

CHAPTER 10

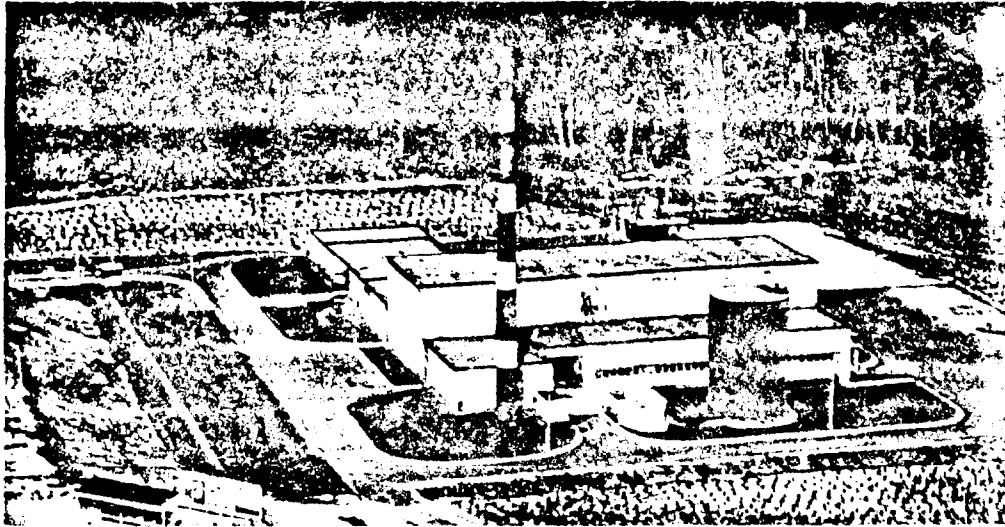
CANDU REACTORS

In the following pages we list some tabular data and show some graphs and figures pertaining to CANDU reactors. Most of this materials is self-explanatory and, hence, the descriptive captions have been kept to a minimum.

	Pickering (nuclear)	Lambton (coal)
<u>PARAMETERS</u>		
Capacity	4 x 514 MW	4 x 495 MW
Life	30 years	30 years
Interest rate	8%	8%
Capital cost	\$746 M	\$264 M
Station capacity factor	80%	80%
<u>UNIT ENERGY COST</u>		
	m/kWhr	m/kWhr
Capital	4.6	1.69
Operation and maintenance	.54	.53
Heavy water upkeep	.20	--
Fuel	.88	4.82
TOTAL	6.22	7.04

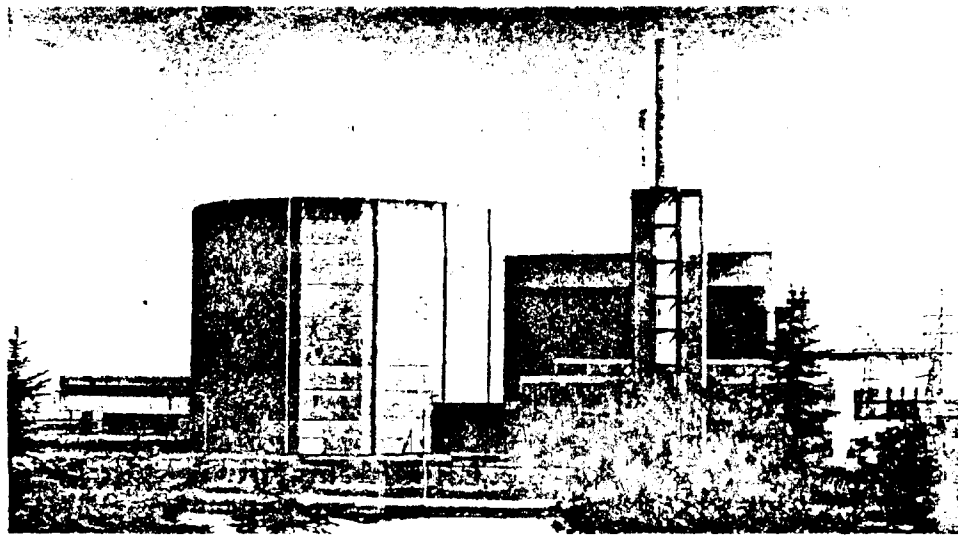
TABLE 10.2: Estimated comparison between nuclear and coal fired plant (1972 data).

CANDU Power Stations



*NPD CANDU-PHW -
22 MWe (net) 1962*

*Douglas Point CANDU-PHW
- 200 MWe (net) 1966*



*Gentilly CANDU-BLW -
250 MWe (net) 1971*

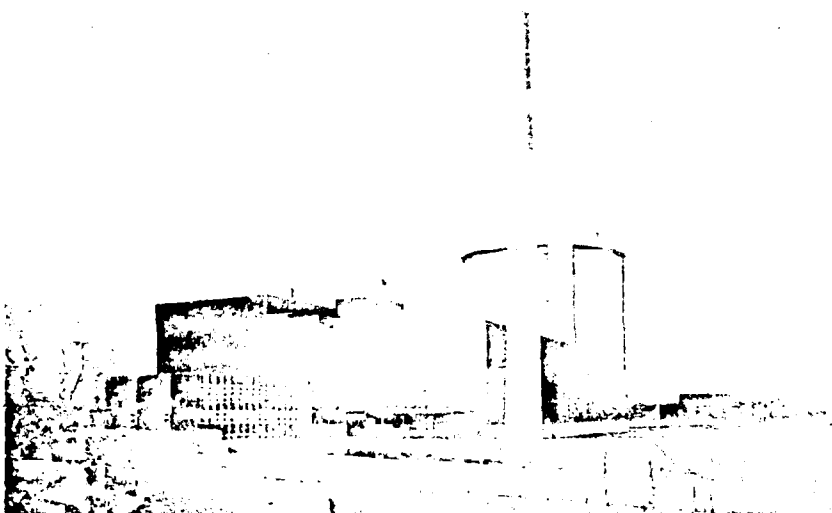
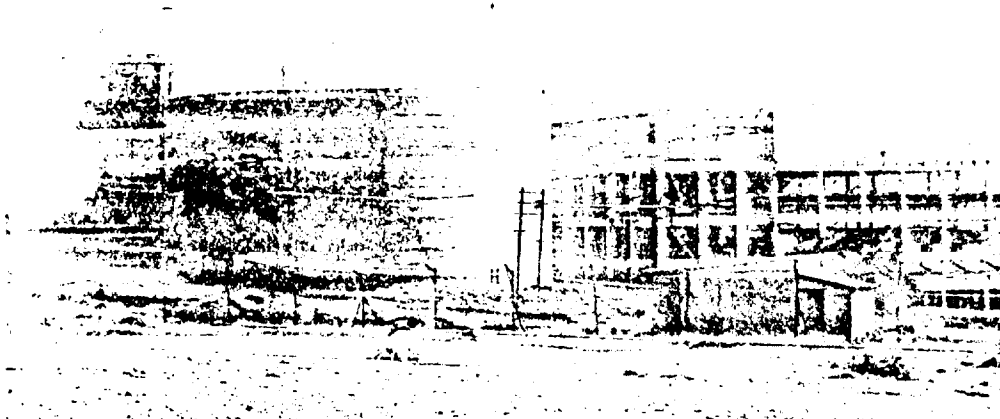
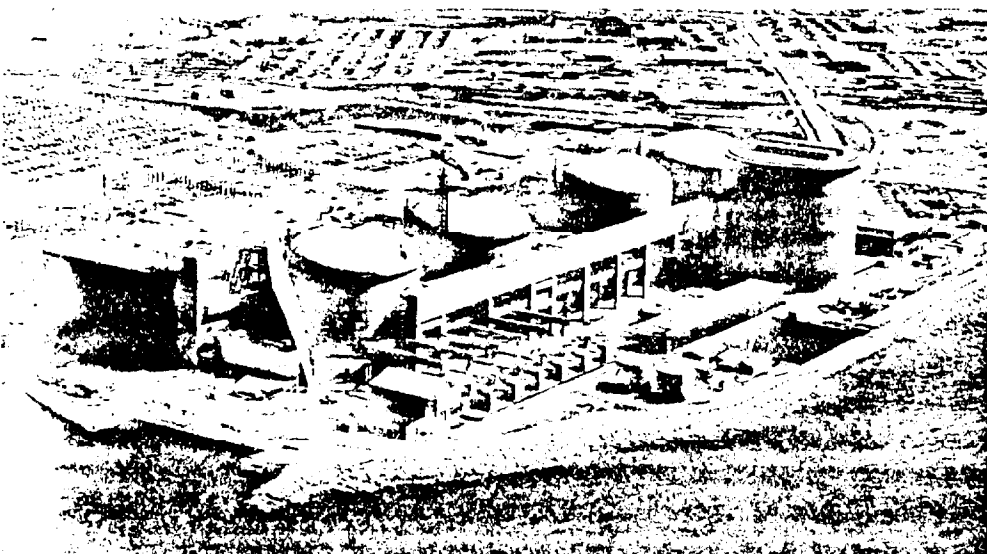
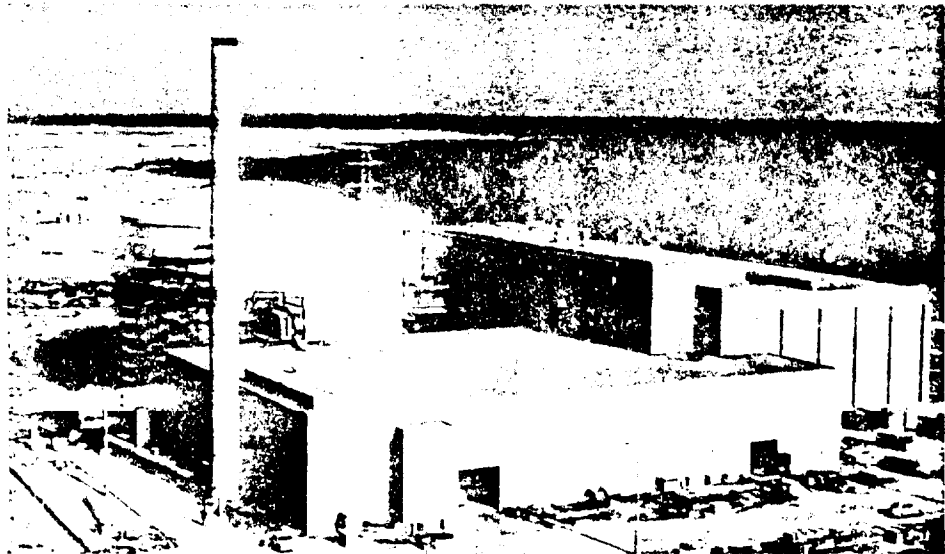


Fig. 10.1 CANDU Power Stations (1)

*Rajasthan Atomic Power
Project CANDU-PHW –
2 x 200 MWe (net)
(scheduled 1972, 1974)*



*KANUPP CANDU-PHW
– 125 MWe (net) 1971*



*Pickering CANDU-PHW –
4 x 500 MWe (net)
Units 1, 2 1971, Units 3 and
4 scheduled for 1972, 1973*

Fig. 10.2 CANDU Power Stations (2)

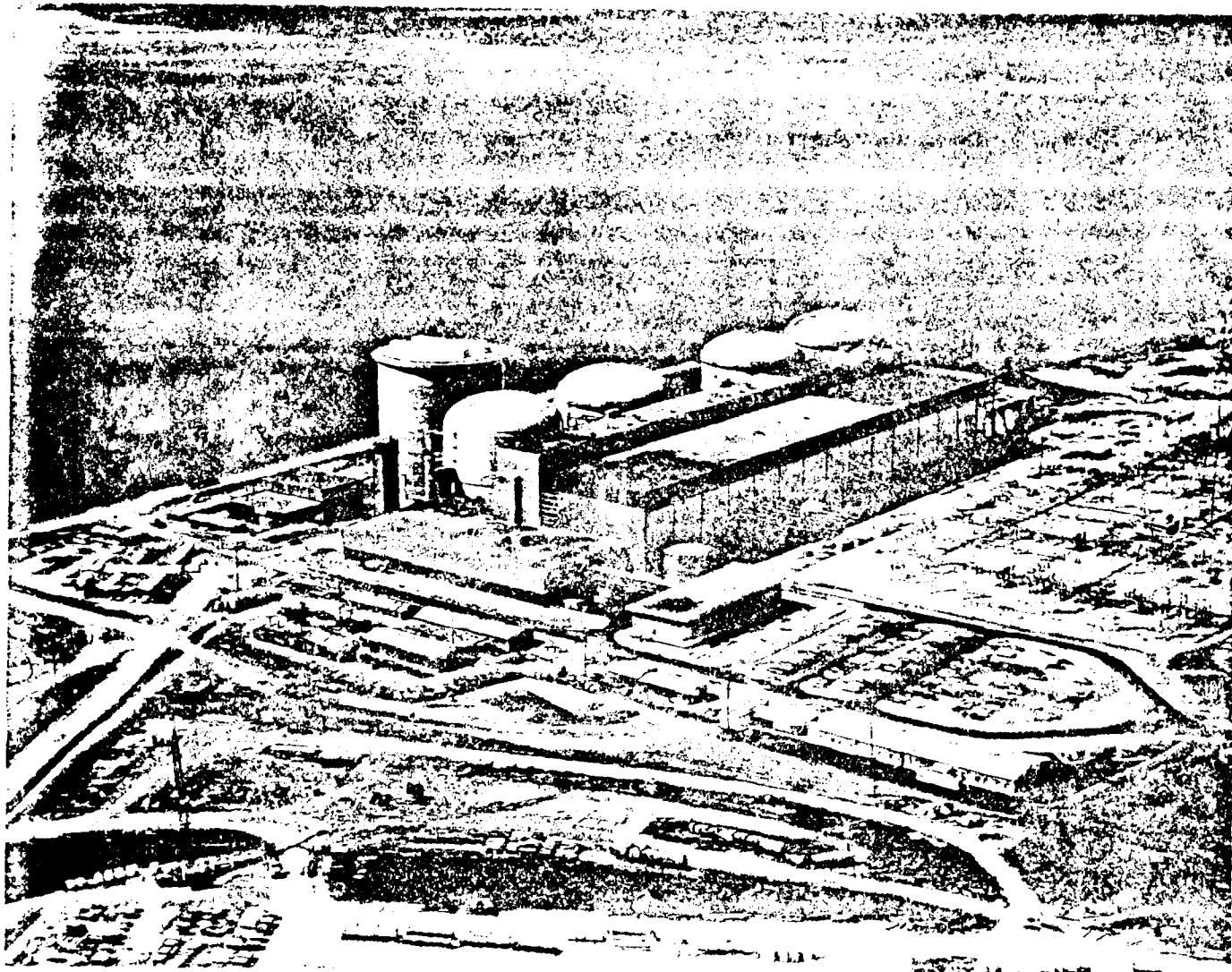
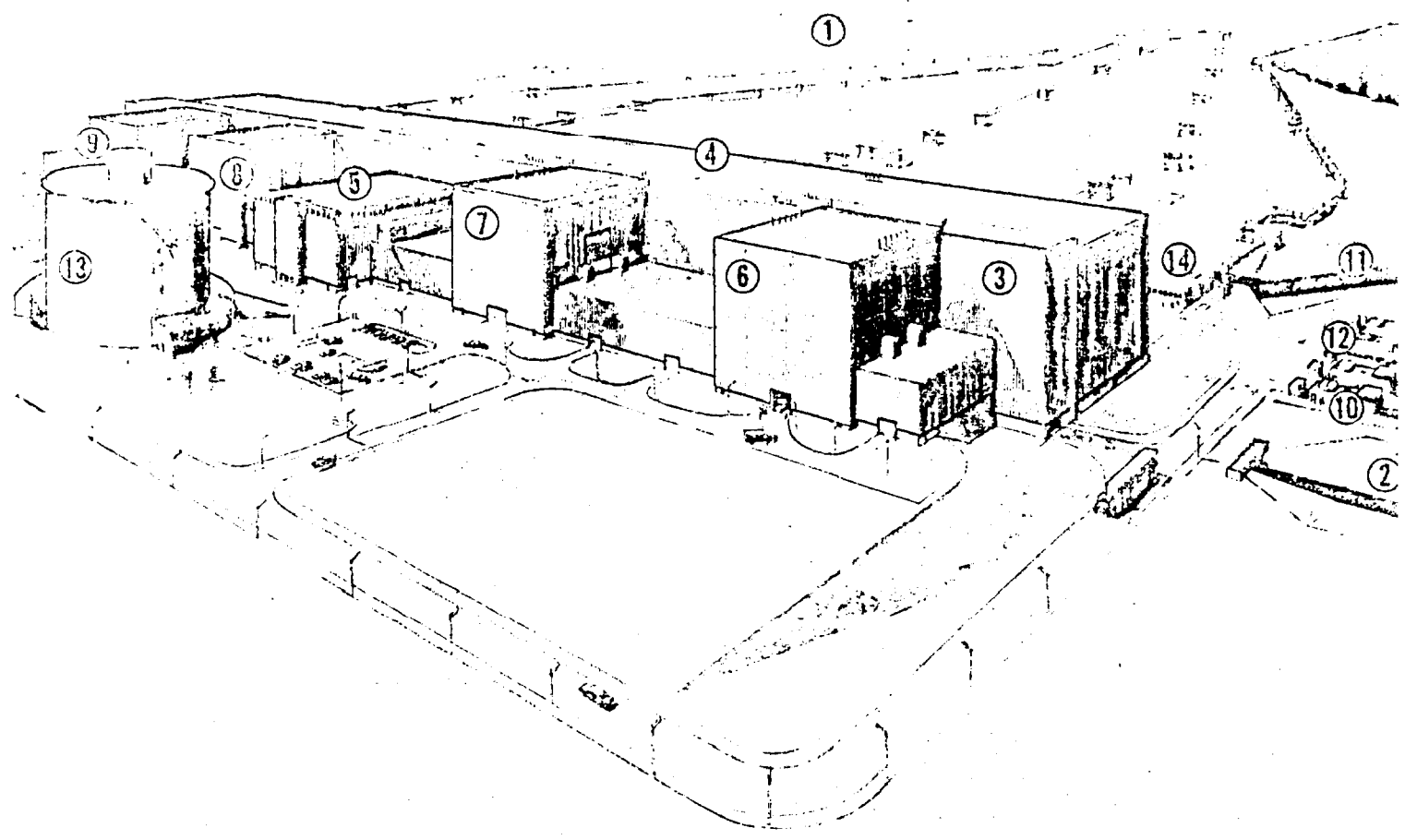
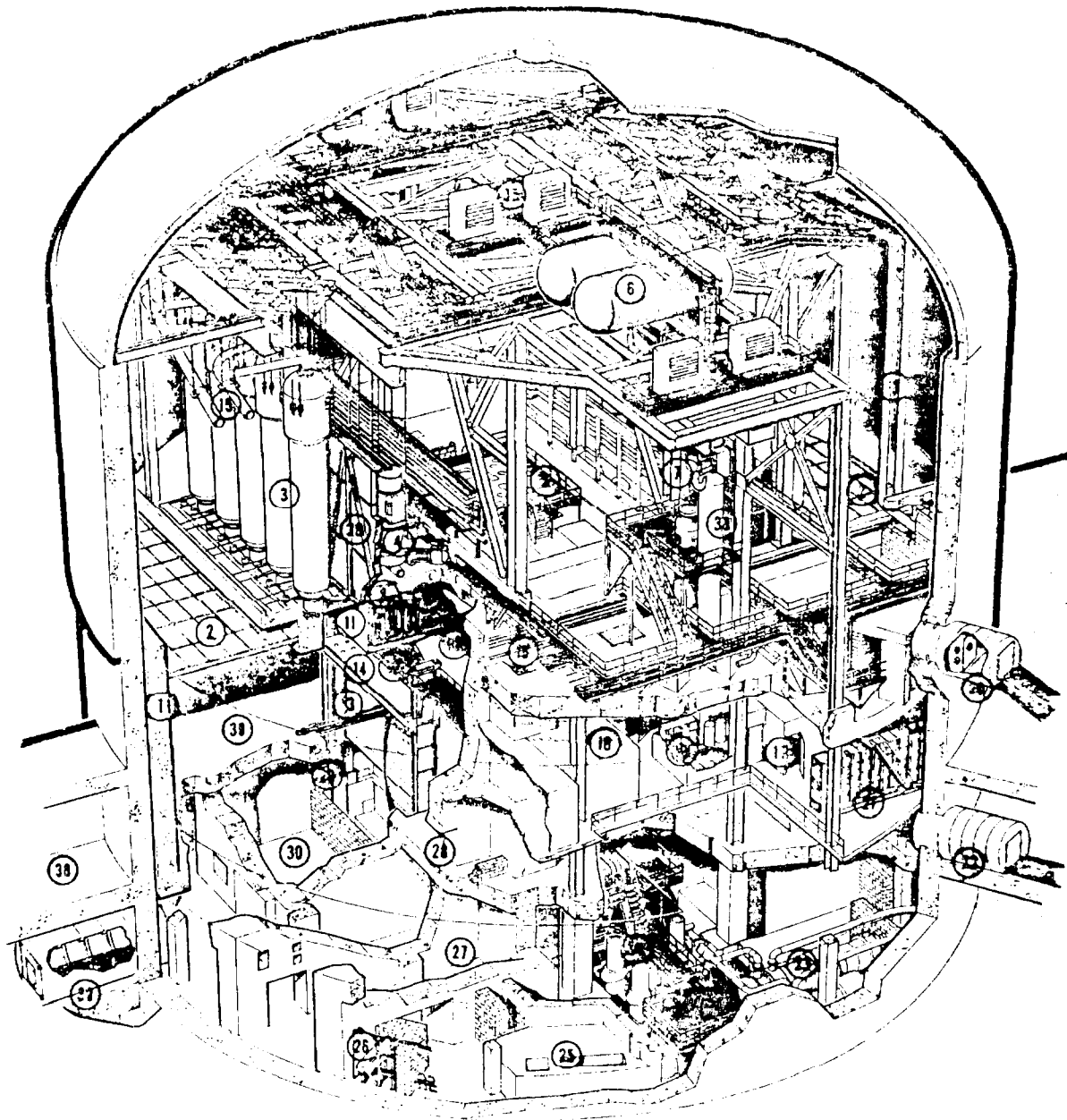


Fig. 10.3: Pickering Generating Station



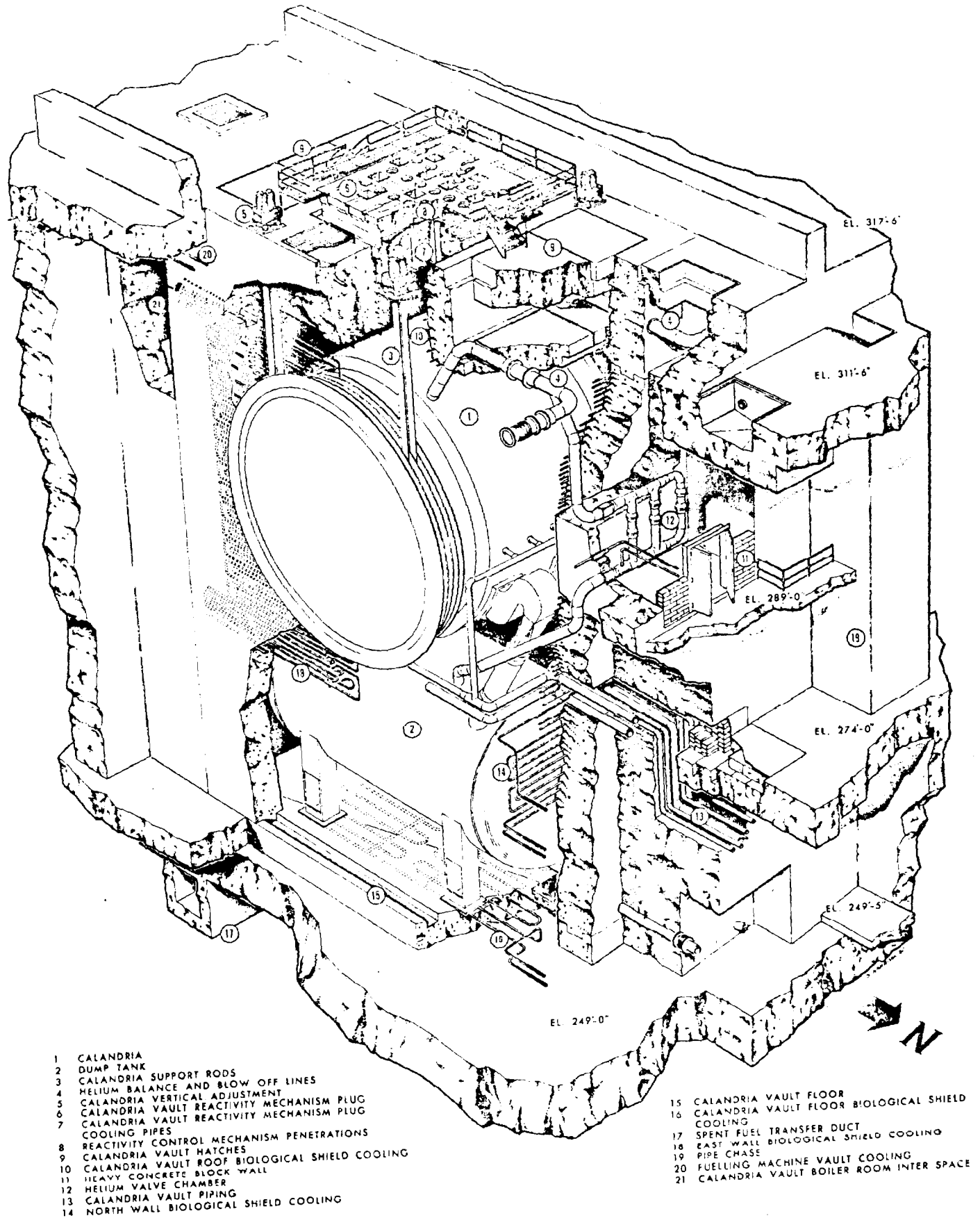
- | | |
|--------------------------|--------------------------------|
| 1 SWITCHYARD | 8 NO. 3 REACTOR BUILDING |
| 2 DISCHARGE DUCT | 9 NO. 4 REACTOR BUILDING |
| 3 POWER HOUSE | 10 STANDBY AUXILIARY GENERATOR |
| 4 TURBINE HALL | 11 INTAKE |
| 5 SERVICE BUILDING | 12 FUEL OIL PUMPHOUSE |
| 6 NO. 1 REACTOR BUILDING | 13 VACUUM BUILDING |
| 7 NO. 2 REACTOR BUILDING | 14 PUMPHOUSE UNIT 1 |

Fig. 10.4: Bruce Generating Station - Looking South



- | | | | | | |
|----|--|----|------------------------------------|----|--------------------------------------|
| 1 | PRESSURE WALLS | 12 | REACTOR END FITTINGS | 24 | MODERATOR PUMPS |
| 2 | BLOWOUT PANELS | 13 | FUELLING MACHINE HEAD | 25 | MODERATOR AND ION EXCHANGE COLUMNS |
| 3 | STEAM GENERATORS | 14 | FUELLING MACHINE BRIDGE | 26 | SPENT RESIN DRYING TANK |
| 4 | PRIMARY HEAT TRANSPORT PUMPS | 15 | MAIN STEAM SUPPLY PIPES | 27 | FUELLING MACHINE AUXILIARIES (EAST) |
| 5 | CONTROL AND SHUT-OFF RODS | 16 | PIPE CHASE | 28 | FUELLING MACHINE VAULT DOORWAY |
| 6 | FEED WATER RESERVE TANKS | 17 | INSTRUMENTATION ROOM (WEST) | 29 | FUEL TRANSFER PORT |
| 7 | BOILER ROOM CRANE | 18 | D ₂ O COLLECTION ROOM | 30 | FUELLING MACHINE SERVICE ROOM (EAST) |
| 8 | PRIMARY HEAT TRANSPORT REACTOR OUTLET HEADER | 19 | ZONE CONTROL SYSTEM ROOM | 31 | FUELLING MACHINE VAULT (EAST) |
| 9 | PRIMARY HEAT TRANSPORT REACTOR INLET HEADER | 20 | BOILER ROOM AIRLOCK | 32 | FUELLING MACHINE AIRLOCK |
| 10 | FEEDER PIPES | 21 | REACTOR CONTROL DISTRIBUTION FRAME | 33 | REACTOR AUXILIARIES BAY |
| 11 | FEEDER INSULATION CABINET | 22 | MAIN EQUIPMENT AIRLOCK | 34 | BLEED CONDENSER AND BLEED COOLER |
| | | 23 | MODERATOR HEAT EXCHANGERS | 35 | BOILER ROOM COOLING UNITS |

Fig. 10.5: Pickering Reactor Building - General Arrangement



- 1 CALANDRIA
- 2 DUMP TANK
- 3 CALANDRIA SUPPORT RODS
- 4 HELIUM BALANCE AND BLOW OFF LINES
- 5 CALANDRIA VERTICAL ADJUSTMENT
- 6 CALANDRIA VAULT REACTIVITY MECHANISM PLUG
- 7 CALANDRIA VAULT REACTIVITY MECHANISM PLUG COOLING PIPES
- 8 REACTIVITY CONTROL MECHANISM PENETRATIONS
- 9 CALANDRIA VAULT HATCHES
- 10 CALANDRIA VAULT ROOF BIOLOGICAL SHIELD COOLING
- 11 HEAVY CONCRETE BLOCK WALL
- 12 HELIUM VALVE CHAMBER
- 13 CALANDRIA VAULT PIPING
- 14 NORTH WALL BIOLOGICAL SHIELD COOLING

- 15 CALANDRIA VAULT FLOOR
- 16 CALANDRIA VAULT FLOOR BIOLOGICAL SHIELD COOLING
- 17 SPENT FUEL TRANSFER DUCT
- 18 EAST WALL BIOLOGICAL SHIELD COOLING
- 19 PIPE CHASE
- 20 FUELLING MACHINE VAULT COOLING
- 21 CALANDRIA VAULT BOILER ROOM INTER SPACE

Fig. 10.6: Pickering Calandria Vault

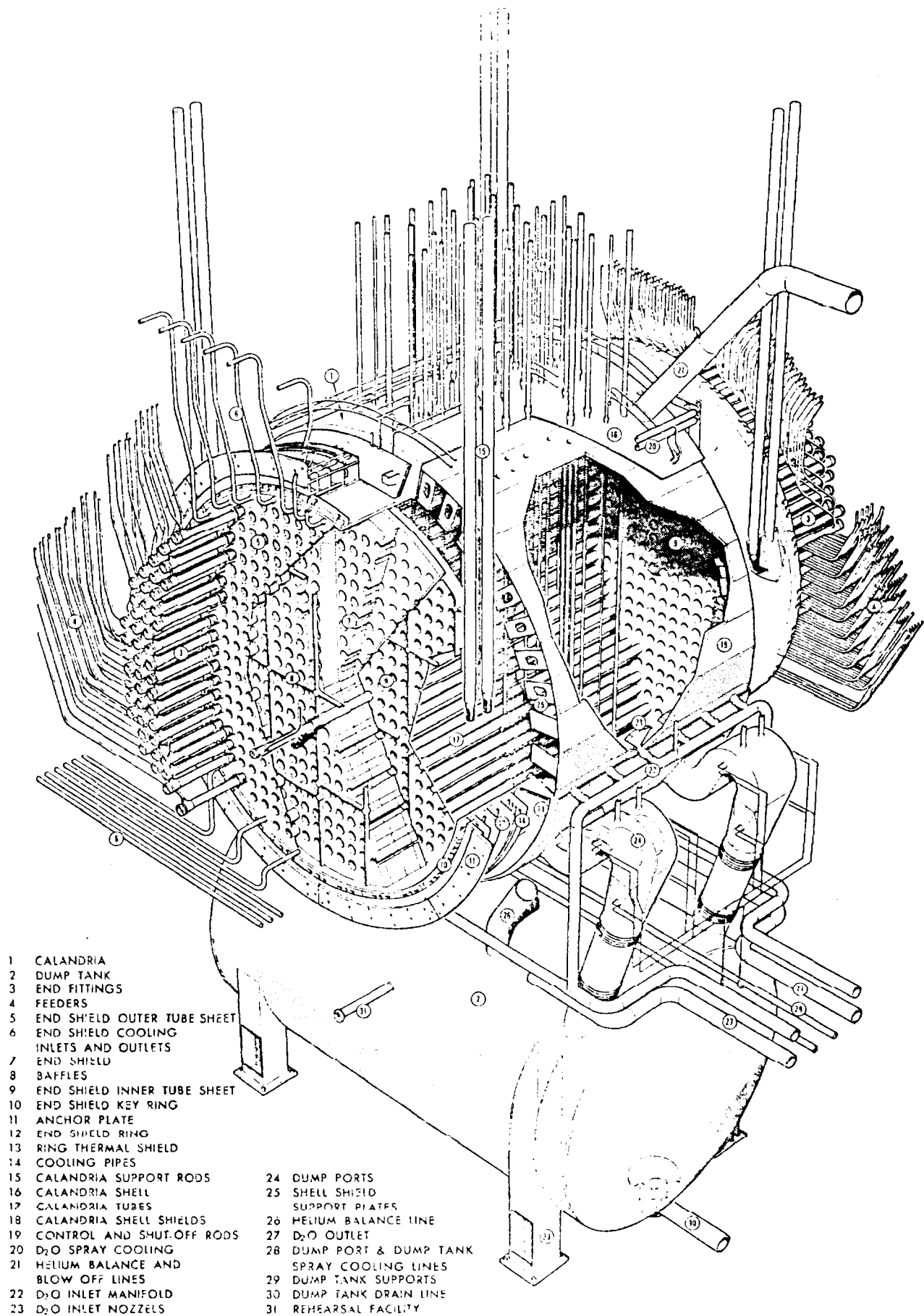


Fig. 10.7: Pickering Reactor Arrangement

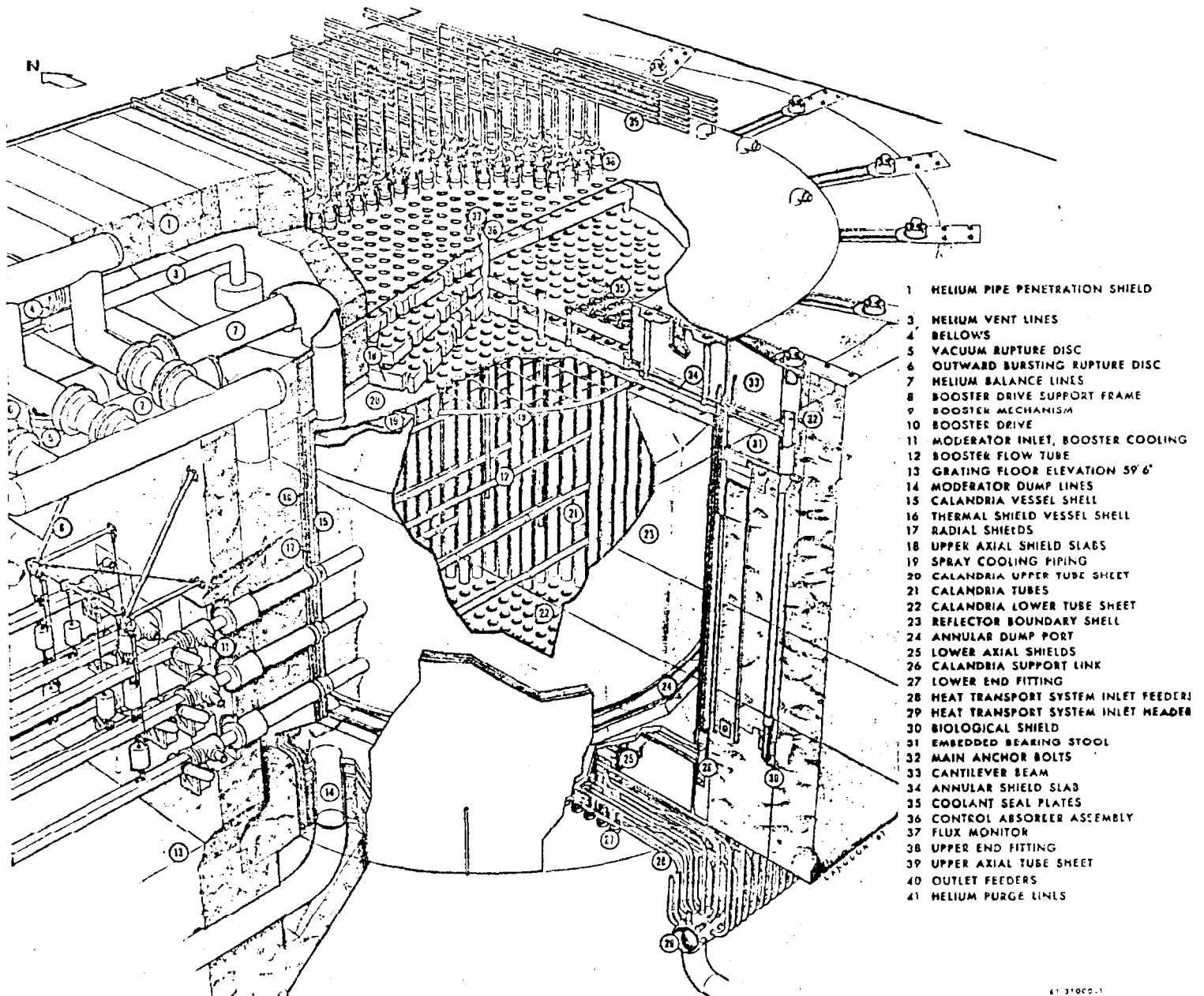


Fig. 10.8: Gentilly Reactor Assembly

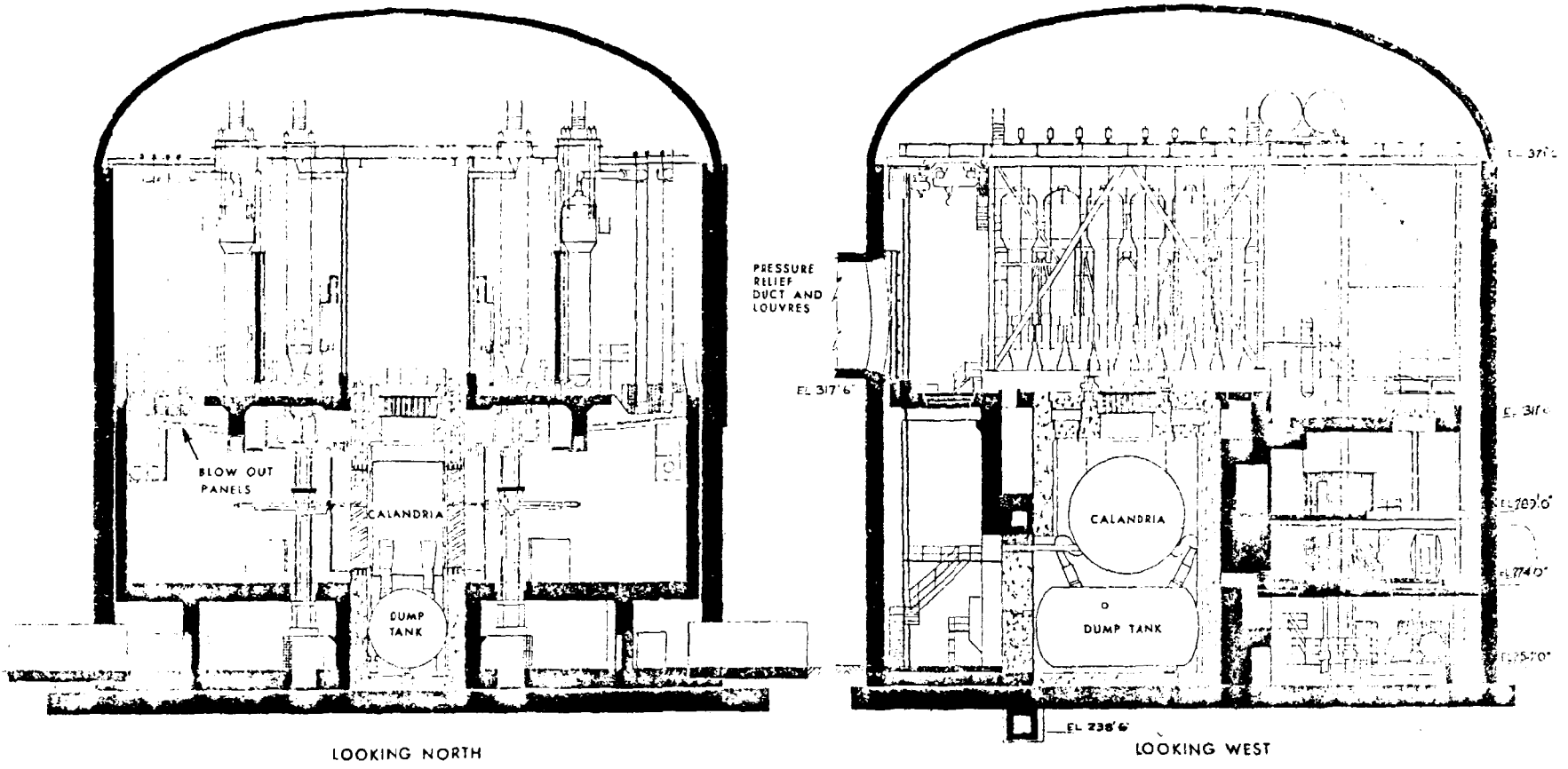
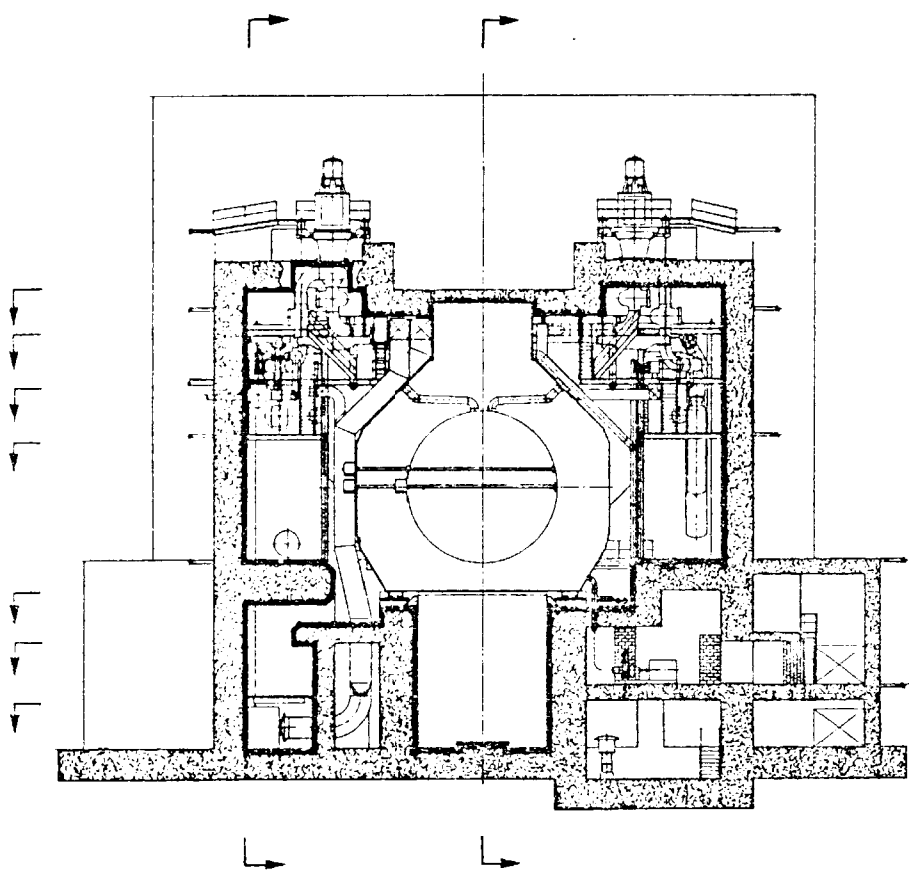
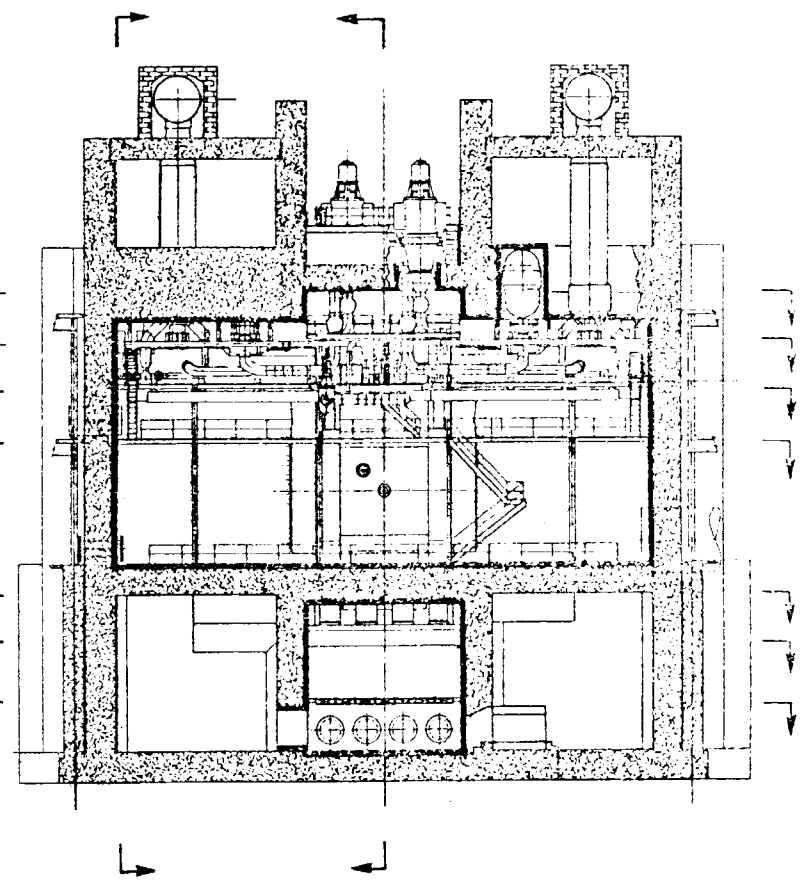


Fig. 10.9: Pickering G.S. Reactor Building - Elevation



ELEVATION 9-9



ELEVATION 10-10
LOOKING SOUTH

Fig. 10.10: Bruce G.S. Reactor Building, Plans and Elevations

Name or Location	Power MW(e) Net	Utility	Date of First Power
NPD	22	Ontario Hydro	1962
Douglas Point	208	Ontario Hydro	1967
KANUPP	125	Karachi Electric Supply Corp., W. Pakistan	1971
RAPP 1 & 2	203	DAE, India	1972-1974
Gentilly 1	250	Hydro-Quebec	1971
Pickering (4 units)	4 x 508	Ontario Hydro	1971-1973
Bruce (4 units)	4 x 732	Ontario Hydro	1975-1978
Gentilly 2	600	Hydro-Quebec	1979
Rio Tercero	600	Comision Nacional de Energia, Atomica, Argentina	1979
Pickering B (4 units)	4 x 500	Ontario Hydro	1980-1982
Bruce B (4 units)	4 x 750	Ontario Hydro	1980-1983
Darlington	4 x 750	Ontario Hydro	1982-1984

TABLE 10.1: CANDU power reactors in operation, under construction, or committed as of July 1974.