemption Request Revision

Fire Zone	Approved Combustible Load Limit (BTU/ft ²)	Exemption Request	SER Section	Requested Load Value (BTU/ft ²)
8.2.10	2500	5.2	9.0	5000
14.1.1	1000	5.2	9.0	5000
8.2.1.A	1000	5.2 5.3 5.9	9.0 10.0	2000
8.2.7.D	30000	5.3 5.7 5.10	10.0 6.0 14.0	40000
11.1.1.B	2500	5.2 5.3 5.9	9.0 10.0 13.0	10000

13.1 LACK OF COMPLETE 3-HOUR FIRE BARRIER BETWEEN THE SOUTHERN AND CENTRAL ZONE GROUPS.

The following exemption request contained in the June 25, 1986 submittal is affected by the revision to the combustible loadings in Fire Zones 8.2.10, 14.1.1, 8.2.1.A and 11.1.1.B:

Section 5.2: Lack of a complete 3-hour fire barrier between the Southern and Central Zone Groups

Fire Zone 8.2.10 (Central Zone Group) and Fire Zone 14.1.1 (Southern Zone Group) share a boundary on the 626'-6" elevation, where the fire zones are separated by a substantial reinforced concrete shield wall that is not specifically fire rated. Personnel access between the zone groups is through substantial, unlabeled, metal doors. There are no safe shutdown cables or equipment in either of the fire zones. The principle concern in either the Central or Southern Zone Group is that a fire could develop, spread to an adjacent zone group and damage the necessary safe shutdown system components.

Fire Zone 8.2.1.A and 11.1.1.B are located in the Southern Zone Group. These fire zones do not share a common boundary with any fire zone contained in the Central Zone Group, however, are discussed in the NRC's SER.

The NRC subsequently granted the proposed exemption. The basis for the Staff's approval of the exemption request contained in the July 21, 1988 Safety Evaluation Report (SER) included:

1. The two fire zones are separated by a reinforced concrete shield wall with metal, personnel access doors that are locked shut.
2. Fire zones 8.2.10 and 14.1.1 contain no safe shutdown cables.
3. The fire load is low and therefore a postulated fire in either area is expected to develop slowly and remain small. The heat would dissipate to surrounding areas without spreading to an adjacent zone group.

The SER concluded since a fire in either the Central or Southern Zone Group would not damage an alternative safe shutdown path located out of the zone groups and/or spread to the adjacent zone group, the complete 3-hour fire rated barrier would not significantly upgrade the level of fire protection.

Since the submittal of the exemption request, no safe shutdown systems or components have been added and the physical configuration of the fire zones remains unchanged; however, the need to increase the allowable combustible loading has been identified.

Commonwealth Edison, therefore, requests that the allowable combustible loading be increased as follows:

	<u>Approved Limit</u>	<u>Requested Limit</u>
Zone 8.2.10	2500 BTU/ft ²	5000 BTU/ft
Zone 14.1.1	1000 BTU/ft ²	2000 BTU/ft
Zone 8.2.1.A	1000 BTU/ft ²	2000 BTU/ft ²
Zone 11.1.1.B	2500 BTU/ft ²	10,000 BTU/ft ²

The increased loading meets the basis of the exemption approval in that the fire load remains low and well within the capability of the concrete shield wall to contain the fire. (NFPA Handbook defines low combustible loading to be less than 100,000 BTU/ft².) Neither Fire Zone 8.2.10 nor 14.1.1 contain safe shutdown equipment. The combination of the shield walls and the low combustible loading continues to assure that a fire cannot propagate between the Central and Southern Zone Groups at this elevation and, therefore, the revision to the exemption should be granted.

13.2 LACK OF COMPLETE 3-HOUR BARRIER BETWEEN NORTHERN AND SOUTHERN ZONE GROUPS.

The following exemption request contained in the June 25, 1986 submittal is affected by the revision to the combustibile loadings in Fire Zone 8.2.1.A, 8.2.7.D and 11.1.1.B

Section 5.3: Lack of complete 3-hour barriers between Northern and Southern Zone Groups.

Fire Zones 8.2.1.A and 11.1.1.B are located in the Southern Zone Group. Fire Zones 8.2.1.A and 11.1.1.B do not share a common boundary with the Northern Zone Group and Fire Zone 8.2.7.D is located in the Northern Zone Group and does not share a common boundary with the Southern Group. These Fire Zones, however, are discussed in the July 21, 1988 SER for this exemption request. The Northern and Southern Zone Groups share a common boundary only along positions of the Unit 2 Cable tunnel (Fire Zone 8.2.5) and in the radwaste pipe tunnel. The principle concern for the lack of a 3-hour barrier is that a fire in either Zone Group could develop and spread to an adjacent zonegroup and damage necessary cable or equipment necessary for safe shutdown.

The Staff's basis for the approval of the exemption request contained in the July 21, 1988 SER primarily focused on the Northern and Southern Zone group interface configuration and existing fire protection systems in the interface zones. Since the Staff's SER also references the non-interface areas, Commonwealth Edison is formally requesting a revision to the exemption approval to reflect increased combustibile loadings as follows:

	<u>Approved Limit</u>	<u>Requested Limit</u>
Fire Zone 8.2.1.A	1000 BTU/ft ²	2000 BTU/ft ²
8.2.7.D	30000 BTU/ft ²	40000 BTU/ft ²
11.1.1.B	2500 BTU/ft ²	10000 BTU/ft ²

The increased loading meets the basis for the exemption approval since loading remains low. In addition, none of these zones share a common boundary with the Northern or Southern Zone Group; therefore, the spread of a fire originating in the Fire Zones to the other Zone Group is limited. The increased loading should, therefore, be approved.

13.3 JUSTIFICATION FOR LACK OF COMPLETE SUPPRESSION AND DETECTION FOR ENCLOSURE OF CABLE IN A FIRE BARRIER HAVING A 1-HOUR RATING.

The following exemption request contained in the June 25, 1986 submittal is affected by the revision to the combustible loadings in Fire Zone 8.2.7.D:

Section 5.7: Justification for Lack of Complete Suppression and Detection for Enclosure of Cable in a Fire Barrier having a 1 hour Rating

The turbine building contains certain cables which are required to be wrapped in a 1-hour fire barrier because they are routed through fire zones which have alternative shutdown methods that take credit for equipment fed by the cable running through the zone. The 4KV bus duct to switchgear 23-1 is wrapped in a 1-hour barrier where it passes through the Fire Zone 8.2.7.D of the Northern Zone Group.

The Northern Zone Group uses alternate shutdown path C for hot shutdown. Shutdown Path C uses equipment powered by switchgear 23-1. This bus duct is protected with complete automatic suppression where it passes through Fire Zone 8.2.7.D and partial detection is provided. There are also hose reels and portable extinguishers in the fire zone which could be used by the fire brigade to fight the fire. The principle concern with a fire in the fire zone having a bus duct penetration is that a fire could spread through the bus duct penetration.

The NRC subsequently approved the exemption request. The following basis for the Staff's approval is contained in the July 21, 1988 SER:

1. The fire loading is low and a fire of major proportions is not expected to occur.
2. Fire Zones 8.2.7.D has automatic sprinkler protection.
3. The bus duct metal enclosure would be resistant to small fires and would not likely fail for up to a one hour time period.

The SER concluded that the installation of a 3-hour rated bus duct penetration would not significantly increase the level of fire protection in this fire zone.

Since the submittal of the exemption request, no safe shutdown equipment or components have been added and the physical configuration of the fire zone remains unchanged; however, the need to increase the allowable combustible loading has been identified. Commonwealth Edison, therefore, requests that the allowable combustible loading in Fire Zone 8.2.7.D be increased from 30,000 to 40,000 BTU/ft².

The increased loading meets the basis of the exemption approval in that the combustible loading remains low and well within the capability of the bus duct to withstand the postulated fire. The combination of complete automatic suppression and 1 hour cable wrap provides a level of protection to switchgear 23-1 that is equivalent to that prescribed in Appendix R Section III.G.2.

13.4 FIRE BARRIER BETWEEN FIRE ZONE 11.1.1.B AND SOUTHERN ZONE GROUP.

The following exemption request contained in the June 25, 1986 submittal is affected by the revision to the combustible loadings in Fire Zone 11.1.1.B and 8.2.1.A:

Section 5.9 Lack of complete 3 hour fire barrier between Fire Zone 11.1.1.B and Southern Zone Group.

Fire Zone 11.1.1.B contains one Division I and one Division II Residual Heat Removal (RHR) service water pump, the swing (1/2) diesel generator cooling water pump and their auxiliaries. The floor, ceiling and all walls are 3 hour rated fire barriers. The east wall contains a nonlabeled watertight door that opens to Fire Zone 8.2.1.A of the Southern Zone Group. Fire Zone 8.2.1.A contains the main and reserve power feeds to the swing diesel generator cooling water pump. The reserve feed is protected with a 1-hour rated fire wrap. Fire protection systems contained in these areas include a complete fire detection and suppression system in Zone 11.1.1.B and a complete automatic wet pipe sprinkler system in Fire Zone 8.2.1.A. The principal fire protection concern for these fire zones is that a fire could start in either fire zone and spread to the unaffected fire zone through a nonrated metal watertight door.

The NRC subsequently granted the proposed exemption. The basis for the Staff's approval of the exemption request is contained in the July 21, 1988 SER and can be summarized as follows:

1. The fire load in either zone is negligible.
2. Both zones have automatic fire suppression systems.
3. The watertight door is of substantial steel construction and sufficient to withstand any expected fire in these zone.
4. In the event of fire damage to safe shutdown components in either zone, an alternate safe shutdown path is available, independent of these fire zones.

The SER concluded that upgrading the existing watertight door to a 3-hour fire rating does not significantly increase the level of fire protection.

Since the submittal of the exemption request, no safe shutdown systems or components have been added and the physical configuration of the fire zones remain unchanged; however, the need to increase the allowable combustible loading has been identified.

Commonwealth Edison, therefore, requests that the allowable combustible loadings be increased as follows:

	<u>Approved Limit</u>	<u>Requested Limit</u>
Zone 11.1.1.B	2500 BTU/Ft ²	10000 BTU/ft ²
Zone 8.2.1.A	1000 BTU/ft ²	2000 BTU/ft ²

The increased loading meets the basis of the exemption request approval in that the fire loading remains low and well within the capability of the watertight door to contain the fire. Fire Zone 11.1.1.B has complete detection and fixed water suppression and Fire Zone 8.2.1.A has complete water suppression. The level of protection provided by the existing fire protection features ensures that damage from a fire in Fire Zone 11.1.1.B would be limited in duration and intensity and would not adversely impact the capability to shut down the plant. The revision to the exemption approval is therefore warranted.

13.5 LACK OF COMPLETE 3-HOUR BARRIER BETWEEN EQUIVALENT FIRE AREA 8.2.8.D AND NORTHERN ZONE GROUP.

The following exemption request contained in the June 25, 1986 submittal is affected by the revision to the combustible loadings in Fire Zone 8.2.7.D:

Section 5.10 Lack of complete 3 hour barrier between equivalent Fire Area 8.2.8.D and Northern Zone Group

Northern Zone Group Fire Zone 8.2.7.D is located directly below equivalent Fire Area 8.2.8.D. The floor of equivalent Fire Area 8.2.8.D is not fire rated and separates the fire zone from the equivalent fire area. Fire Zone 8.2.7.D has a floor area of approximately 6100 ft² and ceiling height of approximately 24 feet. Fire Zone 8.2.7.D is protected by an automatic wet pipe sprinkler throughout, except over the low pressure heaters and in the corridor along row C. Separate detection is provided only around cable risers in the high pressure heater bay. The area directly below equivalent Fire Area 8.2.8.D is protected by automatic suppression and partially covered by detection. The principle concern is that a fire could develop in the Northern Zone Group (Fire Zone 8.2.7.D) and spread to the turbine building operating floor (equivalent Fire Area 8.2.8.D) and vice versa.

The NRC subsequently approved the request for exemption in a SER dated July 21, 1988 from the requirements of Appendix R Section III.G.2.a based on the following:

1. Hazards located below the operating floor are contained in reservoirs and are protected with automatic fire detection and fire suppression systems. The expected fire would be detected early and controlled/extinguished by the fire suppression systems.
2. The areas are open and accessible to the fire brigades.

The SER concluded that the provisions of a complete 3-hour fire rated barrier between the subject fire zones would not significantly upgrade the level of fire protection.

Since the submittal of the exemption request, no safe shutdown equipment or components have been added and the physical configuration of the fire zones remains unchanged; however, the need to increase the allowable combustible loadings has been identified.

Commonwealth Edison, therefore, requests that the fire loading for Fire Zone 8.2.7.D be increased from 30,000 BTU/ft² to 40,000 BTU/ft². The increase in the combustible loading does not impact the basis of the exemption request approval. The low combustible loading coupled with the existence of automatic suppression in the area beneath equivalent Fire Area 8.2.8.D provides a high level of assurance that a fire in this zone would not spread to the equivalent fire area.