

President Engineering Works manufactures fasteners in these grade(s).

⇒ Chemical Properties*:

Alloy	C %	Mn %	P %	S %	Si %	Cr %	Ni %	Mo %	N %	V %	Al %	Ti %	Cb+Ta %
	Min - Max	Max	Max	Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Alloy Steel													
B5	0.10 Min	1.0	0.04	0.03	1.0	4.0-6.0	--	0.40-0.65	--	--	--	--	--
B6	0.15	1.0	0.04	0.03	1.0	11.5-13.5	--	--	--	--	--	--	--
B6X	0.15	1.0	0.04	0.03	1.0	11.5-13.5	--	--	--	--	--	--	--
B7	0.37-0.49	0.65-1.10	0.035	0.040	0.15-0.35	0.75-1.20	--	0.15-0.25	--	--	--	--	--
B7M	0.37-0.49	0.65-1.10	0.035	0.040	0.15-0.35	0.75-1.20	--	0.15-0.25	--	--	--	--	--
B16	0.36-0.47	0.45-0.70	0.035	0.040	0.15-0.35	0.80-1.15	--	0.50-0.65	--	0.25-0.35	0.015	--	--
L7	0.38-0.48	0.75-1.00	0.035	0.040	0.15-0.35	0.80-1.10	--	0.15-0.25	--	--	--	--	--
L7M	0.38-0.48	0.75-1.00	0.035	0.040	0.15-0.35	0.80-1.10	--	0.15-0.25	--	--	--	--	--
L43	0.38-0.43	0.60-0.85	0.035	0.040	0.15-0.35	0.70-0.90	1.65-2.00	0.20-0.30	--	--	--	--	--

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⇒ Mechanical Properties:

Alloy	ASTM	AISI	UNS	W.-Nr.	Dia	Yield Strength (0.2 % Offset) MPa Minimum	Tensile Strength MPa Minimum	Elongation (4 D) % Minimum	Reduction of Area % Minimum	Hardness HRB/HRC Min - Max	Hardness BHN Min - Max
Alloy Steel											
B5	A 193	501	S50100	1.7362	up to 4", incl.	550.00	690.00	16.00	50.00	--	--
B6	A 193	410	S41000	1.4006	up to 4", incl.	585.00	760.00	15.00	50.00	--	--
B6X	A 193	410	S41000	1.4006	up to 4", incl.	485.00	620.00	16.00	50.00	26 HRC Max	258 Max
B7	A 193	4140	G41400	1.7225	2.1/2" & under	720.00	860.00	16.00	50.00	35 HRC Max	321 Max
					over 2.1/2" to 4"	655.00	795.00	16.00	50.00	33 HRC Max	302 Max
					over 4" to 7"	515.00	690.00	18.00	50.00	29 HRC Max	277 Max
B7M	A 193	4140	G41400	1.7225	2.1/2" & under	550.00	690.00	18.00	50.00	99 HRB Max	235 Max
					over 2.1/2" to 4"	550.00	690.00	18.00	50.00	99 HRB Max	235 Max
					over 4" to 7"	515.00	690.00	18.00	50.00	99 HRB Max	235 Max
B16	A 193	--	K14072	1.7711	2.1/2" & under	725.00	860.00	18.00	50.00	35 HRC Max	321 Max
					over 2.1/2" to 4"	655.00	760.00	17.00	45.00	33 HRC Max	302 Max
					over 4" to 7"	586.00	690.00	16.00	45.00	29 HRC Max	277 Max
L7	A 320	4140	G41400	1.7225	2.1/2" & under	725.00	860.00	16.00	50.00	35 HRC Max	321 Max
L7M	A 320	4140	G41400	1.7225	2.1/2" & under	550.00	690.00	18.00	50.00	99 HRB Max	235 Max
L43	A 320	4340	G43400	1.6565	2.1/2" & under	725.00	860.00	16.00	50.00	35 HRC Max	321 Max

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⇒ Chemical Properties*:

Alloy	C %	Mn %	P %	S %	Si %	Cr %	Ni %	Mo %	N %	V %	Al %	Ti %	Cb+Ta %
	Min - Max	Max	Max	Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Alloy Steel													
B 21	0.36-0.44	0.45-0.70	0.025	0.025	0.15-0.35	0.80-1.15	--	0.50-0.65	--	0.25-0.35	--	--	--
B 22	0.39-0.46	0.65-1.10	0.025	0.025	0.15-0.35	0.75-1.20	--	0.15-0.25	--	--	--	--	--
B 23	0.37-0.44	0.60-0.95	0.025	0.025	0.15-0.35	0.65-0.95	1.55-2.00	0.20-0.30	--	--	--	--	--
B 24	0.37-0.44	0.70-0.90	0.025	0.025	0.15-0.35	0.70-0.95	1.65-2.00	0.30-0.40	--	--	--	--	--

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⇒ Mechanical Properties:

Alloy	ASTM	AISI	UNS	W.-Nr.	Dia	Yield Strength (0.2 % Offset) MPa Minimum	Tensile Strength MPa Minimum	Elongation (4 D) % Minimum	Reduction of Area % Minimum	Hardness HRB/HRC Min - Max	Hardness BHN Min - Max
Alloy Steel											
B21 - 1	A 540	--	K14072	1.7711	up to 4", incl.	1035.00	1140.00	10.00	35.00	35 - 45 HRC	321 - 429
B21 - 2					up to 4", incl.	965.00	1070.00	11.00	40.00	33 - 43 HRC	311 - 401
B21 - 3					up to 6", incl.	895.00	1000.00	12.00	40.00	32 - 37 HRC	302 - 352
B21 - 4					up to 6", incl.	825.00	930.00	13.00	45.00	29 - 35 HRC	277 - 331
B21 - 5					up to 6", incl.	725.00	825.00	15.00	50.00	23 - 29 HRC	255 - 285
B22 - 1	A 540	4142	G41420	--	up to 1.1/2", incl.	1035.00	1140.00	10.00	35.00	35 - 43 HRC	321 - 401
B22 - 2					up to 3", incl.	965.00	1070.00	11.00	40.00	33 - 43 HRC	311 - 401
B22 - 3					up to 4", incl.	895.00	1000.00	12.00	40.00	32 - 39 HRC	302 - 363
B22 - 4					up to 4", incl.	825.00	930.00	13.00	45.00	29 - 36 HRC	277 - 341
B22 - 5					up to 4", incl.	725.00	825.00	15.00	50.00	23 - 30 HRC	255 - 293
B23 - 1	A 540	E4340H	H43406	--	up to 6", incl.	1035.00	1140.00	10.00	35.00	36 - 44 HRC	331 - 415
B23 - 2					up to 6", incl.	965.00	1070.00	11.00	40.00	33 - 43 HRC	311 - 401
B23 - 3					up to 6", incl.	895.00	1000.00	12.00	40.00	32 - 39 HRC	302 - 363
B23 - 4					up to 6", incl.	825.00	930.00	13.00	45.00	29 - 34 HRC	277 - 341
B23 - 4					up to 6", incl.	725.00	825.00	15.00	50.00	23 - 36 HRC	255 - 311
B24 - 1	A 540	4340 Mod	--	--	up to 8", incl.	1035.00	1140.00	10.00	35.00	36 - 44 HRC	331 - 415
B24 - 2					up to 8", incl.	965.00	1070.00	11.00	40.00	33 - 43 HRC	311 - 401
B24 - 3					up to 8", incl.	895.00	1000.00	12.00	40.00	32 - 39 HRC	302 - 363

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⇒ Chemical Properties*:

Alloy	C %	Mn %	P %	S %	Si %	Cr %	Ni %	Mo %	N %	V %	Al %	Ti %	Cb+Ta %
	Max	Max	Max	Max	Max	Min - Max	Min - Max	Min - Max	Max	Min - Max	Min - Max	Min - Max	Min - Max
Stainless Steel													
B8	0.08	2.0	0.045	0.030	1.0	18.0-20.0	8.0-11.0	--	--	--	--	--	--
B8A	0.08	2.0	0.045	0.030	1.0	18.0-20.0	8.0-11.0	--	--	--	--	--	--
B8 Class 2	0.08	2.0	0.045	0.030	1.0	18.0-20.0	8.0-11.0	--	--	--	--	--	--
B8C	0.08	2.0	0.045	0.030	1.0	17.0-19.0	9.0-12.0	--	--	--	--	--	10 x C % - 1.10
B8CA	0.08	2.0	0.045	0.030	1.0	17.0-19.0	9.0-12.0	--	--	--	--	--	10 x C % - 1.10
B8C Class 2	0.08	2.0	0.045	0.030	1.0	17.0-19.0	9.0-12.0	--	--	--	--	--	10 x C % - 1.10
B8M	0.08	2.0	0.045	0.030	1.0	16.0-18.0	10.0-14.0	2.0-3.0	--	--	--	--	--
B8MA	0.08	2.0	0.045	0.030	1.0	16.0-18.0	10.0-14.0	2.0-3.0	--	--	--	--	--
B8M Class 2	0.08	2.0	0.045	0.030	1.0	16.0-18.0	10.0-14.0	2.0-3.0	--	--	--	--	--
B8T	0.08	2.0	0.045	0.030	1.0	17.0-19.0	9.0-12.0	--	0.10	--	--	5 x (C+N) - 0.70	--
B8TA	0.08	2.0	0.045	0.030	1.0	17.0-19.0	9.0-12.0	--	0.10	--	--	5 x (C+N) - 0.70	--
B8T Class 2	0.08	2.0	0.045	0.030	1.0	17.0-19.0	9.0-12.0	--	0.10	--	--	5 x (C+N) - 0.70	--

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⇒ Mechanical properties:

Alloy	ASTM	AISI	UNS	W.-Nr.	Dia	Yield Strength (0.2 % Offset) MPa Minimum	Tensile Strength MPa Minimum	Elongation (4 D) % Minimum	Reduction of Area % Minimum	Hardness HRB/HRC Min - Max	Hardness BHN Min - Max
Stainless Steel											
B8	A 193 A 320	304	S30400	1.4301	ALL	205.00	515.00	30.00	50.00	96 HRB Max	223 Max
B8A		304	S30400	1.4301	ALL	205.00	515.00	30.00	50.00	90 HRB Max	192 Max
B8 Cl 2		304	S30400	1.4301	3/4" & under	690.00	860.00	12.00	35.00	35 HRC Max	321 Max
					over 3/4" to 1"	550.00	795.00	15.00	35.00	35 HRC Max	321 Max
					over 1" to 1.1/4"	450.00	725.00	20.00	35.00	35 HRC Max	321 Max
					over 1.1/4" to 1.1/2"	345.00	690.00	28.00	45.00	35 HRC Max	321 Max
B8C		347	S34700	1.4550	ALL	205.00	515.00	30.00	50.00	96 HRB Max	223 Max
B8CA		347	S34700	1.4550	ALL	205.00	515.00	30.00	50.00	90 HRB Max	192 Max
B8C Cl 2		347	S34700	1.4550	3/4" & under	690.00	860.00	12.00	35.00	35 HRC Max	321 Max
					over 3/4" to 1"	550.00	795.00	15.00	35.00	35 HRC Max	321 Max
					over 1" to 1.1/4"	450.00	725.00	20.00	35.00	35 HRC Max	321 Max
					over 1.1/4" to 1.1/2"	345.00	690.00	28.00	45.00	35 HRC Max	321 Max
B8M		316	S31600	1.4401	ALL	205.00	515.00	30.00	50.00	96 HRB Max	223 Max
B8MA		316	S31600	1.4401	ALL	205.00	515.00	30.00	50.00	90 HRB Max	192 Max
B8M Cl 2		316	S31600	1.4401	3/4" & under	665.00	760.00	15.00	45.00	35 HRC Max	321 Max
					over 3/4" to 1"	550.00	690.00	20.00	45.00	35 HRC Max	321 Max
					over 1" to 1.1/4"	450.00	655.00	25.00	45.00	35 HRC Max	321 Max
					over 1.1/4" to 1.1/2"	345.00	620.00	30.00	45.00	35 HRC Max	321 Max
B8T		321	S32100	1.4541	ALL	205.00	515.00	30.00	50.00	96 HRB Max	223 Max
B8TA		321	S32100	1.4541	ALL	205.00	515.00	30.00	50.00	90 HRB Max	192 Max
B8T Cl 2	321	S32100	1.4541	3/4" & under	690.00	860.00	12.00	35.00	35 HRC Max	321 Max	
				over 3/4" to 1"	550.00	795.00	15.00	35.00	35 HRC Max	321 Max	
				over 1" to 1.1/4"	450.00	725.00	20.00	35.00	35 HRC Max	321 Max	
				over 1.1/4" to 1.1/2"	345.00	690.00	28.00	45.00	35 HRC Max	321 Max	

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⇒ Chemical Properties*:

Alloy	C %	Mn %	P %	S %	Si %	Cr %	Ni %	Mo %	Other %	
	Max	Max	Max	Max	Max	Min - Max	Min - Max	Min - Max		
Special Steel (Corrosion Resisting Alloys, High Temperature Resisting Alloys, Hast Alloys, Duplex Alloys, Super Duplex Alloys)										
310	0.25	2.00	0.045	0.030	1.00	24.0-26.0	19.0-22.0	--	----	
310 S	0.08	2.00	0.045	0.030	1.00	24.0-26.0	19.0-22.0	--	----	
317	0.08	2.00	0.045	0.030	1.00	18.0-20.0	11.0-15.0	3.0-4.0	----	
276	0.01	1.0	0.04	0.030	0.08	14.5-16.5	Balance	15.0-17.0	Fe: 4.0 - 7.0, W: 3.0 - 4.5, Co: 2.5, V: 0.35	
400	0.30	2.0	--	0.024	0.50	--	63.0-70.0	--	Cu: Balance, Fe: 2.5	
600	0.15	1.0	--	0.015	0.50	14.0-17.0	72.0 Min	--	Fe: 6.0 - 10.0, Cu: 0.5	
625	0.10	0.5	0.015	0.015	0.50	20.0-23.0	58.0 Min	8.0-10.0	Cb+Ta: 3.15 - 4.15, Co: 1.0, Fe: 5.0, Al: 0.40, Ti: 0.40	
660	0.08	2.0	0.040	0.030	1.00	13.5-16.0	24.0-27.0	1.0-1.5	Ti: 1.90-2.35, Al: 0.35, V: 0.10-0.50, B: 0.001-0.01	
718	0.08	0.35	0.015	0.015	0.35	17.0-21.0	50.0-55.0	2.80-3.30	Co: 1.0, Cb+Ta: 4.75 - 5.50, Ti: 0.65 - 1.15, Al: 0.20 - 0.80, B: 0.006, Fe: Balance, Cu: 0.30	
XM - 19	0.06	4.0-6.0	0.045	0.030	1.00	20.5-23.5	11.5-13.5	1.5-3.0	N: 0.20 - 0.40, Cb: 0.10 - 0.30, V: 0.10 - 0.30	
31254	0.02	1.0	0.030	0.010	0.80	19.5-20.5	17.5-18.5	6.0-6.5	N: 0.18 - 0.22, Cu: 0.50 - 1.0.	
31803	0.03	2.0	0.030	0.020	1.00	21.0-23.0	4.5-6.5	2.5-3.5	N: 0.08 - 0.20	
32750	0.03	1.2	0.035	0.020	0.80	24.0-26.0	6.0-8.0	3.0-5.0	N: 0.24 - 0.32, Cu: 0.50	
32760	0.03	1.0	0.030	0.010	1.00	24.0-26.0	6.0-8.0	3.0-4.0	N: 0.20 - 0.30, Cu: 0.50 - 1.00, W: 0.50 - 1.00	
2205	0.03	2.0	0.030	0.020	1.00	22.0-23.0	4.5-6.5	3.0-3.5	N: 0.14 - 0.20	
8020	0.07	2.0	0.045	0.035	1.00	19.0-21.0	32.0-38.0	2.0-3.0	Cu: 3.0 - 4.0, Cb+Ta: 8 x C - 1.0, Fe: Remainder	
8825	0.05	1.0	--	0.03	0.50	19.5-23.5	38.0-46.0	2.5 - 3.5	Fe: 22.00 Min, Cu: 1.5 - 3.0, Al: 0.2, Ti: 0.6 - 1.2	

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Alloy	ASTM	AISI	UNS	W.-Nr.	Dia	Yield Strength (0.2 % Offset) MPa Minimum	Tensile Strength MPa Minimum	Elongation (4 D) % Minimum	Reduction of Area % Minimum	Hardness HRB/HRC Min - Max	Hardness BHN Min - Max
Special Steel (Corrosion Resisting Alloys, High Temperature Resisting Alloys, Hast Alloys, Duplex Alloys, Super Duplex Alloys)											
310	A 276	310	S31000	1.4845	ALL	205.00	515.00	40.00	50.00	--	--
310 S	A 479	310S	S31008	1.4845	ALL	205.00	515.00	40.00	50.00	--	--
317	A 479	317	S31700	1.4438	ALL	205.00	515.00	30.00	40.00	--	--
276	F 468	--	N010276	2.4819	ALL	310.00	760.00	25.00	--	20-32 HRC	226 - 301
400	F 468	--	N04400	2.4360	1/4" to 7/8"	275.00	550.00	20.00	--	75-103 HRB	137 - 240
					1" to 1.1/2"	205.00	480.00	20.00	--	60-103 HRB	107 - 240
600	B 166	--	N06600	2.4816	under 1/2"	310.00	655.00	20.00	--	--	--
					1/2" to 3"	275.00	620.00	25.00	--	--	--
					over 3"	240.00	585.00	30.00	--	--	--
625	B 446	--	N06625	2.4856	Up to 4"	415.00	825.00	30.00	--	--	--
660 **	A 453	--	S66286	1.4980	ALL	585.00	895.00	15.00	18.00	24-37 HRC	248 - 341
					** Stress Rupture: Temperature 650°C; Stress > 485 MPa; Time to rupture > 100 Hrs; Elong > 5 %						
718 **	B 637	--	N07718	2.4668	ALL	1034.00	1275.00	12.00	15.00	34 HRC Min	331 Min
					** Stress Rupture: Temperature 650°C; Stress > 690 MPa; Time to rupture > 23 Hrs; Elong > 5 %						
XM - 19	A 479	--	S20910	1.3964	Up to 2"	725.00	930.00	20.00	50.00	--	--
					Over 2" to 3"	515.00	795.00	25.00	50.00	--	--
					over 3" to 8"	415.00	690.00	30.00	50.00	--	--
31254	A 479	--	S31254	1.4529	ALL	305.00	655.00	35.00	50.00	--	--
31803	A 479	--	S31803	1.4462	ALL	450.00	620.00	25.00	--	30 HRC Max	290 Max
32750	A 479	--	S32750	1.4468	2" & under	550.00	800.00	15.00	--	32 HRC Max	310 Max
					over 2"	515.00	760.00	15.00	--	32 HRC Max	310 Max
32760	A 479	--	S32760	1.4496	ALL	550.00	750.00	25.00	--	31 HRC Max	300 Max
2205	A 479	--	S32205	1.4462	ALL	450.00	655.00	25.00	--	30 HRC Max	290 Max
8020	B 473	--	N08020	2.4660	ALL	241.00	551.00	30.00	50.00	--	--
8825	B 425	--	N08825	2.4858	ALL	241.00	586.00	30.00	--	--	--

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Alloy	C %	Mn %	P %	S %	Si %	Cr %	Ni %	Mo %	N %	V %	Al %	Ti %	Cb+Ta %
	Min - Max	Max	Max	Max	Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Alloy Steel													
2	0.40 Min	1.0	0.040	0.050	0.40	--	--	--	--	--	--	--	--
2H	0.40 Min	1.0	0.040	0.050	0.40	--	--	--	--	--	--	--	--
2HM	0.40 Min	1.0	0.040	0.050	0.40	--	--	--	--	--	--	--	--
3	0.10 Min	1.0	0.04	0.03	1.0	4.0-6.0	--	0.40-0.65	--	--	--	--	--
4	0.40-0.50	0.70-0.90	0.035	0.040	0.15-0.35	--	--	0.20-0.30	--	--	--	--	--
6	0.15	1.0	0.04	0.03	1.0	11.5-13.5	--	--	--	--	--	--	--
7	0.37-0.49	0.65-1.10	0.035	0.040	0.15-0.35	0.75-1.20	--	0.15-0.25	--	--	--	--	--
7M	0.37-0.49	0.65-1.10	0.035	0.040	0.15-0.35	0.75-1.20	--	0.15-0.25	--	--	--	--	--
16	0.36-0.47	0.45-0.70	0.035	0.040	0.15-0.35	0.80-1.15	--	0.50-0.65	--	0.25-0.35	0.015	--	--
Stainless Steel													
8	0.08	2.0	0.045	0.030	1.0	18.0-20.0	8.0-11.0	--	--	--	--	--	--
8A	0.08	2.0	0.045	0.030	1.0	18.0-20.0	8.0-11.0	--	--	--	--	--	--
8C	0.08	2.0	0.045	0.030	1.0	17.0-19.0	9.0-12.0	--	--	--	--	--	10 x C % - 1.10
8CA	0.08	2.0	0.045	0.030	1.0	17.0-19.0	9.0-12.0	--	--	--	--	--	10 x C % - 1.10
8M	0.08	2.0	0.045	0.030	1.0	16.0-18.0	10.0-14.0	2.0-3.0	--	--	--	--	--
8MA	0.08	2.0	0.045	0.030	1.0	16.0-18.0	10.0-14.0	2.0-3.0	--	--	--	--	--
8T	0.08	2.0	0.045	0.030	1.0	17.0-19.0	9.0-12.0	--	0.10	--	--	5 x (C+N) - 0.70	--
8TA	0.08	2.0	0.045	0.030	1.0	17.0-19.0	9.0-12.0	--	0.10	--	--	5 x (C+N) - 0.70	--

* Unless & otherwise mentioned all values are maximum

President Engineering Works manufactures fasteners in these grade(s).

⇒ Mechanical Properties:

Alloy	ASTM	AISI	UNS	W.-Nr.	Dia	Hardness BHN		Hardness HRC		Hardness HRB	
						Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Alloy Steel											
2	A 194	1045	G10450	1.1191	ALL	159	352				
2H	A 194	1045	G10450	1.1191	below 1.1/2"	248	352	24	38	--	--
					Over 1.1/2"	212	352	--	38	95	--
2HM	A 194	1045	G10450	1.1191	ALL	159	237	--	--	84	99
3	A 194	501	S50100	1.7362	ALL	248	327	24	35	--	--
4	A 194	4042	G40420	1.5432	ALL	248	327	24	35	--	--
6	A 194	410	S41000	1.4006	ALL	228	271	20	28	--	--
7	A 194	4140	G41400	1.7225	ALL	248	327	24	35	--	--
7M	A 194	4140	G41400	1.7225	ALL	159	237	--	--	84	99
16	A 194	--	K14072	1.7711	ALL	248	327	24	35	--	--
Stainless Steel											
8	A 194	304	S30400	1.4301	ALL	126	300	--	32	60	--
8A	A 194	304	S30400	1.4301	ALL	126	192	--	--	60	90
8C	A 194	347	S34700	1.4550	ALL	126	300	--	32	60	--
8CA	A 194	347	S34700	1.4550	ALL	126	192	--	--	60	90
8M	A 194	316	S31600	1.4401	ALL	126	300	--	32	60	--
8MA	A 194	316	S31600	1.4401	ALL	126	192	--	--	60	90
8T	A 194	321	S32100	1.4541	ALL	126	300	--	32	60	--
8TA	A 194	321	S32100	1.4541	ALL	126	192	--	--	60	90