

Maximum force that can be safely applied when pulling long lengths of polyethylene pipes given in the Tables 1-4 is calculated based on short-term tensile strength with safety factor of 2.5. A load cell should be used to control the pulling force.

Safe pull force should not be exceeded whether the pipe length is pulled on the ground, through existing conduits, or bored holes. Use of pull forces greater than the calculated safe pull force may result in pipe damage.

**Table 1. Maximum safe pull force for PE80B pipe (20°C; 1 h)**

Nominal pipe OD, mm	Pulling force, kN (see Notes)								
	SDR								
	41	33	26	21	17	13.6	11	9	7.4
16	By hand								
20									
25									
32									
40	0.86	1.06	1.34	1.64	2.00	2.47	2.99	3.57	4.23
50	1.35	1.66	2.09	2.56	3.13	3.85	4.67	5.59	6.61
63	2.14	2.64	3.32	4.07	4.97	6.12	7.42	8.87	10.49
75	3.03	3.74	4.71	5.77	7.04	8.67	10.52	12.57	14.87
90	4.36	5.38	6.78	8.31	10.14	12.48	15.14	18.10	21.41
110	6.51	8.04	10.12	12.41	15.15	18.64	22.62	27.03	31.99
125	8.41	10.39	13.07	16.03	19.57	24.08	29.21	34.91	41.31
140	10.55	13.03	16.40	20.11	24.54	30.20	36.64	43.79	51.81
160	13.78	17.02	21.41	26.26	32.06	39.45	47.86	57.19	67.68
180	17.44	21.54	27.10	33.24	40.57	49.93	60.57	72.38	85.65
200	21.53	26.59	33.46	41.03	50.09	61.64	74.78	89.36	105.74
225	27.25	33.65	42.35	51.93	63.40	78.01	94.64	113.10	133.83
250	33.64	41.54	52.28	64.11	78.27	96.31	116.84	139.63	165.23
280	42.20	52.11	65.58	80.42	98.18	120.81	146.56	175.15	207.26
315	53.41	65.95	83.00	101.79	124.26	152.90	185.49	221.67	262.31
355	67.83	83.76	105.42	129.28	157.82	194.19	235.59	281.54	333.16
400	86.12	106.35	133.84	164.13	200.37	246.54	299.10	357.44	422.98
450	108.99	134.60	169.40	207.73	253.59	312.03	378.55	452.39	535.33

Notes:

1. Pulling pipe at elevated temperature - multiply the value in the table by 0.87 at 30°C, by 0.74 at 40°C, by 0.61 at 50°C.
2. Pipe is under tension for over 1 h - multiply by 0.95 for pull tension duration up to 12 h, by 0.91 for pull tension duration up to 24 h.

**Table 2. Maximum safe pull force for PE100 pipe (20°C; 1 h)**

Nominal pipe OD, mm	Pulling force, kN (see Notes)								
	SDR								
	41	33	26	21	17	13.6	11	9	7.4
16									
20									
25									
32									
40	1.08	1.33	1.67	2.05	2.5	3.08	3.74	4.47	5.29
50	1.68	2.08	2.61	3.21	3.91	4.82	5.84	6.98	8.26
63	2.67	3.3	4.15	5.09	6.21	7.64	9.27	11.08	13.12
75	3.78	4.67	5.88	7.21	8.81	10.83	13.14	15.71	18.59
90	5.45	6.73	8.47	10.39	12.68	15.6	18.93	22.62	26.77
110	8.14	10.05	12.65	15.52	18.94	23.31	28.27	33.79	39.98
125	10.51	12.98	16.34	20.04	24.46	30.1	36.51	43.63	51.63
140	13.19	16.28	20.49	25.13	30.68	37.75	45.8	54.73	64.77
160	17.22	21.27	26.77	32.83	40.07	49.31	59.82	71.49	84.6
180	21.8	26.92	33.88	41.55	50.72	62.41	75.71	90.48	107.07
200	26.91	33.23	41.83	51.29	62.61	77.05	93.47	111.7	132.18
225	34.06	42.06	52.94	64.92	79.25	97.51	118.3	141.37	167.29
250	42.05	51.93	65.35	80.14	97.84	120.38	146.05	174.53	206.53
280	52.75	65.14	81.98	100.53	122.72	151.01	183.2	218.93	259.07
315	66.76	82.44	103.75	127.23	155.32	191.12	231.86	277.09	327.89
355	84.79	104.71	131.78	161.6	197.27	242.74	294.49	351.93	416.45
400	107.65	132.93	167.3	205.17	250.46	308.18	373.88	446.8	528.72
450	136.24	168.24	211.74	259.66	316.99	390.04	473.19	565.49	669.17

Notes:

1. Pulling pipe at elevated temperature - multiply the value in the table by 0.87 at 30°C, by 0.74 at 40°C, by 0.61 at 50°C.

Note that even safe pull force application and drilling mud pressure affect the buckling resistance of the pipe. Resistance to external collapse during pipe pull-back in directional drilling procedure should be calculated taking into account reduction of collapse resistance due to application of tensile force and pipe bending, including bending at tunnel entry or exit points. Another factor reducing resistance to external collapse is possible out-of-roundness (ovality) of coiled pipe – calculate taking into account ovality compensation factor and do not exceed critical buckling pressure.

Note also that after application of safe pulling force, the pipe may take hours to recover from the axial tension. Typically, main time of recovery is equal to the duration of pull. When pulling pipe through bored holes, it is advisable to pull out over 3% of the whole pull length.

**Table 3. Maximum safe pull force for Nominal Internal Diameter PE pipe (20°C; 1 h)**

PE80B pipe		PE100 pipe							
Nominal pipe ID, mm	Minimum pipe OD, mm	Pulling force, kN (see Notes)			Nominal pipe ID, mm	Minimum pipe OD, mm	Pulling force, kN (see Notes)		
		SDR					SDR		
		21	17	11			21	17	11
10	15.7				10	15.7			
15	21.4				15	21.4			
20	26.6				20	26.6			
25	33.4				25	33.4			
			By hand					By hand	
32	42.1	1.82	2.22	3.31	32	42.1	2.27	2.77	4.14
40	48.1	2.37	2.90	4.33	40	48.1	2.97	3.62	5.41
50	60.2	3.72	4.54	6.77	50	60.2	4.65	5.67	8.47
80	88.7	8.07	9.85	14.71	80	88.7	10.09	12.32	18.38
100	114.1	13.36	16.30	24.34	100	114.1	16.69	20.38	30.42
150	168.0	28.95	35.34	52.76	150	168.0	36.19	44.18	65.95
200	218.8	49.11	59.95	89.49	200	218.8	61.39	74.94	111.87

Notes:

1. Pulling pipe at elevated temperature - multiply the value in the table by 0.87 at 30°C, by 0.74 at 40°C, by 0.61 at 50°C.
2. Pipe is under tension for over 1 h - multiply by 0.95 for pull tension duration up to 12 h, by 0.91 for pull tension duration up to 24 h.

**Table 4. Maximum safe pull force for PE ducting (20°C; 1 h)**

Nominal pipe OD, mm	Pulling force, kN (see Notes)								
	SDR								
	41	33	26	21	17	13.6	11	9	7.4
16	By hand								
20									
25									
32									
40	0.96	1.18	1.49	1.82	2.23	2.74	3.32	3.97	4.7
50	1.5	1.85	2.32	2.85	3.48	4.28	5.19	6.21	7.34
63	2.37	2.93	3.69	4.52	5.52	6.8	8.24	9.85	11.66
75	3.36	4.15	5.23	6.41	7.83	9.63	11.68	13.96	16.52
90	4.84	5.98	7.53	9.23	11.27	13.87	16.82	20.11	23.79
110	7.24	8.94	11.25	13.79	16.84	20.72	25.13	30.04	35.54
125	9.34	11.54	14.52	17.81	21.74	26.75	32.45	38.79	45.9
140	11.72	14.47	18.22	22.34	27.27	33.56	40.71	48.65	57.57
160	15.31	18.91	23.79	29.18	35.62	43.83	53.17	63.55	75.2
180	19.38	23.93	30.11	36.93	45.08	55.47	67.3	80.42	95.17
200	23.92	29.54	37.18	45.59	55.66	68.48	83.08	99.29	117.49
225	30.28	37.39	47.05	57.7	70.44	86.68	105.15	125.66	148.7
250	37.38	46.16	58.09	71.24	86.96	107.01	129.82	155.14	183.58
280	46.89	57.9	72.87	89.36	109.09	134.23	162.84	194.61	230.29
315	59.34	73.28	92.23	113.1	138.06	169.88	206.1	246.3	291.46
355	75.37	93.07	117.14	143.64	175.36	215.77	261.76	312.83	370.18
400	95.69	118.16	148.71	182.37	222.63	273.94	332.33	397.16	469.98
450	121.1	149.55	188.22	230.81	281.76	346.7	420.61	502.65	594.81

Notes:

1. Pulling pipe at elevated temperature - multiply the value in the table by 0.87 at 30°C, by 0.74 at 40°C, by 0.61 at 50°C.
2. Pipe is under tension for over 1 h - multiply by 0.95 for pull tension duration up to 12 h, by 0.91 for pull tension duration up to 24 h.