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OPPD
Omaha Public Power District

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U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

Reference:
1. Docket No. 50-285
2. Letter from NRC (W. C. Seidle) to OPPD (W. C. Jones) Dated July 1, 1983 (NRC-83-202)
3. Letter from OPPD (R. L. Andrews) to NRC (J. R. Miller) Dated January 9, 1985 (LIC-84-0338)
4. Letter from NRC (E. J. Butcher) to OPPD (R. L. Andrews) dated July 3, 1985 (NRC-85-0200)
5. Letter from NRC (D. E. Sells) to OPPD (R. L. Andrews) dated July 1, 1986 (NRC-86-0211)
6. Letter from NRC (D. A. Powers) to OPPD (S. K. Gambhir) dated May 9, 2000 (NRC-00-0054)
7. Letter from NRC (A. T. Howell) to OPPD (S. K. Gambhir) dated January 31, 2001 (NRC-01-0008)

SUBJECT: Exemption Request from the Requirements of 10 CFR 50, Appendix R, Section III.G.2 for Fire Area 32 at the Fort Calhoun Station

This correspondence is being submitted to request an exemption from the requirements in 10 CFR 50, Appendix R, Section III.G.2 as applied to certain cables in Fire Area 32 (FA-32) at the Fort Calhoun Station (FCS). This submittal was prepared in accordance with the requirements of 10.CFR 50.12, and requests that the Nuclear Regulatory Commission (NRC) grant an exemption from certain Appendix R requirements.

As a result of the January 2000 NRC Triennial Fire Protection Team Inspection at FCS, the NRC determined, as noted in Reference 6 (and recharacterized in Reference 7), that certain cables were not covered by an exemption granted to FCS in 1985 (Reference 4). Specifically, the NRC concluded that the exemption granted in Reference 4 does not apply to redundant power cables separated by less than 10 feet and redundant control cables separated by less than 20 feet. Following the January 2000 inspection, Omaha Public Power District (OPPD) completed an exhaustive investigation into the FA-32 design basis. Resulting from this investigation, OPPD has concluded that an additional exemption for this area is appropriate.

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OPPD is requesting that an exemption be granted to FCS as detailed in Attachment 1 of this letter. In June 2002, OPPD and the NRC met in Rockville, Maryland to discuss this exemption request. As discussed in June, OPPD is relying heavily on major portions of the Reference 4 and 5 exemption and safety evaluation reports. As a result, OPPD is providing additional information for all areas of FA-32 and requesting an additional exemption for the area noted in the Reference 6 and 7 inspection reports. In Attachment 2, OPPD is providing a list of manual actions to be approved as part of this exemption request. These manual actions are contained in Attachment 1, but have been separated (in Attachment 2) for clarity. In Attachment 3, OPPD has also provided a summary of the FA-32 Risk Analysis. This analysis demonstrates that a level of safety for the fire area is comparable to that provided by strict compliance with Appendix R prior to this exemption request and manual actions. OPPD has also provided a figure to assist the NRC in understanding the configuration of FA-32. This figure will be annotated in the attachments for reference at various points. Additional figures can be provided upon request.

FA-32 contains an electric-driven auxiliary feedwater pump and a steam-driven auxiliary feedwater pump. Since the Reference 4 1985 exemption was granted, OPPD has added a diesel driven auxiliary feedwater pump that is independent of FA-32. This adds additional defense-in-depth to ensure safe shutdown of the plant following a fire involving the cables that are the subject of this exemption request.

Following the January 2000 Fire Protection Inspection, OPPD commissioned an extensive, state-of-the-art fire hazard evaluation, conducted by recognized industry experts, to evaluate the fire hazards in FA-32 at FCS. The evaluation was completed and is being maintained by OPPD on-site at FCS. The evaluation indicates that this exemption would not pose any undue risk to public health and safety.

In some instances, credited system functions are proposed (in the request for exemption) by adopting feasible manual actions to achieve safe shutdown in the event of a fire in FA-32. These manual actions are comparable to those adopted by other plants in the industry and approved by the NRC. In meetings, the NRC has informed industry that they have concluded that such feasible manual actions should be recognized as an acceptable alternative for achieving compliance. The NRC has noted that they will propose to amend Appendix R to provide for such manual actions. As a result, OPPD has included a list of manual actions (for approval) as part of this request.

In this request, OPPD has demonstrated that a level of protection equivalent to Section III.G.2 of 10 CFR 50 Appendix R is provided for FA-32. OPPD has reviewed this exemption request and determined that it is not in conflict with other legal requirements, does not present an undue risk to the public safety and health, and is consistent with the common defense and security. As a result, OPPD is confident that the exemption request conforms to the requirements of 10 CFR 50.12(a)(1). Additionally, "special circumstances" exist for the requested exemption in that application of the regulation in this particular circumstance is not necessary to achieve the

underlying purpose of Appendix R to 10 CFR 50.

Therefore, OPPD respectfully requests that the NRC grant this exemption from the requirements of 10 CFR 50 Appendix R for FA-32.

There are no commitments made in this letter. However, should the NRC approve this request for exemption, OPPD understands that certain statements in this letter and corresponding attachments could become commitments.

If you have further questions, please contact Mr. Gary Cavanaugh, of my staff, at (402) 533-6913.

Sincerely,

R. T. Ridenoure
Division Manager
Nuclear Operations

RTR/GRC/grc

Attachments (3), Figures (1)

c: E. W. Merschoff, NRC Regional Administrator, Region IV
A. B. Wang, NRC Project Manager
J. G. Kramer, NRC Senior Resident Inspector
INPO Records Center
Winston and Strawn

Attachment 1
Fire Area 32 Exemption Request

Where reference documents are noted in this attachment, please refer to the cover letter.

Exemption Requested

In accordance with the requirements of 10.CFR 50.12, Omaha Public Power District (OPPD) requests the Nuclear Regulatory Commission (NRC) to grant an exemption from certain requirements in 10 CFR 50, Appendix R, Section III.G.2 as applied to certain cables in Fire Area 32 (FA-32) in the Fort Calhoun Station (FCS). In particular, OPPD requests an exemption from the 10 CFR 50, Appendix R, Section III.G.2 requirement that certain redundant power cables be separated by at least 10-feet,[1] that certain control cables be separated by at least 20-feet or, in the alternative, that one set of these redundant cables be protected by a one-hour rated barrier.

This exemption is necessary because the NRC determined in January 2000 that certain cables were not covered by an exemption granted in 1985. This determination was made even though the relevant aspects of the plant configuration in FA-32 have not changed since 1985. In June 2002, OPPD and the NRC met in Rockville, Maryland to discuss this exemption request. As discussed in June, OPPD is relying heavily on major portions of the Reference 4 exemption and safety evaluation report. As a result, in this attachment OPPD is providing clarifying information for all areas in FA-32 and requesting that an additional exemption for the area of contention noted in the Reference 6 and 7 inspection reports.

For the reasons discussed in detail below, the exemption satisfies the criteria in 10 CFR 50.12. In particular, since 1985, OPPD has added a diesel driven auxiliary feedwater pump, independent of FA-32, which adds additional defense-in-depth to ensure safe shutdown of the plant following a fire involving the cables that are the subject of this exemption request. OPPD also commissioned a state-of-the-art fire hazard evaluation for FA-32. The evaluation was conducted by recognized industry experts to evaluate the fire hazards in FA-32 to determine if these exemptions would result in any undue risk to public health and safety. The evaluation indicates that this exemption would not pose any undue risk to public health and safety. This extensive fire hazards analysis is being maintained by OPPD on-site at FCS. In a few instances, credited system function is proposed to be provided by adopting feasible manual actions comparable to those adopted by other plants to achieve safe shutdown in the event of a fire. The NRC has recently concluded that such feasible manual actions should be recognized as an acceptable

[1] In 1985, OPPD received an exemption from the NRC generically regarding cable separation in FA-32. In 2000, this exemption was interpreted by the NRC to permit only certain redundant power cables to be separated by at least 10 feet instead of the 20 feet required under Appendix R.

alternative for achieving compliance and will shortly propose to amend Appendix R to provide for them.[2] Accordingly, an exemption should be granted because a level of safety is demonstrated for the fire area comparable to that provided by strict compliance with Appendix R.

Evaluation of Exemption Criteria

The NRC is authorized to grant an exemption if: it is authorized by law, will not adversely affect public health and protection or the common defense and security, and is supported by a showing of special circumstances. Per 10 CFR 50.12, the NRC is authorized to grant an exemption from Appendix R because it was promulgated solely under the NRC's authority in the Atomic Energy Act of 1954, as amended, and, so can be modified under that same statutory authority. A grant of this exemption will not adversely affect public health and safety for the reasons described in detail below. A grant of this exemption will have no affect on common defense and security. Finally, the special circumstance supporting the exemption is that new information and new equipment demonstrate that with the exemption, the fire protection program at FCS will provide a level of protection comparable to that provided by strict compliance with Appendix R, such that strict compliance would result in an unnecessary regulatory burden. OPPD suggests that for these reasons, this exemption should be granted.

Fire Area 32 Description

Physical Description

FA-32 (Compressor Area) is located along the entire eastern edge of the Auxiliary Building at the basement level. It is bordered on the north and south by exterior walls, on the east by the Turbine Building, and on the west by the Component Cooling Heat Exchanger Area (Fire Area 33), Electrical Penetration Area (Fire Area 34A), and basement level general area (Fire Area 6). The compressors in the area lie under the Battery Areas (Fire Areas 37 and 38) and Switchgear Area (Fire Areas 36A and 36B). FA-32 includes a small corridor and open stairwell running alongside the Battery Rooms and Fire Area 19 on the Auxiliary Building ground floor. Fire Area 33 partially protrudes into FA-32 at the basement level. The protrusion height is approximately 8 feet below the ceiling of FA-32 throughout a 1073 sq. ft. area along the west wall of FA-32.

Walls and floors between this area and other fire areas described in the Updated Fire Hazards Analysis (UFHA) are typically 3-hour fire rated barriers, except for the following barrier elements that contain penetration configurations which have not been fire-rated but have been evaluated as adequate to withstand the fire hazard present. A non-fire rated steel panel (Door

[2]It should be noted that after Appendix R is amended to include manual actions for redundant safe shutdown, this exemption will no longer be necessary if OPPD's feasible manual actions satisfy the new requirements. Therefore, this exemption may only be temporary.

1011-11) separates the Turbine Building from the Auxiliary Building equipment hatch access. An un-mortared, solid block wall separates Room 18 (Fire Areas 6) and FA-32. A non-rated steel plate panel is also in the barrier wall to Fire Area 34A. The floor area at El. 989' is 4646 sq. ft. with a 20' ceiling height. The area at El. 1011' is 804 sq. ft. with a ceiling height of 12 feet.

FA-32 is a large area with high ceilings. It contains process piping networks, equipment installations, and multiple cable tray systems. To understand the configuration of safe shutdown equipment in FA-32, and to facilitate communication, a three-dimensional laser image of the area was created. The attached Figure 1 shows the general configuration of the area. For purposes of analysis, FA-32 has been divided into zones. These zones are also shown on the attached Figure 1.

These zones were selected on the basis of several criteria that support the accuracy of the analysis. The zones: (1) were selected from locations within FA-32 that contain multiple train and redundant cables; (2) are independent of the cable type (power, control or instrument) or the amount of separation that may exist; and (3) were selected from areas where a fire could potentially impact both trains of safe shutdown equipment. The zones were selected based on expert panel consensus, not limited to current license basis issues. Therefore, not all areas examined require exemption consideration but are shown on Figure 1 to demonstrate the in-depth evaluation performed.

Equipment Present

Certain safety related/safe shutdown equipment sets and associated cabling are present in FA-32. Specifically two of three auxiliary feedwater pumps (FW-6, and FW-10) are located in this fire area. Safety related cables of Trains EA and EB are located in various tray systems throughout the area. Cables are also run in rigid-steel conduits. All 480V Motor Control power feeder cables are located in this area.

Fire Protection Features

Cable Tray Covers

FA-32 is comprised of various cable trays, conduit and cable running between conduit and penetrations or cable trays. For the most part, where cables, conduit, or cable trays are above a cable tray, those cable trays are equipped with covers. These covers are typically connected to the top of the cable tray with an offset (airspace) between the top of the tray and the cover. These tray covers are positioned such that in the unlikely event of a cable tray fire, flames would not rise directly to the cables/conduit above.

Fire Detection Systems

The FA-32 fire detection system is an addressable detection system consisting of ionization detectors that provide area wide coverage. These detectors provide Control Room annunciation and actuate the area-wide pre-action sprinkler system. Detection system logic requires two adjacent detectors to be in alarm to activate the pre-action system located in Room 19 (989' elevation portion of FA-32). Also annunciated are the pre-action valve water flow signal, pre-action system piping low air pressure signal and two manual pull stations (located at Door 989-14 and at the top of the stairway in the northeast corner). There are also ionization detectors installed at the ceiling above El. 1011' (Corridor 53) portion of FA-32.

Fixed Suppression Systems

A pre-action sprinkler system actuated by smoke detectors is located in FA-32. The system is designed using 165°F small orifice heads at the ceiling level to provide a density of 0.16 gpm/sq. ft. over the most remote 1500 square foot area. The sprinkler system was designed in accordance with NFPA 13. The pre-action system also includes closed-head spray nozzles directed at cable trays containing safe-shutdown related cables. The cable tray protection system was designed in accordance with NFPA 13 and NFPA 15. The system is designed using 165°F, 5/16" orifice closed head spray nozzles. The hydraulic analysis demonstrates that area coverage is provided by the sprinklers located at the ceiling, while the cable tray spray nozzles mitigate a local, concentrated hazard resulting from a cable tray fire. This combination design provides a robust suppression system that provides protection for multiple hazards.

An additional suppression system consists of two wet pipe pendant sprinklers located immediately above the steam driven auxiliary feedwater pump (FW-10). This system will mitigate the impact of a lube oil fire originating at FW-10 and will prevent exposure damage to the electrically driven auxiliary feedwater pump FW-6.

Manual Suppression/Extinguishers

The Station Fire Water Supply System provides manual hose stream suppression capability in addition to the automatic suppression demand that has been evaluated and determined to be adequate for the hazards present. Four hand held fire extinguishers are also located throughout FA-32 and other extinguishers are available from adjacent areas. There are four fire hose cabinets located within FA-32. Three are located at the basement level and one on the ground level.

Partial Fire Barriers

FA-32 contains partial cable tray fire barriers that are intended to separate cable trays containing

redundant safe shutdown cabling, and will provide a degree of passive protection by shielding the systems from direct flame impingement and the effects of radiant energy from a fire.

The principal fire hazard in this area has been identified as a cable fire in one redundant train that could affect the other. Therefore, passive fire protection in the form of partial Pyrocrete fire barriers was provided where these redundant cables cross each other in cable trays. The fire barriers were designed in accordance with the provisions of Regulatory Guide 1.75 and IEEE-384 (1977).

The typical construction for each of the fire barriers is a steel frame constructed of 3 x 3 x 5/16 angle and 4 x 4 x 2 angle (A36 structural steel). The steel frame is covered with metal lath that in turn is covered with 2" of Pyrocrete. The basic fire barrier design consists of lath, coated with a sufficient layer of Pyrocrete to meet UL standard configurations for a 3-hour barrier. There is a partial fire barrier separating auxiliary feedwater pumps FW-6 and FW-10. This barrier is arranged in an "L"-shape. The north leg consists of a pyrocrete/lath configuration similar to that described previously. The other leg is constructed of structural steel tubes and metal encased panel material. Original fire barrier construction documentation is available for review on-site.

Fire Hazards

Combustible Loads

The principal contributors to combustibles for this fire area are cable insulation, the administratively controlled transient combustibles which are allowed in the area, and small quantities of lube oil. The combustible loading for this area is classified as LOW, with LOW being defined as being less than 60 minutes of burn time. The burn duration for all combustibles in this area, assuming maximum transient load, is approximately 45 minutes. The suppression systems in the area have been designed and installed to address these fire hazards.

Design/License Basis

Background

FA-32 contains power distribution cabling for both trains of 4kV, 480V, and 125Vdc, both trains of instrument and control cabling for a limited number of credited equipment, and both trains of auxiliary feedwater pumps and controls. This configuration is allowed by Appendix R if the room has area-wide suppression and detection, and either; a) one of the trains is enclosed in a 1-hour fire barrier, or b) 20 feet of horizontal separation exists between the trains with no intervening combustibles or fire hazards. FA-32 has the necessary area-wide suppression and detection. However, certain power and control cables are not separated by the minimum required distance. Nor are they enclosed in a fire-rated barrier.

In recognition of this configuration, OPPD requested an exemption to Appendix R requirements in FA-32. An exemption was granted and an SER was issued on July 3, 1985.[3] Excerpts from the July 3, 1985 SER, Section IV, regarding FA-32 are as follows:

> Air Compressor Room (Fire Area 32)
>
> The licensee requested an exemption from Section III.G.2 to the extent that it requires that systems associated with redundant shutdown divisions be completely separated by a continuous 1-hour fire-rated barrier and the fire area containing these systems be protected by an area-wide automatic fire suppression system.
>
> The technical requirements of Section III.G.2 [of 10CFR50, Appendix R] are not met in this area because cables and components of redundant shutdown divisions are not completely separated by a continuous 1-hour fire barrier. The licensee's exemption request originally encompassed the need for an automatic fire suppression system. However, the licensee subsequently committed to install an area-wide automatic sprinkler system in the room.
>
> The staff's concern was that a fire of significant magnitude would damage redundant shutdown cables and/or the auxiliary feedwater pumps. However, the area is equipped with a complete fire detection system designed and installed in accordance with National Fire Protection Association (NFPA) Standard 72E. This system provides the staff with reasonable assurance that any potential fire would be detected in its incipient stages, before significant flame propagation or temperature rise occurred. The fire brigade would then be dispatched and would extinguish the fire using portable fire extinguishers or manual hose stations.
>
> If rapid fire spread occurred prior to arrival of the brigade, the automatic sprinkler system would actuate to suppress the fire, reduce room temperatures, and protect shutdown systems. Until actuation of the suppression system, the fire barriers would provide a degree of passive protection by shielding the systems from direct impingement and the effects of radiant energy from a fire.
>
> Based on the above evaluation, the staff concludes that the existing fire protection with the proposed modifications provides an equivalent level of safety to that achieved by compliance with Section III.G. Therefore, the licensee's request for exemption for a 1-

[3]An SER that clarified various aspects of the July 3, 1985 SER was issued on July 1, 1986.

hour fire barrier in the Air Compressor Room is granted. The exemption request for an automatic fire suppression system is not needed.

In summary, the exemption was based on the finding that, for the limited fire hazards present in FA-32, the following fire protection features provide an equivalent level of protection to that achieved by compliance with Appendix R:

- area-wide suppression and detection systems,
- some level of physical separation,
- some protection via partial fire barriers and manual suppression capability.

For these reasons the NRC concluded that one train of equipment necessary to safely shutdown the plant would survive any credible fire.

Recent Developments

In January 2000, the NRC conducted a Triennial Fire Protection Baseline Team Inspection at FCS. The NRC concluded that it disagreed with the FCS understanding of the scope of the 1985 exemption. In particular, the NRC concluded that the exemption did not apply to redundant power cables that were separated by less than 10-feet, and redundant control cables that were found to be closer than 20 feet. Although OPPD disagreed with these conclusions, it conducted a fire hazards analysis using state-of-the-art techniques to determine whether these configurations are safe. The results of that analysis are provided below and support the continuing safety of the configurations.

In addition, since 1985, OPPD has added a diesel driven auxiliary feedwater pump, FW-54 that is independent of FA-32. While this component is not formally included in, nor specifically credited in, the Appendix R program, its presence provides an additional defense-in-depth layer to enable the plant to be shutdown safely in the event of a fire in FA-32. Accordingly, OPPD is determined to seek an exemption because compliance would impose an unnecessary burden not needed to achieve the level of protection provided by strict compliance with Appendix R.

New Information Supporting an Exemption

Fire Modeling

A detailed fire hazards analysis was prepared to evaluate the significance of combustibles present and anticipated in FA-32. Various combinations of combustibles were packaged for evaluation that represents both in-situ and transient loads. The techniques employed were determined by industry experts as suitable to ascertain credible fire event energy releases, target damage assessments, and fire protection system response in the FA-32 zones shown in Figure 1. Results

of the analysis support the Reference 4 1985 exemption that a fire in FA-32 would be limited in severity and not damage both trains of cable/equipment before suppression.

Briefly, the analysis shows that fire damage would be limited due to the response of the extensive fire detection/suppression system. An example of this analysis is the conservative calculation made based on a 7-gallon oil spill releasing its entire heat content in 2.5 minutes.[4] This calculation is conservative because it represents an extreme heat release rate yet is the smallest fire which would result in an intensity needed to actuate the fire suppression system (which is significantly less than the energy necessary to inflict cable jacket damage). A smaller fire would set off area detection alerting plant staff but not damage redundant cables because it would not develop enough energy to cause credited equipment damage. A larger fire, such as one that could result from a fire during the change out of oil in one or more component lube oil inventories, would result in a greater fire intensity and thus, actuate the fire suppression system earlier on in the event. For brevity, the analysis itself has not been included in this document but, is available for review on-site.

The critical conclusion of this analysis was that in the event of a fire intense enough to cause credited equipment fire damage, area detection/suppression would be initiated before such damage could occur.

Zone Analysis

This evaluation addresses those zones in FA-32 which contain redundant cables. Not all of the cables are credited for safe shutdown. The zones were selected based on physical proximity between Train A and Train B cables and equipment. Figure 1 shows the zone locations in the fire area.

There are areas within the room where non-credited Train A and Train B cables cross, specifically at the south end of the room. The cables in this area are not credited for Appendix R and are therefore not addressed in this analysis.

The room contains a number of radiant energy barriers. Some of these barriers were discussed in correspondence with the NRC and were specifically identified in the Reference 3, January 9, 1985 exemption request for FA-32. Partial barriers are also discussed in the Reference 4, July 3, 1985 Appendix R exemption and associated SER. Only those barriers specifically credited in meeting the design and licensing basis for the area are discussed in this evaluation (i.e., barrier in Evaluation Zone F).

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[4]This spill will result in a fire having a peak fire intensity of about 5,700 Btu/sec. (5.7 MW) - this represents a large fire.

Evaluation

Zone AC

In reference to attached Figure 1, zones A and B contain cables for redundant Train A and Train B power (zones A & B). Zone C contains control cables for Train A and Train B switchgear. The power cables for Train A and Train B switchgear (including control power for the switchgear) are separated by 10-feet. The control cables do not meet the 20-foot separation requirement of Appendix R. The control cables provide control for redundant LPSI pumps.

General Description

Zone AC is a combination of Zone A and Zone C. Zone A runs north/south from approximately 1A to 7A (Figure 1). The power and control cables routed in Zone A are primarily associated with the Train A switchgear and power transformers located in the rooms directly above the cable trays. Zone C contains the two control cable tray systems that run north/south parallel to and between zones A and B. These trays are located at the south end of the room approximately between 1A and 4A and are above the station air compressors.

Safe Shutdown Analysis

Zone A contains the Train A power cables. These cables provide the power from the 4kV buses to the 480V switchgear and from the 480V switchgear to the 480V motor control centers (MCC's). However, in FA-32 these cables are separated by at least ten feet from their redundant Train B cables and addressed by the existing exemption for the area.

The 125 VDC supply for control of the Train A 4kV and 480V switchgear is also routed in Zone A. These cables are associated with the same busses as the power cables (i.e., control cables associated with the switchgear whose power cables are routed through the zone). Therefore, a loss of these control cables would have the same impact as a loss of the power cables for the switchgear that are explicitly addressed by the exemption. These control cables are separated from their redundant components in Zone B by the same distance as the power cables addressed by the exemption.

Zone C contains redundant control cables for LPSI pumps, SI-1A and SI-1B. Loss of the cables would require feasible manual operation of the breakers at the switchgear, as needed, to support cold shutdown. The other cables routed in these trays are either not redundant or are not required for safe shutdown.

The loss of the LPSI control cables will not impact the ability to achieve and maintain hot shutdown. If these control cables were lost during a fire event, it would be necessary to manually

operate the LPSI pump breakers in order to initiate shutdown cooling. Manual operation of these breakers would occur outside of FA-32.

In summary, this exemption would not adversely affect the plants ability to shut down safely in the event of a fire in this zone because:

- In the unlikely event of a fire occurring in FA-32 intense enough to cause credited cable fire damage, analysis shows area detection/suppression would be initiated before such damage could occur.
- The separation between the power cables meets the 10-foot limit in the existing exemption and there is in-tray suppression protecting the cables located in this zone (i.e., Train B power would be available).
- Manual actions could be performed, if necessary, to mitigate spurious operation of breakers associated with the damaged power train. Action is to manually trip 4 kV feeder breaker at the switchgear that is located outside of FA-32.
- Manual actions could be performed, if necessary, to align charging pump suction to the Safety Injection and Refueling Water Tank (SIRWT) or the Boric Acid Storage Tank (BAST).

Evaluation Zone BC

Zone BC is the same as Zone AC. Zone BC contains Train B power cables instead of Train A power cables.

Evaluation Zone D

Zone D contains redundant power cables for Train A MCCs 3A2 and 3C2 and Train B MCCs 4A2 and 4C2. These MCC's provide power to valves used for alignment of the charging pumps to a source of borated water (either the SIRWT or the BAST). Zone D also contains redundant power cables for the LPSI pumps. These redundant cables are separated by approximately 3 feet and do not satisfy the 10-foot power cable separation requirement (noted in Reference 6 and 7).

General Description

Evaluation Zone D is located toward the north end of Room 19 along the west wall. In this zone, power cables of opposite safety division are routed within 3 feet of each other. There are no fixed combustibles at the floor level of this zone. The cable trays have in-tray suppression and are greater than 15 feet above the floor. This configuration was in place when the Reference 4 1985 exemption was granted.

Safe Shutdown Analysis

Loss of power cables to both LPSI pumps would require a permissible cold shutdown repair activity to restore power to the pumps. Zone D also contains power cables for Train A MCCs 3A2 and 3C2 and Train B MCCs 4A2 and 4C2. A component level equipment load review of the above MCCs determined that loss of power would not adversely affect the ability to achieve and maintain hot shutdown from an emergency control station. Local manual operation of the following valves is required for alignment of the charging pumps to the SIRWT. Manual operation of Volume Control Tank (VCT) outlet valve LCV-218-2 and SIRWT Outlet Valve LCV-218-3. Instead of aligning to the SIRWT, the charging pumps could be aligned to the Boric Acid Storage Tanks (BAST's) by manual operation of Gravity Feed Valves HCV-258 and HCV-265 and VCT Outlet Valve LCV-218-2. These actions are not time critical as there are no failures in this zone that result in a challenge to RCS inventory (i.e., spurious operation of pressurizer PORV's are not credible for a fire in this zone). Plant operators are familiar with these actions and the steps to align the charging pump suction are identified in emergency operating procedures.

In summary, an exemption would not adversely affect the plant's ability to shut down safely in the event of a fire in this zone because:

- In the unlikely event of a fire occurring in FA-32 intense enough to cause credited cable fire damage, analysis shows area detection/suppression would be initiated before such damage could occur.
- Manual actions could be performed to align charging pump suction to the SIRWT or the BAST in the unlikely event that a fire disabled both trains of cables.

Evaluation Zone E

Zone E contains redundant control cables for auxiliary feedwater pumps FW-6 and FW-10 and power cables for FW-6. This cabling does not meet the 20-foot separation requirement. This configuration was addressed by the current exemption for the area. However, while historic licensing efforts in this area focused on auxiliary feedwater pumps FW-6 and FW-10, and remains in effect, an additional defense-in-depth level of equipment has been added to the plant. This equipment was previously discussed in this attachment (FW-54, diesel driven auxiliary feedwater pump).

General Description

This zone contains the redundant auxiliary feedwater pumps, FW-6 and FW-10. Additionally, there is a train A cable tray system routed above the area, which is protected from an FW-10 fire by several partial fire barriers and fixed suppression systems.

Safe Shutdown Analysis

Zone E contains redundant cables for FW-6 and FW-10. A fire in this area is mitigated by a dedicated wet pipe suppression system installed above FW-10, a partial height fire barrier installed between FW-6 and FW-10, and a suppression system installed to protect the cables above the pumps. The fire protection features ensure that either FW-6 or FW-10 would be available for safe shutdown.

In summary, an exemption would not adversely affect the plant's ability to shutdown safely in the event of a fire in this zone because:

- In the unlikely event of a fire occurring in FA-32 intense enough to cause credited cable fire damage, analysis shows area detection/suppression would be initiated before such damage could occur.
- A third, diesel driven auxiliary feedwater pump (located outside FA-32) is available to support safe shutdown of the plant. This pump is not included on the Safe Shutdown Equipment List and is not a specific element of the Appendix R program. However, the pump would be available (and would remain undamaged) in the event of a FA-32 fire.

Evaluation Zone F

Zone F contains redundant power cables to MCCs 3A1, 3B1 and 3C1 and MCCs 4A1, 4B1 and 4C1. These cables are separated by less than 10 feet. The cables provide power to redundant motor control centers located outside of the area. Zone F was previously identified as an area of concern in an NRC violation issued on July 1, 1983 (Reference 2). The configuration was documented in the Reference 3, January 9, 1985 OPPD exemption request and was subsequently approved in the Reference 4, 1985 exemption that was granted. The current significance of this area is due to the Room 18 protrusion (see the Zone F detail on Figure 1). The protrusion is significant because it raises the modeled transient fire plume damage threshold into the cable tray system.

General Description

Zone F is located in the center of Room 19 along the west wall. In this zone, Train A cable trays cross above the train B trays. A partial fire barrier separates the redundant trains where the trays cross and the trays are protected by an in-tray fixed suppression system.

Safe Shutdown Analysis

OPPD considers this zone acceptable based upon the fact that it was previously identified by the NRC in Reference 2, was specifically discussed in the associated exemption request, Reference

3, and was approved in the subsequent Reference 4 1985 exemption for FA-32. Current analysis indicates the exposed tray system could be exposed to damage threshold energies without crediting the partial barrier and the suppression system. Functional credibility of the existing partial fire barrier is beyond the capability of the currently available modeling tools. However, due to the remote location and general congestion in the vicinity of the zone, OPPD has concluded that a damaging transient event is not credible. Additionally, there is some additional margin in the unanalyzed fire resistance afforded by the existing partial fire barrier.

In summary, the current exemption would not adversely affect the plant's ability to shut down safely in the event of a fire in this zone because:

- Fire detection and suppression systems adequately protect the cables in the zone.
- There is an existing partial fire barrier between the independent cable tray systems.
- Due to the remote nature of this zone accumulation of enough transient material to cause a cable damaging fire is not credible.

Evaluation Zone G

Zone G contains a control cable for Power Operated Relief Valve (PORV) PCV-102-2 and the MCC power cable for its associated PORV Block Valve HCV-150. These cables are separated by approximately 25 feet. However, there are intervening combustibles (cables). Zone G also contains instrumentation cable for pressurizer level indication L-101Y and cables for redundant pressurizer level indication. These cables are separated by less than 20 feet.

General Description

Zone G is located in the middle section of the fire area along the east wall. Located in this zone is tray section 22S which contains Train B control cables. There is a Train A cable tray system routed above and at a right angle to 22S. The Train A and Train B cable trays are separated by a partial fire barrier and protected with automatic suppression. Tray section 22S contains control cables for Pressurizer PORV, PCV-102-2. The power cables for the MCC which powers the redundant block valve (HCV-150) are routed approximately 25 feet from where the control cables are located. This separation distance is greater than the minimum 10-foot distance specified in the exemption. This zone also contains cables for pressurizer level indication. There are other Appendix R cables in this area; however those cables are not credited for a FA-32 fire. Intervening combustibles are the cables routed in trays in the zone and any transient combustibles that may be in the zone at the floor level.

This zone is being included in this document based on the presence of both a RCS PORV and its associated block valve cabling within close proximity, and the challenge to RCS inventory that a

loss of both components would represent. Also, it appears appropriate to document the necessary manual actions necessary to mitigate the unlikely event.

Safe Shutdown Analysis

As previously stated, the zone contains control cable for PORV, PCV-102-2 and power for its associated block valve (HCV-150). The circuit failure mode is assumed to be a hot short that results in spurious opening of the PORV (loss of power to the Block Valve would leave it in its normally open position, causing a loss of RCS pressure).

If such a failure were to occur, feasible manual action could be taken to remove power from the pressurizer PORV. This action would be performed outside of FA-32. The PORV is powered from an MCC and removal of power at the MCC will cause the PORV to fail closed. Therefore, safe shutdown equipment necessary to achieve and maintain hot shutdown remains available from an emergency control station.

If pressurizer level indication is lost, level can be monitored at remote shutdown panel AI-185. Indication would be available at this panel independent of FA-32.

This zone was deemed acceptable based on the physical separation of the cables (the fact that the 25-foot separation meets and exceeds the 10-foot requirement specified in the exemption), and the fact that both groups of cables are protected by in-tray sprinklers.

In summary, an exemption would not adversely affect the plant's ability to shut down safely in the event of a fire in this zone because:

- In the unlikely event of a fire occurring in Room 19 intense enough to cause credited cable fire damage, analysis shows area detection/suppression would be initiated before such damage could occur.
- Manual actions could be performed to open the PORV breaker to prevent and mitigate the consequences of a spuriously operated valve in the unlikely event that a fire disabled both trains of cables. Also, feasible manual actions could be taken to monitor Pressurizer level at AI-185 if level indication is lost in the main control room.

Conclusion

Based on this evaluation, OPPD has demonstrated that its request for an exemption from certain requirements in 10 CFR 50, Appendix R, Section III.G.2 for FA-32 satisfies the NRC's exemption criteria in 10 CFR 50.12. The basis for the acceptability of the exemption is as follows:

- The area is protected by a robust suppression system that includes area coverage sprinkler heads located at the ceiling with additional suppression at the cable trays.
- Based on the combustible loading in the area and the suppression system, any fire would have a small area of impact and would not spread throughout the area.
- Train A or Train B power would remain available due to the 10-feet of physical separation as approved by the current exemption for the area.
- Manual actions required to support safe shutdown or to mitigate spurious component operation are limited in scope and can easily be performed within the required time limitations.

It is, therefore, OPPD's position that a level of protection equivalent to Section III.G.2 of 10 CFR 50 Appendix R is provided in the area. The requested exemption from Section III.G.2 of 10 CFR 50 Appendix R has been reviewed and determined not to be in conflict with other legal requirements, does not present an undue risk to the public safety and health, and is consistent with the common defense and security. The exemption request, therefore, conforms to the requirements of 10 CFR 50.12(a)(1). In addition, "special circumstances" exist for the requested exemption in that application of the regulation in this particular circumstance is not necessary to achieve the underlying purpose of Appendix R to 10 CFR 50. Accordingly, the exemption should be granted.

Attachment 2
Fire Area 32 Exemption Request
Manual Actions List

The manual actions in this attachment are also contained in attachment 1 of this document. However, they have been included as a separate attachment aid in the review of this document.

In some cases, these manual actions are already contained in existing procedures and training for their completion is provided. In those cases, some procedures may be enhanced following approval of this request. However, in cases where there is no guidance for a manual action, procedural guidance could be developed and training provided following the approval of this request.

Zone D does contain redundant power cables for the LPSI pumps. These redundant cables are separated by approximately 3 feet and do not satisfy the 10-foot power cable separation requirement (noted in Reference 6 and 7). There are no fixed combustibles at the floor level of this zone. The cable trays have in-tray suppression and are greater than 15 feet above the floor. This configuration was in place when the Reference 4 1985 exemption was granted. Loss of power cables to both LPSI pumps would require a cold shutdown repair activity to restore power to the pumps. This cold shutdown repair is permissible per 10 CFR 50, Appendix R, Section III.G.2. As a result, this repair is not being requested for review as a manual action. This cold shutdown repair currently exists for use in another fire area. Upon approval of this request, the existing cold shutdown repair procedure would be revised to include FA-32.

The manual actions listed below are similar to those that the NRC has previously approved for FCS and/or other plants. These actions are requested for approval as part of this exemption request:

Zone AC

1. Manual actions could be performed, if necessary, to mitigate spurious operation of breakers associated with the damaged power train. Action is to manually trip 4 kV feeder breaker at the switchgear that is located outside of FA-32.

2. Manual actions would be performed, if necessary, to align charging pump suction to the SIRWT or the BAST.

Zone BC

1. Manual actions would be performed, if necessary, to mitigate spurious operation of breakers associated with the damaged power train. Action is to manually trip 4 kV feeder breaker at the switchgear that is located outside of FA-32.

2. Manual actions would be performed, if necessary, to align charging pump suction to the SIRWT or the BAST.

Zone D

1. Manual actions would be performed to align charging pump suction to the SIRWT in the unlikely event that a fire disabled both trains of cables.

Zone G

1. Manual actions would be performed to open the PORV breaker to prevent and mitigate the consequences of a spuriously operated valve in the unlikely event that a fire disabled both trains of cables. Also, feasible manual actions would be taken to monitor Pressurizer level at AI-185 if level indication is lost in the main control room.

Attachment 3
Summary of Room 19 Fire Risk Analysis

INTRODUCTION

A focused fire risk assessment was performed for Fire Area 32 (FA-32) (Room 19). The objective of this assessment was to gain risk insights related to the specific separation of key circuits by examining all identified areas where cables are less than 10 feet in FA-32.

OVERALL ASSESSMENT PROCESS

The overall assessment process began with the identification of all key circuits and equipment in the area. The routing of these was determined and cable pinch points were identified. The location of the routing points as well as the identified pinch points represents the targets of concern. These targets could be threatened by in-situ fire ignition sources or postulated transient combustibles.

The in-situ fire ignition sources were examined first to determine their impact on the identified targets sets. This examination used the fire modeling relationships from the EPRI FIVE Methodology. The analysis considered inside of plume, outside of plume, and radiant effects as well as the response of the automatic fire suppression system. The examination of the in-situ fire ignition sources determined that some of the targets in the room were not threatened. Postulated transient combustible fires were then considered to examine these additional targets. The transient combustibles were treated using a range of values in order to gain a better understanding of the room response.

The overall analysis of the area was based on the treatment of 10 fire scenarios as summarized in the table below.

No.	Scenario Description	Discussion
1	FW-10 fire without suppression	Large oil fire with suppression system failure
2	FW-10 fire with suppression	Large oil fire with suppression system success.
3	FW-6 fire without suppression	Large oil fire with suppression system failure
4	FW-6 fire with suppression	Large oil fire with suppression system success.

No.	Scenario Description	Discussion
5	Air Compressor without suppression	Large oil fire with suppression system failure.
6	Air Compressor with suppression	Large oil fire with suppression system success.
7	Transient fire along between column lines C-1a and D-4a	A large transient based fire could present a hazard equivalent to cases 1 through 6 above.
8	Transient fire on roof of CCW Hx Room between 4a and 5b	Because of the relatively small elevation difference between the target and the roof, a moderate volume of transient could result in a damaging fire.
9	Floor based transient fire between column lines C-4a and C-6d	There are no fixed ignition sources located in this area.
10	Floor based transient fire between column lines C-7a and D-7a	There are no fixed ignition sources located in this area.

The postulated oil spill fires were based on the volume of lubricant contained within a single cavity. The postulated severe spill assumes the release, ignition, and combustion of this inventory. The heat release rate was calculated based on material properties from the EPRI FIVE Methodology. The non-severe fire was based on the release of a fraction of this inventory. The consequences of this fire were evaluated for target damage time as well as suppression system actuation time.

The analysis for postulated transient combustible based fires relied on test results presented in the EPRI Fire PRA Implementation Guide. The test results were used to gain insights for characteristic heat release rates while the assumed volume of materials was used to establish the fire duration.

SUMMARY OF SCENARIO ANALYSIS RESULTS

Scenario 1 – Large AFW Pump FW-10 Fire Without Suppression

This scenario considers a postulated severe fire involving 5 ½ gallons of oil released from the AFW pump/turbine. This scenario considers the consequences of a postulated failure of the automatic fire suppression system with a probability of 5.0E-02. This scenario involves a 'beyond Appendix R case' since failure of the suppression system is considered. 'Appendix R' does not require the consideration of any single failures beyond the occurrence of the fire itself.

The fire was modeled with fire intensity of 4,528 Btu's. The fire modeling results shows a critical radial damage distance of 12 feet. Because of the radiant shielding surrounding the pump and the height of the targets above the fire, the 12 foot radiant exposure distance does not cause equipment or cables to be challenged. However, the fire has sufficient energy to damage targets located in the postulated fire plume. In addition, targets located in the ceiling jet region within a 5-foot radial distance are also affected.

The calculated Core Damage Frequency (CDF) for this scenario is 9.86E-07/yr.

Scenario 2 – Large AFW Pump FW-10 Fire With Suppression

This scenario is the same as Scenario 1 except the fire suppression system is credited. This scenario is effectively the 'Appendix R case'. The extent of fire damage is predicted based on the FIVE fire modeling relationships and the calculated suppression system response versus target damage time. The results of the analysis concluded that the extent of target damage would bound that for a postulated non-severe fire originating at FW-10. Therefore, this scenario also includes treatment of the postulated non-severe fire.

The calculated Core Damage Frequency (CDF) for this scenario is 2.01E-08/yr.

Scenario 3 – Large AFW Pump FW-6 Fire w/o Suppression

This scenario considers a postulated severe fire involving 3 ½ gallons of oil released from the AFW pump/motor. This scenario considers the consequences of a postulated failure of the automatic fire suppression system with a probability of 5.0E-02. This scenario involves a 'beyond Appendix R case' since failure of the suppression system is considered. 'Appendix R' does not require the consideration of any single failures beyond the occurrence of the fire itself.

The fire was modeled with fire intensity of 2,882 Btu/s. The fire modeling results shows a critical radial damage distance of less than 10 feet. Because of the radiant shielding surrounding the pump and the height of the targets above the fire, the 10 foot radiant exposure distance does not cause equipment or cables to be challenged. However, the fire has sufficient energy to damage targets located in the postulated fire plume. In addition, targets located in the ceiling jet region within a 2.6 foot radial distance are also affected.

The calculated Core Damage Frequency (CDF) for this scenario is 9.86E-07/yr.

Scenario 4 – Large AFW Pump FW-6 Fire With Suppression

This scenario is the same as Scenario 3 except the fire suppression system is credited. This scenario is effectively the 'Appendix R case'. The extent of fire damage is predicted based on the FIVE fire modeling relationships and the calculated suppression system response versus target damage time. The results of the analysis concluded that the extent of target damage would bound that for a postulated non-severe fire originating at FW-6. Therefore, this scenario also includes treatment of the postulated non-severe fire.

The calculated Core Damage Frequency (CDF) for this scenario is 1.17E-09/yr.

Scenario 5 – Large Air Compressor Fire Without Suppression

This scenario considers a postulated fire involving 7 gallons of oil released from one air compressor. This scenario considers the consequences of a postulated failure of the automatic fire suppression system with a probability of 5.0E-02. This scenario involves a 'beyond Appendix R case' since failure of the suppression system is considered. 'Appendix R' does not require the consideration of any single failures beyond the occurrence of the fire itself.

The fire was modeled with fire intensity of 5,763 Btu/s. The fire modeling results shows a critical radial damage distance of 13 ½ feet. The air compressors are located such that there is greater than 13 ½ feet of spacing between the air compressors and other equipment in the room and the overhead cable trays. Therefore, the radiant exposure represents only a threat to the other air compressors. However, the fire has sufficient energy to damage targets located in the postulated fire plume. In addition, targets located in the ceiling jet region within a 6.4 foot radial distance are also affected.

The calculated Core Damage Frequency (CDF) for this scenario is 4.08E-07/yr.

Scenario 6 – Large Air Compressor Fire With Suppression

This scenario is the same as Scenario 5 except the fire suppression system is credited. This scenario is effectively the 'Appendix R case'. The extent of fire damage is predicted based on the FIVE fire modeling relationships and the calculated suppression system response versus target damage time. The results of the analysis concluded that the extent of target damage would bound that for a postulated non-severe fire originating at the air compressor. Therefore, this scenario also includes treatment of the postulated non-severe fire.

The calculated Core Damage Frequency (CDF) for this scenario is 2.01E-08/yr.

Scenario 7 – Transient Fire on Floor between C-1a and D-4a

This scenario considers a postulated transient combustible based floor fire located between column lines C-1a and D-4a. The analysis concluded that a floor based transient fire would not cause damage to targets. However, the analysis implicitly credited existing transient control procedures. In order to gain further insights as to the potential risk significance of this area, a scenario was developed which assumed a failure in the control procedures resulting in the presence of a large volume of materials.

The calculated Core Damage Frequency (CDF) for this scenario is 1.15E-08/yr.

Scenario 8 – Transient Fire on Roof of CCW Room between 4a and 5b

This scenario is similar to that described for Scenario 7 except that this particular scenario involves the space on the roof of the CCW heat exchanger room. The roof is at elevation 1002' as compared to the overall Room 19 floor elevation of 989'. This results in a remaining available height above the roof of approximately 10 feet. The analysis of this area credits the radiant energy shield that is installed.

The configuration of this area and the limited access would suggest that the accumulation of transient combustibles is unlikely. Nevertheless, the potential exists that should a fire of sufficient magnitude occur, it may represent a challenge to the 'redundant' trays located along column line C. Because of the horizontal spacing that exists due to the radiant energy shield and the presence of an automatic fire suppression system, a failure of the suppression system must occur before redundant circuit damage is considered credible.

The calculated Core Damage Frequency (CDF) for this scenario is 4.59E-08/yr.

Scenario 9 – Transient Fire on Floor between C-4a and C-6d

The treatment of this scenario is identical to that described for Scenario 7 except the specific area being considered is different. The change in the area size alters the scenario fire ignition frequency.

The calculated Core Damage Frequency (CDF) for this scenario is 6.88E-09/yr.

Scenario 10 – Transient Fire on Floor between C-7a and D-7a

The treatment of this scenario is identical to that described for Scenario 7 except the specific area being considered is different. The change in the area size alters the scenario fire ignition frequency.

The calculated Core Damage Frequency (CDF) for this scenario is 2.29E-09/yr.

FIRE RISK ANALYSIS INSIGHTS

The results of the fire risk assessment show that transient fires in the area are not a significant risk contributor. The summary of results presented below shows that the majority of the risk is associated with the large fires associated with the AFW pumps. The transient fires collectively contribute less than 3% of the calculated fire related core damage frequency (CDF). Of the transient fire scenarios, scenario 8 is the most dominant. This scenario involves a postulated fire on the roof of the CCW heat exchanger room.

Fire Scenario Description	CDF Estimate	% Contribution
Scenario 1 – Large AFW Pump FW-10 Fire Without Suppression	9.86E-07	39.5%
Scenario 2 – Large AFW Pump FW-10 Fire With Suppression	2.01E-08	0.8%
Scenario 3 – Large AFW Pump FW-6 Fire Without Suppression	9.86E-07	39.5%
Scenario 4 – Large AFW Pump FW-6 Fire With Suppression	1.17E-09	< 0.1%
Scenario 5 – Large Air Compressor Fire Without Suppression	4.08E-07	16.3%
Scenario 6 – Large Air Compressor Fire With Suppression	2.94E-08	1.2%
Scenario 7 – Transient Fire on Floor between C-1a and D-4a	1.15E-08	0.5%
Scenario 8 – Transient Fire on Roof of CCW Room Between 4a and 5b	4.59E-08	1.8%
Scenario 9 – Transient Fire on Floor between C-4a and C-6d	6.88E-09	0.3%
Scenario 10 – Transient Fire on Floor between C-7a and D-7a	2.29E-09	0.1%
Total Calculated CDF Contribution	2.50E-06	

Based on the results of this assessment, the risk significant attribute of this fire area is the automatic fire suppression system. The scenarios which represent the dominant risk contributors are those which involve postulated failure of the suppression system. While efforts to control transient combustibles in the room have an impact, the cumulative risk contribution associated with these scenarios is minimal. The analysis also identified a potential procedural enhancement that would

limit the amount of plastic type transient combustibles to 48 lbs. The implementation of this recommendation is expected to provide a minor risk benefit.

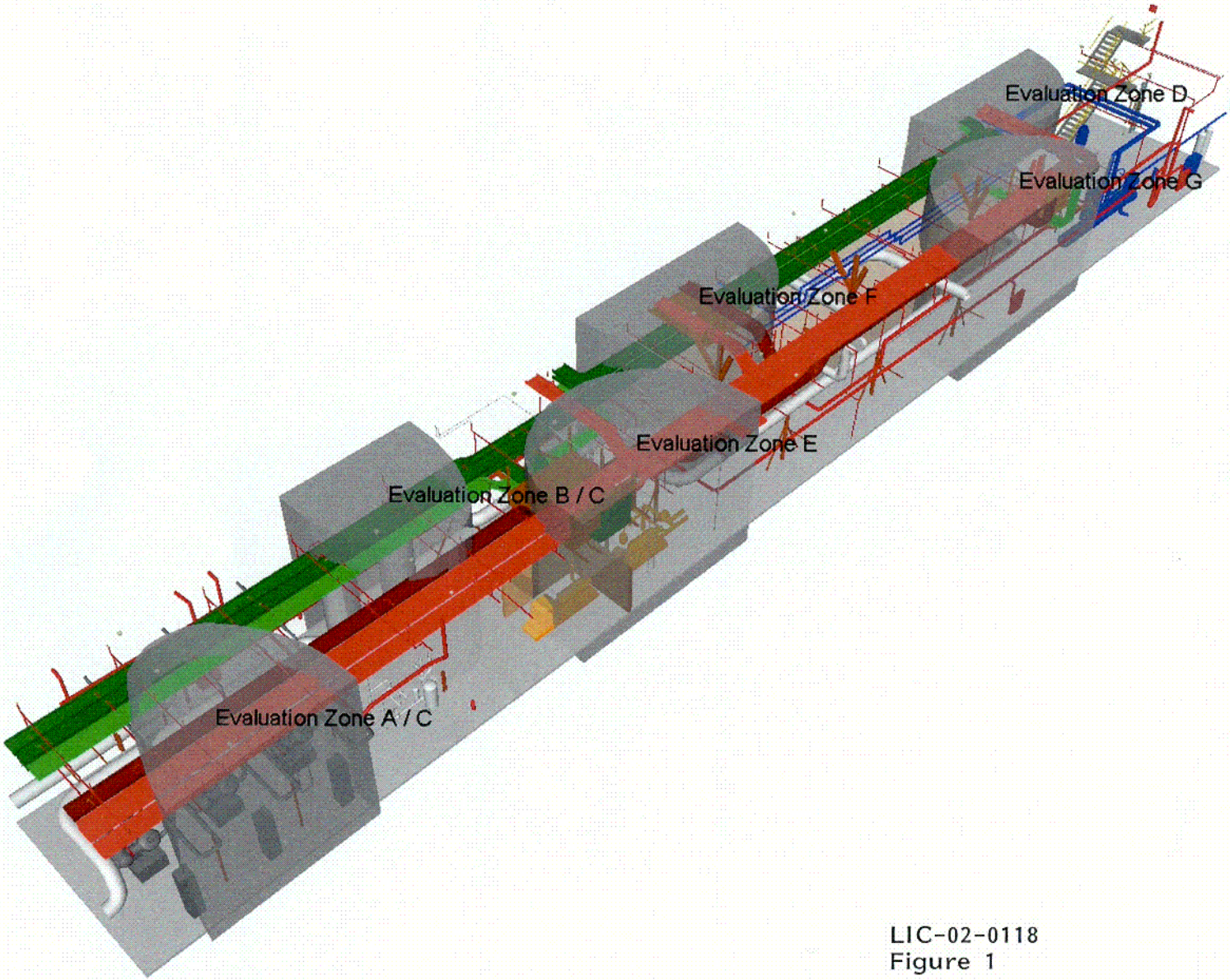

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Figure 1

C01