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Omaha Public Power District

444 South 16th Street Mall
Omaha, NE 68102-2247

LIC-13-0060
May 21, 2013

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

References:
1. Docket No. 50-285
2. Letter from OPPD (J. A. Reinhart) to NRC (Document Control Desk), *License Amendment Request 10-07, Proposed Changes to Adopt NFPA 805, Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants (2001 Edition) at Fort Calhoun Station*, dated September 28, 2011 (LIC-11-0099) (ML112760660)
3. Letter from the NRC (L. E. Wilkins) to OPPD (David J. Bannister), *Fort Calhoun Station, Unit No.1 - Request for Additional Information Re: License Amendment Request to Adopt National Fire Protection Agency Standard NFPA 805 (TAC No. ME7244)*, dated April 26, 2012 (NRC-12-0041) (ML121040048)
4. Letter from OPPD (D. J. Bannister) to NRC (Document Control Desk), *Responses to Requests for Additional Information Re: License Amendment Request 10-07 to Adopt NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants," 2001 Edition, at Fort Calhoun Station*, dated July 24, 2012 (LIC-12-0083) (ML12208A131)
5. Letter from OPPD (D. J. Bannister) to NRC (Document Control Desk), *Responses to Requests for Additional Information Re: License Amendment Request 10-07 to Adopt NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants," 2001 Edition, at Fort Calhoun Station*, dated August 24, 2012 (LIC-12-0120) (ML12240A151)
6. Letter from OPPD (L. P. Cortopassi) to NRC (Document Control Desk), *Responses to Requests for Additional Information Re: License Amendment Request 10-07 to Adopt NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants," 2001 Edition, at Fort Calhoun Station*, September 27, 2012 (LIC-12-0135) (ML12276A046)
7. Email from NRC (L. E. Wilkins) to OPPD (D. L. Lippy), *DRAFT: Fort Calhoun NFPA 805, Second Round (ME7244)*, dated February 22, 2013 (NRC-13-0014)
8. Letter from OPPD (M. J. Prospero) to NRC (Document Control Desk), *Responses to Second Request for Additional Information Re: License Amendment Request to Adopt NFPA 805 at Fort Calhoun Station (TAC No. ME7244)*, dated April 23, 2013 (LIC-13-0033)

SUBJECT: Remaining Responses to Second Request for Additional Information Re: License Amendment Request to Adopt NFPA 805 at Fort Calhoun Station (TAC No. ME7244)

The Omaha Public Power District's (OPPD's) responses to the Nuclear Regulatory Commission (NRC) second request for additional information (RAI) regarding the license amendment request (LAR) to adopt National Fire Protection Association (NFPA) 805 at the Fort Calhoun Station (FCS) are provided in the enclosure to this letter.

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In the Reference 2 LAR, OPPD requested an amendment to Renewed Facility Operating License No. DPR-40 for FCS, Unit No. 1, to adopt NFPA 805, *Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants (2001 Edition).* The NRC staff reviewed OPPD's application and determined that additional information was required in order to complete their review and transmitted the original RAIs in Reference 3. OPPD provided responses to the original RAIs in References 4, 5 and 6. The NRC indicated that the staff had reviewed the information provided by the licensee [in References 4-6] and determined that additional information specified in the Reference 7 email is needed for the staff to complete its evaluation.

In Reference 7, the NRC proposed a 60 calendar day response time from the date of draft issuance of the RAIs. However, it was determined that a number of the RAIs would require additional planning and analysis (e.g., sensitivity studies, etc.) in order to complete the final RAI responses. Therefore, the status and proposed extension of select RAI responses were discussed during a clarification teleconference between the NRC and OPPD staff on March 11, 2013. Based on this call and subsequent follow-up discussion with the NRC Project Manager, OPPD provided responses to a select number of the round 2 NFPA 805 RAIs in Reference 8 and provides the remainder of the RAI responses in this letter. Thus, this letter completes the responses to all draft Round 2 RAIs received from the NRC in Reference 7.

There are no new regulatory commitments being made in this letter as a result of the enclosed NFPA 805 RAI responses. Please note, as indicated in References 4 and 5, OPPD plans to supplement the NFPA 805 transition LAR, which will reflect the applicable information delineated in the enclosed RAI responses. The LAR supplement is being tracked by commitment item AR 48249.

If you should have any questions regarding this submittal or require additional information, please contact the Supervisor – Nuclear Licensing, Mr. Bill R. Hansher at 402-533-6894.

I declare under penalty of perjury that the foregoing is true and correct. Executed on May 21, 2013.

Louis P. Cortopassi
Site Vice President and CNO

LPC/BJV/dll

Enclosure: OPPD's Remaining Responses to Second Request for Additional Information re: NFPA 805 LAR

Attachments:
1. Conceptual Drawings in Response to Safe Shutdown RAIs 15 and 16
2. Sketches of Conceptual Proposed Design Option(s) as Described for REC-112 in Attachment S of the Transition LAR
3. Pyrocrete® Encased Conduit Locations for Tray Section 34S-1, Drawing 11405-E-67, Sheet 78 and FCS Cable Route Report for Cables in Tray Section 34S-1 [Subsections C3, C3A, C4, and I4] Intersecting this Pyrocrete® Assembly

c: A. T. Howell, NRC Regional Administrator, Region IV
L. E. Wilkins, NRC Project Manager
J. M. Sebrosky, NRC Project Manager
J. C. Kirkland, NRC Senior Resident Inspector

**Omaha Public Power District's (OPPD's)
Remaining Responses to Second Request for Additional Information
License Amendment Request to Adopt National Fire Protection Association Standard 805
Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants
Fort Calhoun Station (FCS), Unit 1 (TAC No. ME7244)**

The Nuclear Regulatory Commission (NRC) proposed a 60-calendar-day response time from the date of draft issuance of the emailed requests for additional information (RAIs) associated with the transition to National Fire Protection Association Standard 805 at FCS. It was determined that a number of the RAIs would require additional planning and analysis (e.g., sensitivity studies, etc.) in order to complete the final RAI responses. Therefore, the status of the RAI responses and proposed extension of select RAI responses were discussed during a clarification teleconference between the NRC and the Omaha Public Power District (OPPD) staff on March 11, 2013. Based on this conference call and subsequent follow-up discussion with the NRC Project Manager, OPPD provided the first set of Round 2 RAI responses by letter dated April 23, 2013 (LIC-13-0033). The remaining NFPA 805 Round 2 RAI responses are enclosed; thereby completing the Round 2 RAI responses for NFPA 805. Table 1 identifies the RAI responses contained in this Enclosure.

Table 1 – Round 2 RAI Responses in this Letter

RAI Topic	RAI Number
Fire Modeling	RAI 01.02
Fire Modeling	RAI 01.03
Fire Modeling	RAI 06
Fire Protection Engineering	RAI 18.01
Safe Shutdown	RAI 12.01
Safe Shutdown	RAI 14
Safe Shutdown	RAI 15
Safe Shutdown	RAI 16
Probabilistic Risk Assessment	RAI 01.c.01
Probabilistic Risk Assessment	RAI 01.e.01
Probabilistic Risk Assessment	RAI 01.g.01
Probabilistic Risk Assessment	RAI 01.h.01
Probabilistic Risk Assessment	RAI 01.h.02
Probabilistic Risk Assessment	RAI 01.j.01
Probabilistic Risk Assessment	RAI 03.01
Probabilistic Risk Assessment	RAI 07.01
Probabilistic Risk Assessment	RAI 11.01
Probabilistic Risk Assessment	RAI 15.g.01
Probabilistic Risk Assessment	RAI 18.01
Probabilistic Risk Assessment	RAI 20
Probabilistic Risk Assessment	RAI 21
Probabilistic Risk Assessment	RAI 22

Please note that OPPD plans to supplement the NFPA 805 transition license amendment request (LAR) to reflect any applicable information delineated in the following RAI responses at a later date. **[AR 48249]**

<u>**Fire Modeling RAI 01.02:**</u>

In a letter dated July 24, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12208A131), the licensee responded to Fire Modeling Request for Information (RAI) 01b. Please provide the following additional information:

a. A description of the criteria used to determine the scenarios in which ignition of intervening combustibles was judged not to expand the zone of influence (ZOI) of the ignition source.

<u>OPPD's Response to Fire Modeling RAI 01.02 a.</u>:

In response to Fire Modeling RAI 01b., a plant walkdown of the modeled ignition sources was performed, and scenarios that contain non-cable intervening combustibles were noted. Examples of non-cable intervening combustibles include foam pipe insulation and heating, ventilating, and air conditioning (HVAC) duct insulation. For the subset of scenarios discussed in the table below, the response to Fire Modeling RAI 01b. included engineering judgments that the intervening combustible would not appreciably expand the fire scenario zone of influence. The table below provides additional bases for these engineering judgments.

FMRAI-01.02a Table 1 – Screening Bases for Intervening Combustibles Scenarios

Scenario	Ignition Source	Screening Basis
FC06-3-IS4	AI-205	Recognizing the subjectivity of the original engineering judgment, if a fire in this electrical cabinet were conservatively assumed to fail all targets (due to propagation of intervening combustibles) in this large compartment, the scenario CDF and LERF would increase by 8.95E-10/yr and 4.78E-11/yr, respectively. This increase would not be sufficient to change the total CDF, total LERF, VFDR ΔCDF, or VFDR ΔLERF within the significant digits reported by the NFPA transition LAR (LIC 11-0099).
FC06-3-IS8	LP-5	The intervening combustible is a few feet of small diameter (~3/8 inch) temporary plastic tubing. This tubing is considered a transient combustible and is not part of the fixed LP-1 fire scenario.
FC06-3-IS12	LP-1	Small bucket is combustible of concern. This bucket is considered a transient (walkdowns were performed during shutdown conditions) and would typically be removed during power operation. The bucket is not considered part of the fixed LP-1 fire scenario.
FC20-1-IS9	AI-182	The intervening combustible is a short length of small diameter drain hose. This is considered a transient combustible and is not part of the fixed AI-182 fire scenario.

FMRAI-01.02a Table 1 – Screening Bases for Intervening Combustibles Scenarios		
Scenario	**Ignition Source**	**Screening Basis**
FC20-7-IS12	AI-284A	The intervening combustible is demineralized water insulation. There are no targets overhead above this ignition source, and there would be no new targets to consider if the ZOI were expanded.
FC20-7-IS25	CH-12-MS	Intervening combustible is a small amount of insulation. This insulation is judged to negligibly affect the scenario zone of influence, and there would be no new targets to consider if ZOI were expanded.
FC31-IS12	MCC-3B3 AND MCC-4C4	There would be no new targets to consider if ZOI were expanded. Note also that this intervening combustible is considered a transient combustible, and it is therefore not part of the fixed FC31-IS12 fire scenario.
FC31-IS17	HE-5 Power Switch	There would be no new targets to consider if ZOI were modestly expanded. Note also that this intervening combustible is considered a transient combustible, and it is therefore not part of the fixed FC31-IS17 fire scenario.
FC34C-IS1	MCC-3C1	The intervening combustible is ductwork insulation. This insulation will not ignite as it is not within the plume ZOI, nor is it within the flame radiation ZOI.
FC34C-IS3	MCC-3B1	The intervening combustible is ductwork insulation. This insulation will not ignite as it is not within the plume ZOI, nor is it within the flame radiation ZOI.
FC34C-IS5	RC-4A	The intervening combustible is ductwork insulation. This insulation will not ignite as it is not directly over the ignition source, nor is it within the flame radiation ZOI.
FC36A-IS1	CAB-SWYD-CONN	Intervening combustible is a short length of thin foam pipe insulation. The heat release rate contribution of this very small quantity of combustible insulation is negligible compared to the overall heat release rate of the electrical cabinet and multiple overhead cable trays.
FC36A-IS12	1B3C-4C	Intervening combustible is a short length of thin foam pipe insulation. The heat release rate contribution of this very small quantity of combustible insulation is negligible compared to the overall heat release rate of the electrical cabinet and multiple overhead cable trays.
FC36A-IS25	1A1	Intervening combustible is a short length of thin foam pipe insulation. The heat release rate contribution of this very small quantity of combustible insulation is negligible compared to the overall heat release rate of the electrical cabinet and multiple overhead cable trays.
FC36B-IS38	1A4	Intervening combustible is a short length of thin foam pipe insulation. The heat release rate contribution of this very small quantity of combustible insulation is negligible compared to the overall heat release rate of the electrical cabinet and multiple overhead cable trays.

b. Justification for the basis of the revised core damage frequency (CDF) and large early release frequency (LERF) calculations for scenario FC20-1-IS8 that are based on the assumption that the 98th percentile heat release rate (HRR) is needed to ignite the pipe insulation. For example, in Figure F-1 of NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," the severity factor (SF) for a pump fire with an intervening combustible target at 2 m above the pump is approximately 3%. With a SF of 3% the re-calculated CDF and LERF would be 1.13E-06 and 1.18E-07, respectively (compared to 7.63E-07 and 7.89E-08).

OPPD's Response to Fire Modeling RAI 01.02 b:

Figure F-1 uses criteria of 205° Celsius and 6 kW/m2 (for thermoplastic cable); whereas the FCS fire PRA uses 330° Celsius and 11 kW/m2 (for thermoset cable). Therefore, Figure F-1 of NUREG/CR-6850 is not applicable to the FCS fire PRA.

Figure F-1 also does not list any calculation inputs, such as the ambient air temperature and density, so it is unknown whether they are consistent with the FCS-specific calculations.

The subject foam insulation is in the plume of FC20-1-IS8, which has a peak heat release characterized by a gamma distribution with α=0.84, β=59.3, and a 98th percentile value of 211 kW per Table G-1 of NUREG/CR-6850.

The following equations characterize the centerline plume temperature:

$$T_P - T_\infty = 9.1\left(\frac{T_\infty}{g c_p^2 \rho_\infty^2}\right)^{1/3} \dot{Q}_c^{\,2/3} (z - z_0)^{-5/3}$$

$$\dot{Q}_c = \chi_C \dot{Q}_T$$

$$z_0 = 0.083\dot{Q}_T^{\,2/5} - 1.02D$$

Where,

Parameter	Description	Value	Notes
T_P	Temperature at specified height in plume, K	663° K	Ignition temperature of flexible foam plastic per Table 2-11.3 of the *SFPE Handbook of Fire Protection Engineering,* Fourth Edition.
T_∞	Ambient temperature, K	293° K	
g	Acceleration of gravity, m/s^2	9.81 m/s^2	
c_p	Specific heat of air, kJ/(kg K)	1.01 kJ/ (kg K)	
ρ_∞	Density of air, kg/m^3	1.2 kg/m^3	

Parameter	Description	Value	Notes
$\dot{Q}_c$	Convective heat release rate, kW	Calculated	
$\dot{Q}_T$	Total heat release rate, kW	Calculated	
χ_c	Convective fraction, unitless	0.7	
z	Specified height within plume, m	2.0 m	
z_0	Virtual origin, m	Calculated	
D	Fire source diameter, m	0.34 m	Assumes fire size is one square foot

Solving the above equations for $\dot{Q}_T$, the minimum heat release rate required to ignite the foam pipe insulation is conservatively calculated as 258 kW. This value is greater than the 98th percentile value of 211 kW, and therefore use of a 0.02 severity factor is conservative in response to Fire Modeling RAI 01b.

Note that when the thermoset cable damage temperature (330° Celsius) is conservatively used instead of the foam ignition temperature, the severity factor is calculated to be 0.02, as reported by response to Fire Modeling RAI 01b.

Fire Modeling RAI 01.03:

In a letter dated July 24, 2012 the licensee responded to Fire Modeling RAI 01d.

NUREG-1805, "Fire Dynamics Tools (FDTs) Quantitative Fire Hazard Analysis Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program," states that the method of McCaffrey, Quintiere, and Harkleroad (MQH) correlation cannot be used when the vent is located in the ceiling. The correlation is therefore not valid for compartments with natural ventilation or compartments with forced ventilation that shut down in the event of a fire and that have vents in the upper part of the room.

During the walkdowns that are referred to in the response to RAI 01d, please describe whether compartments were identified that fit the above description. If there are such compartments, justify the validity of the MQH-based analysis.

OPPD's Response to Fire Modeling RAI 01.03:

Per discussion with the OPPD HVAC system engineer and per plant walkdown April 2-6, 2012, HVAC vents are generally not located at the ceiling. They are, however, frequently located in the upper portion of the compartment, often close to the ceiling.

The base fire PRA supporting the NFPA 805 transition LAR (LIC-11-0099) implemented the MQH correlation for all upper layer temperature calculations. The MQH method is most valid for naturally ventilated compartments with an open door. This condition is likely to occur later in the fire event, after fire brigade arrival and manual suppression activities have initiated. However, prior to fire brigade arrival, the doors are typically closed and the compartment is mechanically ventilated.

To more realistically model the period prior to fire brigade arrival, the fire PRA was re-quantified using the method of Foote, Pagni, and Alvares (Equation 2-7 of NUREG-1805) to calculate upper layer temperature in mechanically ventilated compartments. When this method is implemented, the total CDF, total LERF, VFDR ΔCDF, and VFDR ΔLERF are unchanged (within reported significant digits) as compared to the values reported by LIC-11-0099, which implemented the method of MQH.

This result is sensible given the low fire PRA sensitivity to severe fire scenarios leading to upper layer temperatures that exceed target damage thresholds. The frequencies of such scenarios are relatively low. In addition, automatic suppression (where installed) and manual suppression are credited to prevent damaging hot gas layer formation, further reducing the frequency of such events. Finally, for the scenarios that do lead to a damaging hot gas layer, typically at least one train (or a significant portion of one train) of mitigating equipment remains unaffected due to electrical separation.

__Fire Modeling RAI 06__:

a. **The responses to PRA RAI 01.c.ii in the July 24, 2012 letter and to Fire Modeling RAI 01.c in the August 24, 2012 letter (ADAMS Accession no. ML12240A151) discuss modeling of cable tray fires. The response to PRA RAI 01.c.ii indicates that fire is propagated from the ignition source to the overhead cables, indicating that fire is propagated vertically. Additionally, the response states that the fire growth profile of the ignition source and ignited cable tray configuration are summed to obtain the overall fire growth profile. However, the response to Fire Modeling RAI 01.c does not address how the combined HRR was addressed nor how the higher HRR impacts the ZOI. Please explain how the effect of the increased HRR due to vertical propagation to cable trays on the ZOI (in all aspects), and the resulting targets selected for damage in the PRA, were determined.**

   __OPPD's Response to Fire Modeling RAI 06 a:__

   As described in response to PRA RAI 01.c.ii, the fire PRA supporting LIC-11-0099 models fire propagation from the ignition source to overhead cable trays. The fire growth profile of the ignition source and ignited cable tray configuration are summed to obtain the overall fire scenario heat release rate profile. The scenario heat release rate profile is then used to calculate the hot gas layer temperature profile. If at any point the hot gas layer temperature exceeds target damage temperature (e.g., 330 degrees Celsius for thermoset cables), the scenario Zone of Influence (ZOI) is expanded to fail all targets within the compartment.

   If the hot gas layer temperature never exceeds target damage temperature (e.g., 330 degrees Celsius for thermoset cables), then targets within a ZOI local to the ignition source are modeled to fail. This localized ZOI is calculated using fire modeling equations that characterize radiant heat flux, plume temperature profile, and ceiling jet temperature profile. In practice, the ZOI is a cylinder, whose radius is either the distance at which the fire will cause a radiant heat flux exceeding the target damage threshold, or the distance at which the ceiling jet temperature exceeds the target damage threshold, whichever is greater. This cylinder is conservatively applied from floor to ceiling, even if the plume temperature profile is not sufficient to damage targets all the way to the ceiling.

The impact of cable tray fire propagation on the ZOI was considered using the 35 degree outward spread of fire, as it propagates up through the stack, specified by Appendix R to NUREG/CR-6850. A plant walkdown was performed April 2-6, 2012 to assess whether fire PRA targets exist outside the modeled ZOI but within the 35 degree spread of fire upward through a cable tray stack. This walkdown included all areas in which the ZOI fire modeling approach was implemented. The walkdown did not identify any cases in which this effect required revising (adding to) the existing source-target data set.

Fire PRA implementation of this approach resulted in a spectrum of modeled plant damage states, ranging from damage to the ignition source itself, damage to the larger target set within the ignition source ZOI and including 35 degree fire propagation through the tray stack, and damage to all targets within the compartment. The modeled ZOIs are large and conservatively calculated, and this is confirmed when the NPP fire events contributing to the fire frequencies are reviewed (i.e., the modeled ZOIs are significantly larger than those suggested by the fire event reports upon which the modeled frequencies are based).

b. **The response to FM RAI 01.c (Part 2) states that the rate of horizontal flame spread along the cable tray is conservatively not credited because the entire characteristic length is modeled to ignite instantaneously. This is consistent with the guidelines in Section R.4.2.1 of NUREG/CR-6850. However, a characteristic length of 1 ft was assumed which deviates from Section R.4.2.1 of NUREG/CR-6850. Please quantify the effect on the ZOI, hot gas layer (HGL) development and risk (CDF, LERF, delta (∆)CDF and ∆LERF) of using a) The width of the vertical section of origin for fires in cabinets that have vertical barriers (switchgear, MCCs, control panels in relay rooms, auxiliary control rooms, etc.) or, b) The width of the cabinet if it is a single cabinet with no vertical barriers, as the characteristic length for calculating fire propagation in and HRR of horizontal cable trays.**

OPPD's Response to Fire Modeling RAI 06 b:

Additional walkdowns were performed to measure the characteristic length of all electrical cabinets. Per the RAI, for cabinets with vertical dividers between each section, the characteristic length was taken as the width of the vertical section of origin. For cabinets without vertical partitions between each section, the characteristic length was taken as the entire cabinet width. The field-measured values were incorporated in the fire PRA in place of the previously assumed one foot.

The fire PRA models cabinets with multiple vertical sections as individual fire scenarios, with each scenario frequency corresponding to the summation of all vertical section frequencies in the cabinet. For cases where a cabinet consisted of multiple vertical sections of varying characteristic length, the most conservative value was used to represent all of its sections. With consideration for the ability to create a damaging hot gas layer, a greater characteristic length is more conservative (involving a greater length of cable tray in the scenario, thereby increasing the overall scenario HRR). However, with consideration for the severity factor of a given scenario, a smaller characteristic length is more conservative (fires with smaller fire diameters have more aggressive plume temperature profiles). Such cases were evaluated both ways; using the greatest of the individual characteristic lengths, and then the smallest, with the most conservative result used for the final assessment.

When the new characteristic lengths were implemented, the CDF and LERF for all fire scenarios were either unaffected or reduced slightly. The total fire CDF and LERF decreased slightly. Total CDF reduced by 1.89E-07 /yr, and total LERF reduced by 1.66E-09 /yr. This effect is attributed to reduced severity factors for several scenarios when a larger characteristic length (corresponding to the vertical section width) is used in place of the smaller and generically assumed one foot.

In conclusion, the total CDF, total LERF, VFDR ΔCDF, and VFDR ΔLERF remain within RG 1.174, Revision 1, Region II when the electrical cabinet characteristic lengths are taken as either the vertical section width (for cabinets with partitions between each section) or the entire cabinet width (for cabinets without partitions).

<u>Fire Protection Engineering RAI 18.01</u>:

By letter dated July 24, 2012, the licensee responded to Fire Protection Engineering RAI 18.

a. **The letter indicated that Approval #7 would be deleted as compliance with NFPA 805 section 3.11.5, is being met through Exception #2. The licensee stated that these electrical fire barrier raceway system (ERFBS) assemblies being installed prior to issuance of Generic Letter 86-10, Supplement 1, "Fire Endurance Test Acceptance Criteria For Fire Barrier Systems Used To Separate Redundant Safe Shutdown Trains Within The Same Fire Area," were tested against the end point temperature requirements similar to the acceptance criteria of NFPA 251, "Standard Methods of Tests of Fire Resistance of Building Construction and Materials." Please provide a detailed description of the ERFBS testing performed, including the end point temperatures reached and the acceptance criteria used.**

   <u>OPPD's Response to Fire Protection Engineering RAI 18.01 a:</u>

   The time-temperature data supplied by the Pyrocrete® manufacturer is located in Attachment B to letter LIC-80-0062. The purpose of the testing was to experimentally determine the time the back side temperature of Pyrocrete® reached 250°F above ambient, when applied at varying thicknesses, and exposed to the standard ASTM E-119 time/temperature. The results of the testing show that a 2-inch thickness of Pyrocrete® did not reach 250°F above ambient for 195 minutes. These configurations were employed prior to the issuance of Generic Letter 86-10, Supplement 1, and were tested against the end point temperature requirements similar to the acceptance criteria of NFPA 251 that are identified in Generic Letter 86-10, Supplement 1.

   These acceptance criteria are based on the enclosures being designed to limit temperature rise on the cable side of the enclosure to 250°F over the ambient temperature of the space after a three-hour fire. Assuming a 90°F space temperature at the beginning of the fire, this would give a final temperature of 340°F at the end of the three-hour period at the inner surface of the enclosure. Time-temperature data supplied by the Pyrocrete® manufacturer shows that the temperature on the cable side of the enclosure is held to 180°F above ambient for the first 120 minutes. This would give final temperature of 270°F on the inside of the enclosure after the two-hour fire. It then increases to 280°F at 150 minutes and finally reaches 340°F after the full three hours. Power and control cable in use at FCS are type "Pyratrol III®" manufactured by Rockbestos. These cables have been LOCA tested to a minimum of 286°F and have shown no degradation. Cable with similar outer jacket (Fire Wall III®) has been LOCA tested to a minimum of 340°F and, as per information received from Rockbestos, showed no degradation. Therefore, it is concluded that the temperature rise inside the enclosure will not affect the performance of the cables while under load.

   See the revised compliance statement for NFPA 805 Section 3.11.5 in the response to FPE RAI 18.01.b below (delineated with revision bars).

b. **Please describe whether the ERFBS enclosure protecting cable tray 54S (formerly separating fire area 36C from 36B) should also be listed under Table B-1, Section 3.11.5, Exception #2.**

OPPD's Response to Fire Protection Engineering RAI 18.01 b:

The ERFBS enclosure protecting cable tray 54S (formerly separating fire area 36C from 36B) should also be listed under Table B-1, Section 3.11.5, Exception 2. Therefore, it is identified in the updated response to NFPA 805 Section 3.11.5 resulting from fire protection engineering RAIs 17 and 18, as follows (new text identified by revision bars):

NFPA 805 Ch 3 Ref	Compliance Statement	Compliance Basis	Reference Document
3.11.5 Electrical Raceway Fire Barrier Systems (ERFBS)	• Complies with Clarification • Complies by Previous NRC Approval	COMPLIES WITH CLARIFICATION: Letter LIC-06-0076 states: "FCS uses 3M Interam® E50A, Pyrocrete®, and Pabco® materials as fire barrier protection for redundant trains of safe shutdown equipment located in the same fire area to satisfy 10 CFR 50, Appendix R III.G requirements. Installation and inspection procedures have verified that these fire barrier materials were installed in a manner consistent with tested configurations. Deviations from tested and analyzed configurations were evaluated in accordance with Generic Letter 86-10, Supplement 1. These evaluations provide the necessary assurance that the installed fire barrier systems would possess the commensurate level of fire protection." Overhead horizontal Train B cabling encased in conduit, wrapped in metal lath, and surrounded by 2 inches of Pyrocrete® in fire area 36A between column lines 3a and 4a, from fire area 36B and terminating at panel AI-109B in fire area 36A (Panel AI-109B is enclosed in concrete block). Vertical Train B cable tray sections 22S to 5-4A from fire area 32 (below) to fire area 41 (above) within fire area 36A between column lines 6d and 7a is wrapped in metal lath, and surrounded by 2 inches of Pyrocrete®. Vertical Train A cable tray sections 10S to 5-4B from fire area 32 (below) to fire area 41 (above) within fire area 36A between column lines 6d and 7a is wrapped in metal lath, and surrounded by 2 inches of Pyrocrete®. These three (3) Pyrocrete® enclosures comply with Exception No. 2 of section 3.11.5. The time-temperature data supplied by the Pyrocrete® manufacturer is included as Attachment B to letter LIC-80-0062. The purpose of the testing was to experimentally	EA-FC-93-033, "Evaluation of Fire Barrier to GL 92-08 and Evaluation of Additional Miscellaneous Fire Barriers," Rev. 2 / All Letter LIC-79-192 from OPPD (Short) to NRC (Reid) dated July 9, 1979 / Attachment 2, Response to Question 1 Letter LIC-80-0062 from OPPD (Jones) to NRC (Clark) dated May 20, 1980 / Attachment B Letter LIC-83-219 from OPPD (Jones) to NRC (Clark) dated August 30, 1983 / Attachment A, Sections III.A, III.B, VI.A, and VI.B Letter NRC-85-200 from Butcher (NRC) to Andrews (OPPD) dated July 3, 1985 / Enclosure 2, Safety Evaluation, sections 4.2, 4.4, 5.2, 5.4, and 7.3 Letter LIC-06-0076 from Faulhaber (OPPD) to NRC Document Control Desk dated August 2, 2006 / All

NFPA 805 Ch 3 Ref	Compliance Statement	Compliance Basis	Reference Document
		determine the time the back side temperature of Pyrocrete® reached 250°F above ambient, when applied at varying thicknesses, and exposed to the standard ASTM E-119 time/temperature. The results of the testing document that for a 2-inch thickness of Pyrocrete® did not reach 250°F above ambient for 195 minutes. These configurations were employed prior to the issuance of Generic Letter 86-10, Supplement 1, and were tested against the end point temperature requirements similar to the acceptance criteria of NFPA 251 that are identified in Generic Letter 86-10, Supplement 1. Therefore, these Pyrocrete® configurations are acceptable as 3-hour rated enclosures in accordance with Exception No. 2 of Section 3.11.5 of NFPA 805. COMPLIES BY PREVIOUS NRC APPROVAL: A Pyrocrete® barrier separates redundant cabling in the air compressor room (fire area 32, room 19). This configuration was approved by the NRC as identified: Per Sections IV.A and IV.B of attachment A to letter LIC-83-219, "This area contains two cable tray systems which serve various safe shutdown equipment in trains A, B, EA, and EB. All 480V motor control center power feeder cables are located in this area. The trays containing these cables do not meet the separation criteria of section III.G.2 of Appendix R...A fire barrier designed in accordance with Regulatory Guide 1.175 and IEEE-384 (1977) has been provided where these redundant cables cross each other in cable trays. This barrier, (similar to UL design X-719) comprised of metal lath and 2" of Pyrocrete® of standard UL construction, meets the 3-hour rating per independent testing by Johns-Manville Corporation. Specifically, this barrier separates cable tray 7S from cable trays 19S and 20S. A second barrier (of same design as stated above) has been provided where cable tray 18S crosses cable tray 1S."	

NFPA 805 Ch 3 Ref	Compliance Statement	Compliance Basis	Reference Document
		Per sections 5.2 and 5.4 of enclosure 2 to letter NRC-85-200, "The area contains two cable tray systems which serve various safe shutdown equipment in trains. All 480V motor control center power feeder cables are located in this area. A partial fire barrier has been provided at the point where redundant cables cross over one another in cable trays...we conclude that the existing fire protection with the proposed modifications provides an equivalent level of safety to that achieved by compliance with section III.G." An unrated Pyrocrete® enclosure forms part of a credited barrier between fire areas 31 and 31A in the intake structure. This configuration was approved by the NRC as identified: Per sections III.A and III.B of attachment A to OPPD letter LIC-83-219, "The power cables for all four raw water pumps are contained in individual rigid conduits. These conduits are routed through a common fire barrier enclosure, located above the circulating water pump bay, such that the cables inside the barrier do not meet the specific section III.G fire protection requirements of separation, detection, and suppression...A Pyrocrete® enclosure has been installed (details of which were transmitted to the Commission with protect the cables for pumps AC-10A and AC-10B from any credible fire." Per response to question 1 in Attachment 2 to OPPD letter LIC-79-192, "We are proposing to provide 3 hour fire rated enclosure to protect these cables from an area fire. The barrier design will be similar to Fire Area 6..." (per discussion of Fire Area 6 in same letter, "The enclosure will utilize a fire barrier design incorporating metal lath covered with Pyrocrete® which is of standard UL construction. The necessary 3 hour fire rating is achieved by providing 2" Pyrocrete® over metal lath.") Per sections 4.2 and 4.4 of Enclosure	

NFPA 805 Ch 3 Ref	Compliance Statement	Compliance Basis	Reference Document
		2 to NRC letter NRC-85-200, "The power cables for all four raw water pumps are contained in individual rigid conduits. These conduits are routed through a common noncombustible heat shield, located above the circulating water pump bay...we conclude that the existing fire protection provides an equivalent level of safety to that achieved by compliance with section III.G." An unrated Pyrocrete® installation forms the barrier between fire areas 36B and 36C in the west switchgear room. This configuration was approved by the NRC as identified: Per sections VI.A and VI.B of attachment A to OPPD letter LIC-83-219, "In the west half of the switchgear room, cable tray 54S contains 3A backup pressurizer heater control cables. This tray is in the same fire area as the 4B electrical transformers which provide power to the remaining two backup heater banks. A Pyrocrete® barrier has been installed to protect cable tray 54S in this area. However, this application of Pyrocrete® has not been approved by the NRC...Although the use of Pyrocrete® as a 3-hour rated fire barrier in this specific application has not as yet been approved by the Commission, it is the District's position, based on our engineering judgment, that the Pyrocrete® enclosure protecting cable tray 54S effectively separates the control cables for bank 3A backup pressurizer heaters from the 4B electrical transformers, and adequately protects them from any credible fire in the area. The barrier design (similar to UL design X-719) incorporates metal lath covered with Pyrocrete® which is of standard UL construction." Per section 7.3 of Enclosure 2 to MRC letter NRC-85-200, "We consider the barrier to be an unrated heat shield that has a limited capacity to prevent damage to protected cables. But because of the reasons discussed...we do not expect a fire of significant magnitude or duration to	

NFPA 805 Ch 3 Ref	Compliance Statement	Compliance Basis	Reference Document
		occur. Therefore, because of the limited fire load and the automatic fire detection and suppression systems in this area, it is our judgment that this heat shield will provide reasonable assurance that one division of shutdown cable will remain free of damage until the activation of the fixed fire suppression and eventual fire extinguishment." EA-FC-93-033 identifies fire endurance tests that qualify the 3M Interam® fire wrap in fire area 34A as equivalent to a one-hour rating.	

c. **During the site audit walk down of fire area 36A (east switchgear room), the NRC staff noticed the horizontal Pyrocrete® assembly intersected with a non-protected cable tray (approximately mid-room). The Pyrocrete® configuration at this intersection did not appear to match the normal Pyrocrete® assembly, nor the description contained in Attachment L, Approval #7, page L-14. Please clarify whether the configuration at this intersection is acceptable and meets the analyzed configuration. Please provide the basis for the conclusion and any reference to the engineering analysis and testing. Identify the non-protected cables intersecting this Pyrocrete® assembly (e.g. division, equipment/system).**

OPPD's Response to Fire Protection Engineering RAI 18.01 c:

The cable tray in the east switchgear room is completely enclosed with 2 inches of Pyrocrete® on metal lath between the adjacent intersecting exposed cable trays. This configuration is consistent with other Pyrocrete® enclosures at FCS. As identified in response to Fire Protection Engineering RAI 18.01a, the results of the time-temperature testing data documented in Attachment B to letter LIC-80-0062 that a 2-inch thickness of Pyrocrete® did not reach 250°F above ambient for 195 minutes. Since this configuration was employed prior to the issuance of Generic Letter 86-10 Supplement 1, and was tested against the end point temperature requirements similar to the acceptance criteria of NFPA 251 that are identified in Generic Letter 86-10 Supplement 1, the Attachment L request is no longer required, as identified in the original response to Fire Protection Engineering RAI 18.

The tray section identification for the cables is 34S-1. There are four trays in the 34S-1 stack. The Pyrocrete® enclosed conduits pass between the lowest tray at elevation 1019'-6" and the next highest tray at elevation 1020'-6". (Reference drawings 11405-E-73, Sheet 1 and 11405-E-67, Sheet 78) Attachment 3 provides drawing 11405-E-67, Sheet 78, delineating the Pyrocrete encased conduits location relative to the tray sections. In addition, Attachment 3 includes the FCS Cable Route Report from the FCS Automated Cable Tracking System (FACTS) cable routing database for the cables identified in tray section 34S-1 intersecting this Pyrocrete® assembly.

Safe Shutdown RAI 12.01:

Attachment S, Table S-2, Committed Modifications Item REC-111 of the LAR indicates that high energy arcing fault (HEAF) barriers will be installed around/near the 4 KV switchgear and bus ducts in the 4kV Switchgear Rooms. These barriers are intended to reduce the local damage association with a potential HEAF, and subsequently reduce the risk calculated for fire areas 36A and 36B.

Please provide complete design and construction information for the HEAF barriers and supporting structures including dimensions, materials, construction types, etc. In addition, describe how the zone of influence (ZOI) was translated into the physical dimensions of the HEAF barrier, and also how the HEAF barrier will be tested to ensure it will mitigate a HEAF. Please include in the response pictures, drawings or renditions of the 4 kv switchgear and related equipment and bus ducts for Fire Areas 36A and 36B.

OPPD's Response to Safe Shutdown RAI 12.01:

During a teleconference with the NRC Project Manager and technical reviewers on March 11, 2013, clarification of this RAI was provided and the NRC is requesting only conceptual information related to this NFPA 805 transition implementation item; therefore, specific pictures, drawings and renditions of the 4kv switchgear related equipment and bus ducts for Fire Areas 36A and 36B are not required in response to this RAI. While the detailed design and construction specifications will be developed during the NFPA 805 implementation period, the proposed HEAF barriers are envisioned to have the attributes described in the following paragraphs.

Note that OPPD is considering plant modifications to reduce the scope of, or potentially replace, the HEAF barrier installation. These modifications are primarily to prevent loss of offsite power during switchgear room fire events. OPPD plans to notify the NRC if these other modifications are pursued in lieu of the HEAF barriers described herein.

The HEAF barriers are intended to minimize risk significant target failures beyond the faulted switchgear or load center, and any components electrically dependent on the faulted bus. Similarly for bus ducts, the barriers are intended to minimize risk significant target failures beyond the bus duct itself, and any components electrically dependent on the bus duct.

Switchgear and Load Center HEAFs

The objective is to minimize damage to risk significant targets beyond the faulted switchgear or load center. In describing the HEAF zone of influence (ZOI), NUREG/CR-6850 Section M.4.2 states that unprotected cables in the first overhead cable tray will be ignited concurrent with the initial arcing fault provided that this first tray is within 1.5 m (5') vertical distance of the top of the cabinet. Similarly, trays within 0.3 m (1') horizontally of the cabinet's front or rear face will ignite. The NUREG also states that "cables in conduit are protected in this context."

So, to prevent damage and ignition of the first overhead cable tray(s), the HEAF barriers will be of non-flammable construction, and they will each consist of a steel plate mounted between the HEAF source and target(s) requiring protection. Any conduits penetrating the plate, and originating from the faulted switchgear or load center, will contain elastomer plugs. Any gaps between the steel plate and conduits will be fitted snugly with a fire barrier material, such as HEMYC®.

The barriers will primarily be mounted to existing supports and structural members associated with the cable trays requiring protection. The barriers will meet applicable seismic design requirements.

The HEAF barriers will be, at a minimum, of similar gauge to an electrical cabinet enclosure. Per NUREG/CR-6850 Supplement 1 Section 7.2.1.5 (for bus duct HEAFs), the first "solid surface" encountered by the blast will truncate the ZOI. Examples of a "solid surface" include a sealed cabinet top or solid (unventilated) cable tray cover. While this guidance suggests the relatively thin gauge of a tray cover would be sufficient, OPPD will conservatively use a thicker gauge similar to an electrical cabinet enclosure.

Aluminum will not be used, per the guidance of NUREG/CR-6850 Supplement 1 Section 7.2.1.5, which states that aluminum tray covers are not sufficient to prevent ignition of cables by molten materials originating from a bus duct HEAF.

Note that while the referenced guidance in NUREG/CR-6850 Supplement 1 Section 7.2.1.5 was written for bus duct HEAFs, OPPD is extending this guidance to switchgear and load center HEAFs, which are expected to be of similar (or lower) energy release.

For each postulated switchgear or load center HEAF, there is an ensuing fire that follows the growth characteristics of an electrical cabinet. For cases where minimizing damage to overhead cable trays is required, the width of the barrier will extend beyond the edge of the cable tray stack, such that the plume is deflected sufficiently away from the stack to preclude damage and/or ignition. The National Institute of Standards and Technology (NIST) Fire Dynamics Simulator will be used to verify the barrier width and plume deflection are sufficient to prevent cable temperature and incident heat flux from causing damage and/or ignition.

Bus Duct HEAFs

The objective is to minimize damage to risk significant targets beyond the faulted bus duct and component electrically dependent on the faulted bus. NUREG/CR-6850 Supplement 1 Section 7.2.1.5 describes the ZOI for bus duct HEAFs. This ZOI is summarized as a sphere of 1.5 feet radius originating from the fault, in addition to a circular cone (of 30 degree solid angle) extending downward from the fault location. This ZOI is truncated by the first "solid surface" encountered. Examples of a "solid surface" include a sealed cabinet top or solid (unventilated) cable tray cover.

So, in order to prevent damage to risk significant targets within the ZOI, a barrier of similar attributes to the switchgear / load center HEAF barrier is proposed. The barrier would be a steel plate, of similar gauge to an electrical cabinet enclosure. The barriers will primarily be mounted to existing supports and structural members associated with the cable trays requiring protection. The barriers will meet applicable seismic design requirements.

Differing from the previously described barriers, it is not envisioned that conduits would penetrate this plate (conduit penetrations are more applicable to switchgear / load center HEAF, which have conduits originating from the faulted bus cabinet). The bus duct barrier would not require fire barrier material atop the plate, which is primarily used by the switchgear / load center HEAF barrier to prevent fire propagation to overhead cable trays.

Safe Shutdown RAI 14:

LAR Attachment T Clarifications to Approved Exemptions – For the requests for approval regarding the previously approved exemptions, provide clarifications as follows:

a. **Prior Approval Clarification Request 1 (page T-2): For steam generator (SG) level and pressure instrumentation, reactor coolant system (RCS) temperature instrumentation, and source range monitoring in the containment, cable routing is provided in the original exemption. Because instrument sensing line tubing was not addressed in the original exemption, Attachment T requests that this tubing be included in the exemption as well.**

The original SER identifies acceptable separation criteria for cables in various areas of the containment. The LAR clarification states, "The instrument sensing line routings meet these criteria and therefore are considered to be covered under this exemption. Based on this assumption, the instrument sensing lines have adequate separation to support NFPA 805 safe shutdown requirements for providing at least one channel of reliable indication for process monitoring of pressurizer level and pressure, and steam generator level and pressure."

Please provide a more detailed description of the instrument sensing line separation.

OPPD's Response to Safe Shutdown RAI 14 a:

From EA-89-055, Safe Shutdown Analysis:

Within the Containment, the redundant instrument channels and sensing lines have a minimum of 20 feet of horizontal separation with minimal intervening combustibles. The intervening combustibles consist of lightly loaded cable trays. The sensing lines have common points of origin (i.e., Pressurizer and Steam Generators). At the points of origin it is not possible to achieve physical separation. From the point of origin the lines are routed in different directions to the transmitters which have a minimum of 20 feet of horizontal separation. The steam generator instruments are located in separate quadrants within Containment and typically have 50 feet of separation. This separation is consistent with the separation discussed and credited in the NRC SER dated July 3, 1985. This SER grants an exemption from 20 feet of separation with no intervening combustibles for certain areas within Containment. The SER specifically addresses the pressurizer bays and areas where the intervening combustibles are made up of IEEE-383 qualified cables. The instrument sensing line routings meet these criteria and therefore are considered to be covered under this exemption. Based on this, the instrument sensing lines have adequate separation to support Appendix R safe shutdown.

From Updated Safety Analysis Report (USAR) Section 8.5.6:

The criteria for the process instrumentation inside the Containment Building were as follows:

a. *Process instruments within the containment are located in shielded areas accessible for maintenance. Redundant instruments for safety instrumentation are identified by tag numbers prefixed by a capital letter A, B, C, or D followed by a slash(/). Sensing lines to these redundant instruments are run from separate sensing points.*

Redundant instruments within the containment for a safety channel are located on physically separate racks or on a common rack. However, where these instruments are located on a common rack metal barrier plates are provided to maintain separation between all A/, B/, C/, and D/ instruments and lines. Redundant instrument racks were not placed closer than three feet from each other unless they were separated by a wall or furnished with a metallic plate on their sides. Redundant instrument sensing lines were not placed closer than three feet from each other unless they are separated by an adequate shield (steel plate, steel channel, concrete wall, etc.) to protect the lines against mechanical injury. In the case where two redundant sensing lines cross each other the mechanical separation was provided for a radius of at least two feet from the point of crossing.

b. **Prior Approval Request 1: For SG level and pressure instrumentation, and RCS temperature instrumentation describe the redundant channel availability for fires in the containment. The background/basis describes the separation for redundant trains of safe shutdown components in this area including steam generator pressure and level transmitters, reactor coolant hot and cold leg temperature instrumentation, and neutron flux indication and all associated cables. It states that at least one channel of each will remain free of fire damage.**

Please provide clarification as to whether "free of fire damage" is for both RCS/SG loops or just one loop. If only one RCS/SG loop of instrumentation is available, justify why this is sufficient for safe shutdown.

OPPD's Response to Safe Shutdown RAI 14 b:

The NFPA 805 safe shutdown strategy in Containment credits both steam generators (SGs). Only one of the two SGs may have reactor coolant T-hot and T-cold indication available based on fire location; however, both SGs will always have at least one SG level indication loop and one SG pressure indication loop available regardless of the fire location. Both inside Containment auxiliary feedwater (AFW) flow stop valves (HCV-1107A and HCV-1108A) can be failed open from inside the MCR by opening an AI-41 breaker, and both outside Containment AFW flow control valves (HCV-1107B and HCV-1108B) are free of fire damage. Having delta-T indication available for one SG is adequate to verify that the RCS has natural circulation and effective DHR. Pumps FW-6, FW-10, and FW-54 are all available (start/stop), and with AFW flow control also available, and SG level and SG pressure indication available, the operators have adequate capability to control SG levels.

c. **Prior Approval Requests 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10, identify that because of "conservative re-quantification and additional assumed transient combustible material" the reported amount of combustibles in the original exemption(s) have increased but are still considered low. Please provide a more detailed description of "re-quantification" and "additional transients". Describe whether a major source of combustible loading growth is attributed to additional cable(s) or modification(s) in the areas of concern. Please describe whether there have there been cables added in deference to the exemption granted in 1985, or does re-quantification make the analysis more accurate for the current cable loading. Describe how combustible loading "creep" will be controlled in the post-transition plant.**

OPPD's Response to Safe Shutdown RAI 14 c:

The combustible loading identified in the exemption granted in 1985 only identified fixed and some general combustibles. OPPD, in response to condition report (CR) 2000-01737, performed a review of the NRC safety evaluation report (SER) dated July 3, 1985, and associated OPPD correspondence, and identified an average fire severity of approximately 12 additional minutes in combustible loading calculation FC05814 versus what was submitted to the NRC in the 1985 exemption. This disparity is attributed to a more rigorous accounting of combustibles in the calculation, including estimates of transient and token loading. The control room complex (fire area 42) disparity is larger than the other areas since the area was historically discussed as separate zones, whereas the combustible loading calculation considers all combustibles for the entire fire area. Although some disparity in accounting of combustibles exists, FC05814 concludes that the areas discussed in the exemption still contain low combustible loading levels; therefore, the exemption submittals are still valid.

A general area combustible token quantity is added to each fire zone to conservatively include the aggregate of low British Thermal Units (BTU) miscellaneous combustibles within that zone. This token quantity is calculated to account for miscellaneous items that are not typically figured into combustible loading (i.e., gauges, face plates, identification tags, room nameplates, etc.). The token quantity for a given area is 5% of the existing fixed and general area combustibles in that area. For fire zones with no fixed or general area loads, the token quantity is equivalent to a 5 minute fire severity.

Based on combustible control procedure SO-G-91, an expected transient combustible loading has also been added to each fire zone to support work activities that utilize combustible material that does not require a permit. This material includes 100 pounds of Class A materials, 5 gallons of Class B liquid (lube oil), and 500 ft^3 of flammable gas. The expected transient combustible loading is based on the assumption that one work activity is in progress for every 200 ft^2 of floor area. Therefore, the expected transient combustible loading that is added to each fire zone is 12,620 BTU/ft^2.

The combustible loading growth since the exemptions were granted in 1985 is not attributed to additional cable loading or significant modifications. Based on a comparison of the cable combustible loading identified in the 1985 exemption request to the current combustible loading calculation, FC05814, there are negligible changes to the current cable combustible loading; therefore, there are no significant changes to cable loading in deference to the exemption granted. The current combustible loading calculation provides a more accurate analysis (including specific individual combustibles, allowed transients, and a token general area quantity) as compared to the general overview of combustibles identified in the 1985 exemption.

The combustible loading "creep" is controlled via the engineering change process during which time the engineer reviews for effects on the combustible loading. The engineer reviews the combustible loading calculation and any associated memos. This review will continue to control the combustible loading "creep" in the post-transition plant.

d. The separation schemes in Attachment 'T' and exemptions of Attachment K describe clarification of the previously approved exemption requests of the current licensing basis of Appendix R. NFPA 805 requires more equipment to be evaluated than just traditional Appendix R safe shutdown equipment. Please describe how the following elements of the FPRA are addressed specifically with regard to the other categories of equipment in:

i. Containment isolation (LERF)
ii. Internal Events PRA (IEPRA) equipment (CDF and LERF)
iii. Spurious equipment that could affect the success of the mitigating safety functions credited in the FPRA
iv. Equipment whose fire-induced failure will cause an initiating event to be modeled in the FPRA Model

Because equipment lists for the FPRA consist of more than just traditional Appendix R analysis, please describe how the separation scheme described in Attachment T and K is used in NFPA 805. Describe whether there are separation schemes similarly applied to other components and systems added to the NFPA 805 FPRA where separation is credited.

OPPD's Response to Safe Shutdown RAI 14 d:

The FPRA models fire impact on each category of equipment described in items i, ii, iii, and iv. The FPRA uses engineering analyses, based on the physical principals of fire behavior, (e.g., size of fire and physical layout of containment) and it does not rely on the exemption requests and licensing clarifications in the NFPA 805 transition LAR (LIC-11-0099), Attachments T and K. The FPRA does not credit the separation schemes described in Attachments T and K.

Safe Shutdown RAI 15:

LAR Attachment S, identifies the proposed plant modifications REC-119 (Train A 125VDC power), and REC-120 (Train B 125VDC power) for additional electrical isolation. The LAR for modification REC-119 states "this proposed modification will maintain DC Control power for Train A breaker and diesel generator control with no reliance upon operator manual actions for fire area 37 [battery room #1]". The LAR for modification REC-120 states the same for Train B breaker control in fire area 38 [battery room #2].

Apparently, the current design could result in the loss of EE-8F / EE-8G (DC distribution panel(s)) because of a fire in its' respective battery room. Relocating/additional fuses to provide isolation of the DC distribution panel(s) from their respective batteries is the proposed resolution.

Please provide a more detailed description of these modifications (how the manual disconnect will be modified), and breaker/fuse coordination curves to achieve the continued availability of DC distribution panels EE-8F and EE-8G. Explain how the modifications will eliminate reliance on the operator manual actions.

OPPD's Response to Safe Shutdown RAI 15:

The Enclosure, Attachment 1 provides sketches of the conceptual proposed design option(s) to achieve the objective of the associated plant modification for NFPA 805 as described for REC-119 and REC-120 in Attachment S of the transition LAR (LIC-11-0099). As discussed with the NRC during the March 11, 2013, teleconference with the NRC Project Manager and technical reviewers, the specific design details, such as how the manual disconnect will be modified, breaker/fuse coordination, etc., will be developed during NFPA 805 implementation.

Safe Shutdown RAI 16:

LAR Attachment S for the proposed plant modification REC-112 states "the purpose of these modifications is to ensure that the breakers will remain functional to trip on demand for automatic load shed, overcurrent, and manual control from the main control room. These modifications generally involve wiring changes within the switchgear cubicles, installation of additional coordinated DC control power fuses within the switchgear cubicles, and/or installation of interposing relays within the switchgear cubicles." The applicable breakers are: 1A1-0 (FP-1A); 1A1-1 (FW-5A); 1A1-2 (FW-4A); 1A1-3 (FW-2A); 1A1-4 (CW-1A); 1A2-6 (CW-1B); 1A2-7 (FW-2B); 1A2-8 (FW-4B); 1A2-9 (FW-5B); 1A4-3 (CW-1C); 1A4-4 (FW-5C); 1A4-5 (FW-4C); and 1A4-6 (FW-2C).

The LAR for REC-112 also states "this proposed modification addresses issues associated with loss of overcurrent trip capability for load breakers (trip and lockout of credited switchgear and secondary fires). The proposed modification will maintain breaker manual trip capability from the main control room, protective trip, automatic load shed trip and accident signal trip for fire areas 31, 46, and 47."

Please provide a more detailed description of the modifications for various breakers (typical(s) for various breakers), including fuse coordination curves with the upstream protective devices.

OPPD's Response to Safe Shutdown RAI 16:

The Enclosure, Attachment 2 provides sketches of the conceptual proposed design option(s) to achieve the objective of the associated plant modification for NFPA 805 as described for REC-112 in Attachment S of the transition LAR (LIC-11-0099). As discussed with the NRC during the March 11, 2013, teleconference with the NRC Project Manager and technical reviewers, the specific design details will be developed during NFPA 805 implementation.

<u>Probabilistic Risk Assessment RAI 01.c.01</u>:

Components of an analysis of hot work induced cable fires have been provided through the response to RAI 01.c.ii in a letter dated July 24, 2012 (ADAMS Accession No. ML12208A131). Also, through the NRC staffs review, it has been established that only qualified cable is installed in the plant. A frequently asked question (FAQ 13-0005) is expected to be released for evaluating hot work induced cable fires, and self-ignited cable fires in the FPRA. Among the differences from your approach for hot work induced cable fires, no suppression credit is given prior to damage of the cable tray in which the fire initiates. Also qualified cables must be evaluated for self-ignited cable fires, if these cables are located in an under-ventilated area.

As a result, perform a sensitivity analysis on hot work induced cable fires, and self-ignited cable fires addressing the above differences. Please provide the impact on CDF, LERF, ΔCDF, and ΔLERF as a result of this change.

<u>OPPD's Response to Probabilistic Risk Assessment RAI 01.c.01:</u>

FAQ 13-0005 (draft version dated February 7, 2013) requires that the potential for self-ignited cable fires be considered for cables routed through "under-ventilated" areas. As part of the FCS design process, OPPD has adequately de-rated cables to ensure that self-ignition is not of concern for cable routes where airflow is minimized. This includes both cables routed through electrical penetrations and cables routed through enclosures.

FAQ 13-0005 (draft version dated February 7, 2013) also provides scenario development guidance for Cable Fires caused by Welding and Cutting (CFWC). The following paragraphs document a sensitivity study in which the FAQ 13-0005 approach for CFWC fire scenario development is implemented. Note that this study uses the CFWC frequencies developed in response to PRA RAI 07, which incorporate more recent generic fire frequency data, as well as a more appropriate distribution of maintenance influence factors throughout the plant.

First, for each fire compartment, the CFWC fire frequency was multiplied by the CCDP and CLERP conservatively assuming failure of all FPRA targets in the compartment. No credit for suppression was taken.

Next, for compartments in which the above approach was too conservative, one CFWC fire scenario for each cable tray was defined. The fire frequency for each individual cable tray was calculated as the total CFWC frequency for the compartment, divided by the number of cable trays in the compartment. The CCDP and CLERP for each scenario were calculated with target damage limited to the tray of origin. No credit for suppression was taken.

The following table summarizes the total plant CDF, total plant LERF, total VFDR ΔCDF, and total VFDR ΔLERF for the base fire PRA (Reference LIC-11-0099) and for the sensitivity study implementation of FAQ 13-0005.

	Base Fire PRA*	Sensitivity Study** (FAQ 13-0005)
Net VFDR ΔCDF for NFPA 805 Transition (/yr)	5.72E-06	5.82E-06
Net VFDR ΔLERF for NFPA 805 Transition (/yr)	6.67E-07	6.68E-07
Total CDF (internal, flood, fire) (/yr)	6.01E-05	5.96E-05
Total LERF (internal, flood, fire) (/yr)	4.82E-06	4.77E-06

*Base Fire PRA results as reported in Section W.2 of LIC-11-0099.

**Sensitivity study case for VFDR ΔCDF and VFDR ΔLERF for several compartments used a conservative bounding approach, while others used a detailed approach, commensurate with the VFDR risk significance of the CFWC scenarios.

As shown above, the net VFDR ΔCDF and VFDR ΔLERF increased slightly, while both the total plant CDF and LERF decreased slightly. The total CDF and LERF decrease is sensible, considering that FAQ 13-0005 limits CFWC target damage to the tray of origin, whereas the base fire PRA considers CFWC target damage to collections of trays.

The increase in calculated VFDR risk is dominated by FC43. In the base fire PRA, the CFWC CCDP and CLERP values were taken as the average CCDP and CLERP across all fixed and transient ignition sources in the compartment. Because the FC43 ignition sources generally have little potential to damage cable trays, the calculated CFWC risk using the base fire PRA methodology was lower than that using the FAQ 13-0005 approach, which considers damage to every individual tray routed through the compartment.

In conclusion, the total CDF, total LERF, VFDR ΔCDF, and VFDR ΔLERF remain within RG 1.174, Revision 1, Region II when the FAQ 13-0005 methodology for cable fires caused by welding and cutting is implemented.

Probabilistic Risk Assessment RAI 01.e.01:

By letter dated July 24, 2012, the licensee responded to Probabilistic Risk Assessment RAI 01.e stating that the review of the Halon system operating history did not identify any "repeated patterns of system unavailability" and discussed the use of a continuous fire watch when the Halon system is declared inoperable. A continuous fire watch is an acceptable DID measure for an inoperable Halon system, but is not as reliable as an operating automatic Halon fire suppression system. As a result, please discuss whether the review of the Halon system operating history identified any outlier behavior such as any periods of extended unavailability and, if so, discuss how this behavior was included in the PRA. (e.g., inclusion of a basic event representing out of service unavailability due to failures, test, and maintenance).

To credit the continuous fire watch when the Halon system is inoperable, the detection and suppression must be discussed for fires associated with all the different types of ignition sources in the rooms containing the Halon system. In the case of transient fires, the full discussion needed for crediting manual suppression in the case of a continuous fire watch is described in PRA RAI 07.01. For electrical cabinet fires, a continuous fire watch may provide prompt detection. In order to credit manual suppression for a continuous fire watch in the case of an electrical cabinet fire, several considerations must be addressed in the quantitative analysis as follows: 1) Please discuss whether the fire watch is instructed to open the cabinet door and fight the fire upon its initiation or does he/she simply relay the

occurrence of the fire to the MCR, 2) Please discuss the fire brigade response time if they must be summoned to the area to fight the fire after the fire watch reports the fire, 3) Please discuss how much time prior to cable damage in the overhead is available after fire suppression activities have started, and 4) Please discuss fire suppression equipment staging and access to that equipment. If crediting the continuous fire watch when the Halon system is inoperable, provide a discussion of both detection and suppression for both electrical cabinet fires and transient fires, and related these elements directly to the quantification provided in the PRA.

OPPD's Response to Probabilistic Risk Assessment RAI 01.e.01:

A review of switchgear room Halon impairment reports was performed covering the five-year period between January 1, 2003 and December 31, 2007. Note that only the switchgear room Halon system is directly credited by the fire PRA. This review identified that the system was rendered out-of-service for 874 hours over the five-year period, corresponding to an annual unavailability of 0.02. This unavailability includes the contribution of testing and maintenance directly on the Halon system, issues with penetration seals and fire doors enclosing the switchgear rooms, as well as one incidence following Halon discharge and preceding system restoration.

The FCS fire PRA models the Halon system unreliability as 0.05 per NUREG/CR-6850. Therefore, the probability that the Halon system will either randomly fail or is unavailable when demanded is (0.05) + (0.02) – (0.05)(0.02) = 0.069. Incorporating this value into the fire PRA yields the total CDF, total LERF, VFDR ΔCDF and VFDR ΔLERF summarized in the following table.

	Base Fire PRA*	Sensitivity Study** (2% unavailability)
Net ΔCDF for NFPA 805 Transition (/yr)	5.72E-06	7.79E-06
Net ΔLERF for NFPA 805 Transition (/yr)	6.67E-07	7.52E-07
Total CDF (internal, flood, fire) (/yr)	6.01E-05	6.22E-05
Total LERF (internal, flood, fire) (/yr)	4.82E-06	4.90E-06

*Base Fire PRA results as reported in Section W.2 of LIC-11-0099.

**Sensitivity study case for VFDR ΔCDF and ΔLERF conservatively assessed by adding the net CDF and LERF increases between the two cases to the base case VFDR ΔCDF and ΔLERF, regardless of if and how the Halon unavailability actually contributes to VFDR fire risk. That is, CDF and LERF are conservatively used as surrogates for VFDR ΔCDF and ΔLERF.

No credit is taken for a continuous fire watch when the Halon system is inoperable; therefore, the information requested in the second paragraph of this RAI is not applicable.

In conclusion, the total CDF, total LERF, VFDR ΔCDF, and VFDR ΔLERF remain within RG 1.174, Revision 1, Region II when Halon system unavailability is quantitatively included in the fire PRA model.

Probabilistic Risk Assessment RAI 01.g.01:

By letter dated July 24, 2012, the licensee responded to Probabilistic Risk Assessment RAI 01.g which does not provide sufficient justification for the conclusion that the cable routing assumptions described in response to Safe Shutdown RAI 03 is judged to negligibly impact the FPRA results and conclusions. Specifically, the table provided in response to "Assumption "c" of SSD RAI 03 identifies numerous scenarios where fire-induced failures of cables have not been included in the FPRA and are excluded without assessing the potential for fire damage. Thus failure of these cables could impact the FPRA results. The specific cables are as follows:

- **Cables EA4220A-D, EA42222A-D – "there is minimal fire impact on AFW…."**
- **Cables EB4257C-D, EB4256C-D – "there is a relatively low frequency of fire…"**
- **Cable EB12191G – "This cable will be walked down..."**
- **Cable B1641B – "the cables will be walked down…"**
- **Cable B1655A – "the cables will be walked down…"**
- **Cables 7700A-B – "modeling the exact routing of the relevant cables is not expected to appreciably increase…"**
- **Cables 5022C-M – "there is minimal potential fire impact…"**

The treatment of these cables in the FPRA is non-conservative and is contrary to the PRA standard (i.e., supporting requirement (SR) CS-A11, Note 11: "the Fire PRA should assume that those cables fail for any fire scenario that has a damaging effect on any raceway or location where the subject cable might reasonably exist"). For each of these cables please either provide further justification that they are not failed by a fire or provide an assessment of the impact on CDF, LERF, ΔCDF, and ΔLERF from appropriately considering their fire-induced failure. Please provide appropriate justification for any fire scenarios that are either qualitatively or quantitatively screened. Furthermore, provide an assessment of whether the FPRA meets SR FSS-E4. If this SR is not met, provide justification for why this is acceptable for the application or revise the FPRA as appropriate to meet SR FSS-E4.

OPPD's Response to Probabilistic Risk Assessment RAI 01.g.01:

The table below provides further review of the identified cables. In all but one case, the review concluded that that the CDF, LERF, ΔCDF, and ΔLERF values reported by LIC-11-0099 remain valid. In the excepting case, the review identified one fire scenario in which examining credible cable routes for 7700A and 7700B added a component failure that had not been included in the base fire PRA quantification. This scenario was re-quantified with the additional failure, and it was demonstrated that the CDF, LERF, ΔCDF, and ΔLERF remain within the R.G. 1.174, Revision 1, Region II acceptance criteria.

The RAI also questions whether fire scenarios, which can affect cables subject to routing assumptions, could have been inappropriately screened. However, the FCS fire PRA does not implement quantitative screening, and qualitative screening is only implemented at the compartment level (not the scenario level). The cable routing assumptions are well-founded at the compartment level, as described in response to Safe Shutdown RAI 03, and pose a negligible source of uncertainty to the fire PRA.

Finally, this RAI requires an assessment of the FCS fire PRA against ASME/ANS RA-Sa-2009 Supporting Requirement FSS-E4, which states "Provide a characterization of the uncertainties associated with cases where cable routing has been assumed based on SRs CS-A10 and/or CS-A11". Through response to Safe Shutdown RAI 03 and PRA RAI 01.g.01, OPPD has systematically reviewed its use of assumed cable routing. Through the course of this review, the underlying assumptions were either eliminated (i.e., via walkdown to identify the precise routing), or they were evaluated and determined to pose a negligible source of uncertainty to the fire PRA. FSS-E4 is met based on the work performed in response to these two RAIs.

Cable	**Fire Compartment**	**Discussion**
EA4220A-D	FC06-3	There are no fixed or transient ignition sources in the vicinity of the originating junction box (JB-202A), the terminating valve (HCV-2880B), nor credible routes for this short cable run. Therefore, knowledge of the precise routing of this short cable run would not change the CDF, LERF, ΔCDF, and ΔLERF calculations reported by LIC-11-0099. Refer to coordinate E-1 of drawing 11405-E-62 Revision 68 for junction box and valve locations.
EA4222A-D	FC06-3	There are no fixed or transient ignition sources in the vicinity of the originating junction box (JB-204A), the terminating valve (HCV-2881B), nor credible routes for this short cable run. Therefore, knowledge of the precise routing of this short cable run would not change the CDF, LERF, ΔCDF, and ΔLERF calculations reported by LIC-11-0099. Refer to coordinate E-1 of drawing 11405-E-62 Revision 68 for junction box and valve locations.
EB4257C-D	FC06-3	There are no fixed or transient ignition sources in the vicinity of the originating junction box (JB-138A), the terminating valve (HCV-485), nor credible routes for this short cable run. Note that the junction box is not clearly identified on the layout drawing, however, the valve is shown and the cable lengths are 10 feet (EB4257D) and 15 feet (EB4257C), and the closest ignition sources are remote from this area. Therefore, knowledge of the precise routing of this short cable run would not change the CDF, LERF, ΔCDF, and ΔLERF calculations reported by LIC-11-0099. Refer to coordinate D-1 of drawing 11405-E-62 Revision 68.

Cable	Fire Compartment	Discussion
EA4256C	FC06-3	There are no fixed or transient ignition sources in the vicinity of the originating junction box (JB-137A), the terminating valve (HCV-484), nor credible routes for this short cable run. Therefore, knowledge of the precise routing of this short cable run would not change the CDF, LERF, ΔCDF, and ΔLERF calculations reported by LIC-11-0099. Refer to coordinate E-1 of drawing 11405-E-62, Revision 68 for junction box and valve locations. Note that the RAI refers to cables EB4256C-D; however, these cables are not discussed in response to PRA RAI 01.g. It is assumed that PRA RAI 01.g.01 intended to refer to only cable EA4256C.
EB12191G	FC32	This cable is routed in FC32 from AI-279 to YCV-1045. This cable was walked down on April 4, 2013, and it was determined to be routed through the ZOIs of FC32-IS7-Motor, FC32-IS7-Oil10, and FC32-IS7-Oil100. FC32-IS7-Oil100 already models YCV-1045 as failed. Therefore, for this scenario, knowledge of the precise cable routing would not change the CDF, LERF, ΔCDF, and ΔLERF calculations reported by LIC-11-0099. When FC32-IS7-Motor and FC32-IS7-Oil10 are quantified considering failure of YCV-1045, the total CDF and LERF increases (for both scenarios combined) are 2.86E-09/yr and 1.12E-11/yr, respectively. This potential CDF and LERF increase is sufficiently small such that the R.G. 1.174 acceptance criteria for CDF, LERF, VFDR ΔCDF, and VFDR ΔLERF reported by LIC-11-0099 are still met.

Cable	Fire Compartment	Discussion
B1641B	FC36B, FC32	The consequences of fire-induced failure of B1641B are loss of 161 kV offsite power, 1A4 fault, 1B4A fault, 1B4B fault, and 1B4C fault. The routing of this cable has been identified by walkdown and drawing review. Reference Design Documents Correction Request EC47217 Revision 0 titled "JB-567A Location Clarification" dated 09/23/09. In FC36B, ignition sources in the vicinity of and with the potential to damage this cable (FC36B-IS34, FC36B-IS35, FC36B-IS36, and FC36B-IS38) are already modeled by the base fire PRA to cause a loss of 161 kV offsite power, 1A4 fault, 1B4A fault, 1B4B fault, and 1B4C fault. Therefore, addition of cable B1641B to the target set for these scenarios will not change the fire PRA results. In FC32, the ignition sources in the vicinity of and with the potential to damage this cable (FC32-IS11-Oil100b, FC32-IS12-Oil100b, and FC32-IS13-Oil100b) are already modeled by the base fire PRA to cause a loss of 161 kV offsite power. Therefore, addition of cable B1641B to the target set for these scenarios will not change the fire PRA results. Note that B1641B was verified to not be within the FC32-IS11, 12, and 13 motor fire ZOIs.
B1655A	FC36B, FC32	The consequences of fire-induced failure of B1655A are loss of 161 kV offsite power, 1A4 fault, 1B4A fault, 1B4B fault, and 1B4C fault. The routing of this cable has been identified by walkdown and drawing review. Reference design document correction request (DCR) EC47217, Revision 0, "JB-567A Location Clarification," dated September 25, 2009. In FC36B, ignition sources in the vicinity of and with the potential to damage this cable (FC36B-IS34, FC36B-IS35, FC36B-IS36, and FC36B-IS38) are already modeled by the base fire PRA to cause a loss of 161 kV offsite power, 1A4 fault, 1B4A fault, 1B4B fault, and 1B4C fault. Therefore, addition of cable B1655A to the target set for these scenarios will not change the fire PRA results. In FC32, the ignition sources in the vicinity of and with the potential to damage this cable (FC32-IS11-Oil100b, FC32-IS12-Oil100b, and FC32-IS13-Oil100b) are already modeled by the base fire PRA to cause a loss of 161 kV offsite power. Therefore, addition of cable B1655A to the target set for these scenarios will not change the fire PRA results. Note that B1655A was verified to not be within the FC32-IS11, 12, and 13 motor fire ZOIs.

Cable	Fire Compartment	Discussion
7700A-B	FC36B	Cable 7700A runs from 1B4A-7 to AI-109A, and cable 7700B runs from 1B4A-7 to AI-109B. Fire-induced failure of either cable may fail DG-2. With one exception, all ignition sources having cables within their ZOI and whose location is within the vicinity of the 'from' and 'to' locations, as well as credible routing pathways, are modeled to fail DG-2 and/or 4 kV bus 1A4. Therefore, inclusion of these two potential cable failures would not change the CDF, LERF, ΔCDF, and ΔLERF calculations reported by LIC-11-0099 for these ignition sources. Relevant ignition sources include FC36B-IS4, 6, 7, 8, 13, 14, 15, 16, 20, 21, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, and 36. FC36B-IS5 is a transformer whose zone-of-influence could affect credible routing pathways between 1B4A-7 and AI-109A. It has an ignition frequency of 1.74E-04 /yr, severity factor of 0.06, and non-suppression probability of 0.05. Inclusion of cables 7700A and 7700B in the target set for this ignition source increases CCDP from 4.01E-04 to 4.59E-04 and CLERP from 2.43E-05 to 2.44E-05. This corresponds to CDF and LERF increases of 3.03E-11 /yr and 5.22E-14, respectively. This potential CDF and LERF increase is sufficiently small such that the R.G. 1.174 acceptance criteria for CDF, LERF, ΔCDF, and ΔLERF reported by LIC-11-0099 would still be met. The uncertainty associated with cables 7700A and 7700B, therefore, does not affect the results and conclusions of the NFPA 805 transition.
5022C,F,J,M	FC46	Cables 5022C, F, J, and M are solenoid control cables supporting PC-909-1, PC-909-2, PC-909-3, and PC-909-4, respectively. The fire PRA failure of concern is spurious opening of the condenser steam dump and/or bypass valves, causing excess steam flow to the condenser, which is conservatively modeled as a main steam line break. Detailed circuit analysis of these cables indicates that that their fire-induced failure will not cause the valve(s) to spuriously open. The uncertainty associated with this assumed cable routing therefore does not affect the results and conclusions of the NFPA 805 transition.

Probabilistic Risk Assessment RAI 01.h.01:

By letter dated August 24, 2012, (ADAMS Accession No. ML12240A151) the licensee responded to Probabilistic Risk Assessment RAI 01.h and stated "automatic suppression (if present in the exposed compartment) is credited to prevent fire propagation into the exposed compartment." Please discuss if this includes exposed compartments that rely on gaseous suppression systems (e.g., Fire Areas 36A, 36B, 41, 42, and 46). Gaseous suppression systems should not be relied upon to prevent fire propagation to the exposed compartment since failure of the barrier may degrade its ability to retain the concentration of the suppressant. If relevant, identify the fire areas where this assumption was made and assess the impact on the risk results of not crediting the gaseous suppression systems in the multi-compartment analysis.

OPPD's Response to Probabilistic Risk Assessment RAI 01.h.01:

The multi-compartment analysis currently relies on gaseous suppression for FC34B-2, FC36A, FC36B and FC41. There is no gaseous suppression installed in FC46 as previously noted in the multi-compartment analysis spreadsheet, and no credit is taken by the fire PRA for gaseous suppression in FC46. When credit for gaseous suppression is removed from the multi-compartment analysis (analysis from response to PRA RAI 01.h was used as the starting point for PRA RAI 01.h.01), the multi-compartment CDF and LERF increase by 1.04E-06 /yr and 8.50E-09 /yr, respectively.

The following table extends this sensitivity study to the total plant fire risk and total VFDR change in fire risk.

	Base Fire PRA*	Sensitivity Study** (No Credit to Gaseous Suppression)
Net VFDR ΔCDF for NFPA 805 Transition (/yr)	5.72E-06	6.76E-06
Net VFDR ΔLERF for NFPA 805 Transition (/yr)	6.67E-07	6.76E-07
Total CDF (internal, flood, fire) (/yr)	6.01E-05	6.11E-05
Total LERF (internal, flood, fire) (/yr)	4.82E-06	4.83E-06

*Base Fire PRA results as reported in Section W.2 of LIC-11-0099.

**Sensitivity study case for VFDR ΔCDF and VFDR ΔLERF conservatively assessed by adding the net CDF and LERF increases between the two cases to the base case VFDR ΔCDF and VFDR ΔLERF. That is, CDF and LERF are conservatively used as surrogates for VFDR ΔCDF and VFDR ΔLERF, regardless of if and how the multi-compartment scenarios actually impact VFDR cables.

In conclusion, the total CDF, total LERF, VFDR ΔCDF, and VFDR ΔLERF remain within RG 1.174, Revision 1, Region II when credit for gaseous suppression is removed from the multi-compartment analysis.

Probabilistic Risk Assessment RAI 01.h.02:

By letter dated August 24, 2012, the licensee responded to Probabilistic Risk Assessment RAI 01.h.ii and described what time available for manual fire suppression was assumed in the multi-compartment analysis for rated fire barriers. Discuss and justify how this time was determined and how the analysis was performed for non-rated fire barriers and barriers with non-rated propagation pathways (e.g., fire dampers, doors, penetrations, etc.).

OPPD's Response to Probabilistic Risk Assessment RAI 01.h.02:

Response to PRA RAI 01.h.ii assumed the time available for manual fire suppression was equivalent to half of the fire barrier rating. That analysis therefore does not account for barriers that may be failed at time zero.

In response to the current PRA RAI 01.h.02, and to demonstrate the fire PRA relative insensitivity to time available for manual suppression, the multi-compartment analysis was revised to conservatively exclude all credit for manual suppression. To accommodate this change, modeling realism for various scenarios was improved, primarily by limiting the multi-compartment fire frequency to the frequency of fires physically capable of generating a hot gas layer within the originating compartment. In the original analysis, the entire fire frequency for several compartments was conservatively assumed capable of generating a hot gas layer.

The following table extends this sensitivity study to the total plant fire risk and total VFDR change in fire risk.

	Base Fire PRA*	Sensitivity Study**
Net ΔCDF for NFPA 805 Transition (/yr)	5.72E-06	6.59E-06
Net ΔLERF for NFPA 805 Transition (/yr)	6.67E-07	6.75E-07
Total CDF (internal, flood, fire) (/yr)	6.01E-05	6.38E-05
Total LERF (internal, flood, fire) (/yr)	4.82E-06	4.86E-06

*Base Fire PRA results as reported in Section W.2 of LIC-11-0099

**For most multi-compartment scenarios, the sensitivity study case for VFDR ΔCDF and VFDR ΔLERF was conservatively assessed by adding the net CDF and LERF increases between the two cases to the base case VFDR ΔCDF and VFDR ΔLERF. That is, CDF and LERF are conservatively used as surrogates for VFDR ΔCDF and VFDR ΔLERF, regardless of if and how the multi-compartment scenarios actually impact VFDR cables. For scenarios where this approach was too conservative, the model was re-quantified with VFDR cables protected to calculate the actual VFDR ΔCDF and ΔLERF.

In conclusion, the total CDF, total LERF, VFDR ΔCDF, and VFDR ΔLERF remain within RG 1.174, Revision 1, Region II when credit for manual suppression is removed from the multi-compartment analysis. This removes any uncertainty associated with assumed time available for manual suppression.

<u>Probabilistic Risk Assessment RAI 01.j.01</u>:

By letter dated July 24, 2012, the licensee responded to Probabilistic Risk Assessment RAI 01.j. Please address the following issues identified in the response to PRA RAI 01.j:

a. **The response to RAI 01.j.iii justifies the use of a CCDP of 0.1 and conditional large early release probability (CLERP) of 0.01 where this failure probability represents both failures of equipment and operator actions. The justification for these CCDP and CLERP values is based on a qualitative feasibility assessment of the operator actions, which consists of a qualitative argument that the actions have been determined to be feasible. It may be acceptable to take the position that operator actions are dominant in the CCDP and CLERP. However, no quantitative assessment of failure of alternate shutdown was provided to verify the CCDP of 0.1 and CLERP of 0.01, given the operator actions dominate. Despite feasibility considerations being addressed, it is not obvious that a CCDP value of 0.1 (and CLERP of 0.01) represents the failure probability of an action of this complexity. Please provide further justification for the 0.1 and 0.01 by providing the results of the human failure event (HFE) quantification process described in Section 5 of NUREG-1921, "Fire Human Reliability Analysis Guidelines – Final Report", considering the following:**

   i. **The feasibility assessment of the operator action(s) associated with the HFEs, specifically addressing each of the criteria discussed in Section 4.3 of NUREG-1921.**

   <u>OPPD's Response to Probabilistic Risk Assessment RAI 01.j.01.a.i:</u>

   The following table documents the alternate shutdown feasibility assessment in accordance with NUREG-1921, Section 4.3. This assessment confirmed that the alternate shutdown process per abnormal operating procedure AOP-06 is feasible.

Criterion	Assessment
Time	FCS calculation FC07869, "NFPA 805 Recovery Actions Evaluation at FCS for EPU," supports that plant operators have 60 minutes (with margin) post-trip to isolate the power operated relief valves (PORVs) and establish AFW without core uncovery. Based upon operator interviews and walk-throughs, 20 minutes was conservatively selected as the time for establishing control at the alternate shutdown panels.
Manpower	There are sufficient operators available to perform the required actions.
Cues	The cues (loss of habitability and/or significant loss of plant control) that MCR abandonment is necessary are obvious and clear. The required instrumentation for corrective actions is available outside of the control room.
Procedures and training	AOP-06 is the procedure that governs fire-induced MCR abandonment. It is a step-by-step procedure. This procedure is reviewed in classroom training every two years. The alternate shutdown process is practiced on the simulator and in the plant every two years, though not necessarily for every operator.

Criterion	Assessment
Action location accessibility	Required equipment and instrumentation are available and accessible. Environmental conditions are normal (ambient, without smoke) once operators abandon the MCR. Actions required in the MCR are performed before environmental conditions deteriorate to a point of action infeasibility.
Equipment and tools	No special equipment or tools are required for establishing control at the alternate shutdown panels.
Required components operable	Equipment and instrumentation required for alternate shutdown are available and accessible. The alternate shutdown panel and equipment are electrically independent from the MCR (after transfer of control), and they are therefore not affected by the fire. Note that random equipment failures are addressed separately.

ii. **The results of the process in Section 5.2.7 of NUREG-1921 for assigning scoping human error probabilities (HEPs) to actions associated with switchover of control to an alternate shutdown location. Please address the bases for the answers to each of the questions asked in the Figure 5-4.**

iii. **The process in Section 5.2.8 of NUREG-1921 for assigning scoping HEPs to actions for performing alternate shutdown once switchover is accomplished. Please address the bases for the answers to each of the questions asked in the Figure 5-5.**

OPPD's Responses to Probabilistic Risk Assessment RAIs 01.j.01.a.ii. and iii.:

The actions to swap control from the MCR to the alternate shutdown panel and the actions to complete the alternate shutdown process per AOP-06 are combined into a single human failure event, which is assessed using the bounding ASD flowchart (Figure 5-5 in NUREG 1921) below. This study resulted in a scoping HEP of 0.4 (ASD26 per Table 5-5 of NUREG 1921).

Note that while the RAI requests the switchover to be assessed with Figure 5-4 and the remainder of the shutdown actions to be assessed with Figure 5-5, combining the two actions into one HFE is more consistent with the OPPD procedure AOP-06 in which the switchover to the ASD panels and the remainder of the ASD actions are continuous steps in the same procedure.

1) Are all the necessary cues for the required actions protected?

   Yes. In the event of MCR abandonment, the necessary cues will remain available in the MCR and at the alternate shutdown panels.

2) For the given action, do the procedures match the scenario?

   Yes. AOP-06 is the relevant procedure. It is explicitly written to address fire emergencies including those necessitating MCR abandonment, and it, therefore, matches the scenario of concern.

3) Is one of the following conditions met: 1) there are procedures for executing the action or 2) it is skill-of-the-craft?

Yes. AOP-06 specifies actions required for fires requiring MCR abandonment.

4) Are both conditions met: 1) the area is accessible and 2) there is no fire in the vicinity of the action?

   Yes. The alternate shutdown panel, and actions remote from the panel, are unaffected by fire and smoke within the MCR. Note that AOP-06 directs some actions (e.g., reactor trip) inside the MCR prior to abandonment; however, these actions are performed prior to loss of habitability.

5) Is the time available greater than 30 minutes?

   Yes. Per Attachment G of the NFPA 805 Transition LAR (LIC-11-0099), timing for the credited NFPA 805 recovery actions for a cable spreading room (FC41) or control room (FC42) fire is based, in part, on the following: FCS calculation FC07869, "NFPA 805 Recovery Actions Evaluation at FCS for EPU," (for fire area 34B-1, used as a bounding calculation for spurious PORV mitigation, and restoration of AFW).

   FCS calculation FC07869, "NFPA 805 Recovery Actions Evaluation at FCS for EPU," supports that plant operators have 60 minutes (with margin) post-trip to isolate the PORVs and establish AFW without core uncovery.

6) Is the execution complexity high?

   Yes. Due to the number of critical execution steps, and the coordination between multiple operators required, the complexity is considered high.

7) Is there smoke or other hazardous elements in the vicinity?

   Yes. AOP-06 directs some actions (e.g., reactor trip) inside the MCR prior to abandonment; however, these actions are performed prior to loss of habitability. Nonetheless, smoke in the vicinity of these actions is expected.

8) Is SCBA required?

   No. Actions from within the control room are performed prior to it becoming uninhabitable, and the environment for the ex-MCR actions is unaffected by the MCR fire.

9) Table 5-5: HEP AK with ≥ 100% time margin = ASD26 = 0.4

   Time Margin = $(T_{avail} - T_{reqd}) / T_{reqd} \times 100\%$
   Time Margin = (60 min – 20 min) / 20 min x 100%
   Time Margin = 200%

iv. **The results of a detailed human reliability analysis (HRA) quantification, per Section 5.3 of NUREG-1921 in place of items 2 and 3 if a CCDP as low as 0.1 (and CLERP as low as 0.01) is not attainable through the scoping approach. For the detailed study, please quantify the contribution via the evaluation of different scenarios upon MCR evacuation, including the sum of those scenarios in the results for the CCDP and CLERP.**

OPPD's Response to Probabilistic Risk Assessment RAI 01.j.01.a.iv.:

OPPD performed a detailed HRA of the alternate shutdown process, in accordance with NUREG-1921 Section 5.3. While the option exists to develop fire scenario-specific HFEs (based on equipment and timing impacts of each scenario), more of a bounding approach focusing on the critical steps of AOP-06 was used for the purpose of this HRA, given that AOP-06 is written to mitigate the full spectrum of possible MCR fire impacts.

This analysis yielded a human error probability of 1.50E-02, which represents operator failure to prevent core damage using the alternate shutdown process. When equipment reliability is considered, the CCDP of control room abandonment is calculated as 1.41E-01. The CLERP is also taken to be 1.41E-01, since the alternate shutdown process does not include provision for containment isolation. (Containment isolation may occur automatically following control room abandonment, but this plant response has not been explicitly evaluated.) Because AOP-06 provides direction only to align one safe shutdown train, equipment reliability is the dominant contributor to the overall CCDP.

The calculated CCDP and CLERP values are higher than the 0.1 and 0.01, respectively, assumed by the base fire PRA. In light of these results, the abandonment frequency calculation was re-visited with the intent of improving its level of realism to be commensurate with the detailed HRA and equipment reliability assessment performed for alternate shutdown. The base fire PRA used the optical density abandonment criterion of 0.3 m^{-1} specified by Section 11.5.2.11 of NUREG/CR-6850.

A subsequent erratum to NUREG/CR-6850 clarified that the correct value is 3.0 m^{-1} (not 0.3 m^{-1}). The FDS simulations supporting response to Fire Modeling RAI 05c-i were re-run using this revised abandonment criterion. The electrical cabinet fire soot yield was increased from 0.08 (used in response to Fire Modeling RAI 05c.i) to 0.172, and the transient fire soot yield was increased to 0.172 as well, for the purpose of demonstrating margin.

The resulting fire CDF and LERF associated with control room abandonment, considering the higher optical density abandonment criterion and the revised CCDP and CLERP values (based on HRA, equipment reliability, and equipment availability), are both 1.35E-07 /yr. Note that CDF and LERF are equivalent because the alternate shutdown process does not include provision for containment isolation. These CDF and LERF values are less than those supporting the NFPA-805 transition LAR (LIC-11-0099), and the FCS total CDF, total LERF, VFDR ΔCDF, and VFDR ΔLERF for the NFPA 805 transition remain within the RG 1.174, Revision 1, Region II acceptance criteria.

b. Please provide justification for the assumption in response to RAI 01.j.iv that a fire must spread at least 0.5 meters on the main control board (MCB) to threaten abandonment. Furthermore, revise the response to this RAI to incorporate the results of (i.) above, as applicable.

OPPD's Response to Probabilistic Risk Assessment RAI 01.j.01.b.:

The response to PRA RAI 01.j.iv provides a quantitative justification for the FPRA exclusion of control room abandonment caused by Main Control Board (MCB) fires. That analysis assumed that an MCB fire must be at least of sufficient size to damage targets 0.5 meters apart to threaten abandonment. This value was then used with NUREG/CR-6850 Figure L-1 to estimate an associated non-suppression probability.

If the analysis instead conservatively assumed that any fire spread on the MCB (i.e., any fire spread beyond the component of origin) would be sufficient to cause abandonment, the corresponding non-suppression probability would be 9E-03 (per NUREG/CR-6850 Figure L-1 conservatively for unqualified cables).

The revised CDF and LERF attributed to MCB fires leading to abandonment would each be 5.23E-08 /yr. These CDF and LERF estimates use the revised CCDP and CLERP values calculated in Part 'a' to this RAI response, which are equivalent because the alternate shutdown process does not include provision for containment isolation. This conservative estimate of CDF is "insignificant" in the sense that it is neither within the top 95% of total fire CDF nor does it contribute greater than 1% of total CDF reported by transition LAR LIC-11-0099. However, this conservative estimate of LERF is "significant" because it is within the top 95% and contributes slightly over 1% of total LERF reported by transition LAR LIC-11-0099.

The following table reports the total CDF, total LERF, VFDR ΔCDF and VFDR ΔLERF with the combined impact of the revised abandonment CCDP and CLERP (RAI PRA 01.j.01 Part 'a'), revised fire simulations (RAI PRA 01.j.01 Part 'a'), and the conservatively estimated contribution of MCB fires to abandonment.

	Base Fire PRA*	Sensitivity Study**
Total VFDR ΔCDF for NFPA 805 Transition (/yr)	5.72E-06	1.32E-06
Total VFDR ΔLERF for NFPA 805 Transition (/yr)	6.67E-07	3.95E-07
Total CDF (internal, flood, fire) (/yr)	6.01E-05	5.57E-05
Total LERF (internal, flood, fire) (/yr)	4.82E-06	4.55E-06

*Base Fire PRA results as reported in Section W.2 of LIC-11-0099.

**Calculated by subtracting the abandonment CDF and LERF supporting LIC-11-0099 from the 'Base Fire PRA' column, and adding the newly calculated abandonment CDF and LERF, incorporating the new CCDP and CLERP values (as delineated in RAI PRA 01.j.01 Part 'a'), the new fire simulations (per RAI PRA 01.j.01 Part 'a'), and the MCB contribution to abandonment (per RAI PRA 01.j.01 Part 'b').

As shown in the above table, the VFDR ΔCDF and ΔLERF reduced considerably. This is because abandonment risk constituted the majority of total VFDR ΔCDF and ΔLERF, and this calculated risk was reduced considerably when the incorrect optical density abandonment criterion (0.3 m^{-1} per NUREG/CR-6850) was replaced with the correct criterion (3.0 m^{-1} per erratum to NUREG/CR-6850).

<u>**Probabilistic Risk Assessment RAI 03.01**</u>:

By letter dated July 24, 2012, the licensee responded to Probabilistic Risk Assessment RAI 03. The peer review determined SR PP-B4 to be met, however, the response to PRA RAI 03 states that the FPRA credits the Pyrocrete® enclosure in FC36C as a fire compartment boundary. SR PP-B4 specifically does not allow credit for raceway fire barriers, thermal wraps, fire-retardant coatings, radiant energy shields, or any other localized cable or equipment protection feature as partitioning elements in defining physical analysis units. Please provide the updated CDF/LERF/Delta CDF/Delta LERF from the impact of not crediting the Pyrocrete® barrier as a plant partitioning feature.

<u>OPPD's Response to Probabilistic Risk Assessment RAI 03.01.</u>:

In response to this RAI and consistent with PP-B4, the Pyrocrete® enclosure has been re-characterized from its own fire compartment (FC36C) to an electrical raceway fire barrier system within the West Switchgear Room (FC36B). This re-characterization allows PP-B4 to be met. The total CDF, total LERF, VFDR ΔCDF, and VFDR ΔLERF are not affected by this re-characterization since the barrier design has been determined adequate to withstand the fire hazards within FC36B per NRC and OPPD licensing correspondence discussed in LIC-11-0099, Attachment A, NEI 04-02 Table B-1.

<u>**Probabilistic Risk Assessment RAI 07.01**</u>:

By letter dated September 27, 2012 (ADAMS Accession No. ML12276A046), the licensee responded to Probabilistic Risk Assessment RAI 07. The sensitivity analysis provided in response to PRA RAI 07 for transient fires in FC28, FC32, and FC41 makes three key assumptions:

a. The sensitivity analysis credits the suppression curve for welding and cutting based on continuous fire watches 1) anytime combustibles are stored on the roof of Room 18 in FC32, 2) when greater than five pounds of combustibles are stored in FC41, and 3) anytime combustibles are stored in FC28. A continuous fire watch generally provides detection, but not necessarily suppression. To take prompt detection credit for a continuous fire watch, the combustibles must be observable at all times and the fire watch's line of sight must be unencumbered such that he/she can easily see the entire area being surveilled. [Note that the NRC staff does not consider the roving fire watches described in FCS procedures SO-M-9 and FCSG-15-35 to be equivalent to continuous fire watches because these procedures allow for the fire watch to check on hot work activity every five minutes rather than continuously.] Should the fire watch be credited for suppression with the welding and cutting suppression curve, other criteria besides those related to prompt detection must be met. In addition to the criteria for prompt detection, 1) one of the fire watch's purposes must be to extinguish the fire; 2) an extinguisher must be readily available for this action, including being located in the vicinity being surveilled; and 3) the fire watch must have undergone adequate training in the use of extinguishers. A more capable suppressant system (i.e. fire hose) can be used in place of an extinguisher to qualify for this credit given proper training, and given that the prompt detection criteria are met. However, a discussion of the staging and rapidity with which the suppressant can be applied must be provided to demonstrate that the hose stream can be applied as rapidly as the fire watch would apply an extinguisher. The credit for suppression via the use of continuous fire watches credited in the sensitivity analysis should be discussed and justified in light of the criteria for both prompt detection and for suppression.

The estimate of the non-suppression factor must be justified based on detection and suppression times. If this type of non-suppression credit is used elsewhere in the fire PRA, please identify and discuss along similar lines, ensuring that the PAU/fire area in which it is used is identified. Absent a complete response that demonstrates that all the fire watches are continuous fire watches and meet the criteria for prompt detection and suppression, apply the transient fire suppression curve where the criteria are not met, and provide an assessment of the impact on the PRA results (CDF, LERF, ΔCDF, ΔLERF).

OPPD's Response to Probabilistic Risk Assessment RAI 07 a.:

The FCS fire PRA credits prompt detection and suppression via continuous fire watch if combustible control limitations are exceeded in the FC32 Compressor Area or the FC41 Cable Spreading Room. In these areas, OPPD plans to revise their combustible control procedures to require a continuous fire watch if combustibles are stored on the roof of Room 18 (which is within FC32) or if the existing five-pound combustible limitation is exceeded in the FC41 Cable Spreading Room.

Continuous fire watches at FCS meet the criteria outlined in this RAI for prompt detection and suppression. Note that hourly fire watches, implemented via SO-G-58, are not credited by the fire PRA, consistent with the RAI text.

Regarding prompt detection, SO-G-58 specifies that the fire watch continually inspect and patrol the affected area checking for possible fires. They are to remain in the designated area, and they may not leave the area until responsibility has been properly transferred to another individual. The procedure notes that continuous fire watch duties are typically performed by a craft person associated with the work but may be performed by other personnel.

Regarding suppression, SO-G-58 states that if a fire occurs, the fire watch should notify the control room, and then attempt to extinguish the fire, if possible. SHB 1065-00 (Fire Watch Duties lesson plan) states that continuous fire watches shall obtain an A/B/C fire extinguisher from the tool room, and SO-G-58 also requires fire watches to note the location of the nearest fire extinguishers and to ensure they are rated for the type of fires that could occur in the area being surveilled. Continuous fire watches receive formal hands-on training in the use of fire extinguishers.

Consistent with the RAI text, the non-suppression probabilities applied to the FC32 and FC41 scenarios involving continuous fire watch are based on the time available for suppression (i.e., time prior to target damage). The time to damage is calculated on a scenario-specific basis using the distance to the nearest target, the fire growth profile, and fire modeling equations.

b. **The sensitivity analysis credits the HRR probability density function from "Motors" from NUREG/CR-6850 for transient fires, rather than the transient combustibles HRR probability density function. The 98th percentile HRR is 69 kW for "motors," rather than 317 kW for transient fires.**

No basis is provided for why postulated transient combustible fires in FC32 and FC41 have an HRR distribution similar to that of the electrical motor fires included in the NUREG/CR-6850 distribution for "Motors." Furthermore, with regard to the five pound combustible limitation in FC41, Table G-7 of NUREG/CR-6850 provides numerous fire test examples where combustible quantities of five pounds and less yielded transient fires

having peak HRRs greater than 69 kW. Please provide justification that the 69 kW HRR distribution for electrical motor fires bounds the postulated transient fires in FC32 and FC41. In the response, address the full range of types and quantities of combustibles that are expected to be located in each location. If adequate justification cannot be provided that the 69 kW HRR distribution is bounding, provide a revised sensitivity analysis that either uses the normal transient HRR distribution from NUREG/CR-6850 or an appropriately justified alternate HRR distribution. Please provide a description of the revised sensitivity analysis and the impact on the PRA results (CDF, LERF, ΔCDF, ΔLERF).

<u>OPPD's Response to Probabilistic Risk Assessment RAI 07 b.:</u>

There is uncertainty selecting a heat release that will bound all reasonably expected transient combustibles in the FC41 Cable Spreading Room or FC32 Compressor Area.

For FC41, the CCDP and CLERP associated with the postulated transient fire scenarios are equivalent to the CCDP and CLERP values associated with damage to all targets in the compartment (i.e., "full compartment burnup") and subsequent credit of the alternate shutdown process. Selection of a higher heat release rate would not change the scenario CCDP and CLERPs.

For FC32, the CCDP associated with the postulated transient fire is equivalent to the CCDP assuming failure of all targets in the compartment. Selection of a higher heat release rate would not change the scenario CCDP.

The FC32 transient fire CLERP is about a factor of five lower than the CLERP assuming failure of all targets in the compartment. So, a fire larger than the postulated 69 kW could conceivably cause a higher CLERP. However, 69 kW does bound all transients reasonably expected to occur at the postulated location (roof of CCW heat exchanger room). In fact, no transient storage is expected in this area. There is no mechanical plant equipment in this area. There is no routine maintenance in this area. The area does not receive regular foot traffic. The area is only accessible by ladder, and there is no permanently installed ladder. There is no reason to access this area as part of routine plant operation and maintenance. In addition transient storage is procedurally disallowed in absence of a continuous fire watch per proposed revision to the combustible control program.

c. **The sensitivity analysis did not address the additional risk from combustible control violations where the allowed transient combustible quantities are exceeded and no continuous fire watch is present (i.e., more than five pounds of transient combustibles are stored in FC41, more than zero pounds of transient combustibles are stored in FC28 and FC32). Please provide an assessment of the impact of this effect on the PRA results (CDF, LERF, ΔCDF, ΔLERF). The transient fires suppression curve from NUREG/CR-6850 should be used for these postulated fires. Also, the HRR assigned to the modeled violation should reflect those HRRs for the transient combustibles which may exist in the room, considering the equipment and required maintenance, storage, and occupancy. Also, the HRR for the modeled violation should consider any actual violations of administrative combustible controls which have occurred in the room or comparable locations of the plant, and exceed those HRRs identified in the previous sentence. The HRR for the modeled violation should be discussed and justified in light of these considerations.**

OPPD's Response to Probabilistic Risk Assessment RAI 07 c.:

To support re-sizing of the postulated transient fire sizes in FC32 and FC41, a search of OPPD corrective action documents over the past five years was performed and did not indicate a pattern of combustible control violations. Three CRs were identified in this search, all on the 989 feet elevation of FC32. 2011-6342 and 2011-6346 both involve the same issue of scaffolding in FC32, and 2011-7299 involves two plastic trash bins in FC32, contrary to SO-G-91, which requires trash receptacles to be metal. Note that the trash bin was not stored on the CCW heat exchanger roof area, which will be the area subject to enhanced controls.

Of these three CRs, the scaffolding issue is the only instance of combustible storage without obtaining the required permit. Because the trash receptacle issue does represent a violation of combustible controls, it will also be included in this assessment. The scaffolding was removed July 28, 2011, and it is unclear from the CR description at what point the scaffolding was installed. It is similarly unclear for what duration the plastic trash receptacles were in place. Assuming both the unapproved scaffolding and the plastic receptacles were each in place for 10 days, the likelihood of unapproved combustible storage in FC32 at any given time can be approximated as 1.10E-02, which is calculated as [20 days / (5 years * 365 days/year)]. This factor is conservatively applied to the FC41 cable spreading room, even though no combustible control violations were identified in FC41.

The fire risk contribution of a transient fire, where the combustible control procedure is violated, is conservatively estimated in Table E-1. This conservatively uses the CCDP and CLERP associated with failure of all targets in the compartment. It also conservatively does not credit severity factor and non-suppression probability, due to uncertainty in maximum fire size and the fire growth profile associated with combustible control violations. The frequencies used in Table G-1 are those used to support response to PRA RAI 07a.

Table E-1: Estimated Risk Associated with Combustible Control Violations

FC	λ(/yr)	P(violation)	SF	NSP	CCDP	CLERP	CDF (/yr)	LERF (/yr)
FC32	3.37E-05	1.10E-02	1.0	1.0	1.00E+00	7.97E-02	3.71E-07	2.95E-08
FC41	1.91E-05	1.10E-02	1.0	1.0	1.00E-01	1.00E-02	2.10E-08	2.10E-09

The FC32 estimate is also conservative because it is significantly less likely that combustible control violations will occur at the postulated pinch point (roof of CCW heat exchanger room). There is no mechanical plant equipment in this area. There is no routine maintenance in this area. The area does not receive regular foot traffic. The area is only accessible by ladder, and there is no permanently installed ladder. There is no reason to access this area as part of routine plant operation and maintenance.

The following table extends this sensitivity study to the total plant fire risk and total VFDR change in fire risk.

	Base Fire PRA*	**Sensitivity Study** (Including Comb. Control Violations)**
Net VFDR ΔCDF for NFPA 805 Transition (/yr)	5.72E-06	6.11E-06
Net VFDR ΔLERF for NFPA 805 Transition (/yr)	6.67E-07	6.99E-07
Total CDF (internal, flood, fire) (/yr)	6.01E-05	6.05E-05
Total LERF (internal, flood, fire) (/yr)	4.82E-06	4.85E-06

* Base Fire PRA results as reported in Section W.2 of LIC-11-0099.

**Sensitivity study case for VFDRΔCDF and VFDR ΔLERF conservatively assessed by adding the CDF and LERF associated with the postulated combustible control violations to the base case VFDR ΔCDF and VFDR ΔLERF, regardless of whether and how the postulated combustible control violations actually affect VFDR cables.

In conclusion, when a conservative estimate of the additional risk posed by combustible control violations in FC32 and FC41 is considered, the VFDR ΔCDF, VFDR ΔLERF, total CDF, and total LERF remain within the RG 1.174 Revision 1 Region II acceptance criteria.

d. **The sensitivity analysis did not address the additional risk of transient fires in FC41 during normal plant operations when less than five pounds of transient combustibles are being stored and no continuous fire watch is called for by procedures. Please provide an assessment of the impact of both of these effects on the PRA results (CDF, LERF, ΔCDF, ΔLERF). The normal transient suppression curve from NUREG/CR-6850 should be used for these postulated fires. Please provide justification for the HRR distribution used for these transient combustibles.**

OPPD's Response to Probabilistic Risk Assessment RAI 07 d.:

In response to this RAI, OPPD proposes an additional improvement to the combustible control process for the FC41 Cable Spreading Room. The process proposed by LIC-11-0099 requires a continuous fire watch if the five-pound combustible limitation in FC41 is exceeded. Part 'a' to this RAI points out that even just five pounds, in the correct configuration and location, can create a more aggressive fire than the 69 kW postulated by the fire PRA. For example NUREG/CR-6850 Table G-7 cites a Von Volkinburg test where two plastic trash bags, totaling 5.2 lbs and containing polystyrene cups, paper cups, and paper towels reached a peak heat release rate of 297 kW, which would be sufficient to damage cable targets in FC41.

In place of the simple five-pound limitation, OPPD proposes revising SO-G-91 to require a continuous fire watch when transient combustibles with the potential to damage targets are stored in FC41. This will allow the combustible control process to consider factors such as combustible type, configuration, location, and fire test data to ensure that no temporary combustibles with the potential to damage targets are left in FC41. As a hypothetical example, this process might disallow leaving unattended trash bags of any weight (even less than five pounds) in FC41. Conversely, the process might allow, for example, a multi-meter and small box of tools exceeding five pounds if it is placed in an area where its ignition could not threaten cable targets.

With this process, any permitted combustible storage will not damage targets, and therefore creates no quantifiable fire risk. Risk associated with allowing combustible storage with the potential to damage targets, accompanied by continuous fire watch per the propose SO-G-91 revision, is included in the fire PRA. Risk associated with violating the combustible control process is assessed in response to part 'c' of this RAI.

Probabilistic Risk Assessment RAI 11.01:

By letter dated July 24, 2012, the licensee responded to Probabilistic Risk Assessment RAI 11. The response to PRA RAI 11 describes the PRA modeling strategy for assessing variance from deterministic requirement (VFDR) risk as consisting of modeling each individual VFDR explicitly in the FPRA model (with the exception of those not considered risk-relevant or addressed using an alternative bounding approach). Calculation FC07883 (Fire Risk Assessment of FCS Variances from Deterministic Requirements of NFPA 805) describes a case on page A6-5 for Fire Compartment 34A in which the VFDR risk is stated

to be bounded by conservatism in the Plant Response Model (PRM) which does not credit ability to isolate a steam generator using the main steam isolation valve (MSIV) or MSIV bypass valves. No risk for this VFDR is calculated and the risk for Fire Compartment 3[4]A is reported to be zero CDF and LERF. In light of this, please provide the following:

a. **An explanation of how conservatism in the PRM related to inadvertent opening of condenser steam dump and bypass valves can bound the fire-induced spurious opening of the MSIV and MSIV bypass valves. In the response, please, specifically, address the frequency of the fire-induced scenarios relative to the quantitative impact of not crediting successful closure of the MSIV and MSIV bypass valves.**

OPPD's Response to Probabilistic Risk Assessment RAI 11.01a:

The specific VFDRs referenced by this RAI are 34A-002 and 34A-003, which identify that MSIV Bypass Valves HCV-1041C or HCV-1042C could spuriously open, or fail to close, due to fire in FC34A.

While fire cannot physically cause a Main Steam Line Break (MSLB) via pipe rupture, the FPRA models failure to isolate (or spurious opening of) the condenser steam dump and bypass valves as an MSLB. For these sequences, prevention or termination of the excess steam flow via MSIV isolation is not credited. This approach is conservative for the NFPA 805 transition in the sense that crediting MSIV isolation would reduce the total plant CDF and LERF, as compared to the values reported in the NFPA-805 transition LAR (LIC-11-0099). Note that in FC34A, the downstream condenser steam dump and bypass valves are unaffected.

However, as identified by the RAI, this approach is potentially non-conservative with respect to VFDR ΔCDF and ΔLERF, which were each reported as 0.00E+00 /yr for VFDRs 34A-002 and 34A-003. The concern is that, if the fire PRA "conservatively" does not model a VFDR component(s), whose proper operation could mitigate a fire induced initiating event(s), then the risk reduction afforded by protecting that component(s) would be underestimated (i.e., the VFDR ΔCDF and ΔLERF would be underestimated).

For the specific issue identified by Part 'a' to this RAI (i.e., failure to isolate MSIV bypass valves), the fire risk evaluation conclusion remains valid because flow through the MSIV bypass valves alone would not be sufficient to be considered an MSLB, even if the downstream condenser steam dump and bypass valves were to fail open. Therefore, the ΔCDF and ΔLERF for VFDRs 34A-002 and 34A-003 remain 0.00E+00.

Note that VFDRs 34A-002 and 34A-003 relate to the MSIV bypass valves. The only VFDRs for the MSIVs are in FC41 (cable spreading room) and FC42 (main control room). Refer to the table in response to PRA RAI 11.01b for assessment of the potential to underestimate FC41 and FC42 VFDR fire risk.

b. **An assessment of the impact of this and similar conservatisms in the FPRA modeling on the determination of VFDR risk. If VFDR risk (i.e., Δ CDF and Δ LERF) is under-estimated please provide risk estimates without these conservatisms.**

OPPD's Response to Probabilistic Risk Assessment RAI 11.01b:

The remaining fire risk evaluations were reviewed for cases in which the FPRA "conservative" non-crediting of VFDR components, whose proper operation could mitigate fire-induced initiating events, resulted in the underestimation of VFDR ΔCDF and ΔLERF.

FC	Assessment
FC20-1	No instance of modeling conservatism causing underestimation of VFDR ΔCDF and ΔLERF was identified.
FC20-7ROOF	No instance of modeling conservatism causing underestimation of VFDR ΔCDF and ΔLERF was identified. See response to PRA RAI 21 regarding treatment of loss of main control room HVAC.
FC28	VFDR 28-001 is that fire damage to cable EB12194 could spuriously open the turbine driven AFW pump FW-10 steam supply valve, YCV-1045. Unmitigated spurious opening of this valve may cause Steam Generator (SG) overfill, which may fail FW-10, due to water intrusion into the FW-10 steam supply. The FPRA relies upon the AFW and MFW flow control valves to prevent SG overfill. The FPRA does not credit availability of YCV-1045 to throttle steam flow and prevent SG overfill. There is therefore a potential for underestimation of VFDR ΔCDF and ΔLERF. However, FW-10 is modeled as failed for all FC28 fire scenarios that could impact the VFDR cable. Note that FW-10 failure is the ultimate consequence of the VFDR failure (i.e., due to SG overfill). Protection of VFDR cable EB12194 would afford no measurable risk reduction. The ΔCDF and ΔLERF are therefore not underestimated by the FPRA treatment of VFDR 28-001.
FC31	No instance of modeling conservatism causing underestimation of VFDR ΔCDF and ΔLERF was identified.
FC32	The fire risk evaluation for FC32 uses a bounding approach in which the total fire compartment CDF and LERF are used as conservative surrogates for the VFDR ΔCDF and ΔLERF. Since the total compartment CDF and LERF are within the R.G. 1.174 acceptance criteria, and this includes contribution from all risk-relevant VFDRs, then by definition the VFDR ΔCDF and ΔLERF must also be within the R.G. 1.174 acceptance criteria. With this approach, modeling conservatisms would not cause underestimation of VFDR ΔCDF and ΔLERF, since the calculated risk increase associated with the conservatisms would carry into VFDR ΔCDF and ΔLERF characterization.
FC34A	No instance of modeling conservatism causing underestimation of VFDR ΔCDF and ΔLERF was identified. VFDRs 34A-002 and 34A-003 involve spurious operation of MSIV bypass valves. Refer to Part 'a' of this RAI response.

FC	Assessment
FC34B-1	No instance of modeling conservatism causing underestimation of VFDR ΔCDF and ΔLERF was identified. VFDRs 34B-1-003 and 34B-1-004 involve spurious operation of MSIV bypass valves. Refer to Part 'a' of this RAI response. VFDR 34B-1-017 is that fire damage to cables EB12194 and EB12192 could spuriously open YCV-1045. The disposition of this VFDR failure in FC28 is also valid for VFDR 34B-1-017.
FC36A	No instance of modeling conservatism causing underestimation of VFDR ΔCDF and ΔLERF was identified. VFDR 36A-006 is that fire damage to cable EB12193 may spuriously open YCV-1045. It was determined that no fire scenarios in FC36A have the potential to fail this particular cable, and there is therefore no concern about model conservatism potentially causing underestimation of VFDR ΔCDF and ΔLERF.
FC36B	No instance of modeling conservatism causing underestimation of VFDR ΔCDF and ΔLERF was identified.
FC41	The fire risk evaluation for FC41 uses a bounding approach in which the total fire compartment CDF and LERF are conservatively used as surrogates for the VFDR ΔCDF and ΔLERF. Since the total compartment CDF and LERF are within the R.G. 1.174 acceptance criteria, and this includes contribution from risk-relevant VFDRs, then by definition the VFDR ΔCDF and ΔLERF must also be within the R.G. 1.174 acceptance criteria. With this approach, modeling conservatisms would not cause underestimation of VFDR ΔCDF and ΔLERF, since the calculated risk increase associated with the conservatisms would carry into VFDR ΔCDF and ΔLERF characterization.
FC42	The fire risk evaluation for FC42 uses a bounding approach in which the total fire CDF and LERF associated with control room abandonment are conservatively used as surrogates for the VFDR ΔCDF and ΔLERF. Since the total abandonment CDF and LERF are within the R.G. 1.174 acceptance criteria, and this includes contribution from risk-relevant VFDRs, then by definition the VFDR ΔCDF and ΔLERF must also be within the R.G. 1.174 acceptance criteria. With this approach, modeling conservatisms would not cause underestimation of VFDR ΔCDF and ΔLERF, since the calculated risk increase associated with the conservatisms would carry into VFDR ΔCDF and ΔLERF characterization.
FC43	The fire risk evaluation for FC43 uses a bounding approach in which the total fire compartment CDF and LERF are conservatively used as surrogates for the VFDR ΔCDF and ΔLERF. Since the total compartment CDF and LERF are within the R.G. 1.174 acceptance criteria, and this includes contribution from risk-relevant VFDRs, then by definition the VFDR ΔCDF and ΔLERF must also be within the R.G. 1.174 acceptance criteria. With this approach, modeling conservatisms would not cause underestimation of VFDR ΔCDF and ΔLERF, since the calculated risk increase associated with the conservatisms would carry into VFDR ΔCDF and ΔLERF characterization.

In conclusion, this systematic review did not identify any instances of FPRA modeling conservatism causing underestimation of VFDR ΔCDF and ΔLERF.

Probabilistic Risk Assessment RAI 15.g.01:

By letter dated July 24, 2012, the licensee responded to Probabilistic Risk Assessment RAI 15. The response, related to impact on the PRA from model uncertainty and assumptions, explains that plant specific analysis was performed to identify and characterize sources of generic modeling uncertainty. This included identifying model assumptions, putting them into a database, and characterizing them in terms of importance (i.e., Important, Medium, and Non-Important). According to the RAI response assumptions and uncertainties were reviewed using this new approach and an additional key assumption was identified for which a sensitivity study was performed and presented. In light of the fact that this approach appears to hinge on assigning of "Important, Medium, and Non-Importance" significance levels, please discuss the process for assigning these levels and the specific criteria involved.

OPPD's Response to Probabilistic Risk Assessment RAI 15.g.01:

The procedure that is used to characterize assumptions is documented in the OPPD PRA procedure "Identification and Assessment of Modeling Assumptions." This procedure has the PRA analyst enter several different pieces of information into the assumptions database to support its characterization; this information is discussed below.

Assumption Type:

- "Simplifying" Assumptions: These are generally minor assumptions made to simplify portions of the model. These may include assumptions such as: "It is appropriate to assign all Loss of Coolant Accidents (LOCAs) to loop A, because LOCA location doesn't affect accident progression," or an assumption made to exclude transferring closed of manual isolation valves.

- "Simplifying / Conservative" Assumptions: This type of assumption is made to simplify the PRA model and is made in such a way that it will have a conservative (risk-overestimate) impact on the baseline model.

- "Simplifying / Optimistic" Assumptions: This type of assumption is made to simplify the PRA model and is made in such a way that it will introduce nonconservatism (risk-understatement) into the baseline model. These assumptions should only be made when their impact is small.

- "Realistic" Assumptions: This type of assumption is made in such a way that it very closely models reality in the plant. Types of assumptions that are classified as realistic include "statements" that are tracked in the assumptions database as well as simplifying assumptions that are very close to reality.

- "Consensus" Assumptions: These are assumptions that are based on a model or approach that is widely accepted throughout the industry. These may include assumptions such as: "The generic Motor Operated Valve failure rates are applicable because the MOVs used at FCS equivalent to the population of MOVs upon which the generic failure rates are based."

- "Unknown" Assumptions: The majority of these assumptions are made in response to generic areas of uncertainty for which there is insufficient existing information to suggest if the assumption is simplifying, realistic or even applicable. This type of assumption was formally classified as "state-of-knowledge." However, to avoid confusion with the generic area of uncertainty surrounding the "State of Knowledge Correlation" this category was renamed "Unknown."

Sensitivity Impact:

The Sensitivity Impact is the PRA analyst's qualitative estimate of the impact of replacing the current assumption with reasonable alternative assumptions. It represents the difference between reality, and the assumption that is being used to represent reality. The "impact" of this sensitivity is a qualitative measure of the change in PRA results that would be seen if the current assumption was replaced with a reasonable alternative assumption. Therefore, based on these definitions:

- A "High" Sensitivity Impact indicates that replacing the current assumption with one of the reasonable alternative assumptions will likely cause changes to the risk profile of the plant that could change the top contributors to risk.
- A "Medium" Sensitivity Impact indicates that replacing the current assumption with one of the reasonable alternative assumptions will change the results of the baseline PRA such that the changes will be noticeable, but will not change a dominant risk contributor.
- A "Low" Sensitivity Impact indicates that replacing the current assumption with one of the reasonable alternative assumptions will not noticeably change the results of the baseline quantification.
- An entry of "None," for the Sensitivity Impact indicates that either there is no "Sensitivity Issue" because the assumption has been identified as a "Statement," or the assumption has zero impact on the at power PRA model.

Classification:

The classification is qualitatively assigned by reviewing the quality of the assumption's basis and considering its type (i.e., one of the six items listed above). The following definitions should be used as a guideline to qualitatively assess the level of importance that a given assumption is assigned. Here importance is defined relative to the amount of attention that an assumption should be given when being considered for an application. Table 1 is provided as a guide to aid in assumption classification and how it relates to the assumption type and its impact on the model.

Table 1: Guidelines For Classifying PRA Assumptions Based on the Assumption Type and Sensitivity Impact

Sensitivity Issue / Assumption Type	High	Medium	Low	None
Simplifying	Medium Importance / Non-Important	Non-Important	Non-Important	Non-Important
Simplifying / Conservative	Medium Importance	Non-Important	Non-Important	Non-Important
Simplifying / Optimistic	Important	Important	Medium Importance / Non-Important	Non-Important
Realistic	Medium Importance / Non-Important	Non-Important	Non-Important	Non-Important
Consensus	Non-Important	Non-Important	Non-Important	Non-Important
Unknown	Important*	Important*	Medium Importance* / Non-Important	Non-Important

* Note that these classifications are only suggested if the "Unknown" assumption has a reasonable more conservative alternative assumption identified in the "Sensitivity Issue" field.

Probabilistic Risk Assessment RAI 18.01:

By letter dated July 24, 2012, the licensee responded to Probabilistic Risk Assessment (PRA) RAIs 17, 18a and 18b acknowledging that the last peer review of the internal events PRA (IEPRA) was performed in 1999 and that certain model changes performed since then warrant a peer review (i.e., the HRA, internal flooding, loss of off-site power (LOOP), recovery actions (RAs), and the update of the LERF model). In light of this, please perform a focused scope peer review of the internal events HRA and two of the PRA elements (i.e. LOOP recovery actions, and update of the LERF model) identified in response to PRA RAI 18.a and b. Please provide the findings from these peer reviews and the resolutions to these findings. If the resolutions to the peer review findings require changes to the FPRA, provide the CDF, LERF, ΔCDF, and ΔLERF for each fire area and the total based on the updated PRA model. In addition, if these resolutions impact the sensitivity studies performed, please provide revised sensitivity studies results.

OPPD's Response to Probabilistic Risk Assessment RAI 18.01:

A focused scope peer review was performed at Fort Calhoun Station in February 2013 that reviewed three specific areas of the OPPD Internal Events (IE) PRA that qualified as PRA upgrades or changes in methodology. These areas were the HRA, which was upgraded to the Human Reliability Analysis (HRA) Calculator, the Large Early Release Frequency (LERF) assessment, which adopted the Pressurized Water Reactor Owner's Group (PWROG) Simplified Level 2 methodology, and the Loss of Offsite Power (LOOP) recovery analysis, which used a convolution approach. Table 2 documents the disposition or resolution of the Facts and Observations (F&Os) from the February 2013 focused scope peer review from a FPRA perspective and provides an explanation of why the IE PRA, specifically in relation to these areas, is acceptable for the NFPA-805 transition.

Table 2: Disposition / Resolution of February 2013 Focused Scope Peer Review F&Os

F&O	Level of Significance	Finding/Observation	FPRA Disposition / Resolution
HR-A3-01	Finding	**Basis for Significance:** There is no discussion of mechanisms that simultaneously affect either different trains of a redundant system or diverse systems. **Possible Resolution:** Document a discussion on mechanisms that simultaneously affect either different trains of a redundant system or diverse systems.	Work practices rarely involve mechanisms that simultaneously affect equipment in diverse systems. For example, it is unlikely that Structures, Systems, and Components (SSCs) supporting auxiliary feedwater and once-through-core-cooling would be removed from service at the same time because the Maintenance Rule risk assessment would be unsatisfactory. Another example is that a crew would not be dispatched to calibrate instrumentation for Containment Pressure High Signal (CPHS) and Pressurizer Pressure Low Signal (PPLS) on the same shift, because each would require different tools and equipment. Therefore, work practices affecting availability and reliability of diverse systems are not represented in the PRA and this assumption is judged to have a negligible impact on the CDF and LERF results for FCS. With respect to work practices involving mechanisms that simultaneously affect equipment in redundant systems, the original HRA development document acknowledges the importance of creating pre-initiator Human Failure Events (HFEs) at the system level and not the train level: "...naming the human failure uniquely [for each train] rather than according to procedure or equipment functional grouping, would yield two single event, human failure event cutsets for the system failure. Quantifying these events would then doubly count the failure probability of what really is only a single event. Redundant systems developed using [this method] can yield non-conservative estimates ..." This is especially important for standby systems or systems that are not operating during an outage. For example, it is not uncommon for a team of instrumentation and control technicians to calibrate multiple channels for an engineered safeguards function on the same shift. Consistent with the preceding discussion, pre-initiator HFEs were created to represent failure at the system level, not the component or train level. Therefore, the FCS HRA identified the work practices described by SR HR-A2, and assessed the joint probabilities described in Supporting Requirement (SR) HR-D5. A new issue has been opened in the FCS PRA configuration control database to ensure that the basis for this modeling practice is more clearly documented. Thus, this is considered to be a documentation issue and will not impact the results of the FCS FPRA.

Table 2: Disposition / Resolution of February 2013 Focused Scope Peer Review F&Os			
F&O	**Level of Significance**	**Finding/Observation**	**FPRA Disposition / Resolution**
HR-E1-01	Finding	**Basis for Significance:** There is no discussion of procedures used in the HFE analysis in the HRA notebook. The procedures used per the HFEs are discussed in the HRA Calculator but there is no way to verify that the correct and/or all the applicable procedures have been reviewed. **Possible Resolution:** Add a discussion of the procedures used in the development of the HFEs.	This F&O is a documentation issue that will not impact the Fire Probabilistic Risk Assessment (FPRA) results. This issue has been logged into the FCS PRA configuration control database and will be resolved going forward. The FCS HRA is primarily documented within the HRA Calculator and not all information is available in the HRA notebook. However, the information documented within the HRA Calculator is considered to be of the same quality as the HRA notebook and fulfills the same function. Therefore, this documentation issue will not impact the results of the FCS FPRA.
HR-E2-01	Finding	**Basis for Significance:** There is no discussion of how the HFE to be analyzed were determined or the methodology used for this determination in the HRA notebook. There are actions described in the HRA Calculator. The actions screened out are not discussed in either the HRA notebook or HRA. **Possible Resolution:** Add a discussion of the HFEs that were considered for the internal PRA.	Appendices B and F of the PRA project plan discuss the original HFEs and the methodology used. Additional HRA work is documented for the projects performed by CeltCo (1998) in and by Scientech (2004). Additionally, PRA Procedure, "Maintenance of the Human Reliability Analysis," provides guidance for HFEs that are added during PRA revisions. Although documentation of this issue is documented throughout the references above, it is recognized that consolidated documentation should be created going forward. A new issue has been opened in the FCS PRA configuration control database to more clearly document this issue. Thus, this is considered to be a documentation issue and will not impact the results of the FCS FPRA.

Table 2: Disposition / Resolution of February 2013 Focused Scope Peer Review F&Os

F&O	Level of Significance	Finding/Observation	FPRA Disposition / Resolution
HR-G6-01	Finding	**Basis for Significance:** There is no evidence that a review of the HFE reasonableness given the scenario context, plant history, procedures, operational practices and experience was performed. **Possible Resolution:** Include a discussion of the review of HFE for their reasonableness given the scenario context, plant history, procedures, operational practices and experience.	The reasonableness of the HFEs in the FCS PRA model is considered on a regular basis by individuals with intimate knowledge of the plant and its past and current operation. Since its inception, the FCS PRA team has been composed of OPPD employees and PRA consultants. The OPPD team member most responsible for HRA had extensive FCS experience, having held an active Senior Reactor Operator license, and previous positions including Reactor Engineer, operations and engineering training supervisor, and emergency operating procedure coordinator. Additionally, dominant human failure events were reviewed by an operating crew using either simulator or table top scenarios. This level of involvement provides assurance of HFE reasonableness given the scenario context, plant history, procedures, operational practices and experience. Therefore, this finding is judged to have negligible, if any, impact upon the results of the FCS PRA. It may be desirable to enhance the documentation that demonstrates compliance with this SR; therefore, a new issue has been opened in the FCS PRA configuration control database for that purpose. This is considered to be a documentation issue and will not impact the results of the FCS FPRA.

Table 2: Disposition / Resolution of February 2013 Focused Scope Peer Review F&Os			
F&O	**Level of Significance**	**Finding/Observation**	**FPRA Disposition / Resolution**
HR-I1-01	Finding	**Basis for Significance:** There are several sections which are included in the HRA Calculator which, should be added to the HRA notebook to facilitate PRA applications, upgrades, and peer reviews. An example is the procedures reviewed for each HFE and which were applicable to the particular scenario. **Possible Resolution:** Add the appropriate sections to the HRA notebook.	This F&O is a documentation issue that will not impact the FPRA results. This issue has been logged into the FCS PRA configuration control database and will be resolved going forward. The FCS HRA is primarily documented within the HRA Calculator, and not all information is available in the HRA notebook. However, the information documented within the HRA calculator is considered to be of the same quality as the HRA notebook and fulfills the same function. Therefore, this documentation issue will not impact the results of the FCS FPRA.
HR-I2-01	Finding	**Basis for Significance:** There is no methodology section in the HRA notebook. **Possible Resolution:** Add a methodology section to the HRA notebook to include the objectives of this SR.	This F&O is a documentation issue that will not impact the FPRA results. This issue has been logged into the FCS PRA configuration control database and will be resolved going forward. The FCS HRA is primarily documented within the HRA Calculator and not all information is available in the HRA notebook. However, the information documented within the HRA Calculator is considered to be of the same quality as the HRA notebook and fulfills the same function. The HRA methodology is documented in the Probabilistic Risk Assessment Project for Fort Calhoun Station Project Plan," (1989) and is maintained consistent with the HRA Calculator User's Manual. This documentation issue will not impact the results of the FCS FPRA.

Table 2: Disposition / Resolution of February 2013 Focused Scope Peer Review F&Os

F&O	Level of Significance	Finding/Observation	FPRA Disposition / Resolution
LE-C9-01	Finding	**Basis for Significance:** Credit was taken for operation of Containment Sprays (CS) during a severe accident. However, there is no documentation of equipment survivability assessment for the CS system. Such discussion is required to fully meet this SR. **Possible Resolution:** Perform an equipment survivability assessment for the CS system and document this assessment appropriately.	This F&O has no impact on the FPRA LERF results. Because the CS system is not credited for fission product reduction and is only credited with respect to maintaining long term containment pressure, the CS system only impacts the frequency of late releases due to long term containment over-pressure related failures. An equipment survivability assessment was performed for the containment fan coolers and resulted in the same conclusion. This issue has been logged into the FCS PRA configuration control database and will be resolved going forward; however this F&O does not impact the FPRA LERF results.

Table 2: Disposition / Resolution of February 2013 Focused Scope Peer Review F&Os			
F&O	**Level of Significance**	**Finding/Observation**	**FPRA Disposition / Resolution**
LE-F2-01	Finding	**Basis for Significance:** Although significant LERF contributors are discussed in the model development sections, there was no documentation to suggest that a review of the dominant LERF sequences was performed post-quantification. **Possible Resolution:** Include a write-up in the LERF results section discussing the various contributors and the insights gained. Reference any applicable cutsets reviews or plant procedures related to cutset reviews.	This F&O has been resolved. A review of the LERF cutsets was performed and documented within the FCS PRA Configuration Control Form (CCF) related to this issue. The results of this review showed that the LERF cutsets and results were correct and consistent with expectations. The dominant LERF contributors are Inter-System Loss of Coolant Accident (ISLOCA), Thermally-Induced Steam Generator Tube Rupture (TI-SGTR) and Level 1 Induced-SGTRs from Main Steam and Feedwater Line Break (MSFLB) initiators. These results are expected as early containment failure modes such as hydrogen burns, steam explosions and High Pressure Melt Ejection (HPME) related phenomena typically challenge containment integrity due to large pressure differentials. The FCS containment has a relatively large containment volume for its core size and has a high median containment failure pressure. These containment characteristics make these failure modes less likely, thus increasing the relative contribution of bypass events to LERF. Closure of this F&O did not result in any changes in the LERF model or results. Therefore, this F&O does not impact the FPRA LERF results.

Table 2: Disposition / Resolution of February 2013 Focused Scope Peer Review F&Os			
F&O	**Level of Significance**	**Finding/Observation**	**FPRA Disposition / Resolution**
LE-G1-01	Finding	**Basis for Significance:** There is no roadmap provided that indicates where the conformance to the various SRs of the PRA Standard is addressed. A roadmap will facilitate the PRA Peer review. This is a documentation issue and does not impact the PRA results. **Possible Resolution:** Include a roadmap that indicates where the conformance to the various SRs of the PRA Standard is addressed.	This F&O is a documentation issue that will not impact the FPRA LERF results. This issue has been logged into the FCS PRA configuration control database and will be resolved going forward. Upon closure, this CCF will result in a document that can be used as a roadmap for the LE SRs from the most recent version of the ASME/ANS PRA Standard (Reference 1).

Table 2: Disposition / Resolution of February 2013 Focused Scope Peer Review F&Os			
F&O	**Level of Significance**	**Finding/Observation**	**FPRA Disposition / Resolution**
LE-G3-01	Finding	**Basis for Significance:** LERF results are tabulated in Section 6.4 of CN-RRA-06-27. However, there is no discussion provided to identify the significance of these results. The dominant contributors are not identified and whether there is a potential to reduce the result is not identified. Also, the contribution of the Level 1 initiators to LERF are not identified as has been done in Figure 3.7-1 of the PRA Summary document for Level 1 PRA. Such discussion is required to fully meet this SR. **Possible Resolution:** Add a discussion results to the tables in Section 6.4 of the report where the LERF results are summarized.	This F&O has been resolved. Within the CCF related to this issue, additional LERF results are documented and characterized. The following items are now documented appropriately: • A discussion of the significance of the LERF results • The potential to reduce the LERF frequency is identified • The dominant contributors to LERF are now more clearly documented • The contribution of Level 1 initiators to LERF has been added Closure of this F&O did not result in any changes in the LERF model or results. Therefore, this F&O does not impact the FPRA LERF results.

In conclusion, all issues identified in the peer review have been shown to be either documentation issues that do not impact the FPRA, or are positions that will not significantly impact the FPRA CDF or LERF results and are not expected to alter any FPRA risk insights. The issues identified as part of the peer review have either been resolved, or have been entered into the OPPD PRA configuration control form database to be resolved in the future. Therefore, no ΔCDF or ΔLERF FPRA sensitivity studies are required.

Probabilistic Risk Assessment RAI 20:

Please identify if any VFDRs in the LAR involved performance-based evaluations of wrapped or embedded cables. If applicable, describe how wrapped or embedded cables were modeled in the FPRA including assumptions and insights on how the PRA modeling of these cables contributes to the VFDR delta-risk evaluations.

OPPD's Response to Probabilistic Risk Assessment RAI 20:

There are no VFDRs involving performance-based evaluation of wrapped or embedded cables.

Probabilistic Risk Assessment RAI 21:

F&O PRM-B9-01: Per Calculation FC07819 and FC07826 the MCR heating ventilation and air conditioning (HVAC) is qualitatively screened from the FPRA. One of the reasons for the screening cited in the plant disposition is that there is a low frequency of fires with the potential to damage both HVAC trains, VA-46A and VA-46B. Please indicate if the cables for these trains were traced and describe how the frequency for damage to both of these trains was established. Please discuss if a fire in other locations can result in loss of MCR HVAC and how this was considered in the fire PRA. If the cables were not traced, discuss how the feasibility of implementing AOP-13 is ensured. Provide a quantitative assessment for the failure of MCR HVAC and other forms of room cooling as identified in the plant response to the F&O and, if significant, evaluate the MCR CDF/LERF given loss of MCR HVAC.

OPPD's Response to Probabilistic Risk Assessment RAI 21:

Cables supporting the control room HVAC units VA-46A and VA-46B have been identified in support of the NFPA 805 transition. As described in the following bullets, fire compartments in which cabling and/or equipment associated with both HVAC units are co-located include FC20-7R (auxiliary building roof), FC41 (cable spreading room), and FC42 (main control room) :

- FC20-7R: This compartment houses the VA-46A and VA-46B condensers and is located on the roof of compartment FC20-7. No fixed ignition source in this area could fail both HVAC units. A transient fire could potentially fail both HVAC units. Note that no fire-induced failures beyond the HVAC units would occur for this transient fire scenario.

- FC41: No fixed ignition source in this area could fail both HVAC units. A transient fire between column lines E and slightly north of column line 7a, or a transient fire between column lines 7a and 6d, could potentially fail both HVAC units. However, these transient fires would also cause widespread damage sufficient to warrant control room abandonment and alternate shutdown, rendering the loss of MCR HVAC irrelevant. FC41 is, therefore, excluded from this analysis, and its risk contribution is included in the base FPRA.

- FC42: Overlap occurs in the mechanical equipment room where HVAC units VA-46A and VA-46B are physically located. No fixed ignition source in this area could fail both HVAC units. There is a portion of this area where a transient fire could impact both trains. This area of the control room is roped off with a chain and not anticipated to be an area for transient storage, but nonetheless a transient fire is conservatively postulated for this analysis. Note that no fire-induced failures beyond the HVAC units would occur for this transient fire scenario.

Beyond the HVAC units themselves, EA-FC-95-014, Revision 0, systematically considers dependencies for the HVAC units (namely electrical), and it confirms that FC41, FC42, and FC20-7R are the only areas where fire may fail both trains of control room HVAC.

Note that the HVAC units contain economizers that are required when the outside air temperature is below 0°F, since the condensing units are not qualified below 0°F. Analysis EA-FC-95-014 states, via reference to calculation FC06311, that "...for the loss of the condensing units due to low outside temperatures, the control room would not be expected to reach elevated temperatures for approximately 25 hours." This duration exceeds the PRA mission time and is, therefore, excluded from further analysis.

The following table documents ignition frequencies for transient fires capable of damaging both trains of HVAC.

PRA-RAI-21 Table 1: Transient Fire Ignition Frequencies Failing Both Trains of HVAC

Fire Compartment	Transient Fire Frequency for FC	Fraction of Floor Area	Transient Fire Frequency Failing VA-46A and VA-46B
FC42	8.04E-04	4.68E-02*	3.76E-05
FC20-7ROOF	3.10E-04	2.69E-02**	8.34E-06

*Based on the routing of the relevant HVAC cables, a transient fire occurring anywhere within approximately 50% of the mechanical equipment room floor area could damage both trains of HVAC. The fraction of the total control room floor area where loss of both HVAC trains may occur is therefore (0.5)(473)/(5056) = 4.68E-02.

** Based on the routing of the relevant HVAC cables, a transient fire occurring anywhere within room containing the HVAC condensers in FC20-7ROOF could damage both trains of HVAC. The fraction of the total FC20-7ROOF area where loss of both HVAC trains may occur is therefore (473)/(17,561) = 2.69E-02. The floor area of this room is assumed consistent with the MCR HVAC room and per drawing review.

AOP-13 Attachments A, B, and C provide direction to align one of the following three diverse backup methods of control room ventilation: turbine building exhaust fans, auxiliary building exhaust fans, and using portable fans. An HRA of operator alignment of backup room cooling using Attachment A yielded an HEP of 3.80E-03. For the purpose of this analysis, failure to align backup cooling is conservatively assumed to result in CCDP and CLERP values of 1.0. The CDF and LERF for fire-induced loss of control room HVAC are conservatively assessed in the following table.

PRA-RAI-21 Table 2: Fire Induced Loss of Control Room HVAC CDF and LERF

Fire Compartment	Frequency	HEP Backup Cooling	CCDP	CLERP	CDF	LERF
FC42	3.76E-05	3.80E-03	1.0	1.0	1.43E-07	1.43E-07
FC20-7ROOF	8.34E-06	3.80E-03	1.0	1.0	3.17E-08	3.17E-08
				TOTAL	1.75E-07	1.75E-07

The OPPD total CDF, total LERF, VFDR ΔCDF, and VFDR ΔLERF would remain within RG 1.174 (Revision 1) Region II with the conservative assessment of sequences involving loss of control room HVAC numerically included. This is summarized in the following table.

PRA-RAI-21 Table 3: Sensitivity Study Loss of MCR HVAC Summary		
	Base Fire PRA*	Sensitivity Study (Conservative Modeling of Loss of MCR HVAC)
Net VFDR ΔCDF for NFPA 805 Transition (/yr)	5.72E-06	5.75E-06**
Net VFDR ΔLERF for NFPA 805 Transition (/yr)	6.67E-07	6.99E-07**
Total CDF (internal, flood, fire) (/yr)	6.01E-05	6.03E05
Total LERF (internal, flood, fire) (/yr)	4.82E-06	5.00E06

*Base Fire PRA results as reported in Section W.2 of LIC-11-0099.

** VFDR ΔCDF and ΔLERF calculated as the base case values, added to the ΔCDF and ΔLERF for FC20-7ROOF, which have VFDRs associated with loss of control room HVAC. While the FC42 CDF and LERF contribute to total plant risk, they do not contribute to the risk associated with FC42 VFDRs.

Probabilistic Risk Assessment RAI 22:

Calculation FC07821 describes the fire ignition frequency development methodology and results. Relative to this report, please provide the following:

Section 5.2 states that a Bayesian update was not performed. SR IGN-A4 requires that a Bayesian update be performed to meet this SR. Table 5-1 shows that the plant has experienced two "potentially challenging" fires, one dated 12/19/2001 and another dated 11/29/1997. An update should be performed for the 2001 event which is not a part of the generic database. An update should be performed for the 1997 event if it is not a part of the generic database. In addition, the June 2011 Switchgear Room fire may also be classified as a "potentially challenging" fire. Please provide an assessment of the impact on CDF, LERF, ΔCDF, and ΔLERF of a Bayesian update of the fire ignition frequencies considering these plant-specific fires.

OPPD's Response to Probabilistic Risk Assessment RAI 22:

The three referenced plant specific fire events are shown in the following table:

Table PRA-RAI-22 – Three Plant Specific Fire Events					
Fire Event	Date	Location	Ignition Source Bin	Mode of Operation	"Potentially Challenging"
CR199701629: Control Room Fire	11/29/1997	Fire Area 42	Bin 4: Main Control Board	At Power	Yes
CR200103787: Stressing Gallery Fire	12/19/2001	Tendon Stressing Gallery, accessed from one of two SI pump rooms	Bin 7: Transient Fires	At Power	Yes
CR 2011-5414 Halon actuated within switchgear room due to fire within West Switchgear	06/07/2011	West Switchgear Room	Bin 15.1: Electrical Cabinets non-HEAF	Mode 5 (SDC)	Yes

The FCS fire ignition frequency calculation (Calculation FC07821) uses the generic frequencies from EPRI 1019259, which include fire events data through the year 2000. The first FCS fire event (1997), is within the range of data considered by EPRI 1019259; therefore, a Bayesian update is not required.

The occurrence of one Bin 4 event does not indicate a particular susceptibility of FCS to this fire type, as compared to the industry operating experience, and the generic frequency is therefore applicable to FCS.

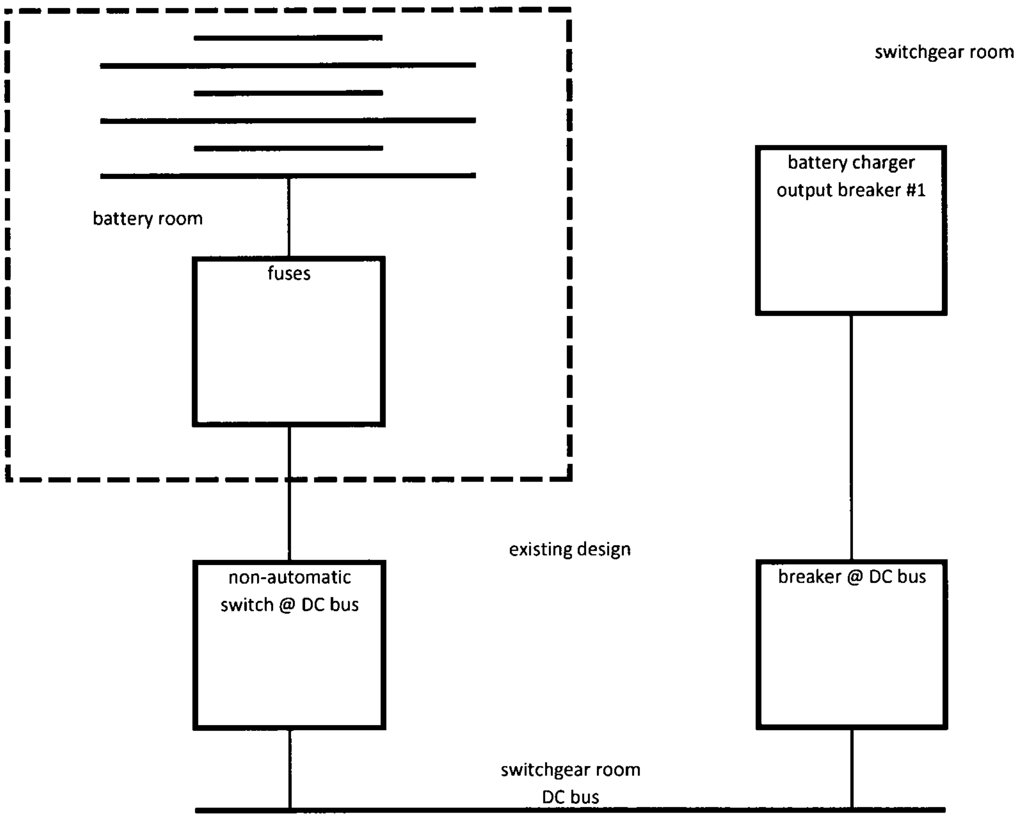
Similarly, the Bin 7 event and the Bin 15.1 event do not demonstrate a particular susceptibility to these fire types, as compared to the industry operating experience. The generic frequencies for these two bins are therefore applicable to FCS. While these two events occurred outside the date range considered by the generic data, when the generic frequencies are updated, the contribution of these two events will be distributed across the total reactor years for all US reactors.

Safe Shutdown RAI 15 Response

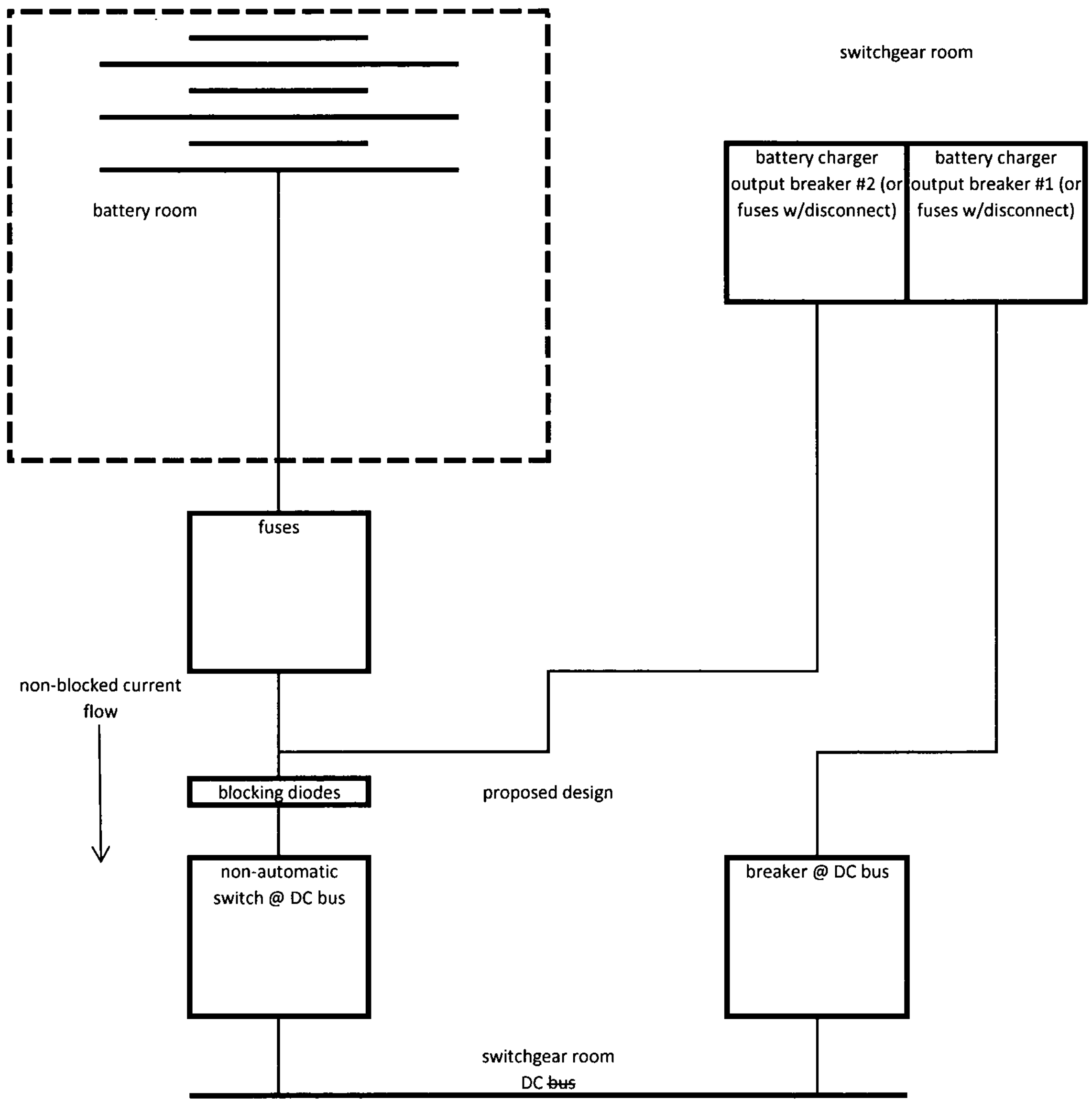
Sketches of Conceptual Proposed Design Option(s)
as Described for REC-119 and REC-120
in Attachment S of the Transition LAR (LIC-11-0099)

(Battery Room)

REC-119 and REC-120 Proposed Modification Conceptual Design



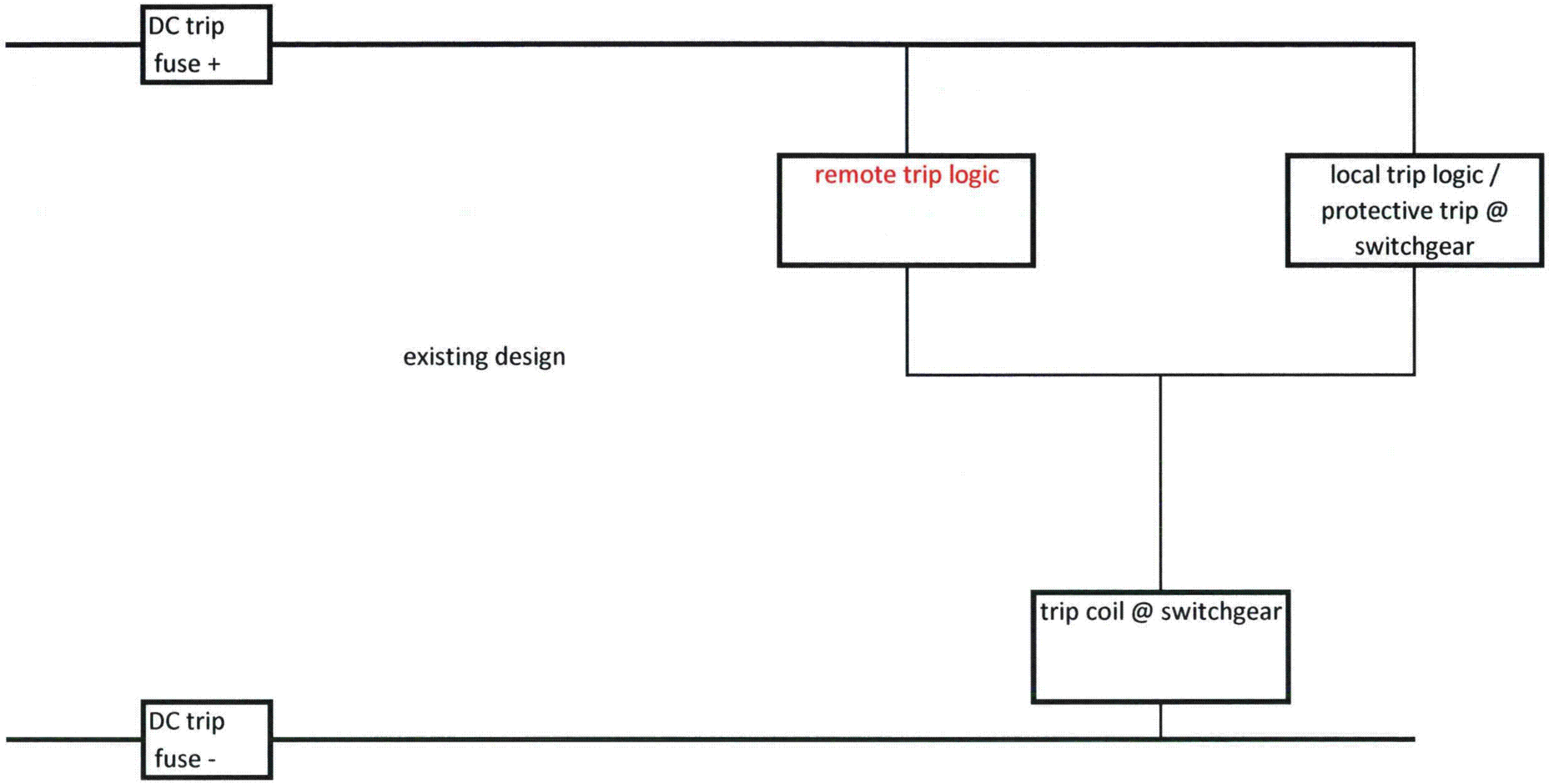
REC-119 and REC-120 Proposed Modification Conceptual Design



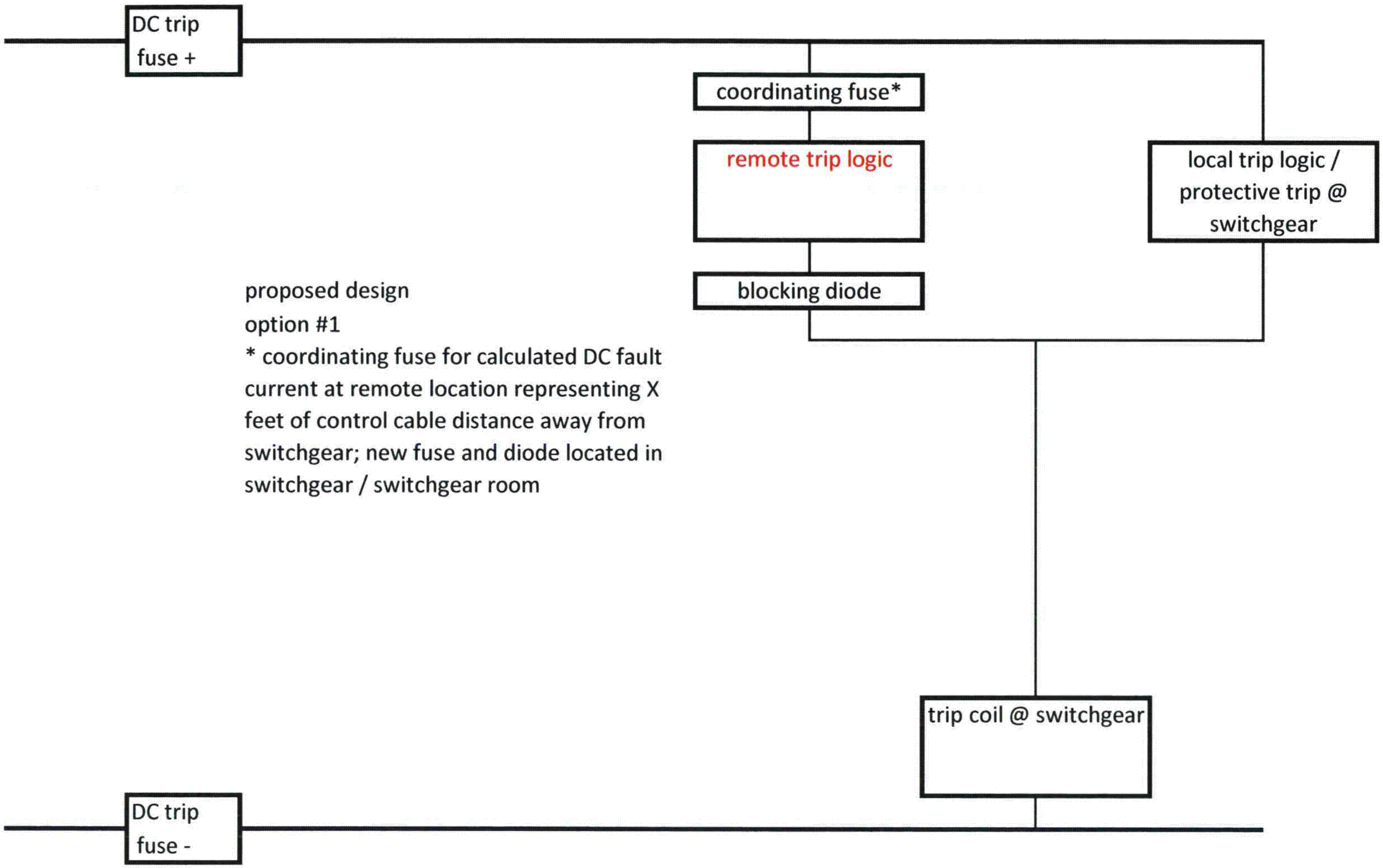
Safe Shutdown RAI 16 Response

Sketches of Conceptual Proposed Design Option(s)
as Described for REC-112
in Attachment S of the Transition LAR (LIC-11-0099)

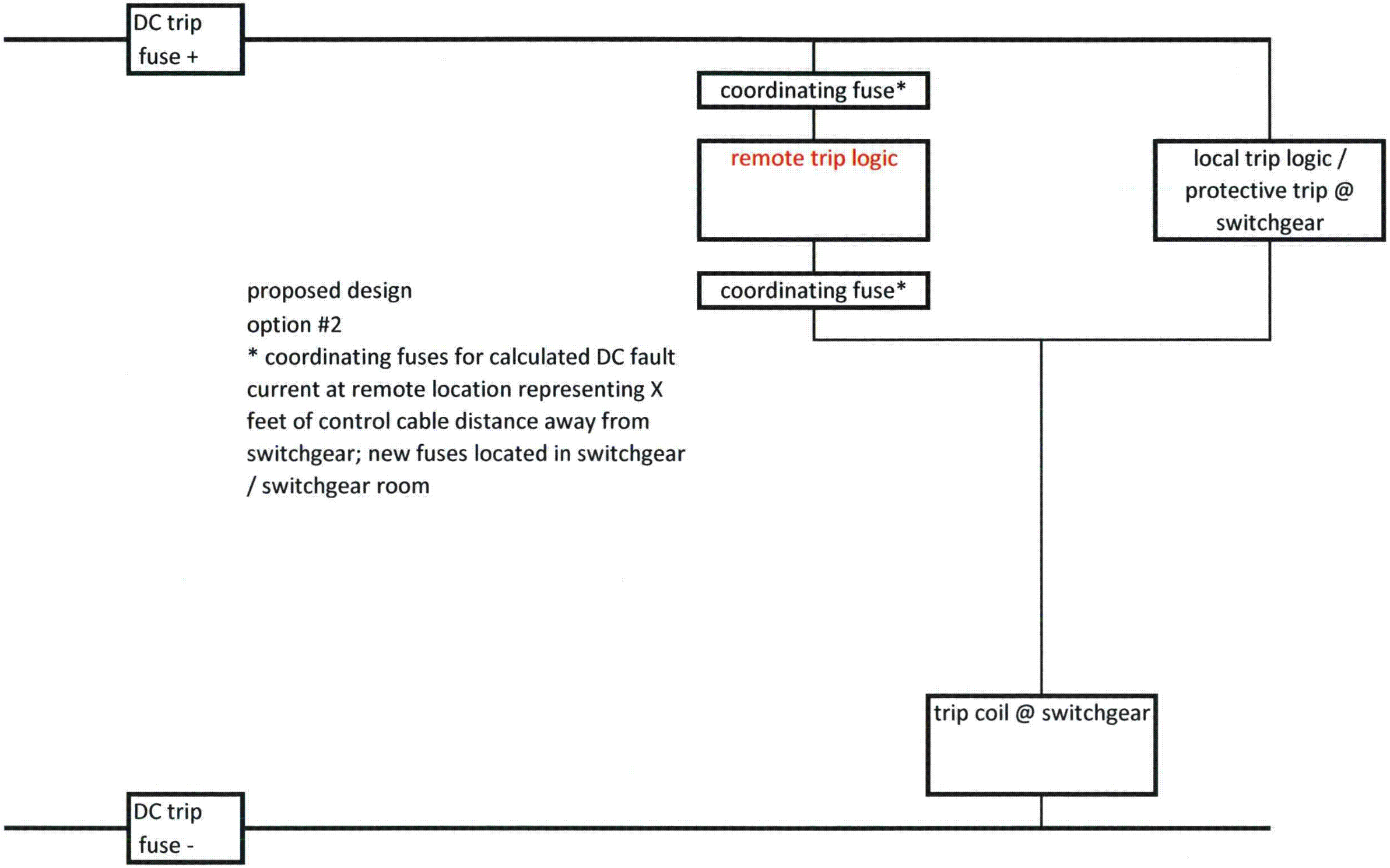
REC-112 Proposed Modification Conceptual Design



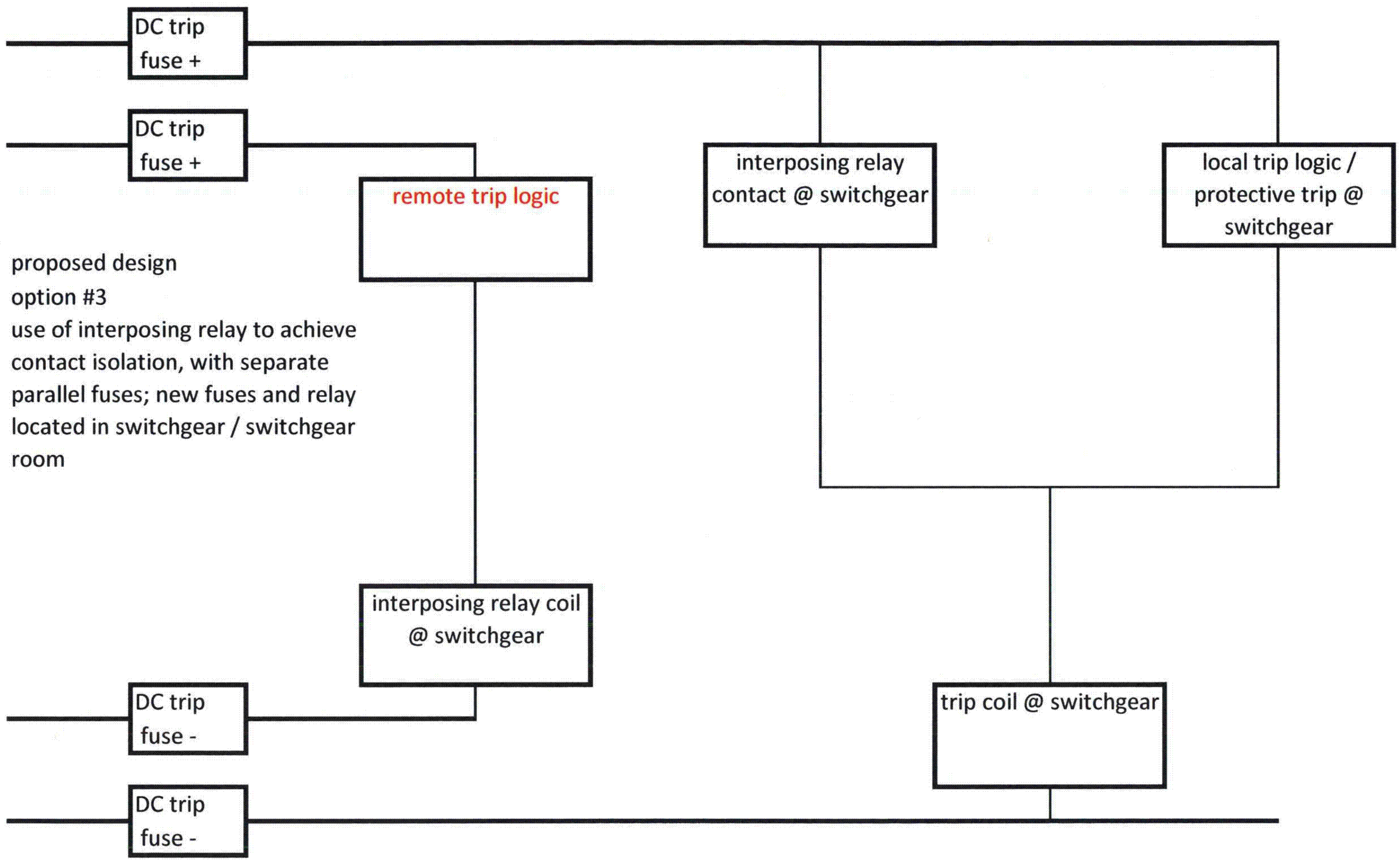
REC-112 Proposed Modification Conceptual Design



REC-112 Proposed Modification Conceptual Design



REC-112 Proposed Modification Conceptual Design

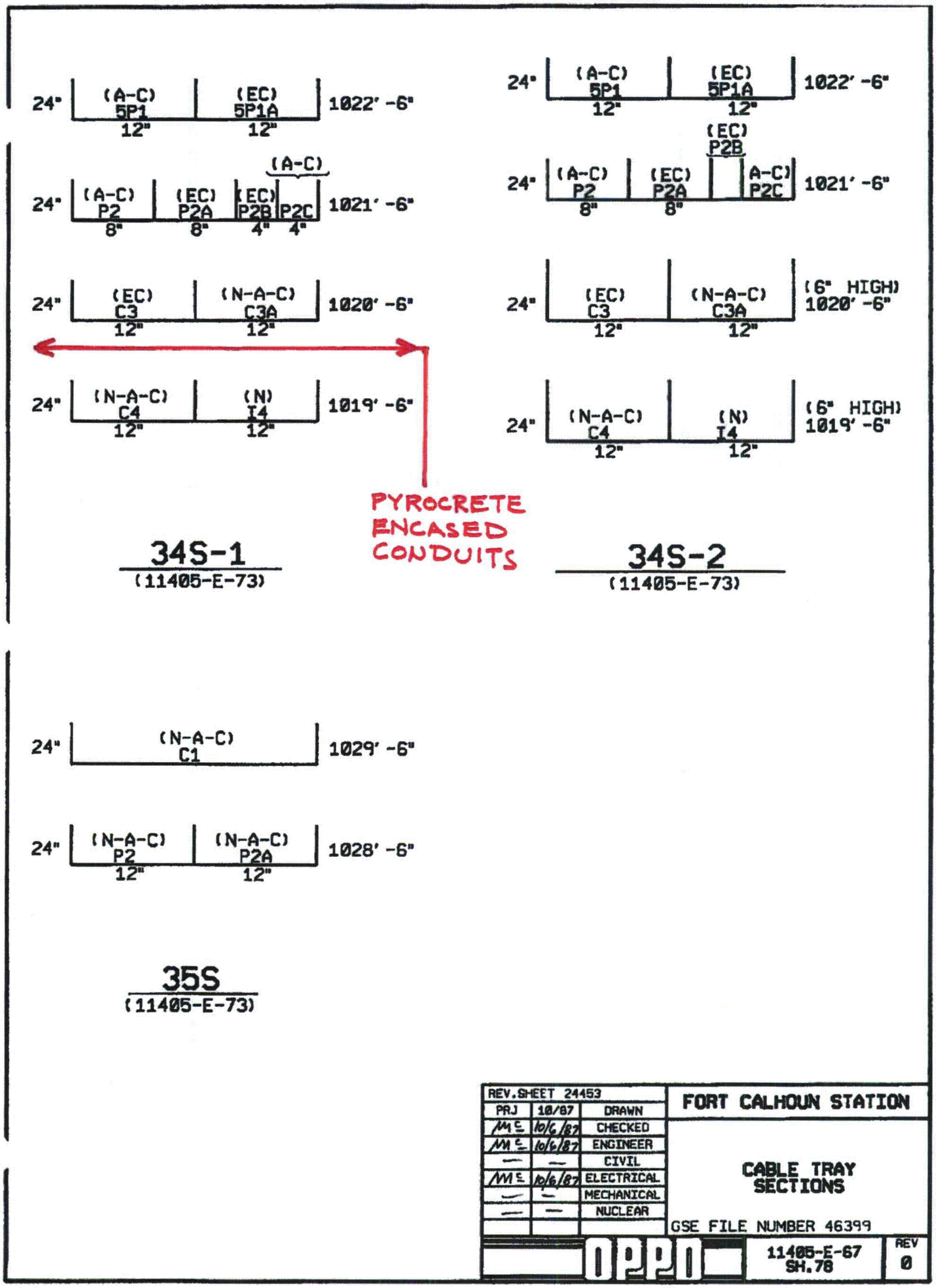


Fire Protection Engineering RAI 18.01c Response

Pyrocrete® Encased Conduit Locations for Tray Section 34S-1
Drawing 11405-E-67, Sheet 78

and

FCS Cable Route Report for Cables in Tray Section 34S-1
[Subsections C3, C3A, C4, and I4]
Intersecting this Pyrocrete® Assembly


24"
(A-C) 5P1 12"
(EC) 5P1A 12"
1022' -6"
24"
(A-C) P2 8"
(EC) P2A 8"
(EC) P2B 4"
(A-C) P2C 4"
1021' -6"
24"
(EC) C3 12"
(N-A-C) C3A 12"
1020' -6"
24"
(N-A-C) C4 12"
(N) I4 12"
1019' -6"
PYROCRETE ENCASED CONDUITS
34S-1
(11405-E-73)
24"
(A-C) 5P1 12"
(EC) 5P1A 12"
1022' -6"
(EC) P2B
24"
(A-C) P2 8"
(EC) P2A 8"
(A-C) P2C
1021' -6"
24"
(EC) C3 12"
(N-A-C) C3A 12"
(6" HIGH) 1020' -6"
24"
(N-A-C) C4 12"
(N) I4 12"
(6" HIGH) 1019' -6"
34S-2
(11405-E-73)
24"
(N-A-C) C1
1029' -6"
24"
(N-A-C) P2 12"
(N-A-C) P2A 12"
1028' -6"
35S
(11405-E-73)
REV.SHEET 24453
PRJ 10/87 DRAWN
10/6/87 CHECKED
10/6/87 ENGINEER
CIVIL
10/6/87 ELECTRICAL
MECHANICAL
NUCLEAR
FORT CALHOUN STATION
CABLE TRAY SECTIONS
GSE FILE NUMBER 46399
OPPD
11405-E-67 SH.78
REV 0

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC1780	AC	Y	EC	C	EE	1	175	W040

Origin	Destination
CB-4AUX <42>	1A3-2 <>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1780	OPLS CONTROL

Routing: 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A> 38S(C1)<36A> 20(C1)<41> 18(C1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC5932	AC	N	EC	C	CA	1	85	W041

Origin	Destination
AI-108A <36A>	MCC-CA-1C <>
Raceway Description	**Associated Equipment**
T,1 1/2"C	<>

Project	Numeric Part	Cable Use
NONE	5932	AIR COMPRESSOR CA-1C SEQ S1-1 START &

Routing: 34S-1(C3)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC5932A	AC	N	EC	C	CA	1	85	W041

Origin	Destination
AI-108A <36A>	MCC-CA-1C <>
Raceway Description	**Associated Equipment**
T,1 1/2"C	<>

Project	Numeric Part	Cable Use
NONE	5932	AIR COMPRESSOR CA-1C SEQ S1-2 START &

Routing: 34S-1(C3)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC7315	AC	Y	EC	C	AC-RW	1	245	W040

Origin	Destination
1A3-10 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	HCV-2852 <31>

Project	Numeric Part	Cable Use
NONE	7315	VALVE HCV-2852 CONTROL

Routing: 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A> 38S(C1)<36A> 20(C1)<41> 18(C1)<41> 15(C1)<41>

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC7316	AC	Y	EC	C	AC-RW	1	790	W041

Origin	Destination
CB-1 <42>	JB-82T <31>
Raceway Description	**Associated Equipment**
T,4"C	HCV-2852 <31>

Project	Numeric Part	Cable Use
NONE	7316	PUMP DISCH PRESS IND & HCV-2852 CONTROL

Routing:

15(C1)<41>	18(C1)<41>	20(C1)<41>
38S(C1)<36A>	37S(C2)<36A>	36S(C3)<36A>
34S-2(C3)<36A>	34S-1(C3)<36A>	34S(C3)<36A>
33S(C2A)<36A>	A6(DUCT)<>	C-7316(CND)<31A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC7320	AC	Y	EC	C	AC-RW	1	790	W041

Origin	Destination
JB-84T <31>	CB-1 <42>
Raceway Description	**Associated Equipment**
4"C,T	HCV-2876A <31>

Project	Numeric Part	Cable Use
NONE	7320	HCV-2876A CONTROL & HYD PRESS IND

Routing:

A6(DUCT)<>	33S(C2A)<36A>	34S(C3)<36A>
34S-1(C3)<36A>	34S-2(C3)<36A>	36S(C3)<36A>
37S(C2)<36A>	38S(C1)<36A>	20(C1)<41>
18(C1)<41>	15(C1)<41>	C-7320(CND)<31A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC7341	AC	N	EC	C	AC-RW	1	215	W038

Origin	Destination
1A3-10 <36A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	AC-10C <31>

Project	Numeric Part	Cable Use
NONE	7341	AC-10C AUTO STDBY INITIATING CKT DC SEQ

Routing:

34S-1(C3)<36A>	34S-2(C3)<36A>	36S(C3)<36A>
37S(C2)<36A>	38S(C1)<36A>	20(C1)<41>
66(C1)<41>	7-1(C1B)<41>	

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC7341A	AC	N	EC	C	AC-RW	1	215	W038

Origin	Destination
1A3-10 <36A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	AC-10C <31>

Project	Numeric Part	Cable Use
NONE	7341	AC-10C AUTO STDBY INITIATING CKT AC SEQ

Routing:

34S-1(C3)<36A>	34S-2(C3)<36A>	36-S(C3)<>
37S(C2)<36A>	38S(C1)<36A>	20(C1)<41>
66(C1)<41>	7-1(C1B)<41>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC7383	AC	Y	EC	C	AC-RW	1	240	W042

Origin	Destination
1A3-10 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	AC-10C <31>

Project	Numeric Part	Cable Use
NONE	7383	RAW WATER PUMP AC-10C CONTROL

Routing:

34S-1(C3)<36A>	34S-2(C3)<36A>	36S(C3)<36A>
37S(C2)<36A>	38S(C1)<36A>	20(C1)<41>
18(C1)<41>	15(C1)<41>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC7384	AC	Y	EC	C	AC-RW	1	240	W042

Origin	Destination
1A3-10 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	AC-10C <31>

Project	Numeric Part	Cable Use
NONE	7384	RAW WATER PUMP AC-10C CONTROL

Routing:

34S-1(C3)<36A>	34S-2(C3)<36A>	36S(C3)<36A>
37S(C2)<36A>	38S(C1)<36A>	20(C1)<41>
18(C1)<41>	15(C1)<41>	

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC7385	AC	N	EC	C	AC-RW	1	240	W040

Origin	Destination
1A3-10 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	AC-10C <31>

Project	Numeric Part	Cable Use
NONE	7385	RAW WATER PUMP AC-10C ALARMS

Routing: 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A>
37S(C2)<36A> 38S(C1)<36A> 20(C1)<41>
18(C1)<41> 15(C1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC7386	AC	Y	EC	C	AC-RW	1	240	W033

Origin	Destination
1A3-10 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	AC-10C <31>

Project	Numeric Part	Cable Use
NONE	7386	RAW WTR PUMP AC-10C MOTOR CT LEADS

Routing: 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A>
37S(C2)<36A> 38S(C1)<36A> 20(C1)<41>
18(C1)<41> 15(C1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC7389	AC	Y	EC	C	AC-RW	1	215	W039

Origin	Destination
1A3-10 <36A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	AC-10C <31>

Project	Numeric Part	Cable Use
NONE	7389	RAW WTR PUMP AC-10C AUTO START SEQ S1-1

Routing: 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A>
37S(C2)<36A> 38S(C1)<36A> 20(C1)<41>
66(C1)<41> 7-1(C1B)<41>

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC7389A	AC	Y	EC	C	AC-RW	1	215	W039

Origin	Destination
1A3-10 <36A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	AC-10C <31>

Project	Numeric Part	Cable Use
NONE	7389	RAW WTR PUMP AC-10C AUTO START SEQ S1-2

Routing: 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A> 38S(C1)<36A> 20(C1)<41> 66(C1)<41> 7-1(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC7390	AC	N	EC	C	AC-RW	1	215	W041

Origin	Destination
1A3-10 <36A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	AC-10C <31>

Project	Numeric Part	Cable Use
NONE	7390	RAW WATER PUMP AC-10C ALARMS

Routing: 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A> 38S(C1)<36A> 20(C1)<41> 66(C1)<41> 7-1(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9515	AC	N	EC	C	VA-CON	1	135	W038

Origin	Destination
1B3C-4C-3 <>	E-2 <34B.1>
Raceway Description	**Associated Equipment**
T	VA-7C <>

Project	Numeric Part	Cable Use
NONE	9515	HEATER SUPPLY

Routing: 34S-2(C3)<36A> 34S-1(C3)<36A> 46S(C1A)<36B> 54S-2(C1A)<34B.1> 50S(C1A)<34B.1> 91S(C2A)<34B.1> 90S(C2)<34B.1>

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9534	AC	N	EC	C	CA	1	220	W038

Origin	Destination
1B3A-4A-2 <>	CA-1C-M <>
Raceway Description	**Associated Equipment**
1"C,T,1"C	CA-1C <>

Project	Numeric Part	Cable Use
NONE	9534	HEATER SUPPLY

Routing: 36S(C3)<36A> 34S-2(C3)<36A> 34S-1(C3)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9542	AC	Y	EC	C	DG	1	260	W042

Origin	Destination
AI-30A <42>	AI-133A <35A>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9542	DIESEL 1 REMOTE MANUAL START/STOP

Routing: 7-1(C1B)<41> 66(C1)<41> 20(C1)<41>
38S(C1)<36A> 37S(C2)<36A> 36S(C3)<36A>
34S-2(C3)<36A> 34S-1(C3)<36A> 34S(C3)<36A>
32S(C1)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9542A	AC	N	EC	C	DG	1	260	W038

Origin	Destination
AI-30A <42>	AI-133A <35A>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9542	DIESEL DISPLAY LIGHT SUPPLY

Routing: 7-1(C1B)<41> 66(C1)<41> 20(C1)<41>
38S(C1)<36A> 37S(C2)<36A> 36S(C3)<36A>
34S-2(C3)<36A> 34S-1(C3)<36A> 34S(C3)<36A>
32S(C1)<36A>

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9552	AC	Y	EC	C	DG	1	270	W038

Origin	Destination
CB-21 <42>	AI-133A <35A>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9552	DIESEL 1 TRIP

Routing: 16(C1)<41> 18(C1)<41> 20(C1)<41>
38S(C1)<36A> 37S(C2)<36A> 36S(C3)<36A>
34S-2(C3)<36A> 34S-1(C3)<36A> 34S(C3)<36A>
32S(C1)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9556A	AC	Y	EC	C	DG	1		W038

Origin	Destination
AI-24 <42>	AI-133A <35A>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9556	4160V BUS 1A3 BACK-UP LOSS OF VOLTAGE

Routing: 12(C1)<41> 14(C1)<41> 18(C1)<41>
20(C1)<41> 38S(C1)<36A> 37S(C2)<36A>
36S(C3)<36A> 34S-2(C3)<36A> 34S-1(C3)<36A>
34S(C3)<36A> 32S(C1)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9558	AC	Y	EC	C	DG	1	290	W041

Origin	Destination
AI-26 <42>	AI-133A <35A>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9558	DIESEL 1 REMOTE GOV & VOLT CONT

Routing: 12(C1)<41> 14(C1)<41> 18(C1)<41>
20(C1)<41> 38S(C1)<36A> 37S(C2)<36A>
36S(C3)<36A> 34S-2(C3)<36A> 34S-1(C3)<36A>
34S(C3)<36A> 32S(C1)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9562	AC	N	EC	C	DG	1	320	W040

Origin	Destination
CB-21 <42>	AI-133A <35A>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9562	4160V BKRS 1A13 & 1A33 LOCKOUT

Routing:

16(C1)<41>	18(C1)<41>	20(C1)<41>
38S(C1)<36A>	37S(C2)<36A>	36S(C3)<36A>
34S-2(C3)<36A>	34S-1(C3)<36A>	34S(C3)<36A>
32S(C1)<36A>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9562A	AC	Y	EC	C	DG	1		W041

Origin	Destination
CB-21 <42>	AI-133A <35A>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9562	4160V BKRS 1A13 & 1A33 LOCKOUT

Routing:

16(C1)<41>	18(C1)<41>	20(C1)<41>
38S(C1)<36A>	37S(C2)<36A>	36S(C3)<36A>
34S-2(C3)<36A>	34S-1(C3)<36A>	34S(C3)<36A>
32S(C1)<36A>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9564	AC	Y	EC	C	DG	1	260	W041

Origin	Destination
AI-133A <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9564	4160V BKR 1AD1 AUTO CLOSE DEMAND CHNL"A"

Routing:

32S(C1)<36A>	34S(C3)<36A>	34S-1(C3)<36A>
34S-2(C3)<36A>	36S(C3)<36A>	37S(C2)<36A>
38S(C1)<36A>	20(C1)<41>	66(C1)<41>
7-1(C1B)<41>		

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9566	AC	Y	EC	C	DG	1	240	W040

Origin	Destination
1A3-20 <36A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9566	4160V BKR 1AD1 AUTO CLOSE DEMAND CHNL"A"

Routing: 34S(C3)<36A> 34S-1(C3)<36A> 34S-2(C3)<36A>
36S(C3)<36A> 37S(C2)<36A> 38S(C2)<36A>
20(C1)<41> 66(C1)<41> 7-1(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9568	AC	N	EC	C	DG	1	260	W038

Origin	Destination
AI-133A <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9568	DIESEL 1-CIRCUIT CLOSING ALARM SUP

Routing: 32S(C1)<36A> 34S(C3)<36A> 34S-1(C3)<36A>
34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A>
38S(C1)<36A> 20(C1)<41> 66(C1)<41>
7-1(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9568A	AC	Y	EC	C	DG	1	260	W038

Origin	Destination
AI-133A <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9568	DIESEL 1-ENGINE SPEED INDICATION INPUT

Routing: 32S(C1)<36A> 34S(C3)<36A> 34S-1(C3)<36A>
34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A>
38S(C1)<36A> 20(C1)<41> 66(C1)<41>
7-1(C1B)<41>

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9570	AC	N	EC	C	DG	1	260	W041

Origin	Destination
AI-133A <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9570	DIESEL 1-ANNUN

Routing: 32S(C1)<36A> 34S(C3)<36A> 34S-1(C3)<36A>
34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A>
38S(C1)<36A> 20(C1)<41> 66(C1)<41>
7-1(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9570A	AC	Y	EC	C	DG	1	260	W038

Origin	Destination
AI-133A <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9570	DIESEL 1-DISPLAY LTS

Routing: 32S(C1)<36A> 34S(C3)<36A> 34S-1(C3)<36A>
34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A>
38S(C1)<36A> 20(C1)<41> 66(C1)<41>
7-1(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9572	AC	Y	EC	C	DG	1	300	W041

Origin	Destination
D1 <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9572	DIESEL DG-1 DISPLAY LGTS

Routing: 32S-2(C)<35A> 32S-1(C2)<35A> 32S(C1)<36A>
34S(C3)<36A> 34S-1(C3)<36A> 34S-2(C3)<36A>
36S(C3)<36A> 37S(C2)<36A> 38S(C1)<36A>
20(C1)<41> 66(C1)<41> 7-1(C1B)<41>

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9572A	AC	N	EC	C	DG	1	300	W041

Origin	Destination
D1 <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9572	DIESEL DG-1 DISPLAY LGTS

Routing:

32S-2(C)<35A>	32S-1(C2)<35A>	32S(C1)<36A>
34S(C3)<36A>	34S-1(C3)<36A>	34S-2(C3)<36A>
36S(C3)<36A>	37S(C2)<36A>	38S(C1)<36A>
20(C1)<41>	66(C1)<41>	7-1(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9572B	AC	N	EC	C	DG	1	300	W042

Origin	Destination
D1 <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9572	DIESEL DG-1 DISPLAY LGTS

Routing:

32S-2(C)<35A>	32S-1(C2)<35A>	32S(C1)<36A>
34S(C3)<36A>	34S-1(C3)<36A>	34S-2(C3)<36A>
36S(C3)<36A>	37S(C2)<36A>	38S(C2)<36A>
20(C1)<41>	66(C1)<41>	7-1(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9572C	AC	N	EC	C	DG	1	300	W042

Origin	Destination
D1 <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9572	DIESEL DG-1 DISPLAY LGTS

Routing:

32S-2(C)<35A>	32S-1(C2)<35A>	32S(C1)<36A>
34S(C3)<36A>	34S-1(C3)<36A>	34S-2(C3)<36A>
36S(C3)<36A>	37S(C2)<36A>	38S(C2)<36A>
20(C1)<41>	66(C1)<41>	7-1(C1B)<41>

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9574	AC	Y	EC	C	DG	1	300	W038

Origin	Destination
D1 <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9574	DIESEL DG-1 AUTO CLS DEMAND CHAN "A"

Routing: 32S-2(C)<35A> 32S-1(C2)<35A> 32S(C1)<36A> 34S(C3)<36A> 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A> 38S(C2)<36A> 20(C1)<41> 66(C1)<41> 7-1(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9576	AC	Y	EC	C	DG	1	305	W041

Origin	Destination
AI-30A <42>	RB-D1 <>
Raceway Description	**Associated Equipment**
T,1 1/2"C	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9576	DAMPERS YCV-871G&H CONTROL & INDIC

Routing: 7-1(C1B)<41> 66(C1)<41> 20(C1)<41> 38S(C1)<36A> 37S(C2)<36A> 36S(C3)<36A> 34S-2(C3)<36A> 34S-1(C3)<36A> 34S(C3)<36A> 32S(C1)<36A> 32S-1(C2)<35A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9577	AC	N	EC	C	DG	1	305	W038

Origin	Destination
AI-30A <42>	RB-D1 <>
Raceway Description	**Associated Equipment**
T,1"C	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9577	DAMPERS YCV-871G&H ALARM

Routing: 7-1(C1B)<41> 66(C1)<41> 20(C1)<41> 38S(C1)<36A> 37S(C2)<36A> 36S(C3)<36A> 34S-2(C3)<36A> 34S-1(C3)<36A> 34S(C3)<36A> 32S(C1)<36A> 32S-1(C2)<35A>

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9578	AC	N	EC	C	DG	1	305	W038

Origin	Destination
AI-30A <42>	D1 <35A>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9578	DAMPERS YCV-871G&H CONTROL

Routing:

7-1(C1B)<41> 66(C1)<41> 20(C1)<41>
38S(C1)<36A> 37S(C2)<36A> 36S(C3)<36A>
34S-2(C3)<36A> 34S-1(C3)<36A> 34S(C3)<36A>
32S(C1)<36A> 32S-1(C2)<35A> 32S-2(C)<35A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9601	AC	Y	EC	C	DG	1	290	W040

Origin	Destination
AI-133A <35A>	AI-26 <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9601	DSL BKR 1AD1-RLY&METERING CTS

Routing:

32S(C1)<36A> 34S(C3)<36A> 34S-1(C3)<36A>
34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A>
38S(C1)<36A> 20(C1)<41> 18(C1)<41>
14(C1)<41> 12(C1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9602	AC	Y	EC	C	DG	1	290	W040

Origin	Destination
AI-133A <35A>	AI-24 <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9602	DSL BKR 1AD1-DIFF CTS

Routing:

32S(C1)<36A> 34S(C3)<36A> 34S-1(C3)<36A>
34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A>
38S(C1)<36A> 20(C1)<41> 18(C1)<41>
14(C1)<41> 12(C1)<41>

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9603	AC	Y	EC	C	DG	1	270	W039

Origin	Destination
AI-133A <35A>	CB-22 <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9603	DSL BKR 1AD1-METERING PTS

Routing: 32S(C1)<36A> 34S(C3)<36A> 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A> 38S(C1)<36A> 20(C1)<41> 18(C1)<41> 16(C1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9608	AC	N	EC	C	DG	1	240	W041

Origin	Destination
1A3-20 <36A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9608	DSL BKR 1AD1-ANNUN

Routing: 34S(C3)<36A> 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A> 38S(C1)<36A> 20(C1)<41> 66(C1)<41> 7-1(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9609	AC	N	EC	C	DG	1	260	W041

Origin	Destination
1A3-20 <36A>	CB-24 <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9609	DSL BKR 1AD1-INDICATING LIGHTS (BUS 1A3)

Routing: 34S(C3)<36A> 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A> 38S(C1)<36A> 20(C1)<41> 18(C1)<41> 16(C1)<41>

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9610	AC	Y	EC	C	DG	1	265	W040

Origin	Destination
1A3-20 <36A>	AI-24 <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
EC48271	9610	DSL BKR 1AD1-DIFFER CTS

Routing: 34S(C3)<36A> 34S-1(C3)<36A> 34S-2(C3)<36A>
36S(C3)<36A> 37S(C2)<36A> 38S(C1)<36A>
20(C1)<41> 18(C1)<41> 14(C1)<41>
12(C1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9611	AC	Y	EC	C	DG	1	240	W038

Origin	Destination
1A3-20 <36A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
ECN-96-054	9611	DSL BKR 1AD1-BKR CONTROL

Routing: 34S(C3)<36A> 34S-1(C3)<36A> 34S-2(C3)<36A>
36S(C3)<36A> 37S(C2)<36A> 38S(C1)<36A>
20(C1)<41> 66(C1)<41> 7-1(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9614	AC	Y	EC	C	DG	1	265	W042

Origin	Destination
AI-30A <42>	AI-133A <35A>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
ECN-96-054	9614	DIESEL BKR 1AD1-CONTROL

Routing: 7-1(C1B)<41> 66(C1)<41> 20(C1)<41>
38S(C1)<36A> 37S(C2)<36A> 36S(C3)<36A>
34S-2(C3)<36A> 34S-1(C3)<36A> 34S(C3)<36A>
32S(C1)<36A>

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9616	AC	N	EC	C	DG	1	260	W038

Origin	Destination
1A3-20 <36A>	CB-21 <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9616	DIESEL BKR 1AD1 - BKR TRIP ALARM

Routing: 34S(C3)<36A> 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A> 38S(C1)<36A> 20(C1)<41> 18(C1)<41> 16(C1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9617	AC	N	EC	C	DG	1	240	W038

Origin	Destination
1A3-20 <36A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9617	DIESEL BKR 1AD1 J/V BACKUP TRIP

Routing: 34S(C3)<36A> 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A> 38S(C1)<36A> 20(C1)<41> 66(C1)<41> 7-1(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9620	AC	Y	EC	C	DG	1	270	W038

Origin	Destination
AI-133A <35A>	CB-22 <42>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9620	DIESEL 1 RELAYING PTS

Routing: 32S(C1)<36A> 34S(C3)<36A> 34S-1(C3)<36A> 34S-2(C3)<36A> 36S(C3)<36A> 37S(C2)<36A> 38S(C1)<36A> 20(C1)<41> 18(C1)<41> 16(C1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9693	AC	N	EC	C	DG	1	270	W038

Origin	Destination
ATA-D1 <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
1"C,T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9693	DIESEL 1 DISPLAY LTS

Routing:

32S(C1)<36A>	34S(C3)<36A>	34S-1(C3)<36A>
34S-2(C3)<36A>	36S(C3)<36A>	37S(C2)<36A>
38S(C2)<36A>	20(C1)<41>	66(C1)<41>
7-1(C1B)<41>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9693A	AC	N	EC	C	DG	1	275	W038

Origin	Destination
ATD-D1 <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
1"C,T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9693	DIESEL 1 DISPLAY LTS

Routing:

32S(C1)<36A>	34S(C3)<36A>	34S-1(C3)<36A>
34S-2(C3)<36A>	36S(C3)<36A>	37S(C2)<36A>
38S(C1)<36A>	20(C1)<41>	66(C1)<41>
7-1(C1B)<41>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9693B	AC	N	EC	C	DG	1	275	W038

Origin	Destination
ATD-D1 <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
1"C,T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9693	DIESEL 1 ANN 125V D-C XFER SW OFF NORM

Routing:

32S(C1)<36A>	34S(C3)<36A>	34S-1(C3)<36A>
34S-2(C3)<36A>	36S(C3)<36A>	37S(C2)<36A>
38S(C1)<36A>	20(C1)<41>	66(C1)<41>
7-1(C1B)<41>		

FCS Cable Route Report for 34S-1(C3)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC9696	AC	N	EC	C	DG	1	125	W038

Origin	Destination
AI-30A <42>	RB-D1 <>
Raceway Description	**Associated Equipment**
T,3/4"C	YCV-871E <>

Project	Numeric Part	Cable Use
NONE	9696	DSL RDTR EXH DMPR YCV-871E-INDICATION

Routing:

7-1(C1B)<41>	66(C1)<41>	20(C1)<41>
38S(C1)<36A>	37S(C2)<36A>	36S(C3)<36A>
34S-2(C3)<36A>	34S-1(C3)<36A>	34S(C3)<36A>
32S(C1)<36A>	32S-1(C2)<35A>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
EC11964	AC	N	EC	C	VA	1	400	W048

Origin	Destination
AI-133A <35A>	AI-30A <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
MR-FC-90-073	11964	ALARM CIRCUIT TEMPERATURE HI IN EXCITER

Routing:

32S(C1)<36A>	34S(C3)<36A>	34S-1(C3)<36A>
34S-2(C3)<36A>	36S(C3)<36A>	37S(C2)<36A>
38S(C1)<36A>	20(C1)<41>	66(C1)<41>
7-1(C1B)<41>		

FCS Cable Route Report for 34S-1(C3A)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A918	AC	N	A	P4	EE	1	130	W038

Origin	Destination
1A3-6 <>	1C3A-0 <>
Raceway Description	**Associated Equipment**
T,1"C	<>

Project	Numeric Part	Cable Use
NONE	918	SHUNT TRIP DEVICE (SIGMA-2 PWR)

Routing: 34S-1(C3A)<36A> 34S-2(C3A)<36A> 36S(C3A)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1303	AC	N	A	C	CW	2		W016

Origin	Destination
IB-1A <>	AI-120 <31>
Raceway Description	**Associated Equipment**
21/2"C,T,4"C,T	<>

Project	Numeric Part	Cable Use
NONE	1303	NORM INSTR PWR FOR AI-120(CKT-8)

Routing: T14(C1A)<46> T29(C1)<46> 35S(C1)<36A>
34S-2(C3A)<36A> 34S-1(C3A)<36A> 34S(C3A)<36A>
33S(C2B)<36A> A45(DUCT)<> T46(C1)<31A>
T47(C1)<31>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
1456	AC	N	N	C	EE	1	290	W038

Origin	Destination
CAB-SWYD-CONN <36A>	JB-107T <>
Raceway Description	**Associated Equipment**
T,2"C	<>

Project	Numeric Part	Cable Use
EC50410	1456	TRANS "T1" CLG FAN INTLK

Routing: 63S(C1)<36A> 34S(C3A)<36A> 34S-1(C3A)<36A>
34S-2(C3A)<36A> 35S(C1)<36A> T29(C1)<46>
T14(C1A)<46> T13-1(C1A)<46> T13(C1A)<46>

FCS Cable Route Report for 34S-1(C3A)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1460C	AC	N	A	C	EE	1	300	W036

Origin	Destination
JB-107T <>	CAB-SWYD-CONN <36A>
Raceway Description	**Associated Equipment**
2 1/2"C,T	<>

Project	Numeric Part	Cable Use
EC50410	1460	GEN PCB 3451-4 CONTROL

Routing:

T13(C1A)<46>	T13-1(C1A)<46>	T14(C1A)<46>
T29(C1)<46>	35S(C1)<36A>	34S-2(C3A)<36A>
34S-1(C3A)<36A>	34S(C3A)<36A>	63S(C1)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
2258C	AC	N	N	C	FP	1	480	W038

Origin	Destination
JB-100T <46>	JB-1Y <>
Raceway Description	**Associated Equipment**
2"CT4"CT11/2"C	<>

Project	Numeric Part	Cable Use
EC50410	2258	FIRE PROTECTION FOR T1

Routing:

T13(C1A)<46>	T13-1(C1A)<46>	T14(C1A)<46>
T29(C1)<46>	35S(C1)<36A>	34S-2(C3A)<36A>
34S-1(C3A)<36A>	34S(C3A)<36A>	63S(C1)<36A>
B28(DUCT)<>	TRENCH(N)<>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
2258E	AB	N	N	C	FP	1	580	W038

Origin	Destination
*TRENCH <>	AIPE1 <>
Raceway Description	**Associated Equipment**
4 C, 1 1/2C, T,	<>

Project	Numeric Part	Cable Use
EC33033	2258	FIRE PROTECTION

Routing:

TRENCH(N)<>	B28(DUCT)<>	63S(C1)<36A>
34S(C3A)<36A>	34S-1(C3A)<36A>	34S-2(C3A)<36A>
35S(C1)<36A>		

FCS Cable Route Report for 34S-1(C3A)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
2259C	AC	N	N	C	FP	1	465	W038

Origin	Destination
JB-101T <46>	*T1A-1-THERMOSTATS <>
Raceway Description	**Associated Equipment**
2"CT4"CT11/2"C	<>

Project	Numeric Part	Cable Use
EC50410	2259	FIRE PROTECTION

Routing:

T13(C1A)<46>	T13-1(C1A)<46>	T14(C1A)<46>
T29(C1)<46>	35S(C1)<36A>	34S-2(C3A)<36A>
34S-1(C3A)<36A>	34S(C3A)<36A>	63S(C1)<36A>
B26(DUCT)<>	TRENCH(N)<>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
2259E	AC	N	N	C	FP	1	565	W038

Origin	Destination
*T1A-1-THERMOSTATS <>	FD-SVC1-T1A1 <>
Raceway Description	**Associated Equipment**
11/2"CT4"C3/4"C	<>

Project	Numeric Part	Cable Use
EC50410	2259	FIRE PROTECTION

Routing:

TRENCH(N)<>	B26(DUCT)<>	63S(C1)<36A>
34S(C3A)<36A>	34S-1(C3A)<36A>	34S-2(C3A)<36A>
35S(C1)<36A>	T29(C1)<46>	T14(C1A)<46>
T13-1(C1A)<46>	T13(C1A)<46>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
2259H	AC	N	N	C	FP	1	520	W038

Origin	Destination
JB-101T <46>	*T1A-3-THERMOSTATS <>
Raceway Description	**Associated Equipment**
2"CT4"CT11/2"C	<>

Project	Numeric Part	Cable Use
EC50410	2259	FIRE PROTECTION (VIA JB #127T)

Routing:

T13(C1A)<46>	T13-1(C1A)<46>	T14(C1A)<46>
T29(C1)<46>	35S(C1)<36A>	34S-2(C3A)<36A>
34S-1(C3A)<36A>	34S(C3A)<36A>	63S(C1)<36A>
B26(DUCT)<>	TRENCH(N)<>	

FCS Cable Route Report for 34S-1(C3A)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
2259K	AC	N	N	C	FP	1	530	W038

Origin	Destination
*T1A-3-THERMOSTATS <>	FD-SVC1-T1A3 <>
Raceway Description	**Associated Equipment**
11/2"CT4"CT3/4C	<>

Project	Numeric Part	Cable Use
EC50410	2259	FIRE PROTECTION (VIA JB #127T)

Routing: TRENCH(N)<> B26(DUCT)<> 63S(C1)<36A>
34S(C3A)<36A> 34S-1(C3A)<36A> 34S-2(C3A)<36A>
35S(C1)<36A> T29(C1)<46> T14(C1A)<46>
T13-1(C1A)<46> T13(C1A)<46>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A2264	AC	N	A	C	EE	1	165	W094

Origin	Destination
1A3-6 <>	FT-T1C-3A,4A <>
Raceway Description	**Associated Equipment**
T,1"C	CS/FT-T1C-3A,4A <>

Project	Numeric Part	Cable Use
EC14959	2264	BUS TIE-STATION LIGHTING (1A3 OR 1A4)

Routing: 34S-1(C3A)<36A> 34S-2(C3A)<36A> 36S(C3A)<36A>
CND1(A)<>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
2879	AB	N	N	C	EE	1	225	W038

Origin	Destination
JB-107T <>	1A1-7 <>
Raceway Description	**Associated Equipment**
2"C,T	<>

Project	Numeric Part	Cable Use
EC50410	2879	DISC/TAPED AND ABANDONED IN PLACE

Routing: T13(C1A)<46> T13-1(C1A)<46> T14(C1A)<46>
T29(C1)<46> 35S(C1)<36A> 34S-2(C3A)<36A>
34S-1(C3A)<36A>

FCS Cable Route Report for 34S-1(C3A)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
2885	AC	N	N	C	EE	1	285	W033

Origin	Destination
EE-17 <>	CAB-SWYD-CONN <36A>
Raceway Description	**Associated Equipment**
2"C,T	<>

Project	Numeric Part	Cable Use
EC50410	2885	GEN PCB 3451-4&5 INTLK W/ VS-PER-HERTZ

Routing: T13(C1A)<46> T13-1(C1A)<46> T14(C1A)<46> T29(C1)<46> 35S(C1)<36A> 34S-2(C3A)<36A> 34S-1(C3A)<36A> 34S(C3A)<36A> 63S(C1)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5401C	AC	N	A	C	FW	1	320	W042

Origin	Destination
AI-285A <46>	1A1-2 <>
Raceway Description	**Associated Equipment**
3 1/2"C,T	FW-4A <>

Project	Numeric Part	Cable Use
EC26252	5401	CONTROL & INTERLOCK SGFD PMP FW-4A

Routing: T18(C1A)<46> T17(C1A)<46> T3(C1A)<46> T16(C1A)<46> T15(C1A)<46> T29(C1)<46> 35S(C1)<36A> 34S-2(C3A)<36A> 34S-1(C3A)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5411	AC	N	A	C	FW	1	385	W038

Origin	Destination
1A1-1 <>	JB-11T <>
Raceway Description	**Associated Equipment**
T,1 1/2"C	FCV-1216A <>

Project	Numeric Part	Cable Use
NONE	5411	CONT RECIR CONT VALVE FCV-1216A

Routing: 34S-1(C3A)<36A> 34S-2(C3A)<36A> 35S(C1)<36A> T29(C1)<46> T14(C1A)<46> T15(C1A)<46> T16(C1A)<46> T3(C1A)<46> T17(C1A)<46> T19(C1A)<46> T33(C1)<46>

FCS Cable Route Report for 34S-1(C3A)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
5517	AC	N	N	C	FW	1	385	W042

Origin	Destination
1A1-1 <>	FW-5A-M <>
Raceway Description	**Associated Equipment**
T,1"C,F	FW-5A <>

Project	Numeric Part	Cable Use
NONE	5517	MOTOR HEATER CIRCUIT

Routing: 34S-1(C3A)<36A> 34S-2(C3A)<36A> 35S(C1)<36A>
T29(C1)<46> T15(C1A)<46> T16(C1A)<46>
T3(C1A)<46> T17(C1A)<46> T19(C1A)<46>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
5541	AC	N	N	C	FW-CD	1	195	W038

Origin	Destination
1A1-3 <>	FW-2A-M <>
Raceway Description	**Associated Equipment**
T,1"C,F	FW-2A <>

Project	Numeric Part	Cable Use
EC43208	5541	MOTOR HEATER CIRCUIT

Routing: 34S-1(C3A)<36A> 34S-2(C3A)<36A> 35S(C1)<36A>
T29(C1)<46> T14(C1A)<46>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5562	*R	N	A	C	FW	1	415	W034

Origin	Destination
1A1-2 <>	*CT-TERM-BOX-AT-FW-4A <>
Raceway Description	**Associated Equipment**
T,1 1/2"C,F	FW-4A-M <>

Project	Numeric Part	Cable Use
EC43224	5562	STM GEN FDW PMP FW-4A CT LEADS FOR DIFF

Routing: 34S-1(C3A)<36A> 34S-2(C3A)<36A> 35S(C1)<36A>
T29(C1)<46> T15(C1A)<46> T16(C1A)<46>
T3(C1A)<46> T17(C1A)<46> T19(C1A)<46>
T33(C1)<46>

FCS Cable Route Report for 34S-1(C3A)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
5571	*R	N	N	C	FW	1	320	W038

Origin	Destination
1A1-2 <>	FW-4A-M <>
Raceway Description	**Associated Equipment**
T,1"C,F	FW-4A <>

Project	Numeric Part	Cable Use
EC43224	5571	MOTOR HEATER CIRCUIT

Routing: 34S-1(C3A)<36A> 34S-2(C3A)<36A> 35S(C1)<36A>
T29(C1)<46> T15(C1A)<46> T16(C1A)<46>
T3(C1A)<46> T17(C1A)<46> T18(C1A)<46>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A6056	AB	N	A	C	FW	1	170	W038

Origin	Destination
1A1-2 <>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	FW-4A <>

Project	Numeric Part	Cable Use
NONE	6056	DISCONNECT & TAPE BOTH ENDS

Routing: 34S-1(C3A)<36A> 34S-2(C3A)<36A> 36S(C3A)<36A>
37S(C2A)<36A> 38S(C1A)<36A> 20(C1A)<41>
18(C1B)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A6805	*R	N	A	C	LO	1	220	W040

Origin	Destination
MCC-3A4-B01 <>	1A1-2 <>
Raceway Description	**Associated Equipment**
21/2"C,T	FW-4A <>

Project	Numeric Part	Cable Use
EC43224	6805	CONT & INTERLOCK STEAM GEN FD PMP FW-4A

Routing: T3(C1A)<46> T16(C1A)<46> T15(C1A)<46>
T29(C1)<46> 35S(C1)<36A> 34S-2(C3A)<36A>
34S-1(C3A)<36A>

FCS Cable Route Report for 34S-1(C3A)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
9624	AC	N	N	C	DG	1	270	W040

Origin	Destination
VA-52A-MS <>	AI-30A <42>
Raceway Description	**Associated Equipment**
1"C,T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9624	EXHAUST FAN VA-52A-INDIC LTS

Routing: 32S(C1A)<36A> 34S(C3A)<36A> 34S-1(C3A)<36A> 34S-2(C3A)<36A> 36S(C3A)<36A> 37S(C2A)<36A> 38S(C1A)<36A> 20(C1A)<41> 66(C1B)<41> 7-1(C1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A9823	AC	N	A	C	FP	1	290	W038

Origin	Destination
AI-54B <42>	AI-146 <>
Raceway Description	**Associated Equipment**
T,1"C	VA-52A <>

Project	Numeric Part	Cable Use
MR-FC-90-017	9823	FAN VA-52A INTERLOCK

Routing: 39(C1)<41> 38(C1)<41> 28(C1A)<41> 14(C1B)<41> 18(C1B)<41> 20(C1A)<41> 38S(C1A)<36A> 37S(C2A)<36A> 36S(C3A)<36A> 34S-2(C3A)<36A> 34S-1(C3A)<36A> 34S(C3A)<36A> 32S(C1A)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A11184	AB	N	A	C	EE	1		W038

Origin	Destination
AI-109A <36A>	34S-1(C3A) <>
Raceway Description	**Associated Equipment**
2"C	<>

Project	Numeric Part	Cable Use
MR-FC-90-002	11184	DISCONNECTED TAPED & ABANDONED IN TRAY

Routing: 34S-1(C3A)<36A>

FCS Cable Route Report for 34S-1(C3A)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A11188	AC	N	A	C	VA	1		W038

Origin	Destination
AI-109A <36A>	VA-52A-MS <>
Raceway Description	**Associated Equipment**
2"C,1"C	<>

Project	Numeric Part	Cable Use
NONE	11188	LOAD SHED ON OPLS & SIAS

Routing: 34S-1(C3A)<36A> 34S(C3A)<36A> 32S(C1A)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A11815	AC	N	A	C	VA-AUX	1	340	W038

Origin	Destination
AI-187 <46>	JB-191A <>
Raceway Description	**Associated Equipment**
1-1/2"C,T,1-1/2	<>

Project	Numeric Part	Cable Use
DCN10106	11815	COMPRESSOR VA-89 ANNUNCIATION

Routing: CND1(A)<> T15(C1A)<46> T29(C1)<46>
35S(C1)<36A> 34S-2(C3A)<36A> 34S-1(C3A)<36A>
34S(C3A)<36A> 32S(C1A)<36A> SLEEV35(A)<>
CND2(A)<>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A11816	AC	N	A	C	VA-AUX	1	340	W041

Origin	Destination
AI-187 <46>	JB-191A <>
Raceway Description	**Associated Equipment**
1-1/2"C,T,1-1/2	<>

Project	Numeric Part	Cable Use
DCN10106	11816	COMPRESSOR VA-89 CONTROL

Routing: CND1(A)<> T15(C1A)<46> T29(C1)<46>
35S(C1)<36A> 34S-2(C3A)<36A> 34S-1(C3A)<36A>
34S(C3A)<36A> 32S(C1A)<36A> SLEEV35(A)<>
CND2(A)<>

FCS Cable Route Report for 34S-1(C3A)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
11839	AC	N	N	C	VA-AUX	1	195	W041

Origin	Destination
JB-602A <>	AI-187 <46>
Raceway Description	**Associated Equipment**
	<>

Project	Numeric Part	Cable Use
NONE	11839	CONT & IND

Routing: 34S-1(C3A)<36A> 34S-2(C3A)<36A> 35S(C1)<36A> T29(C1)<46> T15(C1A)<46>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
11840	AC	N	N	C	VA-AUX	1	235	W041

Origin	Destination
JB-603A <>	AI-187 <46>
Raceway Description	**Associated Equipment**
	<>

Project	Numeric Part	Cable Use
NONE	11840	CONT & IND

Routing: 34S-1(C3A)<36A> 34S-2(C3A)<36A> 35S(C1)<36A> T29(C1)<46> T15(C1A)<46>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
11844	AC	N	N	C	VA-AUX	1	200	W041

Origin	Destination
JB-607A <>	AI-187 <46>
Raceway Description	**Associated Equipment**
	<>

Project	Numeric Part	Cable Use
NONE	11844	CONT & IND

Routing: 34S-1(C3A)<36A> 34S-2(C3A)<36A> 35S(C1)<36A> T29(C1)<46> T15(C1A)<46>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A12121	RE	N	A	C	FW-CD	1	195	W034

Origin	Destination
1A1-3 <>	JB-356T <>
Raceway Description	**Associated Equipment**
T, 1"C, F	FW-2A-M <>

Project	Numeric Part	Cable Use
EC43208	12121	CT LEADS FOR DIFF

Routing: 34S-1(C3A)<36A> 34S-2(C3A)<36A> 35S(C1)<36A> T29(C1)<46> T14(C1A)<46> T25(C1)<46>

FCS Cable Route Report for 34S-1(C3A)*

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A9828	AB	N	A	C	FP	1		W038

Origin	Destination
CB-20 <>	FC-4150 <>

Raceway Description	Associated Equipment
T,3/4"C	<>

Project	Numeric Part	Cable Use
NONE	9828	ABANDONED IN PLACE

Routing:

12(C1A)<41>	14(C1B)<41>	18(C1B*)<>
20(C1A*)<>	38S(C1A*)<>	37S(C2A*)<>
36S(C3A*)<>	34S-2(C3A*)<>	34S-1(C3A*)<>
34S(C3A*)<>	32S(*)<>	

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1601	AC	N	A	C	EE	1	195	W040

Origin	Destination
1A1-7 <>	AI-23 <>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1601	CTS 51/1A11 & TRANSF T1A-1 DIFF PROTECT

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	14(C5)<41>	12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1602	AC	N	A	C	EE	1	190	W042

Origin	Destination
1A1-7 <>	CB-23 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1602	BREAKER 1A11 CONTROL

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	16(C5A)<41>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1603	AC	N	A	C	EE	1	205	W041

Origin	Destination
1A1-7 <>	AI-23 <>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1603	BREAKER 1A11 ALARM

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	14(C5)<41>	12(C5)<41>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1607	AC	N	A	C	EE	1	205	W038

Origin	Destination
1A1-7 <>	AI-23 <>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1607	TRANSF T1A-1 GND ALARM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 14(C5)<41> 12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1608	AC	Y	A	C	EE	1	210	W040

Origin	Destination
1A3-3 <36A>	AI-26 <42>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1608	CT 51/1A13 & TRANSF T1A-1 DIFF PROTECT

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 14(C5)<41> 12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1609	AC	Y	A	C	EE	1	205	W042

Origin	Destination
1A3-3 <36A>	CB-23 <42>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
ECN-96-054	1609	BREAKER 1A13 CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 16(C5A)<41>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1610	AC	N	A	C	EE	1	205	W041

Origin	Destination
1A3-3 <36A>	CB-23 <42>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1610	BREAKER 1A13 ALARM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1615	AC	N	A	C	EE	1	205	W040

Origin	Destination
1A1-9 <>	AI-23 <>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1615	CT 51/1A31 37-1/1A31 TRANSF.T1A-3 DIFF

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 14(C5)<41> 12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1616	AC	N	A	C	EE	1	200	W042

Origin	Destination
1A1-9 <>	CB-23 <42>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1616	BREAKER 1A31 CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1617	AC	N	A	C	EE	1	200	W040

Origin	Destination
1A1-9 <>	CB-23 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1617	BREAKER 1A31 ALARM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1621	AC	N	A	C	EE	1	205	W038

Origin	Destination
1A3-2 <>	AI-23 <>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1621	TRANSF T1A-3 GND ALARM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 14(C5)<41> 12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1622	AC	Y	A	C	EE	1	205	W040

Origin	Destination
1A3-1 <36A>	AI-26 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1622	CTS 51/1A33 37-1/1A33 TRANSF T1A-3 DIFF

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 14(C5)<41> 12(C5)<41>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1623	AC	Y	A	C	EE	1	200	W042

Origin	Destination
1A3-1 <36A>	CB-22 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
ECN-96-054	1623	BREAKER 1A33 CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1624	AC	N	A	C	EE	1	200	W041

Origin	Destination
1A3-1 <36A>	CB-22 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1624	BREAKER 1A33 ALARM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1628	AC	N	A	C	EE	1	220	W040

Origin	Destination
1A3-4 <>	CB-20 <>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
MR-FC-91-008	1628	OPLS / TEST SWITCH ANNUNCIATION

Routing: 34S-1(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A>
38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41>
14(C5)<41> 12(C5)<41>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1659	AC	N	A	C	EE	1	210	W040

Origin	Destination
1A1-1A3 <36A>	AI-23 <>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1659	125V DC TO 4160V BUSES 1A1-1A3 OFF NORM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 14(C5)<41> 12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1663	AC	N	A	C	EE	1	235	W040

Origin	Destination
1A3-11 <36A>	CB-24 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1663	AMMETER LEADS FOR TRANSF T1B-3A FEEDER

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1664	AC	Y	A	C	EE	1	235	W041

Origin	Destination
1A3-11 <36A>	CB-23 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
ECN-96-054	1664	BKR T1B-3A CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1665	AC	N	A	C	EE	1	235	W040

Origin	Destination
1A3-11 <36A>	CB-23 <42>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1665	BKR T1B-3A ALARM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1666	AC	Y	A	C	EE	1	145	W

Origin	Destination
1A3-11 <36A>	1B3A-0 <36A>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
ECN-96-054	1666	BKR 1B-3A INTERLOCKS

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1666A	AC	Y	A	C	EE	1	135	W040

Origin	Destination
1A3-11 <36A>	1B3A-BT-1B3A <36A>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
ECN-96-054	1666	BKR BT-1B3A CLOSE & TRIP INTERLOCKS

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1668	AC	N	A	C	EE	1	235	W040

Origin	Destination
1A3-12 <36A>	CB-24 <42>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1668	AMMETER LEADS FOR TRANSF T1B-3B FEEDER

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1669	AC	Y	A	C	EE	1	235	W041

Origin	Destination
1A3-12 <36A>	CB-23 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
ECN-96-054	1669	BKR T1B-3B CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1670	AC	N	A	C	EE	1	235	W040

Origin	Destination
1A3-12 <36A>	CB-23 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1670	BKR T1B-3B ALARM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1671	AC	Y	A	C	EE	1	120	W040

Origin	Destination
1A3-12 <36A>	1B3B-0 <36A>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
ECN-96-054	1671	BKR 1B-3B INTERLOCKS

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1671A	AC	N	A	C	EE	1	120	W040

Origin	Destination
1A3-12 <36A>	1B3B-BT-1B3B <>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1671	BKR BT-1B3B CLOSE & TRIP INTERLOCK

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1672	AC	N	A	C	EE	1	125	W038

Origin	Destination
1A3-12 <36A>	1B4B-BT-1B4B <36B>
Raceway Description	**Associated Equipment**
T,1"C	<>

Project	Numeric Part	Cable Use
EC49548	1672	BKR BT-1B4B CLOSE INTERLOCK

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1673	AC	N	A	C	EE	1	255	W040

Origin	Destination
1A3-13 <36A>	AI-24 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1673	AMMETER LEADS FOR TRANSF T1B-3C FEEDER

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 14(C5)<41> 12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1674	AC	Y	A	C	EE	1	240	W041

Origin	Destination
1A3-13 <36A>	CB-23 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
ECN-96-054	1674	BKR T1B-3C CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1675	AC	N	A	C	EE	1	240	W040

Origin	Destination
1A3-13 <36A>	CB-23 <42>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1675	BKR T1B-3C ALARM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1676	AC	Y	A	C	EE	1	95	W040

Origin	Destination
1A3-13 <36A>	1B3C-0 <36A>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
ECN-96-054	1676	BKR 1B-3C INTERLOCKS

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1676A	AC	Y	A	C	EE	1	95	W040

Origin	Destination
1A3-13 <36A>	1B3C-BT-1B3C <36A>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
ECN-96-054	1676	BKR BT-1B3C CLOSE & TRIP INTERLOCK

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1678	AC	N	A	C	EE	1	230	W040

Origin	Destination
1A3-6 <>	AI-25 <>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1678	AMMETER LEADS FOR TRANSF T1C-3A FEEDER

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 14(C5)<41> 12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1679	AC	N	A	C	EE	1	225	W041

Origin	Destination
1A3-6 <>	CB-22 <42>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1679	BKR T1C-3A CONTROL

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	16(C5A)<41>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1680	AC	N	A	C	EE	1	225	W040

Origin	Destination
1A3-6 <>	CB-22 <42>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1680	BKR T1C-3A ALARM

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	16(C5A)<41>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1683	AB	N	A	C	EE	1	245	W040

Origin	Destination
1A3-15 <>	CB-23 <42>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
MR-FC-98-001	1683	ABANDONED IN PLACE

Routing:

34S(C4)<36A>	34S-1(C4)<36A>	34S-2(C4)<36A>
36S(C4A)<36A>	37S(C3A)<36A>	38S(C2A)<36A>
20(C4A)<41>	18(C5A)<41>	16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1684	AB	N	A	C	EE	1	250	W041

Origin	Destination
1A3-15 <>	AI-25 <>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
MR-FC-98-001	1684	ABANDONED IN PLACE

Routing: 34S(C4)<36A> 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 14(C5)<41> 12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1685	AB	N	A	C	EE	1	250	W041

Origin	Destination
1A3-15 <>	AI-25 <>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
MR-FC-98-001	1685	ABANDONED IN PLACE

Routing: 34S(C4)<36A> 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 14(C5)<41> 12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
1697	AC	N	N	C	EE	1	135	W038

Origin	Destination
1A4-9 <36B>	1B3B-BT-1B3B <>

Raceway Description	Associated Equipment
1"C,T	<>

Project	Numeric Part	Cable Use
EC49548	1697	BKR BT-1B3B CLOSE INTERLOCK

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1710	AC	N	A	C	EE	1	195	W040

Origin	Destination
T1A-1 <>	CB-22 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1710	PTS FOR SYNCH VOLTMETER

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1711	AC	N	A	C	EE	1	205	W040

Origin	Destination
T1A-3 <>	CB-22 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1711	PTS FOR SYNCH VOLTMETER

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1712	AC	N	A	C	EE	1	205	W041

Origin	Destination
T1A-1 <>	CB-23 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1712	TRANSF T1A-1 UNDERVOLTAGE 27-1,2/1A1-13

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1713	AC	N	A	C	EE	1	215	W041

Origin	Destination
T1A-3 <>	AI-24 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1713	TRANSF T1A-3 UNDERVOLTAGE 27-1,2/1A1-13

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	14(C5)<41>	12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1714	AC	N	A	C	EE	1	190	W040

Origin	Destination
1A1-6 <>	CB-22 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1714	BUS PTS FOR SYNCH VOLTMETER

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	16(C5A)<41>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1715	AC	Y	A	C	EE	1	215	W040

Origin	Destination
1A3-4 <>	CB-22 <42>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1715	BUS PTS FOR SYNCH VOLTMETER

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	16(C5A)<41>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1716	AC	N	A	C	EE	1	195	W041

Origin	Destination
1A1-6 <>	CB-23 <42>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1716	BUS 1A1 UVOLTAGE 27-1/1A1,27-2/1A1

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1717	AC	Y	A	C	EE	1	220	W041

Origin	Destination
1A3-4 <>	CB-24 <42>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1717	BUS 1A3 UNDERVOLTAGE 27-1/1A3,27-2/1A3

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 16(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1751A	AC	N	A	C	EE	1	205	W033

Origin	Destination
CB-24 <42>	1A3-3 <36A>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	1751	CT LEADS GND FAULT LOCATOR BUS 1A3

Routing: 16(C1B)<41> 18(C1B)<41> 20(C1A)<41>
38S(C2A)<36A> 37S(C3A)<36A> 36S(C4A)<36A>
34S-2(C4)<36A> 34S-1(C4)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1753A	AC	N	A	C	EE	1	205	W033

Origin	Destination
CB-23 <42>	1A3-1 <36A>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
NONE	1753	CT LEADS GND FAULT LOCATOR BUS 1A3

Routing: 16(C1B)<41> 18(C1B)<41> 20(C1A)<41>
38S(C2A)<36A> 37S(C3A)<36A> 36S(C4A)<36A>
34S-2(C4)<36A> 34S-1(C4)<36A>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1757	AC	N	A	C	FP	1	175	W042

Origin	Destination
1A1-0 <36A>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	FP-1A <31>

Project	Numeric Part	Cable Use
NONE	1757	FIRE PUMP FP-1A (A) CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1758	AC	N	A	C	FP	1	175	W040

Origin	Destination
1A1-0 <36A>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	FP-1A <31>

Project	Numeric Part	Cable Use
NONE	1758	FIRE PUMP FP-1A ALARMS

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1760	AC	N	A	C	FP	1	175	W033

Origin	Destination
1A1-0 <36A>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	FP-1A <31>

Project	Numeric Part	Cable Use
NONE	1760	FIRE PUMP FP-1A CT LEADS

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1787	AC	N	A	C	EE	1	242	W041

Origin	Destination
AI-30A <42>	1A3-4 <>
Raceway Description	**Associated Equipment**
T	S1-1 <>

Project	Numeric Part	Cable Use
NONE	1787	ANN OPLS TRIP CH "A" SEQ S1-1 BUS 1A3

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C1A)<41>
66(C1B)<41> 7-1(C1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
C1789	AC	N	C	C	EE	1	203	W039

Origin	Destination
AI-30A <42>	1A3-2 <>
Raceway Description	**Associated Equipment**
T	S1-2 <>

Project	Numeric Part	Cable Use
NONE	1789	SEQ S1-2 BUS 1A3 VOLTAGE INDIC

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C1A)<41>
66(C1B)<41> 7-1(C1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1791	AC	N	A	C	EE	1	210	W038
Origin				**Destination**				
CB-20 <>				1A1-8 <>				
Raceway Description				**Associated Equipment**				
T				<>				
Project	**Numeric Part**	**Cable Use**						
NONE	1791	ANN PRE-TRIP 345KV SYS						

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 14(C5)<41> 12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A1792	AC	N	A	C	EE	1	220	W038
Origin				**Destination**				
CB-20 <>				1A3-2 <>				
Raceway Description				**Associated Equipment**				
T				<>				
Project	**Numeric Part**	**Cable Use**						
NONE	1792	ANN PRE-TRIP 161KV SYS						

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 14(C5)<41> 12(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
C1795	AB	N	C	C	EE	1	195	W038
Origin				**Destination**				
AI-30A <42>				1A3-2 <>				
Raceway Description				**Associated Equipment**				
T				<>				
Project	**Numeric Part**	**Cable Use**						
MR-FC-79-002	1795	DISC & ABANDONED IN PLACE						

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C1A)<41> 66(C1B)<41> 7-1(C1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
C1796	AB	N	C	C	EE	1	205	W038

Origin	Destination
AI-30A <42>	1A1-8 <>
Raceway Description	**Associated Equipment**
T	<>

Project	Numeric Part	Cable Use
MR-FC-79-002	1796	DISC & ABANDONED IN PLACE

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C1A)<41>
66(C1B)<41>	7-1(C1)<41>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A3549	AC	N	A	C	RC	1	160	W041

Origin	Destination
1A1-5 <36A>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	RC-3A <>

Project	Numeric Part	Cable Use
NONE	3549	METER LEADS (CURRENT) FOR RC-3A

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A3551	AC	N	A	C	RC	1	180	W039

Origin	Destination
1A1-5 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	RC-3A <>

Project	Numeric Part	Cable Use
NONE	3551	CONTROL INTERLOCK FOR RC-3A MTR HEATER

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	15(C5)<41>	

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A3552	AC	Y	A	C	RC	1	180	W042

Origin	Destination
1A1-5 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	RC-3A <>

Project	Numeric Part	Cable Use
ECN-96-054	3552	BREAKER RC-3A CONTROL

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	15(C5)<41>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A3553	AC	N	A	C	RC	1	190	W040

Origin	Destination
1A1-5 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	RC-3A <>

Project	Numeric Part	Cable Use
NONE	3553	BKR RC-3A O/L OR TRIP ALM RC-3A-1 ALARM

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	15(C5)<41>	9(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A3554	AC	N	A	C	RC	1	180	W039

Origin	Destination
1A1-5 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	RC-3A <>

Project	Numeric Part	Cable Use
NONE	3554	BKR RC-3A CONTROL (LOCKOUT RELAY)

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	15(C5)<41>	

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
C3575	AC	N	C	C	RC	1	190	W041

Origin	Destination
1A3-5 <36A>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	RC-3C <>

Project	Numeric Part	Cable Use
NONE	3575	METER LEADS (CURRENT) FOR RC-3C

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
C3577	AC	N	C	C	RC	1	210	W039

Origin	Destination
1A3-5 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	RC-3C <>

Project	Numeric Part	Cable Use
NONE	3577	CONTROL INTERLOCK FOR MOTOR HEATER

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 15(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
C3578	AC	Y	C	C	RC	1	210	W042

Origin	Destination
1A3-5 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	RC-3C <>

Project	Numeric Part	Cable Use
ECN-96-054	3578	BREAKER RC-3C CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 15(C5)<41>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
C3579	AC	N	C	C	RC	1	220	W040

Origin	Destination
1A3-5 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	RC-3C <>

Project	Numeric Part	Cable Use
NONE	3579	BKR RC-3C O/L TRIP ALM RC-3C-1 OIL ALARM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 15(C5)<41> 9(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
C3580	AC	N	C	C	RC	1	210	W039

Origin	Destination
1A3-5 <36A>	CB-1 <42>
Raceway Description	**Associated Equipment**
T	RC-3C <>

Project	Numeric Part	Cable Use
NONE	3580	BKR RC-3C CONTROL (LOCKOUT RELAY)

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 15(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
C3582	AC	N	C	C	RC	1	220	W039

Origin	Destination
1A3-5 <36A>	AI-21 <42>
Raceway Description	**Associated Equipment**
T	RC-3C <>

Project	Numeric Part	Cable Use
NONE	3582	BKR RC-3C CONT (BACKUP LOAD SHED)

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 14(C5)<41> 12(C5)<41>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5510	AC	N	A	C	FW	1	195	W042

Origin	Destination
1A1-1 <>	AI-12 <42>
Raceway Description	**Associated Equipment**
T	FW-5A <>

Project	Numeric Part	Cable Use
NONE	5510	HEATER DRAIN PUMP FW-5A CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 14(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5511	AC	N	A	C	FW	1	195	W042

Origin	Destination
1A1-1 <>	AI-12 <42>
Raceway Description	**Associated Equipment**
T	FW-5A <>

Project	Numeric Part	Cable Use
NONE	5511	HEATER DRAIN PUMP 5W-5A CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 14(C5)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5512	AC	N	A	C	FW	1	195	W041

Origin	Destination
1A1-1 <>	AI-12 <42>
Raceway Description	**Associated Equipment**
T	FW-5A <>

Project	Numeric Part	Cable Use
NONE	5512	HTR DRN PMP 5W-5A STOPPED OR OVLD ALM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41> 14(C5)<41>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5513	AC	N	A	C	FW	1	215	W033

Origin	Destination
1A1-1 <>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	FW-5A <>

Project	Numeric Part	Cable Use
NONE	5513	HTR DRM PUMP FW-5A MOTOR CT LEADS

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5534	AC	N	A	C	FW-CD	1	190	W042

Origin	Destination
1A1-3 <>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	FW-2A <>

Project	Numeric Part	Cable Use
NONE	5534	CONDENSATE PUMP FW-2A CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5535	AC	N	A	C	FW-CD	1	190	W041

Origin	Destination
1A1-3 <>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	FW-2A <>

Project	Numeric Part	Cable Use
NONE	5535	CONDENSATE PUMP FW-2A CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A>
37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41>
18(C5A)<41>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5536	AC	N	A	C	FW-CD	1	190	W041

Origin	Destination
1A1-3 <>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	FW-2A <>

Project	Numeric Part	Cable Use
NONE	5536	COND PMP FW-2A STOPPED OR OVERLOAD ALARM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5537	AC	N	A	C	FW-CD	1	190	W033

Origin	Destination
1A1-3 <>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	FW-2A <>

Project	Numeric Part	Cable Use
NONE	5537	COND PUMP FW-2A MOTOR CT LEADS

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5558	AC	N	A	C	FW	1	185	W042

Origin	Destination
1A1-2 <>	AI-12 <42>
Raceway Description	**Associated Equipment**
T	FW-4A <>

Project	Numeric Part	Cable Use
NONE	5558	STEAM GEN FEEDWATER PMP FW-4A CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41> 14(C5)<41>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5559	AC	Y	A	C	FW	1	185	W042

Origin	Destination
1A1-2 <>	AI-12 <42>

Raceway Description	Associated Equipment
T	FW-4A <>

Project	Numeric Part	Cable Use
NONE	5559	STM GEN FEEDWATER PUMP FW-4A CONTROL

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	14(C5)<41>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5560	AC	N	A	C	FW	1	185	W041

Origin	Destination
1A1-2 <>	AI-12 <42>

Raceway Description	Associated Equipment
T	FW-4A <>

Project	Numeric Part	Cable Use
NONE	5560	STM GEN FDW PMP FW-4A

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>	14(C5)<41>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A5561	AC	N	A	C	FW	1	230	W033

Origin	Destination
1A1-2 <>	CB-10 <42>

Raceway Description	Associated Equipment
T	FW-4A <>

Project	Numeric Part	Cable Use
NONE	5561	STM GEN FDW PMP FW-4A CT LEADS FOR AMM

Routing:

34S-1(C4)<36A>	34S-2(C4)<36A>	36S(C4A)<36A>
37S(C3A)<36A>	38S(C2A)<36A>	20(C4A)<41>
18(C5A)<41>		

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A6618	AC	N	A	C	CW	1	180	W042

Origin	Destination
1A1-4 <>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	CW-1A <>

Project	Numeric Part	Cable Use
NONE	6618	CIRC WATER PUMP CW-1A (A) CONTROL

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A6619	AC	N	A	C	CW	1	180	W039

Origin	Destination
1A1-4 <>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	CW-1A <>

Project	Numeric Part	Cable Use
NONE	6619	CIRC WTR PUMP "A" STOPPED OR OVLD ALARM

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A6622	AC	N	A	C	CW	1	180	W039

Origin	Destination
1A1-4 <>	CB-10 <42>
Raceway Description	**Associated Equipment**
T	FCV-1904A <>

Project	Numeric Part	Cable Use
NONE	6622	PISTON OPRD DISCH VLV FCV-1904A POSN IND

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41>

FCS Cable Route Report for 34S-1(C4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A6633	AC	N	A	C	CW	1	180	W033

Origin	Destination
1A1-4 <>	CB-10 <42>

Raceway Description	Associated Equipment
T	CW-1A <>

Project	Numeric Part	Cable Use
NONE	6633	CWP CW-1A MOTOR CT

Routing: 34S-1(C4)<36A> 34S-2(C4)<36A> 36S(C4A)<36A> 37S(C3A)<36A> 38S(C2A)<36A> 20(C4A)<41> 18(C5A)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
A11801	AC	N	A	C	VA-AUX	1	263	W039

Origin	Destination
JB-222A <>	JB-191A <>

Raceway Description	Associated Equipment
1-1/4"C,T,1-1/2	TS-6604 <>

Project	Numeric Part	Cable Use
DCN10106	11801	CONTROL

Routing: CND1(A)<> 36S(C4A)<36A> 34S-2(C4)<36A> 34S-1(C4)<36A> 34S(C4)<36A> 32S(C1A)<36A> SLEEV35(A)<> CND2(A)<>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
1Z113	AC	N	N	I	PC-ERF	1	245	W057

Origin	Destination
1A1-4 <>	JB-694A <41>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	113	CIRC WTR PUMP A TRIP (ERF INPUT Y3305)

Routing:

34S-1(I4)<36A>	34S-2(I4)<36A>	36S(I4)<36A>
37S(I3)<36A>	38S(I2)<36A>	20(I3)<41>
18(I4)<41>	14(I4A)<41>	28(I4A)<41>
38(I4A)<41>	39(I4)<41>	40(I1)<41>

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
1Z118	AC	N	N	I	PC-ERF	1	305	W057

Origin	Destination
JB-694A <41>	1A3-9 <36A>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	118	RAW WTR PUMP A START ERF INPUT Y3434

Routing:

34S-1(I4)<36A>	34S-2(I4)<36A>	36S(I4)<36A>
37S(I3)<36A>	38S(I2)<36A>	20(I3)<41>
18(I4)<41>	16(I4)<41>	13(I4)<41>
30(I4)<41>	42(I4)<41>	40(I1)<41>
74(I2)<41>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
1Z120	AC	N	N	I	PC-ERF	1	310	W057

Origin	Destination
JB-694A <41>	1A3-10 <36A>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	120	RAW WATER PUMP C START ERF INPUT Y3436

Routing:

34S-1(I4)<36A>	34S-2(I4)<36A>	36S(I4)<36A>
37S(I3)<36A>	38S(I2)<36A>	20(I3)<41>
18(I4)<41>	16(I4)<41>	13(I4)<41>
30(I4)<41>	42(I4)<41>	40(I1)<41>
74(I2)<41>		

FCS Cable Route Report for 34S-1(I4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
3559	AC	N	N	I	PC-ERF	1	225	W057

Origin	Destination
1A1-5 <36A>	JB-694A <41>

Raceway Description	Associated Equipment
T	RC-3A <>

Project	Numeric Part	Cable Use
NONE	3559	BKR RC-3A TRIP SIG (ERF CMPTR INP RC003A

Routing:

34S-1(I4)<36A>	34S-2(I4)<36A>	36S(I4)<36A>
37S(I3)<36A>	38S(I2)<36A>	20(I3)<41>
18(I4)<41>	14(I4A)<41>	28(I4A)<41>
38(I4A)<41>	39(I4)<41>	40(I1)<41>
74(I2)<41>		

Cable	Status	App R	Safety	Function	System-	Qty	Length	W Number
3585	AC	N	N	I	PC-ERF	1	255	W057

Origin	Destination
1A3-5 <36A>	JB-694A <41>

Raceway Description	Associated Equipment
C	RC-3C <>

Project	Numeric Part	Cable Use
NONE	3585	BKR RC-3C TRIP SIG (ERF CMPTR INP RC003C

Routing:

34S-1(I4)<36A>	34S-2(I4)<36A>	36S(I4)<36A>
37S(I3)<36A>	38S(I2)<36A>	20(I3)<41>
18(I4)<41>	14(I4A)<41>	28(I4A)<41>
38(I4A)<41>	39(I4)<41>	40(I1)<41>
74(I2)<41>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
3982	AC	N	N	I	PC-ERF	1	275	W057

Origin	Destination
1A3-7 <36A>	JB-694A <41>

Raceway Description	Associated Equipment
T	<>

Project	Numeric Part	Cable Use
NONE	3982	BKR SI-1A CONTROL (ERF CMPTR INP Y3418)

Routing:

34S-1(I4)<36A>	34S-2(I4)<36A>	36S(I4)<36A>
37S(I3)<36A>	38S(I2)<36A>	20(I3)<41>
18(I4)<41>	14(I4A)<41>	28(I4A)<41>
38(*)<>	39(*)<>	40(I1)<41>
74(I2)<41>		

FCS Cable Route Report for 34S-1(I4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
5397	AC	N	N	I	PC-ERF	1	280	W057

Origin	Destination
1A3-16 <36A>	JB-694A <41>

Raceway Description	Associated Equipment
T	FW-6 <32>

Project	Numeric Part	Cable Use
NONE	5397	BREAKER FW-6 ERF COMPUTER INPUT Y3426

Routing:

34S(I4)<36A>	34S-1(I4)<36A>	34S-2(I4)<36A>
36S(I4)<36A>	37S(I3)<36A>	38S(I2)<36A>
20(I3)<41>	18(I4)<41>	14(I4A)<41>
28(I4A)<41>	38(I4A)<41>	39(I4)<41>
40(I1)<41>	74(I2)<41>	

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
9583	AC	N	N	I	PC-ERF	1	365	W063

Origin	Destination
D1 <35A>	JB-692A <41>

Raceway Description	Associated Equipment
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9583	DIESEL DG-1 LO STD-BY L.O. PR LO IDLE,

Routing:

32S-2(I)<35A>	32S-1(I2)<35A>	32S(I1)<36A>
34S(I4)<36A>	34S-1(I4)<36A>	34S-2(I4)<36A>
36S(I4)<36A>	37S(I3)<36A>	38S(I2)<36A>
20(I2A)<41>	18(I2)<41>	16(I2)<41>
13(I2)<41>	30(I2)<41>	42(I2)<41>
41(I1)<41>		

FCS Cable Route Report for 34S-1(I4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
9584	AC	N	N	I	PC-ERF	1	365	W057

Origin	Destination
D1 <35A>	JB-692A <41>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9584	DIESEL DG-1 LO LEVEL LO ERF INPUT #Y3343

Routing:

32S-2(I)<35A>	32S-1(I2)<35A>	32S(I1)<36A>
34S(I4)<36A>	34S-1(I4)<36A>	34S-2(I4)<36A>
36S(I4)<36A>	37S(I3)<36A>	38S(I2)<36A>
20(I2A)<41>	18(I2)<41>	16(I2)<41>
13(I2)<41>	30(I2)<41>	42(I2)<41>
41(I1)<41>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
9592	AC	N	N	I	DG	1	365	W057

Origin	Destination
D1 <35A>	JB-692A <41>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9592	DIESEL DG-1 ENG WATER TEMP HI-LO ERF

Routing:

32S-2(I)<35A>	32S-1(I2)<35A>	32S(I1)<36A>
34S(I4)<36A>	34S-1(I4)<36A>	34S-2(I4)<36A>
36S(I4)<36A>	37S(I3)<36A>	38S(I2)<36A>
20(I2A)<41>	18(I2)<41>	16(I2)<41>
13(I2)<41>	30(I2)<41>	42(I2)<41>
41(I1)<41>		

FCS Cable Route Report for 34S-1(I4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
9593	AC	N	N	I	DG	1	365	W060

Origin	Destination
D1 <35A>	JB-692A <41>

Raceway Description	Associated Equipment
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9593	DIESEL DG-1 ENG WTR PRSR LO WATER LVL

Routing:

32S-2(I)<35A>	32S-1(I2)<35A>	32S(I1)<36A>
34S(I4)<36A>	34S-1(I4)<36A>	34S-2(I4)<36A>
36S(I4)<36A>	37S(I3)<36A>	38S(I2)<36A>
20(I2A)<41>	18(I2)<41>	16(I2)<41>
13(I2)<41>	30(I2)<41>	42(I2)<41>
41(I1)<41>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
9594	AB	N	N	I	DG	1	365	W057

Origin	Destination
D1 <35A>	JB-692A <41>

Raceway Description	Associated Equipment
T	DG-1 <35A>

Project	Numeric Part	Cable Use
MR-FC-83-133	9594	DIESEL DG-1 ENG CRKCASE DR HI(DISC&TAPED

Routing:

32S-2(I)<35A>	32S-1(I2)<35A>	32S(I1)<36A>
34S(I4)<36A>	34S-1(I4)<36A>	34S-2(I4)<36A>
36S(I4)<36A>	37S(I3)<36A>	38S(I2)<36A>
20(I2A)<41>	18(I2)<41>	16(I2)<41>
13(I2)<41>	30(I2)<41>	42(I2)<41>
41(I1)<41>		

FCS Cable Route Report for 34S-1(I4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
9595	AC	N	N	I	DG	1	365	W057

Origin	Destination
D1 <35A>	JB-692A <41>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9595	DIESEL DG-1 FO INLT (FILTER #1) HI

Routing:			
	32S-2(I)<35A>	32S-1(I2)<35A>	32S(I1)<36A>
	34S(I4)<36A>	34S-1(I4)<36A>	34S-2(I4)<36A>
	36S(I4)<36A>	37S(I3)<36A>	38S(I2)<36A>
	20(I2A)<41>	18(I2)<41>	16(I2)<41>
	13(I2)<41>	30(I2)<41>	42(I2)<41>
	41(I1)<41>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
9595A	AC	N	N	I	DG	1	365	W057

Origin	Destination
D1 <35A>	JB-692A <41>
Raceway Description	**Associated Equipment**
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9595	DIESEL DG-1 FO INLT (FILTER #2) HI

Routing:			
	32S-2(I)<35A>	32S-1(I2)<35A>	32S(I1)<36A>
	34S(I4)<36A>	34S-1(I4)<36A>	34S-2(I4)<36A>
	36S(I4)<36A>	37S(I3)<36A>	38S(I2)<36A>
	20(I2A)<41>	18(I2)<41>	16(I2)<41>
	13(I2)<41>	30(I2)<41>	42(I2)<41>
	41(I1)<41>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
9596	AC	N	N	I	DG	1	365	W057

Origin	Destination
D1 <35A>	JB-692A <41>

Raceway Description	Associated Equipment
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9596	DIESEL DG-1 ENG RUN (ERF INPUT #Y3368)

Routing:

32S-2(I)<35A>	32S-1(I2)<35A>	32S(I1)<36A>
34S(I4)<36A>	34S-1(I4)<36A>	34S-2(I4)<36A>
36S(I4)<36A>	37S(I3)<36A>	38S(I2)<36A>
20(I2A)<41>	18(I2)<41>	16(I2)<41>
13(I2)<41>	30(I2)<41>	42(I2)<41>
41(I1)<41>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
9597	AC	N	N	I	DG	1	365	W057

Origin	Destination
D1 <35A>	JB-692A <41>

Raceway Description	Associated Equipment
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9597	DIESEL DG-1 ENG STOP (ERF INPUT #Y3370)

Routing:

34S-2(I)<>	34S-1(I2)<>	32S(I1)<36A>
34S(I4)<36A>	34S-1(I4)<36A>	34S-2(I4)<36A>
36S(I4)<36A>	37S(I3)<36A>	38S(I2)<36A>
20(I2A)<41>	18(I2)<41>	16(I2)<41>
13(I2)<41>	30(I2)<41>	42(I2)<41>
41(I1)<41>		

FCS Cable Route Report for 34S-1(I4)

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
9598	AC	N	N	I	DG	1	365	W057

Origin	Destination
D1 <35A>	JB-692A <41>

Raceway Description	Associated Equipment
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9598	DIESEL DG-1 ENG STRT FAILURE

Routing:

32S-2(I)<35A>	32S-1(I2)<35A>	32S(I1)<36A>
34S(I4)<36A>	34S-1(I4)<36A>	34S-2(I4)<36A>
36S(I4)<36A>	37S(I3)<36A>	38S(I2)<36A>
20(I2A)<41>	18(I2)<41>	16(I2)<41>
13(I2)<41>	30(I2)<41>	42(I2)<41>
41(I1)<41>		

Cable	Status	App R	Safety	Function	System	Qty	Length	W Number
9599	AC	N	N	I	DG	1	365	W060

Origin	Destination
D1 <35A>	JB-692A <41>

Raceway Description	Associated Equipment
T	DG-1 <35A>

Project	Numeric Part	Cable Use
NONE	9599	DIESEL DG-1 ENG OUT OF AUTO

Routing:

32S-2(I)<35A>	32S-1(I2)<35A>	32S(I1)<36A>
34S(I4)<36A>	34S-1(I4)<36A>	34S-2(I4)<36A>
36S(I4)<36A>	37S(I3)<36A>	38S(I2)<36A>
20(I2A)<41>	18(I2)<41>	16(I2)<41>
13(I2)<41>	30(I2)<41>	42(I2)<41>
41(I1)<41>		