



444 South 16th Street Mall  
Omaha NE 68102-2247

April 9, 2003  
LIC-03-0053

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

- References:
1. Docket No. 50-285
  2. Letter from OPPD (R. T. Ridenoure) to NRC (Document Control Desk) dated November 8, 2002, (LIC-02-0118)
  3. Letter from NRC (A. B. Wang) to OPPD (R. T. Ridenoure) dated February 11, 2003, Fort Calhoun Station Fire Protection Exemption For Fire Area 32 (TAC NO. MB6746) (NRC-03-027)

**SUBJECT: Response to Request For Additional Information (RAI), Related to Exemption Request from the Requirements of 10 CFR 50, Appendix R, Section III.G.2 for Room 19 at Fort Calhoun Station (FCS)**

In Reference 3, the NRC noted that Omaha Public Power District (OPPD) had agreed to provide responses to an RAI concerning the Reference 2 OPPD exemption request. This letter contains the requested responses.

Mr. Gary R. Cavanaugh (OPPD) contacted Mr. Alan B. Wang (NRC) to discuss a June 27, 2002 public meeting between NRC and OPPD. In that meeting OPPD provided presentation materials to the NRC. Mr. Wang noted that the NRC is still in possession of those materials. Those documents provide some clarifying details and should assist the NRC in reviewing OPPD's response to the RAI. Those documents are color-coded and provide good detail for cable trays, fire barriers, and trains. OPPD will refer to those documents in Attachment 1 of this response.

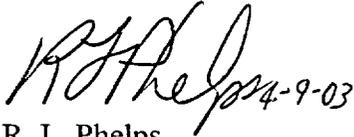
Attachment 2 provides additional drawings to clarify information in this response.

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If you have any questions or require additional information, please contact Mr. Gary R. Cavanaugh of the FCS Licensing staff at (402) 533-6913.

Sincerely,

Handwritten signature of R. L. Phelps in black ink, with the date "4-9-03" written in the lower right corner of the signature.

R. L. Phelps  
Division Manager  
Nuclear Engineering

RLP/GRC/grc

Attachments (2)

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

**Response to NRC Request for Additional Information  
For OPPD  
Exemption Request from the Requirements of 10 CFR 50, Appendix R,  
Section III.G.2 for Room 19 at FCS**

**NRC Question 1:**

**The 3-dimensional Figure 1 attached in the November 8, 2002, exemption request (exemption request) does not provide the appropriate level of detail for staff review. Please submit a revised drawing (P&ID) which shows the following for Fire Area (FA) 32:**

- **room dimensions (including height),**
- **location of compressors and auxiliary feedwater pumps,**
- **fire doors and fire barriers,**
- **the location of cable trays identified in exemption request (identifying both power and control cables),**
- **ventilation system details, and**
- **locations of any fixed and/or transient ignition sources.**

**OPPD Response:**

Refer to Attachment 2 for additional clarification on room dimensions, major equipment locations, fire door and barrier designations, and the location of fixed and potential transient ignition sources. Ventilation for FA 32 is provided by supply and exhaust fans located in a different fire area. Approximately 2,200 cubic feet/minute (cfm) of non-cooled air is provided to the room with ductwork running along the west (supply) from columns 1a to 4a and east (exhaust) from columns 1a to 6d of the area. Approximately 3,400 cfm of cooled air is also provided for the room by air handling unit, VA-100, which is shown in Attachment 2. OPPD requests the NRC refer to the 3-dimensional Figure 1 submitted on November 8, 2002 for location of cable trays identified in the exemption request. This level of detail for the cable trays is difficult to display on plan view drawings and is much better depicted in the 3-dimensional color-coded figure previously submitted. Additionally, OPPD recommends that the NRC refer to the June 27, 2002 Public Meeting Presentation materials (which OPPD provided to the NRC) that depict detailed information within each zone. The Public Meeting Presentation materials contain color-coded cable trays with redundant tray designations, which may be helpful to the reviewers. Finally, OPPD recommends that the reviewers conduct a site visit to inspect FA 32. A site visit will help the reviewers better understand the layout and physical attributes of the fire area.

**NRC Question 2:**

**Attachment 2 of the exemption request contains a list of manual actions for FA-32. Omaha Public Power District (OPPD) states that some manual actions are already contained in existing procedures and training and that some procedures may be enhanced following approval of the exemption request.**

- **It is not clear from Attachment 2 which manual actions are already approved and incorporated into the existing procedures and training, and which manual actions would require an enhancement to existing procedures. For each zone in FA-32, state which manual actions are already contained in existing procedures and training and which manual actions are considered as enhancements.**
- **In addition, for those manual actions that are already contained in existing procedures and training, please state if they are NRC-approved manual actions for FCS and list the safety evaluation where the staff approved the manual action for FA-32.**
- **With regard to the manual actions listed in Attachment 2 of the exemption request, OPPD did not provide the appropriate level of detail for the staff to determine if the manual actions are feasible. Evaluate each manual action with respect to the guidance contained in NRC staff's following letters to the Nuclear Energy Institute:**

**November 29, 2001 (ADAMS No.: MLO133703020)**

**May 16, 2002 (ADAMS No.: ML0214100260)**

**Both letters are also available on the NRC fire protection website at:**

**<http://www.nrc.gov/reactors/operating/ops-experience/fire-protection/technical-issues.html#manual>**

**OPPD Response:**

- **In response to the first and second bullet in NRC Question 2, the manual actions provided in Attachment 2 to reference 2 are proposed by OPPD. They have not yet been approved by the NRC and accordingly are not yet incorporated into existing procedures. Following the acceptance of the actions by the NRC (and noted in a safety evaluation report on this subject) OPPD will proceduralize the manual actions.**
- **In response to the third bullet in NRC Question 2, the following is provided as additional clarification to support the NRC's feasibility determination for the proposed manual actions:**

**Zone AC**

- **Trip 4160 V feeder breakers - these breakers are located in the 4160 V switchgear rooms at elevation 1011' and have local control switches at the breaker front to trip the breakers. The East and West switchgear rooms are directly above FA 32 in the Auxiliary Building and are each separate fire areas (FA 36A and FA 36B). Emergency lighting and**

communications capabilities (Gai-Tronics, plant telephone system) are provided in each of these rooms. These manual actions are identical to similar manual actions previously approved by the NRC for alternate shutdown due to control room evacuation in accordance with plant procedure AOP-06, Fire Emergency.

- Align charging pump suction to the Safety Injection Refueling Water Tank (SIRWT) or Boric Acid Storage Tanks (BAST) –
  - SIRWT –
    - Open 480 V breaker for LCV-218-3 at MCC 3A2
    - Open 480 V breaker for LCV-218-2 at MCC 3A2
    - Manually open valve LCV-218-3 in Room 7
    - Manually close valve LCV-218-2 in Room 29
  - BAST –
    - Open 480 V breaker for LCV-218-2 at MCC 3A2
    - Open 480 V breaker for HCV-258 at MCC 4A2
    - Open 480 V breaker for HCV-265 at MCC 3C2
    - Manually close valve LCV-218-2 in Room 29
    - Manually open either valve HCV-258 or HCV-265

These steps are identical to steps currently contained in AOP-06, Fire Emergency procedure to be used in the event of a control room evacuation and use of approved alternate shutdown methods at FCS. The feasibility of these steps has been previously demonstrated to the NRC.

#### Zone BC

- Trip 4160 V feeder breakers – identical to the first bullet above
- Align charging pump suction to the Safety Injection Refueling Water Tank (SIRWT) or Boric Acid Storage Tanks (BAST) – identical to second bullet above

#### Zone D

- Align charging pump suction to the Safety Injection Refueling Water Tank (SIRWT) – identical to the second bullet above

#### Zone G

- Manual actions to open a PORV breaker – open the 480 V breaker for either PORV at MCC 3C1 or MCC 4B1. These steps are identical to steps currently contained in AOP-06, Fire Emergency procedure. Feasibility of these actions is ensured through emergency lighting, emergency communications, procedural direction and operator training on the specific tasks.

- Manual actions to monitor pressurizer level at Alternate Shutdown Panel, AI-185 if indication is unavailable in the main control room. An Operator is required to monitor level indication and report readings back to the main control room. Feasibility of these actions is ensured through emergency lighting, emergency communications, procedural direction and operator training on the specific tasks.

### **NRC Question 3:**

**Page 5 of the November 8, 2002 exemption request states that the combustible loading in FA 32 consists of cable insulation, administratively controlled transient combustibles, and small quantities of lube oil. Combustible load is a measure of the maximum heat that would be released if all the combustibles in a given fire area burned and does not consider other significant factors such as heat release rate (HRR), room configuration, ventilation rate, or other parameters which describe the fire dynamics over a period of time. The 18<sup>th</sup> Edition of the National Fire Protection Association (NFPA) Fire Protection Handbook (FPH), pages 7-78, states that the original concepts of fire severity and fire load (combustible load) are very important even though they are technically obsolete. The National Institute of Standards and Technology (NIST) Technical Report NISTIR 5842', page ix, also identifies that there are technical shortcomings of this method, and states that:**

- **there is no technical basis for the equal-area hypothesis**
- **real room fire intensities are not a sole function of fire (combustible) load**
- **temperatures of real fires can rise much faster than the standard time-temperature curve**

**NISTIR 5842, page ix, also states that the NFPA FPH 18<sup>th</sup> Edition acknowledges that the fire load method is technically obsolete. The staff requests that OPPD provide the rationale or technical justification for classifying large amounts of cable insulation as a low combustible loading.**

### **OPPD Response:**

OPPD maintains a combustible loading calculation for safety-related fire areas at FCS. In 1998, OPPD revised the methodology of the calculation to incorporate conservative interpretations from the 17<sup>th</sup> Edition of the NFPA Fire Protection Handbook and developed categories of low, moderate and high combustible loading classifications. Each fire area is classified according to the fire load present. Based on actual fire loading and size of the area, FA-32 is considered a "low" fire severity area. This calculation was benchmarked in 1998 and again in 2002 and found to be in accordance with the industry standard.

This calculation is based on fire load (fixed and transient combustibles) and the results are provided in terms of fire severity (minutes of burn time) for each evaluated fire area. The results of this calculation provide OPPD a comparison of overall combustible load for each evaluated

fire area at FCS and are primarily used in NRC GL 86-10 evaluations of non-typical fire barrier installations.

The details regarding combustible loading for FA 32 were provided to the NRC as supporting information and not intended to form the technical basis for this exemption. OPPD is aware that there are technical shortcomings with the fire load method of combustible calculations. However, OPPD considers the results appropriate for the current level of use. The calculation is available for on site review by the NRC if desired.

#### **NRC Question 4:**

**OPPD states on page 8 of the exemption request that an analysis was performed which demonstrates that fire damage would be limited due to the response of the extensive fire detection/suppression system. In particular, OPPD states that the maximum HRR estimated is not sufficient to damage redundant cables. With regard to the fire analysis, provide the following:**

- **From Attachment 3 of the November 8, 2002 exemption request, it appears that the Electric Power Research Institute FIVE fire methodology was used to determine that in the event of a fire in FA-32, redundant cables, which are not adequately separated in accordance with Appendix R, would not be damaged. The staff requests the analysis for further review.**
- **What failure temperature was assumed to damage redundant cables? The thresholds are different for IEEE-383 rated cables versus non-IEEE-383 rated cables.**
- **What was the maximum HRR estimated for each fire zone that was used in the fire modeling analysis?**
- **From review of the exemption request, the staff determined that FA-32 is a large open area without physical barriers (walls, etc.). Discuss how this type of configuration (open area) is considered in a fire model hazard analysis which typically requires that zones contain physical barriers which will prevent the spread of fire and smoke to adjacent areas.**
- **Provide the detailed analysis, which includes assumptions and results of the fire model for further staff review.**

#### **OPPD Response:**

- In response to the first bullet in NRC Question 4, due to the size of the document, OPPD would prefer not to submit the entire analysis on the docket. Again, OPPD extends an invitation to the NRC reviewers to visit FCS and review the analysis with the preparers and OPPD contractors. Some of this information is contained in the exemption request dated November 8, 2002, Attachment 3.
- In response to the second bullet in NRC Question 4, the analysis was performed based on IEEE-383 qualified cables. Therefore, a damage threshold temperature of 700 deg F was used instead of the 425 deg F value recommended for non-IEEE 383 cables.

- In response to the third bullet in NRC Question 4, the maximum HRR used in the analysis was 5,763 BTU/sec. This was the maximum value used for Evaluation Zones A/C, B/C, and E. This value resulted from the large air compressor fire scenario. Evaluation Zones D, F and G used a maximum HRR value of 1,316 BTU/sec based on postulated transient fire loads in these locations.
- In response to the fourth bullet in NRC Question 4, the development of the evaluation zones was used primarily as a “tool” to support the target based approach to the analysis. The use of “zones” in this case is not intended to represent a means to deterministically limit the extent of fire products or fire damage. The fire modeling analysis for the fire area was based on the in-situ configuration – a large open area without any intervening barriers or boundaries to separate it into compartments.
- In response to the fifth bullet in NRC Question 4, again, due to the size of the document, OPPD would prefer not to submit the entire analysis on the docket. Again, OPPD extends an invitation to the NRC reviewers to visit FCS and review the analysis with the preparers and OPPD contractors. Some of this information is contained in the exemption request dated November 8, 2002 - Attachment 3.

#### **NRC Question 5:**

**OPPD states on page 8 of the exemption request that there are areas within FA 32 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 therefore were not addressed in this analysis by the licensee. The staff is concerned that although these cables are not credited for Appendix R, they may provide a potential path for propagation of a fire to cables that are credited for Appendix R within FA-32. Because cables and circuits credited for Appendix R frequently share certain physical or electrical configurations with cables which are not credited for Appendix R, it is not sufficient to only consider the effects of fire damage to cables required for Appendix R. Address the staff's concerns and provide a circuit analysis for these cables to demonstrate that a fire which impacts non-credited Train A and Train B cables could not impact the achievement of safe shutdown conditions.**

#### **OPPD Response:**

The fire modeling analysis for the fire area concluded that for a postulated auxiliary feedwater pump or air compressor fire, the installed fire suppression system would actuate prior to reaching damage threshold temperatures for any cable target. This is the largest postulated fire scenario for the fire area. Therefore, the presence of non-credited cables in the fire area does not represent an unanalyzed fire propagation scenario. As a result, OPPD considers no additional circuit analysis necessary.

**NRC Question 6:**

**Fire Zone D contains redundant power cables for the low-pressure safety injection pumps which are separated by 3 feet. In addition, page 11 of the November 8, 2002, exemption request states that actions to align charging pumps to the safety injection and refueling water or to the boric acid storage tank are not time critical as there are no failures in this zone that result in a challenge to the reactor coolant system inventory and that spurious operation of the power operated relief valves (PORV's) are not credible for a fire in this zone. Provide a technical analysis to support the statement that a spurious operation of the PORV's are not credible for a fire in this zone considering that Zone G, which contains the control cables for a PORV, is adjacent to Zone D. In accordance with the defense-in-depth concept, as defined in Appendix R, there is no physical separation provided by a barrier such as; a wall or other feature, which might hinder or prevent fire and smoke spread to an adjacent zone in the event that the first levels of defense-in-depth (prevention, detection and fire suppression) fail to control the fire.**

**OPPD Response:**

As stated in OPPD response to NRC RAI No. 2, OPPD will develop procedural guidance to direct manual operator actions for FA 32. The actions identified for FA 32 - Zone G include mitigating the consequences of a spuriously opened PORV. Manual actions include closing the PORV block valve (motor operated valves) and opening the 480 V breakers for the PORV and PORV block valves. This manual action is identical to the action currently contained in Abnormal Operating Procedure AOP-06, Fire Emergency. Feasibility of these actions is ensured through emergency lighting, emergency communications, procedural direction and operator training on the specific tasks. These manual actions have been previously by the NRC.

**NRC Question 7:**

**Zone E contains redundant control cables for auxiliary feedwater pumps FW-6 and FW-10. The exemption request states that adequate separation in accordance with Appendix R, Section III.G.2 is not provided. What is the distance between the redundant control cables for FW-6 and FW-10 since it does not meet the minimum 20 foot separation required by the regulation? This information was not provided in the exemption request.**

**OPPD Response:**

Control cables for FW-6 and FW-10 in Zone E are separated by approximately 3 feet at the closest point. At the point where the cables are at 3 feet of separation, the FW-6 cables are in a cable tray that is protected by both in-tray suppression and area-wide suppression. At the point where the cables are at 3 feet of separation, the FW-10 cables are both in conduit and in tray. The in conduit cables are protected by area-wide suppression. The in tray cables are protected by both in-tray and area wide suppression. The cables are within 3 feet for only a short distance (~15 feet) and then diverge.

**NRC Question 8:**

**In Zone F, the exemption request states that Train A cable trays cross above the Train B trays. The licensee states that their analysis shows that the exposed tray system could be exposed to damaging threshold energies without crediting partial barrier and fire suppression system. This area contains redundant power cables to motor control centers 3A1, 381 I 3C1 4A1 4B1, and 4C1, which are separated by less than 10 feet.**

- **What is the distance between the Zone F redundant power cables, which are separated by less than 10 feet? This information was not reported in the exemption request.**
- **Discuss how a fire in this area is not considered credible, even though the exemption request states that the exposed cable tray system could be exposed to damage threshold energies for Zone F. Also, state which scenario in Attachment 3 of the exemption request represents the fire scenario associated with Zone F?**
- **Page 13 of the November 8, 2002, exemption request states that OPPD considers this zone acceptable based on the licensing for FA-32. The staff reviewed the licensing information included by OPPD in the reference section and did not find any discussion pertaining to approval of redundant power cables separated by less than 10 feet. In fact, the letters dated January 9, 1985, July 3, 1985, and July 1, 1986, do not even address the concept of fire zones for FA-32 or state that for this particular zone that the power cables do not meet the minimum 10 foot separation as stated in the January 9, 1985, letter to the NRC. Provide an explanation to clarify the OPPD position that this fire area is acceptable based on the licensing documents included as references for the exemption request.**

**OPPD Response:**

- In response to the first bullet, vertical distance between redundant power cables at Zone F is approximately 2 feet. It is important to note that a 3 hour fire rated partial fire barrier is provided between the cable trays at this location. Horizontal distance between the redundant power cables at this zone is approximately 10 feet, as stated in the letter from NRC to OPPD dated July 1, 1983, (NRC-83-202, Reference No. 2 to the November 8, 2002 exemption request). Additionally, OPPD recommends that the NRC refer to the June 27, 2002 Public Meeting Presentation materials that depict detailed information within each zone. In Zone F, the fire barrier is depicted as brown over the blue cable trays.
- In response to the second bullet, a fire in this zone is not credible for the following reasons:
  - Other than the power cables, there are no ignition sources located in this zone.
  - Cable insulation is the only combustible material within this zone.
  - The fire scenario for this zone is a transient fire load and ignition source. OPPD will provide administrative control of transient combustibles and potential ignition sources for this area, to ensure any temporary activity is strictly controlled.

- This area is located at elevation 1002', which is 13 feet above the floor of the general area. There is no normal means of access to this area. Access to this area would be via a ladder.
  - Scenario 8 in Attachment 3 to the November 8, 2002 exemption request represents the fire scenario associated with Zone F. This is the transient fire on the roof of CCW Room between columns 4a and 5b.
- In response to the third bullet, please note that during the June 27, 2002 public meeting with the NRC, OPPD stated that it was our intent to take credit for areas where the NRC had previously agreed. This is an example of one of those areas.

In the OPPD exemption request, OPPD referenced a January 9, 1985 letter (LIC-84-0338). On page 7 of LIC-84-0338, Item IV, Fire Area 32 (3), OPPD identified that:

“cable trays containing redundant trains of power cables have a minimum separation of approximately 10 feet horizontally. It is, therefore the District’s position, based on our engineering judgment, that no credible fire in this fire area can disable both redundant trains of shutdown equipment.”

The NRC acknowledged this condition in a July 3, 1985 letter to OPPD (NRC-85-0200), in the Safety Evaluation Report on Page 8, Section 5.2.

- Also in response to the third bullet, OPPD acknowledges that the concept of fire zones for FA-32 was not discussed in previous correspondence regarding this fire area. The development of the evaluation “zones” was recently used as a “tool” primarily to support the target based approach to the fire modeling analysis. The use of “zones” in this case is not intended to represent a means to deterministically limit the extent of fire products or fire damage.

As stated in the exemption request, 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:

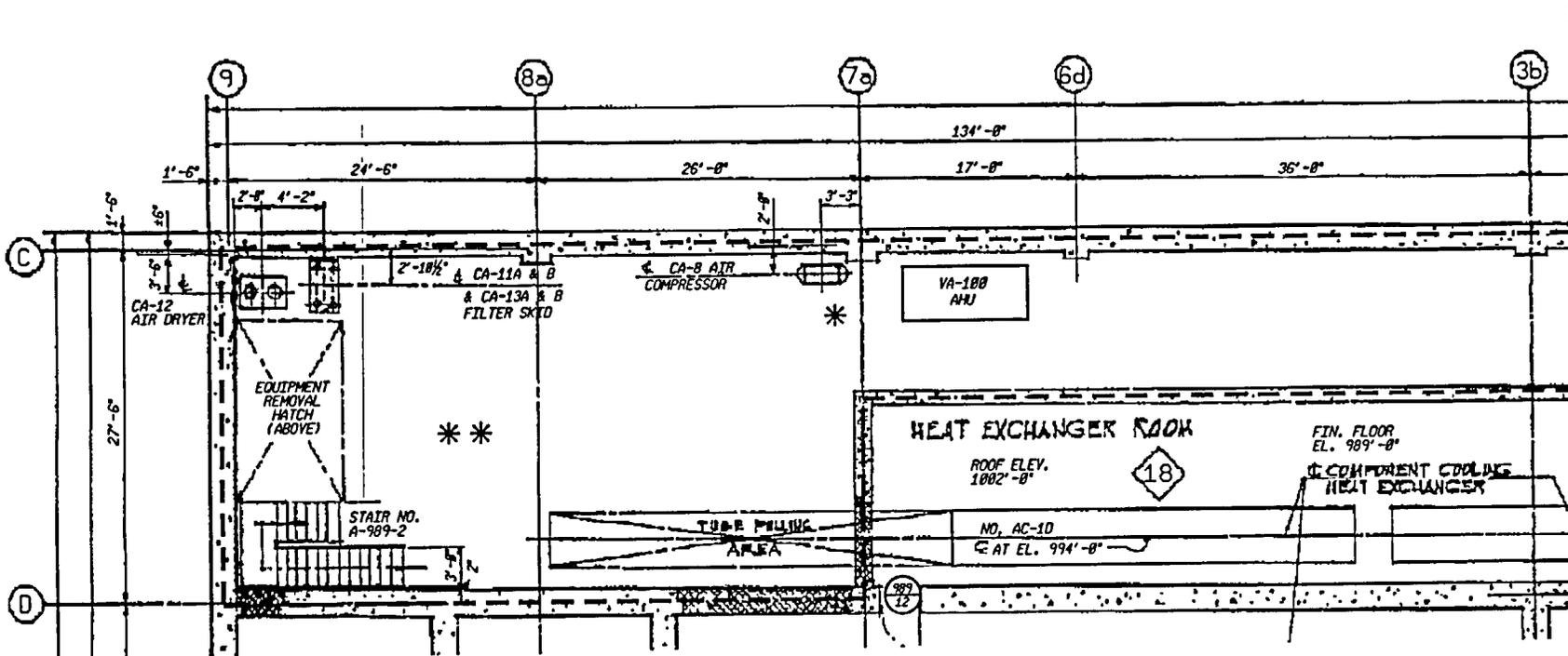
- Fire detection and suppression systems adequately protect the cables in the zone.
- A partial fire barrier exists between the redundant cable trays.
- Due to the location of this zone, accumulation of enough transient material to cause a cable damaging fire is not credible.

Attachment 2  
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Page 1

**OPPD Response to  
NRC Request for Additional Information  
Additional Drawings Providing Clarifying Information Attachment 1**

**The following drawings are attached for use in NRC review of the FA 32 Exemption Request for FCS:**

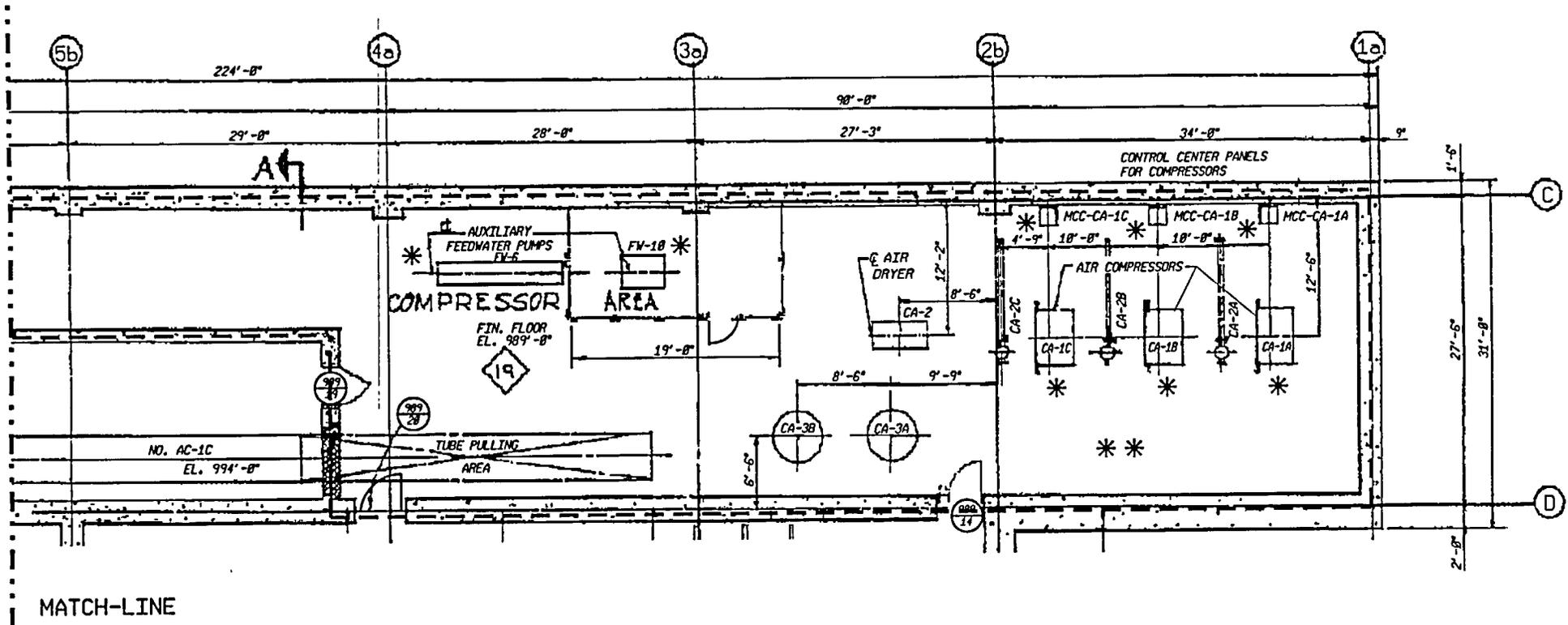
ATTACHMENT 2  
PAGE 1  
FORT CALHOUN STATION  
FIRE AREA 32



- FIRE AREA BOUNDARY
- \* POTENTIAL FIXED IGNITION SOURCE
- \*\* POTENTIAL TRANSIENT IGNITION SOURCE AREA

MATCH-LINE

ATTACHMENT 2  
 PAGE 2  
 FORT CALHOUN STATION  
 FIRE AREA 32



--- FIRE AREA BOUNDARY

\* POTENTIAL FIXED IGNITION SOURCE

\*\* POTENTIAL TRANSIENT IGNITION SOURCE AREA