TENSIONING MATERIALS for PRESTRESSED CONCRETE

A Comparison of Specification for Prestressing Strand

			Nominal Dia. D		Dia. Tolerance of Strand	Min. difference between Center Wire Dia. and Outer Wire Dia.	Pitch	Nominal Steel Area	Nominal Weight	Permitte a Deviation on Nominal Weight	Min. Breaking Strength	Min. Yield Strength		Specified Characteristic 0.1% of Proof Load	Min. Total Elongation		Relaxation			Straightness	Chemical Composition
												Normal Relax.	Low Relax.		Gauge Length	Elongation	Initial Stress	Testing Time	%		
			in.	mm	mm	mm		mm²	kg/1,000m	%	KN	KN	KN	KN	mm	%					%
ASTM A416-06	Grade 1725 [250]		1/4 5/16 3/8 7/16 1/2 0.6	6.4 7.9 9.5 11.1 12.7 15.2	0.40	0.025 0.038 0.051 0.064 0.076 0.102	12–16D	23.2 37.4 51.6 69.7 92.9 139.4	182 294 405 548 730 1,094		40 64.5 89 120.1 160.1 240.2	34 54.7 75.6 102.3 136.2 204.2	36 58 80 108 144.1 216.2	— — — — — —	600 ≦	3.5	<<<Normal Relax. Material>>> No Difinition <<<Low Relax. Material>>> *8 0.70 σ_{pu1} or 0.80 σ_{pu1}	1,000hr	2.5 MAX. 3.5 MAX.	—	—
	Grade 1860 [270]		3/8 7/16 1/2 0.6	9.53 11.11 12.70 15.24	+0.65 –0.15	0.0508 0.0635 0.0762 0.1016	12–16D	54.8 74.2 98.7 140	432 582 775 1,102		102.3 137.9 183.7 260.7	*6 87 117.2 156.1 221.5	*6 92.1 124.1 165.3 234.6	— — — —	600 ≦	3.5					
BS 5896 1980	7-wire strandard	*1 1770	(3/8) (7/16) (1/2)	9.3 11.0 12.5	+0.3 –0.15 +0.4	*2 $d_c \geqq 1.02d_o$	12–18D	*3 52 71 93	*4 408 557 730	+ 4 – 2	*5 92 125 164	*7 81 110 144		78 106 139	500 ≦	3.5	*9 <<<Normal Rerax. Material>>> 0.60 σ_{pu2} 0.70 σ_{pu2} 0.80 σ_{pu2}	1,000hr	4.5 MAX. 8.0 MAX. 12.0 MAX.	See Note *11	P : 0.040 MAX. S : 0.040 MAX.
		*1 1670	(0.6)	15.2	–0.2			139	1,090		232	204		197							
	7-wire super	*1 1860	(5/16) (3/8) (7/16)	8.0 9.6 11.3	+0.3 –0.15			*3 38 55 75	*4 298 432 590	+ 4 – 2	*5 70 102 139	*7 61 90 122		59 87 118	500 ≦	3.5	<<<Low Rerax. Material>>> 0.60 σ_{pu2} 0.70 σ_{pu2} 0.80 σ_{pu2}	1,000hr	1.0 MAX. 2.5 MAX. 4.5 MAX.		
		*1 1770	(1/2) (0.6)	12.9 15.7	+0.4 –0.2			100 150	785 1,180		186 265	163 233		158 225							
prEN 10138 2005	Y1770S7 Y1860S7		— — — — — — — — — — — — —	6.9 6.9 7.0 8.0 9.0 9.0 9.3 9.3 9.6 9.6 11.0 11.0 11.3 12.5 12.5 12.9 12.9 13.0 15.2 15.2 15.3 15.3 15.7 15.7 18.0	—	*2 $d_c \geqq 1.03d_o$ *2 $d_c \geqq 1.03d_o$	14–18D 14–18D	29 29 30 38 50 50 52 52 55 55 70 70 75 93 93 100 100 102 139 139 140 140 150 150 200	226.5 226.5 234.3 296.8 390.5 390.5 406.1 406.1 429.6 429.6 546.7 546.7 585.8 726.3 726.3 781 781.0 796.6 1086 1086 1093 1093 1172 1172 1562	± 2	51.3 53.9 55.8 70.7 88.5 93 92 96.7 97.4 102 124 130 140 165 173 177 186 190 246 259 248 260 266 279 354	Maximum Volue of maximum force	59.0 62.0 64.2 81.3 102 107 106 111 112 117 143 150 161 190 199 204 214 219 283 298 285 299 306 321 407	45.1 47.4 49.1 62.2 77.9 81.8 81.0 85.1 85.7 89.8 109 114 123 145 152 156 164 167 216 228 218 229 234 246 312		*9 0.70 σ_{pu2} 0.80 σ_{pu2} *9 0.70 σ_{pu2} 0.80 σ_{pu2}	1,000hr 1,000hr	2.5 MAX. 4.5 MAX. 2.5 MAX. 4.5 MAX.		
	Y1860S7G		— —	12.7 15.2				112 165	874.7 1289	± 2	208 307		239 353	183 270							
JIS G 3536-2008	SWPR 7AN SWPR 7AL		(3/8) (7/16) (1/2) (0.6)	9.3 10.8 12.4 15.2	+0.4 –0.2	0.05 0.07 0.08 0.08	12–18D	51.61 69.68 92.90 138.7	405 546 729 1,101		88.8 120 160 240	75.5 102 136 204		— — — —	600 ≦	3.5	<<<Normal Rerax. Material>>> *8 0.7 σ_{pu1}	1,000hr	8.0 MAX.	—	—
	SWPR 7BN SWPR 7BL		(3/8) (7/16) (1/2) (0.6)	9.5 11.1 12.7 15.2	+0.4 –0.2	0.05 0.07 0.08 0.08	12–18D	54.84 74.19 98.71 138.7	432 580 774 1,101		102 138 183 261	86.8 118 156 222		— — — —	600 ≦	3.5	<<<Low Rerax. Material>>> 0.7 σ_{pu1}	1,000hr	2.5 MAX.		
JIS G 3536-2008 Ninteen-wire strand	SWPR 19N SWPR 19L		(0.7) (0.76) (0.8) (0.86) (1.13)	17.8 19.3 20.3 21.8 28.6	+0.6	— — — — —	12–18D	208.4 243.7 270.9 312.9 532.4	1,652 1,931 2,149 2,482 4,229		387 451 495 573 949	330 387 422 495 807		— — — — —	600 ≦	3.5					
Sumitomo Spec	Super-high strength 7-wire		(0.6)	15.7	+0.4 –0.2	*2 $d_C \geqq 1.02d_O$	12–18D	150	1,180		335	—		298	500 ≦	3.5	*8 0.7 σ_{pu1}	1,000hr	6.5 MAX.		

<Note> Values of parentheses are only for your reference
*1 Nominal tensile strength N/mm²
*2 d_c : Center Wire Dia. d_o : Outer WIre Dia.
*3 Cross sectional area tolerance +4%, -2%
*4 Weight (Mass) tolerance +4%, -2%
*5 Specified characteristic breaking load
*6 Load at 1% extension
*7 Load at 1% elongation
The characteristic load at 1% elongation may be specified alternatively by agreement between the purchaser and the manufacture
*8 σ_{pu1} : Specified minimum breaking strength (load)
*9 σ_{pu2} : Actual breaking load
*10 σ_{py} : Specified minimum yield strength
*11 Curvature of strand
When a length of seven-wire strand is lying free on a flat surface, the max. bow height from a base line 1 m in length, measured to the inside of the curve, shall not be greater than 25 mm.