

PLC *Professional Loss Control, Inc.*

STRUCTURAL STEEL ANALYSIS

for

LIMERICK GENERATING STATION

Unit 1 Reactor Building El. 217'

Safeguard System Area Room 309

Fire Area 43

December 20, 1983

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LIMERICK GENERATING STATION

1. AREA DESCRIPTION

The area under consideration is the Safeguard System Area, Room 309, on the 217' elevation of the Unit 1 Reactor Building (Fire Area 43). Bounding walls to the north, south, and east are of reinforced concrete construction while the west wall is of concrete masonry unit construction. The average wall thickness is 2 ft. The total surface area for heat transfer is 13,777 ft² (see Attachment A for sketch and surface area calculations).

2. COMBUSTIBLE LOADING

Combustible loading in this area consists of two cable trays, 10CRA and 10IWA, which are located along the south wall of the area. The total surface area of the cable trays is 460 ft² with an average combustible loading of 6.5 lbs/ft² of cable tray surface area. There are no combustible liquids in this area.

3. VENTILATION PARAMETERS

Two steam tight doors each measuring 3' wide by 7' high enter this area. One door is located in the east wall while the other door is located in the west wall.

4. CASES EXAMINED

Two cases were examined for this area. The first case assumed all cable trays in the area to be burning simultaneously with one door open. The second case assumed all cable trays burning simultaneously with two doors open.

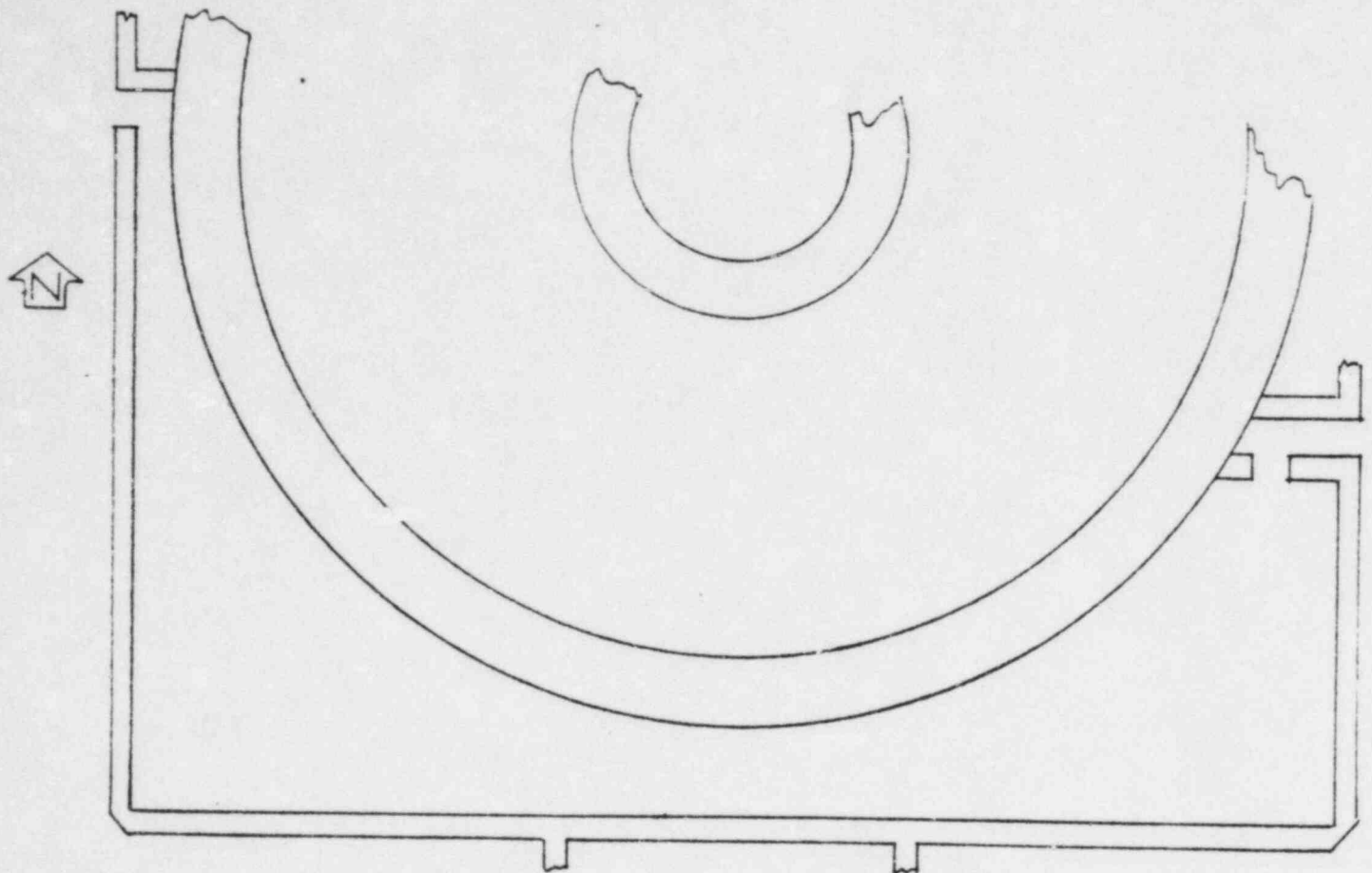
5. RESULTS

Case number one assumed one 3' x 7' door open with all cables burning simultaneously. This resulted in a ventilation controlled fire with a heat output of 4504 kW and a duration of 120 minutes. The gas temperature at this time would be 472°F which is below the critical temperature of the structural steel (see Attachment B).

Case number two assumed both 3' x 7' doors open with all cables burning simultaneously. This resulted in a fuel controlled fire with a heat output of 8123 kW. The fire duration would be $6.5 \text{ lbs/ft}^2 \div \frac{.1 \text{ lbs}}{\text{min/ft}^2} = 65 \text{ minutes}$.

The gas temperature at this time would be 604°F, which is below the critical temperature of the structural steel (see Attachment B).

The location of the 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 structural steel.



Unit 1 Reactor Building El 217'
Safeguard System Area Room 309

Surface Area Calculation

Walls

North wall	(140' x 35')	4900 ft ²
South wall	(107' x 35')	3745 ft ²
East wall	(31' x 35')	1085 ft ²
West wall	(62' x 35')	2170 ft ²
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		11,900 ft ²

Ceiling

Area 1	(7' x 107')	749 ft ²
Area 2	1/2(32' x 36')	576 ft ²
Area 3	1/2(48' x 23')	552 ft ²
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Total Surface Area for Heat Transfer	13,777 ft ²
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CASE NUMBER: 1
 BUILDING: UNIT 1 REACTOR BUILDING
 ELEVATION AND AREA DESCRIPTION: 217' SAFEGUARD SYSTEM AREA ROOM 309
 CASE DESCRIPTION: ONE DOOR OPEN ALL CABLES BURNING

CEILING/WALL THICKNESS (ft)	CEILING/ WALL MATERIAL	Ao (ft2)	Ho (ft)	Aw (ft2)	Q (kW)
2.0	CONCRETE	21.0	7.0	13777	4504

FIRE IS VENTILATION CONTROLLED

FIRE DURATION (min)	GAS TEMPERATURE (deg.F)
10	188
20	236
30	272
40	303
50	331
60	355
70	378
80	399
90	419
100	438
110	455
120	472

CASE NUMBER: 2

BUILDING: UNIT 1 REACTOR BUILDING

ELEVATION AND AREA DESCRIPTION: 217' SAFEGUARD SYSTEM AREA ROOM 309

CASE DESCRIPTION: TWO DOORS OPEN ALL CABLES BURNING

CEILING/WALL THICKNESS (ft)	CEILING/ WALL MATERIAL	Ao (ft ²)	Ho (ft)	Aw (ft ²)	Q (kW)
2.0	CONCRETE	42.0	7.0	13777	8123

FIRE IS FUEL CONTROLLED

FIRE DURATION
(min)

GAS TEMPERATURE
(deg.F)

5	220
10	281
15	328
20	367
25	402
30	433
35	462
40	489
45	514
50	538
55	561
60	583
65	604