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RESEARCH REPORT: RR 23835  
(CSI #02260)

Expires: February 01, 2021  
Issued Date: March 01, 2019  
Code: 2017 LABC

**GENERAL APPROVAL** – Clerical Modification - Dywidag System International 4-0.6 “SA, 7-0.6” SA, 5-0.6” MA, 9-0.6” MA, and 12-0.6” MA, 9-0.6” GT and 12-0.6” GT wedge plates systems used for temporary tieback earth retaining anchors and for bonded post-tensioning system in pre-stressed concrete applications

Dywidag 19-0.6” MA Strand System for bonded post-tensioning systems in prestressed concrete applications and for temporary tieback earth anchors

Removable Quick-EX 4-0.6” and 7-0.6” strand assembly systems are used for temporary earth retaining anchors. Anchorage and strands will be removed after permanent concrete wall is in place.

Removable Quick-EX 1-3/8” and 1-3/4” DYWIDAG Threadbar® assembly systems are used for temporary earth retaining anchors. Anchorage and Threadbars® will be removed after permanent concrete wall is in place.

Dywidag Threadbars® for use as reinforcement, tie rods, prestressed concrete tendons, temporary (up to 2 years) tieback earth anchors, soil nails and micropiles. Dywidag Threadbars® Couplers, Hexagonal Nuts and Anchor Nuts developing the full load of the Threadbar®, can be used as splices or anchorage devices for the Dywidag Threadbars®.

RR 23835  
Page 1 of 5

Dywidag Systems International, USA, Incorporated.  
RE: Dywidag multi strand and Threadbar prestressing anchorage systems.

## **DETAILS**

### **4-0.6" SA, 7-0.6" SA, 5-0.6" MA, 9-0.6" MA, 12-0.6" MA, 9-0.6" GT and 12-0.6" GT Strands Anchorage System:**

The anchorages are used in conjunction with 0.6-inch diameter (7-wire) pre-stressing strands, which conform to ASTM-A416, grade 270 steel, 3-part wedges, wedge washers and bearing plates.

The anchorages consist of a circular (barrel type) wedge plate of various thickness and truncated cone-shaped wedges. The number of wedges in each anchor corresponds to the number of prestressing strands. The 4, 5 and 7 Strand wedge plates are made of ductile cast iron conforming to ASTM A-536, Grade 80-55-06. The 9 and 12 Strand Wedge Plates are forged from ASTM A-521 Steel. The 9 GT and 12 GT wedge plates are machined from hot rolled bar steel, AISI 1045.

The wedges are placed over the strand inside the wedge plate holes and are used to lock the post-tensioning strand onto the anchorage system. All wedges conform to case-hardened AISI-12L14 Steel or AISI-11L17 Steel. See attached drawings for details of the hardware.

### **19-0.6" MA Strand Anchorage System:**

The anchorage system is used in conjunction with 19-06" Multi-plane anchor, 19-0.6" wedge plate, 3-part wedges, 19-0.6" Transition trumpet, 19-0.6" Standard spiral for MA, and 0.6-inch diameter (7-wire) pre-stressing strands which conform to ASTM-A416, grade 270. The Multi-plane anchor is made from ductile cast iron conforming to ASTM A-536, Grade 65-45-12. The Wedge plate material is forged from steel conforming to ASTM A521. The 3-part wedges are made from AISI C12L14 or AISI C11L17 hardened steel. The Transition Trumpet is made of high density polyethylene (HDPE). The 19-0.6" standard spiral for MA is made from ASTM A615, grade 60.

### **Removable Quick-EX 4-0.6" and 7-0.6" Strand Assembly System :**

The two systems use approved 0.6" strands ASTM A416, 3-part wedges and wedge plate anchorages. The system assemblies are pre-manufactured and delivered to the job site. Strands are inserted inside HDPE tubes from top stressing anchorage to bottom footbox anchorage. Tubes will provide unbonded length of the anchor. Tensioned load applied at the top anchorage is transferred to the bottom of the anchor through several short-length compression bodies bonded to grout. At the completion of the permanent concrete wall, anchorage is detensioned and removed together with the strands.

### **Removable Quick-EX 1-3/8" and 1-3/4" DYWIDAG Threadbar® Assembly System :**

The two systems use approved 1-3/8" and 1-3/4" Grade 150, ASTM A722 threadbars and hexnuts. The system assemblies are pre-manufactured and delivered to the job site. One threadbar per anchor is inserted inside PVC pipe from top stressing anchorage to bottom plate anchorage. Pipe will provide unbonded length of the anchor. Tensioned load applied at the top anchorage is transferred to the bottom of the anchor through several short-length compression bodies bonded to grout. At the completion of the permanent concrete wall, anchorage is detensioned and removed together with threadbars.

Dywidag Systems International, USA, Incorporated.  
 RE: Dywidag multi strand and Threadbar prestressing anchorage systems.

**Dywidag Threadbars®:**

The Dywidag Threadbar® system has a continuous rolled-in pattern of threadlike deformations along its entire length, which conforms to ASTM A615 or A722. Dywidag 1”, 1 ¼”, 1 3/8” and 1 ¾” Threadbar® grade 150 ksi conforming to ASTM A722, are high strength alloy steel with hot-rolled threads that is proof-stressed to 80% of ultimate tensile strength and then stress-relieved. 1 3/4” Threadbar can be also high strength alloy steel with cold-rolled threads for the entire mill length.

The Dywidag 2 1/2" grade 150 ksi conforming to ASTM A722 Threadbar® is high strength alloy steel with cold- rolled threads for the entire length

The bars can be spliced by use of the full load coupler and anchored by use of full load hexagonal nuts or anchor nuts.

Dywidag Threadbars® and accessories can be epoxy coated in accordance with ASTM A775 or A934 and galvanized in accordance with ASTM A123 and A153.

**A. Prestressing Steel ASTM A722 Properties**

Nominal Diameter (inches)	Ultimate Tensile Stress (ksi)	Ultimate Tensile Load (kips)	Yield Tensile Stress (ksi)	Yield Tensile Load (kips)	Nominal Cross Section Area (in <sup>2</sup> )	Nominal Weight (Lbs/ft)
1”	150	127.5	120	102.5	0.85	3.01
1-1/4”	150	187.5	120	150.0	1.25	4.39
1-3/8”	150	237.0	120	189.6	1.58	5.56
1-3/4”	150	387.0	120	310.0	2.58	9.37
2-1/2”	150	774.0	120	619.2	5.16	18.20

**B. Reinforcing Steel ASTM A615 Properties**

Threadbar Designation (In)	Ultimate Tensile Stress (ksi)	Ultimate Tensile Load (kips)	Yield Tensile Stress (ksi)	Yield Tensile Load (kips)	Nominal Cross Section Area (in <sup>2</sup> )	Nominal Weight (lbs/ft)
#6	100	44	75	33.0	0.44	1.50
#7	100	60	75	45.0	0.60	2.04
#8	100	79	75	59.3	0.79	2.67
#9	100	100	75	75.0	1.00	3.40
#10	100	127	75	95.3	1.27	4.30
#11	100	156	75	117.0	1.56	5.31
#14	100	225	75	168.8	2.25	7.65
#18	100	400	75	300	4.00	13.60
#20	100	491	75	368.3	4.91	16.70

Dywidag Systems International, USA, Incorporated.  
RE: Dywidag multi strand and Threadbar prestressing anchorage systems.

**The approval is subject to the following conditions:**

1. For each shipment, the manufacturer shall furnish a certificate indicating that the hardware complies to the manufacturer's specifications on file with the Department. Test data to verify the physical and chemical properties of the hardware shall be submitted upon request.
2. The pieces of hardware shall be identified by the designation D.S.I. and drawing/part number stamped onto each piece.
3. Where the anchors are used with less than the full number of prestressing strands, the strands shall be symmetrically placed within the anchors when possible. The location of the strands within the wedge anchor plate shall be clearly detailed on the approved plans for each job.
4. Mill test data or test data prepared by a Los Angeles City approved testing agency to verify the material and physical properties of the anchor hardware shall be kept on file with the manufacturer for each shipment of anchors and shall be submitted to Department upon request.
5. Other tests and inspections of the anchor hardware shall be conducted in accordance with D.S.I.'s Quality Control and Assurance Program, a copy of which is on file with the Engineering Research Section.
6. Installation of the anchorage and reinforcing system shall be in accordance with the manufacturer's instructions except where specified herein.
7. Where the couplers are used or where design  $f'c$  exceeds 2,500 psi, continuous Inspection by a Deputy Building Inspector for concrete shall be provided. In addition to normal duties, the Deputy shall verify that the couplers are centered at the ends of bars spliced.
8. Design by Dywidag Threadbars<sup>®</sup> for use in concrete or prestressed concrete construction shall be in accordance with the requirements of the 2017 Los Angeles City Building Code.
9. Design and installation of the hardware for temporary tieback earth anchors shall comply with the manufacturer's instructions and the attached "REQUIREMENTS FOR TEMPORARY TIEBACK EARTH ANCHORS".
10. Bearing stresses on the bearing plates and the piles shall be checked for each installation. Calculations and plans signed by a licensed engineer or architect registered in the State of California shall be submitted to Structural Plan Check for approval of the design of the anchorage system.

Dywidag Systems International, USA, Incorporated.  
RE: Dywidag multi strand and Threadbar prestressing anchorage systems.

11. Concrete cover of the anchor shall be provided as required by the 2017 Los Angeles City Building Code for fire protection.

## **DISCUSSION**

The clerical modification is to update the description for Dywidag Threadbars® and to update the values in Table A.

The report is in compliance with the 2017 Los Angeles City Building Code.

Products included in this report were previously approved by reports 24121, 25053, and 23835.

The approval is based on static and cyclic tests and on physical and chemical analyses of the hardware. Dywidag 4-0.6" SA, 7-0.6" SA, 5-0.6" MA, 9-0.6" MA, 12-0.6" MA, 19-0.6" MA, 9-0.6" GT and 12-0.6" GT may not be used as unbonded tendons in post-tensioned concrete structures as no cyclic (fatigue) tensile load tests were submitted.

Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.

This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this approval have been met in the project in which it is to be used.

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ACI 318-14 Sections: 25.5.7.1, 18.2.7.1, 18.2.7.2

**ATTACHMENTS:** Detailed Drawings of Specifications & Requirements for Tieback Earth Anchors (28 pages)