Cable Splicing and Terminating, MV

4.5 Days, 3.2 CEUs

Solid dielectric power cable systems are subject to higher voltages than ever before. Inadequate installation and testing of cable splices and terminations is the number one cause of failure (IEEE Std 493-2007 Table 10-33). Yet over the last few decades, cable splicing as a profession has declined as multi-crafting and departmental merges have made it just a function among many. Proper installation of cable splices and terminations drastically improves the lifetime of cables, and prevents damage to downstream equipment and nearby personnel.

This hands-on course is intended for new or experienced electricians and technicians that install, maintain, repair or troubleshoot 5-35 kV solid dielectric power cables.

The student should have some field experience and basic knowledge of AC/DC electricity.

Lab and Classroom Attire

AVO is committed to the personal safety of each participant and requires safety glasses, long pants and ANSI rated "safety-toe" work shoes for lab activities. Lecture courses may involve a tour of a work or shop area and for this reason open-toe shoes and shorts are not considered appropriate attire for the classroom.

Learning Objectives:

To receive 3.2 CEUs, the participant must attend 4.5 days of class (32 contact hours) and attain a minimum average grade of 80% (overall grade will consist of 50% lab and 50% final exam). Upon completion of this course and lab practice, the participant will demonstrate that he/she is able to:

- Explain medium voltage cable components and construction.
- Identify applications of different cable types including marine, offshore, mining, underground (URD) and tech.
- Prepare cable for splicing utilizing hand tools, abrasives and solvents.
- Install taped, molded and heat shrink splices on tape-shielded and jacketed concentric (JCN) cables.
- Install taped, cold shrink, heat shrink and molded elbow terminations.
- Utilize a high potential tester for performing withstand tests on assembled splices.
- Identify the causes of splice and termination failures.
- Explain procedures for buried, duct and tray installation and relevant OSHA safety requirements.

SCOPE

Day 1* ***(7 contact hours)***

I. Introduction (0.5 hours)
- A. Schedule
- B. Course outline

II. Medium Voltage Splicing and Termination (1 hour)
- A. Material Technology
- B. Human Factors in Splicing
- C. Safety for Technicians
- D. Safety Rules

AM Break

III. Types, Application and Manufacture of Medium Voltage Cables (1.5 hours)
- A. Cable Types
- B. Application of Medium Voltage Cable
- C. Manufacturing of Medium Voltage Cable

IV. Medium Voltage Cable Components (3 hours)
- A. Conductor

Lunch
- B. Insulation
- C. Insulation Shield System
- D. Bedding Tape
- E. Jacket

PM Break
- F. How Solid Dielectric Cables are Made

V. Cable Installation and Handling (1 hour)
- A. Safety
- B. Environmental Protection

*Class scheduling times may vary based on discussions and size of class

AVO Training Institute is accredited by the International Association for Continuing Education and Training (IACET) and is accredited to issue the IACET CEU

Cable Splicing and Terminating, MV

4.5 Days, 3.2 CEUs

SCOPE (continued)

Day 2 ***(7 contact hours)***

V. Cable Installation and Handling (cont'd) (3.5 hr)

C. Light, Power, and Ventilation
D. Housekeeping

AM Break

E. Cable Handling
F. Direct Bury
G. Causes of Cable Failures

Lunch

VI. Cable Preparation (3.5 hours)

A. Safety
B. Hand Tools
C. Abrasives and Solvents

PM Break

D. Supplies and Materials
E. Knives and Cutting Tools Safety
F. Cable Preparation

Day 3 ***(7 contact hours)***

VII. Cable Splicing (7 hrs)

A. Application of Tapes
B. Making a Splice

AM Break

C. Corona
D. Soldering
E. Torch Safety Precautions

Lunch

F. Heat Shrink Splice
G. Molded Splice Installation

PM Break

H. Cable Splicing Labs
1. Tape Splice
2. Cold Shrink
3. Heat Shrink

Day 4 (7 ***contact hours)***

VIII. Cable Terminations (7 hours)

A. Classification of Terminations
B. Stress Control

AM Break

C. External Leakage Insulation
D. Basic Impulse Level
E. Seal to the External Environment

Lunch

F. Hand Taped Termination
G. Terminating URD Cable

PM Break

H. Cable Termination Labs
1. Tape Term
2. Cold Shrink Term
3. Molded Elbow
4. Heat Shrink Term

Day 5 (Half day) ***(4 contact hours)***

IX. Cable Testing (3 hours)

A. Testing Safety
B. DC Withstand

AM Break

C. VLF Withstand
D. VLF Withstand Test Lab

X. Conclusion (1 hour)

A. Review
B. Test

AVO Training Institute is accredited by the International Association for Continuing Education and Training (IACET) and is accredited to issue the IACET CEU

STANDARD EQUIPMENT LIST
CABLE SPLICING & TERMINATING, MEDIUM VOLTAGE

REVISED 10/10/17 BY: MARK FRANKS /RALPH CARILLO
COURSE NUMBER 130, REV3
4.5 DAYS

TEXT

1 / STUDENT	*CABLE SPLICING & TERMINATING, MEDIUM VOLTAGE* #130, REV3, JUNE 2018

SUPPLIES

10 FT/2 STUDENTS	1/0 15 KV CABLE EPR TAPE SHIELD (2 EA 5 FT PIECES)
15 FT/2 STUDENT	1/0 15 KV CABLE URD (3 EACH 5 FOOT PIECES)

1 / 2 STUDENTS LAB MATERIALS KIT

1 EACH	3M QUICK SPLICE II #5411A-C1-1/0 4 EACH 3M SPLICING CONNECTOR C1-1/0#11867
1 EACH	3M QT II 5641, UPC 11963, 2-2/0 AWG, 15 KV TERMINATION
1 EACH	3M LOADBREAK ELBOW 200AMP #5810-B-1/0
1 EACH	3M INLINE SPLICE KIT FOR TAPE SHIELDED 133% 220 MIL 1/0 #5718 UPC 12048
1 EACH	3M COLD SHRINK RE-JACKETING KIT 15 KV JCN, 1/0 220 MIL URD #SJ-1A
1 EACH	TYCO RAYCHEM HEAT SHRINK INLINE SPLICE #HVS-1511S-J
1 EACH	TYCO RAYCHEM HEAT SHRINK TERMINATION # HVT-Z-152-SJ
3 EACH	3M COMPRESSION LUG FOR TERMINATIONS (3M PART#40032)
1 EACH	ROLL SCOTCH 70 TAPE

MATERIALS & SPECIAL TOOL LIST

12/CLASS	CC-2 PREP KITS
1 / STUDENT	ROLLS OF 3M #35 YELLOW, RED, ORANGE, GREEN, BLUE, OR WHITE IN COLOR
1 / CLASS	FIRST AID KIT
1 / CLASS	EMMORY CLOTH #120 OR 150 GRIT - 1 ROLL
1 / CLASS	TUBE OF SILICONE (DOW CORNING 111)
2 / CLASS	LINT FREE SHOP TOWELS
1/ 2 STUDENTS	AIR SCRUBBER (DALLAS ONLY)
2 / CLASS	EXTRA LARGE (XL) FLAME RESISTANT SHIRTS
1 / CLASS	ROLL OF “DANGER HIGH VOLTAGE” BARRIER TAPE

STANDARD EQUIPMENT LIST
CABLE SPLICING & TERMINATING, MEDIUM VOLTAGE

MATERIALS & SPECIAL TOOL LIST (CONTINUED)

1 / 4 STUDENTS	TOOL BOX PER TOOL LIST (SEE SEPARATE LIST)
1 / 2 STUDENTS	SPEED SYSTEMS CABLE PREP TOOL KIT
2 / CLASS	MD-6 TOOL WITH DIE SET
2 / CLASS	ROLL OF SOLDER
2 / CLASS	SOLDERING PASTE
2 / CLASS	RAYCHEM TORCH
1 / 4 STUDENTS	PROPANE BOTTLES FOR RAYCHEM TORCH
1 / 2 STUDENTS	BANANA PEELER
1 / STUDENTS	SAFETY GLASSES
1 / STUDENT	CUT RESISTANT GLOVES (CORDOVA MONARCH BLACK, TAEKI5 #3752 (50% L & 50% XL)

TEST EQUIPMENT

1 / CLASS	VLF 45 KV 0.1 HZ TEST SET WITH LEADS
1 / CLASS	GROUNDING STICK WITH BLEED DOWN CAPABILITY
2 / CLASS	6 FT. BRAIDED BONDING/GROUNDING JUMPER
2 / CLASS	EXTENSION CORD
1 PR / CLASS	RUBBER GLOVES SIZE 10 (WITH CURRENT TEST DATE)
1 SET/2 STUDENTS	CABLE MOUNTING BRACKETS
1 / CLASS	LOT/CABLE DEMOS VARIOUS EXAMPLES OF CABLE SPLICING