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NSD-NRC-96-4669
DCP/NRC0480
Docket No.: STN-52-003

March 21, 1996

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

ATTENTION: T. R. QUAY

SUBJECT: AP600 ELECTRICAL SEPARATION REQUIREMENTS

Dear Mr. Quay:

This letter provides the justification for AP600 separation criteria exception to Regulatory Guide 1.75 (Open Item 8.3.2.1-6).

Separation between safety-related cables and between safety-related and nonsafety-related cables in the AP600 generally follows the guidance of Regulatory Guide 1.75. The AP600 separation criteria in SSAR subsection 8.3.2.4.2 is as follows:

**8.3.2.4.2 Raceway and Cable Routing**

There are five separation groups for the cable and raceway system: group A, B, C, D, and N. Separation group A contains safety-related circuits from division A. Similarly, separation group B contains safety-related circuits from division B; group C from division C; group D from division D; and group N from nonsafety-related circuits.

Cables of one separation group are run in separate raceway and physically separated from cables of other separation groups. Group N raceways are separated from safety-related groups A, B, C and D. Raceways from group N are routed in the same areas as the safety-related groups according to spatial separation stipulated in Regulatory Guide 1.75 and IEEE 384 with the following exceptions:

- Within the main control room and remote shutdown area (nonhazard areas), the minimum vertical separation for open top cable tray is 3 inches and the minimum horizontal separation is 1 inch.

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- Within general plant areas (limited hazard areas), the minimum vertical separation is 12 inches, and the minimum horizontal separation is 6 inches for open top cable trays with low-voltage power circuits for cable sizes <2/0 AWG. For configurations that involve exclusively limited energy content cables (instrumentation and control), these minimum distances are reduced to 3 inches and 1 inch respectively.

- Within panels and control switchboards, the minimum horizontal separation between components or cables of different separation groups (both field-routed and vendor-supplied internal wiring) is 1 inch, and the minimum vertical separation distance is 6 inches.

The following paragraph will be added to SSAR subsection 8.3.2.4.2:

> The exceptions to the guidance in Regulatory Guide 1.75 are based on test results used to support exceptions to the separation guidance for operating nuclear power plants. A summary of test results from ten electrical separation test programs is documented in Young, G. L. et al (Reference 1.) These test programs support the AP600 exceptions.

The reference will also be added to the list of references for SSAR subsection 8.3:

For an example of exceptions to the Regulatory Guide 1.75 guidance, supported by test and analysis and approved for use in an operating nuclear power plant, see subsection 8.3.1.4.3 of Reference 2.

References:

1. Young, G. L. et al, "Cable Separation - What Do Industry Programs Show?," *IEEE Transactions of Energy Conversion*, September 1990, Volume 5, Number 3, pp 585-602.

2. Vogtle Electric Generating Station, Updated Final Safety Analysis Report, Revision 4, 1994.

The specific rationale from Young, G. L. et al (Reference 1) for each AP600 exception is provided in the attached table.

Brian A. McIntyre, Manager
Advanced Plant Safety and Licensing

/nja

Attachment

cc: W. Huffman, NRC
N. J. Liparulo, Westinghouse

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Justification for AP600 Separation Criteria Exceptions

| Configuration | Separation |
|---|---|
| 1. Minimum vertical separation for open top cable tray in the main control room and remote shutdown area (nonhazard areas)<br>**Rationale**:<br>Nine tests in a nonenclosed tray configuration were performed successfully with 1 inch or less separation. Three inches was chosen for conservatism. | 3 inches |
| 2. Minimum horizontal separation for open top cable tray in the main control room and remote shutdown area (nonhazard areas)<br>**Rationale**:<br>Two tests were performed with 0 to 3 inch separation. Also, the vertical test are more severe and envelop the horizontal case. The nine vertical tests had a separation of 1 inch or less. | 1 inch |
| 3. Minimum vertical separation for open top cable tray with low-voltage power circuits for cable sizes <2/0 AWG within general plant areas (limited hazard areas)<br>**Rationale**:<br>Twenty-one tests of this configuration were performed successfully with 12 inches or less vertical separation. Configuration #1 in Table 8.3.1-4 of Reference 2 also supports this distance. | 12 inches |
| 4. Minimum horizontal separation for open top cable tray with low-voltage power circuits for cable sizes <2/0 AWG within general plant areas (limited hazard areas)<br>**Rationale**:<br>Fourteen tests of this configuration were performed successfully with between 0 and 1 inches of horizontal separation. The 6 inch separation is conservative. | 6 inches |
| 5. Minimum vertical separation for open top cable tray for configurations that involve exclusively limited energy content cables (instrumentation and control) within general plant areas (limited hazard areas)<br>**Rationale**:<br>Tests of control and instrumentation cable in free air with a vertical separation of 1 inch vertical separation for internal panel wiring were acceptable. Tests of internal panel wiring using 1 inch vertical separation also support the separation requirement. The 3 inch separation is conservative. Configuration #18 in Table 8.3.1-4 of Reference 2 also supports this separation distance. | 3 inches |

Justification for AP600 Separation Criteria Exceptions

| Configuration | Separation |
|---|---|
| 6. Minimum horizontal separation for open top cable tray for configurations that involve exclusively limited energy content cables (instrumentation and control) within general plant areas (limited hazard areas)<br>**Rationale**:<br>Tests of control and instrumentation cable in free air with a 1 inch horizontal separation in free air were acceptable. Tests of internal panel wiring using horizontal separation of 1 inch also support the separation requirement. Configuration #18 in Table 8.3.1-4 of Reference 2 also supports this separation distance. | 1 inch |
| 7. Minimum vertical separation within panels and control switchboards between components or cables of different separation groups<br>**Rationale**:<br>Three tests of internal panel wiring using 1 inch vertical separation for internal panel wiring were acceptable. Tests of control and instrumentation cable in free air with a vertical separation of 1 inch also support the separation requirement. The 6 inch separation is conservative. Configuration #18 in Table 8.3.1-4 of Reference 2 also supports this separation distance. | 6 inches |
| 8. Minimum horizonal separation within panels and control switchboards between components or cables of different separation groups<br>**Rationale**:<br>Three tests of internal panel wiring using 1 inch horizontal separation for internal panel wiring were acceptable. Tests of control and instrumentation cable in free air with a horizontal separation of 1 inch also support the separation requirement. Configuration #18 in Table 8.3.1-4 of Reference 2 also supports this separation distance. | 1 inch |