



# GEOSTRUCTURALS



# TIE RODS

## KEY FEATURES

Tie Rods produced from THREADBAR® are used for marine bulkheads, docking facilities, barge and ship docks as well as offshore platforms. They are a cost effective alternative to large diameter A36 Tie Rods with upset threads.

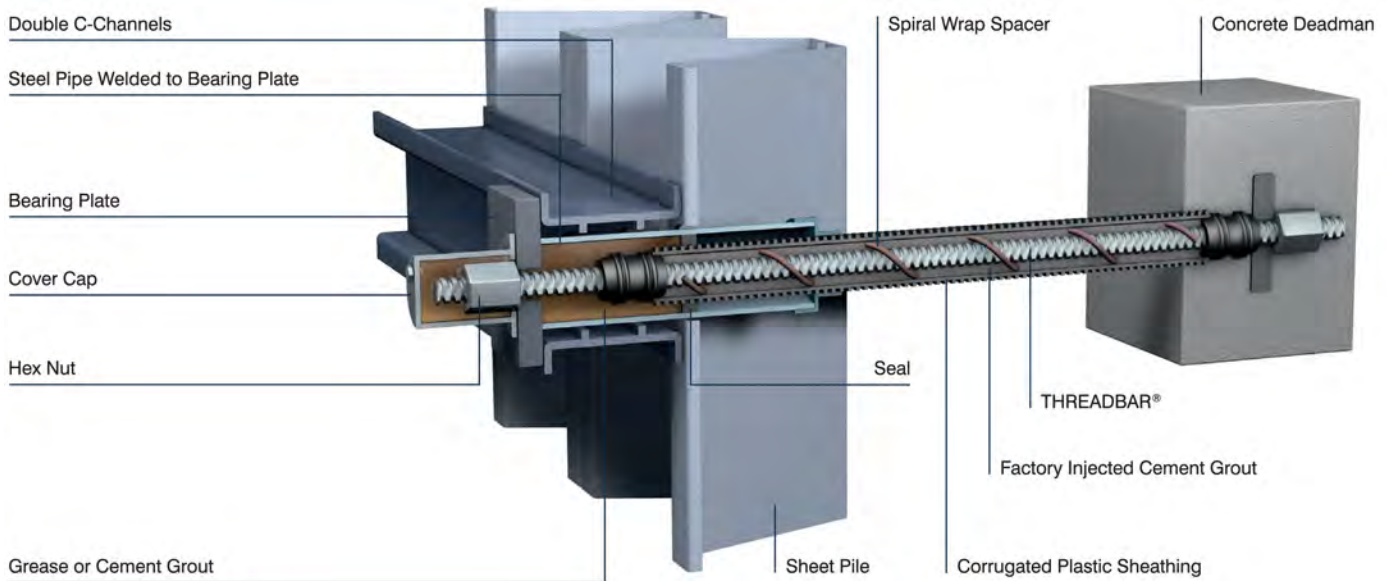
Continuous, coarse thread allows for rough site handling and for easy on site length adjustments since cutting or coupling of the rod is possible along its entire length.

## CORROSION PROTECTION OPTIONS

- Double Corrosion Protection (DCP)
- Hot dip galvanizing
- Epoxy coating
- Tape coating

## TIE ROD WITH DOUBLE CORROSION PROTECTION (DCP)

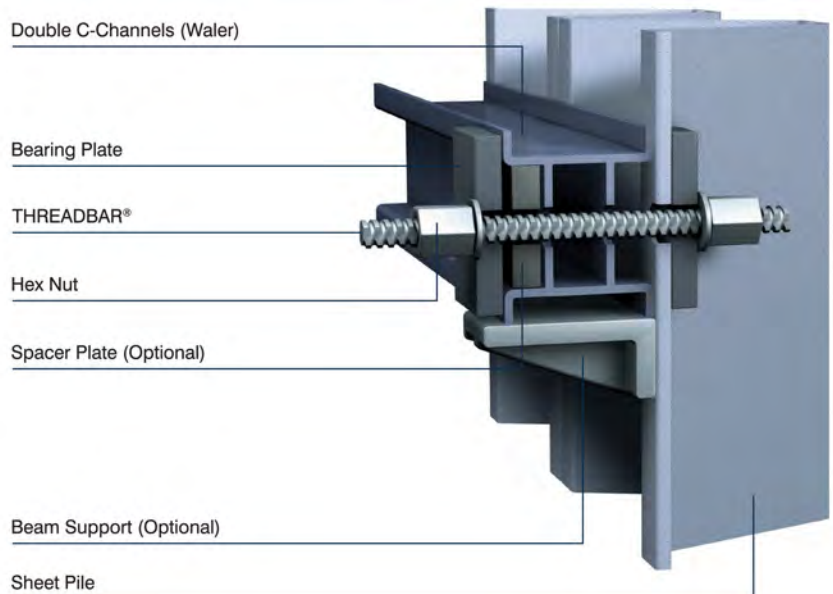
Recommended for permanent applications in aggressive environments



## WALER CONNECTION

Short bolts are needed to connect a standard sheet pile wall or a modular sheet pile wall to a load distributing double channel beam. This can be done with Grade 75 or Grade 80 THREADBAR®.

The required length of the bar depends on the depth of the sheet pile profile, the width of the beam, the plate thickness and the nut length.



# THREADBAR® REINFORCING SYSTEMS

## TIE ROD CONNECTIONS

Anchorage in different variations for steel and concrete structures

- Clevis connection
- Eye anchor connection
- Welded connection
- Embedded connection
- Plate-nut connection

## FEATURES

- Articulated
- Angle compensating
- Self-aligning under load
- Tensionable

## COUPLERS AND CONNECTIONS

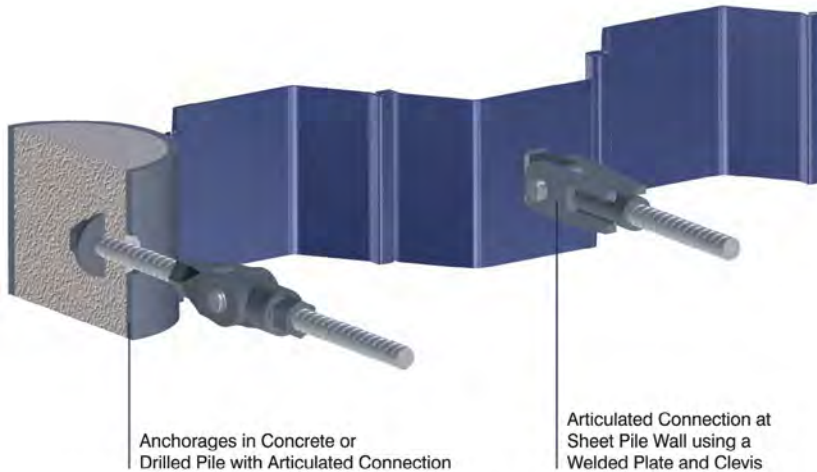
### COUPLER



### TURNBUCKLE



### DOUBLE EYE ANCHOR CONNECTION



## GRADE 75, 80 & 100 THREADBAR® – REINFORCING STEEL PER ASTM A615

| THREADBAR®<br>Designation | Maximum<br>THREADBAR®<br>Diameter |      |    | Minimum<br>Yield Stress<br>( $f_y$ ) |     | Nominal<br>Cross Section Area<br>( $A_s$ ) |                 | Minimum<br>Yield Load<br>( $f_y \times A_s$ ) |       | Nominal Weight |       |
|---------------------------|-----------------------------------|------|----|--------------------------------------|-----|--|-----------------|---|-------|----------------|-------|
|                           | mm                                | in   | mm | ksi                                  | MPa | in <sup>2</sup>                            | mm <sup>2</sup> | kips  | kN    | lbs/ft         | kg/m  |
| <b>GRADE 75 and 80</b>    |                                   |      |    |                                      |     |  |                 |   |       |                |       |
| #6                        | 19                                | 0.86 | 22 | 75                                   | 517 | 0.44                                       | 284             | 33.0  | 147   | 1.50           | 2.23  |
| #7                        | 22                                | 0.99 | 25 | 75                                   | 517 | 0.60                                       | 387             | 45.0  | 200   | 2.04           | 3.04  |
| #8                        | 25                                | 1.12 | 28 | 75                                   | 517 | 0.79                                       | 510             | 59.3  | 264   | 2.67           | 3.97  |
| #9                        | 29                                | 1.26 | 32 | 75                                   | 517 | 1.00                                       | 645             | 75.0  | 334   | 3.40           | 5.06  |
| #10                       | 32                                | 1.43 | 36 | 75                                   | 517 | 1.27                                       | 819             | 95.3  | 424   | 4.30           | 6.40  |
| #11                       | 36                                | 1.61 | 41 | 75                                   | 517 | 1.56                                       | 1,006           | 117.0   | 520   | 5.31           | 7.90  |
| #14                       | 43                                | 1.86 | 47 | 80                                   | 552 | 2.25                                       | 1,452           | 180.0   | 801   | 7.65           | 11.38 |
| #18                       | 57                                | 2.50 | 64 | 80                                   | 552 | 4.00                                       | 2,581           | 320.0   | 1,423 | 13.60          | 20.24 |
| #20                       | 63                                | 2.72 | 69 | 80                                   | 552 | 4.91                                       | 3,168           | 393.0   | 1,748 | 16.70          | 24.85 |
| #24 <sup>1)</sup>         | 75                                | 3.18 | 81 | 75                                   | 517 | 7.06                                       | 4,555           | 529.5   | 2,355 | 24.09          | 35.85 |
| #28 <sup>1)</sup>         | 90                                | 3.68 | 94 | 75                                   | 517 | 9.62                                       | 6,206           | 721.5   | 3,209 | 32.79          | 48.80 |
| <b>GRADE 100</b>          |                                   |      |    |                                      |     |  |                 |   |       |                |       |
| #6                        | 19                                | 19   | 22 | 100                                  | 689 | 0.44                                       | 284             | 44.0  | 196   | 1.50           | 2.23  |
| #7                        | 22                                | 22   | 25 | 100                                  | 689 | 0.60                                       | 387             | 60.0  | 267   | 2.04           | 3.04  |
| #8                        | 25                                | 25   | 28 | 100                                  | 689 | 0.79                                       | 510             | 79.0  | 351   | 2.67           | 3.97  |
| #9                        | 29                                | 29   | 32 | 100                                  | 689 | 1.00                                       | 645             | 100.0   | 445   | 3.40           | 5.06  |
| #10                       | 32                                | 32   | 36 | 100                                  | 689 | 1.27                                       | 819             | 127.0   | 565   | 4.30           | 6.40  |
| #11                       | 36                                | 36   | 41 | 100                                  | 689 | 1.56                                       | 1,006           | 156.0   | 694   | 5.31           | 7.90  |
| #14                       | 43                                | 43   | 47 | 100                                  | 689 | 2.25                                       | 1,452           | 225.0   | 1,001 | 7.65           | 11.38 |
| #18                       | 57                                | 57   | 64 | 100                                  | 689 | 4.00                                       | 2,581           | 400.0   | 1,779 | 13.60          | 20.24 |
| #20                       | 63                                | 63   | 69 | 100                                  | 689 | 4.91                                       | 3,168           | 491.0   | 2,184 | 16.70          | 24.85 |

Note: Maximum allowable temporary tension is 90% of yield load. Mill length is 60 ft (#6 through #20) and 53 ft for #24 and #28.

<sup>1)</sup> Threadbar sizes not listed by ASTM A 615 but yield strength is in conformance with A615 standard.

# THREADBAR® REINFORCING SYSTEMS

## INTRODUCTION

THREADBAR® Reinforcing Steel is available in Grades 75, 80, 100 for sizes #6 through #20, and Grade 75 to #24 and #28. Threadbars conform to the requirements of ASTM A615, except in markings. Threadbars may be shipped to the job in mill lengths or fabricated to specifications.

THREADBAR® Reinforcing Steel has a continuous rolled-in pattern of thread-like deformations along its entire length. More durable than machined threads, the deformations allow nuts couplers to thread onto a Threadbar at any point along its length.

Threadbars may be epoxy coated in accordance with ASTM A775 or galvanized in accordance to ASTM A123. Threaded accessories for coated bars thread over the coating.

## ADVANTAGES OF HIGH-STRENGTH THREADBAR® REINFORCEMENT

- Fewer bars to handle
- Less congestion
- Lighter reinforcement assemblies
- Faster construction
- Easy to install coupler system
- Can replace rebar terminator with a bearing plate with top and bottom nuts

Having to hoist, handle and place a lower volume of reinforcing steel makes installation simpler and faster. And, less congestion results in higher quality concrete placement with reduced risk of consolidation issues. All these advantages result in a reduced volume of steel and shorter construction time leading to a lower overall cost of the reinforced concrete structure.

## FIELDS OF APPLICATION

- Concrete reinforcement
- Micropiles
- Auger cast piles
- Caissons
- Drilled shafts

## THREADBAR® PROPERTIES – REINFORCING STEEL PER ASTM A615R

| THREADBAR®<br>Designation      | Maximum<br>THREADBAR®<br>Diameter |      |    | Minimum<br>Yield Stress<br>( $f_y$ ) |     | Nominal<br>Cross Section Area<br>( $A_g$ ) |                 | Minimum<br>Yield Load<br>( $f_y \times A_g$ ) |       | Nominal Weight |       |
|--------------------------------|-----------------------------------|------|----|--------------------------------------|-----|--|-----------------|---|-------|----------------|-------|
|                                | mm                                | in   | mm | ksi                                  | MPa | in <sup>2</sup>                            | mm <sup>2</sup> | kips  | kN    | lbs/ft         | kg/m  |
| <b>GRADE 75, 80 THREADBAR®</b> |                                   |      |    |                                      |     |  |                 |   |       |                |       |
| #6                             | 19                                | 0.86 | 22 | 75                                   | 517 | 0.44                                       | 284             | 33.0  | 147   | 1.50           | 2.23  |
| #7                             | 22                                | 0.99 | 25 | 75                                   | 517 | 0.60                                       | 387             | 45.0  | 200   | 2.04           | 3.04  |
| #8                             | 25                                | 1.12 | 28 | 75                                   | 517 | 0.79                                       | 510             | 59.3  | 264   | 2.67           | 3.97  |
| #9                             | 29                                | 1.26 | 32 | 75                                   | 517 | 1.00                                       | 645             | 75.0  | 334   | 3.40           | 5.06  |
| #10                            | 32                                | 1.43 | 36 | 75                                   | 517 | 1.27                                       | 819             | 95.3  | 424   | 4.30           | 6.40  |
| #11                            | 36                                | 1.61 | 41 | 75                                   | 517 | 1.56                                       | 1,006           | 117.0   | 520   | 5.31           | 7.90  |
| #14                            | 43                                | 1.86 | 47 | 80                                   | 552 | 2.25                                       | 1,452           | 180.0   | 801   | 7.65           | 11.38 |
| #18                            | 57                                | 2.50 | 64 | 80                                   | 552 | 4.00                                       | 2,581           | 320.0   | 1,423 | 13.60          | 20.24 |
| #20                            | 63                                | 2.72 | 69 | 80                                   | 552 | 4.91                                       | 3,168           | 393.0   | 1,748 | 16.70          | 24.85 |
| #24 <sup>1)</sup>              | 75                                | 3.18 | 81 | 75                                   | 517 | 7.06                                       | 4,555           | 529.5   | 2,355 | 24.09          | 35.85 |
| #28 <sup>1)</sup>              | 90                                | 3.68 | 94 | 75                                   | 517 | 9.62                                       | 6,206           | 721.5   | 3,209 | 32.79          | 48.80 |
| <b>GRADE 100 THREADBAR®</b>    |                                   |      |    |                                      |     |  |                 |   |       |                |       |
| #6                             | 19                                | 0.86 | 22 | 100                                  | 689 | 0.44                                       | 284             | 44.0  | 196   | 1.50           | 2.23  |
| #7                             | 22                                | 0.99 | 25 | 100                                  | 689 | 0.60                                       | 387             | 60.0  | 267   | 2.04           | 3.04  |
| #8                             | 25                                | 1.12 | 28 | 100                                  | 689 | 0.79                                       | 510             | 79.0  | 351   | 2.67           | 3.97  |
| #9                             | 29                                | 1.26 | 32 | 100                                  | 689 | 1.00                                       | 645             | 100.0   | 445   | 3.40           | 5.06  |
| #10                            | 32                                | 1.43 | 36 | 100                                  | 689 | 1.27                                       | 819             | 127.0   | 565   | 4.30           | 6.40  |
| #11 <sup>2)</sup>              | 36                                | 1.61 | 41 | 100                                  | 689 | 1.56                                       | 1,006           | 156.0   | 694   | 5.31           | 7.90  |
| #14 <sup>2)</sup>              | 43                                | 1.86 | 47 | 100                                  | 689 | 2.25                                       | 1,452           | 225.0   | 1,001 | 7.65           | 11.38 |
| #18 <sup>2)</sup>              | 57                                | 2.50 | 64 | 100                                  | 689 | 4.00                                       | 2,581           | 400.0   | 1,779 | 13.60          | 20.24 |
| #20 <sup>2)</sup>              | 63                                | 2.72 | 69 | 100                                  | 689 | 4.91                                       | 3,168           | 491.0   | 2,184 | 16.70          | 24.85 |

Note: Mill length is 60 ft (#6 through #20) and 53 ft for #24 and #28.

<sup>1)</sup> Threadbar sizes not listed by ASTM A 615 but yield strength is in conformance with A615 standard.

<sup>2)</sup> #11, #14, #18 and #20 Threadbars and their Couplers have ICC-ES Evaluation Report Approval ESR-3367.

# THREADBAR® REINFORCING SYSTEMS

## COUPLER SYSTEM

Couplers and hex nuts develop the full ultimate load of the Threadbar. Slippage of the coupler under stress is controlled by torquing opposing Threadbars together or by using nuts. The magnitude of the torque required varies with the allowable slip and Threadbar size.

The THREADBAR® reinforcing system offers a simple, reliable and economical splice. A splice requires less crane time and less labor time for assembly than required for other splices.

Unlike some splices, the splice may be installed in adverse weather conditions and does not create a fire hazard. Opposing Threadbars need only to be chalk marked before assembly to assure proper engagement, supervision and quality control requirements are minimized.

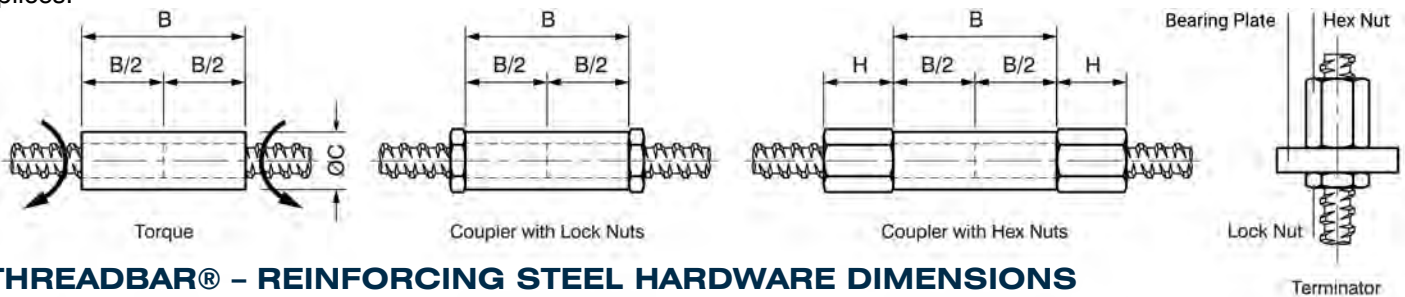
### COUPLER WITH HEXNUTS

When opposing threadbars are not torqued together, hex nuts will be used on each end of the coupler and tightened against the coupler.

The splice will develop the full ultimate load of the bar in tension and compression.

### COUPLER WITH LOCKNUTS

Locknuts can also be used each side end of the coupler similar to hex nuts. The splice will develop the full load ultimate load of the bar in tension and about half the ultimate load in compression.

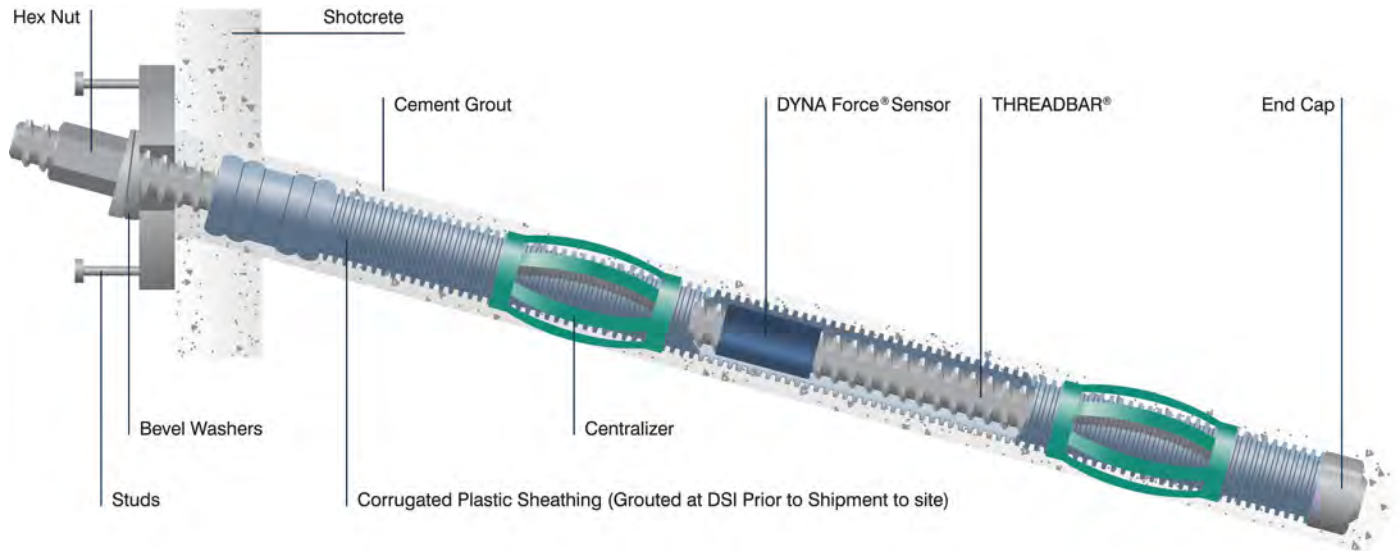


## THREADBAR® - REINFORCING STEEL HARDWARE DIMENSIONS

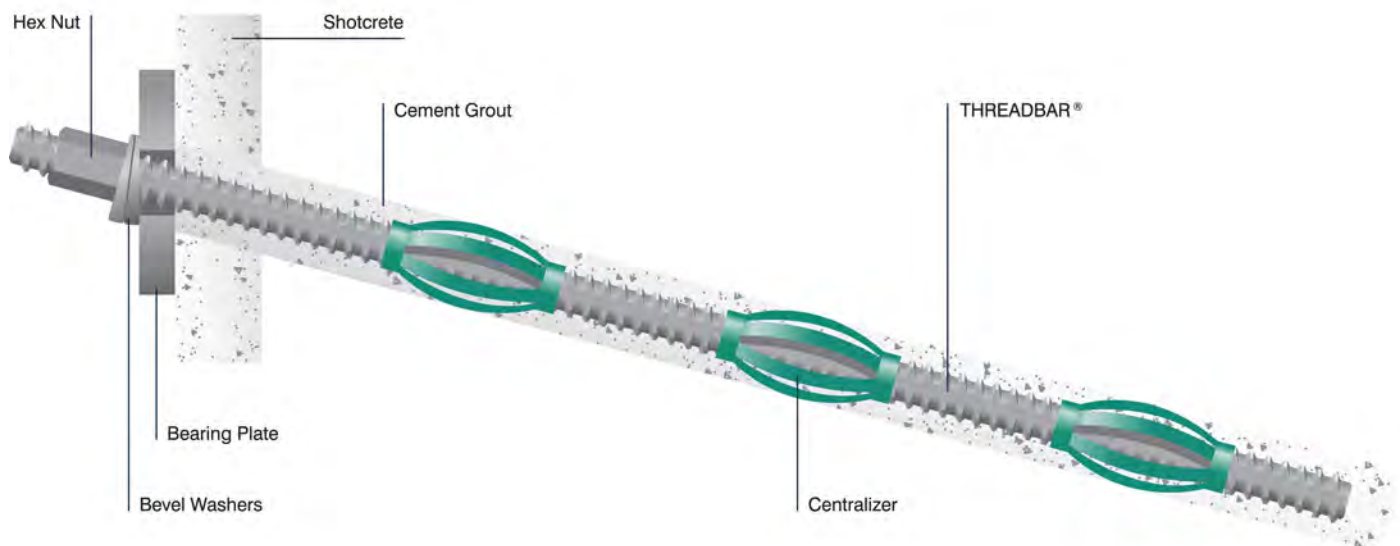
| THREADBAR®<br>Designation      | Hexnut Length<br>H |     | Coupler Length<br>B |     | Coupler Outer Diameter<br>ØC |     |
|--------------------------------|--------------------|-----|---------------------|-----|------------------------------|-----|
|                                | in                 | mm  | in                  | mm  | in                           | mm  |
| <b>GRADE 75, 80 THREADBAR®</b> |                    |     |                     |     |                              |     |
| #6                             | 1.43               | 36  | 3.12                | 79  | 1.22                         | 31  |
| #7                             | 1.71               | 43  | 3.73                | 95  | 1.41                         | 36  |
| #8                             | 1.84               | 47  | 4.03                | 102 | 1.59                         | 40  |
| #9                             | 2.30               | 58  | 5.02                | 128 | 1.79                         | 45  |
| #10                            | 2.56               | 65  | 5.70                | 145 | 2.02                         | 51  |
| #11                            | 2.89               | 73  | 6.37                | 162 | 2.25                         | 57  |
| #14                            | 3.55               | 90  | 7.82                | 199 | 2.65                         | 67  |
| #18                            | 4.23               | 107 | 9.35                | 237 | 3.50                         | 89  |
| #20                            | 4.85               | 123 | 10.38               | 264 | 3.86                         | 98  |
| "#24                           | 4.10               | 104 | 9.20                | 234 | 4.75                         | 121 |
| #28                            | 4.80               | 122 | 10.61               | 269 | 5.38                         | 137 |
| <b>GRADE 100 THREADBAR®</b>    |                    |     |                     |     |                              |     |
| #6                             | 2.88               | 73  | 6.25                | 159 | 1.25                         | 32  |
| #7                             | 3.13               | 80  | 7.00                | 178 | 1.50                         | 38  |
| #8                             | 3.38               | 86  | 7.13                | 181 | 1.75                         | 44  |
| #9                             | 3.50               | 89  | 7.25                | 184 | 1.88                         | 48  |
| #10                            | 3.75               | 95  | 7.50                | 191 | 2.13                         | 54  |
| #11                            | 3.88               | 99  | 8.00                | 203 | 2.38                         | 60  |
| #14                            | 4.50               | 114 | 8.25                | 210 | 2.75                         | 70  |
| #18                            | 5.25               | 133 | 10.50               | 267 | 3.63                         | 92  |
| #20                            | 6.00               | 152 | 12.25               | 311 | 4.00                         | 102 |



## THREADBAR® SOIL NAIL WITH DCP FOR THE MOST AGGRESSIVE SOIL CONDITIONS



## THREADBAR® SOIL NAIL - BARE, EPOXY COATED OR GALVANIZED



# SOIL NAILS

## KEY FEATURES

- Top-down construction
- Lower construction costs versus tieback walls with soldier beams and lagging
- Can be used for temporary and permanent applications
- Simple components and assembly
- Easy to install and test
- Durable full length threads allow for cutting and coupling the bar at any point along its length

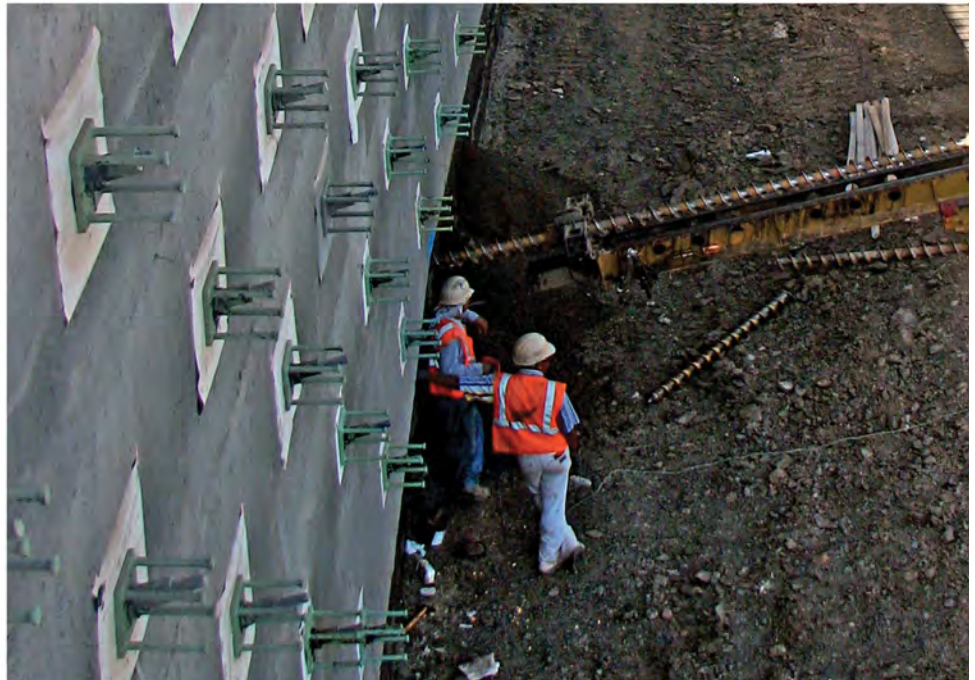
## GRADE 75, 80 & 100 THREADBAR® – REINFORCING STEEL PER ASTM A615

| THREADBAR® Designation        | Maximum THREADBAR® Diameter |      |    | Minimum Yield Stress ( $f_y$ ) |     | Nominal Cross Section Area ( $A_s$ ) |                 | Minimum Yield Load ( $f_y \times A_s$ ) |       | Nominal Weight |       |
|-------------------------------|-----------------------------|------|----|--------------------------------|-----|--------------------------------------|-----------------|---|-------|----------------|-------|
|                               | mm                          | in   | mm | ksi                            | MPa | in <sup>2</sup>                      | mm <sup>2</sup> | kips                                    | kN    | lbs/ft         | kg/m  |
| Grade 75 and 80 <sup>1)</sup> |                             |      |    |                                |     |                                      |                 |   |       |                |       |
| #6                            | 19                          | 0.86 | 22 | 75                             | 517 | 0.44                                 | 284             | 33.0                                    | 147   | 1.50           | 2.23  |
| #7                            | 22                          | 0.99 | 25 | 75                             | 517 | 0.60                                 | 387             | 45.0                                    | 200   | 2.04           | 3.04  |
| #8                            | 25                          | 1.12 | 28 | 75                             | 517 | 0.79                                 | 510             | 59.3                                    | 264   | 2.67           | 3.97  |
| #9                            | 29                          | 1.26 | 32 | 75                             | 517 | 1.00                                 | 645             | 75.0                                    | 334   | 3.40           | 5.06  |
| #10                           | 32                          | 1.43 | 36 | 75                             | 517 | 1.27                                 | 819             | 95.3                                    | 424   | 4.30           | 6.40  |
| #11                           | 36                          | 1.61 | 41 | 75                             | 517 | 1.56                                 | 1,006           | 117.0                                   | 520   | 5.31           | 7.90  |
| #14                           | 43                          | 1.86 | 47 | 80                             | 552 | 2.25                                 | 1,452           | 180.0                                   | 801   | 7.65           | 11.38 |
| Grade 100                     |                             |      |    |                                |     |                                      |                 |   |       |                |       |
| #6                            | 19                          | 0.86 | 22 | 100                            | 689 | 0.44                                 | 284             | 44.0                                    | 196   | 1.50           | 2.23  |
| #7                            | 22                          | 0.99 | 25 | 100                            | 689 | 0.60                                 | 387             | 60.0                                    | 267   | 2.04           | 3.04  |
| #8                            | 25                          | 1.12 | 28 | 100                            | 689 | 0.79                                 | 510             | 79.0                                    | 351   | 2.67           | 3.97  |
| #9                            | 29                          | 1.26 | 32 | 100                            | 689 | 1.00                                 | 645             | 100.0                                   | 445   | 3.40           | 5.06  |
| #10                           | 32                          | 1.43 | 36 | 100                            | 689 | 1.27                                 | 819             | 127.0                                   | 565   | 4.30           | 6.40  |
| #11                           | 36                          | 1.61 | 41 | 100                            | 689 | 1.56                                 | 1,006           | 156.0                                   | 694   | 5.31           | 7.90  |
| #14                           | 43                          | 1.86 | 47 | 100                            | 689 | 2.25                                 | 1,452           | 225.0                                   | 1,001 | 7.65           | 11.38 |

<sup>1)</sup> Note: Maximum allowable temporary tension is 90% of minimum yield load.  
Mill length is 60 ft.



THREADBAR® with Centralizer



# THREADBAR® ANCHORS

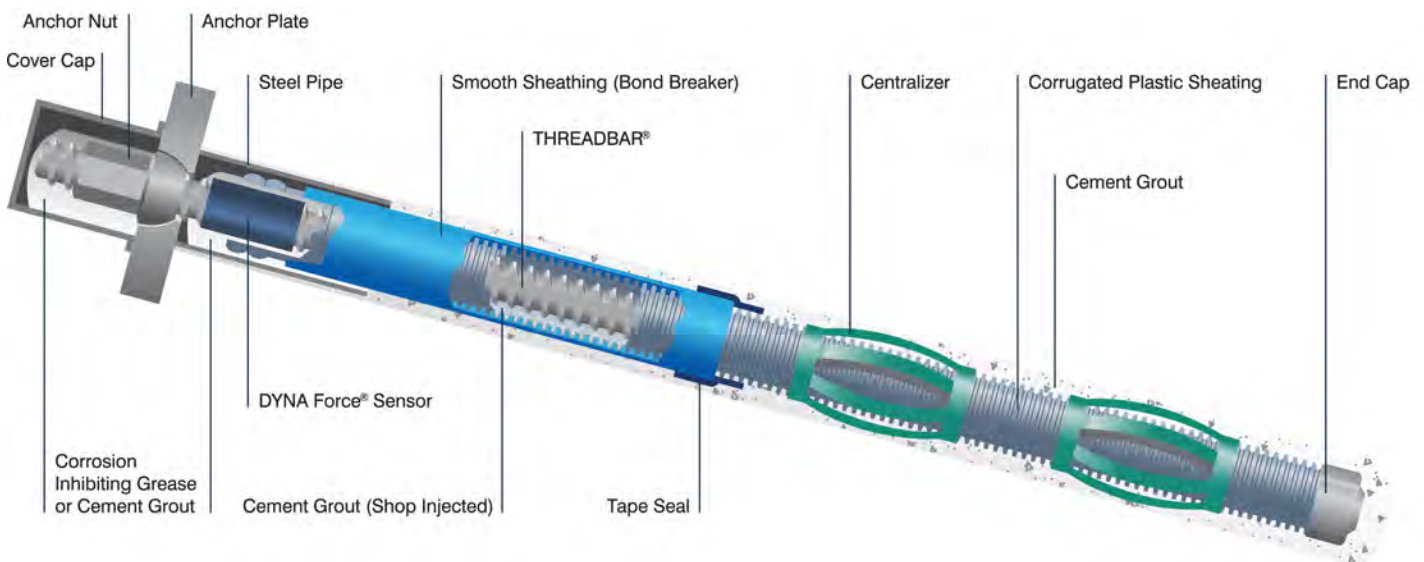
## KEY FEATURES

- Threadbars with proven coarse thread along the entire length. Bar
- length can be adjusted on site without any problems
- Variable anchor head and angle compensation designs
- Easy handling, tensioning, retensioning or detensioning
- Can be utilized for fully or partially removable anchors
- Can be supplied with Double Corrosion
- Protection (DCP) for permanent applications

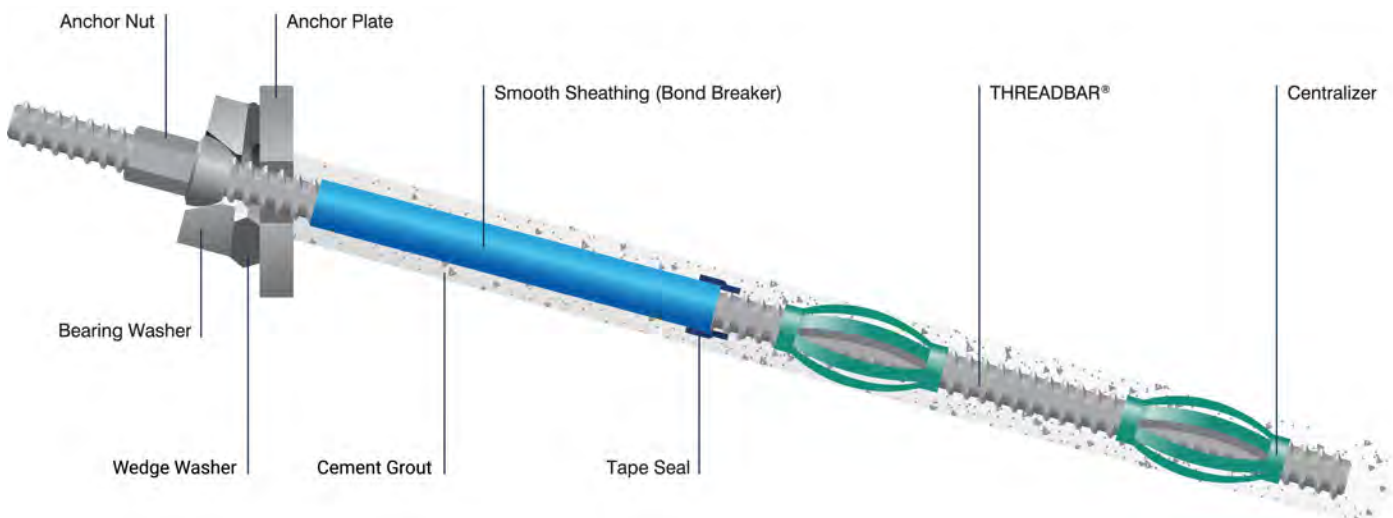
## FIELDS OF APPLICATION

- Excavations
- Tiebacks
- Rock and slope stabilization
- Tiedown anchors

## THREADBAR® ANCHOR – PERMANENT (DCP)



## THREADBAR® ANCHOR – TEMPORARY





# THREADBAR® ANCHORS

## GRADE 150 THREADBAR® – PRESTRESSING STEEL PER ASTM A722

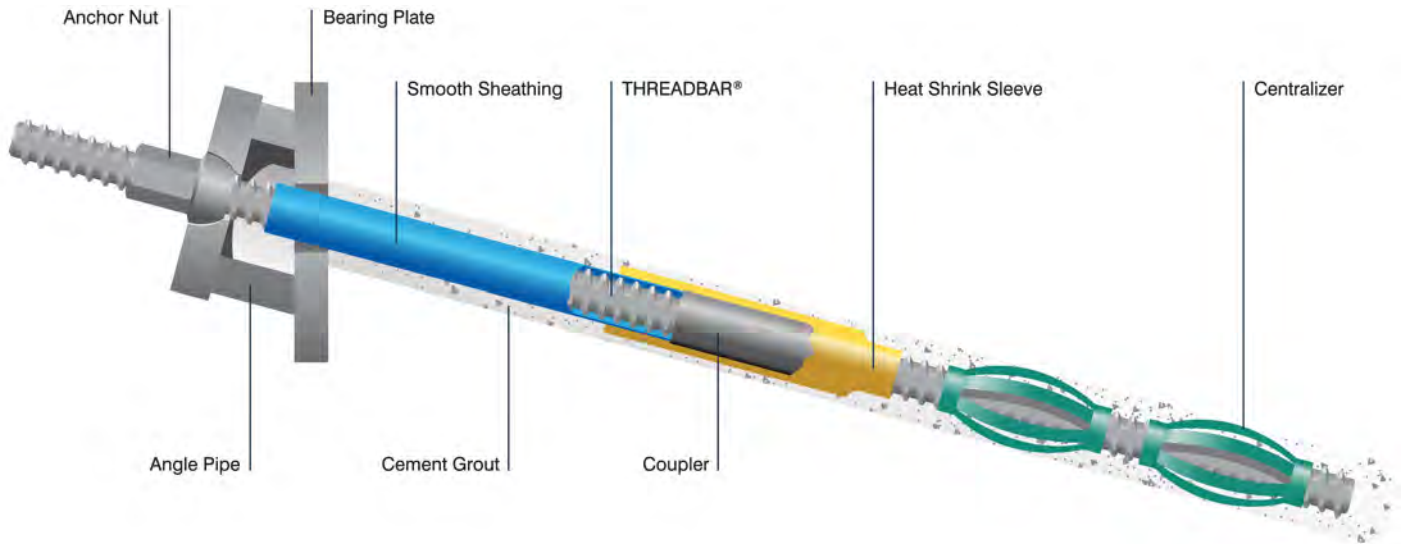
| THREADBAR® Designation |    | Maximum THREADBAR® Diameter |    | Minimum Ultimate Tensile Strength (f <sub>u</sub> ) |       | Nominal Cross Section Area (A <sub>s</sub> ) |                 | Minimum Ultimate Tensile Load (f <sub>u</sub> x A <sub>s</sub> ) |       | Nominal Weight |       |
|------------------------|----|-----------------------------|----|---|-------|--|-----------------|--|-------|----------------|-------|
| in                     | mm | in                          | mm | ksi   | MPa   | in <sup>2</sup>                              | mm <sup>2</sup> | kips   | kN    | lbs/ft         | kg/m  |
| 1                      | 26 | 1.20                        | 30 | 150   | 1,034 | 0.85   | 548             | 127.5  | 567   | 3.01           | 4.48  |
| 1 ¼                    | 32 | 1.445                       | 37 | 150   | 1,034 | 1.25   | 806             | 187.5  | 834   | 4.39           | 6.53  |
| 1 ½                    | 36 | 1.630                       | 41 | 150   | 1,034 | 1.58   | 1,019           | 237.0  | 1,054 | 5.56           | 8.27  |
| 1 ¾                    | 46 | 2.08                        | 53 | 150   | 1,034 | 2.58   | 1,665           | 387.0  | 1,721 | 9.37           | 13.94 |
| 2 ¼ <sup>1)</sup>      | 57 | 2.482                       | 63 | 150   | 1,034 | 4.08   | 2,632           | 612.0  | 2,722 | 14.55          | 21.65 |
| 2 ½                    | 65 | 2.790                       | 71 | 150   | 1,034 | 5.16   | 3,329           | 774.0  | 3,443 | 18.20          | 27.08 |
| 3                      | 75 | 3.146                       | 80 | 150   | 1,034 | 6.85   | 4,419           | 1,028  | 4,571 | 24.09          | 35.85 |

Note: Maximum allowable temporary test tension is 80% of minimum ultimate tensile load. Mill lengths are 60 ft for 1", 1 ¼", 1 ½" and 1 ¾" and 45 ft for 2 ¼", 2 ½" and 3" bars.

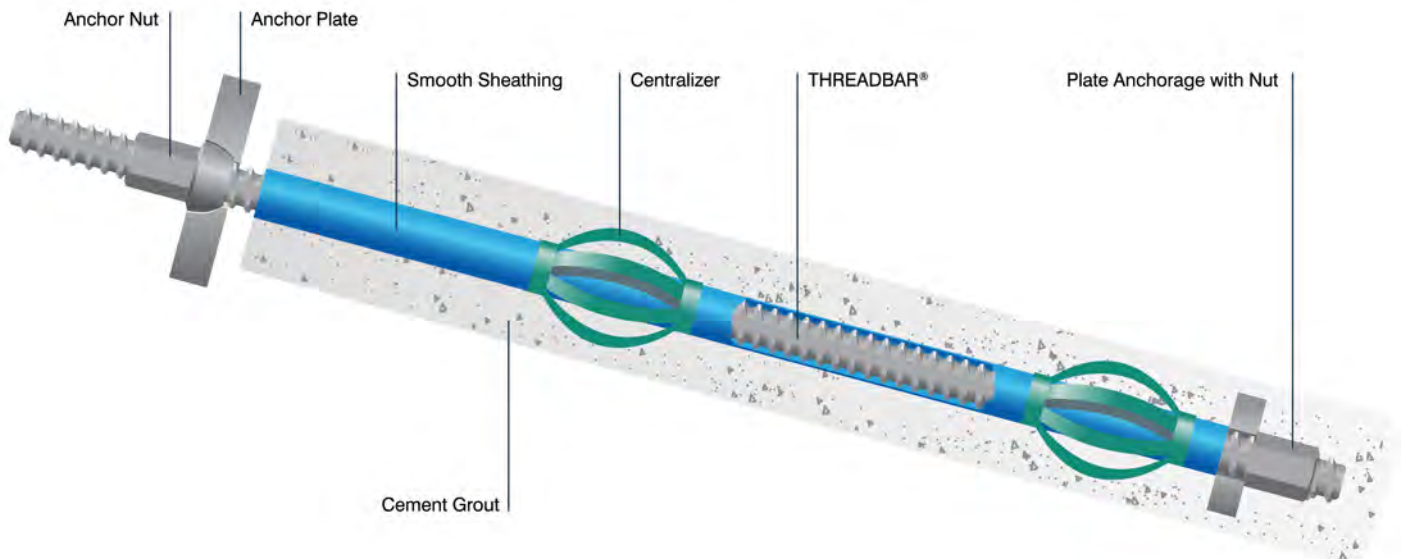
<sup>1)</sup> Threadbar size not listed in the ASTM A 722 but its strength is in conformance with this standard.

**WARNING: DO NOT WELD** on or near A722 prestressing bars or their anchorages.

### THREADBAR® ANCHOR – PARTIALLY REMOVABLE



### THREADBAR® ANCHOR – FULLY REMOVABLE



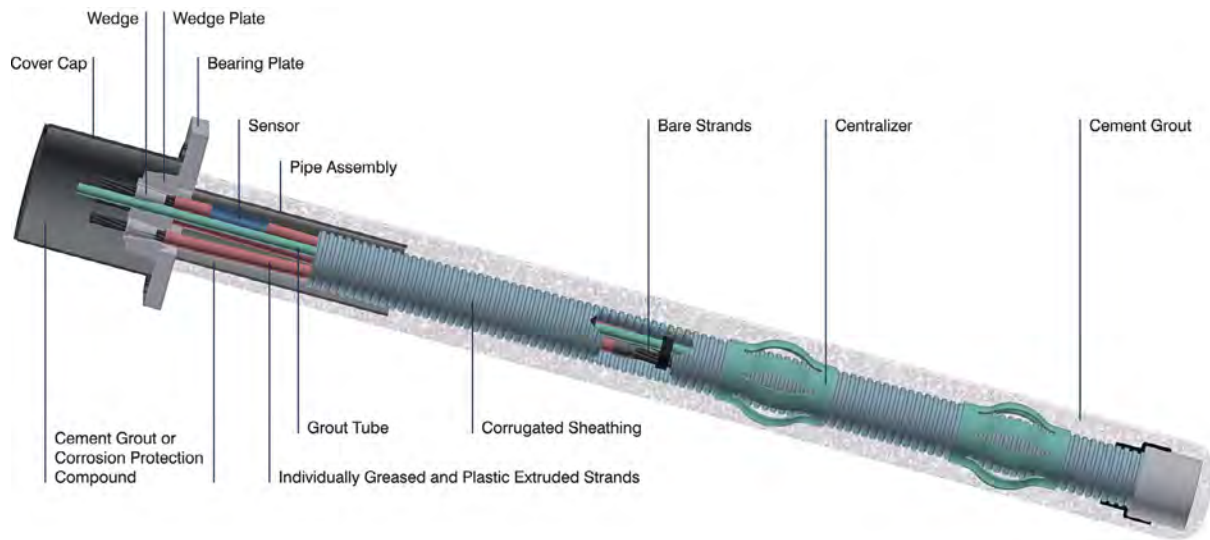
# STRAND ANCHORS

## PERMANENT (DCP) ANCHOR – KEY FEATURES

- Long-lasting system for permanent use
- Variable anchor head and angle compensation designs
- Double Corrosion Protection (DCP) is achieved by protecting the strands with barrier against corrosion. It consists of a corrugated sheathing, a pipe welded to the bearing plate and a cover cap along with encasement in cement grout.

## FIELDS OF APPLICATION

- Retaining walls
- Rock and slope stabilization
- Tiedown anchors
- Excavations

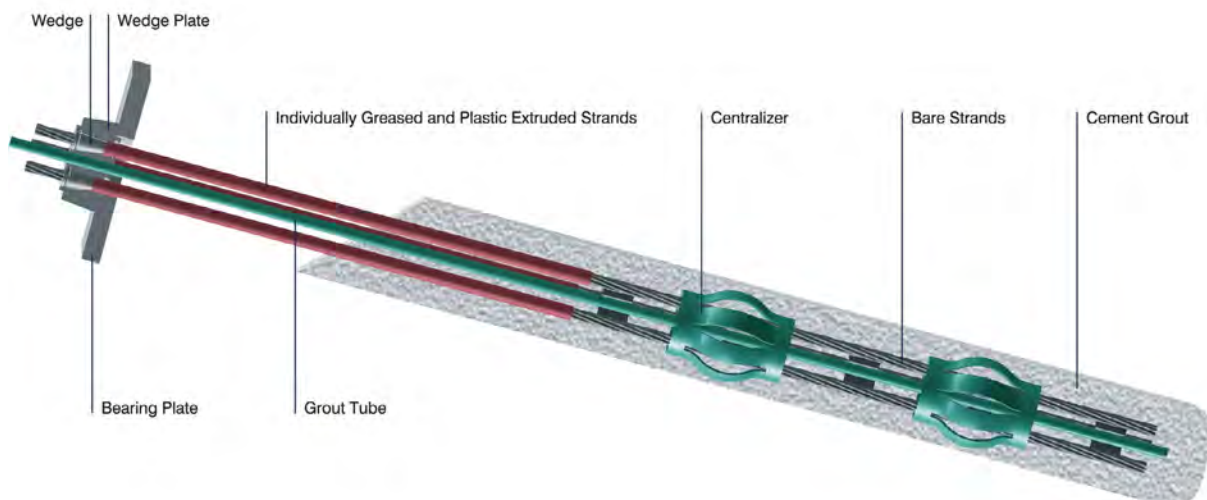


## TEMPORARY ANCHOR – KEY FEATURES

- Temporary system for a service life of up to two years
- Variable anchor head and angle compensation designs

## FIELDS OF APPLICATION

- Excavations
- Temporary structures



# STRAND ANCHORS

## STRAND ANCHORS PROPERTIES

Strand Anchors utilize 0.6" dia. 7-wire, low relaxation 270 ksi Strand conforming to ASTM A416 (bare strand) or ASTM A882 (epoxy coated strand).

| Number of Strands | Nominal Cross Section Area ( $A_{ps}$ ) |                 | Ultimate Strength ( $F_{pu} \times A_{ps}$ ) |        | Prestressing Force          |        |                             |        |                             |       | Nominal Weight (Bare Steel only) |       |
|-------------------|---|-----------------|--|--------|-----------------------------|--------|-----------------------------|--------|-----------------------------|-------|----------------------------------|-------|
|                   |   |                 |  |        | $0.80 F_{pu} \times A_{ps}$ |        | $0.70 F_{pu} \times A_{ps}$ |        | $0.60 F_{pu} \times A_{ps}$ |       |                                  |       |
| ea                | in <sup>2</sup>                         | mm <sup>2</sup> | kips   | kN     | kips                        | kN     | kips                        | kN     | kips                        | kN    | lbs/ft                           | kg/m  |
| 1                 | 0.217                                   | 140             | 58.6   | 261    | 46.9                        | 208    | 41                          | 182    | 35.2                        | 156   | 0.74                             | 1.09  |
| 2                 | 0.434                                   | 280             | 117.2  | 521    | 93.7                        | 417    | 82                          | 365    | 70.3                        | 313   | 1.48                             | 1.64  |
| 3                 | 0.651                                   | 420             | 175.8  | 782    | 140.6                       | 625    | 123                         | 547    | 105.5                       | 469   | 2.22                             | 3.27  |
| 4                 | 0.868                                   | 560             | 234.4  | 1,043  | 187.5                       | 834    | 164.1                       | 730    | 140.6                       | 626   | 2.96                             | 4.46  |
| 5                 | 1.085                                   | 700             | 293.0  | 1,303  | 234.4                       | 1,043  | 205.1                       | 912    | 175.8                       | 782   | 3.70                             | 5.51  |
| 6                 | 1.302                                   | 840             | 351.6  | 1,564  | 281.3                       | 1,251  | 246.1                       | 1,095  | 210.9                       | 938   | 4.44                             | 6.55  |
| 7                 | 1.519                                   | 980             | 410.2  | 1,825  | 328.2                       | 1,460  | 287.2                       | 1,277  | 246.2                       | 1,095 | 5.18                             | 7.74  |
| 8                 | 1.736                                   | 1,120           | 468.8  | 2,085  | 375.0                       | 1,668  | 328.1                       | 1,460  | 281.3                       | 1,251 | 5.92                             | 8.78  |
| 9                 | 1.953                                   | 1,260           | 527.4  | 2,346  | 421.9                       | 1,877  | 369.2                       | 1,642  | 316.4                       | 1,408 | 6.66                             | 9.97  |
| 12                | 2.604                                   | 1,680           | 703.2  | 3,128  | 562.6                       | 2,503  | 492.3                       | 2,190  | 422.0                       | 1,877 | 8.88                             | 13.24 |
| 15                | 3.255                                   | 2,100           | 879.0  | 3,910  | 703.2                       | 3,128  | 615.3                       | 2,737  | 527.4                       | 2,346 | 11.10                            | 16.52 |
| 19                | 4.123                                   | 2,660           | 1,113.4                                      | 4,953  | 890.7                       | 3,962  | 779.4                       | 3,467  | 668.0                       | 2,972 | 14.06                            | 20.98 |
| 27                | 5.859                                   | 3,780           | 1,582.2                                      | 7,038  | 1,265.8                     | 5,631  | 1,107.6                     | 4,927  | 949.4                       | 4,223 | 19.98                            | 29.76 |
| 37                | 8.029                                   | 5,180           | 2,168.2                                      | 9,645  | 1,734.6                     | 7,716  | 1,517.8                     | 6,751  | 1,301.0                     | 5,787 | 27.38                            | 40.78 |
| 48                | 10.416                                  | 6,720           | 2,812.8                                      | 12,512 | 2,250.2                     | 10,009 | 1,968.9                     | 8,758  | 1,687.7                     | 7,507 | 35.52                            | 52.83 |
| 54                | 11.718                                  | 7,560           | 3,164.4                                      | 14,076 | 2,531.5                     | 11,261 | 2,215.1                     | 9,853  | 1,898.6                     | 8,446 | 39.96                            | 59.38 |
| 61                | 13.237                                  | 8,540           | 3,574.6                                      | 15,901 | 2,859.7                     | 12,721 | 2,502.2                     | 11,131 | 2,144.8                     | 9,540 | 45.14                            | 67.12 |

$A_{ps}$  = Area Prestressing Steel.

$F_{pu}$  = Minimum Ultimate Strength.

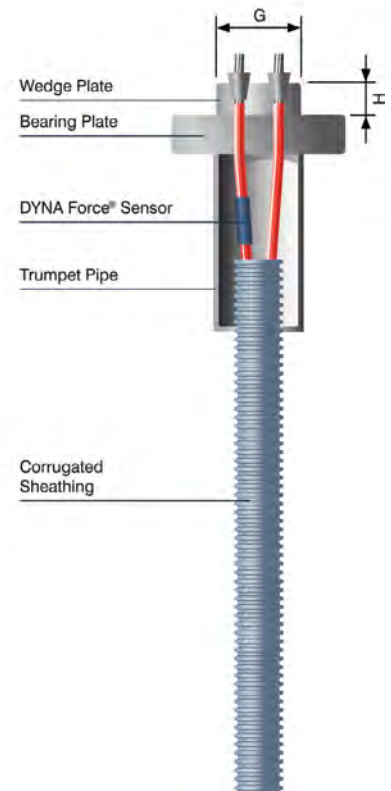
Please consult your local sales office for systems exceeding 61 strands.

## DCP STRAND ANCHOR AND WEDGE PLATE DIMENSIONS

| Strand Range Inside Sheathing <sup>1)</sup> | HDPE Corrugated |         |         | Trumpet Pipe |         | Wedge Plate Dimensions |       |      |      |
|---|-----------------|---------|---------|--------------|---------|------------------------|-------|------|------|
|   | Nom. Size in    | O.D. in | O.D. mm | O.D. in      | O.D. mm | ØG in                  | ØG mm | H in | H mm |
| 1-3   | 2               | 2.44    | 62      | 4.5          | 114     | 4.69                   | 119   | 1.8  | 46   |
| 4   | 2.5             | 2.92    | 74      | 4.5          | 114     | 4.69                   | 119   | 1.8  | 46   |
| 5-6   | 2.5             | 2.92    | 74      | 4.5          | 114     | 5.61                   | 142   | 2.2  | 56   |
| 7   | 3               | 3.60    | 91      | 4.5          | 114     | 5.61                   | 142   | 2.2  | 56   |
| 8-9   | 3               | 3.60    | 91      | 5.63         | 143     | 5.75                   | 146   | 1.69 | 43   |
| 10-12                                       | 4               | 4.60    | 117     | 5.63         | 143     | 6.75                   | 171   | 1.95 | 50   |
| 13-15                                       | 4               | 4.60    | 117     | 6.63         | 168     | 7.09                   | 180   | 1.97 | 50   |
| 16-17                                       | 4               | 4.60    | 117     | 8.63         | 219     | 7.87                   | 200   | 2.17 | 55   |
| 18-19                                       | 5               | 5.85    | 149     | 8.63         | 219     | 7.87                   | 200   | 2.17 | 55   |
| 20-24                                       | 5               | 5.85    | 149     | 8.63         | 219     | 9.45                   | 240   | 2.95 | 75   |
| 25-27                                       | 6               | 6.8     | 173     | 8.63         | 219     | 9.45                   | 240   | 2.95 | 75   |

<sup>1)</sup> Based on the use of a single 0.5" ID x 0.75" OD internal grout tube. Bearing plate sizes subject to project specific requirements.

Strand anchors larger than 27 strand systems also available.



# MICROPILES

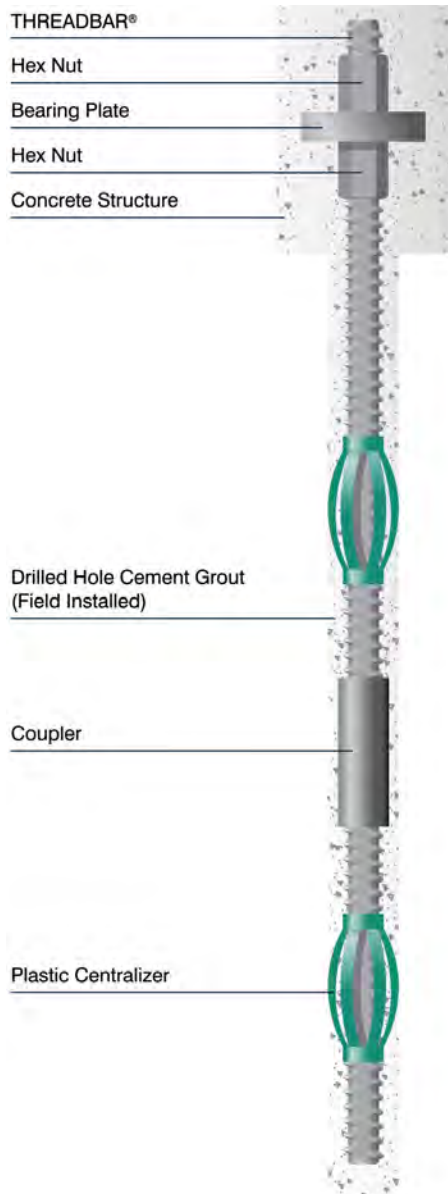
## BASIC CONCEPT

A drilled and grouted micropile, with a diameter of less than 12 inches. It is centrally reinforced with either one or a group of **THREADBARS®**. The deformations on the bar transfer the load into the surrounding grout body and friction transfers the load from the grout into the ground.

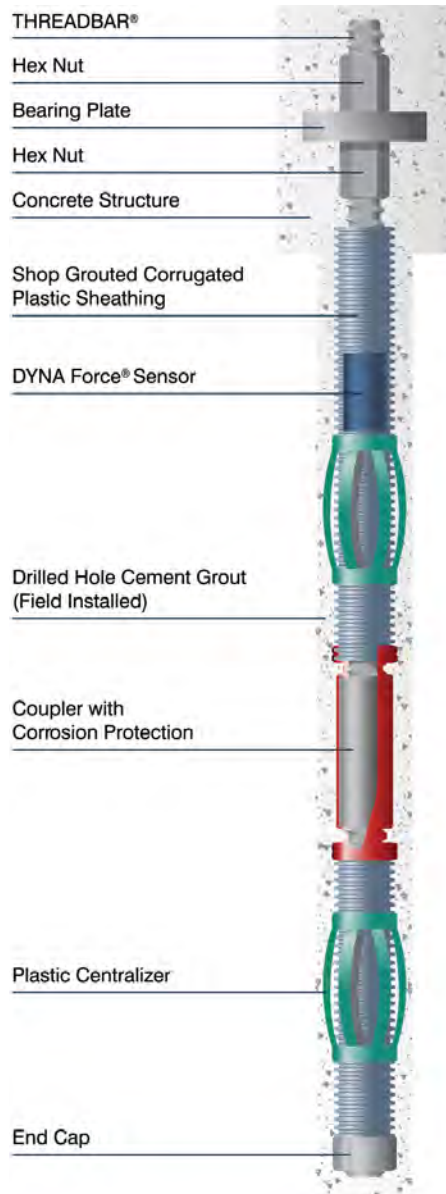
## KEY FEATURES

- Compact lightweight drilling equipment allows for pile installation even in areas with low headroom
- Small economic drill hole diameters
- Drill holes can be placed closely to existing walls or structures
- Vibration free drilling prevents damage to adjacent structures
- Double Corrosion Protected (DCP) bars may be utilized for piles in aggressive ground
- Multiple bars can be installed into a single borehole
- Short bar sections with couplers can be utilized in low headroom locations
- Continuous, coarse thread allows for rough site handling and for easy on site length adjustments since cutting or coupling of the rod is possible along its entire length

## SINGLE CORROSION PROTECTION (SCP)



## DOUBLE CORROSION PROTECTION (DCP)



# THREADBAR® PROPERTIES

## GRADE 75, 80 THREADBAR® – REINFORCING STEEL PER ASTM A615

| THREADBAR® Designation | Maximum THREADBAR® Diameter |      |    | Minimum Yield Stress (f <sub>y</sub> ) |     | Nominal Cross Section Area (A <sub>s</sub> ) |                 | Minimum Yield Load (f <sub>y</sub> x A <sub>s</sub> ) |       | Nominal Weight |       |
|------------------------|-----------------------------|------|----|--|-----|--|-----------------|---|-------|----------------|-------|
|                        | mm                          | in   | mm | ksi                                    | MPa | in <sup>2</sup>                              | mm <sup>2</sup> | kips  | kN    | lbs/ft         | kg/m  |
| #6                     | 19                          | 0.86 | 22 | 75                                     | 517 | 0.44   | 284             | 33.0  | 147   | 1.50           | 2.23  |
| #7                     | 22                          | 0.99 | 25 | 75                                     | 517 | 0.60   | 387             | 45.0  | 200   | 2.04           | 3.04  |
| #8                     | 25                          | 1.12 | 28 | 75                                     | 517 | 0.79   | 510             | 59.3  | 264   | 2.67           | 3.97  |
| #9                     | 29                          | 1.26 | 32 | 75                                     | 517 | 1.00   | 645             | 75.0  | 334   | 3.40           | 5.06  |
| #10                    | 32                          | 1.43 | 36 | 75                                     | 517 | 1.27   | 819             | 95.3  | 424   | 4.30           | 6.40  |
| #11                    | 36                          | 1.61 | 41 | 75                                     | 517 | 1.56   | 1,006           | 117.0   | 520   | 5.31           | 7.90  |
| #14                    | 43                          | 1.86 | 47 | 80                                     | 552 | 2.25   | 1,452           | 180.0   | 801   | 7.65           | 11.38 |
| #18                    | 57                          | 2.50 | 64 | 80                                     | 552 | 4.00   | 2,581           | 320.0   | 1,423 | 13.60          | 20.24 |
| #20                    | 63                          | 2.72 | 69 | 80                                     | 552 | 4.91   | 3,168           | 393.0   | 1,748 | 16.70          | 24.85 |
| #24 <sup>1)</sup>      | 75                          | 3.18 | 81 | 75                                     | 517 | 7.06   | 4,555           | 529.5   | 2,355 | 24.09          | 35.85 |
| #28 <sup>1)</sup>      | 90                          | 3.68 | 94 | 75                                     | 517 | 9.62   | 6,206           | 721.5   | 3,209 | 32.79          | 48.80 |

Note: Maximum allowable temporary tension is 90% of minimum yield load. Mill length is 60 ft (#6 through #20) and 53 ft for #24 and #28.

<sup>1)</sup> Threadbar sizes not listed by ASTM A 615 but yield strength is in conformance with A615 standard.

## GRADE 100 THREADBAR® – REINFORCING STEEL PER ASTM A615

| THREADBAR® Designation | Maximum THREADBAR® Diameter |      |    | Minimum Yield Stress (f <sub>y</sub> ) |     | Nominal Cross Section Area (A <sub>s</sub> ) |                 | Minimum Yield Load (f <sub>y</sub> x A <sub>s</sub> ) |       | Nominal Weight |       |
|------------------------|-----------------------------|------|----|--|-----|--|-----------------|---|-------|----------------|-------|
|                        | mm                          | in   | mm | ksi                                    | MPa | in <sup>2</sup>                              | mm <sup>2</sup> | kips  | kN    | lbs/ft         | kg/m  |
| #6                     | 19                          | 0.86 | 22 | 100                                    | 689 | 0.44   | 284             | 44.0  | 196   | 1.50           | 2.23  |
| #7                     | 22                          | 0.99 | 25 | 100                                    | 689 | 0.60   | 387             | 60.0  | 267   | 2.04           | 3.04  |
| #8                     | 25                          | 1.12 | 28 | 100                                    | 689 | 0.79   | 510             | 79.0  | 351   | 2.67           | 3.97  |
| #9                     | 29                          | 1.26 | 32 | 100                                    | 689 | 1.00   | 645             | 100.0   | 445   | 3.40           | 5.06  |
| #10                    | 32                          | 1.43 | 36 | 100                                    | 689 | 1.27   | 819             | 127.0   | 565   | 4.30           | 6.40  |
| #11                    | 36                          | 1.61 | 41 | 100                                    | 689 | 1.56   | 1,006           | 156.0   | 694   | 5.31           | 7.90  |
| #14                    | 43                          | 1.86 | 47 | 100                                    | 689 | 2.25   | 1,452           | 225.0   | 1,001 | 7.65           | 11.38 |
| #18                    | 57                          | 2.50 | 64 | 100                                    | 689 | 4.00   | 2,581           | 400.0   | 1,779 | 13.60          | 20.24 |
| #20                    | 63                          | 2.72 | 69 | 100                                    | 689 | 4.91   | 3,168           | 491.0   | 2,184 | 16.70          | 24.85 |

Note: Maximum allowable temporary tension is 90% of minimum yield load. Mill length is 60 ft.

## GRADE 150 THREADBAR® – PRESTRESSING STEEL PER ASTM A722

| THREADBAR® Designation | Maximum THREADBAR® Diameter |    | Minimum Ultimate Tensile Strength (f <sub>u</sub> ) |    | Nominal Cross Section Area (A <sub>s</sub> ) |       | Minimum Ultimate Tensile Load (f <sub>u</sub> x A <sub>s</sub> ) |                 | Nominal Weight |       |        |       |
|------------------------|-----------------------------|----|---|----|--|-------|--|-----------------|----------------|-------|--------|-------|
|                        | in                          | mm | in  | mm | ksi  | MPa   | in <sup>2</sup>  | mm <sup>2</sup> | kips           | kN    | lbs/ft | kg/m  |
| 1                      |                             | 26 |   | 30 | 150  | 1,034 | 0.85   | 548             | 127.5          | 567   | 3.01   | 4.48  |
| 1 ¼                    |                             | 32 |   | 37 | 150  | 1,034 | 1.25   | 806             | 187.5          | 834   | 4.39   | 6.53  |
| 1 ½                    |                             | 36 |   | 41 | 150  | 1,034 | 1.58   | 1,019           | 237.0          | 1,054 | 5.56   | 8.27  |
| 1 ¾                    |                             | 46 |   | 53 | 150  | 1,034 | 2.58   | 1,665           | 387.0          | 1,721 | 9.37   | 13.94 |
| 2 ¼ <sup>1)</sup>      |                             | 57 |   | 63 | 150  | 1,034 | 4.08   | 2,632           | 612.0          | 2,722 | 14.55  | 21.65 |
| 2 ½                    |                             | 65 |   | 71 | 150  | 1,034 | 5.16   | 3,329           | 774.0          | 3,443 | 18.20  | 27.08 |
| 3                      |                             | 75 |   | 80 | 150  | 1,034 | 6.85   | 4,419           | 1,028          | 4,571 | 24.09  | 35.85 |

Note: Maximum allowable temporary test tension is 80% of minimum ultimate tensile load. Mill lengths are 60 ft for 1", 1 ¼", 1 ½" and 1 ¾" and 45 ft for 2 ¼", 2 ½" and 3" bars.

<sup>1)</sup> Threadbar size not listed in the ASTM A 722 but its strength is in conformance with this standard.

WARNING: DO NOT WELD on or near A722 prestressing bars or their anchorages.

# DRILL HOLLOW BAR SYSTEM

## BASIC CONCEPT

The Drill Hollow Bar System consists of fully threaded steel bar sections, couplers, nuts and drill bits.

It can be drilled and grouted into loose or collapsible soil without a casing.

The bar sections feature a hollow center that allows for a simultaneous drilling and grouting operation.

The Drill Hollow Bar serves as a drill rod. It is fitted with a lost drill bit at the front that can be adapted to different ground conditions. After each single bar section of 1 to 6 m, the subsequent bar is coupled to the previously installed section.

During drilling, cement grout is injected into the hollow core of the bar using an injection adapter that is mounted on the drill rig. The cement grout exits at the bottom end through openings in the drill bit. The injected grout initially serves

as slurry to stabilize the borehole and ensures the efficient flushing of the drill spoils. Once the grout reached strength it bonds the bar to the ground.

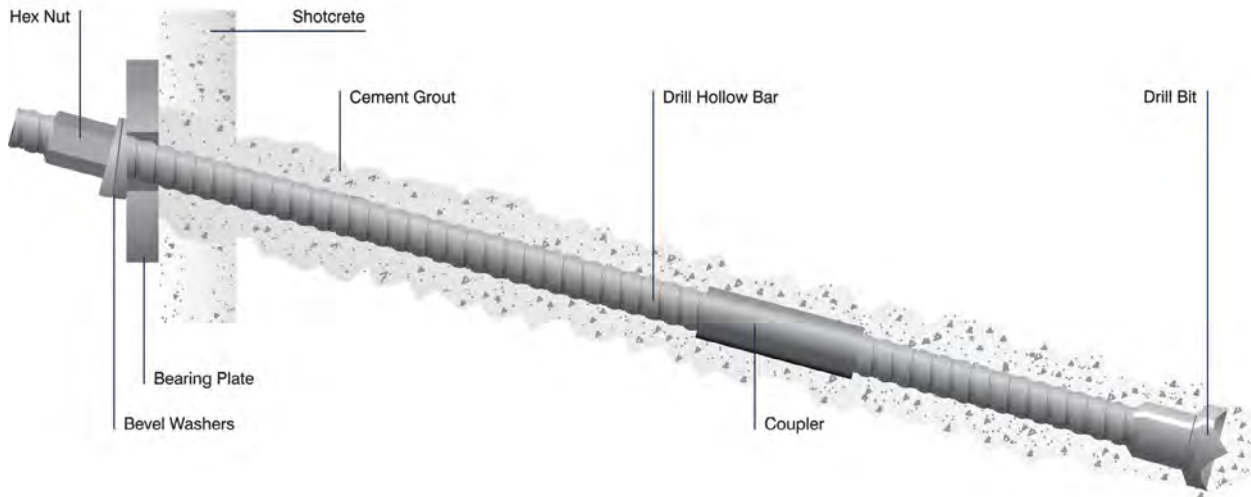
Once the required installation depth has been reached, the hollow bar serves as a steel tendon and can carry

out its function as a soil nail, rock bolt or pile upon the grout reaching its required strength.

The comprehensive Drill Hollow Bar System product range offers tendons with ultimate loads from 45 kips to 832 kips including all system components such as drill bits, couplers, spacers and anchor heads.

Additional installation tools such as injection adapters can be produced customized or adjusted to job site requirements on short notice.

## DRILL HOLLOW BAR – SOIL NAIL



## KEY FEATURES

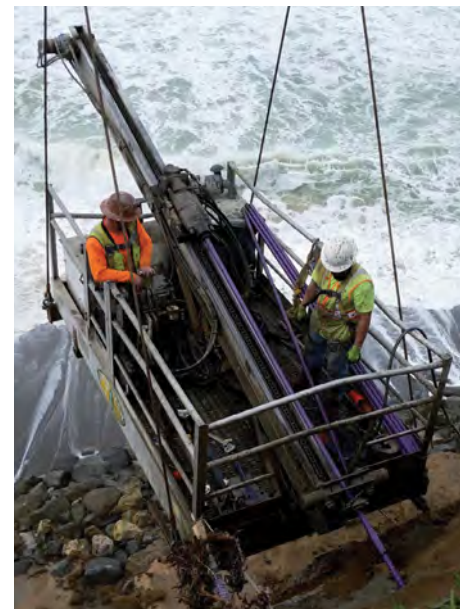
- The tendon simultaneously serves as a drill rod
- Extremely fast installation because borehole drilling is made redundant by simultaneous drilling and grouting
- System can be installed in confined spaces utilizing simple and compact drilling equipment
- Variable anchorage and angle compensation designs
- Irregular grout body enhances capacity
- Drill bits are available for various ground conditions
- Can be used as a soil nail, rock bolt or a pile

## FIELDS OF APPLICATION

- Slope, embankment and rock stabilization
- Shoring and excavations
- Fixation of rock fall mesh
- Avalanche barriers
- Foundations



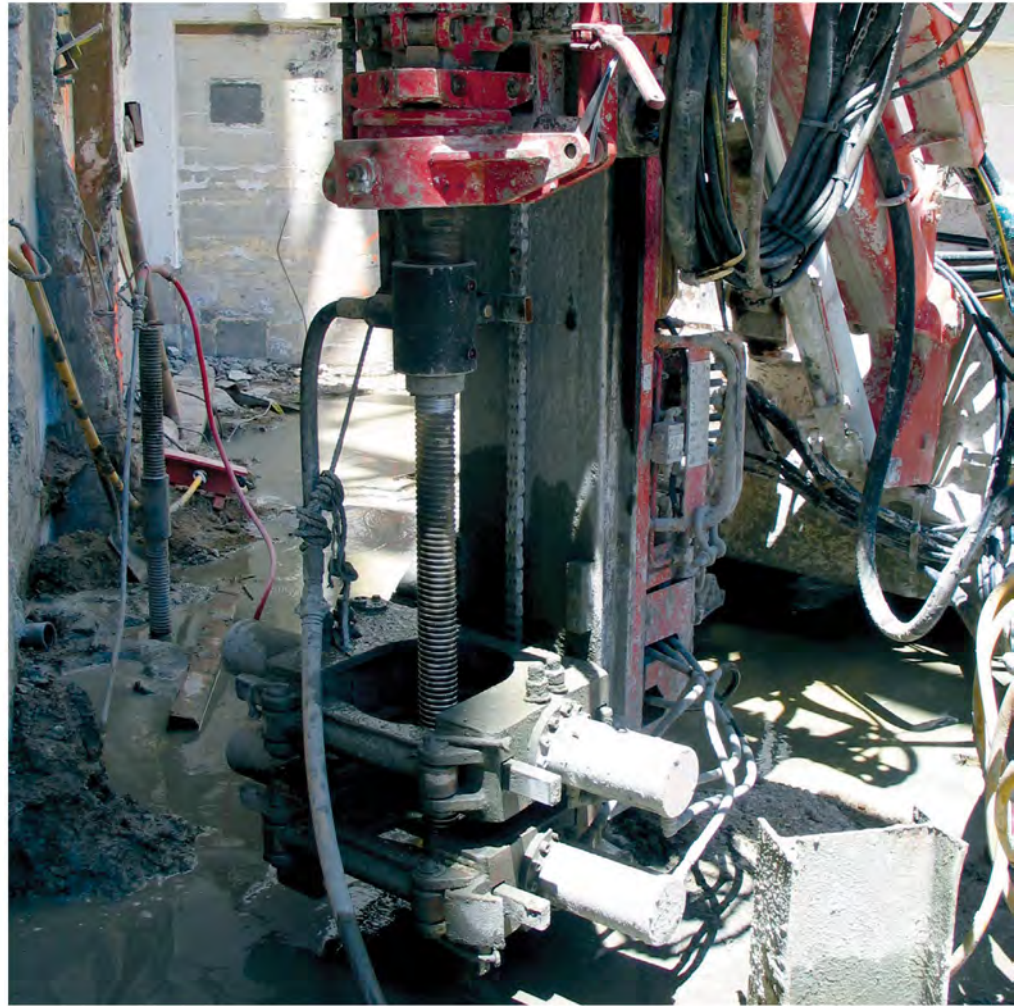
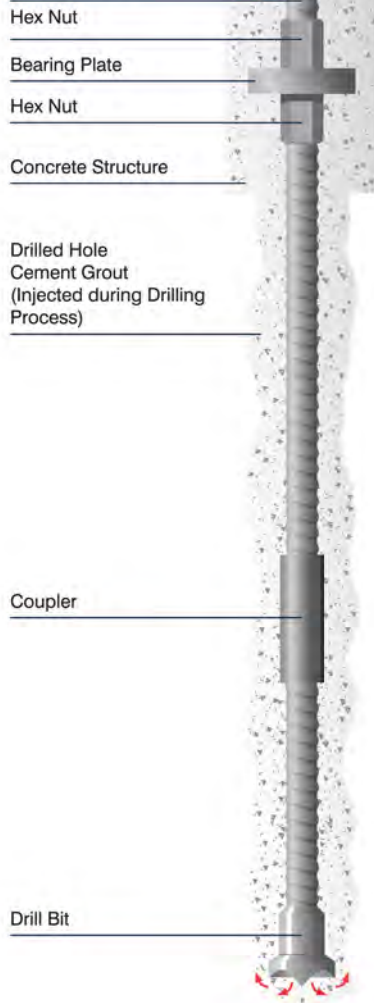
Various Style Drill Bits for DYWI® Drill



# DRILL HOLLOW BAR MICROPILE

## DRILL HOLLOW BAR – MICROPILE

Drill Hollow Bar



Simultaneous Drilling and Grouting

## DRILL HOLLOW BAR PROPERTIES

| Bar Des. | Nominal Outer Diameter |     | Average Yield Strength ( $f_y$ ) |     | Average Ultimate Tensile Strength ( $f_u$ ) |     | Average Cross Section Area ( $A_s$ ) |                 | Yield Load ( $f_y \times A_s$ ) |       | Ultimate Load ( $f_u \times A_s$ ) |       | Nominal Weight |       |
|----------|------------------------|-----|----------------------------------|-----|---|-----|--------------------------------------|-----------------|---------------------------------|-------|------------------------------------|-------|----------------|-------|
|          | in                     | mm  | ksi                              | Mpa | ksi   | MPa | in <sup>2</sup>                      | mm <sup>2</sup> | kips                            | kN    | kips                               | kN    | lbs/ft         | kg/m  |
| R25N     | 1.00                   | 25  | 90                               | 620 | 120   | 830 | 0.37                                 | 240             | 34                              | 150   | 45                                 | 200   | 1.28           | 1.90  |
| R32N     | 1.26                   | 32  | 94                               | 650 | 116   | 800 | 0.54                                 | 350             | 52                              | 230   | 63                                 | 280   | 1.81           | 2.70  |
| R32S     | 1.26                   | 32  | 94                               | 650 | 120   | 830 | 0.67                                 | 430             | 63                              | 280   | 81                                 | 360   | 2.28           | 3.40  |
| R38N     | 1.50                   | 38  | 97                               | 670 | 122   | 840 | 0.91                                 | 590             | 90                              | 400   | 112                                | 500   | 3.16           | 4.70  |
| R51L     | 2.00                   | 51  | 87                               | 600 | 107   | 740 | 1.15                                 | 740             | 101                             | 450   | 124                                | 550   | 3.97           | 5.90  |
| T40N     | 1.57                   | 40  | 99                               | 680 | 123   | 850 | 1.19                                 | 770             | 118                             | 525   | 148                                | 660   | 4.03           | 6.00  |
| R51N     | 2.00                   | 51  | 97                               | 670 | 123   | 850 | 1.46                                 | 940             | 142                             | 630   | 180                                | 800   | 4.97           | 7.40  |
| T76N     | 3.00                   | 76  | 83                               | 570 | 110   | 760 | 3.22                                 | 2,080           | 270                             | 1,200 | 360                                | 1,600 | 10.95          | 16.30 |
| T76S     | 3.00                   | 76  | 87                               | 600 | 112   | 770 | 3.81                                 | 2,460           | 337                             | 1,500 | 427                                | 1,900 | 12.97          | 19.30 |
| T103N    | 4.00                   | 103 | 81                               | 560 | 103   | 710 | 4.96                                 | 3,200           | 405                             | 1,800 | 517                                | 2,300 | 16.80          | 25.00 |
| T103S    | 4.00                   | 103 | 74                               | 510 | 103   | 710 | 8.06                                 | 5,200           | 600                             | 2,670 | 832                                | 3,700 | 26.88          | 40.00 |

Note: Maximum allowable temporary tension is the yield load. Cross section area is based on average internal diameter of the bar. The ultimate tensile and yield strength are calculated average values. Standard length = 9'-10" (3 m). Other lengths available on special order.