



WILLIAMS[®]
FORM ENGINEERING CORP.

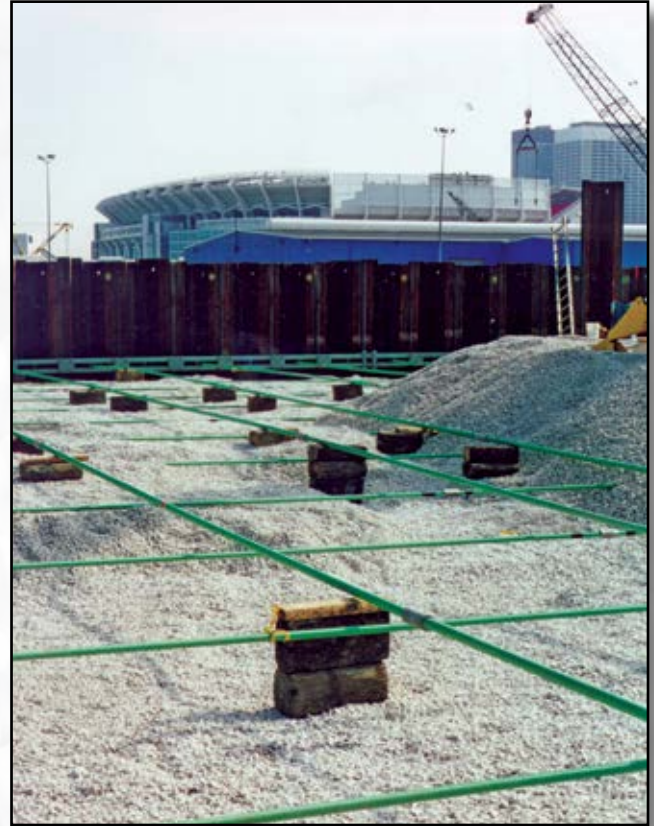
*Tie Rod Systems for
Marine Sheet Piles
and Tieback Anchors*

No. 624_{U1}



Williams Tie Rod Advantages

- Lower costs with higher strengths and lighter weights.
- Continuously threaded for maximum versatility or threaded on ends only
- Durable threads and components capable of developing the full capacity of the bar
- Both right hand and left hand threads available upon request to tighten tie rods using turnbuckles or sleeve nuts.
- Up to 50 foot stock lengths, 60 foot available on special request.
- Several options of corrosion protection available from simple coatings to advanced designs for aggressive environments.



150 KSI All-Thread-Bar

Williams 150 KSI All-Thread Bar consist of high tensile steel available in seven diameters from 1" (26 mm) to 3" (75 mm) with guaranteed tensile strengths up to 1027 kips (4568 kN). All diameters are available in continuous lengths up to 50'. Bars are provided with cold rolled threads over all or a portion of the bar's length. All tension components for the systems are designed to develop 100% of the bars published ultimate strength. Bars are produced to ASTM A-722 physical standards. Williams All-Thread 150 KSI Bar must never be welded, subjected to the high heat of a torch, or used as a ground. Field cutting should be done with an abrasive wheel or band saw. All components of the systems are designed and manufactured in the United States and have been proven on job sites around the world.



Grade 75 & Grade 80 All-Thread Rebar

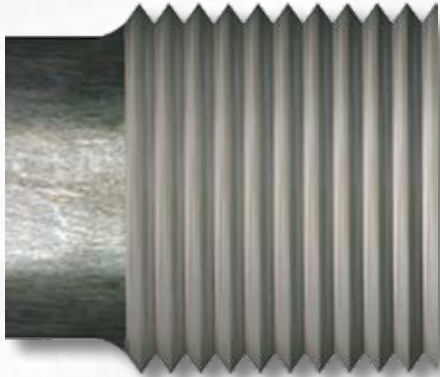
Williams Grade 75 and Grade 80 All-Thread Rebar is a continuously threaded bar specially designed to be used with fasteners. Common applications for All-Thread Rebar are tie rods and ground anchors. All-Thread Rebar is available in 12 diameters from #6 (20 mm) through #32 (102 mm) with ultimate tensile strengths up to 1278 kips (5685 kN). Diameters #6 to #24 are available in continuous lengths up to 50-foot, larger diameters up to 40-foot. The bars are provided with a special thread designed to meet the requirements of ASTM A615 and Canadian Rebar Specifications CSA-G30.18-M92.

Threads are cold rolled on the entire length or a portion of the bar as desired. Because of the full 360 degrees concentric thread, Williams All-Thread Rebar should only be bent under special provisions. All tension components are designed to develop 100% of the bar's published ultimate strengths. All components for the system are manufactured in North America.



Conversion Chart

Williams All-Thread-Bars are more economical than heavier ASTM A36 upset threaded rods. All-Thread Bars are usually on the order of 10-30% less expensive than A36 tie rods when bar comparisons are based on equivalent ultimate strengths. Not only are the bars less expensive but since the bars are smaller they are lighter. Additional savings result with smaller connectors, protective coatings and material freight. The bars below are shown in sizes relative to each other and have approximately equal yield strength.



Old A36 Tie Rods

Actual Tie Rod Diameter	Heavy Upset Thread Diameter	Nominal Weight	Minimum Yield Strength	Minimum Ultimate Strength
1-1/4" (32 mm)	1-1/2" (38 mm)	4.17 lbs/ft (6.21 kg/m)	44.2 kips (197 kN)	71.2 kips (317 kN)
1-3/8" (36 mm)	1-3/4" (43 mm)	5.05 lbs/ft (7.52 kg/m)	53.5 kips (238 kN)	86.2 kips (383 kN)
1-1/2" (38 mm)	2" (51 mm)	6.01 lbs/ft (8.94 kg/m)	63.6 kips (283 kN)	103 kips (456 kN)
1-5/8" (41 mm)	2" (51 mm)	7.05 lbs/ft (10.5 kg/m)	74.7 kips (332 kN)	120 kips (535 kN)
1-3/4" (43 mm)	2-1/4" (57 mm)	8.18 lbs/ft (12.2 kg/m)	86.6 kips (385 kN)	140 kips (620 kN)
2" (51 mm)	2-1/2" (65 mm)	10.7 lbs/ft (15.9 kg/m)	113 kips (503 kN)	182 kips (810 kN)
2-1/4" (57 mm)	2-3/4" (70 mm)	13.5 lbs/ft (20.1 kg/m)	143 kips (636 kN)	231 kips (1026 kN)
2-1/2" (65 mm)	3-1/4" (83 mm)	16.7 lbs/ft (24.9 kg/m)	177 kips (787 kN)	285 kips (1266 kN)
2-3/4" (70 mm)	3-1/2" (89 mm)	20.2 lbs/ft (30.1 kg/m)	214 kips (952 kN)	345 kips (1532 kN)
3" (76 mm)	3-3/4" (95 mm)	24.0 lbs/ft (35.7 kg/m)	254 kips (1130 kN)	410 kips (1823 kN)
3-1/4" (83 mm)	4" (102 mm)	28.2 lbs/ft (42.0 kg/m)	299 kips (1330 kN)	481 kips (2141 kN)
3-1/2" (89 mm)	4-1/4" (108 mm)	32.7 lbs/ft (48.7 kg/m)	346 kips (1539 kN)	558 kips (2482 kN)
3-3/4" (95 mm)	4-1/2" (114 mm)	37.6 lbs/ft (56.0 kg/m)	398 kips (1770 kN)	641 kips (2851 kN)
4" (102 mm)	4-1/2" (114 mm)	43.1 lbs/ft (64.1 kg/m)	452 kips (2011 kN)	729 kips (3242 kN)
4-1/4" (105 mm)	4-3/4" (121 mm)	48.6 lbs/ft (72.3 kg/m)	511 kips (2273 kN)	823 kips (3661 kN)
4-1/2" (114 mm)	5" (127 mm)	54.5 lbs/ft (81.1 kg/m)	573 kips (2549 kN)	922 kips (4101 kN)
4-3/4" (121 mm)	5-1/4" (133 mm)	60.7 lbs/ft (90.3 kg/m)	638 kips (2838 kN)	1028 kips (4573 kN)
5" (127 mm)	5-1/2" (140 mm)	67.3 lbs/ft (100 kg/m)	707 kips (3145 kN)	1139 kips (5067 kN)
5-1/4" (133 mm)	5-3/4" (146 mm)	74.2 lbs/ft (110 kg/m)	779 kips (3465 kN)	1256 kips (5587 kN)

Grade 75 All-Thread Rebar

Bar Designation & Nominal Diameter	Approx. Thread Major Dia.	Nominal Weight	Minimum Yield Strength	Minimum Ultimate Strength
#8 - 1" (25 mm)	1-1/8" (29 mm)	2.7 lbs/ft (3.9 kg/m)	59.3 kips (264 kN)	79 kips (351 kN)
#9 - 1-1/8" (29 mm)	1-1/4" (32 mm)	3.4 lbs/ft (5.1 kg/m)	75 kips (334 kN)	100 kips (445 kN)
#10 - 1-1/4" (32 mm)	1-3/8" (35 mm)	4.3 lbs/ft (6.4 kg/m)	95.3 kips (424 kN)	127 kips (565 kN)
#11 - 1-3/8" (36 mm)	1-1/2" (38 mm)	5.3 lbs/ft (7.9 kg/m)	117 kips (521 kN)	156 kips (694 kN)
#14 - 1-3/4" (43 mm)	1-7/8" (48 mm)	7.7 lbs/ft (11.4 kg/m)	169 kips (750 kN)	225 kips (1001 kN)
#18 - 2-1/4" (57 mm)	2-7/16" (62 mm)	13.6 lbs/ft (20.2 kg/m)	300 kips (1335 kN)	400 kips (1780 kN)
#20 - 2-1/2" (64 mm)	2-3/4" (70 mm)	16.7 lbs/ft (24.8 kg/m)	368 kips (1637 kN)	491 kips (2184 kN)
#24 - 3" (76 mm)	3-3/16" (81 mm)	24.0 lbs/ft (35.8 kg/m)	512 kips (2277 kN)	682 kips (3034 kN)
#28 - 3-1/2" (89 mm)	3-3/4" (95 mm)	32.7 lbs/ft (48.6 kg/m)	720 kips (3206 kN)	961 kips (4274 kN)
#32 - 4" (102 mm)	4-1/4" (108 mm)	43.0 lbs/ft (64.0 kg/m)	942 kips (4190 kN)	1278 kips (5685 kN)

150 KSI All-Thread-Bar

Nominal Bar Diameter	Approx. Thread Major Dia.	Nominal Weight	Minimum Yield Strength	Minimum Ultimate Strength
1" (26 mm)	1-1/8" (29 mm)	3.09 lbs/ft (4.6 kg/m)	102 kips (454 kN)	128 kips (567 kN)
1-1/4" (32 mm)	1-7/16" (37 mm)	4.51 lbs/ft (6.71 kg/m)	150 kips (667 kN)	188 kips (834 kN)
1-3/8" (36 mm)	1-9/16" (40 mm)	5.71 lbs/ft (8.50 kg/m)	190 kips (843 kN)	237 kips (1054 kN)
1-3/4" (46 mm)	2" (51 mm)	9.06 lbs/ft (13.5 kg/m)	312 kips (1388 kN)	390 kips (1734 kN)
2-1/4" (57 mm)	2-1/2" (64 mm)	14.1 lbs/ft (20.8 kg/m)	490 kips (2181 kN)	613 kips (2727 kN)
2-1/2" (65 mm)	2-3/4" (70 mm)	18.2 lbs/ft (27.1 kg/m)	622 kips (2766 kN)	778 kips (3457 kN)
3" (75 mm)	3-1/8" (79 mm)	24.1 lbs/ft (35.8 kg/m)	822 kips (3656 kN)	1027 kips (4568 kN)



Connectors



Stop-Type Couplings

Sleeve Nuts

Turnbuckles

Clevis

Bar Desig. & Nominal Dia.	Outside Diameter	Overall Length	Part Number
Grade 75			
Grade 75 Couplings			
#6 - 3/4" (19 mm)	1-1/4" (32 mm)	3-1/2" (89 mm)	R62-06
#7 - 7/8" (22 mm)	1-3/8" (35 mm)	4" (102 mm)	R62-07
#8 - 1" (25 mm)	1-5/8" (41 mm)	4-1/2" (114 mm)	R62-08
#9 - 1-1/8" (29 mm)	1-7/8" (48 mm)	5" (127 mm)	R62-09
#10 - 1-1/4" (32 mm)	2" (51 mm)	5-1/2" (140 mm)	R62-10
#11 - 1-3/8" (36 mm)	2-1/4" (57 mm)	6" (152 mm)	R62-11
#14 - 1-3/4" (43 mm)	2-7/8" (73 mm)	6" (152 mm)	R62-14
#18 - 2-1/4" (57 mm)	3-1/2" (89 mm)	7-1/8" (181 mm)	R62-18
#20 - 2-1/2" (64 mm)	4" (102 mm)	8" (203 mm)	R62-20
#24 - 3" (76 mm)	5" (127 mm)	9-3/4" (248 mm)	R62-24
#28 - 3-1/2" (89 mm)	5-1/2" (140 mm)	12" (305 mm)	R62-28
150 KSI			
150 KSI Couplings			
1" (26 mm)	1-3/4" (44 mm)	4" (102 mm)	R72-08
1-1/4" (32 mm)	2-1/8" (54 mm)	4-1/2" (114 mm)	R72-10
1-3/8" (36 mm)	2-3/8" (60 mm)	5" (127 mm)	R72-11
1-3/4" (46 mm)	3" (76 mm)	8-1/2" (216 mm)	R72-14
2-1/4" (57 mm)	3-1/2" (89 mm)	8-1/2" (216 mm)	R72-18
2-1/2" (65 mm)	4-1/4" (108 mm)	8-5/8" (219 mm)	R72-20
3" (75 mm)	5" (127 mm)	11-7/8" (302 mm)	R72-24

Across Flats	Overall Length	Part Number
Grade 75 Sleeve Nuts		
1-1/4" (32 mm)	5-1/2" (140 mm)	R63-06SN
1-1/2" (38 mm)	6-1/2" (165 mm)	R63-07SN
1-5/8" (41 mm)	7-1/2" (191 mm)	R63-08SN
1-7/8" (48 mm)	8-1/2" (216 mm)	R63-09SN
2-1/4" (57 mm)	9-1/4" (235 mm)	R63-10SN
2-3/8" (60 mm)	10" (254 mm)	R63-11SN
3" (76 mm)	12" (305 mm)	R63-14SN
3-1/2" (89 mm)	13-1/2" (343 mm)	R63-18SN
4" (102 mm)	14-1/2" (368 mm)	R63-20SN
4-1/2" (114 mm)	16" (406 mm)	R64-24SN
5-1/2" (140 mm)	18" (457 mm)	R64-28SN
150 KSI Sleeve Nuts		
2" (51 mm)	6-1/2" (165 mm)	R73-08SN
2-1/2" (64 mm)	8" (203 mm)	R73-10SN
2-3/4" (70 mm)	9-1/2" (241 mm)	R73-11SN
3" (76 mm)	13" (330 mm)	R73-14SN
3-1/2" (89 mm)	14-1/4" (362 mm)	R73-18SN
4" (102 mm)	16-1/2" (419 mm)	R73-20SN
4-3/4" (121 mm)	18-1/4" (464 mm)	R74-24SN

Overall Length	Working Load	Part Number
Grade 75 Turnbuckles		
8-7/8" (225 mm)	9.3 kips (41 kN)	CTB21G06
9-1/8" (232 mm)	11.6 kips (52 kN)	CTB26G07
15-1/8" (384 mm)	15.2 kips (68 kN)	CTB30G08
15-3/4" (400 mm)	21 kips (93 kN)	CTB36G09
17-1/2" (445 mm)	26 kips (116 kN)	CTB40G10
17-1/2" (445 mm)	37 kips (165 kN)	CTB46G11
12-5/8" (321 mm)	48 kips (214 kN)	CTB53G14
14-3/4" (375 mm)	79.4 kips (353 kN)	CTB67G18
22-1/2" (572 mm)	100 kips (445 kN)	CTB70G20
18" (457 mm)	168 kips (746 kN)	CTB88G24
22-1/2" (572 mm)	234 kips (1040 kN)	CTB98G28
150 KSI Turnbuckles		
17-1/2" (445 mm)	26 kips (116 kN)	CTB40K08
17-1/2" (445 mm)	37 kips (165 kN)	CTB50K10
19-5/8" (498 mm)	48 kips (214 kN)	CTB54K11
22-1/2" (572 mm)	79.4 kips (353 kN)	CTB65K14
22-1/2" (572 mm)	122 kips (544 kN)	CTB87K18
18" (457 mm)	168 kips (746 kN)	CTB88K20
22-1/2" (572 mm)	234 kips (1040 kN)	CTB98K24

Overall Length	Working Load	Part Number
Grade 75 Clevis		
7-7/8" (200 mm)	15 kips (67 kN)	CL3G06
7-7/8" (200 mm)	15 kips (67 kN)	CL3G07
9-5/8" (244 mm)	21 kips (93 kN)	CL4G08
9-5/8" (244 mm)	21 kips (93 kN)	CL4G09
11-3/4" (298 mm)	37.5 kips (167 kN)	CL5G10
11-3/4" (298 mm)	37.5 kips (167 kN)	CL5G11
13-3/4" (349 mm)	54 kips (240 kN)	CL6G14
15-1/2" (394 mm)	68.5 kips (305 kN)	CL7G18
18-1/8" (460 mm)	135 kips (601 kN)	CL8G20
18-1/8" (460 mm)	135 kips (601 kN)	CL8G24
18-1/8" (460 mm)	135 kips (601 kN)	CL8G28
150 KSI Clevis		
11-3/4" (298 mm)	37.5 kips (167 kN)	CL5K08
11-3/4" (298 mm)	37.5 kips (167 kN)	CL5K10
13-3/4" (349 mm)	54 kips (240 kN)	CL6K11
15-1/2" (394 mm)	68.5 kips (305 kN)	CL7K14
18-1/8" (460 mm)	135 kips (601 kN)	CL8K18
18-1/8" (460 mm)	135 kips (601 kN)	CL8K20
18-1/8" (460 mm)	135 kips (601 kN)	CL8K24

Couplers

Williams mechanical couplers develop 100% of the All-Thread-Bar published ultimate strength. Couplers can be ordered Tap Thru or Stop-Type (ensuring 50:50 engagement). A coupler, as opposed to a turnbuckle or sleeve nut, is generally used when a splice is required and tensioning of the tie rod is easily accessible externally at the nut/plate interface.

Turnbuckles & Sleeve Nuts

Sleeve Nuts and Turnbuckles are ideal when tensioning or adjusting of the tie rods is required internally at the bar to bar connection. The sleeve nut is less susceptible to bending than the turnbuckle and will develop 100% of the All-Thread-Bar published ultimate strength, however the turnbuckle allows the installer to see the thread engagement. Both components require right and left hand threads.

Clevis

A clevis can be used when tie rods are designed for angle adjustment, or when access to the outer side of the sheet pile is difficult. Designers must provide the hole diameter required in the structural steel to allow for proper sizing of the clevis pin. Pin diameters are available from 3/4" through 4-1/4" diameter.

Articulating Coupler

Williams offers a specially designed articulating couplers for longer tie rod systems that allows the designer to mitigate soil backfill settlement concerns that potentially could cause failure of the tie rod in bending or shear. The articulating coupler allows freedom of vertical rotation on each side of the system as settlement occurs, and will develop 100% of the All-Thread-Bar published ultimate strength.





Other Accessories



Hex Nut



Round Collar Nut



Hex Nuts / Collar Nuts

Spherical Washers/Hex Nuts

Hardened Washers

Bar Desig. & Nominal Dia.	Across Flats	Across Corners	Thickness	Part Number
Grade 75				
Grade 75 Hex Nuts				
#6 - 3/4" (19 mm)	1-1/4" (32 mm)	1.44" (37 mm)	1-1/8" (29 mm)	R63-06
#7 - 7/8" (22 mm)	1-7/16" (37 mm)	1.66" (42 mm)	1-1/4" (32 mm)	R63-07
#8 - 1" (25 mm)	1-5/8" (41 mm)	1.88" (48 mm)	1-3/8" (35 mm)	R63-08
#9 - 1-1/8" (29 mm)	1-7/8" (48 mm)	2.17" (55 mm)	1-1/2" (38 mm)	R63-09
#10 - 1-1/4" (32 mm)	2" (51 mm)	2.31" (59 mm)	2" (51 mm)	R63-10
#11 - 1-3/8" (36 mm)	2-1/4" (57 mm)	2.60" (66 mm)	2-1/8" (54 mm)	R63-11
#14 - 1-3/4" (43 mm)	2-3/4" (70 mm)	3.18" (81 mm)	3" (76 mm)	R63-14
#18 - 2-1/4" (57 mm)	3-3/4" (95 mm)	4.33" (110 mm)	3-3/4" (95 mm)	R63-18
#20 - 2-1/2" (64 mm)	4" (102 mm)	4.62" (117 mm)	3-3/4" (95 mm)	R63-20
#24 - 3" (76 mm)	4-1/2" (114 mm)	OD 5" (127 mm)	4-3/8" (111 mm)	R64-24*
#28 - 3-1/2" (89 mm)	5-1/2" (140 mm)	OD 6" (152 mm)	5-1/2" (140 mm)	R64-28*
150 KSI				
150 KSI Hex Nuts				
1" (26 mm)	1-3/4" (44 mm)	2.0" (51 mm)	1-5/8" (41 mm)	R73-08
1-1/4" (32 mm)	2-1/4" (57 mm)	2.6" (66 mm)	1-7/8" (48 mm)	R73-10
1-3/8" (36 mm)	2-1/2" (64 mm)	2.9" (73 mm)	2-1/8" (54 mm)	R73-11
1-3/4" (46 mm)	3" (76 mm)	3.5" (88 mm)	3-1/2" (89 mm)	R73-14
2-1/4" (57 mm)	3-3/4" (95 mm)	4.3" (109 mm)	3-3/4" (95 mm)	R73-18
2-1/2" (65 mm)	4-1/4" (108 mm)	4.9" (124 mm)	3-3/4" (95 mm)	R73-20
3" (75 mm)	4-1/2" (114 mm)	OD 5" (127 mm)	5-1/2" (140 mm)	R74-24*

*Rounded Collar Nuts with flats

Outside Dome	Thickness	Across Flats	Part Number
Grade 75 Spherical Washers			
2" (51 mm)	35/64" (14 mm)	-	R81-0675
2-1/4" (57 mm)	39/64" (15 mm)	-	R81-0775
2-1/2" (64 mm)	5/8" (16 mm)	-	R81-0875
2-3/4" (70 mm)	3/4" (19 mm)	-	R81-0975
3" (76 mm)	53/64" (21 mm)	-	R81-1075
3-1/4" (83 mm)	29/32" (23 mm)	-	R81-1175
3-3/4" (95 mm)	1-7/64" (28 mm)	-	R81-1475
5" (127 mm)	1-13/32" (36 mm)	-	R81-1875
5-1/4" (133 mm)	1-1/2" (38 mm)	-	R81-2075
6-1/2" (165 mm)	1-7/8" (48 mm)	-	R81-2475
7" (178 mm)	1-1/2" (38 mm)	-	R81-2875
150 KSI Spherical Hex Nuts			
2-1/2" (64 mm)	2-1/4" (57 mm)	1-3/4" (44 mm)	R88-08
3-1/8" (80 mm)	2-3/4" (70 mm)	2-1/4" (57 mm)	R88-10
3-5/8" (90 mm)	3-1/4" (83 mm)	2-1/2" (64 mm)	R88-11
4" (102 mm)	3-1/2" (89 mm)	3" (76 mm)	R88-14
5-1/2" (140 mm)	5-1/4" (133 mm)	3-3/4" (95 mm)	R73-18 *
6" (152 mm)	5-1/2" (140 mm)	4-1/4" (108 mm)	R73-20 *
7" (178 mm)	7-1/2" (191 mm)	4-1/4" (108 mm)	R74-24 **

* Standard Nut with Spherical Washer assembly

** Rounded Collar Nut with Spherical Washer assembly.

Outside Diameter	Inside Diameter	Thickness	Part Number
Grade 75 Hardened Washers			
1-3/4" (44 mm)	15/16" (24 mm)	5/32" (4 mm)	R9F-07-436
2" (51 mm)	1-1/16" (29 mm)	5/32" (4 mm)	R9F-08-436
2-1/4" (57 mm)	1-3/16" (30 mm)	5/32" (4 mm)	R9F-09-436
2-1/2" (64 mm)	1-3/8" (35 mm)	5/32" (4 mm)	R9F-10-436
2-1/2" (64 mm)	1-3/8" (35 mm)	5/32" (4 mm)	R9F-10-436
3" (76 mm)	1-5/8" (41 mm)	5/32" (4 mm)	R9F-12-436
3-3/8" (86 mm)	1-7/8" (48 mm)	7/32" (6 mm)	R9F-14-436
4-1/2" (114 mm)	2-5/8" (67 mm)	9/32" (7 mm)	R9F-20-436
5" (127 mm)	2-7/8" (73 mm)	9/32" (7 mm)	R9F-22-436
6" (142 mm)	3-3/8" (86 mm)	9/32" (7 mm)	R9F-26-436
7" (178 mm)	3-7/8" (98 mm)	9/32" (7 mm)	R9F-30-436
150 KSI Hardened Washers			
2-1/4" (57 mm)	1-3/16" (30 mm)	5/32" (4 mm)	R9F-09-436
2-3/4" (70 mm)	1-1/2" (38 mm)	5/32" (4 mm)	R9F-11-436
3" (76 mm)	1-5/8" (41 mm)	5/32" (4 mm)	R9F-12-436
3-3/4" (95 mm)	2-1/8" (54 mm)	7/32" (6 mm)	R9F-16-436
4-1/2" (114 mm)	2-5/8" (67 mm)	9/32" (7 mm)	R9F-20-436
5" (127 mm)	2-7/8" (73 mm)	9/32" (7 mm)	R9F-22-436
6" (152 mm)	3-3/8" (86 mm)	9/32" (7 mm)	R9F-26-436

To achieve full strength of the system, hardened washers must be used with R73 hex nuts.

Bearing Plates

Williams supplies anchorage plates that can be customized for each application. Plates can be flat, dished to accommodate spherical washers, include trumpets for corrosion protection continuity and holes that allow attachment to steel walers and sheet pile.



End Caps

Williams offers several different types end caps to provide corrosion protection at otherwise exposed anchor ends. Most often the caps are packed with corrosion inhibiting grease. Caps made from steel are used in exposed impact areas.

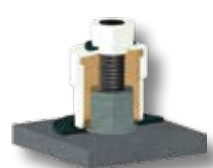
Screw-on Fiber Reinforced Nylon Cap

Steel Tube welded on Flange with Threaded Screw Connections

Steel Tube with Jam Nut

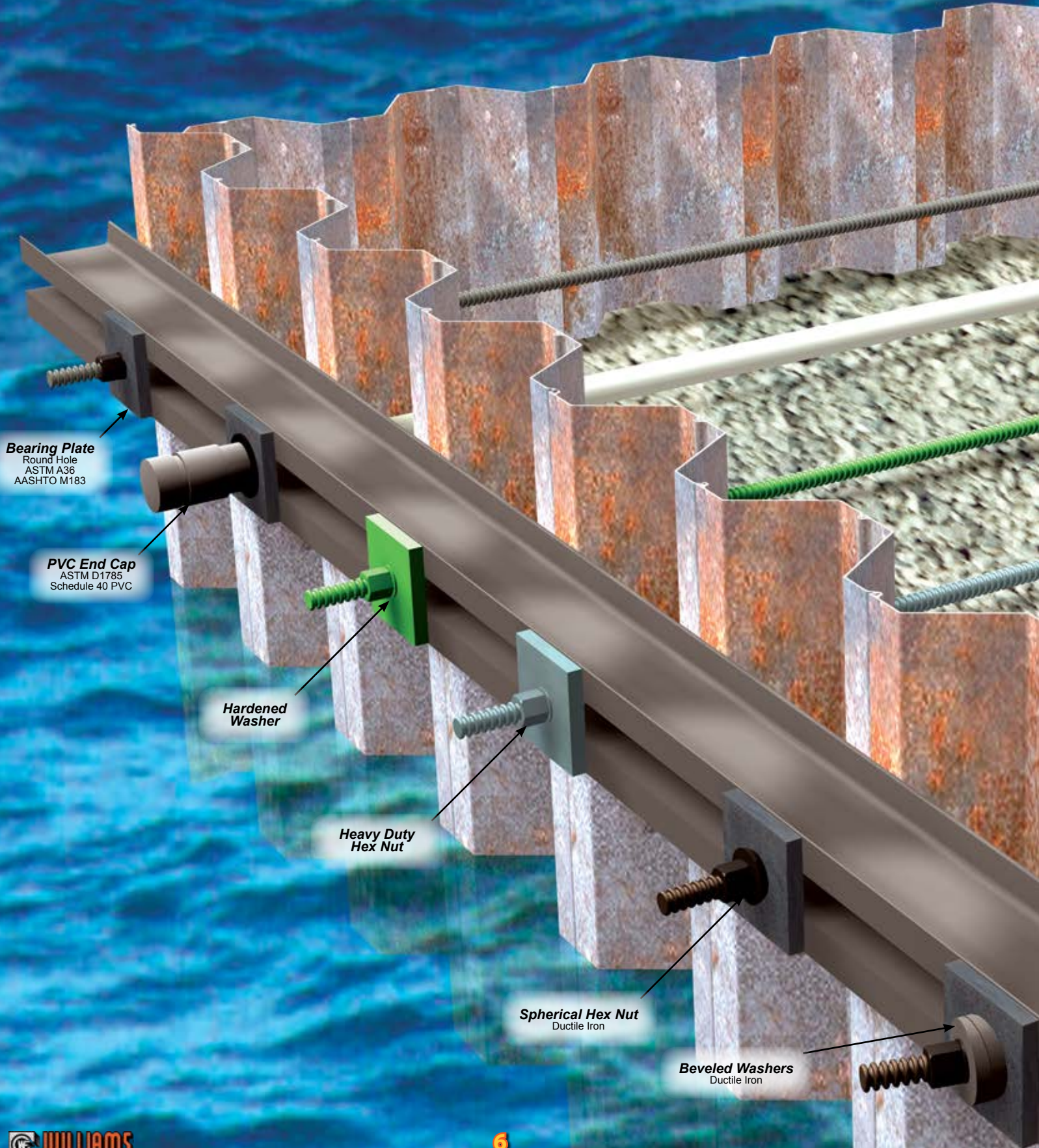
Screw-on PVC Cap

Slip-on PVC Cap w/ Plastic Nut





Specifications



Bearing Plate
Round Hole
ASTM A36
AASHTO M183

PVC End Cap
ASTM D1785
Schedule 40 PVC

Hardened Washer

Heavy Duty Hex Nut

Spherical Hex Nut
Ductile Iron

Beveled Washers
Ductile Iron

Specifications



Smooth PVC Sleeve

Schedule 40 Pipe:
ASTM D1785
Class 200 Pipe:
ASTM D1785 & D2241
AASHTO No. R-6

Epoxy Coating

ASTM A775,
A884, D3963
AASHTO M284, M254

Hot Dip Galvanizing

ASTM A153
AASHTO No. M232
For Accessories:
ASTM A123
AASHTO M111

150 KSI All-Thread-Bar

Type II ASTM A722
AASHTO M275

Stop-Type Coupling

Also available:
Turnbuckles & Sleeve Nuts

Factory Bitumastic Tape Wrap

AWWA C217

Grade 75 All-Thread Rebar

ASTM A615
AASHTO M31



Corrosion Protection

Corrosion Protection Method	Abrasion Resistance (4 = best)	Typical Thickness	Relative Cost (3 = highest)	Production Lead Time	Can be Applied to Accessories?	Can be Applied in the Field?
Hot Dip Galvanizing	4	3-4 mils	2	2-4 weeks	yes	no
Epoxy Coating	1	12-15 mils	1	2-3 weeks	yes	no
Pre-Grouted Bars	3	2", 3" or 4" tubing	3	2 weeks	no	yes
Bitumastic Tape	2	N.A.	2	field applied	yes	yes
Coal Tar Epoxy	3	up to 35 mils	1	2-3 weeks	yes	yes



Hot Dip Galvanizing

Zinc serves as a sacrificial metal corroding preferentially to the steel. Galvanized bars have excellent bond characteristics to grout or concrete and do not require as much care in handling as epoxy coated bars. However, galvanization of anchor rods is more expensive than epoxy coating and often has greater lead time. Hot dip galvanizing bars and fasteners should be done in accordance with ASTM A153. Typical minimum galvanized coating thickness for steel bars and components is between 3 and 4 mils. However, actual coating thickness will be much greater and may prevent full length threadability of fasteners unless methods to control thickness are used. Typically 1 to 2 feet of workable thread is provided on galvanized bar unless specified otherwise.



Epoxy Coating

Fusion bonded epoxy coating of steel bars to help prevent corrosion has been successfully employed in many applications because of the chemical stability of epoxy resins. Epoxy coated bars and fasteners should be done in accordance with ASTM A775 or ASTM A934. Epoxy coated bars and components are subject to damage if dragged on the ground or mishandled. Heavy plates and nuts are often galvanized even though the bar may be epoxy coated since they are difficult to protect against abrasion in the field. Epoxy coating patch kits are often used in the field for repairing nicked or scratched epoxy surfaces.



Pre-Grouted Bars

Cement Grout filled corrugated polyethylene tubing is often used to provide an additional barrier against corrosion attack in highly aggressive soils. These anchors are often referred to as MCP or Multiple Corrosion Protection anchors. The steel bars are wrapped with an internal centralizer then placed inside of the polyethylene tube where they are then factory pre-grouted. When specifying couplings with MCP ground anchors, verify coupling locations with a Williams representative.



Petrolatum Tape

This is a non-woven synthetic fabric carrier, fully impregnated with a neutral petroleum-based compound. This product is stable in composition and plasticity over a wide temperature range. It is commonly applied over coupled bars in the field and is typically covered with an adhesive heat shrink sleeve or tape.



Coal Tar Epoxy

Coal tar epoxy has shown to be abrasion resistant, economical and durable. This product when specified should meet or exceed the requirements of (a) Corp of Engineers C-200, C200a and (b) AWWA C-210-92 for exterior. Typically the dry thickness is between 8 and 24 mils. Make sure the surfaces of the bar are clean and dry before coating.



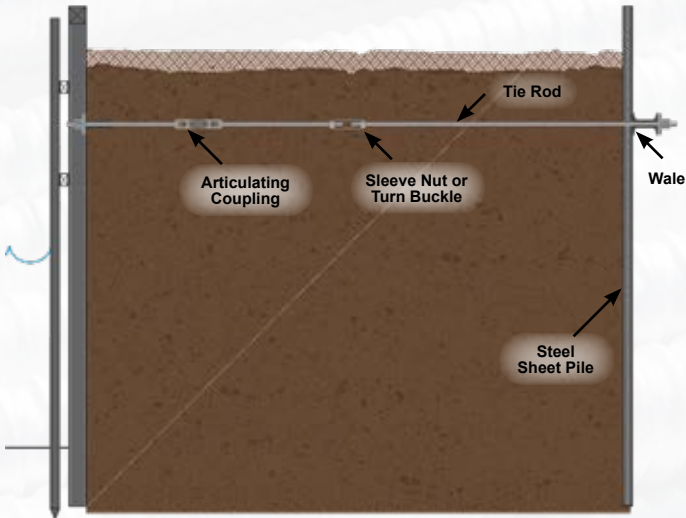
Heat Shrink Tubing

Provides a corrosion protected seal when connecting smooth or corrugated segments.

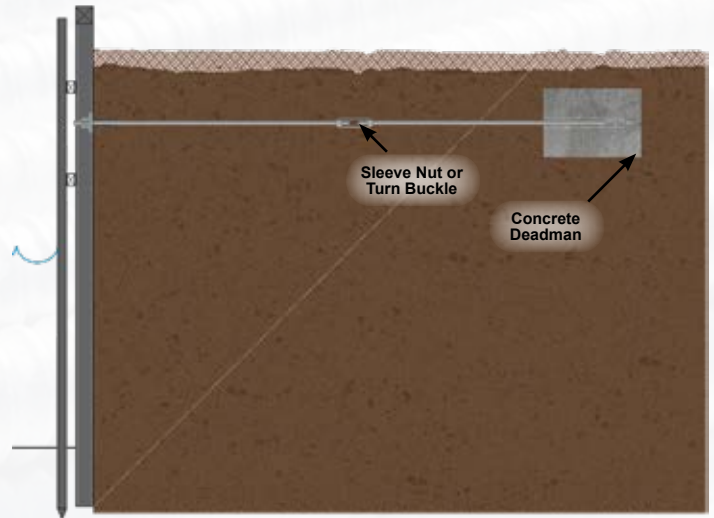


Typical Applications

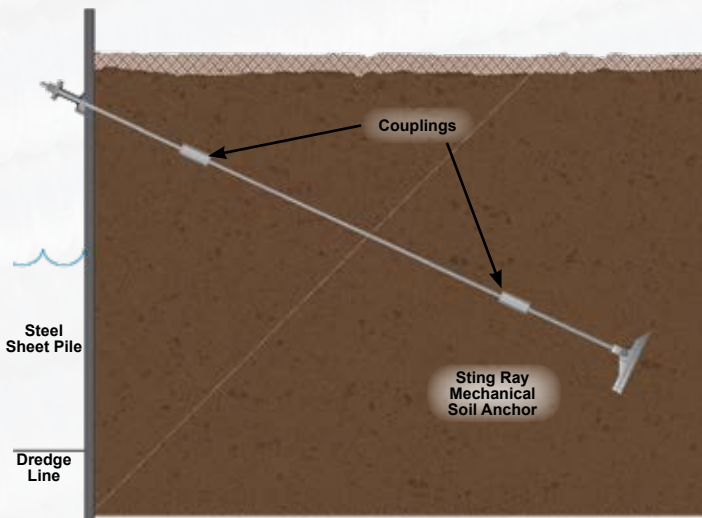
Tie Thru System



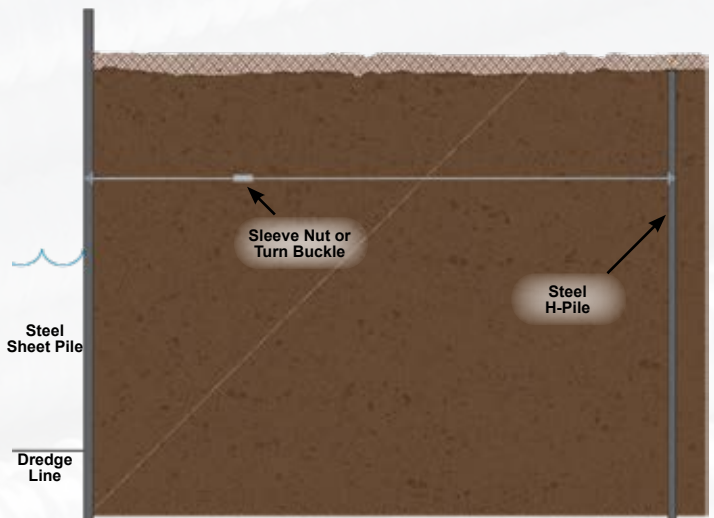
Tie Rods to Concrete Deadman



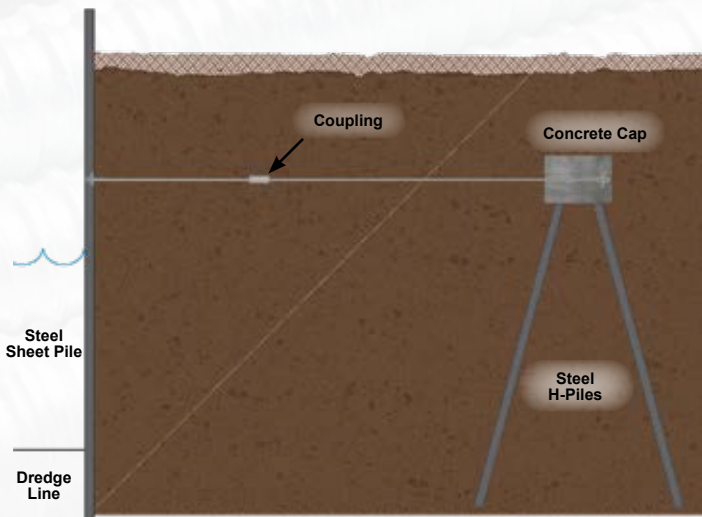
Tieback with Mechanical Soil Anchor



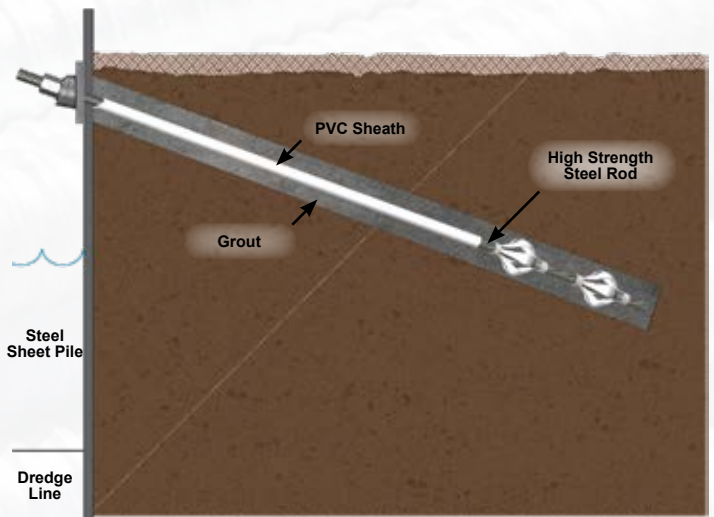
Tie Rods to Steel H-Pile Deadman



Tie Rods to A-Frames



Grout Bonded Rock or Soil Anchors





Mechanical Soil Anchors

Williams offers two versions of Soil Earth Anchors in order to meet customer needs. These anchors are intended for use in soil conditions for moderately loaded anchoring requirements. WFEC Soil Anchors use a tipping plate which is dependent upon the strength of the soil in order to react tensile loads. Anchors are driven into soil to a specified depth using special drive steel which is adaptable to percussion driving equipment, (i.e. jackhammer, concrete breaker or similar). The drive steel is removed and the anchor is tipped into place and proof tested with Williams' Anchor Locking Kit by pulling on the anchor rod. This is called "load locking" and provides an immediate proof test of each anchor's holding capacity. Interested customers should contact their local Williams technical representative in order to evaluate the appropriate anchor for each specific project.

Applications

- Retaining Walls
- Slope Stabilization
- Bridges
- Sheet Piling
- Gabion Support
- Buoyancy Control
- Guyed Structures
- Scaffolding
- Foundations
- Portable Buildings
- General Security
- Marine Applications
- Temporary Shoring
- Utility Poles
- Seawalls
- Pipelines
- Erosion Control
- Underwater Applications

Advantages

- Fast, easy installation
- Immediate proof test results
- No grout
- Inexpensive installation equipment
- Environmentally friendly
- No drilling required



The Platipus® Earth Anchoring Systems offer anchors with available tensile loading up to 44,000 lbs. These anchors are made from spheroidal graphite cast iron and are galvanized for superior corrosion protection. They are manufactured by a NAFTA free trade country and may meet domestic requirements on publically funded projects. Platipus "Stealth" Anchors are used for lower load applications and numerous termination options are available. Platipus "BAT" anchors achieve higher loads, utilize a unique "t-knuckle" pivoting attachment point, and utilize Williams' Grade 75 All-Thread Rebar, couplings, hex nuts and other accessories necessary for load transfer. Williams' robust course thread pattern used on the All-Thread Rebar is extremely durable during anchor driving and eliminates the concern for thread chasing often required when using NC thread pattern anchor rods. All products are available galvanized upon request.



Bat Anchor Structural Properties

Anchor Type	Dimensions L x W x H	Projected Surface Area	Typical Load Range*	Minimum Driven Depth
B4	12.2" x 4.3" x 3.6" (310 x 110 x 93 mm)	~44.33 in ² (286 cm ²)	4.4 - 13.2 kips (20 - 60 kN)	5' - 8' (1.5-0.5 m)
B6	13.2" x 8.1" x 3.6" (336 x 206 x 91 mm)	~71.3 in ² (460 cm ²)	6.6 - 22 kips (30 - 100 kN)	6' - 10' (2 - 3 m)
B8	16.6" x 10.2" x 4.1" (423 x 259 x 105 mm)	~142.6 in ² (925 cm ²)	11 - 33 kips (50 - 150 kN)	10' - 13' (3 - 4 m)
B10	21.3" x 13.2" x 4.3" (541 x 335 x 110 mm)	~213.9 in ² (1380 cm ²)	16.5 - 44 kips (75-200 kN)	13' - 16' (4 - 5 m)

*The typical load range of an anchor is dependent on the engineering properties of the soil.

The stealth anchor is designed to cover a wide range of lightweight anchoring solutions. Its chisel point and streamline shape makes installation easy, in most cases, using simple hand or power tools. These anchors are also an idea choice when working in areas with restricted access.

Stealth Anchor Structural Properties

Anchor Type	Dimensions L x W x H	Projected Surface Area	Typical Load Range*	Minimum Driven Depth
S6**	6.7" x 2.3" x 2.0" (171 x 58 x 50 mm)	12.71 in ² (820 cm ²)	1.1 - 5.5 kips (5 - 25 kN)	3.9' (1.2 m)
S8	10.4" x 3.5" x 3.0" (263 x 90 x 76 mm)	30.31 in ² (195.6 cm ²)	2.2 - 8.8 kips (10 - 40 kN)	4.9' (1.5 m)

*The typical load range of an anchor is dependent on the engineering properties of the soil.

** 1/2" High Tensile UNC Rod is recommended for this size.

R61 Grade 75 All-Thread Rebar

Diameter	Minimum Ultimate Strength	Minimum Yield Strength	Nominal Weight	Approx. Thread Major Dia.	Part Number
#6 (19 mm)	44 kips (196 kN)	33 kips (147 kN)	1.5 lbs/ft (2.4 kg/m)	7/8" (22 mm)	R61-06
#7 (22 mm)	60 kips (267 kN)	45 kips (200 kN)	2.0 lbs/ft (3.0 kg/m)	1" (25 mm)	R61-07

Fully threaded rods can be field cut and coupled in lengths up to 50 feet uncoated. Galvanized rods should be cut to size prior to galvanizing to insure good nut fit. See page 5 for accessories.



Stealth Anchor Steel Bar Options

Steel Type	Diameter	Minimum Net Area	Minimum Ultimate Strength	Minimum Yield Strength	Part Number
High Tensile UNC Rod	1/2" - 13 (13 mm)	0.14 in ² (91.6 mm ²)	17.0 kips (75.7 kN)	13.1 kips (58.0 kN)	B8S-04
Grade 60 All-Thread	#4 - 1/2" (13 mm)	0.2 in ² (129 mm ²)	18 kips (80.1 kN)	12.0 kips (53.4 kN)	R51-04

Fully threaded rods can be field cut and coupled in lengths up to 40 feet uncoated. Galvanized rods should be cut to size prior to galvanizing to insure good nut fit. See Williams Concrete Forming Hardware catalog for accessories.

Project Photos



Project: Pier 3 Replacement
Contractor: Weeks Marine
Location: Portsmouth, VA



Project: Ohio River Bridge
Contractor: Walsh Construction
Location: Louisville, KY



Project: Igor's Seawall
Contractor: R&R Drilling
Location: Carlsbad, CA



Project: East Cliff Drive Bluff Stabilization
Contractor: Drill Tech Drilling & Shoring
Location: Santa Cruz, CA

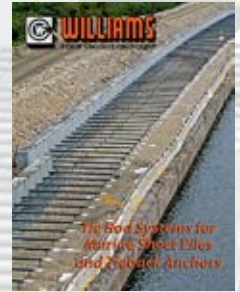
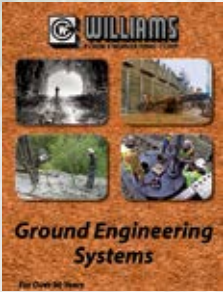


Project: Elgin Air Force Base
Contractor: C.W. Roberts Contracting & Contech Construction Products
Location: Destin, FL



Project: Duluth Costal Infrastructure Rehab
Contractor: Wren Works LLC
Location: Duluth, MN

Williams offers a full line of Ground Anchors, Concrete Anchors, Post-Tensioning Systems, Wind Turbine Foundation Systems, Marine Tieback Systems and Concrete Forming Hardware Systems for whatever your needs may be. Please visit our website for the most current information.



Also available from Williams are Rock & Soil Anchor Sample Specifications and High Capacity Concrete Anchor Sample Specifications



Please visit our website for the most current information

Web: www.williamsform.com

E-mail: williams@williamsform.com

Corporate Headquarters

8165 Graphic Dr.
Belmont, MI 49306
Ph: (616) 866-0815
Fax: (616) 866-1890

251 Rooney Road
Golden, CO 80401
Phone: (303) 216-9300
Fax: (303) 216-9400

2600 Vulcan Dr.
Lithia Springs, GA 30122
Phone: (770) 949-8300
Fax: (770) 949-2377

7601 North Columbia
Portland, OR 97203
Phone: (503) 285-4548
Fax: (503) 285-6858

103 Kestrel Dr.
Collegeville, PA 19426
Phone: (610) 489-0624
Fax: (610) 489-0629

6440 Flanders Dr.
San Diego, CA 92121
Phone: (858) 320-0330
Fax: (858) 320-0360

25232 74th Ave. South
Kent, WA 98032
Phone: (253) 854-2268
Fax: (253) 854-2318



FORM HARDWARE & ROCK BOLT (Canada) LTD.

670 Industrial Road
London, ON, N5V 1V1
Ph: (519) 659-9444
Fax: (519) 659-5880

Québec, QC
Ph: (581) 994-3156
Fax: (519) 519-3623

Vernon, BC
Ph: (250) 306-0737
Fax: (519) 659-3623

We have representation in the following organizations:

