

PALISADES NUCLEAR POWER STATION

DESIGNER & CONTRACTOR
 Nuclear Steam Supply System and Nuclear Fuel:
 Combustion Engineering, Inc.
 Balance of Plant, Systems and Structures:
 Bechtel Corporation
OWNER & OPERATOR
 Consumers Power Co., Jackson, Michigan
LOCATION
 South Haven, Michigan
TYPE
 Pressurized water; fuel-slight enriched UO₂; Zircaloy clad;
 chemical shim; 2 650 MW(th), 845 MW(e)

CONSTRUCTION SCHEDULE
 Site work started August, 1966
 Reactor critical January, 1970
 Full power operation Spring, 1970

CAPACITY
 Gross generation 845 MW(e)
 Net electrical output 830 MW(e)
 Overall station net efficiency 830/2 650 = 31.4%

REACTOR CORE
 Reactor output 2 650 MW(th)
 Core diameter 136.7 in equivalent (3.48 m)
 Core height 132 in (3.35 m)
 Number of fuel assemblies 204
 Lattice square pitch 0.550 in (14 mm)

FUEL
 Fuel material Slightly enriched UO₂
 Total quantity of UO₂ 210 524 lb (95 480 kg)
 Discharge irradiation 10 180 MWd/te average
 Number of rods/element 212
 Pellet diameter 0.359 in (9.12 mm)
 Clad material Zircaloy-4
 Clad thickness 0.024 in (0.61 mm)
 Enrichment 1.65 W/O

CONTROL
 Number of control rods 41
 Number of part length rods 4
 Absorber material Ag-In-Cd
 Rod type Rack and pinion
 Max. rod span 12 x 12 cruciform
 Stroke length 132 in (3.35 m)

THERMAL DATA
 Steam flow 9.4 x 10⁶ lb/hr (4.2 x 10⁶ kg/hr)
 Steam pressure 770 psia (54.4 kg/cm²)
 Steam temperature:
 Saturated steam operation 513.8 F (267 C)
 Feed water temperature 417 F (214 C)
 Max. fuel temperature:
 Saturated steam operation 1 800 F, UO₂ (982 C)

REACTOR PRESSURE VESSEL
 Inside diameter 172 in (4.37 m)
 Inside height 40 ft (12.2 m)
 Average wall thickness 8 1/2 in (217 mm)
 Thickness of SS cladding 1/2 in (6.35 mm)
 Design pressure 2 500 psia (175.75 kg/cm²)
 Design temperature 650 F (343 C)
 Material SA-302 B
 Weight (incl. vessel head) 847 500 lb (384 400 kg)

TURBINE
 Type Tandem-compound, 1 HP 2 LP turbines
 Speed 1 800 rev/min
 Boiler steam at turbine inlet:
 Pressure 770 psia (54.1 kg/cm²)
 Temperature 513.8 F (267.7 C)

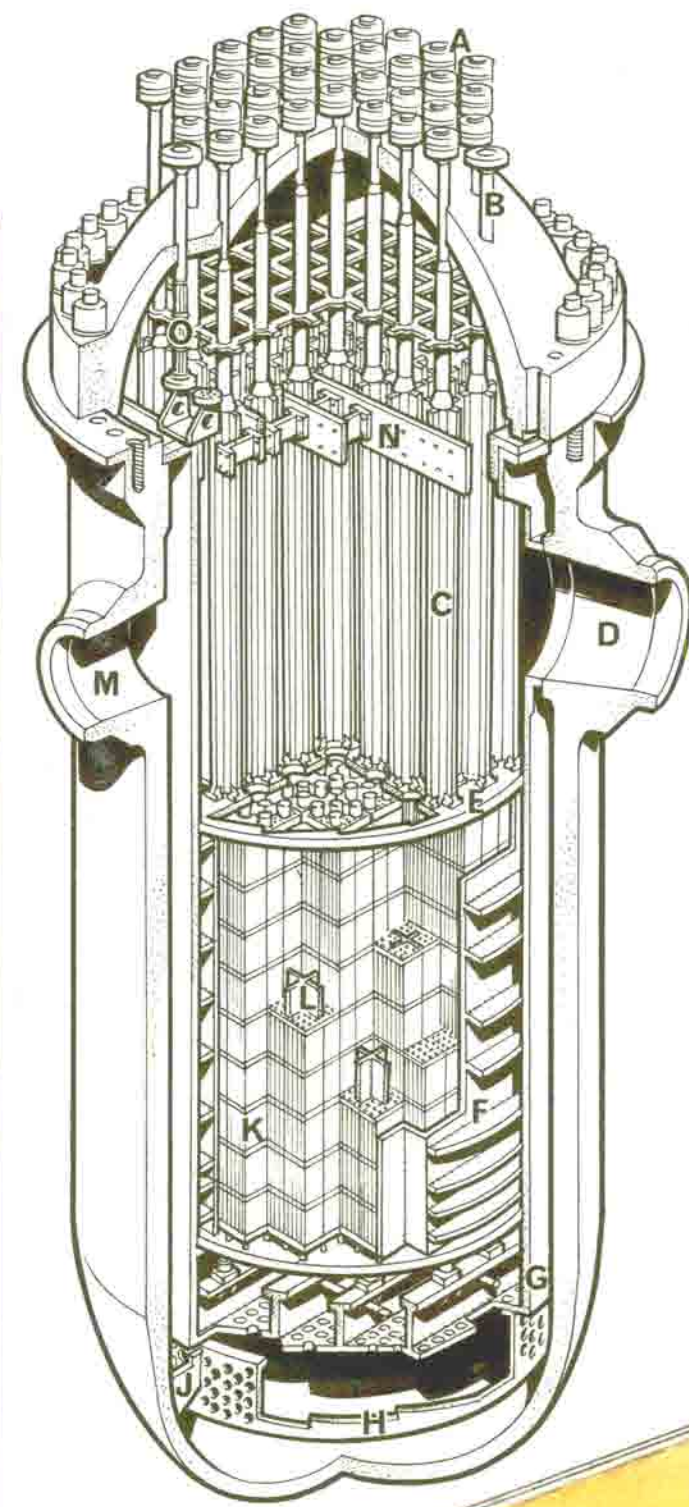
CONDENSER
 Condenser pressure:
 Saturated steam operation 1.8 in Hg (4.5 mm)
 Cooling water temperature 65 F (18.3 C)
 Cooling water flow 390 000 US gal/min (1 500 000 l/min or 333 000 UK gal/min)
 511 490 ft³ (47 500 m³)
 27 976

Cooling area
 Number of tubes 70 ft (21.3 m)
 Tube length 1 in dia
 Tube dimension Admiralty, 304 S.S.

GENERATOR
 Design Hydrogen inner cooled
 Speed 1 800 rev/min
 Rating 955 MVA
 Terminal voltage 21 kV
 Power factor 0.85
 Frequency 60 c/s
 Coolant H₂

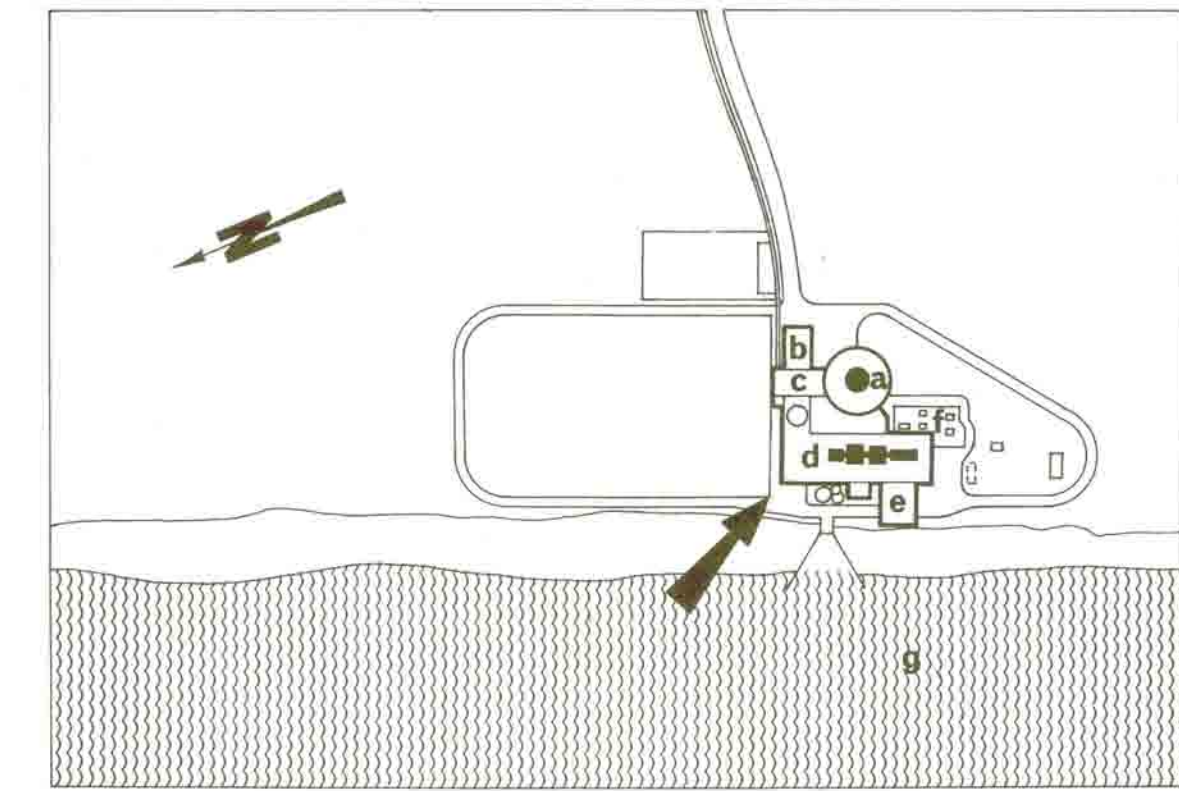
MAIN TRANSFORMER
 Rated power 890 MVA
 High voltage rating 345 kV
 Low voltage (2 windings) 21 kV

CONTAINMENT
 Type Reinforced concrete, prestressed, post-tensioned
 Diameter 118 ft ID (35.36 m)
 Height 190.5 ft inside (58.1 m)
 Wall thickness 3.5 ft (1.7 m)
 Material Concrete, crushed dolomitic limestone aggregate
 Design pressure 55 psig (3.87 kg/cm²)

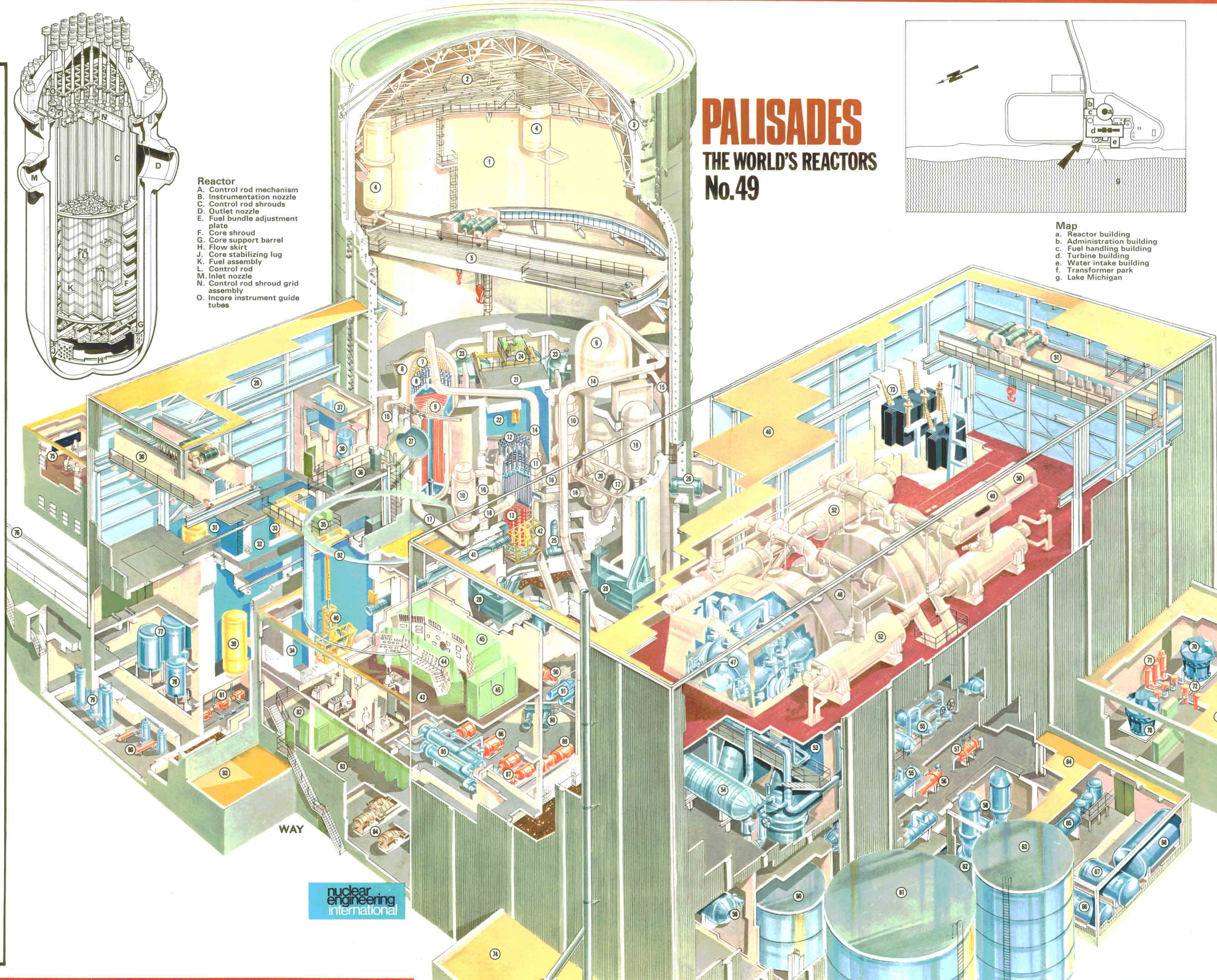


- Reactor**
 A. Control rod mechanism
 B. Instrumentation nozzle
 C. Control rod shrouds
 D. Outlet nozzle
 E. Fuel bundle adjustment plate
 F. Core shroud
 G. Core support barrel
 H. Flow skirt
 J. Core stabilizing lug
 K. Fuel assembly
 L. Control rod
 M. Inlet nozzle
 N. Control rod shroud grid assembly
 O. Incore instrument guide tubes

PALISADES THE WORLD'S REACTORS No.49



- Map**
 a. Reactor building
 b. Administration building
 c. Fuel handling building
 d. Turbine building
 e. Water intake building
 f. Transformer park
 g. Lake Michigan



1. Reactor building
2. Reactor building containment spray piping
3. Containment vessel stressing tendons
4. Safety injection tanks (4)
5. Reactor building crane
6. Steam generators (2)
7. Dryer screens
8. Centrifugal separators
9. Tube bundle
10. Primary coolant pumps (4)
11. Reactor vessel
12. Control rod drives
13. Reactor core
14. Main steam pipes (2)
15. Feedwater pipes (2)
16. Primary steam pipes (2), reactor—steam generators
17. Primary return pipes (4), steam generators—coolant pumps
18. Primary return pipes (4), coolant pumps—reactor
19. Pressurizer
20. Pressurizer quench tank
21. Missile shield
22. Reactor internals storage pool
23. Clean waste receiver tanks (4)
24. Refuelling machine pond bridge
25. Access tunnel
26. Emergency personnel access
27. Equipment access door
28. Containment coolers
29. Fuel handling building
30. Fuel handling building crane
31. Cask washdown pit
32. Spent fuel pool
33. New fuel storage
34. Future fuel tilt machine pit
35. Fuel handling machine
36. Drum winch platform
37. Exhaust unit
38. Cooling water surge tank
39. Spent fuel cask
40. Fuel tilt machine
41. Fuel transfer tube
42. Reactor building fuel tilt machine
43. Control room
44. Control console
45. Indicating panels (2)
46. Turbine building
47. H.P. turbine
48. L.P. turbine (2)
49. Generator
50. Exciter
51. Turbine building crane
52. Moisture separators and reheaters (4)
53. Condenser
54. Moisture separator and heater drain tank
55. Feedwater heaters (8)
56. Air ejector
57. Gland steam condenser
58. Condensate pumps (2)
59. Lubricating oil reservoir
60. Lubricating oil storage tank (clean and dirty)
61. Condensate storage tank
62. Domestic water tank
63. Primary system make-up storage tank
64. Water treatment building
65. Domestic water accumulator
66. Acid storage tank
67. Caustic storage tank
68. Hypochlorite storage tank
69. Water intake building
70. Circulating water pumps (2)
71. Service water pumps
72. Fire pumps
73. Transformer yard
74. Boiler room
75. Lecture room
76. Railway
77. Boric acid tanks
78. Treated and filtered waste monitor tanks
79. Waste gas decay tanks
80. Waste gas compressors
81. Monitoring pumps
82. Switch gear room
83. Cable spreading room
84. Diesel generators
85. Shut-down cooling heat exchangers
86. H.P. safety injection pumps
87. Containment spray pumps
88. Cooler unit
89. L.P. safety injection pump
90. Component cooling pumps
91. Component cooling heat exchanger
92. Safety injection refuelling water tank
93. Baler room



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