

PLC *Professional Loss Control, Inc.*

STRUCTURAL STEEL ANALYSIS

for

LIMERICK GENERATING STATION

Control Structure El. 200'

East Chiller Equipment Room, Room 263

Fire Area 1M

December 20, 1983

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LIMERICK GENERATING STATION

1. AREA DESCRIPTION

The area under consideration is the East Chiller Equipment Room, Room 263, on the 200' elevation of the Control Structure (Fire Area 1M). The bounding walls of the room are of reinforced concrete and concrete masonry unit construction with an average thickness of 2.5 ft. The total surface area for heat transfer is 4872 ft² (see Attachment A for sketch and surface area calculations).

2. COMBUSTIBLE LOADING

Combustible loading in this area consists of cable insulation in cable trays. The total surface area of the cable trays is 160 ft² with an average combustible loading of 2.0 lbs/ft² of cable tray surface area. There are no combustible liquids in this area.

3. VENTILATION PARAMETERS

There are three doors which enter the area. Two of the doors are double doors, each measuring 8' high by 10' wide. One door is located in the east wall while the other door is located in the west wall. The third door is 3' wide by 7' high and is located in the north wall.

4. CASES EXAMINED

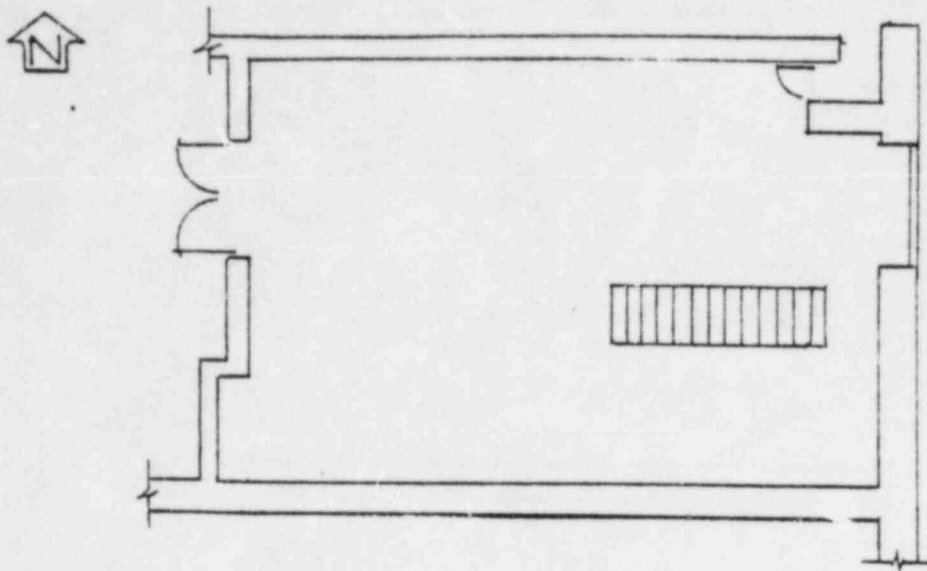
With the light combustible loading in this area, the assumption that all cables are burning simultaneously would present the worst case. With all cable trays burning, a surface area of 160 ft² would be involved. This corresponds to a heat output of approximately 2828 kW. With all cables assumed to be burning simultaneously, the duration of the fire would be

$$2.0 \text{ lbs/ft}^2 \div \frac{.1 \text{ lbs}}{\text{min/ft}^2} = 20 \text{ minutes.}$$

5. RESULTS

With all the cable trays in the area burning simultaneously and one 3' x 7' door open, the resulting fire was fuel controlled. A gas temperature of 363°F was achieved after 20 minutes, which is below the critical temperature for the structural steel (see Attachment B). Since the fire was fuel

controlled with only one door open, the opening of additional doors into the area will not effect the burn rate or final gas temperature. The location of cable trays relative to structural steel members was examined in the area. No cable trays were positioned so as to present a localized heating exposure to the structural steel.



Control Structure El. 200'
East Chiller Equipment Room 263

Surface Area Calculation

| | | |
|--------------------------------------|-------------|----------------------|
| <u>Walls</u> | | |
| North wall | (56' x 16') | 896 ft ² |
| East wall | (35' x 16') | 560 ft ² |
| South wall | (56' x 16') | 896 ft ² |
| West wall | (35' x 16') | 560 ft ² |
| | | <hr/> |
| | | 2912 ft ² |
| | | |
| <u>Ceiling</u> | (56' x 35') | <hr/> |
| | | 1960 ft ² |
| Total Surface Area for Heat Transfer | | <hr/> |
| | | 4872 ft ² |

ATTACHMENT A

CASE NUMBER: 1
 BUILDING: CONTROL STRUCTURE
 ELEVATION AND AREA DESCRIPTION: 200' EAST CHILLER EQ. RM. FIRE ZONE 1M
 CASE DESCRIPTION: ONE DOOR OPEN ALL CABLES BURNING

| CEILING/WALL THICKNESS (ft) | CEILING/ WALL MATERIAL | Ao (ft2) | Ho (ft) | Aw (ft2) | Q (kW) |
|-----------------------------------|---------------------------|-------------|------------|-------------|-----------|
| 2.5 | CONCRETE | 21.0 | 7.0 | 4872 | 2828 |

FIRE IS FUEL CONTROLLED

FIRE DURATION
(min)

GAS TEMPERATURE
(deg.F)

| | |
|----|-----|
| 1 | 138 |
| 2 | 165 |
| 3 | 185 |
| 4 | 203 |
| 5 | 218 |
| 6 | 232 |
| 7 | 244 |
| 8 | 256 |
| 9 | 267 |
| 10 | 278 |
| 11 | 288 |
| 12 | 297 |
| 13 | 306 |
| 14 | 315 |
| 15 | 324 |
| 16 | 332 |
| 17 | 340 |
| 18 | 348 |
| 19 | 355 |
| 20 | 363 |