

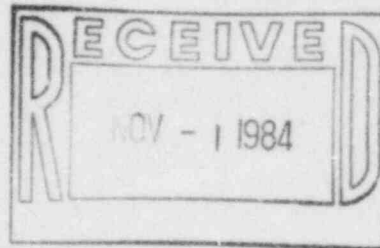
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October 31, 1984

W3P84-2967
Q-3-A35.07.105
3-A1.01.04

Mr. John T. Collins
Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011



Dear Mr. Collins:

Subject: Waterford 3 SES
Docket No. 50-382
SIGNIFICANT CONSTRUCTION DEFICIENCY NO. 105
"Electrical Separation Deficiencies (Reg. Guide 1.75)"
Final Report

Reference: LP&L letter W3P84-2669 dated September 21, 1984

The referenced letter revised the schedule for submittal of the final report on SCD-105. In accordance with 10CFR50.55(e)(3), enclosed are two copies of the LP&L final report on SCD-105 with the Justification for Interim Operation.

Very truly yours,

K.W. Cook
Nuclear Support & Licensing Manager

KWC:GEW:sms

Enclosure

cc: NRC, Director, Office of I&E (15 copies)
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FINAL REPORT OF
SIGNIFICANT CONSTRUCTION DEFICIENCY NO. 105 R1
"ELECTRICAL SEPARATION DEFICIENCIES" (REGULATORY GUIDE 1.75)

INTRODUCTION

This report is submitted pursuant to 10CFR50.55(e). It describes a Construction Deficiency and Quality Assurance Program breakdown that resulted in deviations from the FSAR commitment to IEEE-384-1974, "Criteria for Separation of Class IE Equipment and Circuits"; as endorsed by Regulatory Guide 1.75, "Physical Independence of Electric Systems".

To the best of our knowledge, this deficiency had not been reported to the USNRC pursuant to 10CFR21.

DESCRIPTION

Design drawings detail the requirements for physical separation between redundant class IE raceways and between class IE and non-class IE raceways in order to implement the commitments of the FSAR. FSAR Section 8.3.1.2.19 sets forth the Waterford-3 commitment to IEEE 384-1974 as endorsed by Regulatory Guide 1.75. It states that separation of one foot horizontal and three feet vertical in the cable vault, and three feet horizontal and five feet vertical in general plant areas should be maintained. When these separation distances cannot be maintained, the raceways should be enclosed and separated by a minimum of one inch. When one inch separation cannot be maintained, a flame retardant material shall be placed between the raceways to provide the equivalent of one inch separation in air. During the CAT Audit, inspectors noted instances where neither cable tray covers nor fire barriers were provided when the separation distances outlined above could not be maintained.

Investigation into the deficiencies cited in the CAT Audit revealed a lack of adherence to the specified separation requirements throughout the plant. A review of contractor's installation documents and procedures revealed that verification of separation was required for safety related installations. Non-safety installation procedures did not require inspection for separation from safety related installations. It was determined that a Significant Construction Deficiency existed in Construction for not installing per the design drawings and in the Quality Assurance Program for not adequately implementing the Inspection Program.

SAFETY IMPLICATIONS

A walkdown of cable raceways to determine those installations which require interposing barriers in accordance with the design criteria was envisioned prior to the time of the audit. However, procedures did not require inspection of non-safety related conduit for separation from safety-related installations, and they would not, therefore, have fully ensured that the FSAR commitments to physical and electrical separation would be met.

ENGINEERING EVALUATION

Essentially the criteria used in the walkdowns was extracted from B-288 Sheets 8,9,9A and 10 which contain details specifying separation distances as follows:

- | | |
|----------------------|--|
| (1) Enclosed Raceway | 1" Horizontal or Vertical |
| (2) Open Raceway | 3'-0 Horizontal/5'-0 Vertical |
| | (General Plant Area) |
| | 1'-0 Horizontal/3'0 Vertical (Cable Spread Room) |

Several of these details provide for barrier installation including cable tray covers which reduce separation requirements to that of enclosed raceways.

The deviations recorded and submitted for evaluation were basically divided into the following categories:

- (A) Available separation distance was greater than one inch but less than required.
- (B) Available separation was less than one inch.

For Group A, the violation was brought in line with the installation design criteria by introducing a barrier between the affected components of the raceway. In each instance, the barrier was installed even if analysis could demonstrate that it was not required. For Group B, a more detailed subclassification was required which included:

- I. None of the raceway contained power cables.
- II. At least one of the affected raceway contained a power cable.

Under each of these headings, the following relationships were considered:

- A. conduit to conduit
- B. conduit to tray
- C. conduit to equipment
- D. tray to tray
- E. tray to equipment

In deciding if a modification was required, the following features affected the decision making process:

- (1) Specifications require that cable utilized at Waterford-3 meets the requirements of IEEE 383-1974. Therefore, the cable insulation and jacketing material will not support combustion once the flame source has been removed. For cables installed in enclosed raceway, the only source of ignition is due to cable overloads or short circuiting. The cables may be broken into the two basic categories of power cable and control/instrumentation cable. In the latter case, there is insufficient energy available from the source to create a high temperature condition in the raceway. In both cases, the cabling is provided with protective devices which ensure isolation of the faulted circuit within cycles of inception.

- (2) Certain areas of the plant, specifically the cable spreading room, contain a dedicated cable tray water sprinkler system. (Reference FSAR Amendment 35.)
- (3) In order for the contents of a raceway to affect the contents of another raceway it must introduce a heat transfer large enough and long enough to cause loss of function in the other cable. This temperature would have to be upwards of 250°C on a short time basis. The mean probability that a large energy release will occur in the raceway is 3E-8*. This probability is taken from NUREG/CR-2815 entitled "National Reliability Evaluation Program Procedures Guide" dated 9/9/82.

NOTE: * This number is inherently conservative since it does not consider the probability of the simultaneous occurrence of an accident.

If items (1) and (3) are coupled together, it is obvious that for control/instrumentation circuits in one enclosed raceway which are within one inch (including touching) of another enclosed raceway containing control/instrumentation circuits, a modification to the design is not justified since there is neither sufficient energy nor high enough probability that the event would ever occur. This position is independent of the safety affiliation of the cables involved.

As a result, the criteria for those situations which involve a lack of minimum separation between enclosed raceways containing control/instrumentation cables, was to accept as is.

- (4) Where one or more of the enclosed raceways is a covered cable tray and the minimum separation distance does not exist, a fire rated barrier was/is being placed between the raceways. If there was insufficient space to add this barrier, an analysis of the possible energy release is made to ascertain if the adjacent circuits could lose function. If the results are negative (insufficient energy) no modification is made. If the results of the heat transfer analysis is positive (there is an adequate heat source) a Failure Modes and Effects Analysis (FMEA) is performed. If the FMEA shows that loss of function is acceptable, no modification is made. If the loss of function cannot be justified, the raceway is modified to an acceptable level.
- (5) If any of the circuits involved contained non-class IE power circuits, the only options are installation of a fire rated barrier, successful FMEA or a raceway modification to achieve the required separation.

In accordance with the criteria detailed above corrective action was determined by ESSE engineering as follows:

- (i) If the condition could be corrected by installation of cable tray covers, this was accomplished and documented. In a large number of the cases, the requirement for cable tray covers to be installed already existed.

- (2) If the condition could be corrected by minor modification to the raceway such as installation of minerallac straps to provide 1" separation between conduits (usually flexible conduits) the modification was made by the craft personnel, inspected by QA/QC and documented on the punch list generated.
- (3) If the condition involved clearances of less than 1" between raceways, either fire barrier material was identified as the corrective action or disposition to accept as is was determined by ESSE engineering in accordance with the above established criteria.

It should be noted that a large number of the deviations recorded were the result of installation of non-safety related conduits where procedures did not require inspection for separation from safety related installations.

CORRECTIVE ACTION

Several walkdowns and surveillances were conducted to identify all of the discrepancies. In the initial effort, an engineering walkdown proved insufficient during the surveillance program. A series of follow-up walkdowns and surveillances were conducted and it was determined that a restructuring of the walkdown program was warranted. This program was formulated and controlled by LP&L QA.

The QA walkdown, which identified raceway separation discrepancies has now been completed. An independent walkdown was also conducted by NUS. Results of the NUS walkdown were compared with the final results of the QA walkdown and all differences found were resolved. The evaluation process to provide disposition for all deviations has been completed.

Conditions which could be corrected by minor modification to the raceways were completed by craft personnel, inspected by QA/QC and documented on the punch lists.

Cable trays requiring covers were identified and CIWA's generated. Installation of all cable tray covers has been completed.

Installation of fire barrier material as an alternate to metal tray covers, at conduit entrance points to the tray and as a separation barrier on selected conduits were also identified in the dispositions and CIWA's generated. All rework which has not been completed is being tracked under the LP&L Program via CIWA's.

In addition it should be noted that ESSE engineering also reviewed all conditions involving multiple raceways being installed within the same Appendix R fire wrap for electrical separation requirements internal to the wrap. All such conditions had been previously identified on EIRs generated by B&B, installer of the Appendix R wraps. The above established criteria was applied to each EIR to determine if a potential for rework existed within the Appendix R wrap. All modifications resulting from this review were identified on a CIWA and rework has been completed.

Ebasco procedure CP-764 has been reviewed to require a Q.C. inspection of non-safety related conduit installations to identify discrepancies in separation requirements. Engineering and Quality control personnel shall be trained in separation requirements. Construction supervision will be retrained in these requirements.

Corrective action is scheduled to be complete by 10/31/84.

This is submitted as a revised final report.

JUSTIFICATION FOR INTERIM OPERATION

The small amount of corrective action remaining is scheduled to be completed by 10/31/84. All work in the Reactor Containment Building (RCB) will support this schedule. The items remaining in the Balance of Plant (BOP) will be completed on or shortly thereafter with a completion not exceeding initial criticality. These reworks are not considered a constraint to fuel load for the following reasons:

- (1) Any remaining work outside the RCB will be very limited. Thus the probability of a loss of redundant safety-related electrical circuits due to lack of RG 1.75 separation is extremely low.
- (2) Even in the event of a fault affecting redundant circuits, the lack of fission products prior to Mode 2 provides assurance that the health and safety of the public will not be adversely affected.