

SUPERCritical POWER PLANT MAJOR CV and PSV VALVE SPECIFICATIONS, CURRENT STATE AND FUTURE STATE USC BOILERS

Valve Application	No. per Boiler	Valve Type	Valve Duty	Key Service Conditions	Valve Operating Flow Rate (For 1000 MW Boiler)	Current State 1000MW USC Boiler ¹				Future State 1000MW USC Research Boiler ²				Gap Analysis
						Valve Operating Temp. (°F/°C)	Valve Inlet Pressure (psi/bar)	Valve Outlet Pressure (psi/bar)	Valve Body Metallurgy	Valve Operating Temp. (°F/°C)	Valve Inlet Pressure (psi/bar)	Valve Outlet Pressure (psi/bar)	Valve Body Metallurgy (Super Alloys)	
BOILER CONTROL VALVES														
Boiler Startup Valve (Separator Drain)	1	CV	Severe Service	HI ΔP; HI Press; Flashing; Erosion; Debris; Tight Shutoff	Up to 4,000gpm	840F/450C	4600psi/320bar	150psi/10bar	CrMo Alloy Steel	840F/450C	5000psi/340bar	150psi/10bar	CCA617/IN740	
Sliding Pressure Control Valve	2	CV	Severe Service	HI ΔP; HI Temp; HI Flow; HI Rangeability; Prec. Cont'; Noise	Up to 1,500 t/hr	1120F/604C	4000psi/272bar	Variable on load	P92, austenitic stl	1292F/700C	5076psi/350 bar	Variable on load	CCA617/IN740	
BOILER FEEDWATER VALVES (For 3 X 50% Pump Configuration with main regulator valve and parallel startup valve)														
BFP Regulator Valve	3	CV	Normal Duty	HI Press; HI Flow; HI Rangeability; Precision control	Up to 4,300gpm	580F/305C	5,000psi/345 bar	4000psi/272bar	Conventional	620F/325C	6000psi/413 bar	5000psi/340bar	Conventional	
BFP Startup Valve	3	CV	Severe Service	HI ΔP; Cavitation; Vibration;	Up to 1,200gpm	580F/305C	5,000psi/345 bar	Atmos. at startup	Conventional	620F/325C	6000psi/413 bar	Atmos. at SU	Conventional	
BFP Recirculation Valve	3	CV	Severe Service	HI ΔP; Cavitation; Erosion; Vibration; Tight shutoff	Variable on load	580F/305C	5,000psi/345 bar	150psi/10bar	Conventional	620F/325C	6000psi/413 bar	150psi/10bar	Conventional	
MAIN STEAM SYSTEM VALVES														
Main Steam Isolation Valve	1	CV	Severe Service	HI Temp; HI Press; HI Flow	3,100t/hr	1120F/604C	4000psi/272bar	4000psi/272bar	P92, austenitic stl	1292F/700C	5076psi/350 bar	5076psi/350 bar	CCA617/IN740	
SH Attenuator Spray Valve	2	CV	Normal Duty	HI Press; HI Rangeability; Fast response; Tight Shutoff	Variable on load	580F/305C	5,000psi/345 bar	4000psi/272bar	Conventional	580F/305C	6000psi/413 bar	5076psi/350 bar	Conventional	
RH Attenuator Spray Valve	1	CV	Severe Service	HI ΔP; Cav.; HI Rangeability; Fast response; Tight Shutoff	Variable on load	580F/305C	5,000psi/345 bar	1000psi/69bar	Conventional	580F/305C	6000psi/413 bar	1000psi/69bar	Conventional	
SH Steam Safety Valve	4	PSV	Severe Service	HI Temp; HI Press	100% of load	1120F/604C	4000psi/272bar	Atmosphere	P92, austenitic stl	1292F/700C	5076psi/350 bar	Atmosphere	CCA617/IN740	
RH Steam Safety Valve (cold leg)	4	PSV	Normal Duty	Normal Duty	60% of load	725F/385C	725psi/50 bar	Atmosphere	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
RH Steam Safety Valve (hot leg)	4	PSV	Severe Service	Normal Duty	60% of load	1120F/604C	913psi/63 bar	Atmosphere	P92, austenitic stl	1292F/700C	913psi/63 bar	Atmosphere	CCA617/IN740	
HP Turbine Control Valve	1	CV	Severe Service	HI Temp; HI Press; HI Flow	3,000t/hr	1120F/604C	4000psi/272bar	Variable on load	P92, austenitic stl	1292F/700C	5076psi/350 bar	5076psi/350 bar	CCA617/IN740	
HP Turbine Bypass Valve	3	CV	Severe Service	HI ΔP; HI Press; HI Temp; High Noise; Tight Shutoff	1,000t/hr	1120F/604C	4000psi/272bar	935psi/64 bar	P92, austenitic stl	1292F/700C	5076psi/350 bar	935psi/64 bar	CCA617/IN740	
HP Turbine Bypass Attenuator Valve	3	CV	Normal Duty	HI Press; HI Rangeability; Fast response; Tight Shutoff	Variable on load	580F/305C	5,000psi/345 bar	935psi/64 bar	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
LP Turbine Bypass Valve	3	CV	Severe Service	HI ΔP; HI Temp; High Noise; Tight Shutoff	500t/hr	1120F/604C	935psi/64 bar	Vacuum (cond)	P92, austenitic stl	1292F/700C	935psi/64 bar	Vacuum (cond)	CCA617/IN740	
LP Turbine Bypass Attenuator Valve	3	CV	Severe Service	HI ΔP; Cav.; HI Rangeability; Fast response; Tight Shutoff	Variable on load	580F/305C	5,000psi/345 bar	Vacuum (cond)	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
Turbine Seal Steam Valve	2	CV	Severe Service	HI ΔP; High Noise; High Rangeability	Low capacity	625F/330C	935psi/64 bar	Atmosphere	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
HP Turbine Vent Valve	1	CV	Severe Service	High Press; Tight Shutoff; Fast response	Variable on load	1120F/604C	4000psi/272bar	Vacuum (cond)	P92, austenitic stl	1292F/700C	5076psi/350 bar	Vacuum (cond)	CCA617/IN740	
Soot Blower Header Control Valve	2	CV	Severe Service	HI ΔP; HI Flow; HI Press; HI Temp; HI Cycle; Tight Shutoff;	Variable on load	1120F/604C	4000psi/272bar	500psi/35 bar	P92, austenitic stl	1292F/700C	5076psi/350 bar	500psi/35 bar	CCA617/IN740	
Soot Blower Header Relief Valve	2	PSV	Normal Duty	Normal Duty	Variable on load	900F/482C	500psi/35 bar	Atmosphere	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
HEATER DRAIN VALVES AND RELIEF VALVES (For 4 X LP and 3 X HP Configuration, plus Deaerator)														
HP Heater Drain Valve	3	CV	Severe Service	HI ΔP; Flashing; Erosion; Angle body	Variable on load	625F/330C	935psi/64 bar	150psi/10bar	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
HP Heater Emergency Drain Valve	3	CV	Severe Service	HI ΔP; Flashing; Erosion; Tight Shutoff; Angle body	Variable on load	625F/330C	935psi/64 bar	Cond. Vacuum	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
LP Heater Drain Valve	4	CV	Severe Service	HI ΔP; Flashing; Erosion	Variable on load	395F/200C	215psi/15 bar	Cond. Vacuum	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
LP Heater Emergency Drain Valve	4	CV	Severe Service	HI ΔP; Flashing; Erosion; Tight Shutoff	Variable on load	395F/200C	215psi/15 bar	Cond. Vacuum	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
Heater pressure safety valves	7	PSV	Normal Duty	Normal Duty	100% of input	625F/330C	Htr. Design Press.	Atmosphere	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
Deaerator pressure safety valve	1	PSV	Normal Duty	Normal Duty	100% of input	390F/200C	DeA. Design Press.	Atmosphere	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
MAIN CONDENSER SYSTEM VALVES (For 2 X 100% Pump Configuration)														
Condensate Recirculation Valve	2	CV	Severe Service	HI ΔP; Flashing; Erosion; Cavitation; Tight Shutoff	Variable on load	95F/35C	600psi/41 bar	Cond. Vacuum	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
Deaerator Level Control Valve	2	CV	Severe Service	HI ΔP; Low-Load Cav; Load Fluct; HI Rangeability	Variable on load	390F/200C	600psi/41 bar	150psi/10bar	Conventional	No change	No change	No Change	No Change	Similar to subcritical applications
OTHER VALVES														
Auxiliary Steam PRDS Station	1	CV	Severe Service	HI ΔP; HI Press; HI Temp; High Noise	Variable on load	1120F/604C	4000psi/272bar	Variable on load	P92, austenitic stl	1292F/700C	5076psi/350 bar	Variable on load	CCA617/IN740	

1. Current state USC template boiler: Shanghai Boiler Works/Alstom 1000MW; feedwater flow at 12,500 gpm and 581F, SH steam flow at 3,100 t/hr, 4,061 psi and 1,121F, reheat steam at 2,600 t/hr, 913 psi and 1,117F.

2. Future state research template boiler: BHEL/IGCAR 1000MW Boiler; 350 bar and 700C