



ERICO INTERNATIONAL CORPORATION

LENTON® TERMINATOR MECHANICAL ANCHOR AND HEADED REINFORCING BAR SYSTEM IN CONCRETE

CSI Section:
03210 Reinforced Steel

1.0 RECOGNITION

Erico International Corporation LENTON® TERMINATOR recognized in this report has been evaluated for use as a mechanical anchorage to develop steel reinforcing bars. The structural properties of the LENTON® TERMINATOR were evaluated for compliance with the following codes and regulations:

- 2012, 2009 and 2006 International Building Code® (IBC)
- * • 2012, 2009 and ~~2006~~ International Residential Code® (IRC)

1.2 Compliance with the following standards:

- Building Code Requirements for Structural Concrete (ACI® 318-11)
- Building Code Requirements for Structural Concrete (ACI® 318-08)
- Building Code Requirements for Structural Concrete (ACI® 318-05)

2.0 LIMITATIONS

Use of the LENTON® TERMINATOR recognized in this report is subject to the following limitations:

2.1 Anchorage system shall be installed in accordance with the IBC®, ERICO’s installation instructions and this report. Where conflicts occur, the more restrictive shall govern.

2.2 Anchorage system calculations and installation details shall be submitted to the building official for approval and shall be prepared by a registered design professional when required by the statutes of the jurisdiction in which the project is to be constructed.

2.3 Where required, special inspections shall be provided in accordance with Chapter 17 of the IBC®. Duties of the special inspector shall include verification of grade and size of reinforcement bar, head identification and installation of the headed bar system.

2.4 To satisfy minimum concrete cover requirements specified in Section 7.7 of ACI® 318, the head is considered part of the bar.

3.0 PRODUCT USE

3.1 General: LENTON® TERMINATOR (D6, D16, & D14) is a mechanical device for use as mechanical anchorage to develop steel reinforcing bars in tension in lightweight and normal-weight concrete as an alternative to standard hooks or to reduce development lengths of straight deformed reinforcing bars in reinforced concrete. ACI 318-08 and ACI 318-11 Section 8.6, and ACI 318-05 Section D.3.4, provide details on how to account for use of lightweight concrete.

LENTON® TERMINATOR headed bar system complies with the requirements of the 2011, 2008 and 2005 editions of ACI 318; the 2012, 2009 and 2006 IBC; and the 2012, 2009 and ~~2006~~ IRC. The TERMINATOR system is suitable for use on grades of reinforcing bars complying with ASTM® A615 and ASTM A706 as listed in Table 1 of this report. *

3.2 Design:

3.2.1 Limitations on Obstructions: Limitations on obstructions and interruptions in deformation patterns in front of the bearing surface of the head shall comply with Figure R3.5.9 as noted in ACI® 318-08 or ASTM® A970-09 as noted in Section 3.5.9 of ACI 318-11.

3.2.2 Development Length: When utilizing the equation in Section 12.6.2 of ACI 318-08 or -11 to calculate development length (Figure R12.6(a) of ACI 318-08 or -11), the registered design professional shall verify that the proposed heads are listed in [Table 1](#) of this report as ASTM A970-06 or ASTM A970-09 compliant, as applicable; maximum compressive design strength of the concrete does not exceed 6,000 psi (41.37 MPa) and conditions referenced in Section 12.6.1 of ACI 318-08 or -11 are observed.

Development lengths specified for the development and splices of reinforcement do not require a strength reduction factor in accordance with Section 9.3.3 of ACI 318.

When these design conditions have not been met, anchorage shall be designed in accordance with Appendix D of ACI 318-08 or -11, or designed otherwise to the satisfaction of the registered design professional and approved by the building official.

3.2.3 Termination of Headed Bars: When designed in accordance with Section 12.6.2 of ACI 318-08 or -11, longitudinal headed deformed bars extending from a beam or a slab terminating at a support member, such as a column should extend through the joint to the far face of the confined

The product described in this Uniform Evaluation Service (UES) Report has been evaluated as an alternative material, design or method of construction in order to satisfy and comply with the intent of the provision of the code, as noted in this report, and for at least equivalence to that prescribed in the code in quality, strength, effectiveness, fire resistance, durability and safety, as applicable, in accordance with IBC Section 104.11. This document shall only be reproduced in its entirety.





supporting member in accordance with Figure R12.6(b) of ACI 318-08 or -11.

3.3 Installation General: LENTON® TERMINATOR mechanical anchorage system shall be installed in accordance with ERICO's installation instructions, applicable code sections of ACI 318 and this evaluation report. Where conflicts occur, the more restrictive shall govern.



LENTON TERMINATOR heads are attached to the reinforcing bar utilizing internal taper threads within the head mating with taper threaded bar ends prepared by a fabricator approved by ERICO.

3.3.1 Termination of Headed Bars: When designed in accordance with Section 12.6.2 of ACI 318-08 or -11, longitudinal headed deformed bars extending from a beam or a slab terminating at a support member, such as a column should extend through the joint to the far face of the confined supporting member in accordance with Figure R12.6(b) of ACI 318-08 or -11.

4.0 PRODUCT DESCRIPTION

4.1 Product information: LENTON® TERMINATOR is a headed steel reinforcing bar anchor used to mechanically anchor No. 4, 1/2-inch-diameter (12 mm) through No. 18, 2 1/4-inch-diameter (57 mm) reinforcing steel bars. LENTON taper threaded system utilizes a 6-degree tapered thread with a varying thread pitch of 1.25 mm, 2.0 mm, or 3.5 mm, depending on the reinforcement size. Product dimensions in [Figure 1](#) of this report are listed in [Tables 2, 3](#) and [4](#) for of this report the LENTON® TERMINATOR D6, D16 and D14, respectively. Net bearing area of the D6 and D16 anchor head exceeds four times the nominal cross-sectional area of the reinforcing bar. Net bearing area of the D14 anchor head exceeds nine times the nominal cross-sectional area of the reinforcing bar. Dimensions and illustrations are provided in [Tables 2, 3,](#) and [4](#) of this report and [Figure 1](#) of this report.

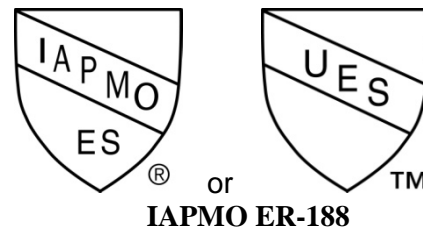
4.2 Material information

4.2.1 Anchor Heads: LENTON® TERMINATOR anchor heads are manufactured from steels listed in [Table 1](#) of this report.

4.2.2 Steel Reinforcing Bars: Reinforcing steel bars shall comply with the grades of ASTM A706 and ASTM A615 as listed in Table 1 of this report. Coatings complying with AASHTO® M 284, ASTM A775, ASTM A934, and ASTM A767 shall be applied prior to threading or in a manner as not to interfere with proper thread engagement.

5.0 IDENTIFICATION

A label shall be affixed on at least one of the following: product, packaging, installation instructions or descriptive literature. The label shall include the company name or trademark, model number, and the IAPMO Uniform ES Mark of Conformity the name of the inspection agency (when applicable) and the Evaluation Report Number (ER-0188) to identify the products recognized in this report. A die-stamp label may also substitute for the label. Either Mark of Conformity may be used as shown below:



6.0 SUBSTANTIATING DATA

Data was submitted in accordance with IAPMO®-UES Evaluation Criteria for Headed and Mechanically Anchored Deformed Reinforcement Bars in Tension (EC 006-2014). Test results are from laboratories in compliance with ISO/IEC 17025.

7.0 CONTACT INFORMATION

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8.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research carried out by IAPMO Uniform Evaluation Service on Erico International Corporation LENTON® TERMINATOR to assess conformance to the codes shown in Section 1.0 of this report, and serves as documentation of the product certification.

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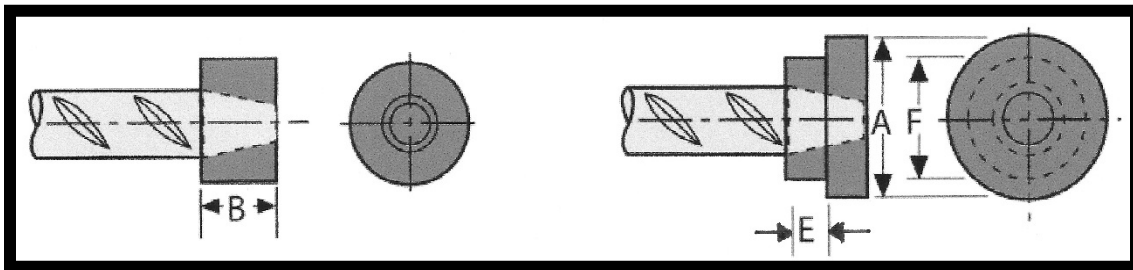
TABLE 1: LENTON® TERMINATOR D6, D16, & D14 SPECIFICATIONS

Series and Part Number Suffix	Anchor Head Material	ASTM® A970 Compliant	Rebar Material	Rebar Sizes
LENTON® TERMINATOR D6	AISI 1141 (or equivalent)	ASTM A970-09	ASTM A706 Gr. 60 & 80 ASTM A615 Gr. 60 ASTM A615 Gr. 75 & 80	#4 to #18 ¹
		ASTM A970-12		#5 to #18 ¹ #5 to #18 ¹
LENTON® TERMINATOR D6	AISI 1141 (or equivalent)	ASTM A970-07 ¹	ASTM A706 Gr. 60 & 80	#4 to #18 ¹
			ASTM A615 Gr. 60	#5 to # 18 ¹
			ASTM A615 Gr. 75 & 80	#5 to # 18 ¹
LENTON® TERMINATOR D16	AISI 1141 (or equivalent)	ASTM A970-09	ASTM A706 Gr. 60 & 80 ASTM A615 Gr. 60 ASTM A615 Gr. 75 & 80	#4 to #18 ¹
		ASTM A970-12		#5 to #18 ¹ #5 to #18 ¹
LENTON® TERMINATOR D16	AISI 1141 (or equivalent)	ASTM A970-07 ¹	ASTM A706 Gr. 60 & 80	#4 to #18 ¹
			ASTM A615 Gr. 60	#5 to # 18 ¹
			ASTM A615 Gr. 75 & 80	#5 to # 18 ¹
		ASTM A970-06	ASTM A706 Gr. 60 & 80	#5 to #14 ¹
			ASTM A615 Gr. 60	#5 to #14 ¹
			ASTM A615 Gr. 75 & 80	#5 & #10
LENTON® TERMINATOR D14	AISI 1141 (or equivalent)	ASTM A970-09	ASTM A706 Gr. 60 & 80 ASTM A615 Gr. 60 ASTM A615 Gr. 75 & 80	#4 to #18 ¹
		ASTM A970-12		#5 to #18 ¹ #5 to #18 ¹
LENTON® TERMINATOR D14	AISI 1141 (or equivalent)	ASTM A970-07 ¹	ASTM A706 Gr. 60 & 80	#4 to #18 ¹
			ASTM A615 Gr. 60	#5 to # 18 ¹
			ASTM A615 Gr. 75 & 80	#5 to # 18 ¹
		ASTM A970-06	ASTM A706 Gr. 60 & 80	#5 to #14 ¹
			ASTM A615 Gr. 60	#5 to #14 ¹
ASTM A615 Gr. 75 & 80	#5 & #10			

¹ Note: Anchorage shall be designed in accordance with ACI 318-08/-11 Appendix D, or designed otherwise to the satisfaction of the registered design professional and approved by the building official for heads compliant with ASTM A970-07, Grade 75 reinforcement bar, Grade 80 reinforcement bar, or for reinforcement bar sizes that exceed No.11.



Figure 1: LENTON[®] TERMINATOR – D6/D16/D14 Series



A = Large Diameter
 B = Length of LENTON TERMINATOR Head & Bar Engagement
 E = Length of Small Step (when applicable)
 F = Small Diameter (when applicable)

Table 2: LENTON[®] TERMINATOR – D6 Series

Reinforcement Bar Designation				Part Number	"A"		"B"		"E"		"F"	
In/lb	Metric (mm)	Canadian	Soft Metric		in	mm	in	mm	in	mm	in	mm
4	12	10M	13	EL12D6	1-3/8	35	9/16	14	-	-	-	-
5	16	15M	16	EL16D6	1-1/2	38	7/8	22	-	-	-	-
6	20	20M	19	EL20D6	1-7/8	48	1-1/8	29	-	-	-	-
7	22	-	22	EL22D6	2	51	1-1/4	32	-	-	-	-
8	25	25M	25	EL25D6	2-1/4	57	1-3/8	35	-	-	-	-
9	28	30M	29	EL28D6	2-3/4	70	1-1/2	38	-	-	-	-
10	32	-	32	EL32D6	3	76	1-9/16	40	-	-	-	-
11	36	35M	36	EL36D6	3-1/4	83	1-11/16	43	-	-	-	-
-	40	-	-	EL40D6	3-3/4	95	2-1/2	64	1	25	2-5/16	76
14	43	45M	43	EL43TD6	4	102	2-1/8	54	1	25	2-1/2	76
-	50	-	-	EL50TD6	4-1/2	114	2-9/16	65	1	25	2-15/16	76
18	57	55M	57	EL57TD6	5-1/8	130	2-3/4	70	1	25	3	76

NOTE 1: Thread does not need to be flush with end of LENTON TERMINATOR. Thread may be +/- 2 threads from the backside of head.
 NOTE 2: Net bearing area (A_{brg}) exceeds 4 times the area of the bar (A_{br}).



Table 3: LENTON® TERMINATOR – D16 Series

<i>Reinforcement Bar Designation</i>				Part Number	“A”		“B”		“E”		“F”	
In/lb	Metric (mm)	Canadian	Soft Metric		in	mm	in	mm	in	mm	in	mm
4	12	10M	13	EL12D16	1-3/8	35	3/4	19	–	–	–	–
5	16	15M	16	EL16D16	1-1/2	38	15/16	24	–	–	–	–
6	20	20M	19	EL20D16	1-7/8	48	1-3/8	35	–	–	–	–
7	22	–	22	EL22D16	2	51	1-7/16	38	–	–	–	–
8	25	25M	25	EL25D16	2-1/4	57	1-9/16	40	–	–	–	–
9	28	30M	29	EL28D16	2-3/4	70	1-5/8	42	–	–	–	–
10	32	–	32	EL32D16	3	76	1-3/4	46	–	–	–	–
11	36	35M	36	EL36D16	3-1/4	83	2-1/16	52	–	–	–	–
–	40	–	–	EL40D16	3-3/4	95	2-1/4	58	1	25	2-5/16	59
14	43	45M	43	EL43TD16	4	102	2-5/8	67	1	25	2-1/2	64
–	50	–	–	EL50TD16	4-1/2	114	2-11/16	71	1	25	2-15/16	75
18	57	55M	57	EL57TD16	5-1/8	130	3-5/16	84	1	25	3-1/8	80

NOTE 1: Thread does not need to be flush with end of LENTON TERMINATOR. Thread may be +/- 2 threads from the backside of head.

NOTE 2: Net bearing area (A_{brg}) exceeds 4 times the area of the bar (A_{br}).



Table 4: LENTON® TERMINATOR – D14 Series

<i>Reinforcement Bar Designation</i>				Part Number	"A"		"B"		"E"		"F"	
In/lb	Metric (mm)	Canadian	Soft Metric		in	mm	in	mm	in	mm	in	mm
4	12	10M	13	EL12D14	1-3/4	45	11/16	18	–	–	–	–
–	14	–	–	EL14D14	1-3/4	45	13/16	21	–	–	–	–
5	16	15M	16	EL16D14	2	55	15/16	24	–	–	–	–
–	18	–	–	EL18D14	2-1/2	60	1-1/8	29	–	–	–	–
6	20	20M	19	EL20D14	2-1/2	65	1-3/8	35	–	–	–	–
7	22	–	22	EL22D14	2-3/4	70	1-7/16	38	–	–	–	–
8	25	25M	25	EL25D14	3-1/4	80	1-9/16	40	–	–	–	–
9	28	30M	29	EL28D14	3-3/4	95	1-5/8	42	1	25	1-11/16	43
–	30	–	–	EL30D14	3-3/4	95	2-1/16	52	1	25	1-3/4	44
10	32	–	32	EL32D14	4	105	1-3/4	46	1	25	1-7/8	48
–	34	–	–	EL34D14	4-3/8	110	2-3/16	55	1	25	2	51
11	36	35M	36	EL36D14	4-1/2	115	2-1/16	52	1	25	2-1/16	52
–	38	–	–	EL38D14	4-3/4	120	2-1/8	53	1	25	2-3/16	56
–	40	–	–	EL40D14	5	130	2-1/4	58	1	25	2-5/16	59
14	43	45M	43	EL43TD14	5-1/2	150	2-5/8	67	1-5/16	34	2-1/2	61
–	50	–	–	EL50TD14	6-1/2	160	2-13/16	71	1-5/16	33	3-1/8	77
18	57	55M	57	EL57TD14	7-1/4	190	3-5/16	84	1-5/8	41	3-1/8	80

NOTE 1: Thread does not need to be flush with end of LENTON TERMINATOR. Thread may be +/- 2 threads from the backside of head.

NOTE 2: Net bearing area (A_{brg}) exceeds 9 times the area of the bar (A_{br}).