

FFTF

**OWNER**  
United States Atomic Energy Commission

**OPERATOR**  
Hanford Engineering Development Laboratory under AEC contract with Westinghouse Hanford Company

**ARCHITECT - ENGINEER**  
Bechtel Corporation

**MAIN CONTRACTOR**  
Westinghouse Electric Corporation

**LOCATION**  
Richland, Washington

**TYPE**  
Sodium-cooled fast test reactor

**GENERAL PERFORMANCE**

Total power output	400 MW (th)
Peak flux	$7 \times 10^{14}$ n/cm <sup>2</sup> s
Heat transport systems	3

**REACTOR CORE**

Core volume	1040 litres
Core length (active)	36 in (914 mm)
Critical mass	640 kg (Pu 239 + 241)
Enrichment zones	2
Fuel cycle period	100 full power days

**Core positions**

Fuel assemblies	91
Closed loops	73
Open test assemblies	4
Primary safety rods	5
Operating control rods	3

**Radial reflector positions**

Peripheral control rods (optional)	108
Radial reflectors	0 to 9
	93 to 108

Lattice pitch (hexagonal)  
Reflector material  
Inconel

	4.715 in (119.7 mm)
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**FUEL ASSEMBLIES**

Fuel material	PuO <sub>2</sub> -UO <sub>2</sub>
Clad material	316 SS
Fuel pins per assembly	217
Fuel pin outside diameter	0.230 in (5.84 mm)
Clad thickness	0.015 in (0.38 mm)
Fuel pin spacer	Spiral wire
Target burnup, peak	80 MWd/kg
Target burnup, average	45 MWd/kg

**CONTROL ASSEMBLIES**

Poison material	B <sub>2</sub> C
Clad material	316 SS
Poison pins per assembly	61
Poison pin outside diameter	0.475 in (12.06 mm)
Poison pin clad thickness	0.053 in (1.34 mm)
Poison pin spacer	Spiral wire

**PRIMARY SYSTEM**

Flow rate	$17.5 \times 10^6$ lb/h (38.6 $\times 10^6$ kg/h)
Hot leg temperature	1050°F (566°C)
Cold leg temperature	792°F (422°C)
Hot leg material	316 SS
Cold leg material	304 SS

**Pumps**

Type	3 Vertical, single stage, free surface centrifugal
Design speed	1100 rev/min
Power	2500 H.P.
Design flow rate	14500 gal/min (12100 imp. gal/min, 915 l/s)

Head  
500 ft sodium (152 m)

**SECONDARY SYSTEM**

Flow rate	$17.4 \times 10^6$ lb/h (38.4 $\times 10^6$ kg/h)
Hot leg temperature	965°F (518°C)
Cold leg temperature	707°F (375°C)
Hot leg material	316 SS
Dump heat exchanger and cold leg material	304 SS

**Pumps**

Type	3 Vertical, single stage, free surface centrifugal
Design speed	1020 rev/min
Power	2000 H.P.
Design flow rate	14500 gal/min (12100 imp. gal/min, 915 l/s)

Head  
400 ft sodium (122 m)

**CLOSED LOOP IRRADIATION FACILITIES**

Number of closed loops	4 initial/6 ultimate
Primary and secondary coolant	Sodium
Total power dissipation capability per loop	2.3 MW(th) initial/ 4.3 MW(th) ultimate
Test length available	94 in
Test cross section	2.5 in
Maximum test outlet temperature	1200°F (649°C)
Test inlet temperature	600°F (min)/1000°F (max) (316°C/538°C)

Maximum test temperature difference	400°F (222°C)
Primary loop flow rate	$1.31 \times 10^6$ lb/h (max) (2.9 $\times 10^6$ kg/h)

Primary and secondary material  
316 SS

**UNIQUE SAFETY FEATURES**

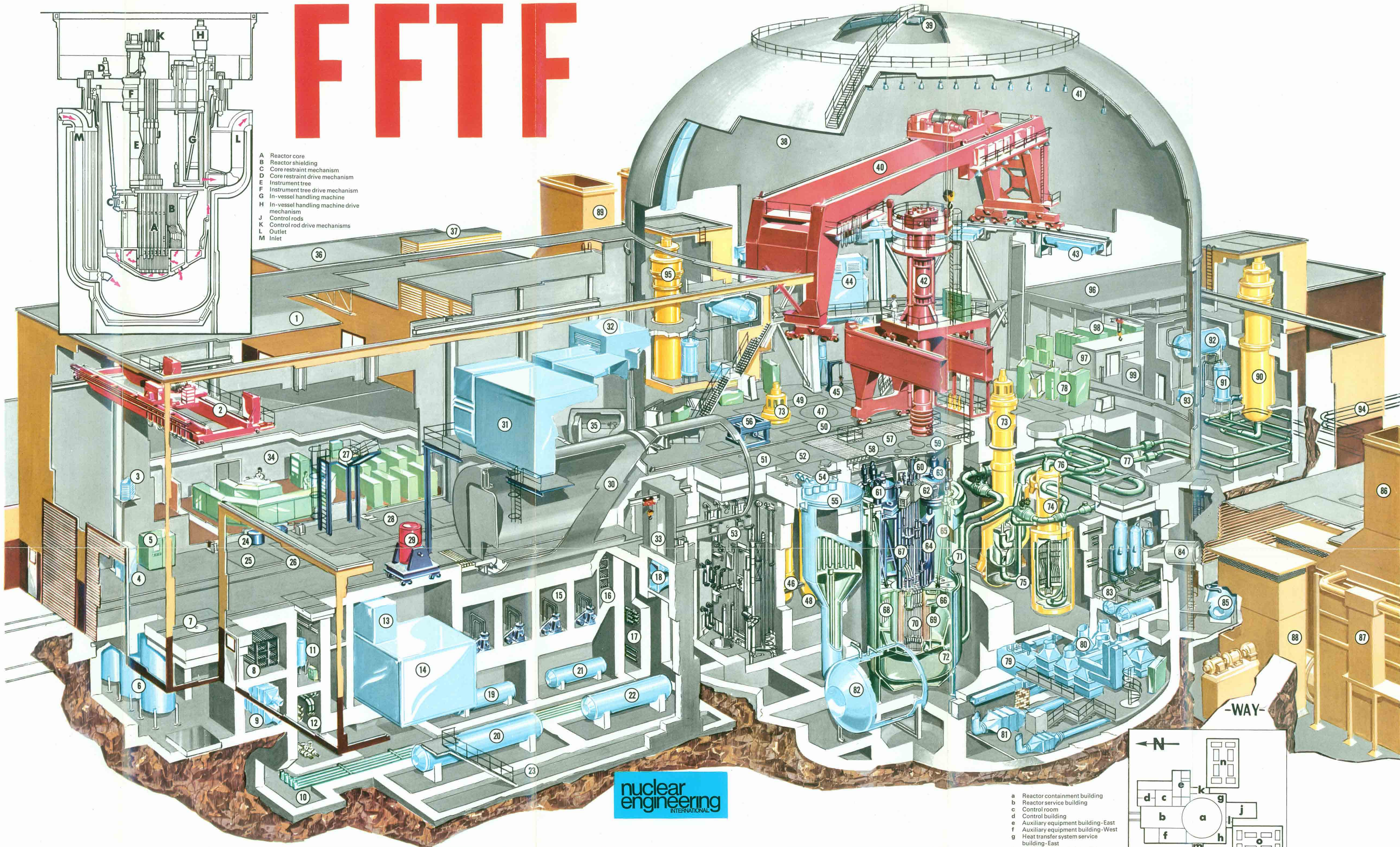
Guard vessels for the reactor vessel, primary pumps and intermediate heat exchangers

Inerted galleries for in-containment heat transport systems

Decay heat removal for reactor and closed loops provided by natural circulation (only two of the primary heat transport loops are required for adequate core cooling following full power operation).

Zero release design. Gaseous fission product and tritium releases from the plant are below detectable limits

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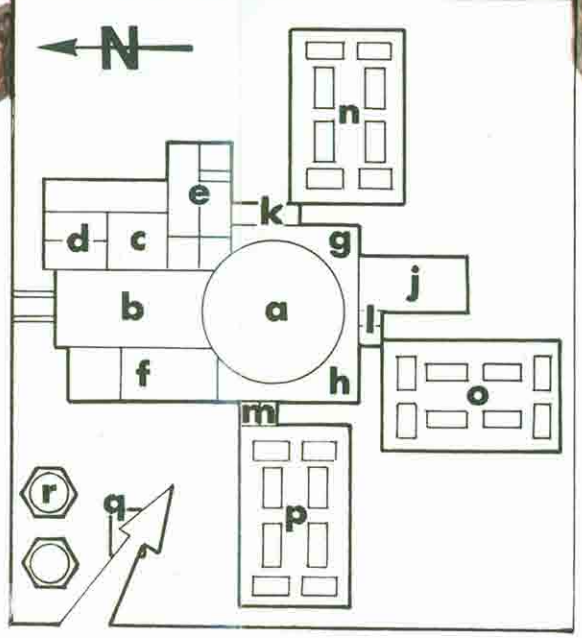
- 1 Reactor service building
- 2 Reactor service building 100/10-ton bridge crane
- 3 Unit heater
- 4 Safety shower
- 5 Radioactive gas decay and disposal control board
- 6 Liquid nitrogen supply tanks
- 7 Cask loading station
- 8 Cableway
- 9 Spent core component gas cooler
- 10 Pipeway
- 11 Spent core component sodium removal station
- 12 Pipe and valve area
- 13 Distillation cooler
- 14 Cold box
- 15 Compressors
- 16 Cableway
- 17 Gas decay pipeway
- 18 Radioactive argon gas cell coolers
- 19 Radioactive gas vacuum tank
- 20 Cell atmosphere hold-up and storage tank
- 21 Radioactive gas surge tank
- 22 Air processing surge delay tank
- 23 Access and operating area
- 24 Radioactive liquid waste flush tanks

- 25 Radioactive solid waste load lugger cell access plug
- 27 Radioactive liquid waste load-out station
- 28 Liquid waste tank cells access plugs
- 29 Bottom loading transfer cask
- 30 Equipment air lock
- 31 Central exhaust filter units
- 32 Air cooler
- 33 Fresh sodium drum unloading station
- 34 Control room
- 35 Personnel air lock
- 36 Auxiliary equipment building-east penthouse
- 37 Diesel generators exhaust
- 38 Reactor containment building
- 39 Ventilating duct
- 40 Reactor containment building
- 41 Reactor containment building lighting
- 42 Closed loop ex-vessel machine and transporter
- 43 Ventilating ducts
- 44 Air cooler unit
- 45 5-ton jib crane
- 46 Primary pump guard vessel (3)

- 47 Intermediate heat exchanger access plug
- 48 Intermediate heat exchanger guards
- 49 Heat transport system access plugs
- 50 Valve access plugs
- 51 Rotary disc valve
- 52 Test assembly conditioning station
- 53 Interim examination/maintenance cell
- 54 Interim decay storage access plugs
- 55 Interim decay storage vessel
- 56 Segmented maintenance cask inverting fixture
- 57 Reactor operating deck
- 58 Fuel transfer port (3)
- 59 Instrument tree access plugs (3)
- 60 Control rod drive mechanisms
- 61 Fuel transfer port shielding
- 62 Instrument and power service lines
- 63 In-vessel handling machine drive mechanism (3)
- 64 In-vessel handling machine (3)
- 65 Core restraint drive mechanism
- 66 Core restraint mechanism
- 67 Instrument tree (3)
- 68 In-vessel storage module (3)
- 69 Radial shield

- 70 Reactor core
- 71 28-inch outlet pipe (3)
- 72 16-inch inlet pipe (3) from intermediate heat exchanger primary outlet
- 73 Primary pump (3) (See also 46)
- 74 Intermediate heat exchanger (3) (See also 47 and 48)
- 75 Primary pump to intermediate heat exchanger pipe
- 76 Intermediate heat exchanger inlet pipe from secondary pump
- 77 Secondary pipe to dump heat exchanger
- 78 Closed loop control cabinets
- 79 Primary sodium storage vessel
- 80 Cell gas coolers
- 81 Reactor cavity gas cooler
- 82 Primary sodium overflow vessel
- 83 Closed loop cell (4)
- 84 Emergency air lock
- 85 Secondary sodium storage vessel
- 86 Dump heat exchanger unit (3 groups of 4 units each)
- 87 Dump heat exchanger heating system
- 88 Fan assembly and air intake
- 89 Dump heat exchanger (East)
- 90 Secondary pump (South)

- 91 Secondary sodium cold trap
- 92 Secondary sodium expansion vessel
- 93 Secondary sodium sampling package
- 94 Feed and return pipes to dump heat exchanger
- 95 Secondary sodium pump (East)
- 96 Heat transfer system service building-East
- 97 Sodium characterization system equipment cells
- 98 Sodium characterization system control boards
- 99 Gas sampling trap cell



- a Reactor containment building
- b Reactor service building
- c Control room
- d Control building
- e Auxiliary equipment building-East
- f Auxiliary equipment building-West
- g Heat transfer system service building-East
- h Heat transfer system service building-West
- j Heat transfer system service building-South
- k Secondary sodium circulation pump-East
- l Secondary sodium circulation pump-South
- m Secondary sodium circulation pump-West
- n Main dump heat exchangers-East
- o Main dump heat exchangers-South
- p Main dump heat exchangers-West
- q Water pump house
- r Water storage tanks