

Maximum force that can be safely applied when pulling long lengths of polyethylene pipes given in the Tables 1, 2 and 5 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 maximum safe pull force may result in pipe damage.

Table 1. Maximum safe pull force for Series 1 PE80 pipe to AS/NZS 4130 (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	116.8	139.63	165.23
280	42.20	52.11	65.58	80.42	98.18	120.8	146.6	175.15	207.26

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.

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.

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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 2. Maximum safe pull force for Series 1 PE100 pipe to AS/NZS 4130 (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	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	84.60
180	21.80	26.92	33.88	41.55	50.72	62.41	75.71	90.48	107.1
200	26.91	33.23	41.83	51.29	62.61	77.05	93.47	111.7	132.2
225	34.06	42.06	52.94	64.92	79.25	97.51	118.3	141.4	167.3
250	42.05	51.93	65.35	80.14	97.84	120.4	146.1	174.5	206.5
280	52.75	65.14	81.98	100.5	122.7	151.0	183.2	218.9	259.1
315	66.76	82.44	103.8	127.2	155.3	191.1	231.9	277.1	327.9
355	84.79	104.7	131.8	161.6	197.3	242.7	294.5	351.9	416.5
400	107.7	132.9	167.3	205.2	250.5	308.2	373.9	446.8	528.7
450	136.2	168.2	211.7	259.7	317.0	390.0	473.2	565.5	669.2
500	168.2	207.7	261.4	320.6	391.3	481.5	584.2	698.1	
560	211.0	260.6	327.9	402.1	490.9	604	732.8	875.7	
630	267.0	329.8	415	508.9	621.3	764.5	927.4	1108	
710	339.2	418.8	527.1	646.4	789.1	971.0	1178	1408	
800	430.6	531.7	669.2	820.7	1002	1233	1496	1787	
900	545.0	673.0	847.0	1039	1268	1560	1893		
1000	672.8	830.8	1046	1282	1565	1926	2337		
1200	968.8	1196	1506	1846	2254	2774			

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 3. Maximum safe pull force for Series 1 “GAS” PE pipe to AS/NZS 4130 (20°C; 1 h) for trenchless installation calculated to ISO/TS 10839:2000

Nominal pipe OD, mm	Pulling force, kN (see Notes)					
	SDR					
	26	21	17	13.6	11	9
16						
20						
25						
32						
40	0.9	1.12	1.38	1.72	2.13	2.61
50	1.41	1.75	2.16	2.69	3.33	4.07
63	2.24	2.77	3.42	4.28	5.29	6.47
75	3.17	3.93	4.85	6.06	7.50	9.16
90	4.57	5.65	6.99	8.73	10.80	13.19
110	6.82	8.45	10.44	13.04	16.13	19.71
125	8.81	10.91	13.47	16.84	20.82	25.45
140	11.05	13.68	16.90	21.13	26.12	31.93
160	14.44	17.87	22.08	27.60	34.12	41.70
180	18.27	22.62	27.94	34.93	43.18	52.78
200	22.56	27.93	34.5	43.12	53.31	65.16
225	28.55	35.34	43.66	54.57	67.47	82.47
250	35.24	43.63	53.90	67.37	83.30	101.8
280	44.21	54.73	67.61	84.52	104.5	127.7
315	55.95	69.27	85.57	107.0	132.3	161.6
355	71.06	87.98	108.7	135.9	168.0	205.3
400	90.22	111.7	138.0	172.5	213.25	260.6
450	114.2	141.4	174.6	218.3	269.9	329.9
500	141.0	174.5	215.6	269.5	333.2	407.2
560	176.8	218.9	270.5	338.1	418.0	510.9
630	223.8	277.1	342.3	427.9	529.0	646.5

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 Series 3 Nominal Internal Diameter “Gas” PE pipe to AS/NZS 4130 (20°C; 1 h) for trenchless installation calculated to ISO/TS 10839:2000

Nominal pipe ID, mm	Minimum pipe OD, mm	Pulling force, kN (see Notes)		
		SDR		
		21	17	11
10	15.7	By hand		
15	21.4			
20	26.6			
25	33.4			
32	42.1	1.24	1.53	2.36
40	48.1	1.62	2.00	3.08
50	60.2	2.53	3.13	4.83
80	88.7	5.49	6.79	10.49
100	114.1	9.09	11.23	17.35
150	168.0	19.70	24.34	37.62
200	218.8	33.42	41.29	63.81

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.

Table 5. 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									
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	57.70	70.44	86.68	105.2	125.7	148.7
250	37.38	46.16	58.09	71.24	86.96	107.0	129.8	155.1	183.6

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.