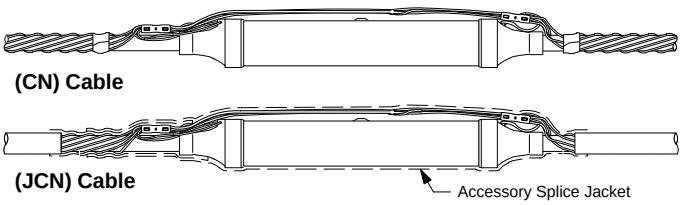
Quick Splice II

5451R

25/28 kV Molded Rubber Cable Repair Splicing Kit

Data Sheet



1. Product Description

The 3M™ 5451R Quick Splice II is a 25/28 kV class inline splice designed to serve as a cable repair for concentric neutral (CN) and jacketed concentric neutral (JCN) distribution class power cables. It is designed to replace up to 6 inches (152 mm) of damaged cable, thus eliminating the need to splice in a new section of cable with two separate splices.

The splice is a one-piece molded design made of specially formulated, peroxide cured EPDM rubbers. Each splice is production tested on CN cable to ensure reliability. The splice is designed for use with the special CIR–Series Inline Compression Connector provided, for connecting either aluminum or copper conductors. The 5451R Quick Splice II meets the 25 kV voltage rating requirements of ANSI/IEEE Std. 404–1986.

Kit Contents:

1 Molded rubber splice body

1 Connector (CIR–Series)

2 Packets of silicone grease

1 Template

1 Instruction sheet

Splice Features:

One-piece design, for simple installation

Elongated splice body, allows for the removal of up to 6″ (152 mm) of damaged cable

Special 3M CIR–Series repair connector, for a one-piece connection to bridge across the gap resulting from the removal of damaged cable

Production tested, partial discharge and alternating current withstand, for long term reliability

Peroxide cured EPDM rubber construction, for long term elastic memory (sealing) and easy installation

Computer designed, for compact size and optimal distribution of the electrical field

2. Applications

To make a repair splice on 25 kV and 28 kV class distribution cables:

For inline repair splicing of damaged cable

For cable repairs up to 6″ (152 mm) in length

For damaged concentric neutral (CN) cable

For damaged jacketed concentric neutral (JCN) cable (used with an accessory splice jacket, e.g. 3M SJ–A Series with additional 8420 Series Cold Shrink™ Insulator or 3M HSJ Series with additional ITCSN Series Heat Shrinkable Sleeve)

For fitting cable insulation diameter sizes of 0.870″ to 1.055″ (22,1 to 62,8 mm)

For direct burial installations

For aerial installations

For submerged locations

3. Data: Physical and Electrical Properties

The 3M 5451R Quick Splice II can be used on distribution class cables with a rated operating temperature of 90°C, and an emergency overload rating of 130°C. Splices made with this kit are rated for 25 kV and 28 kV and meet the 25 kV rating requirements of ANSI/IEEE Std. 404–1986, “IEEE Standard for Cable Joints for Use with Extruded Dielectric Cable Rated 5000 V through 46,000 V.” The current rating of the splice meets or exceeds the current rating for the cables on which it is installed. BIL rating of the splice is 200 kV.

A Special 3M CIR–A or CIR–840 Series connector is included with the splice kit. It is crimped with a standard 5/8 die or 840 die, respectively. These connectors meet the requirements of ANSI C119.4–1986, “Connectors for Use Between Aluminum or Aluminum-Copper Overhead Conductors.”

A. Selection Table

SPLICE KIT SELECTION TABLE

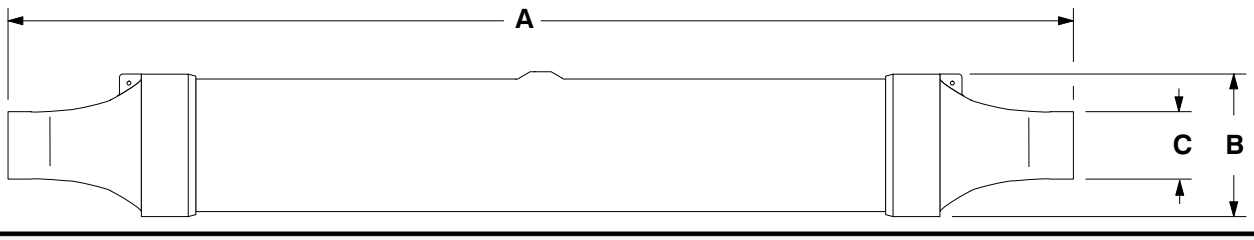
NOTE: Final determining factor is cable insulation diameter.

Kit Number (with connector)*	Cable Insulation (O.D. Range)*	Conductor Size (AWG)	Cable Insulation Thickness (mils)
5451R–CIR–21A	0,870 – 1.055 in. (22,1 – 26,8 mm)	2 or 1 Stranded 1 or 1/0 Solid	260 280 295
5451R–CIR–21–840	0,870 – 1.055 in. (22,1 – 26,8 mm)	2 or 1 Stranded 1 or 1/0 Solid	260 280 295
5451–CIR–1/0A	0,870 – 1.055 in. (22,1 – 26,8 mm)	1/0 Stranded	260 280 295
5451–CIR–1/0–840	0,870 – 1.055 in. (22,1 – 26,8 mm)	1/0 Stranded	260 280 295

*NOTE: CIR–A Series Connectors are sized for 5/8 crimping die;
CIR–840 Series Connectors are sized for 840 crimping die.

Table 1

B. Typical Dimensions



Dimension		
A	**B**	**C**
18.4 in. (467 mm)	2.47 in. (63 mm)	1.16 in. (29 mm)

Table 2

C. Typical Physical and Electrical Properties

Insulating EPDM Rubber

Physical Properties

Test Method	Typical Value*
• Color	White
• Ultimate Elongation ASTM D 412	570% min.
• Ultimate Tensile Strength ASTM D 412	900 psi min. (6.21 MPa min.)
• Shore A Hardness ASTM D 2240	55
• Permanent Set (3M Test Method: 100% strain with 5 min. recovery)	25%
• Compression Set ASTM D 395, Method B	19%
• 100% Modulus ASTM D 412	185 psi (1.28 MPa)
• 300% Modulus ASTM D 412	650 psi (4.49 MPa)

Electrical Properties

Test Method	Typical Value*
• Dielectric Constant ASTM D 150	
73°F (23°C)	2.71
194°F (90°C)	2.58
266°F (130°C)	2.56
• Dissipation Factor ASTM D 150	
73°F (23°C)	0.4%
194°F (90°C)	1.3%
266°F (130°C)	4.7%
• Dielectric Strength ASTM D 149	
25 mil thick slab	1177 Volts/mil (46.4 MV/m)
100 mil thick slab	518 Volts/mil (20.4 MV/m)
• 20 Days @ 96% RH and 194°F (90°C)	
25 mil thick slab	1066 Volts/mil (42.0 MV/m)
100 mil thick slab	790 Volts/mil (31.1 MV/m)

Splice Jacket Semi-Conductive Rubber

Physical Properties

Test Method	Typical Value*
• Color	Black
• Ultimate Elongation ASTM D 412	300% min.
• Ultimate Tensile Strength ASTM D 412	1700 psi min. (11.7 MPa min.)
• Shore A Hardness ASTM D 2240	70
• Die C Tear ASTM D 624	225 lbs/in min. (39.4 KN/m min.)
• Permanent Set (3M Test Method TM 86A)	20% max.
• 100% Modulus ASTM D 412	400 psi (2.8 MPa)
• 300% Modulus ASTM D 412	1800 psi (12.4 MPa)
• Ozone Resistance (70 hrs., 150 ppm @ 20% strain)	No Cracking
• UV Resistance (70 hrs. @ 20% strain)	No Cracking

Electrical Properties

Test Method	Typical Value*
• Volume Resistivity (3M Test Method TM 80)	15.4 Ohm–inch max. (40 Ohm–cm max.)

* This data is not to be used for specification. Values listed are for typical properties and should not be considered minimum or maximum.

4. Specification

Product

(Open Specification)

The concentric neutral (CN) and jacketed concentric neutral (JCN) cable repair splice must meet the requirements of ANSI/ IEEE Std. 404–1986 for a 25 kV rating, and must be rated by the manufacturer for use on 25 kV and 28 kV distribution systems. It must be rated for continuous operation at 90°C, with an emergency overload temperature rating of 130°C. The repair splice must be capable of replacing up to 6 inches (152 mm) of damaged CN or JCN cable. The splice shall be a one-piece, slip-on design made of molded peroxide cured EPDM rubber. It shall be rated for indoor, outdoor and direct burial applications.

Engineering/Architectural

(Closed Specification)

Repair splicing, for up to 6 inches (152 mm) of damaged cable length, of all 25 kV and 28 kV rated concentric neutral (CN) and jacketed concentric neutral (JCN) cables sized 2 AWG through 1/0, shall be performed in accordance with the instructions provided with the 3M 5451R Series Quick Splice II Molded Rubber Cable Repair Splicing Kit. For JCN applications, the splice shall be sealed with an additional jacket installed in accordance with the instructions provided with the 3M SJ–A Series Cold Shrink™ Jacket Kit, plus the addition of an 8420 Series Cold Shrink™ Insulator to provide for additional repair length.

5. Performance Tests

IEEE Std. 404–1986
25/28 kV Voltage Rating

Design Test and Sequence	Test Requirements	
	25 kV	28 kV*
Minimum Partial Discharge (Corona) Level (kV–rms @ <3 pC)	21.6	24.2
Alternating-Current 1 Minute Withstand (kV–rms)	52	58
Direct -Current 15 Minute Withstand (kV–dc)	100	112
Impulse Withstand (BIL) at 68°F (20°C) (kV–crest)	±150	±168
Impulse Withstand (BIL) at 266°F (130°C) (kV–crest)	±150	±168
Minimum Partial Discharge (Corona) Level (kV–rms @ <3 pC)	21.6	24.2
Cyclic Aging (kV–rms)	43	48
High Voltage Time 5 Hour Alternating-Current Withstand (kV–rms) 1 Hour Alternating-Current Withstand (kV–rms)	 52 78	 58 87
Short-Time Current (sec.) (ICEA P–32–382 and ANSI/IEEE C37.09–1979)	0.17	0.17
Alternating-Current 1 Minute Withstand (kV–rms)	52	58
Shielding	IEEE Std. 592–1990	
Connector Thermal and Mechanical	ANSI/NEMA CC3–1978 and ANSI C119.4–1986	
Production Test	**Test Requirements**	
Production Units Tested (%)	100	
Minimum Partial Discharge (Corona) Level (kV–rms @ <3 pC)	24.2	
Alternating-Current 1 Minute Withstand (kV-rms)	58	

* NOTE: 28 kV test requirement values are extrapolated from standard IEEE 404–1986 values.

Table 3

6. Installation Techniques

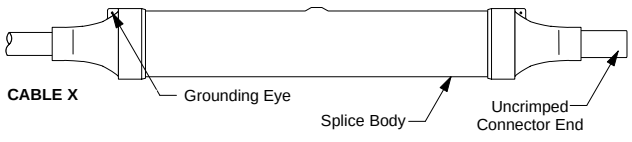
Detailed Instructions for installing the 5451R Quick Splice II are included with each kit. The following is a brief summary of the installation steps required:

a. Cut out damaged section of cable but do not exceed 6″ (152 mm).

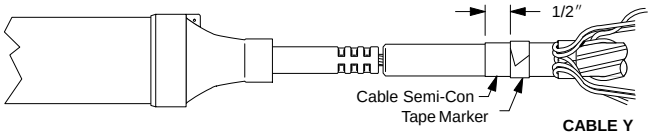
b. Fold neutral wires back and prepare cable.

c. Install CIR Connector onto one cable.

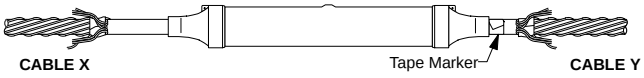
d. Lubricate connector and cable, and slide splice body onto connector until uncrimped end is exposed.



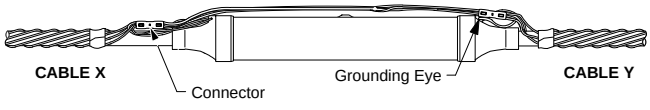
e. Connect other end of connector and place a tape marker 1/2″ (13 mm) from end of cable semi-con.



f. Lubricate exposed connector and cable. Center splice body over connector, aligning its end with the tape marker.

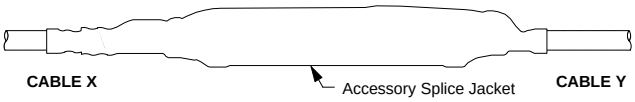


g. Join neutral wires, attaching one wire from each cable to the splice grounding eyes.



Installation Techniques *(continued)*

h. JCN Cables Only: Install accessory splice jacket over splice and exposed neutral wires.



7. Maintenance

Components of the 3M 5451R Quick Splice II Kit are stable under normal storage conditions. Normal stock rotation procedures are recommended. The splice can be field tested using normal field cable testing procedures (reference: ANSI/IEEE Std. 400, “Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field).”

8. Availability

3M 5451R Quick Splice II Kits are available to splice 25/28 kV CN and JCN distribution class cables. They are available in four kits, with the special CIR–Connector included, from your local authorized 3M electrical distributor.

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