TABLE PG-68.7M
SUPERHEAT CORRECTION FACTOR, K_{sh}

Flowing Pressure (MPa)	Superheat Correction Factor, K_{sh}, Total Temperature, °C, of Superheated Steam																	
	205	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625
0.50	0.991	0.968	0.942	0.919	0.896	0.876	0.857	0.839	0.823	0.807	0.792	0.778	0.765	0.752	0.74	0.728	0.717	0.706
0.75	0.995	0.972	0.946	0.922	0.899	0.878	0.859	0.841	0.824	0.808	0.793	0.779	0.766	0.753	0.74	0.729	0.717	0.707
1.00	0.985	0.973	0.95	0.925	0.902	0.88	0.861	0.843	0.825	0.809	0.794	0.78	0.766	0.753	0.741	0.729	0.718	0.707
1.25	0.981	0.976	0.954	0.928	0.905	0.883	0.863	0.844	0.827	0.81	0.795	0.781	0.767	0.754	0.741	0.729	0.718	0.707
1.50	...	...	0.957	0.932	0.907	0.885	0.865	0.846	0.828	0.812	0.796	0.782	0.768	0.755	0.742	0.73	0.718	0.708
1.75	...	...	0.959	0.935	0.91	0.887	0.866	0.847	0.829	0.813	0.797	0.782	0.769	0.756	0.743	0.731	0.719	0.708
2.00	...	...	0.96	0.939	0.913	0.889	0.868	0.849	0.831	0.814	0.798	0.784	0.769	0.756	0.744	0.731	0.72	0.708
2.25	...	...	0.963	0.943	0.916	0.892	0.87	0.85	0.832	0.815	0.799	0.785	0.77	0.757	0.744	0.732	0.72	0.709
2.50	...	...	...	0.946	0.919	0.894	0.872	0.852	0.834	0.816	0.8	0.785	0.771	0.757	0.744	0.732	0.72	0.71
2.75	...	...	...	0.948	0.922	0.897	0.874	0.854	0.835	0.817	0.801	0.786	0.772	0.758	0.745	0.733	0.721	0.71
3.00	...	...	...	0.949	0.925	0.899	0.876	0.855	0.837	0.819	0.802	0.787	0.772	0.759	0.746	0.733	0.722	0.71
3.25	...	...	...	0.951	0.929	0.902	0.879	0.857	0.838	0.82	0.803	0.788	0.773	0.759	0.746	0.734	0.722	0.711
3.50	...	...	...	0.953	0.933	0.905	0.881	0.859	0.84	0.822	0.804	0.789	0.774	0.76	0.747	0.734	0.722	0.711
3.75	...	...	...	0.956	0.936	0.908	0.883	0.861	0.841	0.823	0.806	0.79	0.775	0.761	0.748	0.735	0.723	0.711
4.00	...	...	...	0.959	0.94	0.91	0.885	0.863	0.842	0.824	0.807	0.791	0.776	0.762	0.748	0.735	0.723	0.712
4.25	...	...	...	0.961	0.943	0.913	0.887	0.864	0.844	0.825	0.808	0.792	0.776	0.762	0.749	0.736	0.724	0.713
4.50	...	...	...	...	0.944	0.917	0.89	0.866	0.845	0.826	0.809	0.793	0.777	0.763	0.749	0.737	0.725	0.713
4.75	...	...	...	...	0.946	0.919	0.892	0.868	0.847	0.828	0.81	0.793	0.778	0.764	0.75	0.737	0.725	0.713
5.00	...	...	...	...	0.947	0.922	0.894	0.87	0.848	0.829	0.811	0.794	0.779	0.765	0.751	0.738	0.725	0.714
5.25	...	...	...	...	0.949	0.926	0.897	0.872	0.85	0.83	0.812	0.795	0.78	0.765	0.752	0.738	0.726	0.714
5.50	...	...	...	...	0.952	0.93	0.899	0.874	0.851	0.831	0.813	0.797	0.78	0.766	0.752	0.739	0.727	0.714
5.75	...	...	...	...	0.954	0.933	0.902	0.876	0.853	0.833	0.815	0.798	0.782	0.767	0.753	0.739	0.727	0.715
6.00	...	...	...	...	0.957	0.937	0.904	0.878	0.855	0.834	0.816	0.798	0.783	0.768	0.753	0.74	0.727	0.716
6.25	...	...	...	...	0.96	0.94	0.907	0.88	0.856	0.836	0.817	0.799	0.783	0.768	0.754	0.74	0.728	0.716
6.50	...	...	...	...	0.964	0.944	0.91	0.882	0.859	0.837	0.818	0.801	0.784	0.769	0.754	0.741	0.729	0.716
6.75	...	...	...	...	0.966	0.946	0.913	0.885	0.86	0.839	0.819	0.802	0.785	0.769	0.755	0.742	0.729	0.717
7.00	...	...	...	...	...	0.947	0.916	0.887	0.862	0.84	0.82	0.802	0.786	0.77	0.756	0.742	0.729	0.717
7.25	...	...	...	...	...	0.949	0.919	0.889	0.863	0.842	0.822	0.803	0.787	0.771	0.756	0.743	0.73	0.717
7.50	...	...	...	...	...	0.951	0.922	0.891	0.865	0.843	0.823	0.805	0.788	0.772	0.757	0.744	0.73	0.718
7.75	...	...	...	...	...	0.953	0.925	0.893	0.867	0.844	0.824	0.806	0.788	0.772	0.758	0.744	0.731	0.719
8.00	...	...	...	...	...	0.955	0.928	0.896	0.869	0.846	0.825	0.806	0.789	0.773	0.758	0.744	0.732	0.719
8.25	...	...	...	...	...	0.957	0.932	0.898	0.871	0.847	0.827	0.807	0.79	0.774	0.759	0.745	0.732	0.719
8.50	...	...	...	...	...	0.96	0.935	0.901	0.873	0.849	0.828	0.809	0.791	0.775	0.76	0.746	0.732	0.72
8.75	...	...	...	...	...	0.963	0.939	0.903	0.875	0.85	0.829	0.81	0.792	0.776	0.76	0.746	0.733	0.721
9.00	...	...	...	...	...	0.966	0.943	0.906	0.877	0.852	0.83	0.811	0.793	0.776	0.761	0.747	0.734	0.721
9.25	...	...	...	...	...	0.97	0.947	0.909	0.879	0.853	0.832	0.812	0.794	0.777	0.762	0.747	0.734	0.721
9.50	...	...	...	...	...	0.973	0.95	0.911	0.881	0.855	0.833	0.813	0.795	0.778	0.763	0.748	0.734	0.722
9.75	...	...	...	...	...	0.977	0.954	0.914	0.883	0.857	0.834	0.814	0.796	0.779	0.763	0.749	0.735	0.722
10.00	...	...	...	...	...	0.981	0.957	0.917	0.885	0.859	0.836	0.815	0.797	0.78	0.764	0.749	0.735	0.722
10.25	...	...	...	...	...	0.984	0.959	0.92	0.887	0.86	0.837	0.816	0.798	0.78	0.764	0.75	0.736	0.723
10.50	...	...	...	...	...	...	0.961	0.923	0.889	0.862	0.838	0.817	0.799	0.781	0.765	0.75	0.737	0.723
10.75	...	...	...	...	...	...	0.962	0.925	0.891	0.863	0.839	0.818	0.799	0.782	0.766	0.751	0.737	0.724
11.00	...	...	...	...	...	...	0.963	0.928	0.893	0.865	0.84	0.819	0.8	0.782	0.766	0.751	0.737	0.724
11.25	...	...	...	...	...	...	0.964	0.93	0.893	0.865	0.84	0.819	0.799	0.781	0.765	0.75	0.736	0.723
11.50	...	...	...	...	...	...	0.964	0.931	0.894	0.865	0.84	0.818	0.798	0.78	0.764	0.749	0.735	0.722
11.75	...	...	...	...	...	...	0.965	0.932	0.894	0.865	0.839	0.817	0.797	0.78	0.763	0.748	0.734	0.721
12.00	...	...	...	...	...	...	0.966	0.933	0.894	0.864	0.839	0.817	0.797	0.779	0.762	0.747	0.733	0.719
12.25	...	...	...	...	...	...	0.967	0.935	0.895	0.864	0.839	0.816	0.796	0.778	0.761	0.746	0.732	0.718
12.50	...	...	...	...	...	...	0.967	0.936	0.896	0.864	0.838	0.816	0.796	0.777	0.76	0.745	0.731	0.717
12.75	...	...	...	...	...	...	0.968	0.937	0.896	0.864	0.838	0.815	0.795	0.776	0.759	0.744	0.729	0.716
13.00	...	...	...	...	...	...	0.969	0.939	0.896	0.864	0.837	0.814	0.794	0.775	0.758	0.743	0.728	0.715
13.25	...	...	...	...	...	...	0.971	0.94	0.897	0.864	0.837	0.813	0.792	0.774	0.757	0.741	0.727	0.713
13.50	...	...	...	...	...	...	0.972	0.942	0.897	0.863	0.837	0.813	0.792	0.773	0.756	0.74	0.725	0.712
14.00	...	...	...	...	...	...	0.976	0.946	0.897	0.863	0.835	0.811	0.79	0.771	0.753	0.737	0.723	0.709
14.25	...	...	...	...	...	...	0.978	0.947	0.898	0.862	0.834	0.81	0.789	0.77	0.752	0.736	0.721	0.707
14.50	...	...	...	...	...	...	...	0.948	0.898	0.862	0.833	0.809	0.787	0.768	0.751	0.734	0.72	0.706
14.75	...	...	...	...	...	...	...	0.948	0.898	0.862	0.832	0.808	0.786	0.767	0.749	0.733	0.719	0.704
15.00	...	...	...	...	...	...	...	0.948	0.899	0.861	0.832	0.807	0.785	0.766	0.748	0.732	0.717	0.703
15.25	...	...	...	...	...	...	...	0.947	0.899	0.861	0.831	0.806	0.784	0.764	0.746	0.73	0.716	0.702
15.50	...	...	...	...	...	...	...	0.947	0.899	0.861	0.83	0.804	0.782	0.763	0.745	0.728	0.714	0.7
15.75	...	...	...	...	...	...	...	0.946	0.899	0.86	0.829	0.803	0.781	0.761	0.743	0.727	0.712	0.698
16.00	...	...	...	...	...	...	...	0.945	0.9	0.859	0.828	0.802	0.779	0.759	0.741	0.725	0.71	0.696
16.25	...	...	...	...	...	...	...	0.945	0.9	0.859	0.827	0.801	0.778	0.757	0.739	0.723	0.708	0.694
16.50	...	...	...	...	...	...	...	0.945	0.9	0.858	0.826	0.799	0.776	0.756	0.738	0.721	0.706	0.692
16.75	...	...	...	...	...	...	...	0.944	0.9	0.857	0.825	0.797	0.774	0.754	0.736	0.719	0.704	0.69

TABLE PG-68.7M
SUPERHEAT CORRECTION FACTOR, K_{sh} (CONT'D)

Flowing Pressure (MPa)	Superheat Correction Factor, K_{sh} Total Temperature, °C, of Superheated Steam																	
	205	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625
17.00	...	...	...	...	...	...	...	0.944	0.9	0.856	0.823	0.796	0.773	0.752	0.734	0.717	0.702	0.688
17.25	...	...	...	...	...	...	...	0.944	0.9	0.855	0.822	0.794	0.771	0.75	0.732	0.715	0.7	0.686
17.50	...	...	...	...	...	...	...	0.944	0.9	0.854	0.82	0.792	0.769	0.748	0.73	0.713	0.698	0.684
17.75	...	...	...	...	...	...	...	0.944	0.9	0.853	0.819	0.791	0.767	0.746	0.728	0.711	0.696	0.681
18.00	...	...	...	...	...	...	...	0.944	0.901	0.852	0.817	0.789	0.765	0.744	0.725	0.709	0.694	0.679
18.25	...	...	...	...	...	...	...	0.945	0.901	0.851	0.815	0.787	0.763	0.742	0.723	0.706	0.691	0.677
18.50	...	...	...	...	...	...	...	0.945	0.901	0.85	0.814	0.785	0.761	0.739	0.72	0.704	0.689	0.674
18.75	...	...	...	...	...	...	...	0.945	0.901	0.849	0.812	0.783	0.758	0.737	0.718	0.701	0.686	0.671
19.00	...	...	...	...	...	...	...	0.946	0.901	0.847	0.81	0.781	0.756	0.734	0.715	0.698	0.683	0.669
19.25	...	...	...	...	...	...	...	0.948	0.901	0.846	0.808	0.778	0.753	0.732	0.713	0.696	0.681	0.666
19.50	...	...	...	...	...	...	...	0.95	0.9	0.844	0.806	0.776	0.75	0.729	0.71	0.693	0.677	0.663
19.75	...	...	...	...	...	...	...	0.952	0.899	0.842	0.803	0.773	0.748	0.726	0.707	0.69	0.674	0.66
20.00	...	...	...	...	...	...	...	...	0.899	0.84	0.801	0.77	0.745	0.723	0.704	0.687	0.671	0.657
20.25	...	...	...	...	...	...	...	...	0.899	0.839	0.798	0.767	0.742	0.72	0.701	0.683	0.668	0.654
20.50	...	...	...	...	...	...	...	...	0.899	0.837	0.795	0.764	0.738	0.717	0.697	0.68	0.665	0.651
20.75	...	...	...	...	...	...	...	...	0.898	0.834	0.792	0.761	0.735	0.713	0.694	0.677	0.661	0.647
21.00	...	...	...	...	...	...	...	...	0.896	0.832	0.79	0.758	0.732	0.71	0.691	0.673	0.658	0.643
21.25	...	...	...	...	...	...	...	...	0.894	0.829	0.786	0.754	0.728	0.706	0.686	0.669	0.654	0.64
21.50	...	...	...	...	...	...	...	...	0.892	0.826	0.783	0.75	0.724	0.702	0.682	0.665	0.65	0.636
21.75	...	...	...	...	...	...	...	...	0.891	0.823	0.779	0.746	0.72	0.698	0.679	0.661	0.646	0.631
22.00	...	...	...	...	...	...	...	...	0.887	0.82	0.776	0.743	0.716	0.694	0.674	0.657	0.641	0.627

PG-69 CERTIFICATION OF CAPACITY OF PRESSURE RELIEF VALVES

PG-69.1 Before the Code symbol is applied td any pressure relief valve or power-actuated pressure relieving valve, the valve manufacturer shall have the relieving capacity of his pressure relief valves certified in accordance with the provisions of this paragraph.

PG-69.1.1 Capacity certification tests shall be conducted using dry saturated steam. The limits for test purposes shall be 98% minimum quality and 20°F (l0°C) maximum superheat. Correction from within these limits may be made to the dry saturated condition.

PG-69.1.2 Tests shall be conducted at a place that meets the requirements of A-312.

PG-69.1.3 Capacity test data reports for each pressure relief valve design and size, signed by the manufacturer and Authorized Observer witnessing the tests, together with drawings showing the valve construction, shall be submitted to the ASME designee for review and acceptance.[1]

PG-69.1.4 Capacity certification tests shall be conducted at a pressure that does not exceed the set pressure by 3% or 2 psi (15 kPa), whichever is greater. Pressure relief valves shall be adjusted so that the blowdown does not exceed 4% of the set pressure. For pressure relief valves set at or below 100 psi (700 kPa), the blowdown shall be adjusted so as not to exceed 4 psi (30 kPa). Pressure relief valves used on forced-flow steam generators with no fixed steam and waterline, and pressure relief valves used on high-temperature water boilers shall be adjusted so that the blow down does not exceed 10% of the set pressure. The res eating pressure shall be noted and recorded.

PG-69.1.5 Capacity certification of pilot operated pressure relief valves may be based on tests without the pilot valves installed, provided prior to capacity tests it has been demonstrated by test to the satisfaction of the Authorized Observer that the pilot valve will cause the main valve to open fully at a pressure which does not exceed the set pressure by more than 3% or 2 psi (15 kPa), whichever is greater, and that the pilot valve in combination with the main valve will meet all of the requirements of this Section.

PG-69.1.6 Pressure relief valves for economizer service shall also be capacity certified using water at a temperature between 40°F and 125°F (4°C and 50°C). The pressure relief valves shall be tested without change to the adjustments established in PG-69.1.1 to PG-69.1.4.

PG-69.2 Relieving capacities shall be determined using one of the following methods.

PG-69.2.1 Three Valve Method. A capacity certification test is required on a set of three pressure relief valves for each combination of size, design, and pressure setting. The capacity of each valve of the set shall fall within a range of ±5% of the average capacity. If one of the three pressure relief valves tested falls outside this range, it shall be replaced by two valves, and a new average shall be calculated based on all four valves, excluding the replaced valve. Failure of any of the four capacities to fall within a range of ±5% of the new average shall be cause to refuse certification of that particular valve design.

The rated relieving capacity for each combination of design, size, and test pressure shall be 90% of the average capacity.

[1] Valve capacities are published in "Pressure Relief Device Certifications." This publication may be obtained from the National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Columbus, OR 43299.

TABLE PG-69.2.3
SUPERCRITICAL CORRECTION FACTOR, K_{sc}

Flowing Pressure, psia	Total Temperature, °F, of Supercritical Steam									
	750	800	850	900	950	1,000	1,050	1,100	1,150	1,200
3,208.2	1.059	0.971	0.913	0.872	0.839	0.811	0.788	0.767	0.748	0.731
3,250	1.064	0.975	0.916	0.874	0.841	0.813	0.788	0.767	0.748	0.731
3,300	1.070	0.980	0.919	0.876	0.842	0.814	0.790	0.768	0.749	0.732
3,350	1.077	0.985	0.922	0.878	0.844	0.815	0.791	0.769	0.750	0.732
3,400	1.084	0.990	0.925	0.881	0.846	0.817	0.792	0.770	0.750	0.733
3,450	1.091	0.996	0.929	0.883	0.848	0.818	0.793	0.771	0.751	0.734
3,500	1.100	1.002	0.932	0.885	0.849	0.819	0.794	0.772	0.752	0.734
3,550	1.109	1.008	0.935	0.888	0.851	0.821	0.795	0.773	0.753	0.735
3,600	1.118	1.014	0.939	0.890	0.853	0.822	0.796	0.774	0.754	0.735
3,650	1.129	1.020	0.943	0.893	0.855	0.824	0.797	0.775	0.754	0.736
3,700	1.141	1.027	0.946	0.895	0.857	0.825	0.799	0.775	0.755	0.737
3,750	1.153	1.034	0.950	0.898	0.859	0.827	0.800	0.776	0.756	0.737
3,800	1.168	1.041	0.954	0.900	0.861	0.828	0.801	0.777	0.757	0.738
3,850	1.186	1.048	0.958	0.903	0.862	0.830	0.802	0.778	0.757	0.739
3,900	1.205	1.056	0.962	0.906	0.864	0.831	0.803	0.779	0.758	0.739
3,950	1.227	1.064	0.966	0.908	0.866	0.833	0.804	0.780	0.759	0.740
4,000	1.251	1.072	0.970	0.911	0.868	0.834	0.806	0.781	0.760	0.741
4,050	1.279	1.080	0.974	0.914	0.870	0.836	0.807	0.782	0.760	0.741
4,100	1.310	1.089	0.978	0.916	0.872	0.837	0.808	0.783	0.761	0.742
4,150	1.343	1.098	0.983	0.919	0.874	0.839	0.809	0.784	0.762	0.743
4,200	1.395	1.107	0.987	0.922	0.876	0.840	0.810	0.785	0.763	0.743
4,250	1.444	1.116	0.992	0.925	0.878	0.842	0.812	0.786	0.764	0.744
4,300	1.491	1.125	0.997	0.928	0.881	0.844	0.813	0.787	0.765	0.745
4,350	1.538	1.135	1.002	0.931	0.883	0.845	0.814	0.788	0.765	0.745
4,400	...	1.146	1.007	0.934	0.885	0.847	0.815	0.789	0.766	0.746
4,450	...	1.157	1.012	0.937	0.887	0.848	0.817	0.790	0.767	0.746
4,500	...	1.169	1.017	0.940	0.889	0.850	0.818	0.791	0.768	0.747
4,550	...	1.181	1.022	0.943	0.892	0.852	0.819	0.792	0.768	0.748
4,600	...	1.194	1.027	0.947	0.894	0.853	0.820	0.793	0.769	0.749
4,650	...	1.207	1.033	0.950	0.896	0.855	0.822	0.794	0.770	0.749
4,700	...	1.220	1.038	0.953	0.898	0.857	0.823	0.795	0.771	0.750
4,750	...	1.234	1.044	0.957	0.900	0.858	0.824	0.796	0.772	0.751
4,800	...	1.248	1.050	0.960	0.903	0.860	0.826	0.797	0.773	0.751
4,850	...	1.263	1.056	0.963	0.905	0.862	0.827	0.798	0.774	0.752
4,900	...	1.278	1.062	0.967	0.908	0.863	0.828	0.799	0.774	0.753
4,950	...	1.294	1.069	0.970	0.910	0.865	0.830	0.800	0.775	0.753
5,000	...	1.310	1.075	0.974	0.912	0.867	0.831	0.801	0.776	0.754
5,050	...	1.326	1.082	0.978	0.915	0.869	0.832	0.803	0.777	0.755
5,100	...	1.343	1.088	0.981	0.917	0.871	0.834	0.804	0.778	0.755
5,150	...	1.360	1.095	0.985	0.920	0.872	0.835	0.805	0.779	0.756
5,200	...	1.377	1.102	0.989	0.922	0.874	0.837	0.806	0.780	0.757
5,250	...	1.393	1.109	0.993	0.925	0.876	0.838	0.807	0.780	0.758
5,300	...	1.411	1.116	0.997	0.927	0.878	0.839	0.808	0.781	0.758
5,350	...	1.427	1.123	1.001	0.930	0.880	0.841	0.809	0.782	0.759
5,400	...	1.443	1.131	1.004	0.933	0.882	0.842	0.810	0.783	0.760
5,450	...	1.460	1.139	1.009	0.935	0.884	0.844	0.811	0.784	0.760
5,500	...	1.476	1.146	1.013	0.938	0.886	0.845	0.812	0.785	0.761
5,550	...	1.491	1.154	1.017	0.941	0.887	0.846	0.813	0.786	0.762
5,600	...	1.507	1.162	1.021	0.943	0.889	0.848	0.815	0.787	0.763

TABLE PG-69.2.3
SUPERCRITICAL CORRECTION FACTOR, K_{sc} (CONT'D)

Flowing Pressure, psia	Total Temperature, °F, of Supercritical Steam									
	750	800	850	900	950	1,000	1,050	1,100	1,150	1,200
5,650	...	1.522	1.171	1.025	0.946	0.891	0.849	0.816	0.788	0.763
5,700	...	1.536	1.179	1.030	0.949	0.893	0.851	0.817	0.788	0.764
5,750	...	1.551	1.187	1.034	0.952	0.895	0.852	0.818	0.789	0.765
5,800	...	1.565	1.195	1.038	0.955	0.897	0.854	0.819	0.790	0.765
5,850	...	1.578	1.204	1.043	0.957	0.899	0.855	0.820	0.791	0.766
5,900	...	1.591	1.212	1.047	0.960	0.901	0.857	0.821	0.792	0.767
5,950	...	1.603	1.221	1.052	0.963	0.903	0.858	0.823	0.793	0.768
6,000	...	1.615	1.229	1.057	0.966	0.906	0.860	0.824	0.794	0.768

PG-69.2.2 Slope Method. If a Manufacturer wishes to apply the Code Symbol to a design of pressure relief valves, four valves of each combination of pipe size and orifice size shall be tested. These four valves shall be set at pressures that cover the approximate range of pressures for which the valve will be used or covering the range available at the certified test facility that shall conduct the tests. The capacities based on these four tests shall be as follows:

(a) The slope WIP of the actual measured capacity versus the flow pressure for each test point shall be calculated and averaged

For steam

$$\text{slope} = \frac{W}{P} = \frac{\text{measured capacity}}{\text{absolute flow rating pressure}}$$

For water

$$\text{slope} = \frac{W}{P} = \frac{\text{measured capacity}}{\sqrt{(\text{flow rating pressure}) - (\text{discharge pressure})}}$$

All values derived from the testing must fall within ±5% of the average value:

minimum slope = 0.95 x average slope

maximum slope = 1.05 x average slope

If the values derived from the testing do not fall between the minimum and maximum slope values, the Authorized Observer shall require that additional valves be tested at the rate of two for each valve beyond the maximum and minimum values with a limit of four additional valves.

For steam applications the relieving capacity to be stamped on the valve shall not exceed 90% of the average slope times the absolute accumulation pressure

rated slope = 0.90 x average slope

For water applications the relieving capacity shall not exceed 90% of the average slope multiplied by the square root of the difference between the flow rating pressure and the valve discharge pressure.

$$\text{rated slope} = 0.9 \times \text{average slope} \times \sqrt{\text{flow rating pressure} - \text{discharge pressure}}$$

(U.S. Customary Units)

stamped capacity ≤ rated slope (1.03 x set pressure + 14.7) or (set pressure + 2 psi + 14.7), whichever is greater

(SI Units)

stamped capacity ≤ rated slope (1.03 x set pressure + 0.101) or (set pressure + 0.015 MPa + 0.101), whichever is greater

TABLE PG-69.2.3M
SUPERCRITICAL CORRECTION FACTOR, K_{SC}

Flowing Pressure, MPa	Total Temperature, °C, of Supercritical Steam										
	400	425	450	475	500	525	550	575	600	625	650
22.12	1.056	0.976	0.922	0.883	0.851	0.824	0.801	0.781	0.762	0.745	0.730
22.25	1.058	0.978	0.924	0.884	0.852	0.825	0.802	0.781	0.763	0.746	0.730
22.50	1.063	0.982	0.926	0.886	0.853	0.826	0.803	0.782	0.763	0.746	0.731
22.75	1.067	0.985	0.929	0.887	0.855	0.827	0.803	0.783	0.764	0.747	0.731
23.00	1.072	0.989	0.931	0.889	0.856	0.828	0.804	0.783	0.764	0.747	0.732
23.25	1.077	0.993	0.934	0.891	0.858	0.830	0.805	0.784	0.765	0.748	0.732
23.50	1.082	0.997	0.937	0.893	0.859	0.831	0.806	0.785	0.766	0.748	0.732
23.75	1.087	1.001	0.939	0.895	0.860	0.832	0.807	0.785	0.766	0.749	0.733
24.00	1.093	1.006	0.942	0.897	0.862	0.833	0.808	0.786	0.767	0.749	0.733
24.25	1.099	1.010	0.945	0.899	0.863	0.834	0.809	0.787	0.768	0.750	0.734
24.50	1.106	1.014	0.948	0.901	0.865	0.835	0.810	0.788	0.768	0.751	0.734
24.75	1.112	1.019	0.950	0.903	0.866	0.836	0.811	0.789	0.769	0.751	0.735
25.00	1.120	1.024	0.953	0.905	0.868	0.837	0.812	0.789	0.769	0.752	0.735
25.25	1.128	1.029	0.956	0.907	0.869	0.839	0.813	0.790	0.770	0.752	0.736
25.50	1.136	1.034	0.959	0.909	0.871	0.840	0.814	0.791	0.771	0.753	0.736
25.75	1.145	1.039	0.962	0.911	0.872	0.841	0.815	0.792	0.771	0.753	0.737
26.00	1.155	1.045	0.966	0.913	0.874	0.842	0.816	0.792	0.772	0.754	0.737
26.25	1.166	1.050	0.969	0.915	0.875	0.843	0.817	0.793	0.773	0.754	0.737
26.50	1.178	1.056	0.972	0.917	0.877	0.845	0.818	0.794	0.773	0.755	0.738
26.75	1.192	1.062	0.975	0.919	0.879	0.846	0.819	0.795	0.774	0.755	0.738
27.00	1.206	1.068	0.979	0.921	0.880	0.847	0.820	0.796	0.775	0.756	0.739
27.25	1.222	1.074	0.982	0.924	0.882	0.848	0.820	0.796	0.775	0.756	0.739
27.50	1.239	1.081	0.985	0.926	0.883	0.850	0.821	0.797	0.776	0.757	0.740
27.75	1.258	1.088	0.989	0.928	0.885	0.851	0.822	0.798	0.777	0.758	0.740
28.00	1.278	1.095	0.992	0.930	0.887	0.852	0.824	0.799	0.777	0.758	0.741
28.25	1.300	1.102	0.996	0.933	0.888	0.854	0.825	0.800	0.778	0.759	0.741
28.50	1.323	1.109	1.000	0.935	0.890	0.855	0.826	0.801	0.779	0.759	0.742
28.75	1.354	1.117	1.004	0.937	0.892	0.856	0.827	0.801	0.779	0.760	0.742
29.00	1.390	1.126	1.007	0.940	0.893	0.857	0.828	0.802	0.780	0.760	0.743
29.25	1.424	1.134	1.011	0.942	0.895	0.859	0.829	0.803	0.781	0.761	0.743
29.50	1.457	1.143	1.015	0.945	0.897	0.860	0.830	0.804	0.781	0.762	0.744
29.75	1.490	1.151	1.019	0.947	0.899	0.861	0.831	0.805	0.782	0.762	0.744
30.00	...	1.158	1.023	0.950	0.900	0.863	0.832	0.806	0.783	0.763	0.745
30.25	...	1.098	1.028	0.952	0.902	0.864	0.833	0.806	0.784	0.763	0.745
30.50	...	1.083	1.032	0.955	0.904	0.865	0.834	0.807	0.784	0.764	0.746
30.75	...	1.090	1.036	0.957	0.906	0.867	0.835	0.808	0.785	0.764	0.746
31.00	...	1.099	1.041	0.960	0.908	0.868	0.836	0.809	0.786	0.765	0.746
31.25	...	1.107	1.046	0.963	0.910	0.870	0.837	0.810	0.786	0.766	0.747
31.50	...	1.115	1.050	0.966	0.911	0.871	0.838	0.811	0.787	0.766	0.748
31.75	...	1.124	1.055	0.968	0.913	0.872	0.839	0.812	0.788	0.767	0.748
32.00	...	1.133	1.060	0.971	0.915	0.874	0.840	0.812	0.788	0.767	0.748
32.25	...	1.142	1.065	0.974	0.917	0.875	0.841	0.813	0.789	0.768	0.749
32.50	...	1.151	1.070	0.977	0.919	0.877	0.843	0.814	0.790	0.769	0.750
32.75	...	1.160	1.075	0.980	0.921	0.878	0.844	0.815	0.791	0.769	0.750
33.00	...	1.170	1.080	0.983	0.923	0.879	0.845	0.816	0.791	0.770	0.750
33.25	...	1.180	1.085	0.986	0.925	0.881	0.846	0.817	0.792	0.770	0.751
33.50	...	1.190	1.091	0.988	0.927	0.882	0.847	0.818	0.793	0.771	0.751
33.75	...	1.201	1.096	0.992	0.929	0.884	0.848	0.819	0.793	0.772	0.752
34.00	...	1.211	1.102	0.995	0.931	0.885	0.849	0.820	0.794	0.772	0.752

TABLE PG-69.2.3M
SUPERCRITICAL CORRECTION FACTOR, K_{SC} (CONT'D)

Flowing Pressure, MPa	Total Temperature, °C, of Supercritical Steam										
	400	425	450	475	500	525	550	575	600	625	650
34.25	...	1.222	1.108	0.998	0.933	0.887	0.850	0.820	0.795	0.773	0.753
34.50	...	1.233	1.114	1.001	0.935	0.888	0.852	0.821	0.796	0.773	0.753
34.75	...	1.244	1.119	1.004	0.937	0.890	0.853	0.822	0.796	0.774	0.754
35.00	...	1.255	1.125	1.007	0.939	0.891	0.854	0.823	0.797	0.775	0.754
35.25	...	1.267	1.131	1.011	0.941	0.893	0.855	0.824	0.798	0.775	0.755
35.50	...	1.278	1.137	1.014	0.944	0.894	0.856	0.825	0.799	0.776	0.755
35.75	...	1.290	1.144	1.017	0.946	0.896	0.858	0.826	0.799	0.776	0.756
36.00	...	1.301	1.150	1.021	0.948	0.898	0.859	0.827	0.800	0.777	0.757
36.25	...	1.313	1.156	1.024	0.950	0.899	0.860	0.828	0.801	0.778	0.757
36.50	...	1.324	1.162	1.027	0.952	0.901	0.861	0.829	0.802	0.778	0.758
36.75	...	1.336	1.169	1.031	0.955	0.902	0.862	0.830	0.802	0.779	0.758
37.00	...	1.347	1.175	1.034	0.957	0.904	0.864	0.831	0.803	0.779	0.759
37.25	...	1.358	1.182	1.038	0.959	0.906	0.865	0.832	0.804	0.780	0.759
37.50	...	1.369	1.188	1.042	0.961	0.907	0.866	0.833	0.805	0.781	0.760
37.75	...	1.380	1.195	1.045	0.964	0.909	0.867	0.834	0.805	0.781	0.760
38.00	...	1.391	1.201	1.049	0.966	0.910	0.868	0.834	0.806	0.782	0.761
38.25	...	1.402	1.208	1.053	0.968	0.912	0.870	0.835	0.807	0.783	0.761
38.50	...	1.412	1.215	1.056	0.971	0.914	0.871	0.836	0.808	0.783	0.762
38.75	...	1.422	1.222	1.060	0.973	0.915	0.872	0.837	0.809	0.784	0.762
39.00	...	1.433	1.228	1.064	0.975	0.917	0.873	0.838	0.809	0.784	0.763
39.25	...	1.443	1.235	1.068	0.978	0.919	0.875	0.839	0.810	0.785	0.763
39.50	...	1.453	1.242	1.072	0.980	0.921	0.876	0.840	0.811	0.786	0.764
39.75	...	1.463	1.248	1.076	0.983	0.922	0.877	0.841	0.812	0.786	0.764
40.00	...	1.472	1.255	1.080	0.985	0.924	0.879	0.842	0.812	0.787	0.765
40.25	...	1.481	1.262	1.084	0.988	0.926	0.880	0.843	0.813	0.788	0.765
40.50	...	1.490	1.268	1.088	0.990	0.928	0.881	0.844	0.814	0.788	0.766
40.75	...	1.499	1.275	1.092	0.993	0.929	0.882	0.845	0.815	0.789	0.766
41.00	...	1.507	1.282	1.096	0.995	0.931	0.884	0.846	0.816	0.790	0.767
41.25	...	1.515	1.288	1.100	0.998	0.933	0.885	0.847	0.816	0.790	0.767

PG-69.2.3 Coefficient of Discharge Method. A coefficient of discharge for the design, *K*, may be established for a specific valve design according to the following procedure:

(a) For each design, the pressure relief valve manufacturer shall submit for test at least three valves for each of three different sizes (a total of nine valves). Each valve of a given size shall be set at a different pressure, covering the range of pressures for which the valve will be used or the range available at the facility where the tests are conducted.

For each valve design where the coefficient of discharge has been determined that is intended to be restricted in lift, the Manufacturer shall have capacity tests conducted on three valves of different sizes. Each size valve shall be tested for capacity at the minimum lift for which certification is required, and at two intermediate lift points between the full rated lift and minimum lift certification points. Each of the three test valves shall be set at a different pressure.

For each valve tested, it shall be verified that actual measured capacity at restricted lift will equal or exceed the rated capacity at full rated lift multiplied by the ratio of measured restricted lift to full rated lift.

(b) Tests shall be made on each pressure relief valve to determine its lift at capacity, popping, and blowdown pressures, and actual relieving capacity. An individual coefficient, K_D, shall be established for each valve as follows:

$$K_D = \frac{\text{actual flow}}{\text{theoretical flow}} = \text{individual coefficient of discharge}$$

Where actual flow is determined by test and theoretical flow, W_T is calculated by one of the following equations:

For tests with dry saturated steam

For 45 deg seat

(U.S. Customary Units)

$W_T = 51.5 \times \pi DLP \times 0.707$

(SI Units)

$W_T = 5.25 \times \pi DLP \times 0.707$

For flat seat

(U.S. Customary Units)

$$W_T = 51.5 \times \pi DLP$$

(SI Units)

$$W_T = 5.25 \times \pi DLP$$

For nozzle

(U.S. Customary Units)

$$W_T = 51.5\,AP$$

(SI Units)

$$W_T = 5.25\,AP$$

For tests with water

For 45 deg seat

(U.S. Customary Units)

$$W = 1\,135.8\,\frac{0.95}{5.25} \times \frac{dW}{dP}\sqrt{\frac{P}{v}}$$

(SI Units)

$$W_T = 5\,092\ \pi DL\,(0.707)\sqrt{(P - P_d)w}$$

For flat seat

(U.S. Customary Units)

$$W_T = 2{,}407\ \pi DL\sqrt{(P - P_d)w}$$

(SI Units)

$$W_T = 5\,092\ \pi DL\sqrt{(P - P_d)w}$$

For nozzle

(U.S. Customary Units)

$$W_T = 2{,}407\,A\sqrt{(P - P_d)w}$$

(SI Units)

$$W_T = 5\,092\,A\sqrt{(P - P_d)w}$$

where

A = nozzle throat area, in.^{2} (mm^2)
D = seat diameter, in. (mm)
L = lift at pressure *P*, in. (mm)
P = (1.03 X set pressure + 14.7), psia, or
= (set pressure + 2 + 14.7), psia, whichever is greater
= (1.03 X set pressure + 0.101), MPa, or
= (set pressure + 0.014 + 0.101), MPa, whichever is greater
P d = pressure at discharge of the valve, psia (MPa)
WT = theoretical flow, lb/hr (kg/hr)
w = specific weight of water at inlet conditions, lb/ft^3 (kg/m^3)

To convert lb/hr of water to gal/min of water, multiply the capacity in lb/hr by 1/500, To convert kg/hr of water to liter/min of water, multiply the capacity in liter/min by 1/60.

The average of the coefficients K_D of the nine tests required shall be multiplied by 0.90, and this product shall be taken as the coefficient *K* of that design. All individual coefficients of discharge, K_D, shall fall within a range of ±5% of the average coefficient found. If a valve fails to meet this requirement, the Authorized Observer shall require two additional valves to be tested as replacements for each valve having an individual coefficient, K_D, outside the ±5% range, with a limit of four additional valves. Failure of a coefficient, K_D, to fall within ±5% of the new average value, excluding the replaced valve(s), shall be cause to refuse certification of that particular valve design.

The rated relieving capacity of all sizes and set pressures of a given design, for which *K* has been established under the provision of this paragraph, shall be determined by the equation:

$$W \le W_T \times K$$

where

K = coefficient of discharge for the design
W = rated relieving capacity, lb/hr (kg/hr)
W_T = theoretical flow, defined by the same equation used to determine K_D, lb/hr (kg/hr)

The coefficient of discharge for the design shall be not greater than 0.878 (the product of 0.9 x 0.975). The coefficient shall not be applied to valves whose beta ratio (ratio of valve throat to inlet diameter) lies outside the range of 0.15 to 0.75, unless tests have demonstrated that the individual coefficient of discharge, K_D, for valves at the extreme ends of a larger range, is within ±5% of the average coefficient, K_D.

For designs where the lift is used to determine the flow area, all valves shall have the same nominal lift to seat diameter ratio (*L*/*D*).

For pressures over 1,500 psig (10.3 MPa) and up to 3,200 psig (22.1 MPa), the value of *W* shall be multiplied by the correction factor:

(U.S. Customary Units)

$$\frac{0.1906P - 1{,}000}{0.2292P - 1{,}061}$$

(SI Units)

$$\frac{27.6P - 1\,000}{33.2P - 1\,061}$$

For pressures over 3,200 psig (22.1 MPa), the value of *W* shall be multiplied by the appropriate supercritical correction factor, K_{sc}, from Table PG-69.2.3.

PG-69.3 If a manufacturer wishes to apply the Code symbol to a power-actuated pressure relieving valve under PG-67.4.1, one valve of each combination of inlet pipe size and orifice size to be used with that inlet pipe size shall be tested. The valve shall be capacity tested at four different pressures approximately covering the range of the certified test facility on which the tests are conducted. The capacities, as determined by these four tests, shall be plotted against the absolute flow test pressure and a line drawn through these four test points. All points must lie within ±5% in capacity value of the plotted line and must pass through 0-0. From the plotted line, the slope of the line *dW/dP* shall be determined and a factor of (0.90/51.45) x (*dW/dP*) shall be applied to capacity computations in the supercritical region at elevated pressures by means of the isentropic flow equation.

(U.S. Customary Units)

$$W = 1{,}135.8 \frac{0.90}{51.45} \times \frac{dW}{dP} \sqrt{\frac{P}{v}}$$

(SI Units)

$$W = 1\,135.8 \frac{0.95}{5.25} \times \frac{dW}{dP} \sqrt{\frac{P}{v}}$$

where

dW/dP = rate of change of measured capacity with respect to absolute pressure

P = absolute inlet pressure, psia (MPa)

v = inlet specific volume, ft^3/lb (m^3/kg)

W = capacity, lb of steam/hr (kg/hr)

NOTE: The constant 1,135.8 is based on a γ factor of 1.30, which is accurate for superheated steam at temperature above approximately 800°F (430°C). In interest of accuracy, other methods of capacity computations must be used at temperatures below 800°F (430°C) at supercritical pressures.

PG-69.4 Power-actuated pressure relieving valves, having capacities certified in accordance with the provision of PG-69.3 and computed in accordance with the formula contained therein, shall be marked as required by PG-110 with the computed capacity, corresponding to 3% above the full load operating pressure and temperature conditions at the valve inlet when the valve is operated by the controller, and they shall also be stamped with the set pressure of the controller. When the valve is marked as required by this paragraph, it shall be the guarantee by the manufacturer that the valve also conforms to the details of construction herein specified.

PG-69.6 When changes are made in the design of a safety or safety relief valve in such a manner as to affect the flow path, lift, or performance characteristics of the valve, new tests in accordance with this Section shall be performed.

PG-70 CAPACITY OF PRESSURE RELIEF VALVES

PG-70.1 Subject to the minimum number required by PG-67.1, the number of pressure relief valves required shall be determined on the basis of the maximum designed steaming capacity, as determined by the boiler Manufacturer, and the relieving capacity marked on the valves by the manufacturer.

PG-71 MOUNTING OF PRESSURE RELIEF VALVES

PG-71.1 When two or more pressure relief valves are used on a boiler, they may be mounted either separately or as twin valves made by placing individual valves on Y-bases, or duplex valves having two valves in the same body casing. Twin valves made by placing individual valves on Y-bases, or duplex valves having two valves in the same body, shall be of approximately equal capacity.

When not more than two valves of different sizes are mounted singly the relieving capacity of the smaller valve shall be not less than 50% of that of the larger valve.

PG-71.2 The pressure relief valve or valves shall be connected to the boiler independent of any other connection, and attached as close as possible to the boiler or the normal steam flow path, without any unnecessary intervening pipe or fitting. Such intervening pipe or fitting shall be not longer than the face-to-face dimension of the corresponding tee fitting of the same diameter and pressure under the applicable ASME Standard listed in PG-42 and shall also comply with PG-8 and PG-39. Every pressure relief valve shall be connected so as to stand in an upright position, with spindle vertical. On high-temperature water boilers of the watertube forced-circulation type, the valve shall be located at the boiler outlet.

PG-71.3 The opening or connection between the boiler and the pressure relief valve shall have at least the area of the valve inlet. No valve of any description shall be placed between the required pressure relief valve or valves and the boiler, nor on the discharge pipe between the pressure relief valve and the atmosphere. When a discharge pipe is used, the cross-sectional area shall be not less than the full area of the valve outlet or of the total of the areas of the valve outlets, discharging thereinto. It shall be as short and straight as possible and so arranged as to avoid undue stresses on the valve or valves.

All pressure relief valve discharges shall be so located or piped as to be carried clear from running boards or platforms. Ample provision for gravity drain shall be made in the discharge pipe at or near each pressure relief valve, and where water of condensation may collect. Each valve shall have an open gravity drain

through the casing below the level of the valve seat. For iron- and steel-bodied valves exceeding NPS 2 ½ (DN 65), the drain hole shall be tapped not less than NPS ⅜ (DN 10).

Discharge piping from pressure relief valves on high temperature water boilers shall be provided with adequate provisions for water drainage as well as the steam venting.

The installation of cast iron bodied pressure relief valves for high-temperature water boilers is prohibited.

PG-71.4 If a muffler is used on a pressure relief valve, it shall have sufficient outlet area to prevent back pressure from interfering with the proper operation and discharge capacity of the valve. The muffler plates or other devices shall be so constructed as to avoid a possibility of restriction of the steam passages due to deposit. Mufflers shall not be used on high-temperature water boiler pressure relief valves.

When a pressure relief valve is exposed to outdoor elements that may affect operation of the valve, it is permissible to shield the valve with a satisfactory cover. The shield or cover shall be properly vented and arranged to permit servicing and normal operation of the valve.

PG-71.5 When a boiler is fitted with two or more pressure relief valves on one connection, this connection to the boiler shall have a cross-sectional area not less than the combined areas of inlet connections of all the pressure relief valves with which it connects and shall also meet the requirements of PG-71.3.

PG-71.6 Pressure relief valves may be attached to drums or headers by welding provided the welding is done in accordance with Code requirements.

PG-71.7 Every boiler shall have proper outlet connections for the required pressure relief valve, or valves, independent of any other outside steam connection,. the area of opening to be at least equal to the aggregate areas of inlet connections of all of the pressure relief valves to be attached thereto. An internal collecting pipe, splash plate, or pan may be used, provided the total area for inlet of steam thereto is not less than twice the aggregate areas of the inlet connections of the attached pressure relief valves. The holes in such collecting pipes shall be at least ¼ in. (6 mm) in diameter and the least dimension in any other form of opening for inlet of steam shall be ¼ in. (6 mm).

Such dimensional limitations to operation for steam need not apply to steam scrubbers or driers provided the net free steam inlet area of the scrubber or drier is at least 10 times the total area of the boiler outlets for the pressure relief valves.

PG-71.8 If pressure relief valves are attached to a separate steam drum or dome, the opening between the boiler proper and the steam drum or dome shall be not less than required by PG-71.7.

PG-72 OPERATION OF PRESSURE RELIEF VALVES

PG-72.1 Pressure relief valves shall be designed and constructed to operate without chattering, with a minimum blowdown of 2 psi (15 kPa) or 2% of the set pressure, whichever is greater, and to attain full lift at a pressure not greater than 3% above their set pressure. Pressure relief valves used on forced-flow steam generators with no fixed steam and waterline, and pressure relief valves used on high-temperature water boilers must be marked for these special services by the valve Manufacturer or Assembler.

PG-72.2 The set pressure tolerance plus or minus shall not exceed that specified in the following table:

Set Pressure, psi (MPa)	Tolerance, Plus or Minus From Set Pressure
≤ 70 (0.5)	2 psi (15 kPa)
> 70 (0.5) and ≤ 300 (2.1)	3% of set pressure
> 300 (2.1) and ≤ 1,000 (7.0)	10 psi (70 kPa)
> 1,000 (7.0)	1% of set pressure

PG-72.3 The spring in a pressure relief valve shall not be reset for any pressure more than 5% above or below that for which the valve is marked unless the new setting is within the spring design range established by the manufacturer or is determined to be acceptable to the manufacturer.

If the set pressure is to be adjusted within the limits specified above, the adjustment shall be performed by the manufacturer, his authorized representative, or an assembler. An additional valve data tag identifying the new set pressure, capacity, and date shall be furnished and installed, and the valve shall be resealed.

PG-72.4 If the set pressure of a valve is changed so as to require a new spring, the spring shall be acceptable to the manufacturer. The spring installation and valve adjustment shall be performed by the manufacturer, his authorized representative, or an assembler. A new nameplate as described in PG-110 shall be furnished and installed, and the valve shall be resealed.

PG-73 MINIMUM REQUIREMENTS FOR PRESSURE RELIEF VALVES

PG-73.1 Permissible Pressure Relief Valves

PG-73.1.1 Pressure relief valves shall be either direct spring-loaded safety valves, direct spring-loaded safety relief valves, or pilot-operated pressure relief valves.

PG-73.1.2 Power-actuated pressure relieving valves shall only be used for applications specified in PG-67.4.1.

PG-73.1.3 Deadweight or weighted lever safety valves or safety relief valves shall not be used.

PG-73.1.4 Unless otherwise defined, the definitions relating to pressure relief devices in ASME PTC 25 shall apply.

PG-73.2 Minimum Requirements

PG-73.2.1 All pressure relief valves shall be so constructed that the failure of any part cannot obstruct the free and full discharge of steam and water from the valve. Pressure relief valves shall have the seat inclined at any angle between 45 deg and 90 deg, inclusive, to the centerline of the disk.

PG-73.2.2 The design shall incorporate guiding arrangements necessary to insure consistent operation and tightness.

PG-73.2.3 The spring shall be designed so that the full lift spring compression shall be no greater than 80% of the nominal solid deflection. The permanent set of the spring (defined as the difference between the free height and height measured 10 min after the spring has been compressed solid three additional times after presetting at room temperature) shall not exceed 0.5 % of the free height.

PG-73.2.4 To provide a means for verifying whether it is free, each safety valve or safety relief valve shall have a substantial lifting device, which when activated will release the seating force on the disk when the valve is subjected to pressure of at least 75% of the set pressure. The lifting device shall be such that it cannot lock or hold the valve disk in lifted position when the exterior lifting force is released. Disks of pressure relief valves used on high-temperature water boilers shall not be lifted while the temperature of the water exceeds 200°F (93°C). If it is desired to lift the valve disk to assure that it is free, this shall be done when the valve is subjected to a pressure of at least 75% of the set pressure. Pilot-operated pressure relief valves shall be provided with either a lifting device as described above or means for connecting and applying pressure to the pilot adequate to verify that the moving parts critical to proper operations are free to move. For high-temperature water boilers, the lifting mechanism shall be sealed against leakage.

PG-73.2.5 The seat of a pressure relief valve shall be fastened to the body of the valve in such a way that there is no possibility of the seat lifting.

PG-73.2.6 A body drain below seat level shall be provided in the valve and this drain shall not be plugged during or after field installation. For valves exceeding NPS 2 ½ (DN 65), the drain hole or holes shall be tapped not less than NPS ⅜ (D N 10). For valves of NPS 2 ½ (DN 65) or smaller, the drain hole shall not be less than ¼ in. (6 mm) in diameter.

PG-73.2.7 In the design of the body of the valve, consideration shall be given to minimizing the effects of water deposits.

PG-73.2.8 Valves having screwed inlet or outlet connections shall be provided with wrenching surfaces to allow for normal installation without damaging operating parts.

PG-73.2.9 Means shall be provided in the design of all valves for use under this Section, for sealing all external adjustments. Seals shall be installed by the manufacturer, his authorized representative, or an assembler at the time of the initial adjustment. After spring replacement and/or subsequent adjustment, the valve shall be resealed. Seals shall be installed in such a manner as to prevent changing the adjustment without breaking the seal and, in addition, shall serve as a means of identifying the manufacturer, his authorized representative, or the assembler making the adjustment.

PG-73.2.10 Valve capacity may be restricted by restricting the lift of a valve provided the following requirements are met:

(a) The valve size shall be NPS ¾ (DN 20) or larger.

(b) No changes shall be made in the design of the valve except to change the valve lift by use of a lift restraining device described in (c) below.

(c) The restriction of valve capacity shall be permitted only by the use of a lift restraining device which shall limit valve lift and shall not otherwise interfere with flow through the valve. The design of the lift restraining device shall be subject to review by an ASME designee.

(d) The lift restraining device shall be designed so that, if adjustable, the adjustable feature can be sealed. Seals shall be installed by the valve Manufacturer or Assembler at the time of initial adjustment.

(e) Valves shall not have their lifts restricted to a value less than 30% of full rated lift, or 0.080 in. (2 mm).

(f) When sizing and selecting valves, the restricted lift nameplate capacity shall be determined by multiplying the capacity at full rated lift by the ratio of the restricted lift to the full rated lift.

PG-73.2.11 A pressure relief valve over NPS 3 (DN 80), used for pressure greater than 15 psig (100 kPa), shall have a flanged inlet connection or a welded inlet connection. The dimensions of the flanges subjected to boiler pressure shall conform to the applicable ASME standards as given in PG-42. The facing shall be similar to those illustrated in the standard.

PG-73.2.12 The pilot sensing line of pilot-operated pressure relief valves shall be adequately protected from freezing.

PG-73.3 Material Selections

PG-73.3.1 Cast iron seats and disks are not permitted.

PG-73.3.2 Adjacent sliding surfaces such as guides and disks or disk holders shall both be of corrosion-resistant material. Springs of corrosion-resistant material or having a corrosion-resistant coating are required. The seats and disks of pressure relief valves shall be of suitable material to resist corrosion by the lading fluid.
NOTE: The degree of corrosion resistance, appropriate to the intended service, shall be a matter of agreement between the manufacturer and the purchaser.

PG-73.3.3 Materials used in bodies and bonnets or yokes shall be listed in Section II, Parts A and B, and identified in Tables 1A and 1B of Section II Part D, as permitted for Section I construction. Materials used in body to bonnet or body to yoke bolting shall be listed in

ASME B16.34. Materials used in all other parts required for the pressure relieving or retaining function shall be

(a) listed in ASME Section II

(b) listed in ASTM Specifications (see Note below) or

(c) controlled by the manufacturer of the pressure relief valve by a specification ensuring control of chemical and physical properties and quality at least equivalent to ASTM Standards (see Note below)

PG-73.3.4 Pressure relief valves may have bronze parts complying with either SB-61, SB-62"or SB-148, provided the maximum allowable stresses and temperatures do not exceed the values given in Table 1B of Section II, Part D, and shall be marked to indicate the class of material used. Such valves shall not be used on superheaters delivering steam at a temperature over 450°F (230°C) for SB-61 and SB-148, and 306°F (I50°C) for SB-62, and shall not be used for high-temperature water boilers.

NOTE: It shall be the manufacturer's responsibility to ensure that the allowable stresses at temperature meet the requirements of Section II, Part D, Appendix 1, Mandatory Basis for Establishing Stress Values in Tables 1A and 1B.

PG-73.4 Inspection of Manufacturing and/or Assembly

PG-73.4.1 A manufacturer shall demonstrate to the satisfaction of an ASME designee that his manufacturing, production, and test facilities and quality control procedures will ensure close agreement between the performance of random production samples and the performance of those valves submitted for capacity certification.

PG-73.4.2 Manufacturing, assembly, inspection, and test operations including capacity, are subject to inspections at any time by an ASME designee.

PG-73.4.3 A Manufacturer or Assembler may be granted permission to apply the V Code Symbol to production pressure relief valves capacity-certified in accordance with PG-69, provided the following tests are successfully completed. This permission shall expire on the sixth anniversary of the date it is initially granted. This permission may be extended for 6-yr periods if the following tests are successfully repeated within the 6-mo period before expiration.

(a) Two sample production pressure relief valves of a size and capacity within the capability of an ASME accepted laboratory shall be selected by an ASME designee. The maximum blowdown for these samples shall not exceed the value specified in the following table:

Set Pressure, psi (MPa)	Maximum Blowdown
< 67 (500)	4 psi (30 kPa)
≥ 67 (500) and ≤ 250 (1 700)	6% of set pressure
> 250 (1 700) and < 375 (2 500)	15 psi (100 kPa)
≥ 375 (2 500)	4% of set pressure

The blow down for sample valves designed for use on forced flow steam generators with no fixed steam and waterline or high-temperature water boilers shall not exceed 10% of the set pressure.

(b) Operational and capacity tests shall be conducted in the presence of an ASME designee at an ASME-accepted laboratory .. The valve manufacturer or assembler shall be notified of the time of the test and may have representatives present to witness the test.

(c) Should any valve fail to relieve at or above its certified capacity or should it fail to meet performance requirements in PG-72, the test shall be repeated at the rate of two replacement valves, selected in accordance with PG-73.4.3(a), for each valve that failed.

(d) Failure of any of the replacement valves to meet capacity or the performance requirements of this Section shall be cause for revocation within 60 days of the authorization to use the Code symbol on that particular t type of valve. During this period, the Manufacturer or assembler shall demonstrate the cause of such deficiency and the action taken toward against future occurrence.

PG-73.4.4 Use of the Code Symbol Stamp by an assembler indicates the use of original unmodified parts in strict accordance with the instructions of the manufacturer of the valve.

(a) An assembler may transfer original and unmodified pressure relief parts produced by the Manufacturer to other Assemblers, provided the following conditions are met:

(1) both Assemblers have been granted permission to apply the V or UV Code Symbol to the specific valve type in which the parts are to be used

(2) the Quality Control System of the Assembler receiving the pressure relief valve parts shall define the controls for the procurement and acceptance of those parts

(3) the pressure relief valve parts are appropriately packaged, marked, or sealed by the Manufacturer to ensure that the parts are

(a) produced, by the Manufacturer

(b) the parts are original and unmodified

(b) However, an assembler may convert original finished parts by either machining to another finished part or applying a corrosion-resistant coating to valve springs for a specific application under the following conditions:

(1) Conversions shall be specified by the Manufacturer. Drawings and/or written instructions used for part conversion shall be obtained from the Manufacturer and shall include a drawing or description of the converted part before and after the conversion.

(2) The Assembler's quality control system, as accepted by a representative from an ASME-designated organization, must describe in detail the conversion of original parts, provisions for inspection and acceptance, personnel training, and control of current Manufacturer's drawings and/or written instructions.