Originally Issued: 08/22/2014 Revised 03/10/2017 Valid Through: 08/31/2017

EVALUATION SUBJECT:
DBDI REINFORCING BAR MECHANICAL SPLICE SYSTEM FOR STEEL REINFORCING BARS IN CONCRETE

REPORT HOLDER:
Dayton Superior Corporation
1125 Byers Road
Miamisburg, OH 45342
(800) 745-3700
www.daytonsuperior.com

CSI DIVISION: 03 CONCRETE
CSI Section: 032100 Reinforcing Steel

1.0 SCOPE OF EVALUATION

1.1 Compliance to the Following Codes & Regulations:
- 2015 International Building Code® (IBC)
- 2012 International Building Code® (IBC)
- 2009 International Building Code® (IBC)

1.2 Evaluated in Accordance With:
- ICC-ES AC 133, approved October 2015

1.3 Property Assessed:
- Structural

2.0 PRODUCT USE

The DBDI Reinforcing Bar Mechanical Splice System is used to mechanically splice deformed steel reinforcing bars (rebar) installed in concrete structural members. The splices conform to ACI 318-14 Section 25.5.7.1 (ACI 318-11 Section 12.14.3.2), referenced in Section 1901.2 of the IBC as tension and compression mechanical splices for deformed steel reinforcing bars. The mechanical splices comply with the requirements of ACI 318-14 Section 18.2.7.1 for the 2015 IBC (ACI 318-11 Section 21.1.6.1 for the 2012 IBC and ACI 318-08 for the 2009 IBC), as Type 1 or Type 2 mechanical splices. When used as Type 2 splices the couplers are permitted within the concrete structural member for all seismic design categories.

3.0 PRODUCT DESCRIPTION

3.1 Product Information: DBDI Reinforcing Bar Mechanical Splice System consists of a dowel bar splicer (DB coupler) and dowel-in bar (DI bar), as shown in Figure 1 of this report. The DI bars are joined to DB couplers of the same splice size in steel reinforcing bar sizes No. 4 through No.11 (No.4 bar size is limited to use only with ACI 318-11, -08 and the 2012 and 2009 IBC). The splicer end of the DB coupler has an interior threaded barrel with a flange plate. The externally threaded end of DI bars is manufactured in two configurations: Standard DI and Extended DI. The DI bars may be bent cold in accordance with ACI 318-14 Section 26.6.3.1 (a) for the 2015 IBC (ACI 318 Section 7.3.1 for the 2012 IBC and 2009 IBC Section 1907.3), as shown in Figures 2 and 3 of this report.

3.2 DB Coupler and DI Bar: The DB coupler and corresponding DI bar are formed from steel conforming to ASTM A706 or ASTM A615 Grade 60.

3.3 Steel Reinforcing Bars: Steel reinforcing bars shall be uncoated, Grade 60 deformed reinforcing bars complying with ASTM A615 or ASTM A706.

3.4 Coatings: Finished DB couplers and DI bar may be coated with epoxy or zinc (hot-dip galvanized), except for the threads. Such coatings shall comply with and be applied in accordance with ACI 318-14 Section 20.6.2.2 (ACI 318-11 or -08 Section 3.5.3.8). The zinc hot-dip galvanized coating has a matte gray finish. Coatings such as zinc electroplating conforming to the requirements of ASTM B633 have a bright silver or silver-gold finish and may be applied to finished DB couplers and DI bar, including threads. Coatings not complying with ACI 318-14 Section 20.6.2.2 (ACI 318-11 or -08 Section 3.5.3.8), are allowed but not considered corrosion resistant.

4.0 DESIGN AND INSTALLATION

4.1 General: DBDI Reinforcing Bar Mechanical Splice System shall be installed in accordance with the IBC, ACI 318, this evaluation report and the manufacturer's installation instructions. Where conflicts occur the more restrictive shall govern. The locations of splices shall be detailed on the plans and approved by the code official. Concrete cover and spacing shall be as required in IBC Chapters 7 and 19, and ACI 318-14 Section 20.6.1 (ACI 318-11 Section 7.7) and shall be measured from the outside of the splice system.

4.2 DB Coupler: The DB coupler is secured to concrete formwork with screws, nails or bolts to the flange plate at the couplers' barrel end as shown in Figure 1 of this report. The opposite end of the DB coupler shall be secured against displacement and supported before concrete placement.

4.3 DI Bar: The DI Bar shall be of sufficient length to provide development length as required by ACI 318-14 Sections 25.4.2, 25.4.9 and 24.4.10 (ACI 318-11 Sections 12.2 and 12.3). The DI Bar shall be lap-spliced with reinforcing steel that conforms to Chapter 25 of ACI 318-14 (Chapter 12 of ACI 318-11). After the forms are removed the threaded end of the DI bar shall be threaded into the

exposed barrel end of the DB coupler to the full thread engagement of the DI.

* **4.4 ~~DB~~/DI Hooked Bar:** The ~~DB and~~ DI Hooked bars shall be bent cold, unless otherwise permitted by a registered designed professional conforming to Section 26.6.3.1(a) of ACI 318-14 for the 2015 IBC (Section 7.3.1 of ACI 318-11 for the 2012 IBC and 2009 IBC Section 1907.3). The 90 and 180-degree hook bends shall be installed as conforming to Section 25.3.1 of ACI 318-14 (Sections 7.1.2 and 7.1.1 of ACI 318-11). The hooked bars properties and illustrations are as shown in Tables 2 and 3 and Figures 2 and 3 of this report.

* ~~**4.5 DB/DI Double Ended Bar:** The double ended bars are integrally forged from deformed bar material and are configured with, either DB coupler, or DI bar on both ends, or DB coupler on one end and DI bar on the other. Double ended bars are used to establish a direct load path through a concrete section, thus avoiding multiple hooked bars and reducing rebar congestion. The double ended bars properties and illustrations are shown in Table 4 and Figure 4 of this report.~~

* ~~**4.6 End Anchorage:** The headed DI bar and headed DB coupler each include the opposite end forged into a bolt head configuration. Only the DI bar and DB coupler portions of this product are evaluated by this report. Treatments and connections to the opposite end of the DB or DI bar shall comply with Section 4.7 of this report. The headed bar properties and illustrations are as shown in Table 5 and Figure 5 of this report.~~

4.7 Other Variations: Treatments and connections to the opposite end of the DB or DI bar are outside the scope of this report. The treatments and connections shall be in accordance with the applicable code requirements, referenced in an evaluation report issued by an approved and accredited evaluation agency or as other use specified by the registered design professional and approved by the building official.

4.8 Special Inspection: Special inspection shall be as required by Section 1705 of the 2012 IBC (Section 1704 of the 2009 IBC). In addition to verifying installation of steel reinforcing bar splices in accordance with this report, the special inspector shall verify the grade and size of reinforcing bars, DB coupler and DI bar identification, reinforcing bar embedment length to coupler, position of DB coupler and DI bar, as well as installation of DB coupler and DI bar to the reinforcing bars.

5.0 LIMITATIONS

The DBDI Reinforcing Bar Mechanical Splice System described in this report complies with, or is a suitable alternative to what is specified in, the codes listed in Section 1.0 of this report, subject to the following limitations:

5.1 The DBDI Reinforcing Bar Mechanical Splice System shall be installed in accordance with the applicable code, the manufacturer's instructions, and this report. In the event of a conflict, the more restrictive governs.

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

5.3 For structures regulated by ACI 318-14 Chapter 18 and ACI 318-11 and -08 Chapter 21, as required by 2015 and 2012 IBC Section 1905.1 (2009 IBC Section 1908.1), where the DBDI Reinforcing Bar Mechanical Splice system is used to splice reinforcing bars to resist earthquake-induced flexure, axial force, or both, in special moment frames, special structural walls, and all components of special structural walls including coupling beams and wall piers, mill certificates shall be submitted to the code official as evidence that the steel reinforcing bars comply with ACI 318-14 with Section 20.2.2.5 (ACI 318-11 and -08 with Section 21.1.5.2.

5.4 Special inspections shall be provided in accordance with Section 4.8 of this report.

5.5 Minimum concrete cover shall be in accordance with ACI 318-14 Chapter 20 (ACI 318-11 Chapter 7 as referenced by the 2012 IBC and 2009 IBC Sections 1907.5 and 1907.7) and shall be measured from the outer surface of the splice system.

5.6 Minimum spacing of DBDI shall be in accordance with ACI 318-14 Section 25.6.1.1 as referenced by the 2015 IBC (ACI 318-11 Section 7.6 as referenced by the 2012 IBC and 2009 IBC Section 1907.6).

5.7 If bending of the reinforcing bar shall be necessary prior to being attached to the splice system, the bar shall be cold bent as set forth in Section 26.6.3.1(a) of ACI 318-14 for the 2015 IBC (Section 7.3.1 of ACI 318-11 for the 2012 IBC and Section 1907.3 of the 2009 IBC).

5.8 The DBDI Reinforcing Bar Size No.4 is limited to use only with ACI 318-11, -08 and the 2012 and 2009 IBC.

* Deleted by City of Los Angeles

6.0 SUBSTANTIATING DATA

Data in accordance with the ICC-ES Acceptance Criteria for Mechanical Connector Systems for Steel Reinforcing Bars (AC133), October 2015.

7.0 IDENTIFICATION

All DB splice system components are packaged with a label bearing the manufacturer's name (Dayton Superior Corporation), address, model, size, the IAPMO Uniform ES Mark of Conformity and the Uniform Evaluation Report Number (ER-321). Each DB coupler and DI rebar is permanently stamped/labeled with the catalog number, size, heat number, Type 1 or Type 2 Splice designation, and the mark "T2" or "M2" where "T" refers to the city of the manufacturing facility (T for Tremont, Pennsylvania and M for Modesto, California) and "2" refers to the splice designation.

IAPMO ES ® or UES ™

IAPMO ER #321

Brian Gerber, P.E., S.E.
Vice President, Technical Operations
Uniform Evaluation Service

Richard Beck, PE, CBO, MCP
Vice President, Uniform Evaluation Service

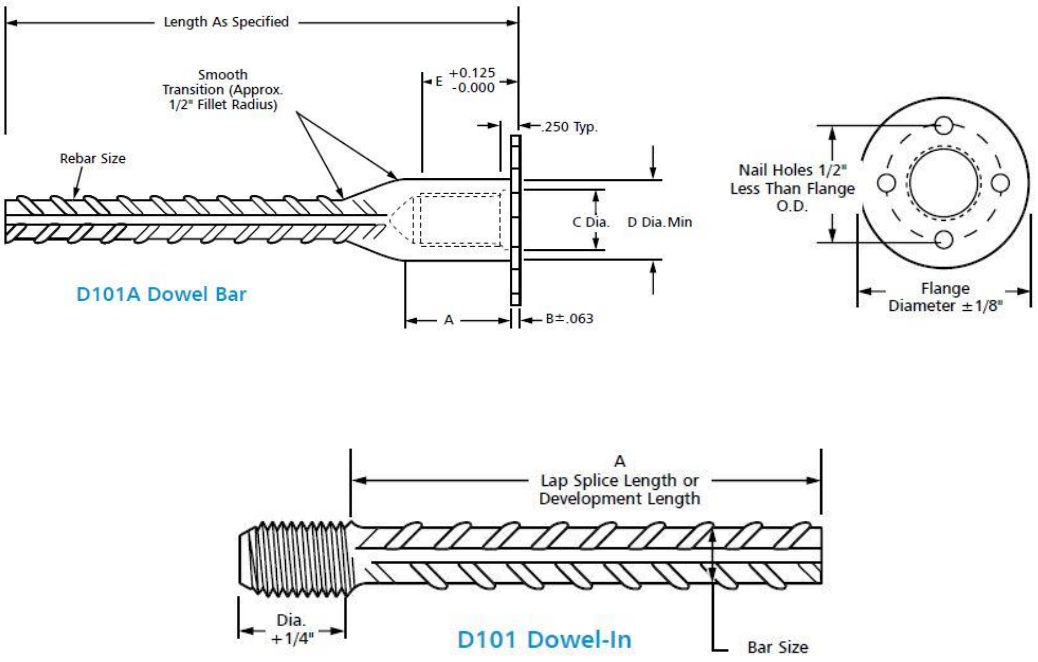
GP Russ Chaney
CEO, The IAPMO Group

For additional information about this evaluation report please visit www.uniform-es.org or email at info@uniform-es.org

Table 1- DBDI Splicer System

Rebar Size	Thread Size (in)	A (in)	B (in)	C (in)	D (in)	E (in)	Flange Diameter (in)
No.4	5/8 -11 UNC	1.25	0.125	0.688	0.855	1.000	1.875
No.5	3/4 - 10 UNC	1.563	0.125	0.813	1.042	1.130	2.063
No.6	7/8 - 9 UNC	1.625	0.125	0.938	1.23	1.250	2.250
No.7	1 - 8 UNC	1.813	0.125	1.063	1.417	1.375	2.438
No.8	1-1/8 - 8 UN	2.063	0.125	1.188	1.603	1.500	2.625
No.9	1-1/4 - 8 UN	2.188	0.125	1.313	1.786	1.625	2.813
No.10	1-7/16 - 8 UN	2.438	0.125	1.50	1.982	1.813	3.000
No.11	1-9/16 - 8 UN	2.563	0.125	1.625	2.219	1.938	3.250

For SI: 1 inch = 25.4 mm



Note: Thread Length is 1-2/3 Dia. +1/4" for Extended DI

Figure 1 – DBDI Splicer Details

Table 2- 90 Degree Hooked DB/DI Bars

90° Hook Dowel In				
Rebar Size	Thread Size	R- Minimum Radius (in)	B - Minimum Length (in)	Ultimate 160% F_y (lbs)
No.4	5/8-11 UNC	1.50	8.00	19,200
No.5	3/4-10 UNC	1.88	10.00	29,760
No.6	7/8-9 UNC	2.25	12.00	42,240
No.7	1/8 UNC	2.63	14.00	57,600
No.8	1 1/8-8 UN	3.00	16.00	75,840
No.9	1 1/4-8 UN	4.75	19.38	96,000
No.10	1 7/16-8 UN	5.38	21.56	121,920
No.11	1 9/16-8 UN	6.00	23.88	149,760

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N
Note:Minimum Length (B) and Radius (R) shall be met to conform to Section 25.3.1 of ACI 318-14 (Section 7.1.2 of ACI 318-11 and -08).

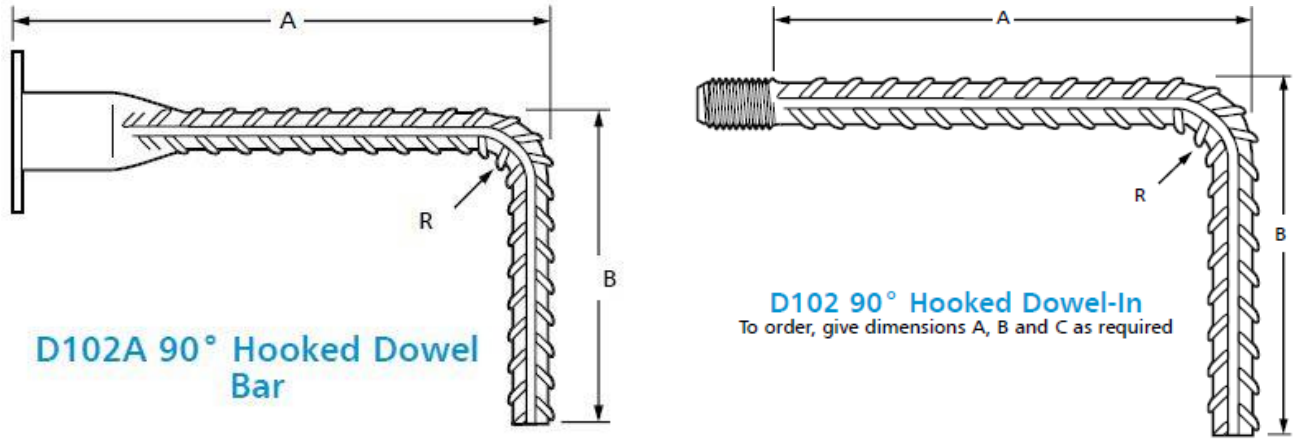


Figure 2 – Hooked Dowel Bar / Dowel-In

Table 3- 180 Degree Hooked DB/DI Bars

180° Hook Dowel In				
Rebar Size	Thread Size	R- Minimum Radius (in)	C- Minimum Length (in)	Ultimate 160% F_y (lbs)
No.4	5/8-11 UNC	1.50	4.50	19,200
No.5	3/4-10 UNC	1.88	5.00	29,760
No.6	7/8-9 UNC	2.25	6.00	42,240
No.7	1/8 UNC	2.63	7.00	57,600
No.8	1 1/8-8 UN	3.00	8.00	75,840
No.9	1 1/4-8 UN	4.75	10.38	96,000
No.10	1 7/16-8 UN	5.38	11.73	121,920
No.11	1 9/16-8 UN	6.00	13.05	149,760

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N
Note:Minimum Length (C) and Radius (R) shall be met to conform to Section 25.3.1 of ACI 318-14 (Section 7.1.1 of ACI 318-11 and -08).

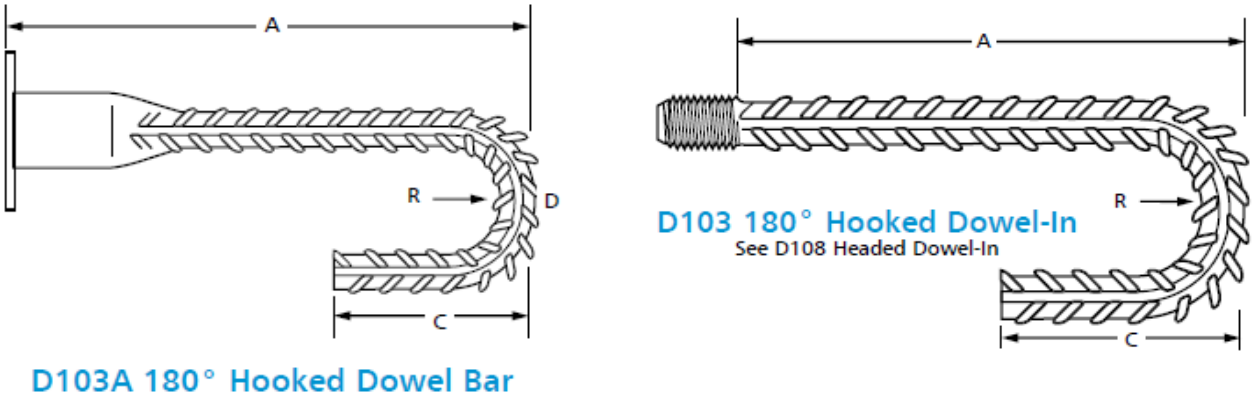


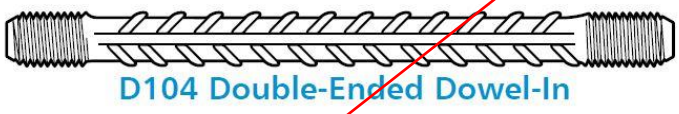
Figure 3 – Hooked Dowel Bar / Dowel-In

*

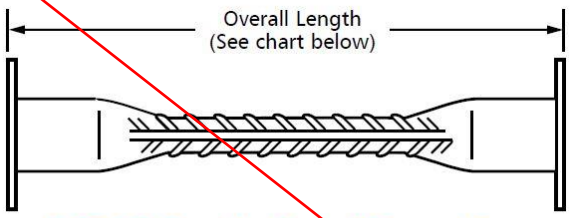
Table 4 – Double Ended DB/DI Bars

Rebar Size	Thread Size	DI - Minimum Length (in)	DB - Minimum Length (in)
No.4	5/8-11 UNC	8.00	12.00
No.5	3/4-10 UNC	8.00	12.00
No.6	7/8-9 UNC	8.00	14.00
No.7	1/8 UNC	8.00	16.00
No.8	1 1/8-8 UN	14.00	16.00
No.9	1 1/4-8 UN	14.00	16.00
No.10	1 7/16-8 UN	14.00	16.00
No.11	1 9/16-8 UN	14.00	16.00

For SI: 1 inch = 25.4 mm



D104 Double-Ended Dowel-In



D104A Double-Ended Dowel Bar Splicer

Figure 4 – Double Ended Dowel Bar / Dowel-In

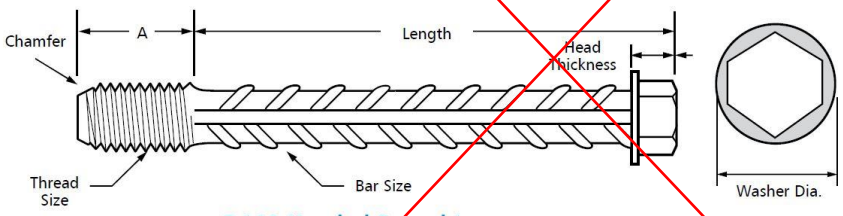
* Deleted by City of Los Angeles

* Originally Issued: 08/22/2014 Revised 03/10/2017 Valid Through: 08/31/2017

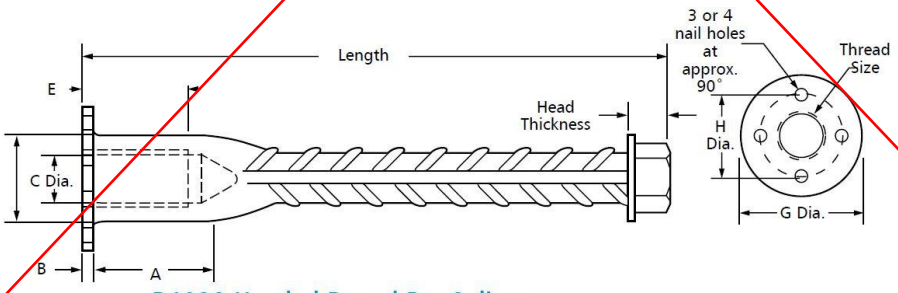
Table 5 – Headed DB/DI Bars

Rebar Size	Thread Size	A(in)	B (in)	C (in)	D (in)	E (in)	Washer Diameter (in)	Head Thickness (in)
No.4	5/8-11 UNC	1.125	0.125	0.688	0.859	1.000	1.375	0.500
No.5	3/4-10 UNC	1.563	0.125	0.813	1.047	1.125	1.625	0.500
No.6	7/8-9 UNC	1.688	0.125	0.938	1.234	1.250	1.625	0.625
No.7	1/8 UNC	1.844	0.125	1.063	1.422	1.375	1.875	0.625
No.8	1 1/8-8 UN	2.063	0.125	1.188	1.594	1.500	1.875	0.625
No.9	1 1/4-8 UN	2.188	0.125	1.313	1.781	1.625	2.125 - 2.25	0.750
No.10	1 7/16-8 UN	2.438	0.125	1.500	2.000	1.813	2.125 - 2.25	0.750
No.11	1 9/16-8 UN	2.563	0.125	1.625	2.219	1.938	2.5 - 2.625	0.875

For SI: 1 inch = 25.4 mm



D108 Headed Dowel-In



D108A Headed Dowel Bar Splicer

Figure 5 – Headed Dowel Bar / Dowel In

* Deleted by City of Los Angeles