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AUG 08 1984

JOHN S. KEMPER  
VICE-PRESIDENT  
ENGINEERING AND RESEARCH

Mr. A. Schwencer, Chief  
Licensing Branch No. 2  
Division of Licensing  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Docket Nos.: 50-352  
50-353

SUBJECT: Limerick Generating Station, Units 1 and 2  
Structural Steel Survivability Evaluation  
Additional Clarification Information

Reference: Telecon between NRC Staff and PECO  
on August 8, 1984

File: GOVT 1-1 (NRC)

Attachment: Responses to Additional Questions  
Concerning the Structural Steel  
Survivability Evaluation

Dear Mr. Schwencer:

Pursuant to the Referenced telecon, the attachment provides our responses to additional questions raised by your Chemical Engineering Branch in concert with their Fire Protection consultant.

We hope that this information will support the final resolution of the SER open item no. 14.

Should any additional information be required, please do not hesitate to contact us.

Sincerely,

*John Kemper*  
*for*  
*JS Kemper*

GJR/mlb/08088402

Copy to: See Attached Service List

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Mr. James Wiggins (w/enclosure)  
Mr. Timothy R. S. Campbell (w/enclosure)  
Ms. Phyllis Zitzer (w/enclosure)  
Judge Peter A. Morris (w/enclosure)

1. Columns - The latest revision (rev. 3) to the methodology describes the exposure criteria and acceptance criteria for columns. The "exposed columns" in the methodology included all steel columns not imbedded in the walls.

Columns were exposed to plume temperatures of 1500°F either from cable tray local effects, pool fires, or transient combustibles. The exposure durations were (1) the duration of cable exposure, (2) the duration of pool fires, or (3) 30 minute transient fire exposure. The longest of these exposures were used where multiple exposures were possible. For Limerick areas containing columns, all in-situ exposures exceeded the 30 minute transient exposure. The calculations contained in the appendix to the steel analysis contains the time-temperature history calculated for each column. The results are summarized in the table below.

The failures were as follows:

| <u>Calc #</u> | <u>Column</u> | <u>Corrective Action</u>         |
|---------------|---------------|----------------------------------|
| 4             | W14X730       | Automatic Sprinklers             |
| 18,19,20,23   | W14X87        | Not required structurally        |
| 19            | W14X119       | Coated Column - 3 hr. protection |

Summary of Column Response to  
Localized Fire Exposure

| Calc # | Localized Fire<br>Type & Duration |             | Column Sizes | Column T(s) |
|--------|-----------------------------------|-------------|--------------|-------------|
| 1      | Oil                               | 85 minutes  | W14X730      | 893°F       |
|        | Oil                               | 44 minutes  | W14X730      | 590°F       |
| 2      | Oil                               | 85 minutes  | W14X730      | 893°F       |
|        | Oil                               | 44 minutes  | W14X730      | 590°F       |
| 4      | Oil                               | 180 minutes | W14X730      | >1000°F     |
| 12     | Cables                            | 35 minutes  | W14X730      | 494°F       |
| 13     | Cables                            | 35 minutes  | W14X550      | 584°F       |
|        |                                   |             | W14X342      | 775°F       |
| 15     | Cables                            | 65 minutes  | W14X730      | 757°F       |
| 16     | Cables                            | 32 minutes  | W14X730      | 463°F       |
|        |                                   |             | W14X550      | 548°F       |
|        |                                   |             | W14X287      | 810°F       |
| 18     | Cables                            | 35 minutes  | W14X730      | 494°F       |
|        |                                   |             | W14X87       | 1402°F      |
| 19     | Cables                            | 47 minutes  | W14X730      | 610°F       |
|        |                                   |             | W14X665      | 642°F       |
|        |                                   |             | W14X550      | 714°F       |
|        |                                   |             | W14X370      | 989°F       |
|        |                                   |             | W14X342      | 926°F       |
|        |                                   |             | W14X119      | 1385°F      |
|        |                                   |             | W14X87       | 1460°F      |
| 20     | Cables                            | 40 minutes  | W14X730      | 544°F       |
|        |                                   |             | W14X665      | 574°F       |
|        |                                   |             | W14X87       | 1434°F      |
| 23     | Cables                            | 35 minutes  | W14X87       | 1402°F      |
| 25     | Cables                            | 35 minutes  | W14X398      | 709°F       |
|        |                                   |             | W14X287      | 857°F       |

2. Cables in oil hazard rooms - For calculating No. 1, 2, 3, 4, 5, 7, and 8, minor amounts of cables are present in these rooms but were not included in the duration of these ventilation controlled fires. The table below shows the additional duration for the addition of cables.

| Calculation No. | In-situ Oil (gal) | Transient Oil (gal) | Cables Insulation (lb) | Duration Oil Only (min) | Oil & Cable (min) |
|-----------------|-------------------|---------------------|------------------------|-------------------------|-------------------|
| 1 Case 1        | 72                | 72                  | 78                     | 85                      | 88                |
| Case 2          | 72                | 72                  | 78                     | 44                      | 46                |
| 2 Case 1        | 72                | 72                  | 84                     | 85                      | 88                |
| Case 2          | 72                | 72                  | 84                     | 44                      | 46                |
| 3               | 80                | 80                  | 137                    | 125                     | 132               |
| 4               | 155               | 155                 | 27                     | 180                     | 180               |
| 5               | 24                | 24                  | 19                     | 37                      | 38                |
| 7               | 24                | 24                  | 17                     | 37                      | 38                |
| 8               | 24                | 24                  | 19                     | 37                      | 38                |

The areas addressed in Calc #3 and 4 are protected with automatic sprinklers. The other calculations were redone using both the large quantity of transient oil and the in-situ cables. The addition of cable in no case increased the area temperature greater than 15°F.

CASE NUMBER: 1  
 BUILDING: UNIT 1 REACTOR  
 ELEVATION AND AREA DESCRIPTION: 177' RHR  
 CASE DESCRIPTION: ONE 3'X7' DOOR

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| CEILING/WALL THICKNESS (ft) | CEILING/ WALL MATERIAL | A <sub>c</sub> (ft <sup>2</sup> ) | H <sub>0</sub> (ft) | A <sub>w</sub> (ft <sup>2</sup> ) | Q (kW) |
|-----------------------------|------------------------|-----------------------------------|---------------------|-----------------------------------|--------|
| 3.0                         | CONCRETE               | 21.0                              | 7.0                 | 7846                              | 4504   |

FIRE IS VENTILATION CONTROLLED

| FIRE DURATION (min) | GAS TEMPERATURE (deg.F) |
|---------------------|-------------------------|
| 5                   | 643                     |
| 10                  | 658                     |
| 15                  | 672                     |
| 20                  | 686                     |
| 25                  | 698                     |
| 30                  | 711                     |
| 35                  | 724                     |
| 40                  | 736                     |
| 45                  | 748                     |
| 50                  | 760                     |
| 55                  | 772                     |
| 60                  | 784                     |
| 65                  | 795                     |
| 70                  | 807                     |
| 75                  | 818                     |
| 80                  | 830                     |
| 85                  | 841                     |
| 90                  | 852                     |

CASE NUMBER: 2  
 BUILDING: UNIT 1 REACTOR  
 ELEVATION AND AREA DESCRIPTION: 177' RHR  
 CASE DESCRIPTION: TWO 3'X7' DOORS

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| CEILING/WALL THICKNESS (ft) | CEILING/ WALL MATERIAL | A <sub>0</sub> (ft <sup>2</sup> ) | H <sub>0</sub> (ft) | A <sub>w</sub> (ft <sup>2</sup> ) | Q (kW) |
|-----------------------------|------------------------|-----------------------------------|---------------------|-----------------------------------|--------|
| 3.0                         | CONCRETE               | 42.0                              | 7.0                 | 7848                              | 9000   |

FIRE IS VENTILATION CONTROLLED

| FIRE DURATION (min) | GAS TEMPERATURE (deg.F) |
|---------------------|-------------------------|
| 2                   |                         |
| 4                   | 834                     |
| 6                   | 849                     |
| 8                   | 862                     |
| 10                  | 876                     |
| 12                  | 890                     |
| 14                  | 903                     |
| 16                  | 917                     |
| 18                  | 930                     |
| 20                  | 944                     |
| 22                  | 958                     |
| 24                  | 971                     |
| 26                  | 985                     |
| 28                  | 998                     |
| 30                  | 1012                    |
| 32                  | 1025                    |
| 34                  | 1039                    |
| 36                  | 1052                    |
| 38                  | 1066                    |
| 40                  | 1079                    |
| 42                  | 1092                    |
| 44                  | 1105                    |
| 46                  | 1118                    |
|                     | 1131                    |

CASE NUMBER: 2  
BUILDING: UNIT 1 REACTOR  
ELEVATION AND AREA DESCRIPTION: 177' RHR  
CASE DESCRIPTION: W 24 x 68

EFFECTS OF LOCAL HEATING ON STRUCTURAL STEEL

FIRE TEMPERATURE (deg. F): 1131  
WEIGHT OF STEEL MEMBER (lbs./ft): 68  
SURFACE OF STEEL MEMBER HEATED (sq.ft./ft): 6.06

| TIME<br>(min) | STEEL TEMPERATURE<br>(deg.F) |
|---------------|------------------------------|
| 5.00          | 442                          |
| 10.00         | 685                          |
| 15.00         | 842                          |
| 20.00         | 944                          |
| 25.00         | 1010                         |
| 30.00         | 1052                         |
| 35.00         | 1080                         |
| 40.00         | 1098                         |
| 45.00         | 1110                         |
| 50.00         | 1117                         |
| 55.00         | 1122                         |
| 60.00         | 1125                         |
| 65.00         | 1127                         |



CASE NUMBER: 1  
 BUILDING: UNIT 1 REACTOR  
 ELEVATION AND AREA DESCRIPTION: 172' RHR ROOM 103  
 CASE DESCRIPTION: ONE 3'X7' DOOR

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| CEILING/WALL THICKNESS (ft) | CEILING/ WALL MATERIAL | Ao (ft <sup>2</sup> ) | Ho (ft) | Aw (ft <sup>2</sup> ) | Q (kW) |
|-----------------------------|------------------------|-----------------------|---------|-----------------------|--------|
| 3.0                         | CONCRETE               | 21.0                  | 7.0     | 9068                  | 4504   |

FIRE IS VENTILATION CONTROLLED

| FIRE DURATION (min) | GAS TEMPERATURE (deg.F) |
|---------------------|-------------------------|
| 5                   |                         |
| 10                  | 605                     |
| 15                  | 618                     |
| 20                  | 630                     |
| 25                  | 641                     |
| 30                  | 652                     |
| 35                  | 663                     |
| 40                  | 673                     |
| 45                  | 683                     |
| 50                  | 693                     |
| 55                  | 703                     |
| 60                  | 713                     |
| 65                  | 723                     |
| 70                  | 732                     |
| 75                  | 742                     |
| 80                  | 751                     |
| 85                  | 761                     |
| 90                  | 770                     |
|                     | 779                     |

CASE NUMBER: 2  
 BUILDING: UNIT 1 REACTOR  
 ELEVATION AND AREA DESCRIPTION: 177' RHR  
 CASE DESCRIPTION: TWO 3'X7' DOORS

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| CEILING/WALL THICKNESS (ft) | CEILING/ WALL MATERIAL | A <sub>0</sub> (ft <sup>2</sup> ) | H <sub>0</sub> (ft) | A <sub>w</sub> (ft <sup>2</sup> ) | Q (kW) |
|-----------------------------|------------------------|-----------------------------------|---------------------|-----------------------------------|--------|
| 3.0                         | CONCRETE               | 42.0                              | 7.0                 | 9068                              | 9008   |

FIRE IS VENTILATION CONTROLLED

| FIRE DURATION (min) | GAS TEMPERATURE (deg.F) |
|---------------------|-------------------------|
| 2                   | 788                     |
| 4                   | 801                     |
| 6                   | 812                     |
| 8                   | 824                     |
| 10                  | 835                     |
| 12                  | 846                     |
| 14                  | 857                     |
| 16                  | 868                     |
| 18                  | 879                     |
| 20                  | 890                     |
| 22                  | 901                     |
| 24                  | 912                     |
| 26                  | 923                     |
| 28                  | 934                     |
| 30                  | 945                     |
| 32                  | 955                     |
| 34                  | 966                     |
| 36                  | 977                     |
| 38                  | 988                     |
| 40                  | 998                     |
| 42                  | 1009                    |
| 44                  | 1020                    |
| 46                  | 1030                    |



CASE NUMBER: 1  
BUILDING: UNIT 1 REACTOR  
ELEVATION AND AREA DESCRIPTION: 177' C.S. RM110  
CASE DESCRIPTION: W27x84

EFFECTS OF LOCAL HEATING ON STRUCTURAL STEEL

FIRE TEMPERATURE (deg. F): 1135  
WEIGHT OF STEEL MEMBER (lbs./ft): 84  
SURFACE OF STEEL MEMBER HEATED (sq.ft./ft): 6.72

| TIME<br>(min) | STEEL TEMPERATURE<br>(deg.F) |
|---------------|------------------------------|
| 5.00          | 406                          |
| 10.00         | 640                          |
| 15.00         | 798                          |
| 20.00         | 905                          |
| 25.00         | 978                          |
| 30.00         | 1028                         |
| 35.00         | 1062                         |
| 40.00         | 1086                         |
| 45.00         | 1101                         |
| 50.00         | 1112                         |
| 55.00         | 1119                         |
| 60.00         | 1124                         |
| 65.00         | 1128                         |

CASE NUMBER: 1  
 BUILDING: UNIT 1 REACTOR  
 ELEVATION AND AREA DESCRIPTION: 177' CORE SRRAY RM 113  
 CASE DESCRIPTION: ONE DOOR

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| CEILING/WALL THICKNESS (ft) | CEILING/ WALL MATERIAL | Ao (ft <sup>2</sup> ) | Ho (ft) | Aw (ft <sup>2</sup> ) | Q (kW) |
|-----------------------------|------------------------|-----------------------|---------|-----------------------|--------|
| 3.0                         | CONCRETE               | 17.5                  | 5.8     | 2976                  | 3417   |

FIRE IS VENTILATION CONTROLLED

| FIRE DURATION (min) | GAS TEMPERATURE (deg.F) |
|---------------------|-------------------------|
| 2                   |                         |
| 4                   | 834                     |
| 6                   | 849                     |
| 8                   | 862                     |
| 10                  | 876                     |
| 12                  | 890                     |
| 14                  | 903                     |
| 16                  | 917                     |
| 18                  | 931                     |
| 20                  | 944                     |
| 22                  | 958                     |
| 24                  | 971                     |
| 26                  | 985                     |
| 28                  | 999                     |
| 30                  | 1012                    |
| 32                  | 1026                    |
| 34                  | 1039                    |
| 36                  | 1052                    |
| 38                  | 1066                    |
|                     | 1079                    |

CASE NUMBER: 1  
 BUILDING: UNIT 1 REACTOR  
 ELEVATION AND AREA DESCRIPTION: 177' CORE SPRAY RM 114  
 CASE DESCRIPTION: ONE DOOR

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| CEILING/WALL THICKNESS (ft) | CEILING/ WALL MATERIAL | Ao (ft2) | Ho (ft) | Aw (ft2) | Q (kW) |
|-----------------------------|------------------------|----------|---------|----------|--------|
| 3.0                         | CONCRETE               | 17.5     | 5.8     | 2784     | 3417   |

FIRE IS VENTILATION CONTROLLED

| FIRE DURATION (min) | GAS TEMPERATURE (deg.F) |
|---------------------|-------------------------|
| 2                   |                         |
| 4                   | 856                     |
| 6                   | 872                     |
| 8                   | 887                     |
| 10                  | 902                     |
| 12                  | 917                     |
| 14                  | 932                     |
| 16                  | 947                     |
| 18                  | 962                     |
| 20                  | 977                     |
| 22                  | 992                     |
| 24                  | 1007                    |
| 26                  | 1022                    |
| 28                  | 1037                    |
| 30                  | 1052                    |
| 32                  | 1067                    |
| 34                  | 1082                    |
| 36                  | 1096                    |
| 38                  | 1111                    |
|                     | 1126                    |

CASE NUMBER: 1  
BUILDING: UNIT 1 REACTOR  
ELEVATION AND AREA DESCRIPTION: 177' C.S. RM114  
CASE DESCRIPTION: W27x145

EFFECTS OF LOCAL HEATING ON STRUCTURAL STEEL

FIRE TEMPERATURE (deg. F): 1126  
WEIGHT OF STEEL MEMBER (lbs./ft): 145  
SURFACE OF STEEL MEMBER HEATED (sq.ft./ft): 7.87

| TIME<br>(min) | STEEL TEMPERATURE<br>(deg.F) |
|---------------|------------------------------|
| 5.00          |                              |
| 10.00         | 295                          |
| 15.00         | 473                          |
| 20.00         | 613                          |
| 25.00         | 723                          |
| 30.00         | 809                          |
| 35.00         | 877                          |
| 40.00         | 931                          |
| 45.00         | 972                          |
| 50.00         | 1005                         |
| 55.00         | 1031                         |
| 60.00         | 1052                         |
| 65.00         | 1067                         |
|               | 1080                         |

3. Stratification - The use of a maximum constant fire size from time zero throughout the fire, and the omission of radiative and convective heat losses through openings make the estimates of area temperature conservatively high. These conservatisms for the area temperature, combined with the evaluation of plume effects adequately address the problem of stratification.

At the request of NRC, the heat balance area temperature method was applied to the UL conducted 20 foot separation test for comparison purposes. This comparison is shown in the tables below and indicate that the heat balance area temperature is conservative enough to compensate for the problem of potential stratification.

#### UL Test Comparison

| Test Description   | Q                                 | Heat Balance T | Measured Peak Temp. |                   |
|--|-----------------------------------|----------------|---------------------|-------------------|
|  |                                   |                | Room Average        | Hot Layer Average |
| #1 5 gal heptane and E/PVC PE/PVC cables, Exp. peak at 5 min duration 15 min | 1160 kW heptane<br>1750 kW cables | 1284°F         | 784°F               | 1212°F            |
| #2 5 gal heptane and XLPE cables, exp peak at 6 min duration 14 min          | 1160 kW heptane<br>1234 kW cables | 1036°F         | 659°F               | 1027°F            |
| #3 10 gal heptane Experimental peak at 20 min Duration 25 min                | 1160 kW                           | 696°F          | 524°F               | 710°F             |



4. Enclosure Feedback Effects - In those cases where enclosures are small, all cables are burning simultaneously, and adequate ventilation is supplied (so the fire is fuel controlled), the question regards whether the "open burning" mass loss rates from EPRI/FMRC intermediate scale test are conservative enough to account for potential enclosure feedback effects. Also, if mass loss rates increase with a corresponding decrease in fire duration, how significant would the change in enclosure temperature be?

Tests conducted at Sandia Laboratories on cable trays containing cross-linked polyethylene cable insulation showed that mass loss rate was a function of the inverse square of the diagonal distance from the ceiling-wall corner. The tests also showed that these effects drop off rapidly within the first five feet of this distance. Beyond that distance, the mass loss rate was rather flat. Based on these Sandia tests and the Limerick cable configuration below deep beams, it is not anticipated that the enclosure feedback effect would have a significant impact on the conservatism built into the methodology.

Sample calculations were run for calculation #9 and #31 picked as arbitrary examples of all cable burning to assess the effect of increased mass loss rate. For Calc 9 mass loss rates were increased by 7, 25, and 50%. These increases resulted in increases in calculated temperatures of 19°F, 63°F, and 118°F, respectively. For calculation 31 mass loss rates were increased by 17, 40, and 55%. These increases resulted in increases in calculated temperatures of 61°F, 139°F, and 157°F, respectively. Since in both cases 50% increase in mass loss rate only increased the resultant calculated temperature by approximately 15%, enclosure feedback effects would not have a significant effect on the conservatism built into the methodology.

CASE NUMBER: 1  
 BUILDING: UNIT 1 REACTOR  
 ELEVATION AND AREA DESCRIPTION: 177' SUMP ROOM  
 CASE DESCRIPTION: ALL CABLES BURNING

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| CEILING/WALL THICKNESS (ft) | CEILING/ WALL MATERIAL | Ao (ft <sup>2</sup> ) | Ho (ft) | Aw (ft <sup>2</sup> ) | Q (kW) |
|-----------------------------|------------------------|-----------------------|---------|-----------------------|--------|
| 2.5                         | CONCRETE               | 17.5                  | 5.8     | 2595                  | 1820   |

FIRE IS FUEL CONTROLLED

| FIRE DURATION (min) | GAS TEMPERATURE (deg.F) |
|---------------------|-------------------------|
| 1                   |                         |
| 2                   | 681                     |
| 3                   | 686                     |
| 4                   | 691                     |
| 5                   | 695                     |
| 6                   | 699                     |
| 7                   | 703                     |
| 8                   | 707                     |
| 9                   | 711                     |
| 10                  | 714                     |
| 11                  | 718                     |
| 12                  | 721                     |
| 13                  | 725                     |
| 14                  | 729                     |
|                     | 732                     |

CASE NUMBER: 2  
 BUILDING: UNIT 1 REACTOR  
 ELEVATION AND AREA DESCRIPTION: 177' SUMP ROOM  
 CASE DESCRIPTION: ALL CABLES BURNING

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| CEILING/WALL THICKNESS (ft) | CEILING/ WALL MATERIAL | Ao (ft2) | Hc (ft) | Aw (ft2) | Q (kW) |
|-----------------------------|------------------------|----------|---------|----------|--------|
| 2.5                         | CONCRETE               | 17.5     | 5.8     | 2595     | 2125   |

FIRE IS FUEL CONTROLLED

| FIRE DURATION (min) | GAS TEMPERATURE (deg.F) |
|---------------------|-------------------------|
| 1                   |                         |
| 2                   | 724                     |
| 3                   | 730                     |
| 4                   | 736                     |
| 5                   | 741                     |
| 6                   | 745                     |
| 7                   | 750                     |
| 8                   | 754                     |
| 9                   | 759                     |
| 10                  | 763                     |
| 11                  | 768                     |
| 12                  | 772                     |
|                     | 776                     |



CASE NUMBER: 1  
 BUILDING: CONTROL STRUCTURE  
 ELEVATION AND AREA DESCRIPTION: 180' TANK AREA 163  
 CASE DESCRIPTION: ALL CABLES BURNING

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| CEILING/WALL THICKNESS (ft) | CEILING/WALL MATERIAL | A <sub>c</sub> (ft <sup>2</sup> ) | H <sub>c</sub> (ft) | A <sub>w</sub> (ft <sup>2</sup> ) | Q (kW) |
|-----------------------------|-----------------------|-----------------------------------|---------------------|-----------------------------------|--------|
| 3.0                         | CONCRETE              | 21.0                              | 7.0                 | 2772                              | 3380   |

FIRE IS FUEL CONTROLLED

| FIRE DURATION (min) | GAS TEMPERATURE (deg.F) |
|---------------------|-------------------------|
| 5                   |                         |
| 10                  | 877                     |
| 15                  | 914                     |
| 20                  | 951                     |
| 25                  | 988                     |
| 30                  | 1026                    |
|                     | 1063                    |



CASE NUMBER: 1  
 BUILDING: CONTROL STRUCTURE  
 ELEVATION AND AREA DESCRIPTION: 180' TANK AREA 163  
 CASE DESCRIPTION: ALL CABLES BURNING

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| CEILING/WALL THICKNESS (ft) | CEILING/ WALL MATERIAL | Ao (ft <sup>2</sup> ) | Ho (ft) | Aw (ft <sup>2</sup> ) | Q (kW) |
|-----------------------------|------------------------|-----------------------|---------|-----------------------|--------|
| 3.0                         | CONCRETE               | 21.0                  | 7.0     | 2772                  | 4504   |

FIRE IS VENTILATION CONTROLLED

| FIRE DURATION (min) | GAS TEMPERATURE (deg.F) |
|---------------------|-------------------------|
| 5                   | 986                     |
| 10                  | 1043                    |
| 15                  | 1101                    |
| 20                  | 1159                    |

5. EPR/Hypalon Cable Test Data - Questions were raised regarding the temperature at which pyrolysis occurs for the EPR/Hypalon Cables. Data reported in EPRI-NP 1767 indicated one cable sample started to pyrolyze at 297°C. Others were reported at 488°C. To clarify these data, Dr. A Tewarson of FMRC, who conducted the tests, was contacted by telephone. Dr. Tewarson indicated that one sample did start to "give off gases" at around 300°C (570°F) but not in sufficient quality or quantity to support piloted ignition. Dr. Tewarson said a range of 450-500°C is where piloted ignition could occur. He further indicated that even with very high radiant heat flux, 70kW/m<sup>2</sup>, they could not create autoignition in the EPR/Hypalon cables.

Relating these test data to the potential for secondary fires in areas where spreading cables fires were quantified, of the 7 areas evaluated for fuel controlled spreading cables fires, only 3 exceeded 800°F (426°C). The other four areas resulted in temperatures calculated between 395°F and 650°F. For the 3 areas exceeding 800°F, two are provided with automatic sprinkler protection and the third was shown to have a self-supporting floor slab not requiring the beams for support.

Based on the test data for EPR/Hypalon and the specific results for Limerick, the potential for secondary fires need not be further evaluated.



6. Ventilation Parameters - Calculations 1 and 2 for the RHR heat exchanger and pump rooms were performed using two doors open as the ventilation flow path. The selection of two doors open is conservative for these cases and would be conservative for any fire area location containing safe shutdown equipment. The RHR rooms have two watertight doors at elevation 177' and two steamtight doors at elevation 201'. All four doors are electrically supervised and monitored at the plant security panel. Whenever a door in a fire barrier is inoperable plant technical specifications require a fire watch. Considering that these doors have multiple design and operational functions including not only fire but security and plant safety (flood and steam line break) the likelihood of even one door being open for longer than the time it takes for personnel access is remote.

GJR/bls/07318404

7. Program to assure that changes to plant fire protection features are controlled. The Limerick Fire Protection Evaluation Report will be maintained as a working document for the life of the plant. Engineering and Research Department Procedures will require that all project engineers evaluate the effect of every proposed modification on fire protection features and safe shutdown separation. All modifications are accompanied by a safety evaluation. The Project Engineer will include in the safety evaluation a conclusion addressing the effects of the modification on fire protection features. The conclusion will be based on review of a fire protection checklist which includes an evaluation of possible increased combustible loadings, relocation of safe shutdown equipment, and the effect of the modification on existing fire protection features, including sprinklers and fire detectors.

A certain margin of safety has already been accounted for in our combustible loading and fire temperature calculations by doubling the quantity of fixed lubricant or fuel oil and adding 10% to the cable quantity.