EVALUATION REPORT

Report Number: 0129
Issued: 02/2009
Expires: 02/2010
Revised: 09/29/2009

DIVISION: 03 – CONCRETE
Section: 03210 – Reinforced Steel

REPORT HOLDER:

ERICO®, INC.
34600 SOLON ROAD
SOLON, OHIO 44139
800 248-2677
www.ERICO.com
sjohnson@ERICO.com
jalbrigo@ERICO.com

EVALUATION SUBJECT:

LENTON® MECHANICAL SPLICE SYSTEM FOR STEEL REINFORCING BARS IN CONCRETE

1.0 EVALUATION SCOPE

1.1 Compliance with the following codes:

- 2006 International Building Code® (IBC)
- 2003 International Building Code® (IBC)
- 2006 International Residential Code® (IRC)
- 2003 International Residential Code® (IRC)
- 2008 American Concrete Institute® 318 (ACI)
- 2005 American Concrete Institute® 318 (ACI)
- 2002 American Concrete Institute® 318 (ACI)
- 1997 Uniform Building Code™ (UBC)

1.2 Evaluated in accordance with:

- ICC AC133 Dated June 2008
- Reference page 6 footnote A.

Property evaluated:

Structural

2.0 USES

The LENTON systems are mechanical couplers used for splicing deformed steel reinforcing bars (rebar) for the purpose of transferring tension and compression forces in reinforced concrete structural members.

- The LENTON system complies with the requirements of ACI 318 (ACI 318 is referenced in the IBC and the IRC) and UBC for use as tension and compression mechanical connections for deformed steel reinforcing bars. The LENTON systems comply with both Type 1 and Type 2 mechanical splice requirement as stated in these codes consisting of (Figure 1):
  - STANDARD (A2 & A12), TRANSITION (A2 & A12), FORM SAVER (SA & FS), POSITION (P9 & P14), LENTON LOCK (B1) and TERMINATOR (D & A2D6) for all grades of ASTM A615 or ASTM A706
  - INTERLOK (LK) for ASTM A615 Grade 60 or ASTM A706
  - WELDED HALF COUPLER (C3J) for ASTM A706
- The LENTON TERMINATOR (D & A2D6) systems comply with the requirements of ACI 318 Development of headed and mechanically anchored deformed bars in tension / Mechanical anchorage.

3.0 DESCRIPTION

3.1 General

The LENTON system, consisting of tapered threaded rebar splicing and bolted rebar splicing, is designed for use in reinforced concrete construction. LENTON couplers are available in eight styles: STANDARD (A2 & A12), TRANSITION (A2 & A12), FORM SAVER (SA & FS), POSITION (P9 & P14), LENTON LOCK (B1), TERMINATOR (D & A2D6), INTERLOK (LK) and WELDED HALF COUPLER (C3J). LENTON couplers are designed to mechanically butt splice No. 4, 1/2-inch-diameter (12 mm) through No. 18, 2 1/4-inch-diameter (57 mm) reinforcing steel. All grades of rebar may be epoxy

Copyright © 2009 by International Association of Plumbing and Mechanical Officials. All rights reserved. Printed in the United States of America. No part of this publication may be reproduced, stored in an electronic retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher.

coated in accordance with ASTM A775 or A934 when utilizing LENTON tapered threaded or bolted couplers. Also, all grades of rebar may be galvanized in accordance to ASTM A767 when utilizing LENTON taper threaded connections. All styles, excluding the LENTON LOCK coupler types, have interior-tapered threads for joining the reinforcing bars. For the LENTON threaded coupler types, the threads on the rebar are right-handed and tapered to match the accompanying coupler. Before shipping from the rebar fabrication shop, the threaded bar ends are protected to ensure damage-free threads at the jobsite.

3.2 Materials

The couplers are manufactured from steels as listed in Figure 1.

4.0 INSTALLATION

4.1 General Installation:

The LENTON couplers must be installed in accordance with the applicable code, this evaluation report, and ERICO Inc.'s installation instructions. Installation instructions are supplied with the product and/or are available on ERICO's website (www.erico.com). The splice locations must be detailed on the plans approved by the building official. All required distances, spacing and coverage should be per applicable codes and shall be measured from the outer surface of the connecting device or as defined by the Engineer of record. As defined in ACI 318, Type 2 coupler splices are permitted in any location within a member for all seismic zones or seismic design categories.

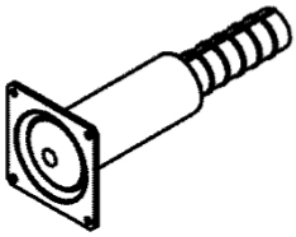
4.2 LENTON Standard Coupler (A2 & A12) illustrated below:

The Standard coupler type is used to join bars where at least one rebar end is able to rotate freely. For field installation of the standard coupler, the thread protector is removed from the threaded rebar end, which is inspected for cleanliness and damage. In some cases, the coupler is fastened to the rebar at the fabrication facility to protect the threads. A wired brush should be used to remove rust and adhered concrete from the threads. The coupler is then screwed onto the threaded end of the rebar to be spliced, and is tightened by hand. The second rebar is then inserted into the coupler and is rotated until hand-tight. The connection is then tightened per the manufactures' instructions.

4.3 LENTON Transition Coupler (A2 & A12) illustrated below:

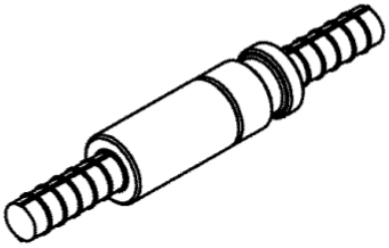
LENTON Transition couplers are similar to the Standard coupler, except the coupler is designed to connect rebars of different sizes. Installation for LENTON Transition couplers are the same as those for LENTON Standard Couplers described in Section 4.2 if this report.

4.4 LENTON FORM SAVER (SA or FS) illustrated below:



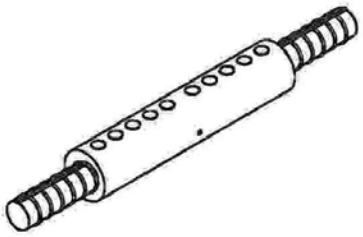
The LENTON FORM SAVER SA or FS are the same in form and function to the LENTON Standard Coupler type except that the SA or FS coupler type has a non-structural form mounting plate attached to the end of the coupler. The mounting plate simply provides a means and method of securing the SA or FS coupler types and or bar attached to these coupler types to form work. An internal thread protector is installed to protect the LENTON coupler internal threads. The FORM SAVER FS coupler type is secured to the rebar by a friction forging process, whereby the ASTM A615 grade 60 rebar is attached to the coupler by forcing the components together while the coupler is revolving at a specific rate. The other end of the FORM SAVER FS accepts rebar with LENTON taper threads. Unlike the FS type coupler the FORM SAVER SA type coupler accepts rebar with LENTON tapered threads at each end. As with the FS coupler type the SA coupler type has a mounting plate attached to one end of the coupler. To install the FORM SAVER (SA or FS) assembly, the mounting plate is used to position and secure these coupler types on the form work. After the completion of the concrete pour and upon removal of the form work where the SA or FS couplers are attached, the protectors are removed from both the rebar and the coupler. Proper size taper threaded male rebar is then screwed into the exposed end of the FORM SAVER SA or FS. The connection is then tightened per the manufactures' instructions. Note: For identification purposes, the face of the LENTON SA or FS nailer plate that is exposed when the form work is removed, this surface has LENTON coupler bar size information stamped onto this surface.

4.5 LENTON Position Couplers (P9 & P8) illustrated below:



LENTON Position Couplers are used to join curved or bent bars as well as straight bars that must be held in a predetermined position during the joining process. The couplers can also be used where neither bar is free to rotate. All Position couplers are manufactured to allow the coupler to rotate. The connection is tightened per the manufactures' instructions. Also, the LENTON Position couplers are designed to accommodate rebar of multiple different sizes.

4.6 LENTON LOCK (B1) illustrated below:

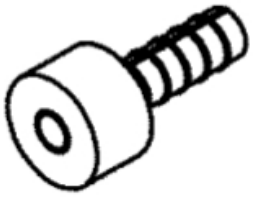


The LENTON LOCK Couplers are used to mechanical connect two bars together. Because there is no bar end preparation involved, one or both bars can be placed in a predetermined position. The rebar is inserted into the coupler and the bolts are tightened in accordance with the manufacturer's instructions. As long as the torque values are achieved, the bolt heads are not required to shear off. Unsheared bolt heads may be cut off if concrete cover is an issue. Refer to the manufacturer's instructions for details.
In addition to connecting the same bar size to the same bar size, the LENTON LOCK coupler can also be used to:

- Connect same size bar to same size bar where both bars are one size smaller than is identified on the coupler
- Transition from the bar size identified on the coupler to the next smaller bar size

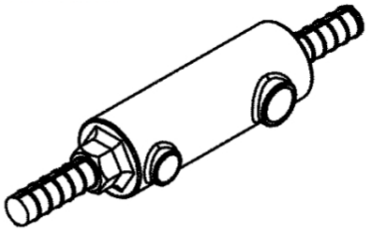
Installation procedures are the same as those for the LENTON LOCK coupler previously described in this section.

4.7 TERMINATOR (D) illustrated below:



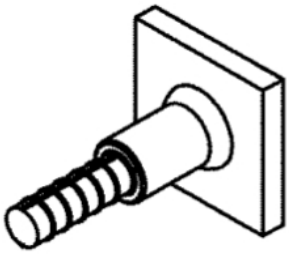
The LENTON TERMINATORS are embedments designed as an alternate to bent sections of reinforcing steel in reinforced concrete construction. The TERMINATOR area is at least five times the nominal area of the reinforcement rebars. The TERMINATOR is machined with a LENTON tapered thread. The connection is tightened per the manufactures' instructions.

4.8 LENTON INTERLOK illustrated below:



The LENTON INTERLOK couplers are cylindrical with one end threaded to receive a LENTON taper threaded rebar and the opposite end having internal annular ridges spaced approximately 1 inch (25.4 mm) on center. The LENTON INTERLOK splicing system must be installed in accordance with the applicable code, the evaluation report, and the ERICO Inc.'s installation instructions. The system consists of a coupler and ERICO, Inc. HY10L grout, which is a non-shrink, cementitious mixture. The threaded end of the coupler is machined with a LENTON tapered thread. A matching LENTON taper threaded piece of rebar is inserted into this end of the LENTON INTERLOK coupler and rotated until hand-tight. This portion of the connection is then tightened per the manufactures' instructions. The opposite end of the sleeve is open to receive the reinforcing steel of the adjoining precast structural member or projecting dowel.. The connection is subsequently completed by pouring or pumping HY10L grout into the interior of the sleeve. Batches of ERICO, HY10L grout are mixed in accordance with the ERICO installation instructions. The correct amount of water to be added to the grout is predetermined by field testing the flow of trial batches of grout mixtures with a 2-inch (51 mm) diameter, 4-inch (102 mm) tall cylinder and a LENTON INTERLOK flow template. The minimum compressive strength of 2-inch (51 mm) cubes of the grout at 28 days, when tested in accordance with ASTM C109-02, must be at least 8,500 psi (58,600 kPa). Compression test specimens must be cured in accordance with ASTM C109-02. Mixed ERICO, Inc. HY10L grout can be poured or pumped into the LENTON INTERLOK coupler. All spaces within the coupler must be fully grouted. All spliced joints must be adequately braced and supported to prevent the movement of the rebar within the coupler. The braces are left in place for at least 24 hours until the grout has attained a minimum compressive strength of 3,000 psi (20,700 kPa) as determined by compression tests of 2-inch (51 mm) cubes.

4.9 Welded HALF COUPLER (C3J) illustrated below:



A LENTON HALF COUPLER provides a mechanical means of connecting reinforcing bar to structural steel plates and shapes. The coupler is manufactured from weldable grades of material. One end of the coupler is machined with a LENTON tapered thread, and the opposite side is prepared for welding. The connection is then tightened per the manufactures' instructions.

5.0 CONDITIONS OF USE

The LENTON mechanical couplers described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The couplers must be installed in accordance with the applicable code, the manufacturer's instructions, and this report. In the case of conflict between the manufacturer's published instructions and this report, this report governs.

5.2 Splice locations must comply with applicable code requirements and be noted on plans approved by the code official.

5.3 Special inspections may be required, refer to Section 1704.4 and 1704.13 of the IBC and Section 1701.5.4 of the UBC. The inspector's duties include verifying grade and size of reinforcement bar, coupler and sleeve identification, position of couplers and sleeves, and installation of couplers and sleeves to rebar.

5.4 The threaded rebar used with LENTON mechanical splice couplers must be fabricated by an approved fabricator to the specifications provided by ERICO, Inc.

5.5 LENTON mechanical couplers may be used on epoxy-coated or galvanized bars as long as the coating process is conducted prior to rebar threading. All threads of the coupler and rebar are to be free of all debris, including epoxy coating, at the time of coupling.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Mechanical Connector Systems for Steel Reinforcing Bars (AC133) dated June 2008.

Reference page 6 footnote A.

7.0 IDENTIFICATION

All couplers and splices are packaged with a label bearing the manufacturer's name (ERICO, Inc.), address, model and size and the IAPMO ES Mark of Conformity. . Each LENTON coupler is permanently stamped/labeled with the catalog number, size, heat number, Type 2 designation, and the name "LENTON".

IAPMO ES ™

Director of Evaluation Services

Figure 1

Series	Part Number Suffix	Material Grade	Rebar	Rebar Sizes	Code Compliance	Section
STANDARD	A2, A12	AISI 1117 / 1141 (or equivalent)	ASTM A706 & A615 Grades 60 and 75	4 through 18	IBC, IRC, ACI, UBC TYPE I + II	4.2
TRANSITION	A2, A12	AISI 1117 / 1141 (or equivalent)	ASTM A706 & A615 Grades 60 and 75	4 through 18	IBC, IRC, ACI, UBC TYPE I + II	4.3
LENTON FORM SAVER	SA	AISI 1117 / 1141 (or equivalent)	ASTM A706 & A615 Grades 60 and 75	4 through 11	IBC, IRC, ACI, UBC TYPE I + II	4.4
	FS	AISI 1117 (or equivalent)	ASTM A706 & A615 Grades 60 and 75	4 through 7	IBC, IRC, ACI, UBC TYPE I + II	
POSITION	P9, P8	AISI 1141 (or equivalent)	ASTM A706 & A615 Grades 60 and 75	6 through 18	IBC, IRC, ACI, UBC TYPE I + II	4.5
LENTON LOCK	B1	AISI 4118 / 4120 (or equivalent)	ASTM A706 & A615 Grades 60 and 75	4 through 11	IBC, IRC, ACI, UBC TYPE I + II	4.6
LENTON TERMINATOR[A]	D6, D16, A2D6	AISI 1141 (or equivalent)	ASTM A706 & A615 Grades 60 and 75	4 through 18	IBC, IRC, ACI, UBC TYPE I + II	4.7
LENTON INTERLOK	LK	ASTM A536 (or equivalent)	ASTM A706 & A615 Grade 60	6 through 14	IBC, IRC, ACI, UBC TYPE I + II	4.8
WELDED-HALF	C3J	AISI 1018 / 1030 / 1035 (or equivalent)	ASTM A706	6 though 14	IBC, IRC, ACI, UBC TYPE I + II	4.9

[A.] *Headed bar assemblies were evaluated in compliance with AC 133 and ACI 318-08 which is adopted in the 2009 IBC. Additional test data and calculations performed by a registered license professional for Terminator D6, D16, A2D6 may be required by the Building Official to establish conformance to the 2006 IBC under the guidelines of section 104.11.*