DYWIDAG

POST-TENSIONING SYSTEMS
MULTISTRAND SYSTEMS
BAR SYSTEMS
REPAIR AND STRENGTHENING

NEW VICTORY BRIDGE, PERTH
AMBOY, NJ

DYWIDAG Post-Tensioning Systems

DYWIDAG Post-Tensioning Systems are world renowned for reliability and performance, most suitable for all applications in post-tensioned construction. They embrace the entire spectrum from bridge construction and buildings, to civil applications, above and below ground.

The first ever structure built with a prototype DYWIDAG Post-Tensioning System using bars was the Alsleben (Germany) arch-bridge in 1927. From that time on DYWIDAG has continuously improved its systems to keep up with the growing demand of modern construction technology. DYWIDAG offers a complete product line in strand and bar post-tensioning (bonded, unbonded and external) as well as stay-cables being able to fully serve the post-tensioning construction industry. DYWIDAG Post-Tensioning Systems have always combined the highest safety and reliability standards with the most economical efficiency in their research and development. Dependable corrosion protection methods incorporated into the DYWIDAG Post-Tensioning Systems contribute to the longevity of modern construction. High fatigue resistance is achieved with optimized material selection and careful detailing of all components especially in their system assembly.

St. Anthony Falls Bridge, Minneapolis, MN

Pitt River Bridge, BC, Canada

DYWIDAG looks back on many years of valuable experience in the field of post-tensioning which leads to our extremely versatile product range that offers economical solutions for practically any problem. This includes our highly developed, most sophisticated field equipment which is easy to operate in all phases of installation including assembly, installation, stressing and finally grouting.

DYWIDAG Post-Tensioning Systems are being developed and maintained by DYWIDAG-Systems International and are serviced and distributed by a worldwide network of subsidiaries, licensees and agents. Our systems comply with the different national and international specifications and recommendations (ASTM, AASHTO, BS, Eurocode, DIN, Austrian Code, SIA, FIP, fib, EOTA, etc.).

Woodrow Wilson Bridge, Virginia Approach, Alexandria, VA

DYWIDAG SCOPE OF SERVICES:

- Consulting
- Design and shop-drawing engineering
- Manufacturing and supply
- Installation or training and/or supervision of installation
- Inspection and maintenance

Water Tanks, FL

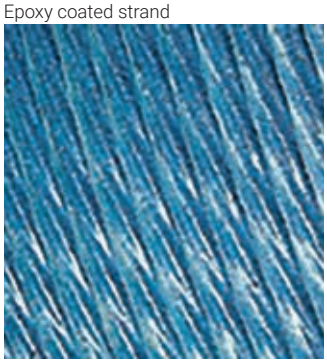
Contents

New Highlands-sea Bright Bridge, New Jersey

Post-Tensioning System Using Strand

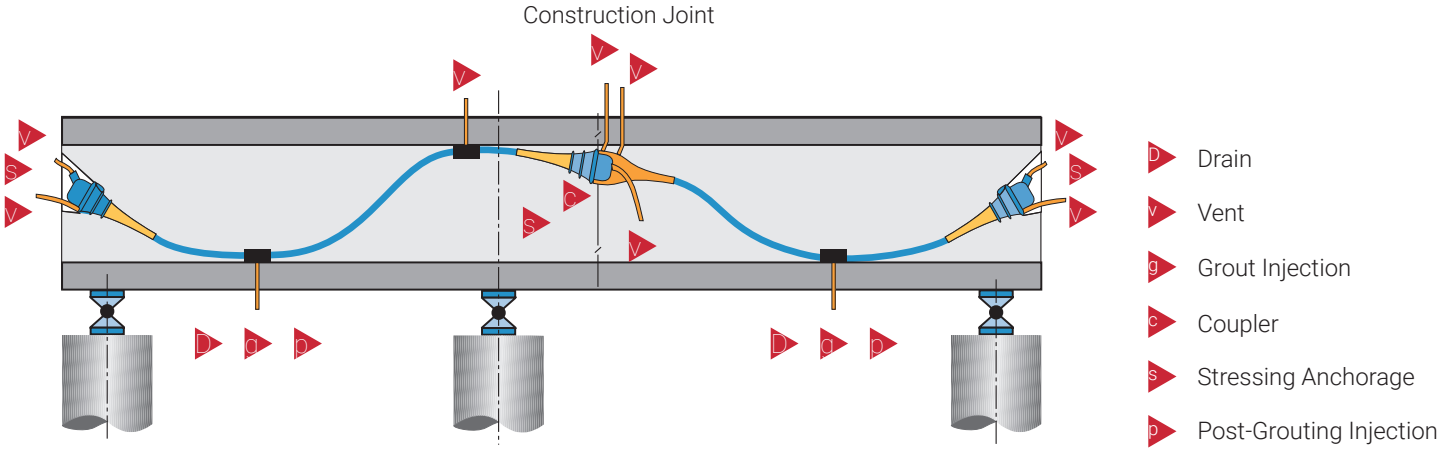
Strand is normally packed in calwrap coils that typically weigh up to 3.2 ton.

Epoxy coated strand



Strand is manufactured from 7 individual cold-drawn wires, 6 outer wires helically wound around one center wire (king wire). The mechanical properties of the strand as well as its corrosion protection are most important to DYWIDAG. Strand coatings do not affect the anchorage's capacity or efficiency. For improved corrosion protection we offer systems using polyethylene (PE) or polypropylene (PP) ducts.

See page 6.



TECHNICAL DATA

CODE/SPECIFICATION TYPE	UNITS	ASTM A 416		UNITS	ASTM A 416	
		0.5" (13mm)	0.6" (15mm)		0.5" (13mm)	0.6" (15mm)
Yield Strength f_y [1]	ksi	243	243	N/mm²	1,670	1,670
Ultimate Strength f_u	ksi	270	270	N/mm²	1,860	1,860
Nom. Diameter	in	0.5	0.6	mm	12.7	15.24
Cross-Sectional Area	in²	0.153	0.217	mm²	98.71	140
Weight	lbs/ft	0.52	0.74	kg/m	0.775	1.102
Ultimate Load	kips	41.3	58.6	kN	183.7	260.7
Modulus of Elasticity	ksi	28,000	28,000	N/mm²	195,000	195,000
Relaxtion after [2] 1,000 h at 0.7 x 9013	%	2.5	2.5	%	2.5	2.5

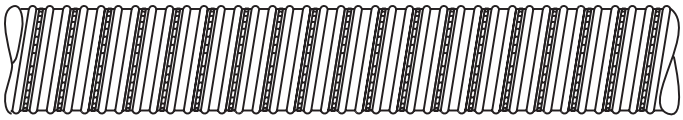
[1] Yield measured at 1% extension under load

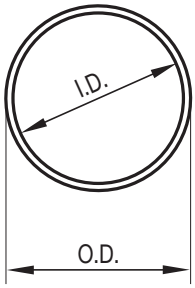
[2] Applicable for relaxation class 2 according to Eurocode prEN 10138/BS 5896: or low relaxation complying with ASTM A 416, respectively

Epoxy coated strand used in the DYWIDAG Post-Tensioning Systems is Flo-Fill® where the interstices are filled with epoxy during the coating process providing exceptional corrosion protection. The epoxy coated strand conforms to ASTM A 882 with either a smooth or grit impregnated surface.

Corrugated Duct

Corrugated metal ducts are the most economical means to create a void for the tensile elements. These thin-walled galvanized corrugated 28ga/0.38 mm - 24ga/0.61 mm sheet metal ducts also provide a secondary corrosion protection with excellent bond behavior between tendon grout and concrete. Primary corrosion protection is provided by the alkalinity of the grout and concrete.





The tendon type number (e.g. 5904, 6807) is composed as follows: the first digit (5 or 6) identifies the nominal strand diameter in tenths of an inch, i.e. 0.5" or 0.6", the last two digits (..07) reference the number of used strands (= 7 strands). The second digit is an internal code.

DIMENSIONS OF CORRUGATED METAL DUCT (STANDARD SIZES)

TENDON TYPE 0.5" (13mm)	TENDON TYPE 0.6" (15mm)	SHEATHING (in/mm) I.D.	O.D.
5907	6805	2/50	2.15/54.6
5909	6807	2.375/60	2.6/66
5912	6809	3.12/80	3.31/84
5915	6812	3.52/90	3.7/94
5920	6815	3.63/93	3.82/97
5927	6819	4/100	4.19/106.3
5937	6827	4.6/117	4.78/121.4
-	6837	5.26/134	5.45/138.4

TENDON TYPE 0.5" (13mm)	TENDON TYPE 0.6" (15mm)	MIN. CENTER DISTANCES in/mm	SUPPORT DISTANCES UP TO in/mm
5904	6804	3.90/99	5.91/1.8
5905	6805	4.25/108	5.91/1.8
5907	6806	4.61/117	5.91/1.8
5909	6807	4.61/117	5.91/1.8
5912	6809	4.61/177	5.91/1.8
5915	6812	5.67/144	5.91/1.8
5920	6815	6.38/162	5.91/1.8
5927	6819	6.73/171	5.91/1.8
5937	6827	7.80/198	5.91/1.8
-	6837	9.25/235	5.91/1.8

PE/PP Round Duct

Thick-walled polyethylene / polypropylene (PPEX3) plastic ducts provide longterm secondary corrosion protection especially in aggressive environments such as waste water treatment plants, acid tanks or silos.

DYWIDAG-Systems International offers polyethylene/ polypropylene (PPEX3) ducts in straight lengths up to 80 feet for all sizes. Standard shipping length is 40 feet. Longer lengths in coils are available for all sizes except 130 mm.

DIMENSIONS OF ROUND CORRUGATED PE/PP DUCT (STANDARD SIZE)

TENDON TYPE 0.5" (13mm)	TENDON TYPE 0.6" (15mm)	SHEATHING (in/mm) I.D.	O.D.	WALL THICKNESS in/mm
5907	6805	2.32/59	2.874/73	.079/2
5909	6807	2.32/59	2.874/73	.079/2
5912	6809	2.99/76	3.58/91	.1/2.54
5915	6812	3.31/84	3.95/100	.1/2.54
5920	6815	3.93/100	4.53/115	.1/2.54
5927	6819	3.93/100	4.53/115	.1/2.54
5937	6827	4.55/115	5.36/136	.14/3.56
-	6837	5.12/130	5.96/151	.14/3.56

FLAT PE/PP DUCT

TYPE	TENDON TYPE 0.6" (15mm)	A in/mm	B in/mm	a in/mm	b in/mm	WALL THICKNESS in/mm
5907	6805	3.55/90.2	1.55/39.5	3.15/80	1.14/29	.079/2

Anchorages

MULTIPLANE ANCHORAGE MA

The two-part multiplane anchorage is primarily used for longitudinal tendons in beams and bridges.

The wedge plate and compact conical anchor body with three load transfer planes introduces the prestressing force gradually into the concrete member.

The separation of anchor body and wedge plate makes it possible to insert the strand after casting the concrete. The wedge plate self-centers on the anchor body providing accurate installation as well as trouble-free stressing. The anchorage is also suitable for cryogenic application (LNG-tanks).

The six bolt hole pattern in the anchor body is designed to accept a permanent plastic cap. Multiple grout ports allow for post grout inspection.

System 100

System 100

- ✓ Stressing anchorage
- ✓ Coupling

Dead end anchorage:

- ✓ Accessible
- ✓ Not accessible

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from 287/1,302
to 2,168/9,644

pocket former for each anchorage system on request

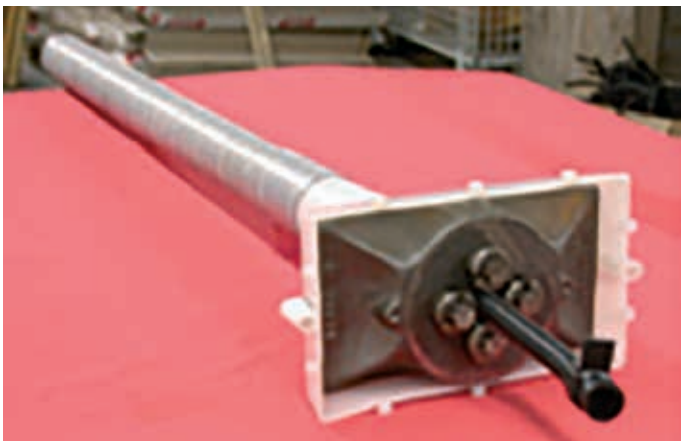

PLATE ANCHORAGE SD

The single unit plate anchorage is designed for slab structures as well as transverse tendons in bridges. Small edge and center distances allow for an economical anchorage layout in tight situations.

- ✓ Stressing anchorage
- ✗ Coupling

Dead end anchorage:

- ✓ Accessible
- ✓ Not accessible

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1,040.8/234

pocket former for each anchorage system on request

BOND HEAD ANCHORAGE ZF/ZR

Primarily used with prefabricated tendons, it is also possible to fabricate this anchorage on site. The strand wires are plastically deformed to ensure safe load transfer up to ultimate capacity in the area of the bond head. Anchorage performance has been proven in static as well as in dynamic applications. Depending on the boundary conditions either a two-dimensional or a threedimensional bond head anchorage pattern is available.

- ✗ Stressing anchorage
- ✗ Coupling

Dead end anchorage:

- ✗ accessible
- ✓ not accessible

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to 1,115/4,961

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from 58.6/261
to 1,582/7,037

ZF

ZR

Anchorages

LOOP ANCHORAGE HV

Often used in large plate-shaped structures, walls, piers or LNG tanks. The 180° loop should be positioned in the center of the tendon to minimize movement of the strand within the loop during simultaneous two-end stressing.

- ✗ Stressing anchorage
- ✗ Coupling

Dead end anchorage:

- ✗ Accessible
- ✓ Not accessible

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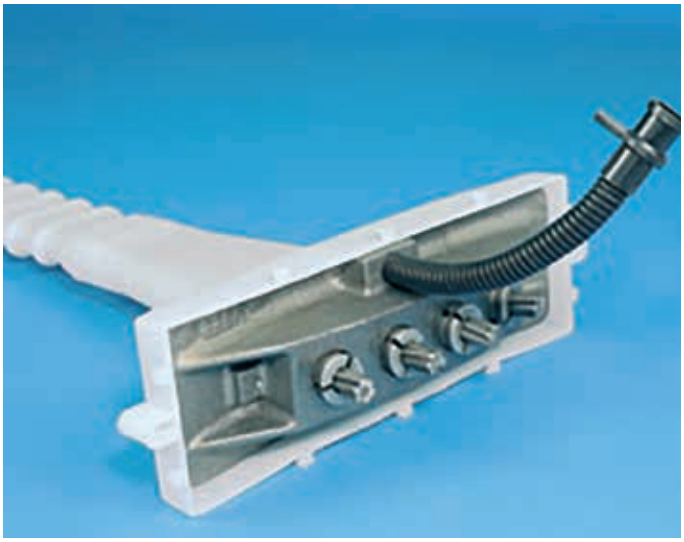
to 1.169/5,301



FLAT ANCHORAGE FA

The 3-0.6" and 4-0.6" Flat Anchorage provides strands in one plane with a trumpet to deviate the strands into an oval duct. The Flat Anchorage is designed to be installed in thin members such as transverse post-tensioning of bridge decks and prestressed flat slabs.

- ✓ Stressing anchorage
- ✗ Coupling

Dead end anchorage:

- ✓ Accessible
- ✓ Not accessible

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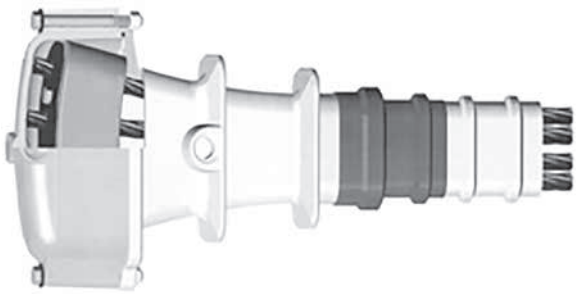
to 234/1043

FLAT ANCHORAGE SYSTEM 100

The two part multiplane anchorage is designed primarily for bridge transverse post-tensioning. The System 100 meets the Florida Department Of Transportation specifications regarding corrosion protection.



Couplers

M

ME

COUPLER M/ME (FLOATING ANCHORAGE BLOCK)

Cylindrical structures (water tanks, digestor tanks, large pipes or dome shells) that require circumferential post-tensioning are the principal applications for the floating coupler M/ME. The tendon anchorage consists of an anchorage block with wedge holes on both sides to accept bare or greased and sheathed strands. The strands overlap within the block. The ringtendon is very compact and requires a small pocket. Stressing is performed using conventional jacks and a curved jack nose.

pocket former for each anchorage system on request
M anchorage available in 2, 4, 6, 8 and 12-0.6 Versions

- ✓ Stressing anchorage
- ✗ Coupling

Dead end anchorage:

- ✓ Accessible
- ✗ Not accessible

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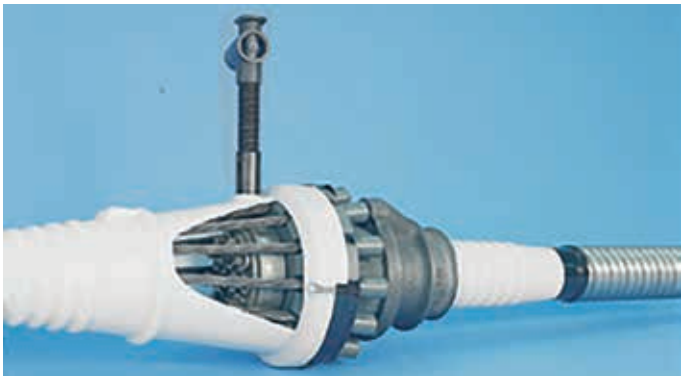
to 738/3,348



COUPLER P

P Coupler consists of a multiplane anchorage body, a standard wedge plate and a coupler ring that accepts the continuing strands with swaged anchorages instead of wedges.

The Coupler P is available in 5, 9, 12, 15, 19 and 27-0.6 versions.

- ✓ Fixed coupler
- ✗ Floating coupler

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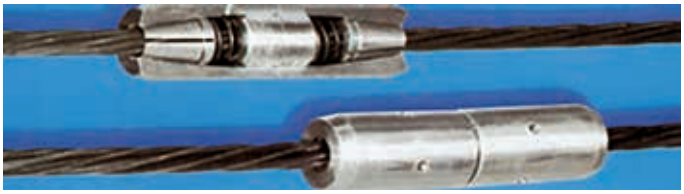
to 1,113/4,953



COUPLER D

The D Coupler is used to lengthen unstressed tendons in segmental bridge construction. The coupler consists of two spring-loaded wedges that connect two strands individually.

- ✗ Fixed coupler
- ✓ Floating coupler

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Available Anchorage Types / Multistrand

TENDON TYPE 59… (0.5“ SYSTEM)

ANCHORAGE TYPE	59...													
	01	02	03	04	05	06	07	08	09	12	15	20	27	37
Multiplane Anchorage MA							•		•	•	•		•	•
Plate Anchorage SD				•										
Bond Head Anchorage ZF/ZR	•		•	•	•	•	•	•	•	•	•	•	•	
Loop Anchorage HV		•	•	•	•	•	•	•	•	•	•	•	•	•
Coupler D	•													

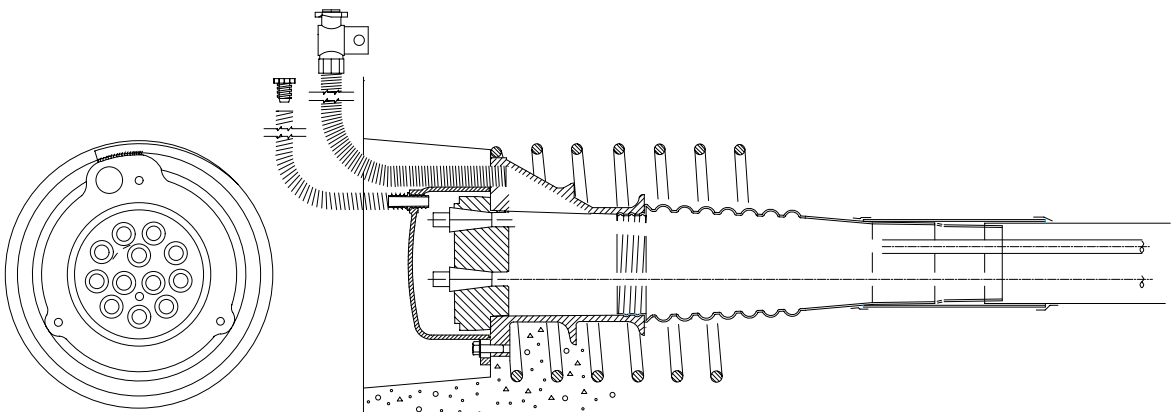
Other size tendons on request

Plate Anchor SD and Flat Anchor FA use 0.5“ Jumbo Wedge

TENDON TYPE 68… (0.6“ SYSTEM)

ANCHORAGE TYPE	68...													
	01	02	03	04	05	06	07	08	09	12	15	19	27	37
Multiplane Anchorage MA					•		•		•	•	•	•	•	•
Plate Anchorage SD				•										
Mono Anchorage EV	•													
Bond Head Anchorage ZF/ZR	•		•	•	•	•	•		•	•	•	•	•	
Loop Anchorage HV		•	•	•	•	•	•		•	•	•	•	•	•
Flat Anchorage FA			•	•										
Coupler M and ME (Floating Anchorage)		•		•		•		•		•				
Coupler P					•				•	•	•	•	•	
Coupler D	•													

Other size tendons on request



System drawings are available on request for each type anchorage showing details and assembly instructions. System 100 castings supplied with 6 bolt holes for installation of permanent plastic cap.

Installation

INSTALLATION

DYWIDAG-Systems International utilizes two different methods to insert strands into ducts. The installation method depends on the access conditions of the structure and the job site.

Uncoiling cages

Stand pusher

METHOD 1: PUSHING

Pushing strands into the duct on the job site is very economical and can be done either before or after casting the concrete. The pushing equipment can be installed remotely and a flexible pipe connected to the insertion point. DYWIDAG strand pushers provide relatively high speeds of up to 25 ft/s (8 m/s) and require minimal operating personnel. These advantages make pushing the preferred method for strand installation.

METHOD 2: PULLING

To install strands while pulling them into the duct can be very efficient in special structures, for example where the loop anchorage is used. In most cases the entire bundle of strands is pulled through the duct using a winch with a steel cable.

PRE-ASSEMBLED TENDONS

The prefabrication of tendons either in the shop or in the field can be very economical when the tendons are short and the location of the job site is close. Special uncoilers and hydraulic winches are usually required to properly install the tendons in the structure.

Stressing

DYWIDAG has developed a series of jacks and hydraulic pumps in order to efficiently and economically stress its tendons. Versatility is provided by changing devices that make one unit adaptable for many different tendon sizes. DYWIDAG jacks have capacities ranging from 56/250 kips/kN up to 2,191/9,750 kips/kN.

DYWIDAG jacks are highly sophisticated, but still easy to operate. They employ inner tube bundles with automatic gripping devices that guide the strand safely through the inside of the jack. This feature makes it possible to control the stressing operation with the highest degree of reliability. Minimal wedge seating losses can be achieved with the power seating option. Power seating hydraulically seats the wedges with a predetermined load, individually and simultaneously, rather than relying simply on friction seating. DYWIDAG jacks also make it possible to overstress and release a tendon to compensate for friction losses and maximize the stress level over the tendon length.

Every jack has a pressure relief valve that safely limits hydraulic pressure to prevent overload. To verify the stressing operation a gauge port is provided directly on the jack.

Stressed tendons can be safely destressed by employing special wedges and a special jack configuration. Hydraulic pumps are generally equipped with a convenient remote control device. Further information concerning the equipment is provided on page 19 to 21.

Jack HoZ 4,000

Tensa 4,800

SOME IMPORTANT NOTES CONCERNING THE SAFE HANDLING OF HIGH STRENGTH STRAND FOR PRESTRESSED CONCRETE:

- Do not damage surface of the strand.
- Do not weld or burn so that sparks or hot slag will touch any portion of the strand which will be under stress.
- Do not use any part of the strand as a ground connection for welding.
- Do not use strand that has been kinked or contains a sharp bend.

Disregard of these instructions may cause failure of material during stressing.

Hydraulic pump

Grouting

The durability of post-tensioned construction depends mainly on the success of the grouting operation. The hardened cement grout provides bond between concrete and prestressed steel as well as primary long-term corrosion protection for the prestressing steel.

DYWIDAG has developed grouting methods based on thixotropic and highly plasticized grout and utilizes durable grouting equipment. Advanced methods such as pressure grouting, post-grouting and vacuum grouting are all results of many years of development.

Grouting is always done from a lowpoint of the tendon. This can be one of the anchorages where a grout cap with grout hose is the port for the grout or along the tendon utilizing an intermediate grout saddle. All grouting components are threaded for easy, fast and positive connection.

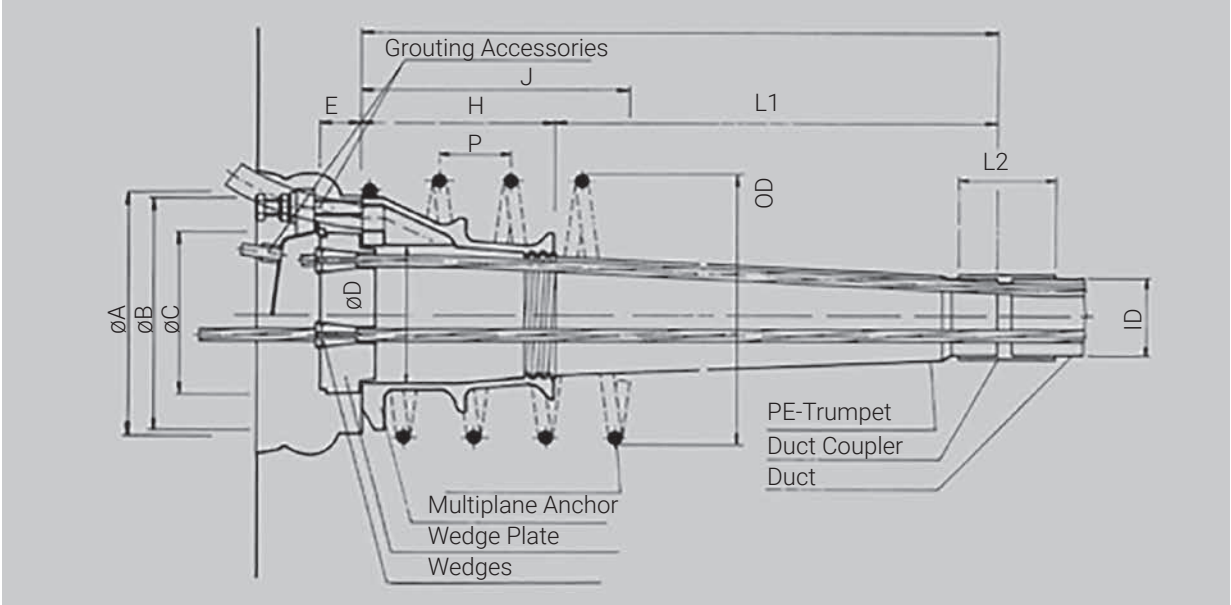
Venting operation

Mixing and pumping equipment

Mxing and pumping

Vacuum grouting

Multiplane Anchorage MA



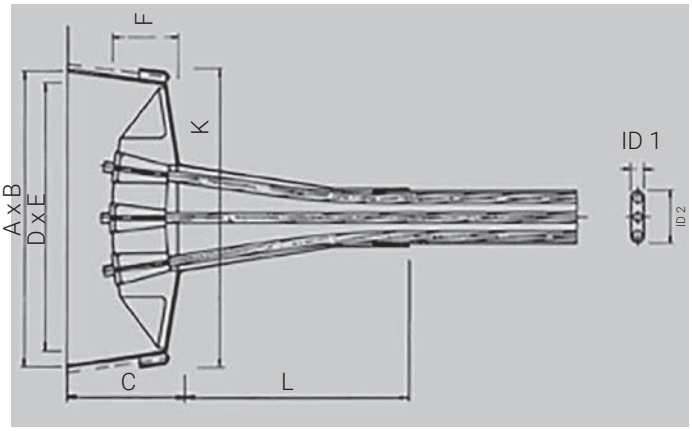
TECHNICAL DATA

ANCHORAGE SIZE	7-0.5"	5-0.6" 9-0.5"	7-0.6" 12-0.5"	9-0.6" 15-0.5"	12-06" 20-0.5"	15-0.6" 27-0.5"	19-0.6" 37-0.5"	27-0.6"	37-0.6"
Min. Block-out Data	A	7 \ 179	8 \ 203	9 \ 229	10 \ 254	11 \ 279	12 \ 305	13-1/2 \ 343	16 \ 407
Transition Length	-	12-3/8 \ 314	13-7/16 \ 341	15-3/4 \ 400	20 \ 508	22-5/8 \ 575	25-3/16 \ 640	27-5/8 \ 702	35 \ 890
Anchor Dia.	B	5-15/16 \ 150	6-11/16 \ 170	7-1/2 \ 190	8-5/8 \ 220	9-7/8 \ 250	11 \ 280	12-3/8 \ 315	14-1/8 \ 360
D	3-9/16 \ 90	3-7/8 \ 98	4-7/16 \ 113	5-1/16 \ 128	5-13/16 \ 148	6-3/8 \ 162	7-1/2 \ 190	8-1/2 \ 220	-
H	3-9/16 \ 90	3-15/16 \ 100	4-15/16 \ 125	7-1/16 \ 180	7-7/8 \ 200	8-5/8 \ 220	9-7/16 \ 240	12-1/2 \ 320	-
Wedge Plate	C	5-1/8 \ 130	5-1/8 \ 130	5 1/2 \ 140	6-5/16 \ 160	7-1/16 \ 180	7-7/8 \ 200	9-7/16 \ 240	10-2/3 \ 270
E	2 \ 50	1-9/16 \ 40	1-11/16 \ 43	1-11/16 \ 43	2 \ 50	2-3/16 \ 55	2-15/16 \ 75	3-1/2 \ 90	-
Trumpet	L1	8-7/8 \ 225	9-1/2 \ 241	10-13/16 \ 275	12-7/8 \ 327	14-3/4 \ 375	16-1/2 \ 419	18-1/8 \ 460	22-1/2 \ 600
Rebar Spiral *	Size	# 4 \ 15M	# 4 \ 15M	# 4 \ 15M	# 5 \ 15M	# 5 \ 15M	# 5 \ 15M	# 6 \ 20M	-
Grade 400 MPa	60 KSI \ 400 MPa	60 KSI \ 400 MPa	60 KSI \ 400 MPa	60 KSI \ 400 MPa	60 KSI \ 400 MPa	60 KSI \ 400 MPa	60 KSI \ 400 MPa	60 KSI \ 400 MPa	-
Pitch	1-7/8 \ 50	1-7/8 \ 50	1-7/8 \ 50	2-1/4 \ 55	1-7/8 \ 50	1-7/8 \ 50	2-1/4 \ 55	2-3/8 \ 60	-
J	10 \ 255	10-1/2 \ 265	10-5/8 \ 270	14 \ 355	14-3/4 \ 365	15 \ 380	16-5/8 \ 420	18 \ 460	-
OD	7-3/4 \ 190	9 \ 230	9-1/2 \ 240	11-1/4 \ 285	12-1/2 \ 315	14-1/2 \ 365	17 \ 430	22 \ 560	-
Duct	ID	2 \ 50	2-3/8 \ 60	3 \ 75	3-3/8 \ 85	3-3/4 \ 95	4 \ 100	4-1/2 \ 115	5-1/8 \ 130
Duct Coupler	L2	8 \ 200	8 \ 200	8 \ 200	8 \ 200	8 \ 200	8 \ 200	8 \ 200	12 \ 300
Grout Requirements	gal/ft \ l/m	0.12 \ 1.5	0.17 \ 2.1	0.28 \ 3.46	0.35 \ 4.39	0.44 \ 5.48	0.47 \ 5.80	0.58 \ 7.25	0.72 \ 8.90

* Spiral required in local anchor zone

All dimensions are nominal and are expressed in inch \ mm

Flat Anchorage FA/Plate Anchorage SD



Flat anchorage FA

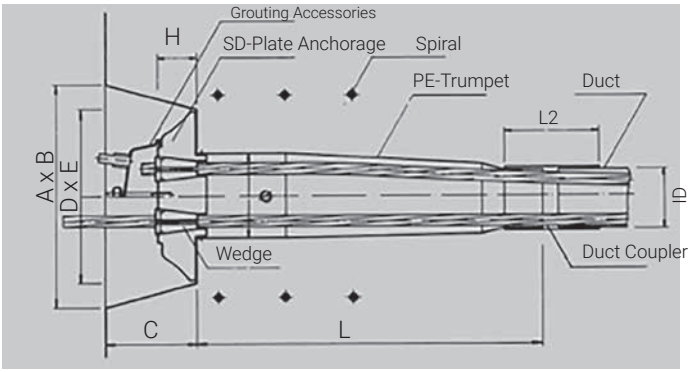


Plate anchorage SD

TECHNICAL DATA

FLAT ANCHORAGE FA

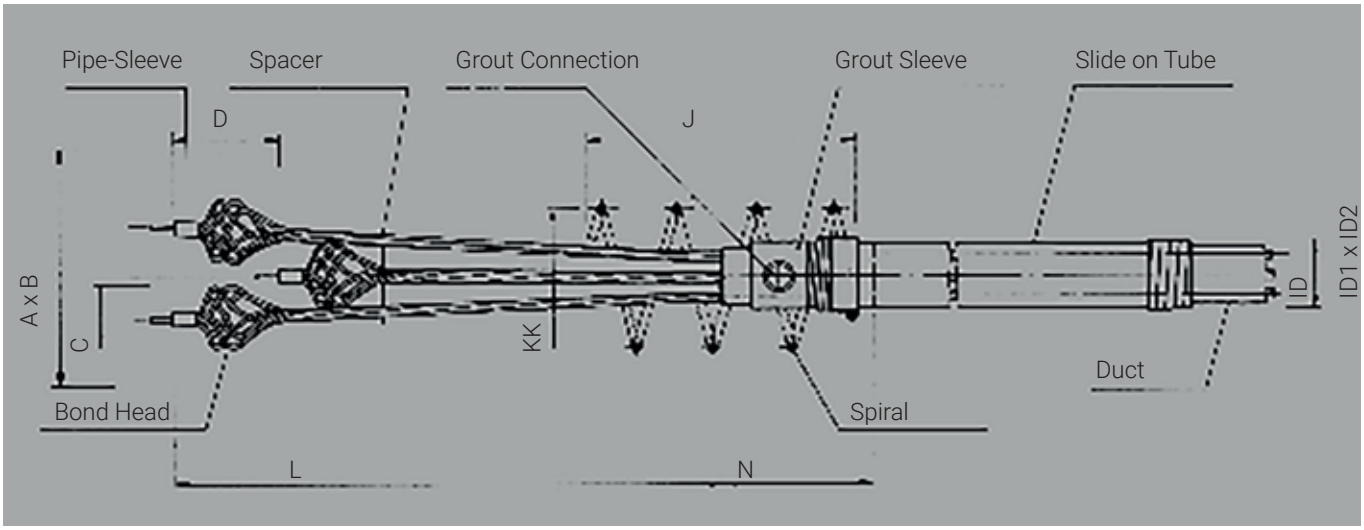
TENDON SIZE	4-0.5"	3-0.6" 5-0.5"	4-0.6"
Flat Anchorage F	D E 2-1/4\57	10\255 4\100 2-1/4\57	13\330 4\100 -
Transition L	K 4-1/2 \ 115	12-1/4\310 8-5/8 \ 220	-
Pocket Former C	A B 5-1/2\140	10-3/4\275 4-1/2\115 5-7/8\148	13-3/4\350 4-7/8\124 -
Duct ID2	ID1 3\75	1\25 3\75	1\25 -

COMBINATION PLATE ANCHORAGE SD

All dimensions are nominal and are expressed in inch \ mm

TENDON SIZE	4-0.5"	3-0.6" 5-0.5"	4-0.6" 7-0.5"	5-0.6" 8-0.5"	6-0.6" 9-0.5"	7-0.6"
Combin. Plate H	D E 1-5/8\41	4-15/16\125 5-1/2\140 1-5/8\41	5-5/16\135 6-5/16\160 1-9/16\40	5-7/8\150 7-1/16\180 1-3/4\44	6-1/2\165 8-1/16\205 1-3/4\44	6-11/16\170 8-1/2\215 -
Transition L	ø 11-3/8 \ 290	2-9/16\65 10-7/16\265	2-15/16\75 14\355	3-3/8\85 15-15/16\405	3-3/4\95 15-15/16\405	3-3/4\95 -
Pocket Former C	A B 3-15/16\100	6-1/2\165 7-5/16\185 3-15/16\100	6-1/2\165 7-5/16\185 3-15/16\100	7-1/16\180 8-1/4\210 4-5/16\110	7-7/8\200 9-7/16\240 4-5/16\110	7-7/8\200 9-7/16\240 -
Duct L2	ID 3\75	1-9/16\40 8\200	1-13/16\46 8\200	2-1/16\52 8\200	2-7/16\62 8\200	2-7/16\62 -

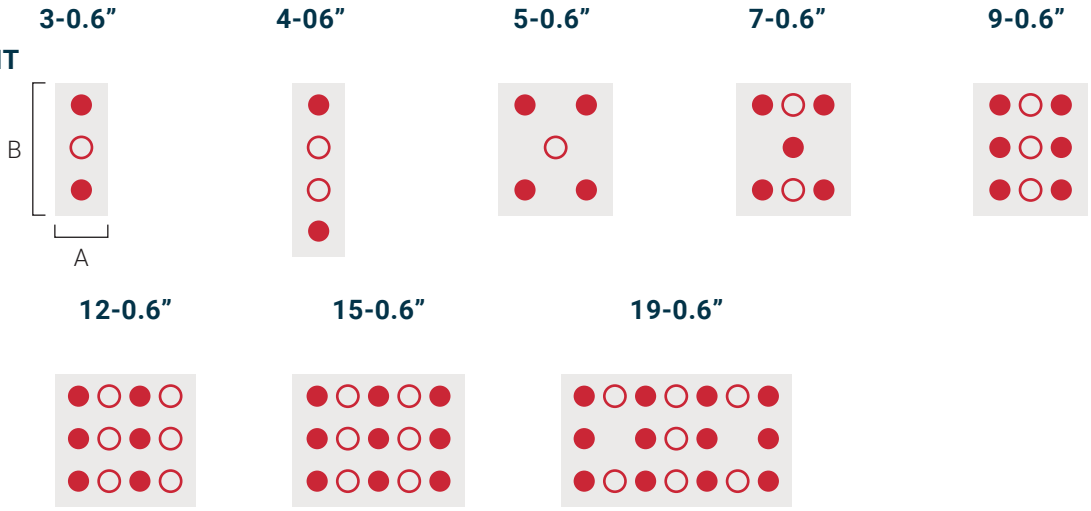
Bond Head Anchorage Z



TECHNICAL DATA

STRAND ARRANGEMENT

- Long
- Short



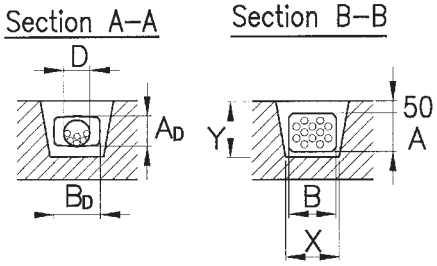
TENDON SIZE	-	3-0.6”	4-0.6“	5-0.6“	7-0.6“	9-0.6“	12-0.6“	15-0.6“	19-0.6“
Anchorage	A	7 \ 178	7 \ 178	11 \ 280	11 \ 280	15 \ 380	15 \ 380	15 \ 380	15 \ 380
B	11 \ 280	13 \ 330	11 \ 280	11 \ 280	11 \ 280	13 \ 330	15 \ 380	19 \ 483	-
C	3 \ 75	3 \ 75	3 \ 75	3 \ 75	3 \ 75	3 \ 75	3 \ 75	3 \ 75	-
D	6 \ 150	6 \ 150	6 \ 150	6 \ 150	6 \ 150	6 \ 150	6 \ 150	6 \ 150	-
L	40 \ 1015	40 \ 1015	40 \ 1015	40 \ 1015	40 \ 1015	40 \ 1015	40 \ 1015	40 \ 1015	-
Grout Sleeve	N	8-1/4 \ 210	9 \ 230	9 \ 230	9 \ 230	9 \ 230	9 \ 230	9 \ 230	9 \ 230
Duct-Round	ID	-	-	2 \ 50	2-3/8 \ 60	3 \ 75	3-1/2 \ 90	3-3/4 \ 95	4 \ 100
Duct-Eliptical	ID1	1 \ 25	1 \ 25	-	-	-	-	-	-
ID2	2 \ 50	3 \ 75	-	-	-	-	-	-	-
Spiral	K	4-1/8 \ 105	7-7/8 \ 200	7-7/8 \ 200	7-7/8 \ 200	7-7/8 \ 200	7-7/8 \ 200	7-7/8 \ 200	7-7/8 \ 200
J	10 \ 255	10 \ 255	10 \ 255	10 \ 255	10 \ 255	10 \ 255	10 \ 255	12 \ 305	-

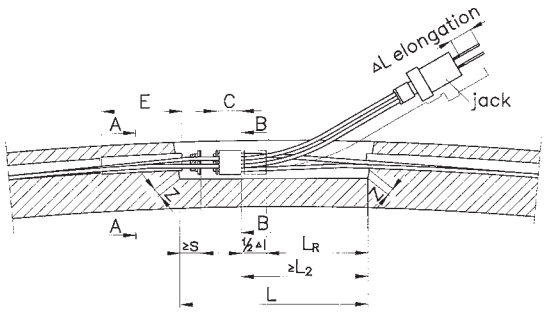
Lightweight hydraulic equipment is used for fabrication of bond heads.
All dimensions are nominal and are expressed in inch\mm

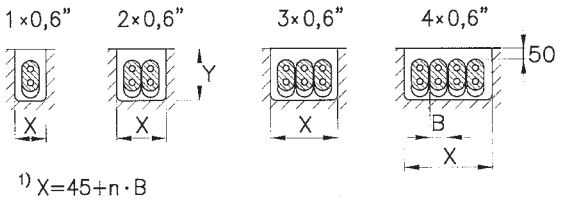
Coupler M/ME (Floating Anchorage Block)

Coupler M

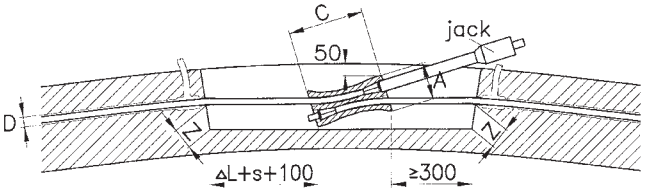
Coupler Me







1) X=45+n·B



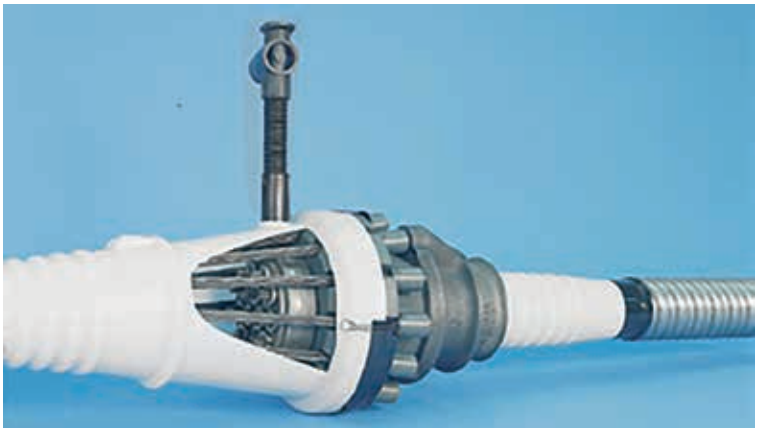
TECHNICAL DATA

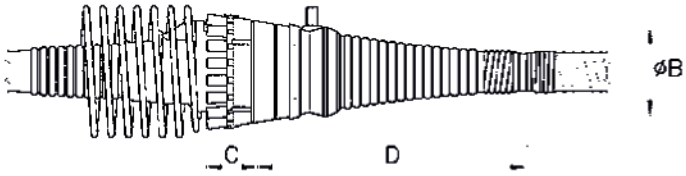
TENDON SIZE	-	2-0.6"	4-0.6"	6-0.6"	8-0.6"	12-0.6"
Block-Out Cross Section for 2" [50mm] Concrete Cover	X	5-1/8 \ 130	7-1/16 \ 180	7-1/16 \ 180	9 \ 230	9 \ 230
-	Y	6-1/8 \ 155	7-11/16 \ 195	7-11/16 \ 195	7-11/16 \ 195	9-1/4 \ 235
-	A	3-1/2 \ 90	5-1/8 \ 130	5-1/8 \ 130	5-1/8 \ 130	6-5/8 \ 168
-	B	4-1/8 \ 105	6-1/4 \ 160	6-1/4 \ 160	8-1/4 \ 210	8-1/4 \ 210
-	C	4-3/4 \ 120	4-3/4 \ 120	4-3/4 \ 120	4-3/4 \ 120	4-3/4 \ 120
Duct	E	7-7/8 \ 200	25-5/8 \ 650	25-5/8 \ 650	41-3/8 \ 1050	45-1/4 \ 1150
- Rectangular	A_D	2-3/8 \ 60	2-3/8 \ 60	2-3/4 \ 70	2-3/4 \ 70	2-3/4 \ 70
- Rectangular	B_D	2-3/4 \ 70	5-1/8 \ 130	5-1/8 \ 130	6-5/8 \ 170	6-5/8 \ 170
- Round	D	1-3/4 \ 45	2-1/8 \ 55	2-5/8 \ 65	3 \ 75	3-1/8 \ 80
- Min. Distance	Z	2 \ 50	2-3/4 \ 70	2-3/4 \ 70	2-3/4 \ 70	3-1/2 \ 90
Min. Required Distance after Stressing	L_2	17-3/4 \ 450	27-1/2 \ 700	27-1/2 \ 700	53-1/8 \ 1350	59 \ 1500
Space Required for Stressing Jack Nose	L_R	21-5/8 \ 550	23-5/8 \ 600	23-5/8 \ 600	23-5/8 \ 600	27-1/2 \ 700
Block-Out Length	$L = s + 11\text{-}1/4"$ (285 mm) + L_2 $L = s + 1/2\ \Delta L + 11\text{-}1/4"$ (285mm) + L_S Where s = 0.2 x 1/2 ΔL, but 5" (125 mm) min. ΔL is Elongation					If $L_R \leq L_2$ - 1/2 ΔL If $L_R \geq L_2$ - 1/2 ΔL

All dimensions are nominal and are expressed in inch\mm

Coupler P

DYWIDAG Coupler "P" utilizes a standard wedge plate and a slotted coupling ring bearing on the multi-plane anchorage. An extruded grip is hydraulically installed on the ends of the coupled strands and the strands are placed in the slots of the coupling ring. This system provides a simple and inexpensive solution for coupling large strand tendons.





Coupler zone

TECHNICAL DATA

TYPE 0.6"	øA (in/mm)	øB (in/mm)	C (in/mm)	D (in/mm)
6805	6.93/176	4.53/115	5.2/132	20/510
6809	9.29/236	8.07/205	5.35/136	22.44/570
6812	10.24/260	8.86/225	5.71/145	29.72/755
6815	11.42/290	9.84/250	5.91/150	29.72/755
6819	12/305	10.43/265	6.1/155	34.65/880
6827	14.37/365	12.6/320	6.69/170	35.63/905

DETAILS OF THE COUPLER ZONE

TYPE 0.6"	CENTER DISTANCE OF ANCHORAGES (in/mm)	LENGTH OF SPACE FOR INSTALLATION (in/mm)
6805	11.81/300	78.75/2000
6809	14.17/360	78.75/2000
6812	15.35/390	78.75/2000
6815	16.54/420	78.75/2000
6819	18.90/480	78.75/2000
6827	22.83/580	78.75/2000

Equipment Overview

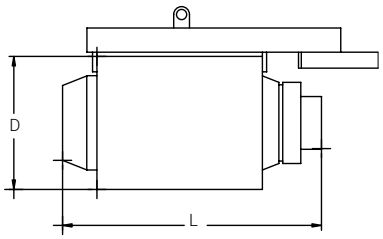
HYDRAULIC JACKS

Monostrand Jack

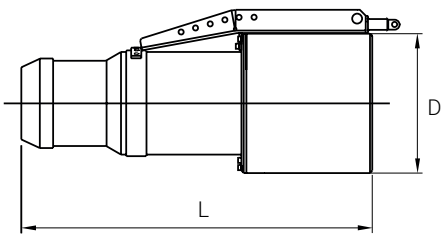
Tensa 4,800 / 6,800 / 8,600

HoZ 3,000 / 4,000

JACK TYPE	59... (0.5")														68... (0.6")												
	01	02	03	04	05	06	07	08	09	12	15	19	27	37	01	02	03	04	05	06	07	08	09	12	15	19	27	37
Mono 0.6	•														•													
HoZ 950		•	•	•	•											•	•	•										
HoZ 1,700						•	•	•	•										•	•	•							
HoZ 3,000										•	•											•	•	•				
HoZ 4,000												•	•												•	•		
Tensa 2,600																						•	•	•				
Tensa 3,000																						•	•	•				
Tensa 4,800																									•	•		
Tensa 6,800																											•	
Tensa 8,600														•														•



Tensa style



Hoz style

Detailed operating and safety instructions are provided with all stressing and grouting units. Read and understand these instructions before operating equipment.

JACK TYPE[1)]	LENGTH L[3)] (in/mm)	DIAMETER D (in/mm)	STROKE (in/mm)	PISTON AREA (in^2/mm^2)	CAPACITY[2)] kip/kN	WEIGHT lbs/kg
Mono 0.6	21.5/546	n/a	8.5/213	7.95/51.3	60/267	52/24
HoZ 950	24.45/621	8/203	3.94/100	25.1/162	218/972	144/65
HoZ 1,700	31.6/803	11/280	5.9/150	46.26/298.45	392/1,745	354/160
HoZ 3,000	44.76/1,137	15.16/385	9.84/250	78.9/509	687/3,054	884/400
HoZ 4,000	50/1,271	18.98/482	9.84/250	138.7/894.6	945/4,204	1,326/600
Tensa 2,600	30.9[3)]/785	14.57/370	9.84/250	85.2/549.8	572/2,546	729/330
Tensa 3,000	30.9[3)]/785	14.57/370	9.84/250	85.2/549.8	680/3,024	782/354
Tensa 4,800	39.6[3)]/1,005	18.5/470	11.81/300	135.86/876.5	1,083/4,820	1,432/648
Tensa 6,800	45.3[3)]/1,150	22/560	11.81/300	191.7/1,237	1,529/6,803	2,619/1,185
Tensa 8,600	46[3)]/1,170	26.8/680	11.81/300	274.7/1,772.5	2,191.4/9,748	3,912/1,770

1) power seating included 2) without friction 3) retracted position

Equipment Overview

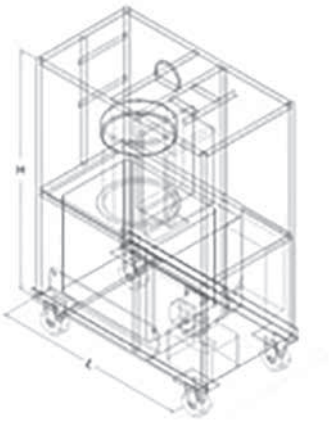
HYDRAULIC PUMPS

PE 55

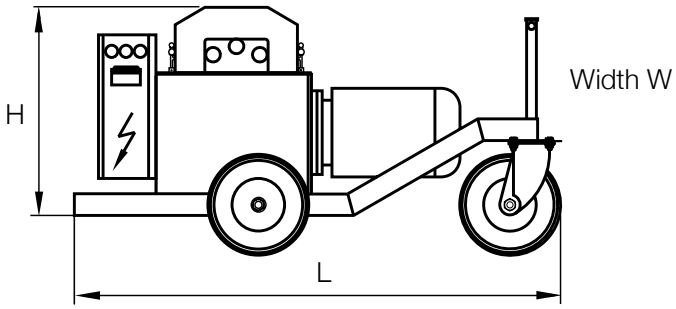
PE 4000

R 11.2 - 11.2/210

PUMP	JACKS						
	0.6 Mono	HoZ 950	HoZ 1,700	HoZ 3,000 Tensa 3,000/2,600	HoZ 4,000 Tensa 4,800	Tensa 6,800	Tensa 8,600
PE 55	•	•					
PE 4000			•	•	•		
R 11.2						•	•



PE 4000



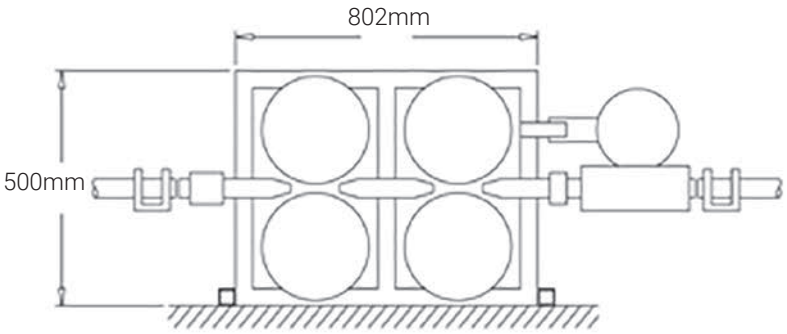
R 11.2

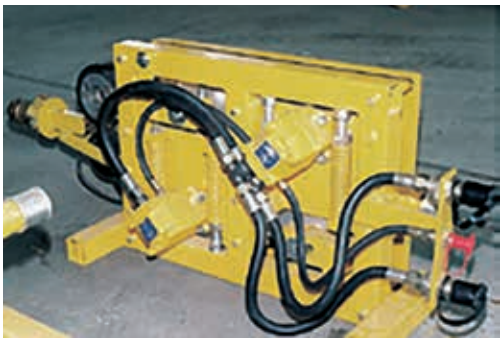
PUMP	OPERATING PRESSURE psi/MPa	CAPACITY V/MIN Gpm/Lpm	EFF. OIL AMOUNT G/L	WEIGHT lbs/kg	DIMENSIONS L-W-H in	DIMENSIONS L-W-H mm	AMP DRAW A
PE 55	10,000/69	0.3[1]/1.14	2/7.57	65/29.4	11.5-9.5-18.25	292-241-464	25[2]
PE 4000	10,000/69	1.95[1]/7.37	20/75.7	492/223	25-24-36.5	635-610-927	17[3]
R 11.2	7,970/55	5.9/22.4	44.9/170	1,590/720	78.75-31.5-51.2	2,000-800-1,300	46[3]

1) At operating pressure
2) At 10,000 psi, 115 Volt
3) At 460 Volt

Pushing and Grouting Equipment

PUSHING EQUIPMENT





ESG 8 - 1

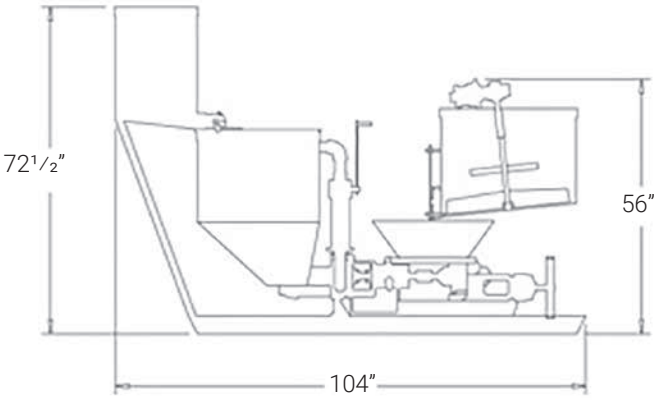
TYPE	PUSHING FORCE (kips/kN)	PUSHING SPEED (ft/s / m/s)	WEIGHT (lbs/kg)	DIMENSIONS L-W-H (in/mm)	HYDRAULIC PUMPS	AMP DRAW
ESG 8 - 1	0.88 / 3.9	20 / 6.1	309 / 140	55-13.8-20 1,400-350-510	ZP 57*	44

* Can also use R35 pump.

GROUTING EQUIPMENT

(MIXING AND PUMPING)

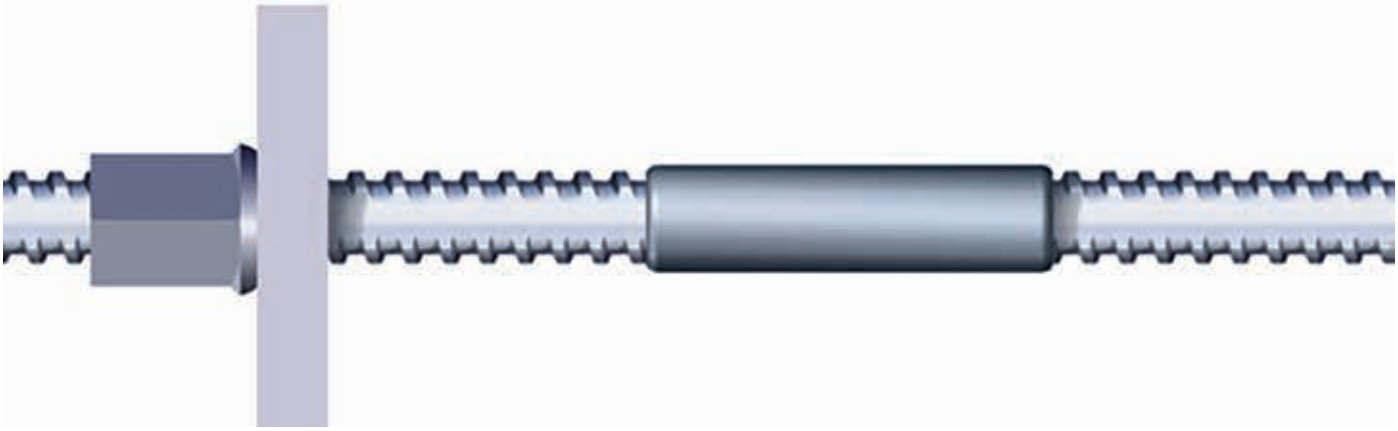
CG600 colloidal



GROUTING EQUIPMENT CG600 Colloidal	MAX INJECTION PRESSURE (psi/MPa)	CAPACITY (gpm / l/h)	WEIGHT lbs / kg	DIMENSIONS L-W-H (in/mm)
with Moyno pumps	250/1.7	20/4542	1,100/500	90-37-63 / 2286-940-1600
with Piston Pump (1,000 psi)	1,000/6.9	20/4542	1,725/784	90-37-63 / 2286-940-1600

Note: Air pressure required to operate is 280 cfm@100 psi

DYWIDAG Post-Tensioning System Using Bars



DYWIDAG BARS

The components of the DYWIDAG Bar System are manufactured in the United States exclusively by DYWIDAG-Systems International. Used worldwide since 1965, the system provides a simple, rugged method of efficiently applying prestress force to a wide variety of structural applications including post-tensioned concrete, as well as rock and soil anchor systems.

Available in 1" (26.5 mm), 1 1/4" (32 mm) and 1 3/8" (36 mm) THREADBARS® are hot rolled and proof stressed alloy steel conforming to ASTM A722 CAN/CSA (G279-M1982). The 1 3/4" (46 mm) and 2 1/2" (65 mm) nominal diameter bar is cold drawn quenched and tempered alloy steel which after threading also conforms to the strength properties specified in A722.

The DYWIDAG THREADBAR® prestressing steel has a continuous rolledin pattern of thread-like deformations along its entire length. More durable than machined threads, the deformations allow anchorages and couplers to thread onto the THREADBAR® at any point. The 1 3/4" (46mm) and 2 1/2" (65mm) bar can be cold threaded for its entire length or if enhanced bond is not required the bars can be supplied with threaded ends only.

The strength of the DYWIDAG anchorages and couplers exceeds the requirements of ACI 318 and the PTI Acceptance Standards for PostTensioning Systems.

Bars may also be galvanized, but will lose about 5% of their strength. Epoxy coating is the preferred method.

Test reports are available for the principal components of the system.

Conforming to the requirements of ASTM A615, the deformations develop an effective bond with cement or resin grout. The continuous thread simplifies stressing. Lift-off readings may be taken at any time prior to grouting and the prestress force increased or decreased as required without causing any damage.

The DYWIDAG Bar System is primarily used for grouted construction. In addition they are sometimes used as external tendons with various types of corrosion protection.

All system components are designed to be fully integrated for quick and simple field assembly. Duct, duct transitions, grout sleeves and grout tubes all feature thread type connections.

Tendon duct can be metal or plastic. Galvanized or epoxy coated accessories that thread over the coated bar are available.

Placing DYWIDAG THREADBAR® anchorages is simplified by the use of reusable plastic pocket formers. Used at each stressing end, the truncated, cone-shaped pocket former can extend through, or butt up against the form bulkhead.

Threadbars are available in mill lengths to 60' (18.3 m), and may be cut to specified lengths before shipment to the job site. Where circumstances warrant, the threadbars may be shipped to the job site in mill lengths for field cutting with a portable friction saw or coupled to extend a previously stressed bar. Cold threaded 1 3/4" (46 mm) and 2 1/2" (65 mm) diameter are available in lengths up to 45 feet.

Prestressing Bar Properties

NOMINAL BAR DIAMETER (in/mm)	ULTIMATE STRESS (ksi/Mpa)	CROSS SECTION AREA (in^2/mm^2)	ULTIMATE STRENGTH (kips/kN)	PRESTRESSING FORCE (kips/kN)			WEIGHT (lbs/ft) (kg/m)	MINIMUM* ELASTIC BENDING RADIUS (ft/m)	MAXIMUM BAR DIAMETER (in/mm)
				$0.8f_{pu}A_{ps}$	$0.7f_{pu}A_{ps}$	$0.6f_{pu}A_{ps}$			
1 26	150 1,030	0.85 548	127.5 567	102.0 454	89.3 397	76.5 340	3.01 4.48	52 15.9	1.20 30.5
1¼ 32	150 1,030	1.25 806	187.5 834	150.0 662	131.3 584	112.5 500	4.39 6.54	64 19.5	1.46 37.1
1⅜ 36	150 1,030	1.58 1,018	237.0 1,055	189.6 839	165.9 738	142.2 633	5.56 8.28	72 22.0	1.63 41.4
1¾ 46	150 1,030	2.62 1,690	400.0 1,779	320 1,423	280 1,245	240 1,068	9.22 12.72	92 28.0	2.00 51.0
2½ 66	150 1,030	5.16 3,331	774 3,442	624 2,753	546 2,409	4,618 20,65	18.2 27.1	-	2.79 70.9

* Prebent bars are required for radii less than the minimum elastic radius

** Grade 160 bar may be available on special request

STEEL STRESS LEVELS

DYWIDAG bars may be stressed to the allowable limits of ACI 318.The maximum jacking stress (temporary) shall not exceed 0.80 fpu, and the transfer stress (lockoff) shall not exceed 0.70 f_{pu}.

ACI 318 does not stipulate the magnitude of prestress losses or the maximum final effective (working) prestress level.

Prestress losses due to shrinkage, elastic shortening and creep of concrete, as well as steel relaxation and friction must be considered.

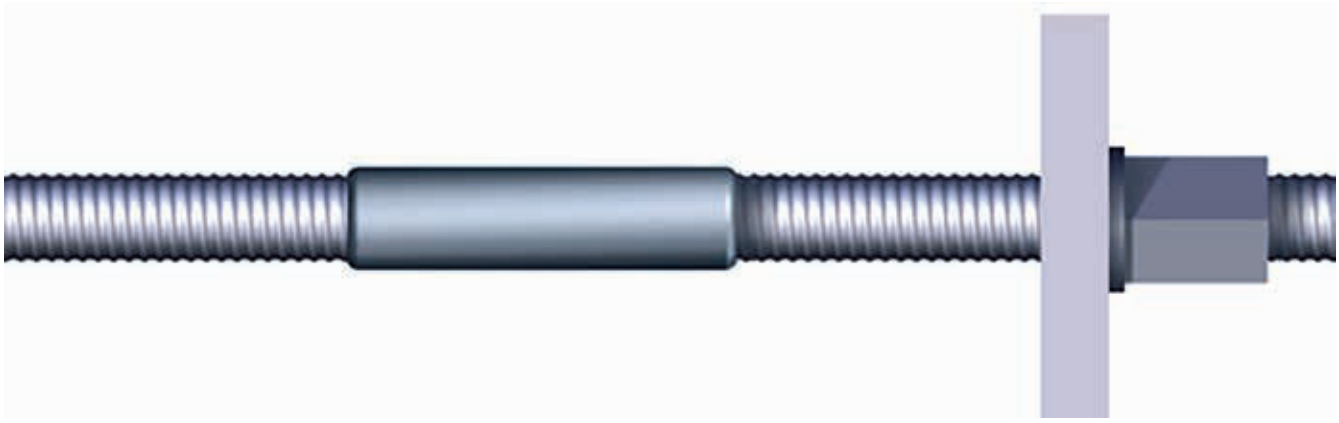
The final effective (working) prestress level depends on the specific application. In the absence of a detailed analysis of the structural system, 0.60 f_{pu} may be used as an approximation of the effective (working) prestress level.

Actual long term loss calculations require structural design information not normally present on contract documents.

SOME IMPORTANT NOTES CONCERNING THE SAFE HANDLING OF HIGH STRENGTH STEEL FOR PRESTRESSED CONCRETE:

- Do not damage surface of bar.
- Do not weld or burn so that sparks or hot slag will touch any portion of bar which will be under stress.
- Do not use any part of bar as a ground connection for welding.
- Do not use bar that has been kinked or contains a sharp bend.

Disregard of these instructions may cause failure of material during stressing.



Cold threaded bar

Threadbar® Accessory Dimensions

ANCHORAGE DETAILS							
Bar Diameter	1"	26mm	1-1/4"	32 mm	1-3/8"	36 mm	1-3/4"
Anchor Plate Size*	5x5x1 1/4	127x140x32	6x7x1 1/2	152x178x38	7x7 1/2x1 3/4	178x191x44	9x9x2
Anchor Plate Size*	4x6 1/2x1 1/4	102x165x32	5x8x1 1/2	127x203 x38	5x9 1/2x1 3/4	127x241x44	-
Nut Extension a	1-7/8	48	2 1/2	64	2 3/4	70	2 7/8
Min. Bar Protrusion**B	3	76	3 1/2	89	4	102	3 5/8
COUPLER DETAILS							
Length C							
For plain bars	6 1/4	159	6 3/4	171	8 3/4	219	6 3/4
For epoxy coated bars	7 3/4	197	8 1/4	210	10 1/8	267	8 3/4
Diameter D	2	51	2 3/8	60	2 3/4	67	3 1/8
DUCT DETAILS (GALVANIZED STEEL)							
Bar Duct O.D.	1 7/8	47	2	51	2 1/8	55	2 3/4
Bar Duct I.D.	1 5/8	43	1 7/8	48	2	51	2 5/8
Coupler Duct O.D.	2 3/4	70	3	76	3 1/2	87	4
Coupler Duct I.D.	2 5/8	67	2 7/8	72	3 1/4	83	3 3/4
DUCT DETAILS (PLASTIC DUCT)							
Bar Duct O.D.	2 7/8	73	2 7/8	73	2 7/8	73	2 7/8
Bar Duct I.D.	2 9/32	63	2 9/32	63	2 9/32	63	2 9/32
Coupler Duct O.D.	2 7/8	73	3 9/16	90.5	3 7/8	98.4	4 17/32
Coupler Duct I.D.	2 9/32	63	3	76	3 1/4	82.5	3 15/16
POCKET FORMER DETAILS							
Depth	7 1/8	178	8	203	8 5/8	219	N/A
Maximum Diameter	5 1/8	130	6 1/2	165	6 1/2	165	N/A

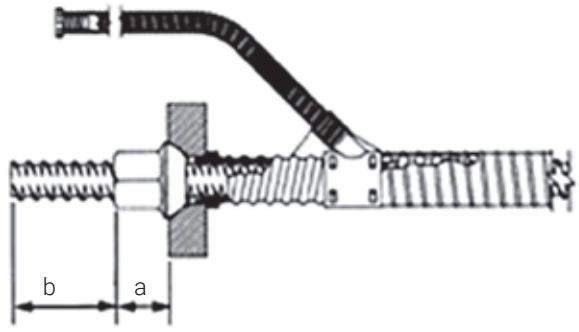
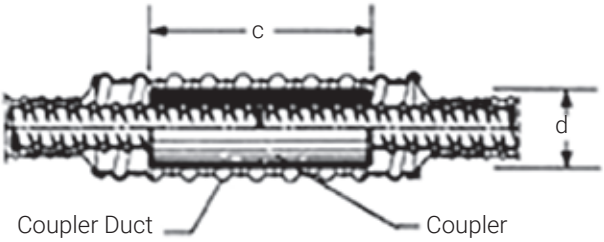
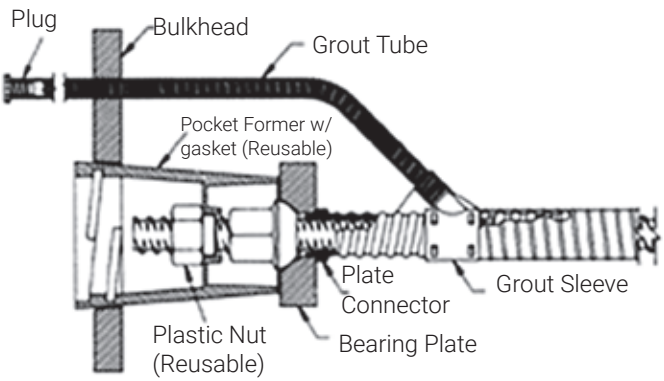


Plate anchorage



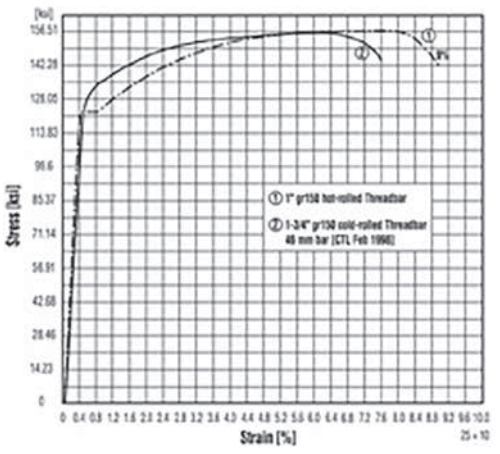
Coupler

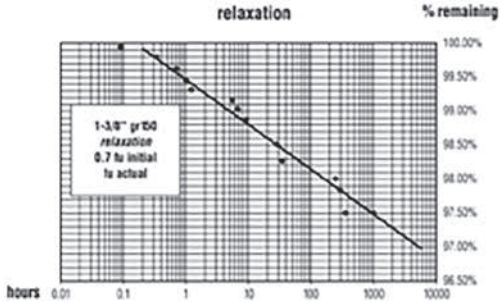


Pocket former detail

Threadbar® Accessory Dimensions

	46 mm	2-1/2"	66 mm
	230x230x57	12x14x2 1/2	305x356x63.5
	-	-	-
	74	5	127
	92	53/8	136.5
	171	10 3/4	273
	222	10 3/4	273
	79	4 1/2	114
	70	3 15/32	88
	67	3 9/32	83.7
	101	5 7/16	138
	95	5 1/4	134
	73	3 7/8	98.4
	63	3 1/4	82.5
	115	6	152.4
	100	5	127
	N/A	N/A	N/A
	N/A	N/A	N/A





MODULUS OF ELASTICITY

The modulus of elasticity „E" is an intrinsic property of steel whose magnitude remains basically constant and is little affected by normal variations in mill processes. For Threadbars this value has been determined to be 29,700 ksi (205 MPa).

RELAXATION

Relaxation is defined as the loss of prestress load in a post-tensioning steel subjected to a specified initial stress while maintaining the length and the temperature constant. Relaxation tests are usually conducted at an initial load equal to 70% of the strand's actual ultimate strength (see chart to the left). The tension loss after 1,000 hrs for a Threadbar® initially stressed to 70% of guaranteed ultimate strength can be assumed between 1.5 and 2%.Tests indicate that the relaxation losses in cold drawn, cold threaded bars are significantly higher.

STRESS-STRAIN CHARACTERISTICS

A typical stress-strain curve for a stretched and stress relieved bar is substantially different from a typical curve produced for a cold drawn, cold threaded bar. Samples of each are illustrated below.The most notable feature is the lack of a definite yield point characteristic of cold drawn bars.

FATIGUE STRENGTH

Under normal circumstances fatigue is not a primary design consideration for prestressing steels. However, all DYWIDAG bars and accessories have been tested and proven to exceed the fatigue requirements specified by the Post-Tensioning Institute.

TEMPERATURE CHARACTERISTICS

Tests have demonstrated that no significant loss of strength occurs when bars are subjected to elevated temperatures up to 1,100 degrees F (593° C). Only the yield strength is reduced when temperatures exceed approximately 750 degrees F (399° C). Bar ductility is not significantly affected by temperatures down to -60 degrees F (-51° C).

SUSCEPTIBILITY TO STRESS CORROSION CRACKING AND HYDROGEN EMBRITTLEMENT

All prestressing steel is susceptible to stress corrosion cracking and hydrogen embrittlement in aggressive environments and therefore must be properly protected. However, accelerated tests have demonstrated that while A 416 strand failed after 5 to 7 hours, bars still held their load when testing was discontinued at 200 hours.

BOND

The deformations on the DYWIDAG Threadbar® exceed the deformation requirements of A 615. Consequently bond strength is at least equivalent to A 615 reinforcing bars.

SHEAR

High strength bars are not usually used to resist transverse shear loads. However, their untensioned shear strength is similar to that of any other steel.

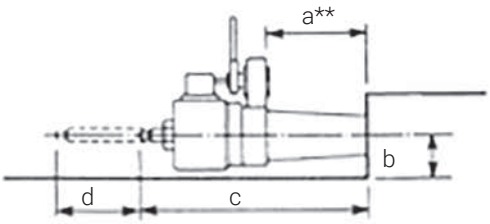
$$t = \frac{fy}{\sqrt{3}}$$

Threadbar® Accessory Dimensions

STRESSING

DYWIDAG Threadbars are stressed using compact lightweight hydraulic jacks. In most cases handled by one man, the jack fits over a pull rod designed to thread over the threadbar® protruding from the anchor nut. The jack nose contains a socket wrench and ratchet device which allow the nut to be tightened as the threadbar® elongates. 1¾" and 2½" bars utilize specially equipped center-hole stressing jacks.

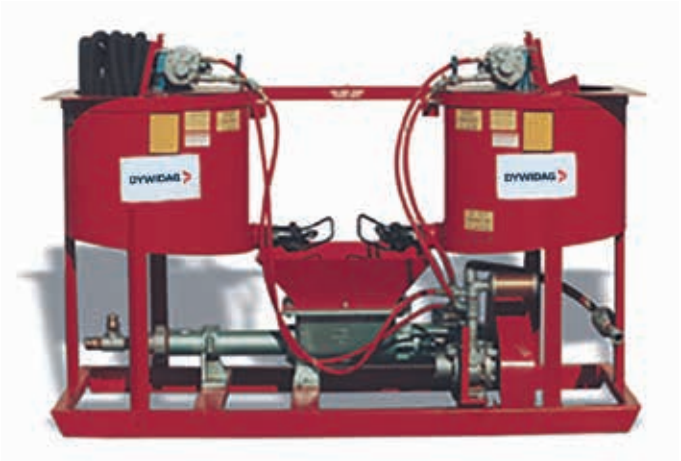
The magnitude of the prestressing force applied is monitored by reading the hydraulic gauge pressure and by measuring the threadbar® elongation. The elongation can be measured directly by noting the change in threadbar protusion.



d = Total tendon elongation

Detailed operating and safety instructions are provided with all stressing and grouting units. Read and understand these instructions before operating equipment.

JACK CAPACITY (kips/kN)	BAR SIZE (in/mm)	A** (in/mm)	B (in/mm)	MIN. C (in/mm)	WEIGHT (lbs/kg)
67/267	⅝ / 15	7¾ / 197	3¼ / 83	24 / 610	50 / 23
160/712	1, 1¼ / 26, 32	8½ / 216	4 / 102	26 / 660	80 / 36
220/979	1¼,1⅜ / 32, 36	11 / 279	6 / 152	30 / 762	110 / 50
330*/1,500	1¾ / 46	N/A	6 / 145	36 / 900	334* / 152
630*/2,800	2½ / 66	N/A	7 / 180	43 / 1,070	500 / 227



CG 500

GROUTING

Grouting completes the installation process for post-tensioned concrete construction.The grout is important in protecting the steel from corrosion and contributes significantly to the ultimate strength of the structure.

After mixing, the grout is injected into a low point vent until consistent material is exhausted at the terminating or anchorage vent. An admixture may be used to control expansion and pumpability.

Threadbar® Details & Applications

THREADBAR® STRESSING OPERATION MOPAC FREEWAY/US 183 INTERCHANGE AUSTIN, TX.

TEMPORARY THREADBARS FOR PRECAST SEGMENTAL CONSTRUCTION

TYPICAL THREADBAR® TENDON INSTALLATION, AERATION/ EQUALIZATION BASIN MCINTOSH, AL

BRIDGE REPAIR THREADBAR® STAYS ROUTE 580 ALTAMONT PASS, CALIFORNIA

Repair & Strengthening

INSPECTION AND REPAIR OF GROUTED TENDONS

With over twenty years of experience in the field of inspection and repair of structures, DYWIDAG offers a complete service package that includes Non-Destructive Testing (NDT) for the non-invasive detection of flaws in structures, in particular, problems of voids in grouted post-tensioning tendons. DYWIDAG also offers special equipment such as metal sensitive drills and videoscopes for the limited invasive inspection at suspect locations in the structure, digital volumeters that measure the volume of any void inside the tendon and vacuum grouting equipment for subsequent filling of the void.

NON-DESTRUCTIVE TESTING (NDT)

DYWIDAG's procedures for NDT include locating the ducts in the concrete using Ground Penetrating Radar (GPR), then using Impact Echo instrumentation to determine the location of any voids located inside the grouted tendons.

Locating tendons using GPR

Using Impact Echo to locate voids in the tendon

VIBRATION TESTING OF EXTERNAL TENDONS

VIBRATION TESTING

Vibration Testing is an economical and efficient procedure used to determine the amount of force existing in external tendons. The method consists of an external sensor located on the tendon to be tested and then generating a vibration in the tendon. The tendon response is recorded and analyzed with special software that will compute, based on the tendon characteristics, the remaining force in the tendon.

GROUT REMEDIATION OF PT TENDONS

DYWIDAG uses vacuum grouting techniques & experienced personnel to fill any voids. As a necessary check, the volume of material injected in the void should be compared to the volume previously measured. DYWIDAG uses only ASBI certified grout technicians cross trained in NDT inspection. All technicians have extensive experience in both pressure and vacuum grouting techniques employing thixotropic grout.

VOLUME MEASURING

DYWIDAG is able to determine the volume of the void through the use of a Digital Volumeter with leak compensating capabilities.

Digital Volumeter with leak compensating capabilities

Result of void grouted with conventional methods

Result of void grouted with Vacuum Grouting

INVASIVE INSPECTIONS

The NDT inspection shall be followed by limited invasive inspection to verify the NDT findings. DYWIDAG offers special devices and techniques developed to minimally invade the structure in order to determine the actual conditions of the grouted tendons and protect the prestressing steel during the inspection.

Repair & Strengthening

REPAIR OF THE TRENT STREET BRIDGE, SPOKANE, WA

WASHINGTON DEPARTMENT OF TRANSPORTATION

DYWIDAG performed an NDT inspection using Ground Penetrating Radar to detect post-tensioning ducts and steel reinforcement as well as an Impact Echo Scanner to detect voids in the grouted ducts. Videoscope inspections were carried out to assess the condition of the post-tensioning strands. The volume of voids inside the ducts was measured with state-of-theart equipment capable of compensating for air leaks. The grouting remediation of the post-tensioned tendons in web b was performed using vacuum grouting.

DYWIDAG SERVICES:

Inspection: NDT (GPR and Impact Echo), Special drills with shut-off capabilities when in contact with metal, Videoscope and Void volume measurement with air leak compensation capabilities / Repair: Vacuum Grouting

MID BAY BRIDGE, DESTIN, FL

MID BAY BRIDGE AUTHORITY

Inspection at anchorage areas of external tendons of the bridge and vacuum grouting of voids.

DYWIDAG SERVICES:

Inspection and Measurement of the Volume of Voids / Repair: Vacuum injected more than 700 voids Engineering: Assisted in preparing procedures for detensioning and replacement of 11 external tendons

I-88 & I-355 INTERCHANGE, DOWNER GROVE, IL

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY

Overall inspection of the posttensioning tendons of 4 segmental ramps. Inspection included both, tendons in the superstructure as well as in the substructure.

DYWIDAG planned and performed NDT and limited invasive inspection in a selected sample of the post-tensioning tendon population of these ramps and assessed the condition of those elements of the structure (i.e. condition of the prestressing steel and grout).

DYWIDAG SERVICES:

Preparation and implementation of the inspection plan. Inspection included the use of GPR, IE, vibration testing of external tendons, drillings, videoscope, volume measurement of the voids found inside the ducts and report preparation

C & D CANAL BRIDGE, SR1 OVER CHESAPEAKE & DELAWARE CANAL, ST. GEORGES, NEW CASTLE CO., DELAWARE

DELAWARE DEPARTMENT OF TRANSPORTATION

DYWIDAG SERVICES:

NDT inspection, by videoscope, of 18 cable stay guide pipes at the stays and NDT, limited invasive inspection and vacuum grouting of the anchorages of the external P.T. tendons in the bridge

Repair & Strengthening

SPECIAL PRODUCTS

HALF PIPE

DYWIDAG's half pipe is the perfect solution for cracked or cracking HDPE external grouted ducts.

Developed to be installed in difficult access contitions, the Half Pipe snaps into place over an existing HDPE duct and has been engineered so that the annular spaces can be pressure grouted; restoring the tendon to it's original corrosion protection specifications.

The DYWIDAG Half Pipe also allows for the complete removal of the existing HDPE pipe to assess the condition of the grout and strands, if required, prior to its installation.

Cracked HDPE Duct

Simulated Repair of Cracked HDPE (White Pipe) duct using Half Pipe (Outer black Pipe). Annulus between pipes has been grouted.

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