

PORTISHEAD B POWER STATION

Portishead B Statistics:

Main Building (General)

Overall length: 704 ft.
Overall width: 186 ft.
Height above ground: 138 ft. (boiler house)
Height above ground: 80 ft. (turbine house)
Structural steelwork: 11,500 tons approx.
Operating floor level: + 58 ft. O.D.
Basement level: + 30 ft. O.D.
Sub-basement (stores, &c.): + 15 ft. O.D.

Chimney

Height above ground: 380 ft.
Diameter at exit: 20 ft.
Diameter at base: 26 ft. 6 in.
Thickness brickwork (top): 1 ft. 1 $\frac{1}{2}$ in.
Thickness brickwork (bottom): 5 ft. 3 in.
Barrel lined acid resisting bricks
Stool in reinforced concrete foundation to rock formation

Pump Pits (each serving 2 turbo sets)

Internal dia. (upper portion): 48 ft.
Internal dia. (lower portion): 45 ft.
Level at bottom: - 78.75 ft. O.D.
Turbo block: 74 ft. x 23 ft. (19.5 ft.) x 28 ft. high

Turbine House

Length: 704 ft.
Centres of crane rails: 55 ft.
Roof level: 107 ft. O.D.

Annexe & Auxiliary Switch house

Length: 703 ft.
Width: 25 ft.
Roof level: + 131.83 ft. O.D.

Bunker Bay

Length: 703 ft.
Width: 22 ft.
Roof level: + 131.83 ft. O.D.

Boiler House

Length: 672 ft.
Width: 78 ft.
Roof level: + 164.77 ft. O.D.

Admin Block

Length: 119 ft.
Width: 40 ft.
Roof level: 73 ft. O.D.

Welfare Block

Length: 154 ft.

Width: 40 ft.

Roof level: + 57 ft. O.D. (nominal)

Transformer Pens

Length: 194 ft. x 3

Width: 30 ft.

C.W. Culverts

4 Culverts each 1/3 mile long (approx.)

Total length of culvert: 1.42 miles

Invert level: - 37.5 ft. O.D.

Culvert size equal to: 9 ft. dia.

Screen House

Length: 166 ft.

Width: 31 ft.

Roof level: + 75 ft. O.D. (nominal)

4 Screen shafts: 21 ft. dia., 70 ft. deep

Auxiliary Building beneath Main Flue Support

Between chimneys at + 30 ft. O.D.:

Oil store: 65 ft. 3 in. x 42 ft.

Ash pump house: 104 ft. x 45 ft.

Machine shop: 65 ft. 3 in. x 42 ft.

Gallery at + 46 ft.: 65 ft. 3 in. x 21 ft.

South No. 1 chimney:

Elec. instrument workshop: + 46 ft. First floor: 156 ft. 6 in. x 22 ft. 6 in.

Carpenters', welders' and blacksmith shops + 30 ft.

Ground floor: 156 ft. 6 in. x 22 ft. 6 in.

North No. 2 chimney at + 30 ft. O.D.:

Aux. boiler house: 112 ft. x 43 ft. 6 in.

North end stores: 46 ft. x 22 ft. 6 in.

Cable Tunnels Under Lock

2 Horizontal tunnels each 345 ft. long x 8 ft. dia.

4 Vertical shafts each 83 ft. deep x 12 ft. dia.

Invert level of tunnels: - 5465 ft. O.D.

Coal Handling Plant – 2 Wharfside Unloaders 150 tons/hr. each

Hoisting speed: 170 f.p.m.

Traversing speed: 400 f.p.m.

Travelling speed: 30 f.p.m.

Average time cycle: 75 secs.

Grab capacity (heaped): 165 cub. ft.

Grab capacity (flush): 130 cub. ft.

Stacking & Reclaiming Transporter – Capacity 260 tons/hr.

Clear height of boom over lower rail level: 52 ft.

Test load: 10 tons

Hoisting speed: 170 f.p.m.

Traversing speed: 600 f.p.m.

Travelling speed: 30 f.p.m.

Average time cycle: 42 secs.

Grab capacity (heaped): 165 cub. ft.
Grab capacity (flush): 130 cub. ft.

Tippler: Twin Side Discharge

Size of wagons up to 2412 tons
Maximum rate each side: 12 wagons per hour
Fitted with dust trapping system

Belt Conveyors

Capacity to B.H.: 400 tons/hr.
No. 1 Conveyor length (cntrs.): 652 ft.
 Width of belt: 42 in.
 Speed of belt: 360 f.p.m.
No. 2 Conveyor length (cntrs.): 664 ft.
 Width of belt: 36 in.
 Speed of belt: 300 f.p.m.
No. 3 Conveyor length (cntrs.): 230 ft.
 Width of belt: 42 in.
 Speed of belt: 360 f.p.m.
No. 4 Conveyor length (cntrs.): 240 ft.
 Width of belt: 42 in.
 Speed of belt: 360 f.p.m.
No. 5 Conveyor length (cntrs.): 252 ft.
 Width of belt: 42 in.
 Speed of belt: 360 f.p.m.
No. 6 Conveyor length (cntrs.): 142 ft.
 Width of belt: 36 in.
 Speed of belt: 300 f.p.m.
No. 7 Conveyor length (cntrs.): 159 ft.
 Width of belt: 36 in.
 Speed of belt: 300 f.p.m.
No. 8 Conveyor length (cntrs.): 521 ft.
 Width of belt: 36 in.
 Speed of belt: 300 f.p.m.

Radial Stacker

Capacity: 260 tons/hr.
Travelling speed: 50 f.p.m.
Slewing speed: ¼ r.p.m.

Belt Feeders

Unloaders belt width: 42 in. vari. speed
Transporter belt width: 42 in. vari. speed
Stacker belt width: 36 in. 320 f.p.m.
Tiplers belt width: 42 in. 300 f.p.m.

Steam Raising Plant

Number of units: 12
Rating: 300 klb./hr.
Type of Unit: Twin drum
 Eight coal fired
 Four oil fired
Radiant furnace with Lopulco water cooled walls
Stop valve pressure: 950 lb./sq. in.
Stop valve temperature: 925°F.

Feed water temperature: 385°F.
Internal dia. of front and rear steam drums: 54 in.
Thickness of drums: 3¼ in.
Overall length of drums: 30 ft. 6 in.
Internal dia. of steam receiver drum: 30 in.
Thickness: 1 7/8 in.
Overall length: 24 ft. 6 in.
Furnace heating surface: 5,710 sq. ft.
Boiler heating surface: 7,200 sq. ft.
Type of primary and secondary super heaters : Multiple loop elements: self-draining type
Effective heating surface (primary): 13,220 sq. ft.
Effective heating surface (secondary): 2,270 sq. ft.
Desuperheaters: type non-contact. No. per boiler: 2
Total external cooling surface: 150 sq. ft.
Economisers external heating surface: 17,718 sq. ft.
No. air preheaters/boiler: type; rotary regenerative: 2

Electrostatic Precipitators

Number per boiler: 2
Type: Electrostatic dust extractor
Capacity of dust hoppers per boiler: 5,600 cub. ft.

Combustion Equipment

No of mills per unit: 3
Type: LM-13
Capacity one mill: 10 tons/hr. approx.
Mill motors 90 h.p. 1480 r.p.m. 415V. P.F. exhauster fans
Capacity wt. fuel and air: 21,500 fuel, 53,000 air
Exhauster motor: h.p. 150/45 1470/ 960 r.p.m.
No. p.f. burners per unit: 12
Capacity per burner: 2600/4400 lb./ hr.
No. oil burners per unit, for p.f. lighting-up: 4
No. of coal bunkers per boiler: One.
Capacity per boiler: 450 tons
Working coal store capacity: 36,000 tons
Emergency coal store capacity: 200,000 tons

Draught Fans

No. of forced draught fans: 2
Type of drive: commutator motor control - variable speed
Vol. of gas: 46,600 c.f.m. at m.c.r.
Temp. of gas: 80°F. at m.c.r.
F.D. fan motors: h.p. 145/43
Speed at rated h.p.: 970/640 r.p.m. 3.3 kV.
No. of induced draught fans: 2
Type of drive: commutator motor
Control: variable speed
Vol. of gas: 71,500 c.f.m. at m.c.r.
Temp. of gas: 260°F. at m.c.r.
I.D. fan motors: h.p. 296/93
Speed at rated h.p.: 730/515 r.p.m. 3.3 kV.

Mechanical Dust Arrestors

Number per boiler: 2
Type: Valmont " S " Hopper capacity per boiler: 3,200 cub. ft.

Oil Handling Plant

Oil Fuel Storage Tanks

No. of tanks: 2

Size: One 120 ft. dia., 30 ft. deep

Capacity approx.: 9,300 tons

Size: One 144 ft. dia., 30 ft. deep

Capacity approx.: 13,400 tons

Oil Transfer Pumps

Number of pumps: 3

Maximum output (variable): 55 tons/hr. per pump

Auxiliary Boilers

Number of boilers (oil fired): 3

Rating (saturated steam): 25,000 lb/ hr. per boiler

Stop valve pressure: 250 p.s.i.g.

Turbo-Alternators

No. of turbo-alternators: 6

Continuous max. and econ. rating: 65 MW.

Speed: 3,000 r.p.m.

P.F. at generator terminals: 0.8

Full load voltage: 11,800

Rated stator current: 3,670 amp.

Steam pressure at t.s.v.: 900 p.s.i.g.

Steam temp. at t.s.v.: 900°F.

Final feed temp. at m.c.r.: 385°F.

Vacuum at m.c.r. (barometer at 30 in. Hg.): 28.9 in. Hg.

Inlet circulating water temp.: 55°F.

Hydrogen operating pressure

Sets 1-4: 0.5 p.s.i.g.

Sets 5 & 6: 15 p.s.i.g.

Generator efficiency: 98.4 % at rated power factor

Turbines: Two cylinder impulse with double flow l.p. cylinder

No. of stages in h.p. cylinder: 19

No. of stages in l.p. cylinder: 6 each side

Overall length of complete turbo-set: 72 ft. 3 in.

Exciters direct coupled to alternator by flexible coupling

Capacity main oil pump: 400 g.p.m.

No. and capacity of oil coolers: three 50 % duty

Weight alternator stator (heaviest lift) without end covers, &c.: 115 tons

Weight alternator rotor: 28½ tons

Total weight of turbo alternator (dry) excluding aux. and condensers: 370 tons

Ash and Dust Handling Plant

Type of system: Hydro jet delivery to ash pit and pumped to ash settling pits

Type of ash hopper: Water filled

No. of ash hoppers: 1 per boiler unit

No. of h.p. sluice water pumps: 4

Capacity of pump: 1,900 g.p.m.

h.p. pump motors: 235

Return water pumps

Capacity of pumps: 2,500 g.p.m.

h.p. pump motors: 70

Ash pumps

Capacity of pumps: 2,300 g.p.m.
h.p. pump motors: 260

Feed Heating Plant

No. of stages of feed heating: 5
No. of l.p. heaters: 3
Type of l.p. heaters: two surface: one high level deaerating contact
No. of h.p. heaters: 2
Type of h.p. heater: surface
Heating surface l.p. heaters: 1,400 sq. ft.
Heating surface h.p. heaters: 2,110 sq. ft.

Condensing Plant

No. of condensers for each turbine: 1
No. of passes: 2
Condenser cooling surface: 58,600 sq. ft.
No. of tubes: 10,880
Size of tubes: 1 in, O/S diameter x 18 s.w.g. thick
Cooling water at 55°F. required at m.c.r.: 48,000 g.p.m.
No. of condensate extraction pumps per condenser: Two 100 % duty
Rating and head of extraction pumps: 910 g.p.m. 285 ft. total head

Boiler Feed Pumps

No. of boiler feed pumps for 2 turbo sets and 4 boilers: 5
Three 100 % electrically driven and two 50 % steam turbine driven
Type (elec.): 7 stage barrel casing
Type (steam): 5 stage barrel casing
Pump rating (elec.): 650 klb./hr.
Pump rating (steam): 325 klb./hr.
Motor rating: 1,390 h.p. 2,970 r.p.m.
Turbine rating: 710 b.h.p. 4,700 r.p.m.

Evaporators

No. of triple effect evaporators: 5
Capacity: 25,000 lb./hr. each of distilled water with steam at 900 p.s.i.g.
Heating surface: 6,540 sq. ft. each

Water Treatment Plant

Type of plant
Precipitator/lime-base exchange process
Capacity of unit: 144,000 gallons of treated water per 24 hours at 6,000 g.p.h.
No. of units: 1
Source of water supply: Bristol Waterworks Company.

C.W. Screens

No. of screens: 8
Type of screen: 72 in. band self-cleaning
Capacity of each screen: 4,600,000 g.p.h.
Minimum immersion: 16 ft.
No. of screen panels per screen: 160
Width screen panels: 75.56 in.
Range of screen speeds: 3 to 30 f.p.m.
Type of variable speed gear: V.S.G. hydraulic transmission gear
Rated h.p. motor: 14 Speed at rated h.p.: 735 r.p.m.

Cranes

Turbine house crane

Capacity of main hoist: 130 tons

Capacity aux. hoist: 26 tons

Span of crane rail centres: 55 ft.

Supplementary turbine house crane

Capacity of main hoist: 35 tons

Capacity aux. hoist: 12 tons

Crane over deaerators on 96 ft. level:

Capacity 14 tons

Two hand-operated overhead travelling cranes for boiler feed pumps: Capacity 6 tons

Hand-operated crane for c.w. screen house: Capacity 7½ tons

Hand-operated crane for ash pump house: Capacity 5 tons

Hand - operated cranes for heavy machine shop: Capacity 5 tons

Hand - operated cranes for light machine shop: Capacity 2 tons

Switchgear - 132 Kv.

Sub-station 900 yds. from power station on opposite side of Portishead Dock

Interconnecting 132 kV cable: 3 core, impregnated gas pressure type, operating at 200 p.s.i.

No. of switches: 22

Type of switch: outdoor air-blast

Breaking capacity: 3,500 MVA.

The installation comprises:

22 Double busbar circuits and includes:

6 Generator transformer circuits

3 132 kV/33 kV grid transformers

A 132 kV reactor is also included, which may be connected as a bus coupler or bus section.

Air for switchgear is produced by four compressors, installed in a compressor house, which serves the whole installation.

The switchgear is controlled from the power station control room by means of 50 V d.c. miniature direct wire control utilising telephone type equipment.

3.3 Kv Auxiliary Switchgear

Type of switchgear: Indoor, airbreak, single bus bar, horizontal drawout truck

Rupturing capacity: 150 MVA.

415 V Auxiliary Switchgear

Type of switchgear: Metalclad, air insulated, switch fusegear with air circuit-breakers controlling incoming supplies to large boards

Rupturing capacity: 25 MVA.

415 V Contactor Control Gear

Type: Air-insulated, air-break, direct-on-line.

Batteries

275 kV and 132 kV switchgear batteries: Two 110 V 250 amp.-hour

Nine station auxiliary switchgear batteries each 240 V 300 amp.-hour

The rating is at a 10-hour discharge rate.

Extracted from CEGB booklet published 1960.