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U. S. Nuclear Regulatory Commission
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Subject: River Bend Station - Unit 1
Docket No. 50-458
License No. NPF-47
Response to Request for Additional Information, Ampacity Derating
(TAC No. M85596)
File Nos. G9.5, G9.33.4

RBG-43571
RBF1-96-0477

Ladies and Gentlemen:

Please find attached the response to the NRC Request for Additional Information (RAI) dated October 16, 1996. Attachment A contains the specific responses to the RAI. Attachments B and C contain supporting draft calculations G13.18.14.0-178, "Ampacity Derating Factors for Thermo-Lag 330-1," Revision 0, and E-218, "Ampacity Verification of Cables within Raceways Wrapped with Appendix R Fire Protection Barrier," Revision 1, respectively. The response is based primarily on these calculations which are currently in the verification process. Once verified and approved, the calculations will be available at your request.

The previous revision of calculation E-218, Revision 0, was completed in 1987 and was reviewed by the NRC. The responses to the staff questions utilize the current draft (Revision 1) of E-218 and, where applicable, provide a comparison with the information previously provided in the Revision 0 calculation. As can be seen in the responses, E-218, Revision 1 provides a more rigorous approach to the calculation subject matter and eliminates many of the design assumptions provided in the original calculation. In addition, it should be noted that much of the information contained within the revised calculation is the result of field walk down data.

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Should you have any questions, please call Tim Gates at 504-381-4866.

Sincerely,

RJK/RMM/kvm
Attachments

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ATTACHMENT A

Responses to Request for Additional Information

QUESTION 2.5: Enclosure 1 - June 28, 1996, Submittal

QUESTION:

In general, it is not clear to what extent Enclosure 1, "River Bend Project Instruction on Ampacity Derating Evaluation," which was part of the licensee submittal dated June 28, 1996, supersedes Calculation E-218, Revision 0. In addition to the specific questions below, the licensee is requested to describe the relationship of the subject document with respect to other applicable station documents.

RESPONSE:

Initially, the Project Instruction, together with the Plant Data Management System (PDMS) ampacity computation results, was intended to supersede E-218, Revision 0. However, it was later decided that E-218 should be revised to include the new ampacity calculation methodology and the PDMS calculation results. The Project Instruction (PI) became a vehicle to (1) obtain EOI concurrence with the ampacity calculation methodology and (2) provide guidance for making the necessary PDMS software changes so that PDMS could perform the calculations in accordance with the methodology. The PI has not been updated since June 18 and it will not be updated in the future. On October 10, 1996, E-218, DRAFT Revision 1, (Attachment C to this letter) was issued for EOI review and comment. It contains the ampacity calculation methodology previously included in the PI. The calculation is in the EOI review process and is expected to be issued by January 31, 1997.

Since the June 28, 1996 submittal, EOI has performed other efforts to complete the Thermo-Lag (T-L) Ampacity Project. These efforts included:

1. Preparation of PDMS Software Changes - PDMS is an on-line relational database that contains data for cables and raceways at RBS. It previously replaced the Electrical Cable Schedule Information System (ECSIS). PDMS was revised to include (1) program changes for performance of the ampacity calculations, (2) data base field additions for data required to compute ampacity and (3) ampacity calculation reports, both on-screen and printed.

2. Preparation of Heat Transfer Calculation (Calculation Number G13.18.14.0-178) - This calculation (1) provides justification for using Texas Utilities, Comanche Peak ampacity derating factor (ADF) and ampacity correction factor (ACF) values for standard T-L enclosures and (2) computes values for uniquely configured T-L enclosures using classical heat transfer analysis techniques. This calculation is identified as Reference A.5.1.15 in the PI. The calculation has undergone initial review by EOI and comments were provided to the originator for resolution. Issuance of the final calcuiation will be in conjunction with the issuance of E-218, Revision 1.

3. Verification of T-L Enclosures - EOI performed a verification of all T-L wrapped raceways in the plant. The verification included reconciliation of drawing / document discrepancies and walkdown of several raceways to confirm T-L installation and

configuration. EOI also confirmed the correct ambient temperature for each fire zone that contains wrapped raceways.

4. PDMS Data Entry - For each cable contained in a T-L wrapped raceway, data entry included the load equipment identification number and the full load current and load factor (i.e. a cable sizing factor of 1.25 by default or lower in some justified cases) of the associated load equipment. Data entry also included nominal ampacity values for the various cable types, ACF values for the various T-L enclosure types, and ambient temperature data for each fire zone.

5. Preparation of DRAFT Revision 1 of E-218 - This revision of E-218 provides a more rigorous methodology for the ampacity calculations than E-218, Revision 0. DRAFT Revision 1 methodology imposes the most current codes and standards. The major differences between DRAFT Revision 1 and Revision 0 are (1) DRAFT Revision 1 uses the latest available ampacity test data and analytical techniques for determination of ADF values for T-L enclosures and (2) Revision 0 used ICEA Standard P-54-440 and DRAFT Revision 1 uses the Stolpe's method for computation of nominal ampacity for random lay cables in tray. ICEA P-54-440 provides ampacity look-up tables based on discrete cable depths. The Stolpe's method determines ampacity based on actual tray depth and the methodology is easily adapted to computerized calculation.

QUESTION:

a) Tables A.4.2.5 and A.4.3.4 of Enclosure 1 refers to a note for the ADF and ACF parameters for the 3-hour fire barriers. The applicable note states that the subject parameters will be provided by Reference A.5.1.15. The licensee is requested to submit Reference A.5.1.15 for staff review.

RESPONSE:

Reference A.5.1.15, calculation G13.18.14.0-178 Draft Revision 0, is contained in Attachment B. Please note that the enclosed calculation does not reflect recent changes resulting from various comments made by the independent reviewer since its submittal.

QUESTION:

b) Enclosure 1 describes conduit group and tray stack which utilizes a group wrap of Thermo-Lag material to form a single enclosure around each raceway type grouping. The subject configurations represent a significant departure from the simple configurations tested under IEEE Standard P848, "Procedure for the Determination of the Ampacity Derating of Fire Protected Cables," methodology. It should be noted that Tennessee Valley Authority has submitted ampacity derating test reports for similar configurations for staff review. The licensee is requested to provide justification for these nonstandard fire barrier configurations.

QUESTION 2.5: Enclosure 1 - June 28, 1996, Submittal

RESPONSE:

The particular T-L enclosure specified in the question is for Fire Zone PT-1. This enclosure contains a multiple tray stack and several conduits. For the most part, the enclosure is a very long 6-sided box; one side, the two ends and the roof of the enclosure are the concrete ceiling and walls; the other two long sides are constructed of T-L panels. Calculation G13.18.14.0-178 Draft Revision 0 analyzes this enclosure, using classical heat transfer theory, to obtain ADF values for the contained trays and conduits. Recent analysis shows that the enclosure is no longer required for fire safe shutdown and it is scheduled for demolition during the next refueling outage.

EOI is not committed to the recommendations and requirements of IEEE P848 which was recently issued as IEEE Standard 848-1996.

QUESTION 2.1: Attachment 2, Licensee Submittal dated 11/9/95, Item 1

QUESTION:

The subject item states that the licensee analysis will focus only on "required and abandoned Thermo-Lag wrapped raceways." This statement implies that those cables which were originally enclosed in fire barriers that were subsequently removed by the licensee will not be considered further by the subject analysis. Since the scope of Generic Letter 92-08 specifically address "all raceways protected by Thermo-Lag 330-1 (for fire protection of safe shutdown capability or to achieve physical independence of electrical systems)" the licensee analysis should include all cables which are either currently or previously enclosed by a fire barrier in order to assess any potential equipment age degradation impact on safety-related cable life. The licensee is requested to confirm the scope of its ampacity derating determinations.

RESPONSE:

DRAFT Revision 1 of E-218 evaluates the ampacity of cables that have been contained in wrapped raceway at RBS except for the following cable types:

- Instrumentation cables (X cables)
- Alarm cables (700 series C cables)
- Computer I/O cables (900 series C cables)
- Intermittent duty power cables (for elevators, cranes, hoists and motor operated valves)

This scope is in agreement with Generic Letter 92-08.

As of early November 1996, no T-L has been removed from electrical raceways. The only T-L that EOI has removed from the plant enclosed a small instrument rack. The T-L enclosure was a 6-sided box; two sides were the concrete floor and rear side. The front side of the T-L box was removed; the remainder of the box was abandoned in place. Analysis showed that the enclosure was unnecessary for fire safe shutdown.

EOI is currently in the process of removing T-L from some electrical raceways and EOI intends to remove additional T-L during the next refueling outage. Based on reevaluation of the Safe Shutdown analysis, most of the raceways that are or have ever been wrapped are no longer required to be wrapped. Power and control cables contained within the enclosures being removed or scheduled for later removal are included in E-218, DRAFT Revision 1.

QUESTION 2.1: Attachment 2, Licensee Submittal dated 11/9/95, Item 10

QUESTION:

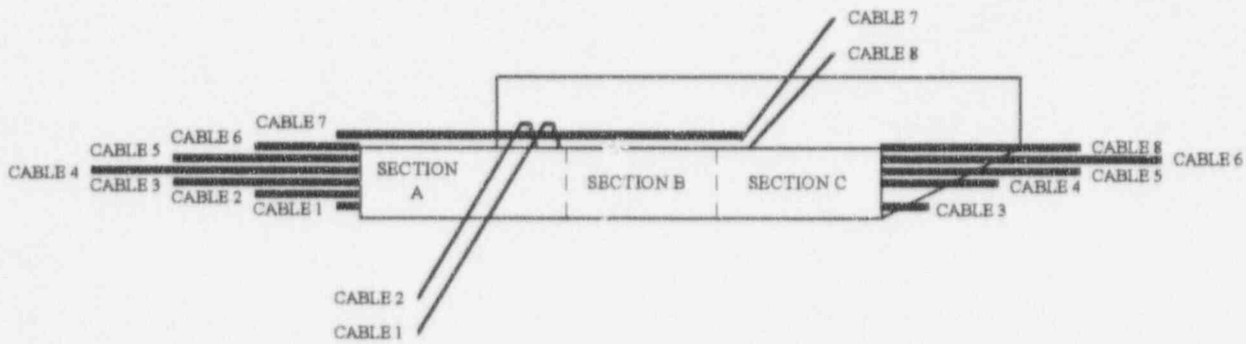
The licensee implies that the subject analysis will "calculate the depth of cables in each wrapped tray (other than control cables)" and will "use this value to determine an ampacity derating adjustment for cable depth." It is not clear whether those control cables which run in raceways with power cables will be included in depth of fill calculations. The staff agrees with our contractor, Sandia National Laboratories (SNL) that the thermal insulation effects of low or non-continuously energized cables must be accounted for in the subject analysis [see Attachment 1(a)]. The licensee is requested to clarify the use of subject assumption in the applicable calculations.

RESPONSE:

E-218, Revision 0 used an assumed tray depth to determine cable ampacity. That assumed depth included any control cables contained in the same raceway(s) as power cables.

E-218, DRAFT Revision 1 and the associated PDMS ampacity computations do not use an assumed tray depth. The ampacity computation uses the results of the PDMS tray fill calculation to compute the ampacity of random lay cables in K (600 Volt power) and C (600 Volt control) trays. PDMS calculates tray fill by summing the cross-sectional areas of all cables in the tray, irrespective of cable type, and then dividing by the tray cross-sectional area. In K tray, control cables may be present with the power cables; PDMS includes these in the calculation. Therefore, the results of PDMS ampacity computations are based on tray fill (or depth) that includes all cables in the tray.

It is important to realize that the PDMS tray fill calculation is conservative because PDMS assumes that if a cable is in the tray anywhere, it is in the tray everywhere. The following figure and discussion explains this point.



Tray section A contains 7 cables (1 through 7), section B contains 5 cables (3 through 7), and section C contains 5 cables (3 through 6 and 8). None of the three tray sections contain all 8 cables. However, PDMS computes tray fill by summing the cross-sectional areas of every cable that enters or leaves the tray. In this example, PDMS computes tray fill based on the 8 cables in each of the three sections.

QUESTION 2.2: Calculation E-218 - General Methodology

QUESTION:

a) Calculation E-218, Revision 0, Page 2 of 35, Item 7: The calculation cites that the licensee "takes credit for the guaranteed average diameters rather than guaranteed minimum cable diameters for 600 volt K and C cables. This assumption will result in slightly higher derating cable ampacity (DCAs) for these cable types." What is the difference between the guaranteed minimum diameter and average diameter? How large would the ampacity impact be if the minimum diameter is used? In general, it would be considered more appropriate to use the minimum diameter value because this would be more conservative, and the manufacturer has apparently indicated that these minimum values are not unlikely. If the DCA impact is significant, then the licensee should reassess its ampacity limits using the minimum cable diameter as the basis for analysis.

RESPONSE:

a) Based on review of several cable specifications, the difference between the guaranteed minimum diameter and average diameter is 5% (i.e. minimum guaranteed diameter = 0.95 x average diameter). RBS contends that cable ampacity for a single cable is not affected by cable diameter (i.e. insulation thickness). A #8AWG, 3/c, 90°C rated cable that has 30 mils of XLPE insulation has the same ampacity as a #8AWG, 3/c, 90°C rated cable with 60 mils of XLPE insulation. Changing cable diameter, however, may affect ampacity for many cables in a tray. This is due to the fact that a reduction in cable diameter reduces calculated tray fill (note that this is non-conservative for a tray fill calculation), which increases nominal cable ampacity. The following analysis is based on Calculation E-218, DRAFT Revision 1 methodology.

The ampacity computation for cables in K and C trays are based on Stolpe's methodology. This methodology computes a heat intensity, Q, in the tray that is based on tray percent fill as:

$$Q = 360 * (\%Fill)^{-1.176} \text{ watts/ft/in}^2$$

PDMS calculates %fill for each tray by summing the cross-sectional areas of all cables in the tray and dividing by the tray cross-sectional area. PDMS uses maximum cable diameter for this computation. From the tray Q, PDMS computes the nominal ampacity of each cable as:

$$I_{nom} = 28.02 * D * \sqrt{\frac{Q}{nR_{ac}}} \text{ Amps}$$

where: R_{ac} = a.c. resistance of conductor at 90°C (Ohms/1000 ft)

D = cable diameter (inches)

n = number of conductors in the cable

By using the minimum diameter (i.e. 0.95 times the average) versus the maximum diameter (i.e. 1.1 times the average) for these cables, the impact on the ampacity computation is as follows:

QUESTION 2.2: Calculation E-218 - General Methodology

1. Since %fill is based on the square of cable diameter, %fill for the minimum cable diameter case is $(0.95 \div 1.1)^2 = 0.7459$ times %fill for the maximum diameter case.

2. Based on the Q equation, Q for the minimum diameter case is $(0.7459)^{-1.176} = 1.4117$ times Q for the maximum diameter case.

3. Based on the I_{nom} equation, I_{nom} for the minimum diameter case is $(0.95 \div 1.1) * (1.4117)^{1/2} = 1.026$ times I_{nom} for the maximum diameter case.

Therefore, by using the minimum cable diameter instead of the maximum cable diameter used by PDMS, ampacity increases by 2.6%.

Note that by using the minimum cable diameter, tray %fill decreases by 25%. This is a non-conservative result.

QUESTION:

b) Calculation E-218, Revision 0, Page 6 of 35, Item II-a-4: This item states that cables in K trays are based on an assumed depth of fill of 1.5 inches. This value appears again on Page 22 of 35, Item 1a, and Attachment 3 of E-218 is cited as the basis for this value. However, Attachment 3 of E-218 states that a depth of fill of 2.5 inches should be used for sizing cables in K trays. In particular, does a value of 1.5 inches bound the upper limit on depth of fill for all such trays? If not, then either an upper bound value or the actual value associated with a given case should be used in the calculation.

RESPONSE:

b) This item is no longer a concern per E-218, DRAFT Revision 1 which does not use assumed tray depth for computation. Cable ampacity is based on actual computed tray fill which is the sum of all cable cross sectional areas divided by the tray cross sectional area. Cable area is calculated from maximum cable diameter and all cables in the tray are included in the calculation.

QUESTION:

c) Calculation E-218, Revision 0, Page 35 of 35, Item E: The licensee has not provided any detailed results for the calculation of ampacity limits for 5kV and 15kV cables. The licensee should either specify whether 5kV or higher voltage cables are applicable for the subject analysis. If 5kV or higher voltage cable systems are applicable to the subject analysis, the licensee should cite the tables from which the ampacity limits for these cables are derived, and should describe the appropriate derating factors applied to the tabulated ampacities.

QUESTION 2.2: Calculation E-218 - General Methodology

RESPONSE:

c) RBS does not have any 15kV cables contained in T-L wrapped raceway. Calculation E-218, Revision 0 does provide detailed results for the calculation of ampacity for 5kV cables. These results are shown in E-218, Revision 0, Attachment 1, anywhere that a 1CH### conduit or 1TH### tray is identified. H in the third position of the raceway identification number indicates 5kV voltage level. E-218, DRAFT Revision 1 also includes the 5kV cables.

QUESTION 2.3: Calculation E-218 - Specific Analyses

QUESTION:

a) Calculation E-218, Revision 0, Page 29 of 35, Item "Chart 2": There appears to be two possible discrepancies in the values cited in this chart (i.e., for the 10AWG 7/C and 12/C cables, and for the 12AWG 7/C and 9/C cables). In general, the ampacity limits should decrease with an increase in the number of conductors. For all cases, except the two pairs cited, this expectation is met. The licensee is requested to verify the ampacity values cited in Column 3 of the subject chart and to resolve the apparent discrepancies for the two cable pairs.

RESPONSE:

a) The values of ampacity for the 10AWG 7/C and 12/C cables, and for the 12AWG 7/C and 9/C cables do appear to be incorrect in E-218, Revision 0. Calculation E-218, DRAFT Revision 1 revises these values. The changes are based on the National Electrical Code, 1996, Article 310-15, Note 8(a) of Notes to Ampacity Tables of 0 to 2000 Volts. Note that the Calculation E-218, DRAFT Revision 1 values cannot be compared directly to those in E-218, Revision 0, Chart 2 since the Ix' values in Column 3 are based on ICEA P-54-440 for control cable in tray with an assumed 2" depth.

QUESTION:

b) The licensee application of the National Electric Code (NEC) conductor grouping ampacity correction factors for more than three conductors in a cable or raceway is considered incomplete. In the case of conduits, the NEC correction factors should be applied to the conduit system as a whole whenever the total count of conductors exceeds three. In contrast, the licensee has only applied these factors to individual multiconductor cables when the conductor count for a given cable exceeds three. This is an incomplete and nonconservative treatment. The licensee analyses should be revised to fully account for the conductor count adjustment factors for all conduit systems in which the conductor count exceeds three.

RESPONSE:

b) Calculation E-218, DRAFT Revision 1 shows the method that PDMS uses to compute ampacity for cables in conduit. The nominal ampacity of the cable is multiplied by a factor that is based on the total number of current-carrying conductors in the conduit. The appropriate factor is from the National Electrical Code, 1996, Article 310-15, Note 8(a) of Notes to Ampacity Tables of 0 to 2000 Volts which is reproduced in E-218, DRAFT Revision 1. For tray, the Stolpe's method is used. This method applies a square-root-of-the-number-of-conductors factor similar to the ICEA P-54-440 method.

QUESTION 2.3: Calculation E-218 - Specific Analyses

The applicable equation from E-218, DRAFT Revision 1 is shown below.

$$I_{nom} = 28.02 * D * \sqrt{\frac{Q}{nR_{ac}}} \text{ Amps}$$

where: R_{ac} = a.c. resistance of conductor at 90°C (Ohms/1000 ft)

D = cable diameter (inches)

n = number of conductors in the cable

QUESTION:

c) Calculation E-218, Revision 0, Page 24 of 35, Item "Chart 1": This item is described as a table of allowable ampacities for L-trays. The base ampacity values are from the Insulated Cable Engineers Association (ICEA) P-46-426 tables for a cable located in free air with no derating factors applied. The use of open air ampacity values for a general cable tray appears inappropriate and must be either corrected or further justified by the licensee. In particular, this practice is not consistent with accepted ampacity design practices, and hence would require explicit and detailed justification and validation. The licensee should also provide justification and validation for the K-tray or revise the subject calculation as necessary.

RESPONSE:

c) Calculation E-218, DRAFT Revision 1 shows the method that PDMS uses to compute ampacity for cables in L tray (i.e. 600V level with maintained spacing). The methodology applies a correction factor that is based on the number of cables in the tray. The correction factor is from IPCEA P-46-426, Table VII and is reproduced in E-218, DRAFT Revision 1.

QUESTION:

d) The licensee has cited the 1984 version of the NEC handbook as the basis for its assumed conductor count correction factors. However, since 1990, NEC has published an updated listing of correction factors which are more conservative for conductor counts of 10 or more. The older (1984) values included an assumption of 50 percent or more load diversity in the installed cables. The licensee should either apply the more recent values in its corrections, or should specifically justify the applicability of the older adjustment factors on the basis of existing cable load diversity.

RESPONSE:

d) Calculation E-218, DRAFT Revision 1 uses the 1996 version of the National Electrical Code. The multiple conductor correction factors are reflected in E-218, DRAFT Revision 1. Please note that E-218, Revision 0 was approved in 1987.

QUESTION 2.4: Nominally Overloaded Cable Analyses

QUESTION:

Attachment 9 to Calculation E-218 documents supplemental assessments performed by the licensee for four specific cables that are nominally identified as operating at least part of the time under overload conditions with respect to ampacity limits. Two of the four cables service certain compressor power loads. There are several points of concern related to the supplemental assessments for these two specific cables:

a) If these cables have operated under the stated conditions for any significant length of time, then the cables may have already exceeded their rated life expectancy. Rough estimates performed by SNL as part of this review indicate that these cables may exceed their nominal "40 year at 90°C" life in as little as seven years. The licensee should provide an assessment of the impact of past operations on the operating life of these cables in addition to any assessment for future operating conditions.

RESPONSE:

E-218, Revision 0, Attachment 9 includes supplemental calculations for five cables. Based on the results of E-218, DRAFT Revision 1 and the analysis shown below, these five cables are not overloaded.

- 1HVKBBC515 and 1HVKDBC506 - These cables are used for chiller controls. Each FLA is 8.33A and the load factor is 1.1 which produces a load current or Cable Sizing Amps (CSA) of 9.16A. The 1.1 load factor is acceptable in this case because (a) circuit components are resistive so a 10% voltage variation must be considered and (b) unlike motors, resistive components are not susceptible to overload, therefore the additional 15% penalty typically used is unnecessary. Derated Cable Ampacity (DCA) is 10.65A based on a tray fill of 50% and a 0.62 ACF for the T-L. Since DCA > CSA, cable ampacity is acceptable. The cable is not overloaded and has not sustained any reduction in life.

- 1SCABNK508 - This is a feeder from a 480-240/120V transformer to a distribution panel. FLA is 37.5A and load factor is 1.25, producing a CSA of 46.88A. DCA is 55.46A based on a tray fill of 58% and a 0.56 ACF. Since DCA > CSA, cable ampacity is acceptable. The cable is not overloaded and has not sustained any reduction in life.

- 1SCAANK500 - This is also a feeder from a 480-240/120V transformer to a distribution panel. FLA is 62.5A and load factor is 1.1, producing a CSA of 68.75A. DCA is 65.9A based on a conduit grouping factor of 0.86 and a 0.79 ACF. The cable does not meet the DCA ≥ CSA criteria. However, DCA = 1.05 FLA. Therefore, for the cable to have sustained any loss of life, it has to have operated at above nominal voltage (at least 105% since the load is resistive, not motor) and at transformer rated current. Either of these conditions is unlikely for any significant amount of time, therefore, it is unlikely that the cable has sustained any reduction in life.

QUESTION 2.4: Nominally Overloaded Cable Analyses

- 1ENSBBH300 - This is a feeder from 4.16kV switchgear to a 4.16kV-480V transformer. FLA is 208A based on transformer rating and load factor is 1.1, producing a CSA of 228.8A. DCA is 194.9A based on a conduit grouping factor of 0.86 and a 0.79 ACF. The cable does not meet the DCA ≥ CSA criteria. However, according to recently issued calculation G13.18.3.6*011, Revision 0, the actual transformer load is only 142.6A based on secondary total connected load of 1236A. Therefore, DCA = 194.9A > 156.9A = 1.1 x 142.6A and the cable has not sustained any reduction in life.

E-218, DRAFT Revision 1 does show a number of cables that have potentially been operated at overloaded conditions. EOI is evaluating these cables. Once this evaluation is complete, EOI will perform compensatory actions to rectify any real cable overload or loss of life situations. Any operability questions will be addressed upon completion of the calculations in accordance with the RBS Condition Report system.

QUESTION:

b) The final justification for the acceptability of the operating conditions of these two cables is based largely on the manufacturer's stated overload conditions for operation. These overload ratings are not generally intended to cover anticipated conditions of normal operation, but are intended to cover only rarely encountered and unexpected emergency conditions of operation. Hence, reliance on overload ratings in this case is potentially inappropriate. At the least, this practice represents a fundamental departure from accepted ampacity assessment practices, and as such should be thoroughly justified and reviewed before being accepted as a cable design practice. In particular, the licensee should consider the full context of the ICEA and Institute of Electrical and Electronic Engineers, Inc. (IEEE) overload ratings which set severe limits on these overload ratings. The licensee should provide significant additional justification and validation of the subject design practice.

RESPONSE:

EOI agrees that manufacturer's stated overload conditions are not generally intended to cover anticipated conditions of normal operation. E-218, DRAFT Revision 1 evaluations do not rely on overload ratings for justification of operating currents that exceed derated cable ampacity.

QUESTION:

c) The licensee cites a specific passage in the IEEE 242 standard as the basis for its assessment of overload conditions [para. 11.5.2(3)]. A review of this section of the standard (1986 version) revealed no relevance whatsoever to the issue of cable overload conditions. The licensee should clarify its intent in citing the IEEE 242 standard.

RESPONSE:

QUESTION 2.4: Nominally Overloaded Cable Analyses

The cited paragraph from IEEE 242-1975 was not available for review. However, this passage is probably equivalent to paragraph 8.5.2.3 of IEEE 242-1986 which discusses the overload capacity of cables. Regardless of the E-218, Revision 0 intent, E-218, DRAFT Revision 1 evaluations do not rely on overload ratings for justification of continuous operating currents that exceed derated cable ampacity.

QUESTION:

d) The licensee has cited a particular equipment qualification (EQ) test report as the basis for its assessment of operating life calculations for the subject cables (Okonite report SWGS-1282-2). The licensee is requested to provide further clarification to support its conclusions based on the subject EQ report.

RESPONSE:

The EQ test report was used in E-218, Revision 0 to determine the life of cables 1HVKBBC515, 1HVKDBC506 and 1ENSBBH300 at the postulated overload conditions. For 1HVKBBC515 and 1HVKDBC506, Attachment 9, page 1 shows CSA = 14.35A and DCA = 12.1A which yielded a cable temperature of 110.3°C using the IEEE 242-1975, Section 11.5.2 (2) equation. The cable life of 6.1×10^4 hours, equivalent to 6.96 years, was read from the chart on page 3 using the 110.3°C temperature. For 1ENSBBH300, Attachment 9, page 6 shows CSA = 269A and DCA = 259A which yielded a cable temperature of 93.94°C. The cable life of 2.5×10^5 hours, equivalent to 28.54 years, was read from the chart on page 9 using the 93.94°C temperature.

E-218, DRAFT Revision 1, evaluated these cables as acceptable.

QUESTION:

The licensee DCA values are based upon an assumed ampacity derating factor (ADF) for a 3-hour wrapped cable tray of 20.5 percent. A more realistic ADF value might well indicate that the subject cables have been operating for some period of time in significant overload condition. The licensee should address the above concerns for worst case conditions or provide further justification for the assumed ADF value.

RESPONSE:

The updated ADF value for 3-hour tray from E-218, DRAFT Revision 1 is 44%; this is more than twice the derating used in the Revision 0 calculation.

Based on the updated enclosure ADF and ACF values, E-218, DRAFT Revision 1 shows cables that have potentially been operated at overloaded conditions. EOI is evaluating these cables. Once this evaluation is complete, EOI will perform compensatory actions to rectify any real cable overload or loss of life situations.

ATTACHMENT B

DRAFT

Calculation G13.18.14.0-178, Revision 0

"Ampacity Derating Factors for Thermo-Lag 330-1"