



# Written Examination Study Guide

The NCSCB Inc. has been established for certification purposes only and therefore does not offer any preparatory training. However, this list of suggested training documents may help you know what to expect on the exam.





*The NCSCB Inc. has been founded to support, and work with, the cable splicing and related cable installation industries, professional, and stakeholders to develop and implement quality credentialing and certification programs for practitioners.*

## **About The NCSCB**

The NCSCB Inc. is a not for profit organization devoted to the development and administration of a Personnel Certification program for Medium Voltage cable splicers. The NCSCB Inc. was created in 2004 with representatives from utilities, contractors, manufacturers, organizations, Cable Splicers and others who are interested in affirming the KSA's (Knowledge, Skills, and Abilities) of workers who splice and terminate medium voltage electrical power cables.

Currently the certification consists of a written examination (See associated fees below) that focuses on common core knowledge of Medium Voltage cable, accessories and safety related topics. A performance or practical examination (See associated fees below) is also administered that requires the candidate to demonstrate core knowledge, skills and abilities common for medium voltage cable splicers working with shielded electrical power cables.

We presently offer three categories of splicing certifications:

Manufactured kits (splices and terminations)  
Hand-applied taping

Many experts agree that the vast majority of Medium Voltage cable and accessory related failures are due to poor workmanship. A properly administered certification program can help assure utilities, contractors, customers and the public that properly trained and equipped personnel will be handling and terminating the cables and components that make up a well engineered medium voltage distribution system. Certified personnel splicing and terminating medium voltage cables can also help to reduce SAIFI (System Average Interruption Frequency Index) used by most utilities as an indicator of system interruptions.

## **The Exam Process**

All individuals that splice or terminate medium voltage solid dielectric shielded power cables through 35kV. Certifications in PILC and higher voltage cables will be available soon.

The intended candidate for the NCSCB Inc. electrical power cable examinations works primarily as a construction/industrial or specialty electrician/lineman for an electrical utility or an electrical contractor (EC) engaged in network systems, underground distribution construction and maintenance, or commercial/industrial installations.

At least two (2) years work in the medium voltage shielded power cable industry. This can be, but not limited to, employment by an electric utility, contractor, engineering, or others in the industry.

The certification is good for a period of seven (7) years from the date of issuance, provided the Splicer maintains his or her NCSCB Inc. membership in good standing.

A core knowledge written examination will be given to applicants, typically in a group setting. Each examination will have approximately 100 questions and will follow a multiple-choice format.

There will be three (3) performance (practical hands-on) examinations offered. An individual can be certified in any category or in all three splicing categories. The categories consist of manufactured kits (splices and terminations), hand-applied taping, PILC splicing and terminating. The applicant, while being observed by examiners, will splice and/or terminate shielded electrical power cable according to a standardized testing process.

The examination has been developed by shielded power cable technical experts directly under the supervision of the American Institutes for Research (AIR) in Washington, D.C. There was national representation on the test development committees. In addition, care was taken to have a mix of utility, contractor, and manufacturer technical experts present in all test development meetings.

The NCSCB Inc. is developing all examinations for a candidate with a minimum of two years related electrical shielded power cable splicing experience. A comprehensive set of applicant materials will be issued explaining the knowledge subject areas that comprise the written examination, a bibliography of sources used in developing examination questions, a specialized glossary, and sample questions. The individual must be familiar with the various types of splices, terminations, and manufactured kits that are used in the industry.



## AMERICAN INSTITUTES FOR RESEARCH®

Knowledge's Captured on the National Cable Splicing Certification Program's Core Knowledge Exam

A. Electrical Theory	
1.	Knowledge of Ohm's Law and related formulas
2.	Knowledge of resistance/impedance and its effects
3.	Knowledge of inductance and capacitance
4.	Knowledge of series, parallel, and combination circuits
5.	Knowledge of direct current (DC) theory
6.	Knowledge of alternating current (AC) theory
7.	Knowledge of system configurations (e.g., delta, wye)
8.	Knowledge of ferro-resonance and its effects in underground systems
B. Grounding	
9.	Knowledge of the principles of grounding theory
10.	Knowledge of cable systems grounding requirements
11.	Knowledge of bonding
12.	Knowledge of how conditions affect grounding (e.g., atmospheric conditions, soil conditions, building materials)
13.	Knowledge of ground conductor routing (e.g., phase ground creepage, fault indicators, shield breaks)
C. Basic Math Principles	
14.	Knowledge of how to apply basic math and measurement principles (e.g., decimals, ratios, order of operations, fractions)
D. Safety	
15.	Knowledge of hazards of energized circuits
16.	Knowledge of personal protective grounding theory and practices
17.	Knowledge of first aid
18.	Knowledge of CPR
19.	Knowledge of emergency response procedures (e.g., manhole entry procedures, pole top rescue)
20.	Knowledge of appropriate OSHA safety regulations and standards
21.	Knowledge of jobsite safety requirements (e.g., contractor, customer)
22.	Knowledge of personal protective equipment (PPE)
23.	Knowledge of proper procedures when working with hazardous materials
E. Cable Properties	
24.	Knowledge of cable and cable components including their electrical/mechanical functions and ratings
25.	Knowledge of the care and handling of cable
26.	Knowledge of the common causes of cable and cable accessory failure
27.	Knowledge of how to avoid damaging cable and cable accessories
28.	Knowledge of cable phasing and rotation
29.	Knowledge of appropriate fire proofing procedures
30.	Knowledge of effective environmental sealing techniques
F. Cable Preparation	
31.	Knowledge of cutbacks and why, when, and how to make them
32.	Knowledge of why, when, and how to pencil insulation
G. Splices	
33.	Knowledge of types, parts, and properties of splices
34.	Knowledge of electric stress control in a splice
35.	Knowledge of how environmental conditions will affect splices
36.	Knowledge of how to build an effective environmental seal
37.	Knowledge of type, properties, and application of connectors
38.	Knowledge of common causes of splice failure and how to avoid them
H. Terminations	
39.	Knowledge of types, parts, and properties of terminations
40.	Knowledge of electric stress control in a termination (e.g., geometric, capacitive, resistive stress control)
41.	Knowledge of how environmental conditions will affect a termination
42.	Knowledge of how to build an effective environmental seal for a termination
43.	Knowledge of type, properties, and application of terminal connectors (e.g., pin terminals, lugs)
44.	Knowledge of tracking protection (e.g., external insulation between conductor and ground)
45.	Knowledge of common causes of termination failure and how to avoid
46.	Knowledge of the difference between load and dead break connectors
I. Splicing and Terminating Materials	
47.	Knowledge of types, properties, and appropriate application of tape
48.	Knowledge of basic type of kits, kit components, and appropriate applications
49.	Knowledge of the type, properties, and appropriate application of cable cleaners
50.	Knowledge of type, properties, and appropriate application of other cable splicing and terminating materials (e.g., silicone grease, potting compound, oxide inhibiting compounds, sealants)

**J. Diagrams and Drawings**

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| 51. | Knowledge of how to read and interpret blueprints/CAD drawings, including symbols and scales used |
| 52. | Knowledge of how to read and interpret schematic diagrams (e.g., circuit diagrams)                |
| 53. | Knowledge of how to read and interpret company, engineer, or manufacturer supplied instructions   |

**K. Tools and Equipment**

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| 54. | Knowledge of how to select and use tools and equipment |
| 55. | Knowledge of how to maintain tools and equipment       |

**L. Management of Cable Splicing and Terminating Tasks**

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| 56. | Knowledge of scope of job  |
| 57. | Knowledge of the design of the system circuits and equipment                           |
| 58. | Knowledge of how to select the appropriate splice, termination, or separable connector |

# **Exam Knowledge Areas**

The following table contains the distribution of knowledge domains within the written exam.

<b>Knowledge Area</b>	<b>Approximate Percent of Exam</b>
A. Electrical Theory B. Grounding C. Basic Math Principles D. Safety	<b>28-32%</b>
E. Cable Properties F. Cable Preparation	<b>22-26%</b>
G. Splices H. Terminations I. Splicing and Terminating Materials	<b>25-29%</b>
J. Diagrams and Drawings K. Tools and Equipment L. Management of Cable Splicing and Terminating Tasks	<b>17-21%</b>

The NCSCB strongly recommends that YOU prepare for the Core Knowledge Written Examination. Below is the Knowledge Topics that are covered on the examination. Also, a short list of reference materials follows.

## **KNOWLEDGE TOPICS TO BE ADDRESSED ON THE WRITTEN PORTION OF THE NCSCB TEST**

1. OSHA SAFETY Requirements
2. BASIC ELECTRICAL Theory, Formulas, Codes & Standards
3. DIELECTRIC THEORY
4. MEDIUM VOLTAGE Cable & CABLE Accessory Terminology
5. MEDIUM VOLTAGE Cable Applications
  - 5.1. SOLID DIELECTRIC
  - 5.2. PAPER INSULATED LEAD COVERED (PILC)
6. MEDIUM VOLTAGE CABLE ACCESSORY APPLICATIONS
  - 6.1. PRE-MOLDED
  - 6.2. HEAT & COLD SHRINK
  - 6.3. TAPED
7. BASIC ELECTRIC System Operation
8. JOB Planning & Execution

## **A partial list of Suggested Reference Materials for the NCSCB Core Knowledge Written Examination**

ANSI C119.4

IEEE 48, 386, 404, 1215, 1637

ICEA S-94-649 & S-97-682

CABLE ACCESSORY INSTALLATION INSTRUCTIONS from Manufacturers

HANDBOOKS & MANUALS From Cable Manufacturers

*CRC ELECTRICAL ENGINEERING Handbook*

OSHA 1910.269, 1926 SUBPART V

NEC®

NESC®

NFPA 70E® and NFPA 70F®

*LINEMAN'S and CABLEMAN'S Handbook*