



SQRIM GROUPEC PRECAST SPLICING SYSTEM FOR STEEL REINFORCING BARS
Sumitomo Mitsui Construction Co.,Ltd. (SMCC)
2-1-6 Tsukuda, Chuo-ku,
Tokyo 104-0051 – Japan

CSI Division: 03 00 00—CONCRETE
CSI Section: 03 21 00—Reinforcing Steel

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:

- 2018, 2015, 2012, and 2009 International Building Code® (IBC)
- 2018, 2015, 2012, and 2009 International Residential Code® (IRC)

1.2 Evaluated in accordance with:

- ICC-ES AC133

1.3 Properties assessed:

- Structural

2.0 PRODUCT USE

The Sumitomo-Mitsui Quick RC Integration Method (SQRIM) Groutec Precast Splicing System is a mechanical splice for deformed steel reinforcing bars in reinforced concrete construction specifically used for the SQRIM full precast technology by SMCC to replace cast-in-place concrete construction. The systems comply with Section 25.5.7.1 of ACI 318-14 for the 2018 and 2015 IBC, and Section 12.14.3.2 of ACI 318-11 for the 2012 IBC (ACI 318-08 for the 2009 IBC) as tension and compression mechanical splices of deformed steel reinforcing bars. The systems also comply with Section 18.2.7.1 of ACI 318-14 for the 2018 and 2015 IBC, and Section 21.1.6.1 of ACI 318-11 for the 2012 IBC (ACI 318-08 for the 2009 IBC), as Type 1 and Type 2 mechanical splices. The SQRIM Groutec Precast Splicing System may also be used where an engineering design is submitted in accordance with Section R301.1.3 of the IRC.

3.0 PRODUCT DESCRIPTION

3.1 Product information: The SQRIM Groutec Precast Splicing System consists of cylindrical couplers and cementitious grout. Each coupler has a tubular profile with a threaded end, multiple internal ridges, and 1 inch diameter inlet port and 3/4-inch-diameter outlet port to receive the grout, as illustrated in Figure 1 of this report. The couplers are provided with plastic port plugs and a dust cap at

the unthreaded end. Optional accessories include a plastic threaded end cap, inlet pipes, and rubber port plugs.

Designed to splice 16 mm (No. 5), 20 mm (No. 6), 25 mm (No. 8), 28 mm (No. 9), 32 mm (No. 10), 36 mm (No. 11) and 40 mm (No. 12) diameter deformed reinforcing bars, the couplers receive the grout after the bars are placed into both ends.

3.2 Material information

3.2.1 Groutec Coupler:

The Groutec coupler is cast in one piece from steel conforming to Grade 65-45-12 and JIS FCD450-10 having a minimum tensile strength of 65,000 psi (450 MPa) and conforming to requirements specified for ASTM A536 and JIS G 5502.

3.2.2 MasterFlow® 870 SQRIM Grout: MasterFlow 870 SQRIM is a non-shrink, natural aggregate precision grout. The grout is packaged in 55 pound (25 kg) multi-ply paper sacks and has a shelf life of approximately 12 months when stored unopened in a cool dry place. The grout is to be used with the Dextra Groutec coupler. Storage, preparation, placement, and expiration date information shall comply with the instructions on the bags.

3.2.3 Reinforcing Bars: Reinforcing bars shall be uncoated, fishbone pattern, deformed steel bars complying with Thailand Standard TIS 24-2548 Grade SD50, ISO 6935-2 Grade B500B, with a minimum yield strength, F_y , of 71,000 psi (490 MPa), a minimum tensile strength, F_t , of 90,000 psi (620 MPa) and a minimum elongation of 13 percent, or ASTM A615 and A706 Grade 60 specifications.

4.0 DESIGN AND INSTALLATION

4.1 General

The SQRIM Groutec Precast Splicing System shall be designed and installed in accordance with the IBC and this evaluation report. Installation shall be limited to Exposure Category F0, as defined in Section 19.3.1 of ACI 318-14 and Section 4.2.1 of ACI 318-11 and -08. Applicable design and installation requirements set forth in Section 12.15 of ACI 318 for reinforcement in tension or Section 12.16 of ACI 318 for reinforcement in compression shall be observed. Installations in special moment frames and special structural walls shall comply with Section 18.2.7 of ACI 318-14 and Section 21.1.6 of ACI 318-11 and -08. The splice locations shall be detailed on plans approved by the building official. Concrete protection (cover) described in IBC Chapters 7 and 19, and Sections 7.6 and 7.7 of ACI 318 shall be measured from the outside of the coupler.

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.





4.2 Installation: All reinforcement shall be clean and free from loose rust, oils, dust, and other foreign material. All foreign matter and water shall be removed from the couplers. The threaded reinforcing bar first shall be installed onto the coupler so that no exposed threads result. The second reinforcing bar is then fully inserted into the opposite end of the coupler to the engagement length range provided in Table 1 of this report. Typical details for fitting the reinforcing bars and end uses in reinforced concrete are shown in Figures 2 and 3 of this report.

4.2.1 Grouting: The couplers shall be oriented such that the outlet port is no higher than the inlet port. The MasterFlow® 870 SQRIM grout shall be mixed with clean water to result in the specified water-cement ratio (w/c) of 0.13 to 0.17 by weight (liter/kg or gallons x 8.33/pound) for the duration as per the grout manufacturer's specification. Pot life shall not exceed 30 minutes as indicated in the grout manufacturer's instructions. Grout shall be proportioned to achieve a minimum compressive strength of 11.1 ksi (76 MPa) at 28 days as determined by testing on grout cube specimens in accordance with ASTM C109 and the sleeve manufacturer's recommendations.

Grout shall be poured or pumped into the coupler inlet (larger) port until material exits and flows freely from the outlet (smaller) port. Immediately after grout outflow is observed, and before the pump nozzle is removed, a rubber plug shall be inserted into the outlet grout tube. Immediately upon removal of the nozzle from the inlet grout tube, a rubber stopper shall be inserted into the inlet grout tube in such a manner so as to prevent leakage of grout from the sleeve. All spaces within the coupler shall be fully packed with the grout, and excess grout shall be removed.

4.2.2 Grouting Testing: Grout strength shall be determined by testing of 2-inch (50 mm) cube specimens in accordance with ASTM C109. The grout cubes shall be kept in a curing box for 24 hours and then kept under the same condition as the job site until the compressive strength testing.

4.3 Special Inspection

4.3.1 General: Special inspection is required in accordance with Section 1705 of the 2018, 2015, and 2012 IBC (Section 1704 of the 2009 IBC). In addition to verifying the installation of steel reinforcing bar splices in accordance with this report, the special inspector shall verify the grade and size of reinforcing bars; reinforcing bar embedment length; coupler identification; grout identification; field preparation of components; grout mixing, grouting, curing and testing; and assembly of the components resulting in spliced bars.

4.3.2 Threaded Bars: Threaded bars shall be threaded by a job site fabricator approved by Dextra and the by the building official. The job site fabricator shall demonstrate the following items to the satisfaction of the special inspector for each coupler type and steel reinforcing bar size:

- (i) The fabricator shall prepare the ends of the steel reinforcing bar in accordance with the Dextra Quality Manual for bar end preparation.
- (ii) For Type 2 splices, connections of each steel reinforcing bar using the fabricator-prepared steel reinforcing bars, tested in static tension, shall develop 100 percent of the specified tensile strength of the steel reinforcing bar and 125 percent of the specified yield strength of the reinforcing bar for use under the IBC or IRC. This may be demonstrated in test report(s) submitted to the building official. These tests shall be conducted prior to commencement, and periodically throughout the duration, of the job site preparation of the ends of the steel reinforcing bars. The frequency of the tensile tests shall be acceptable to the registered design professional for the building project, and the building official.
- (iii) For Type 1 splices, connections of each steel reinforcing bar using the fabricator-prepared steel reinforcing bars, tested in static tension, shall develop 125 percent of the specified yield strength of the steel reinforcing bar. This may be demonstrated in test report(s) submitted to the building official. These tests shall be conducted prior to commencement, and periodically throughout the duration, of the job site preparation of the ends of the steel reinforcing bars. The frequency of the tensile tests shall be acceptable to the registered design professional for the building project, and the building official.

5.0 LIMITATIONS

The 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 limitations:

5.1 The splice system shall be identified and installed in accordance with the applicable code, the manufacturer's instructions, and this report. In the event of a conflict between this report and the manufacturer's instructions, the more restrictive shall govern.

5.2 Installation shall be limited to Exposure Category F0, as defined in Section 19.3.1 of ACI 318-14 and Section 4.2.1 of ACI 318-11 and -08.



5.3 Special inspection shall be provided in accordance with Section 4.3 of this report.

5.4 The minimum concrete cover shall be in accordance with IBC Chapters 7 and 19, and Sections 7.6 and 7.7 of ACI 318, whichever is more restrictive and shall be measured from the outer surface of the splice connectors.

5.5 Splice locations shall comply with applicable IBC and ACI 318 requirements and be noted on plans approved by the building official.

5.6 Installations in special moment frames and special structural walls shall comply with Section 18.2.7 of ACI 318-14 and Section 21.1.6 of ACI 318-11 and -08.

5.7 Under the 2018 IBC, for structures regulated by Chapter 18 of ACI 318-14 (as required by 2018 IBC Section 1905.1), to splice uncoated, deformed reinforcing bars resisting 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, with the SQRIM Groutec Precast Splicing System, mill certificates of reinforcing bars shall be submitted to the building official and the special inspector as evidence that the steel reinforcing bars comply with ACI 318-14 Section 20.2.2.5.

5.8 Under the 2015 IBC, for structures regulated by Chapter 21 of ACI 318-14 (as required by 2015 IBC Section 1905.1), to splice uncoated, deformed reinforcing bars resisting 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, with the SQRIM Groutec Precast Splicing System, mill certificates of reinforcing bars shall be submitted to the building official and the special inspector as evidence that the steel reinforcing bars comply with ACI 318-14 Section 20.2.2.5.

5.9 Under the 2012 IBC, for structures regulated by Chapter 21 of ACI 318-11 (as required by 2012 IBC Section 1905.1), to splice uncoated, deformed reinforcing bars resisting 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, with the SQRIM Groutec Precast Splicing System, mill certificates of reinforcing bars shall be submitted to the building official and the special inspector as evidence that the steel reinforcing bars comply with ACI 318-11 Section 21.1.5.2.

5.10 Under the 2009 IBC, for structures regulated by Chapter 21 of ACI 318-08 (as required by 2009 IBC Section 1908.1), to splice uncoated, deformed reinforcing bars resisting earthquake-induced flexural and axial forces in

frame members, structural walls and coupling beams, with the SQRIM Groutec Precast Splicing System, mill certificates of reinforcing bars shall be submitted to the building official and the special inspector as evidence that the steel reinforcing bars comply with ACI 318-08 Section 21.1.5.2.

5.12 The SQRIM Groutec Precast Splicing System shall be used with MasterFlow 870 SQRIM nonshrink grout complying with Section 3.2.2 of this report only.

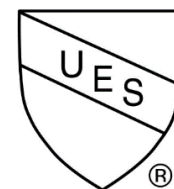
5.13 The use of SQRIM Groutec Precast Splicing System in fire-resistance-rated construction is outside the scope of this evaluation report.

6.0 SUBSTANTIATING DATA

Data in accordance with the ICC-ES Acceptance Criteria for Mechanical Connector Systems for Steel Reinforcing Bars (AC133), Approved August 2019.

7.0 IDENTIFICATION

Each Groutec Coupler is stamped with the coupler size designation, the production lot number, and the Dextra Coupler Systems mark or logo. Each crate of couplers has a shipping tag bearing the Dextra name and address, the product designation and size, the production lot number, the installation instructions, the UES Mark of Conformity, and the IAPMO UES evaluation report number (ER-780). Each bag of grout shall contain information as shown in Section 15 of ASTM C1107. The following Mark of Conformity shall be used as shown below:



IAPMO UES ER-780

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



TABLE 1—DIMENSIONS OF GROUTEC COUPLERS

Bar	A	B	C	D	E	Minimum rebar engagement Length	Maximum rebar engagement length
mm	m	mm	mm	mm	mm	Mm	mm
16 (No.5)	61	44	182	25	20	145	155
20 (No.6)	65	48	195	25	20	150	160
25 (No.8)	68	50	220	25	20	165	180
28 (No.9)	81	62	290	25	20	225	240
32 (No.10)	81	62	290	25	20	225	240
36 (No.11)	95	72	340	25	20	270	285
40 (No.12)	95	72	340	25	20	270	28

1 mm = 0.04 inch

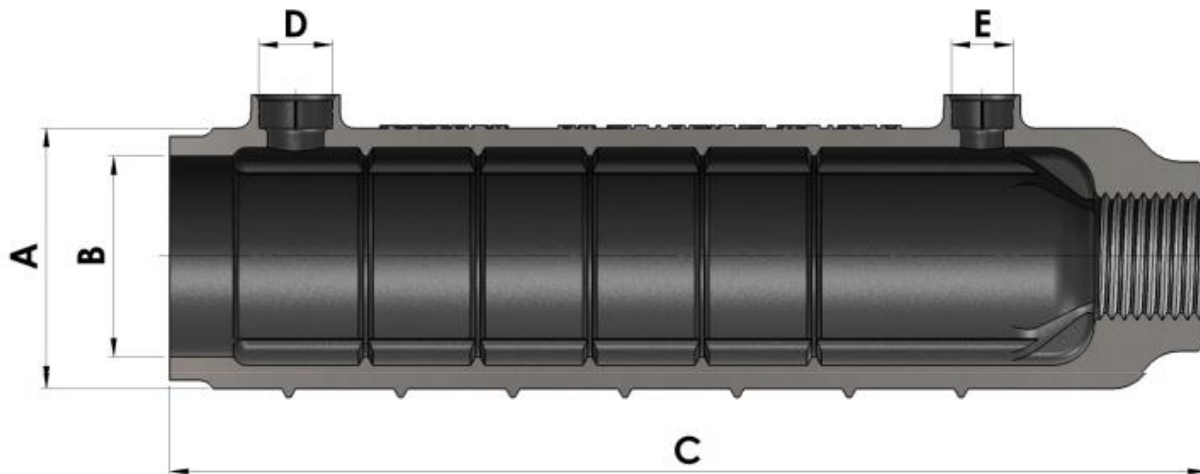


FIGURE 1—GROUTEC COUPLERS SECTIONAL VIEW

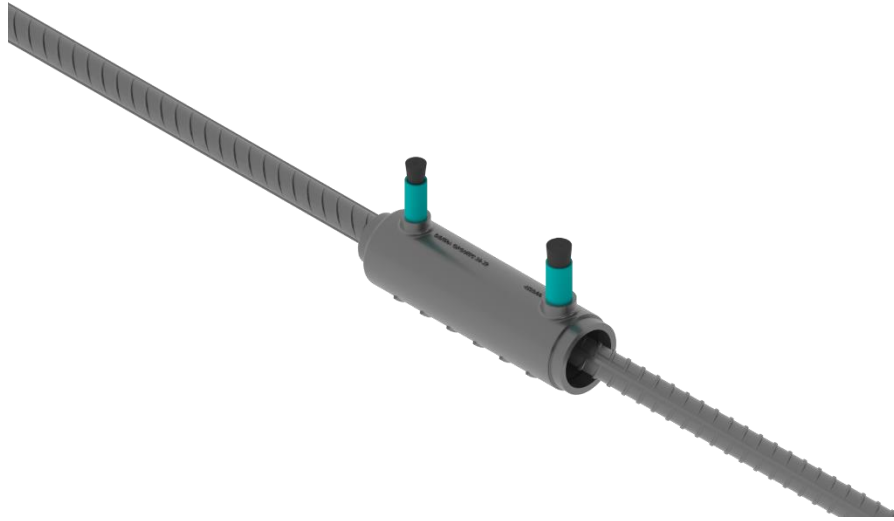


FIGURE 2—GROUTEC COUPLERS FITTED TO REINFORCING BARS

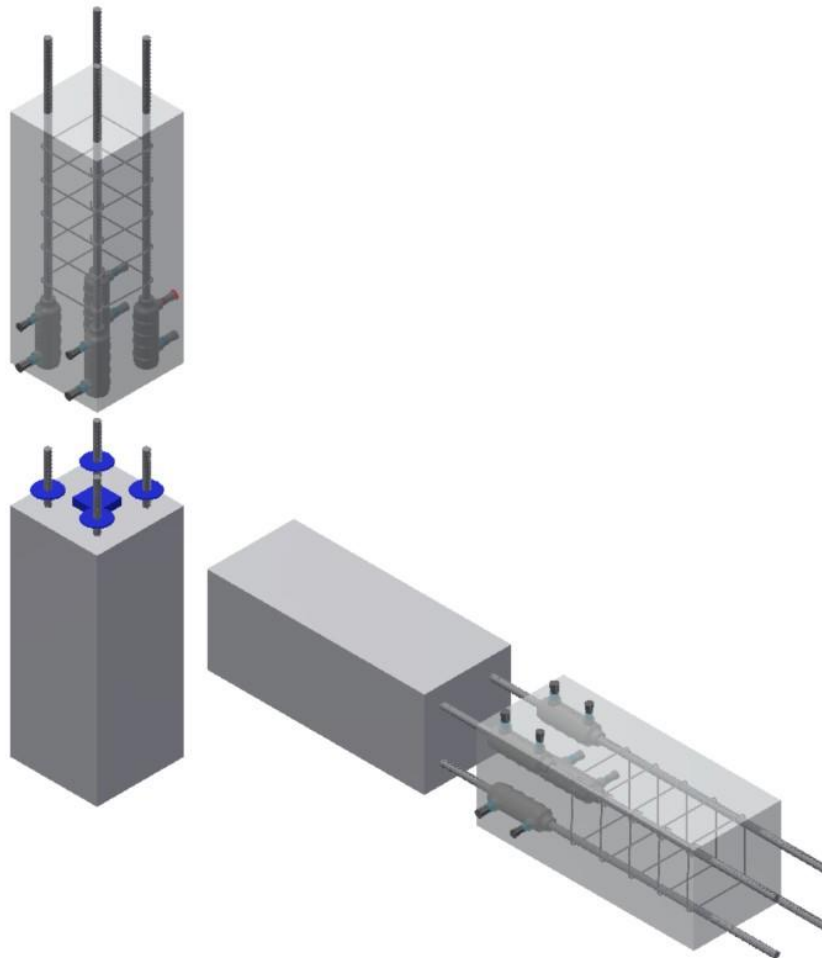


FIGURE 3—GROUTEC COUPLERS APPLICATIONS IN REINFORCED CONCRETE