American Electrical Institute

2021 NFPA 70E Chapter 1, 2, & 3

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ANSWER SHEET • 2021 NFPA 70E Chapter 1, 2, & 3 - Oregon

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11.	Ⓐ Ⓑ Ⓒ Ⓓ	36.	Ⓐ Ⓑ Ⓒ Ⓓ	61.	Ⓐ Ⓑ Ⓒ Ⓓ	86.	Ⓐ Ⓑ Ⓒ Ⓓ
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14.	Ⓐ Ⓑ Ⓒ Ⓓ	39.	Ⓐ Ⓑ Ⓒ Ⓓ	64.	Ⓐ Ⓑ Ⓒ Ⓓ	89.	Ⓐ Ⓑ Ⓒ Ⓓ
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16.	Ⓐ Ⓑ Ⓒ Ⓓ	41.	Ⓐ Ⓑ Ⓒ Ⓓ	66.	Ⓐ Ⓑ Ⓒ Ⓓ	91.	Ⓐ Ⓑ Ⓒ Ⓓ
17.	Ⓐ Ⓑ Ⓒ Ⓓ	42.	Ⓐ Ⓑ Ⓒ Ⓓ	67.	Ⓐ Ⓑ Ⓒ Ⓓ	92.	Ⓐ Ⓑ Ⓒ Ⓓ
18.	Ⓐ Ⓑ Ⓒ Ⓓ	43.	Ⓐ Ⓑ Ⓒ Ⓓ	68.	Ⓐ Ⓑ Ⓒ Ⓓ	93.	Ⓐ Ⓑ Ⓒ Ⓓ
19.	Ⓐ Ⓑ Ⓒ Ⓓ	44.	Ⓐ Ⓑ Ⓒ Ⓓ	69.	Ⓐ Ⓑ Ⓒ Ⓓ	94.	Ⓐ Ⓑ Ⓒ Ⓓ
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V.1

NFPA 70e Chapters 1,2, and 3

105.1 Scope.
Chapter **1** covers electrical safety-related work practices and procedures for employees who are exposed to an electrical hazard in workplaces covered in the scope of this standard.

105.2 Purpose.
These practices and procedures are intended to provide for employee safety relative to electrical hazards in the workplace.

Informational Note: For general categories of electrical hazards, see Informative Annex K.

105.3 Responsibility.
(A) Employer Responsibility.
The employer shall have the following responsibilities:
(1) Establish, document, and implement the safety-related work practices and procedures required by this standard.
(2) Provide employees with training in the employer's safety-related work practices and procedures.

(B) Employee Responsibility.
The employee shall comply with the safety-related work practices and procedures provided by the employer.

105.5 Organization.
Chapter **1** of this standard is divided into five articles. Article **100** provides definitions for terms used in one or more of the chapters of this document. Article **105** provides for application of safety-related work practices and procedures. Article **110** provides general requirements for electrical safety-related work practices and procedures. Article **120** provides requirements for establishing an electrically safe work condition. Article **130** provides requirements for work involving electrical hazards.

Quiz Questions

1) What chapter in this document applies to electrical safety-related work practices and procedures for employees who are exposed to an electrical hazard in workplaces?
A) Chapter 1
B) Chapter 2
C) Chapter 3
D) Chapter 4

2) What Annex in this document applies to general categories of electrical hazards?
A) L
B) K
C) F
D) R

3) Whose responsibility is it to provide employees with training in the employer's safety-related work practices and procedures and establish, document, and implement the safety-related work practices and procedures required by this standard?
A) Site management company
B) Employee Responsibility
C) Employer Responsibility
D) The hazard specific entity

4) The employee _____ comply with the safety-related work practices and procedures provided by the employer.
A) Optionally can
B) May
C) Shall not
D) Shall

5) How many articles is chapter 1 divided into?
A) 5
B) 4
C) 6
D) 7

6) What Article provides definitions for terms used in one or more of the chapters of this document?
A) 105
B) 100
C) 110
D) 120

7) What Article provides for application of safety-related work practices and procedures?
A) 110
B) 100
C) 105
D) 120

8) What Article provides general requirements for electrical safety-related work practices and procedures?
A) 120
B) 100
C) 105
D) 110

9) What Article provides requirements for establishing an electrically safe work condition?
A) 120
B) 100
C) 105
D) 110

10) What Article provides requirements for work involving electrical hazards?
A) 110
B) 120
C) 105
D) 130

110.1 Priority.
Hazard elimination shall be the first priority in the implementation of safety-related work practices.

Informational Note No. 1: Elimination is the risk control method listed first in the hierarchy of risk control identified in 110.5(H)(3). See Annex F for examples of hazard elimination.

Informational Note No. 2: An electrically safe work condition is a state wherein all hazardous electrical conductors or circuit parts to which a worker might be exposed are placed and maintained in a de-energized state, for the purpose of temporarily eliminating electrical hazards. See Article 120 for requirements to establish an electrically safe work condition for the period of time for which the state is maintained. See Informative Annex F for information regarding the hierarchy of risk control and hazard elimination.

110.2 General.
Electrical conductors and circuit parts shall not be considered to be in an electrically safe work condition until all of the requirements of Article **120** have been met.

Safe work practices applicable to the circuit voltage and energy level shall be used in accordance with Article 110 and Article 130 until such time that electrical conductors and circuit parts are in an electrically safe work condition.

Informational Note: See **120.5** for the steps to establish and verify an electrically safe work condition.

110.3 Electrically Safe Work Condition.
Energized electrical conductors and circuit parts operating at voltages equal to or greater than 50 volts shall be put into an electrically safe work condition before an employee performs work if any of the following conditions exist:

(1) The employee is within the limited approach boundary.
(2) The employee interacts with equipment where conductors or circuit parts are not exposed but an increased likelihood of injury from an exposure to an arc flash hazard exists.

110.4 Energized Work.

(A) Additional Hazards or Increased Risk.
Energized work shall be permitted where the employer can demonstrate that de-energizing introduces additional hazards or increased risk.

Informational Note: Examples of additional hazards or increased risk include, but are not limited to, interruption of life-support equipment, deactivation of emergency alarm systems, and shutdown of hazardous location ventilation equipment.

(B) Infeasibility.
Energized work shall be permitted where the employer can demonstrate that the task to be performed is infeasible in a de-energized state due to equipment design or operational limitations.

Informational Note: Examples of work that might be performed within the limited approach boundary of exposed energized electrical conductors or circuit parts because of infeasibility due to equipment design or operational limitations include performing diagnostics and testing (for example, start-up or troubleshooting) of electric circuits that can only be performed with the circuit energized and work on circuits that form an integral part of a continuous process that would otherwise need to be completely shut down in order to permit work on one circuit or piece of equipment.

(C) Equipment Operating at Less Than 50 Volts.
Energized electrical conductors and circuit parts that operate at less than 50 volts shall not be required to be de-energized where the capacity of the source and any overcurrent protection between the energy source and the worker are considered and it is determined that there will be no increased exposure to electrical burns or to explosion due to electric arcs.

(D) Normal Operating Condition.
Normal operation of electric equipment shall be permitted where a normal operating condition exists. A normal operating condition exists when all of the following conditions are satisfied:

(1) The equipment is properly installed.
(2) The equipment is properly maintained.
(3) The equipment is used in accordance with instructions included in the listing and labeling and in accordance with manufacturer's instructions.
(4) The equipment doors are closed and secured.
(5) All equipment covers are in place and secured.
(6) There is no evidence of impending failure.

Informational Note: The phrase properly installed means that the equipment is installed in accordance with applicable industry codes and standards and the manufacturer's

recommendations. The phrase properly maintained means that the equipment has been maintained in accordance with the manufacturer's recommendations and applicable industry codes and standards. The phrase evidence of impending failure means that there is evidence such as arcing, overheating, loose or bound equipment parts, visible damage, or deterioration.

Quiz Questions

11) What is the first priority in the implementation of safety-related work practices?
A) A note pad
B) Hazard elimination
C) PPE
D) Job analysis data sheet

12) What Annex has examples of hazard elimination?
A) F
B) L
C) K
D) R

13) Electrical conductors and circuit parts shall not be considered to be in an electrically safe work condition until all of the requirements of Article _____ have been met.
A) 115
B) 110
C) 105
D) 120

14) At what voltage are energized electrical conductors and circuits required to be put in an electrically safe working condition when an employee is within a limited approach boundary?
A) 12 volts and above
B) 50 volts and above
C) 24 volts and above
D) 36 volts and above

15) When might energized electrical work be conducted due to the risk of turning off a circuit?
A) If the circuit supplies ventilation equipment
B) If the circuit supplies life-support equipment
C) If the circuit supplies emergency alarm systems
D) All listed answers

16) Energized work shall be permitted where the employer can _____that the task to be performed is infeasible in a de-energized state due to equipment design or operational limitations.
A) Authorize
B) Demand
C) Demonstrate
D) Instruct

17) In general, at what voltage do conductors not need to be de-energized to perform work on the system?
A) 50 volts or less
B) 49 volts or less
C) 51 volts or less
D) 60 volts or less

18) How many conditions must be met to be considered a normal operating system?
A) 4
B) 5
C) 6
D) 7

19) What phrase best defines when equipment is installed in accordance with applicable industry codes and standards and the manufacturer's recommendations?
A) Inspected
B) Properly maintained
C) New Installation
D) Properly installed

110.5 Electrical Safety Program.
(A) General.
The employer shall implement and document an overall electrical safety program that directs activity appropriate to the risk associated with electrical hazards.

Informational Note No. 1: Safety-related work practices such as verification of proper maintenance and installation, alerting techniques, auditing requirements, and training requirements provided in this standard are administrative controls and part of an overall electrical safety program.

Informational Note No. 2: See Informative Annex P for information on implementing an electrical safety program within an employer's occupational health and safety management system.

Informational Note No. 3: IEEE 3007.1, Recommended Practice for the Operation and Management of Industrial and Commercial Power Systems, provides additional guidance for the implementation of the electrical safety program.

Informational Note No. 4: IEEE 3007.3, Recommended Practice for Electrical Safety in Industrial and Commercial Power Systems, provides additional guidance for electrical safety in the workplace.

(B) Inspection.
The electrical safety program shall include elements to verify that newly installed or modified electrical equipment or systems have been inspected to comply with applicable installation codes and standards prior to being placed into service.

(D) Awareness and Self-Discipline.
The electrical safety program shall be designed to provide an awareness of the potential electrical hazards to employees who work in an environment with the presence of electrical hazards. The program shall be developed to provide the required self-discipline for all employees who must perform work that may involve electrical hazards. The program shall instill safety principles and controls.

(E) Electrical Safety Program Principles.
The electrical safety program shall identify the principles upon which it is based.

Informational Note: For examples of typical electrical safety program principles, see Informative Annex E.

(1) Elements of a Risk Assessment Procedure.
The risk assessment procedure shall address employee exposure to electrical hazards and shall identify the process to be used before work is started to carry out the following:
(1) Identify hazards
(2) Assess risks
(3) Implement risk control according to the hierarchy of risk control methods

Informational Note No. 1: The risk assessment procedure could include identifying when a second person could be required and the training and equipment that person should have.

Informational Note No. 2: For more information regarding risk assessment and the hierarchy of risk control, see Informative Annex F.

(2) Human Error.
The risk assessment procedure shall address the potential for human error and its negative consequences on people, processes, the work environment, and equipment relative to the electrical hazards in the workplace.

Informational Note: The potential for human error varies with factors such as tasks and the work environment. See Informative Annex Q.

(3) Hierarchy of Risk Control Methods.
The risk assessment procedure shall require that preventive and protective risk control methods be implemented in accordance with the following hierarchy:
(1) Elimination
(2) Substitution
(3) Engineering controls
(4) Awareness
(5) Administrative controls
(6) PPE

Informational Note No. 1: Elimination, substitution, and engineering controls are the most effective methods to reduce risk as they are usually applied at the source of possible injury or damage to health and they are less likely to be affected by human error. Awareness, administrative controls, and PPE are the least effective methods to reduce risk as they are not applied at the source and they are more likely to be affected by human error.

Informational Note No. 2: See Informative Annex F for more information regarding the hierarchy of risk control methods and examples of those methods.

Quiz Questions

20) Who is responsible to implement and document an overall electrical safety program that directs activity appropriate to the risk associated with electrical hazards?
A) Employer
B) Employee
C) Owner
D) Construction management company

21) What Informative Annex has information on implementing an electrical safety program within an employer's occupational health and safety management system?
A) B
B) Q
C) L
D) P

22) The _____ shall include elements to verify that newly installed or modified electrical equipment or systems have been inspected to comply with applicable installation codes and standards prior to being placed into service.
A) Electrical maintenance program
B) Electrical safety program
C) Electrical program
D) Safety program

23) An electrical safety program shall be developed to provide the required _____ for all employees who must perform work that may involve electrical hazards.
A) Procedures
B) Self-discipline
C) Steps
D) Items

24) What Informative Annex has examples of typical electrical safety program principles?
A) D
B) F
C) C
D) E

25) How many elements of a risk assessment procedure are listed to complete?
A) 3
B) 5
C) 2
D) 6

26) What Informative Annex has information regarding risk assessment and the hierarchy of risk control?
A) E
B) F
C) Q
D) B

27) What informative annex has information regarding the potential for human error and contains factors such as tasks and the work environment?
A) B
B) E
C) F
D) Q

28) What are some examples of protective risk control method hierarchy?
A) Awareness
B) Administrative controls
C) Substitution
D) All listed answers

29) What informative annex has information regarding the hierarchy of risk control methods and examples of those methods?
A) Q
B) E
C) F
D) B

(I) Job Safety Planning and Job Briefing.
Before starting each job that involves exposure to electrical hazards, the employee in charge shall complete a job safety plan and conduct a job briefing with the employees involved.

(1) Job Safety Planning.
The job safety plan shall be in accordance with the following:
(1) Be completed by a qualified person
(2) Be documented
(3) Include the following information:
a. A description of the job and the individual tasks
b. Identification of the electrical hazards associated with each task
c. A shock risk assessment in accordance with 130.4 for tasks involving a shock hazard
d. An arc flash risk assessment in accordance with 130.5 for tasks involving an arc flash hazard
e. Work procedures involved, special precautions, and energy source controls

(2) Job Briefing.
The job briefing shall cover the job safety plan and the information on the energized electrical work permit, if a permit is required.

(3) Change in Scope.
Additional job safety planning and job briefings shall be held if changes occur during the course of the work that might affect the safety of employees.

(J) Incident Investigations.
The electrical safety program shall include elements to investigate electrical incidents.

Informational Note: Electrical incidents include events or occurrences that result in, or could have resulted in, a fatality, an injury, or damage to health. Incidents that do not result in fatality, injury, or damage to health are commonly referred to as a "close call" or "near miss."

(K) Electrically Safe Work Condition Policy.
An electrical safety program shall include an electrically safe work condition policy that complies with **110.3**.

(L) Lockout/Tagout Program.
The electrical safety program shall include the information required by one of the following:
(1) A lockout/tagout program in accordance with **120.1(A)**
(2) A reference to the employer's lockout/tagout program established in accordance with **120.1(A)**

(M) Auditing.
(1) Electrical Safety Program Audit.
The electrical safety program shall be audited to verify that the principles and procedures of the electrical safety program are in compliance with this standard. Audits shall be performed at intervals not to exceed 3 years.

(2) Field Work Audit.
Field work shall be audited to verify that the requirements contained in the procedures of the electrical safety program are being followed. When the auditing determines that the principles and procedures of the electrical safety program are not being followed, the appropriate revisions to the training program or revisions to the procedures shall be made. Audits shall be performed at intervals not to exceed 1 year.

(3) Lockout/Tagout Program and Procedure Audit.
The lockout/tagout program and procedures required by Article **120** shall be audited by a qualified person at intervals not to exceed 1 year. The audit shall cover at least one lockout/tagout in progress. The audit shall be designed to identify and correct deficiencies in the following:
(1) The lockout/tagout program and procedures
(2) The lockout/tagout training
(3) Worker execution of the lockout/tagout procedure

(4) Documentation.
The audits required by **110.5(M)** shall be documented.

Quiz Questions

30) Before starting each job that involves exposure to electrical hazards, what is the person in charge required to complete?
A) A job safety plan and conduct a job briefing with the employees involved
B) Lock out tag out
C) Provide a lock box
D) All listed answers

31) What happens if changes occur with your work scope after a job safety plan and job briefing has been given that involves exposure to electrical hazards?
A) Provide an additional lock box
B) A new lock out tag out
C) A new job safety plan and job briefing with the employees involved must be given
D) All listed answers

32) What are some types of electrical incidents?
A) Damage to health
B) A fatality
C) An injury
D) All listed answers

33) What section is an electrical safety program that includes an electrically safe work condition policy required to comply with?
A) 105
B) 120.1(A)
C) 110.3
D) 115.3

34) What section does an electrical lockout/tagout program need to be developed accordance with?
A) 120.1(A)
B) 110.3
C) 105
D) 115.3

35) What is the maximum period allowed before auditing your electrical safety program?
A) 3 months
B) 3 years
C) 6 years
D) 1 year

36) What is the maximum period allowed before doing a field audit?
A) 6 years
B) 3 months
C) 1 year
D) 3 years

37) What does 110.5(M) require an audit to be?
A) Witnessed
B) Verified
C) Documented
D) All listed answers

110.6 Training Requirements.
(A) Electrical Safety Training.
The training requirements contained in **110.6(A)** shall apply to employees exposed to an electrical hazard when the risk associated with that hazard is not reduced to a safe level by the applicable electrical installation requirements. Such employees shall be trained to understand the specific hazards associated with electrical energy. They shall be trained in safety-related work practices and procedural requirements, as necessary, to provide protection from the electrical hazards associated with their respective job or task assignments. Employees shall be trained to identify and understand the relationship between electrical hazards and possible injury.

Informational Note: For further information concerning installation requirements, see NFPA 70, National Electrical Code.

(1) Qualified Person.
A qualified person shall be trained and knowledgeable in the construction and operation of equipment or a specific work method and be trained to identify and avoid the electrical hazards that might be present with respect to that equipment or work method.
(a) Such persons shall also be familiar with the proper use of the special precautionary techniques, applicable electrical policies and procedures, PPE, insulating and shielding materials, and insulated tools and test equipment.
(b) A person can be considered qualified with respect to certain equipment and tasks but still be unqualified for others.
(c) Such persons permitted to work within the limited approach boundary shall, at a minimum, be additionally trained in all of the following:
(1) Skills and techniques necessary to distinguish exposed energized electrical conductors and circuit parts from other parts of electrical equipment
(2) Skills and techniques necessary to determine the nominal voltage of exposed energized electrical conductors and circuit parts
(3) Approach distances specified in Table 130.4(E)(a) and Table 130.4(E)(b) and the corresponding voltages to which the qualified person will be exposed
(4) Decision-making process necessary to be able to do the following:
a. Perform the job safety planning
b. Identify electrical hazards
c. Assess the associated risk
d. Select the appropriate risk control methods from the hierarchy of controls identified in 110.5(H)(3), including PPE
(d) An employee who is undergoing on-the-job training for the purpose of obtaining the skills and knowledge necessary to be considered a qualified person, and who in the course of such training demonstrates an ability to perform specific duties safely at his or her level of training, and who is under the direct supervision of a qualified person shall be considered to be a qualified person for the performance of those specific duties.
(e) Employees shall be trained to select an appropriate test instrument and shall demonstrate how to use a device to verify the absence of voltage, including interpreting indications provided

by the device. The training shall include information that enables the employee to understand all limitations of each test instrument that might be used.
(f) The employer shall determine through regular supervision or through inspections conducted on at least an annual basis that each employee is complying with the safety-related work practices required by this standard.

(2) Unqualified Persons.
Unqualified persons shall be trained in, and be familiar with, any electrical safety-related practices necessary for their safety.

(3) Additional Training and Retraining.
Additional training and retraining in safety-related work practices and applicable changes in this standard shall be performed at intervals not to exceed 3 years. An employee shall receive additional training or retraining if any of the following conditions exists:
(1) The supervision or annual inspections indicate the employee is not complying with the safety-related work practices.
(2) New technology, new types of equipment, or changes in procedures necessitate the use of safety-related work practices different from those that the employee would normally use.
(3) The employee needs to review tasks that are performed less often than once per year.
(4) The employee needs to review safety-related work practices not normally used by the employee during regular job duties.
(5) The employee's job duties change.

Quiz Questions

38) What section has the training requirements that apply to employees exposed to an electrical hazard when the risk associated with that hazard is not reduced to a safe level by the applicable electrical installation requirements?
A) 110.6(A)
B) 110.5(M)
C) 120
D) 120.5

39) What best defines a person that is trained and knowledgeable in the construction and operation of equipment or a specific work method and be trained to identify and avoid the electrical hazards that might be present with respect to that equipment or work method?
A) Qualified person
B) Foreman
C) supervisor
D) Employer

40) What is the maximum period allowed before employees require additional training and retraining in safety-related work practices?
A) 3 months
B) 3 years
C) 6 years
D) 1 year

(4) Type of Training.
The training required by 110.6(A) shall be classroom, on-the-job, or a combination of the two. The type and extent of the training provided shall be determined by the risk to the employee.

Informational Note: Classroom training can include interactive electronic or interactive web-based training components.

(5) Electrical Safety Training Documentation.
The employer shall document that each employee has received the training required by **110.6(A)**. This documentation shall be in accordance with the following:

(1) Be made when the employee demonstrates proficiency in the work practices involved
(2) Be retained for the duration of the employee's employment
(3) Contain the content of the training, each employee's name, and dates of training

Informational Note No. 1: Content of the training could include one or more of the following: course syllabus, course curriculum, outline, table of contents, or training objectives.

Informational Note No. 2: Employment records that indicate that an employee has received the required training are an acceptable means of meeting this requirement.

(B) Lockout/Tagout Procedure Training.
(1) Initial Training.
Employees involved in the lockout/tagout procedures required by 120.2(B) shall be trained in the following:
(1) The lockout/tagout procedures
(2) Their responsibility in the execution of the procedures

(2) Retraining.
Retraining in the lockout/tagout procedures shall be performed as follows:
(1) When the procedures are revised
(2) At intervals not to exceed 3 years
(3) When supervision or annual inspections indicate that the employee is not complying with the lockout/tagout procedures

(3) Lockout/Tagout Training Documentation.
(a) The employer shall document that each employee has received the training required by **110.6(B)**.
(b) The documentation shall be made when the employee demonstrates proficiency in the work practices involved.
(c) The documentation shall contain the content of the training, each employee's name, and the dates of the training.
Informational Note:

Content of the training could include one or more of the following: course syllabus, course curriculum, outline, table of contents, or training objectives.

(C) Emergency Response Training.

(1) Contact Release.

Employees exposed to shock hazards and those responsible for the safe release of victims from contact with energized electrical conductors or circuit parts shall be trained in methods of safe release. Refresher training shall occur annually.

(2) First Aid, Emergency Response, and Resuscitation.

(a) Employees responsible for responding to medical emergencies shall be trained in first aid and emergency procedures.

(b) Employees responsible for responding to medical emergencies shall be trained in cardiopulmonary resuscitation (CPR).

(c) Employees responsible for responding to medical emergencies shall be trained in the use of an automated external defibrillator (AED) if an employer's emergency response plan includes the use of this device.

(d) Training shall occur at a frequency that satisfies the requirements of the certifying body.

Informational Note: Employees responsible for responding to medical emergencies might not be first responders or medical professionals. Such employees could be a second person, a safety watch, or a craftsperson.

Quiz Questions

41) how does the training required by 110.6(A) the training to be done?
A) A combination of the two
B) Classroom
C) On-the-job
D) All listed answers

42) Who is responsible for documenting that the required training in 110.6(A) for each employee has been done?
A) supervisor
B) Foreman
C) Employer
D) Qualified person

43) What section requires training employees involved in the lockout/tagout procedures and their responsibility in the execution of those procedures?
A) 120.6(B)
B) 116.6(B)
C) 120.2(B)
D) 150.6(B)

44) After you have been trained on lockout/tagout procedures, when is supplemental training required?
A) When supervision or annual inspections indicate that the employee is not complying with the lockout/tagout procedures
B) When the procedures are revised
C) At intervals not to exceed 3 years
D) All listed answers

45) Who is responsible for documenting that the required training in 110.6(B) for each employee has been done?
A) Employer
B) Foreman
C) supervisor
D) Qualified person

46) How often is refresher training required to occur for those responsible in the safe release of victims from contact with energized electrical conductors or circuit parts?
A) Annually
B) At intervals not to exceed 3 years
C) When the procedures are revised
D) All listed answers

47) What are employees responsible for responding to medical emergencies required to be trained in?
A) Automated external defibrillator (AED)
B) Cardiopulmonary resuscitation (CPR)
C) First aid and emergency procedures
D) All listed answers

(3) Training Verification.
Employers shall verify at least annually that employee training required by **110.6(C)** is current.

(4) Documentation.
The employer shall document that the training required by **110.6(C)** has occurred.

110.8 Test Instruments and Equipment.
(A) Testing.

Only qualified persons shall perform tasks such as testing, troubleshooting, and voltage measuring on electrical equipment where an electrical hazard exists.

(B) Rating.
Test instruments, equipment, and their accessories shall be as follows:
(1) Rated for circuits and equipment where they are utilized
(2) Approved for the purpose
(3) Used in accordance with any instructions provided by the manufacturer
Informational Note: See UL 61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements, for rating and design requirements for voltage measurement and test instruments intended for use on electrical systems 1000 volts and below and UL 61010-2-033, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use — Part 2-033: Particular Requirements for Hand-Held Multimeters and Other Meters, for Domestic and Professional use, Capable of Measuring Mains Voltage.

(C) Design.
Test instruments, equipment, and their accessories shall be designed for the environment to which they will be exposed and for the manner in which they will be utilized.

(D) Visual Inspection and Repair.
Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors shall be visually inspected for external defects and damage before each use. If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item shall be removed from service. No employee shall use it until a person(s) qualified to perform the repairs and tests that are necessary to render the equipment safe has done so.

110.9 Portable Cord- and-Plug-Connected Electric Equipment.
This section applies to the use of cord- and plug-connected equipment, including cord- and plug-connected test instruments and cord sets (extension cords).

(A) Handling and Storage.
Portable equipment shall be handled and stored in a manner that will not cause damage. Flexible electric cords connected to equipment shall not be used for raising or lowering the

equipment. Flexible cords shall not be fastened with staples or hung in such a fashion as could damage the outer jacket or insulation.

(B) Grounding-Type Equipment.
(a) A flexible cord used with grounding-type utilization equipment shall contain an equipment grounding conductor.
(b) Attachment plugs and receptacles shall not be connected or altered in a manner that would interrupt continuity of the equipment grounding conductor. Additionally, these devices shall not be altered in order to allow use in a manner that was not intended by the manufacturer.
(c) Adapters that interrupt the continuity of the equipment grounding conductor shall not be used.

(D) Conductive or Wet Work Locations.
Portable cord-and-plug-connected electric equipment used in conductive or wet work locations shall be approved for use in those locations. In work locations where employees are likely to contact or be drenched with water or conductive liquids, ground-fault circuit-interrupter protection for personnel shall be used.
Informational Note: The risk assessment procedure can also include identifying when the use of portable tools and equipment powered by sources other than 120 volts ac, such as batteries, air, and hydraulics, should be used to minimize the potential for injury from electrical hazards for tasks performed in conductive or wet locations.

Quiz Questions

48) How often is refresher training required to be verified by the employer as required by 110.6(C)?
A) When the procedures are revised
B) At intervals not to exceed 3 years
C) Annually
D) All listed answers

49) Who is allowed to perform tasks such as testing, troubleshooting, and voltage measuring on electrical equipment where an electrical hazard exists?
A) Qualified person
B) Foreman
C) supervisor
D) Employer

50) What are test instruments, equipment, and their accessories required to be?
A) Used in accordance with any instructions provided by the manufacturer
B) Approved for the purpose
C) Rated for circuits and equipment where they are utilized
D) All listed answers

51) What are required to be designed for the environment to which they will be exposed and for the manner in which they will be utilized?
A) Test accessories
B) Test instruments
C) Test equipment
D) All listed answers

52) Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors shall be _____ inspected for external defects and damage before each use.
A) Manually
B) Visually
C) Physically
D) Electronically

53) What are you required to do If there is a defect or evidence of damage that might expose an employee to injury with regards to electrical testing equipment?
A) Plug it in to see if it arcs
B) Repair it immediately
C) Replace it immediately
D) Remove it from service

54) What section applies to the use of cord- and plug-connected equipment, including cord- and plug-connected test instruments and cord sets (extension cords)?
A) 120.2(B)
B) 110.9
C) 116.6(B)
D) 120.6(B)

55) How are you required to store portable electrical testing equipment?
A) In a special container
B) In a locked room
C) In a manner that will not cause damage
D) All listed answers

56) What is a flexible cord used with grounding-type utilization equipment required to contain?
A) Grounding electrode conductor
B) A twisted shielded pair
C) Stranded conductors
D) An equipment grounding conductor

57) What type of electrical protection is required for people who work in locations where they are likely to contact or be drenched with water or conductive liquids?
A) Ground-fault circuit-interrupter protection
B) Arc-fault circuit-interrupter protection
C) Intermittent duty protection
D) Instantaneous short circuit protection

(E) Connecting Attachment Plugs.
(a) Employees' hands shall not be wet when plugging and unplugging flexible cords and cord- and plug-connected equipment if energized equipment is involved.
(b) Energized plug and receptacle connections shall be handled only with insulating protective equipment if the condition of the connection could provide a conductive path to the employee's hand (e.g, if a cord connector is wet from being immersed in water).
(c) Locking-type connectors shall be secured after connection.

(F) Manufacturer's Instructions.
Portable equipment shall be used in accordance with the manufacturer's instructions and safety warnings.

110.10 Ground-Fault Circuit-Interrupter (GFCI) Protection.

(A) General.
Employees shall be provided with ground-fault circuit-interrupter (GFCI) protection where required by applicable state, federal, or local codes and standards. Listed cord sets or devices incorporating listed GFCI protection for personnel identified for portable use shall be permitted.

(B) Maintenance and Construction.
GFCI protection shall be provided where an employee is operating or using cord sets (extension cords) or cord- and plug-connected tools related to maintenance and construction activity supplied by 125-volt, 15-, 20-, or 30-ampere circuits. Where employees operate or use equipment supplied by greater than 125-volt, 15-, 20-, or 30-ampere circuits, GFCI protection or an assured equipment grounding conductor program shall be implemented.

Informational Note: Where an assured equipment grounding conductor program is used, a special purpose ground-fault circuit interrupter may provide additional protection. See Informative Annex O.

(C) Outdoors.
GFCI protection shall be provided when an employee is outdoors and operating or using cord sets (extension cords) or cord- and plug-connected equipment supplied by 125-volt, 15-, 20-, or 30-ampere circuits. Where employees working outdoors operate or use equipment supplied by greater than 125-volt, 15-, 20-, or 30-ampere circuits, GFCI protection or an assured equipment grounding conductor program shall be implemented.

Informational Note: Where an assured equipment grounding conductor program is used, a special purpose ground-fault circuit interrupter may provide additional protection. See Informative Annex O.

(D) Testing Ground-Fault Circuit-Interrupter Protection Devices.
GFCI protection devices shall be tested in accordance with the manufacturer's instructions.

110.11 Overcurrent Protection Modification.
Overcurrent protection of circuits and conductors shall not be modified, even on a temporary basis, beyond what is permitted by applicable portions of electrical codes and standards dealing with overcurrent protection.

Informational Note: For further information concerning electrical codes and standards dealing with overcurrent protection, refer to Article 240 of NFPA 70, National Electrical Code.

Quiz Questions

58) What state are locking-type connectors required to be in after connection?
A) Irreversible
B) Permanent
C) Secured
D) Locked

59) How is portable equipment required to be used in accordance with?
A) Local codes
B) Manufacturer's instructions and safety warnings
C) Section 139(C)
D) All listed answers

60) True or False? Listed cord sets or devices incorporating listed GFCI protection for personnel identified for portable use shall be permitted.
A) True
B) False

61) At what amperages is GFCI protection required to be provided where an employee is operating or using extension cords or cord- and plug-connected tools related to maintenance and construction?
A) 30 amps
B) 15 amps
C) 20 amps
D) All listed answers

62) At what amperages is GFCI protection required to be provided where an employee outdoors is operating or using extension cords or cord- and plug-connected connected equipment?
A) 30 amps
B) 15 amps
C) 20 amps
D) All listed answers

63) What Informative annex has information for an assured equipment grounding conductor program when used and where a special purpose ground-fault circuit interrupter may provide additional protection?
A) Informative Annex F
B) Informative Annex D
C) Informative Annex O
D) Informative Annex G

64) How are GFCI protection devices required to be tested in accordance with?
A) Manufacturer's instructions
B) Local codes
C) Section 139(C)
D) All listed answers

65) What article in the NFPA 70, National Electrical Code, has further information concerning electrical codes and standards dealing with overcurrent protection?
A) Article 240
B) Article 250
C) Article 300
D) Article 690

200.1 Scope.
Chapter **2** addresses the requirements that follow.
(1) Chapter **2** covers practical safety-related maintenance requirements for electrical equipment and installations in workplaces as included in **90.2**. These requirements identify only that maintenance directly associated with employee safety.
(2) Chapter **2** does not prescribe specific maintenance methods or testing procedures. It is left to the employer to choose from the various maintenance methods available to satisfy the requirements of Chapter **2**.
(3) For the purpose of Chapter **2**, maintenance shall be defined as preserving or restoring the condition of electrical equipment and installations, or parts of either, for the safety of employees who work where exposed to electrical hazards. Repair or replacement of individual portions or parts of equipment shall be permitted without requiring modification or replacement of other portions or parts that are in a safe condition.

Informational Note: Refer to NFPA 70B, Recommended Practice for Electrical Equipment Maintenance; ANSI/NETA MTS, Standard for Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems; and IEEE 3007.2, Recommended Practice for the Maintenance of Industrial and Commercial Power Systems, for guidance on maintenance frequency, methods, and tests.

Article 205 General Maintenance Requirements
205.1 Qualified Persons.
Employees who perform maintenance on electrical equipment and installations shall be qualified persons as required in Chapter **1** and shall be trained in, and familiar with, the specific maintenance procedures and tests required.

205.2 Single-Line Diagram.
A single-line diagram, where provided for the electrical system, shall be maintained in a legible condition and shall be kept current.

205.4 Overcurrent Protective Devices.
Overcurrent protective devices shall be maintained in accordance with the manufacturers' instructions or industry consensus standards. Maintenance, tests, and inspections shall be documented.

205.5 Spaces About Electrical Equipment.
All working space and clearances required by electrical codes and standards shall be maintained.

Informational Note: For further information concerning spaces about electrical equipment, see Article 110, Parts II and III, of NFPA 70, National Electrical Code.

205.6 Grounding and Bonding.
Equipment, raceway, cable tray, and enclosure bonding and grounding shall be maintained to ensure electrical continuity.

205.7 Guarding of Energized Conductors and Circuit Parts.
Enclosures shall be maintained to guard against unintentional contact with exposed energized conductors and circuit parts and other electrical hazards. Covers and doors shall be in place with all associated fasteners and latches secured.

205.9 Clear Spaces.
Access to working space and escape passages shall be kept clear and unobstructed.

Quiz Questions

66) What chapter covers practical safety-related maintenance requirements for electrical equipment and installations in workplaces as included in 90.2?
A) Chapter 3
B) Chapter 2
C) Chapter 1
D) Chapter 4

67) What Article covers general maintenance requirements?
A) 210
B) 207
C) 205
D) 310

68) What type of condition is a single-line diagram of an electrical system required to be kept in?
A) Pristine
B) New
C) Legible
D) Working

69) What are you supposed to do when you maintain, test, and inspect overcurrent protective devices?
A) Document each occurrence
B) Label them with a dated sticker
C) Attach a legible marking
D) All listed answers

70) What Article in the National Electrical Code has further information concerning spaces about electrical equipment?
A) 110
B) 115
C) 200
D) 240

71) What does equipment, raceway, cable tray, and enclosure bonding and grounding ensure?
A) Isolation
B) Separation
C) Continuity
D) Resonance

72) Covers and doors shall be in place with all associated fasteners and _____ secured.
A) Internal components
B) Markings
C) Latches
D) Equipment

73) How is the access to working space and escape passages required to be kept?
A) Secured
B) Unobstructed
C) Locked
D) All listed answers

205.11 Warning Signs.
Warning signs, where required, shall be visible, securely attached, and maintained in legible condition.

205.13 Single and Multiple Conductors and Cables.
Electrical cables and single and multiple conductors shall be maintained free of damage, shorts, and ground that would expose employees to an electrical hazard.

205.14 Flexible Cords and Cables.
Flexible cords and cables shall be maintained to preserve insulation integrity.
(1) Damaged Cords and Cables.
Cords and cables shall not have worn, frayed, or damaged areas that would expose employees to an electrical hazard.
(2) Strain Relief.
Strain relief of cords and cables shall be maintained to prevent pull from being transmitted directly to joints or terminals.
(3) Repair and Replacement.
Cords and cord caps for portable electrical equipment shall be repaired and replaced by qualified personnel and checked for proper polarity, grounding, and continuity prior to returning to service.

210.2 Area Enclosures.
Fences, physical protection, enclosures, or other protective means, where required to guard against unauthorized access or unintentional contact with exposed energized conductors and circuit parts, shall be maintained.

210.3 Conductors.
Current-carrying conductors (buses, switches, disconnects, joints, and terminations) and bracing shall be maintained to perform as follows:
(1) Conduct rated current without overheating
(2) Withstand available fault current

210.4 Insulation Integrity.
Insulation integrity shall be maintained to support the voltage impressed.

215.2 Open Wiring Protection.
Open wiring protection, such as location or barriers, shall be maintained to prevent unintentional contact.

Article 225 Fuses and Circuit Breakers
225.1 Fuses.
Fuses shall be maintained free of breaks or cracks in fuse cases, ferrules, and insulators. Fuse clips shall be maintained to provide adequate contact with fuses. Fuseholders for current-limiting fuses shall not be modified to allow the insertion of fuses that are not current-limiting. Non-current limiting fuses shall not be modified to allow their insertion into current-limiting fuseholders.

230.2 Guards, Barriers, and Access Plates.
Guards, barriers, and access plates shall be maintained to prevent employees from contacting moving or energized parts.

Article 235 Hazardous (Classified) Locations
235.1 Scope.
This article covers maintenance requirements in those areas identified as hazardous (classified) locations.

Informational Note No. 1: These locations need special types of equipment and installation to ensure safe performance under conditions of proper use and maintenance. It is important that inspection authorities and users exercise more than ordinary care with regard to installation and maintenance. The maintenance for specific equipment and materials is covered elsewhere in Chapter **2** and is applicable to hazardous (classified) locations. Other maintenance will ensure that the form of construction and of installation that makes the equipment and materials suitable for the particular location are not compromised.

Informational Note No. 2: The maintenance needed for specific hazardous (classified) locations depends on the classification of the specific location. The design principles and equipment characteristics, for example, use of positive pressure ventilation, explosionproof, nonincendive, intrinsically safe, and purged and pressurized equipment, that were applied in the installation to meet the requirements of the area classification must also be known. With this information, the employer and the inspection authority are able to determine whether the installation as maintained has retained the condition necessary for a safe workplace.

Quiz Questions

74) What are the requirements for warning signs if required?
A) Maintained in legible condition
B) Be visible
C) Securely attached
D) All listed answers

75) Electrical cables and single and multiple conductors are required to be maintained in a way that is free of what?
A) The ground
B) Shorts
C) Damage
D) All listed answers

76) Flexible cords and cables are required to be maintained to preserve _____ integrity.
A) Insulation
B) Electrical
C) Tension
D) All listed answers

77) What is the purpose of providing strain relief for cords and cables?
A) To prevent pull from being transmitted directly to the cabinet
B) To prevent pull from being transmitted directly to joints or terminals
C) To prevent pull from being transmitted directly to the raceway
D) To prevent pull from being transmitted directly to the conductors

78) What can be done to prevent unintentional contact with exposed energized conductors and circuit parts?
A) Erect a physical barrier
B) Install a fence
C) Install an enclosure
D) All listed answers

79) What does section 210.3 cover?
A) Conductors
B) Insulation Integrity
C) Protective Devices.
D) Premises Wiring

80) What is the purpose of insulation integrity?
A) To support the current impressed
B) To support the voltage impressed
C) To support the wattage impressed
D) To support the force impressed

81) What does section 215.2 cover?
A) Insulation Integrity
B) Open Wiring Protection
C) Raceways and Cable Trays
D) Protection and Control Circuitry

82) Where do you look for breaks or cracks with regards to fuses?
A) Fuse insulators
B) Fuse cases
C) Fuse ferrules
D) All listed answers

83) What do Fuse clips provide?
A) Contact with the fuses
B) Rigidity
C) Resistance
D) All listed answers

84) What needs to be maintained to prevent employees from contacting moving or energized parts?
A) Access Plates
B) Guards
C) Barriers
D) All listed answers

85) What article covers the maintenance requirements in those areas identified as hazardous (classified) locations?
A) Article 225
B) Article 235
C) Article 215
D) Article 205

235.2 Maintenance Requirements for Hazardous (Classified) Locations.
Equipment and installations in these locations shall be maintained such that the following criteria are met:
(1) No energized parts are exposed.
Exception to (1): Intrinsically safe and nonincendive circuits.
(2) There are no breaks in conduit systems, fittings, or enclosures from damage, corrosion, or other causes.
(3) All bonding jumpers are securely fastened and intact.
(4) All fittings, boxes, and enclosures with bolted covers have all bolts installed and bolted tight.
(5) All threaded conduit are wrenchtight and enclosure covers are tightened in accordance with the manufacturer's instructions.
(6) There are no open entries into fittings, boxes, or enclosures that would compromise the protection characteristics.
(7) All close-up plugs, breathers, seals, and drains are securely in place.
(8) Marking of luminaires (lighting fixtures) for maximum lamp wattage and temperature rating is legible and not exceeded.
(9) Required markings are secure and legible.

Article 240 Batteries and Battery Rooms
240.1 Ventilation.
When forced or natural ventilation systems are required by the battery system design and are present, they shall be examined and maintained to prevent buildup of explosive mixtures. This maintenance shall include a functional test of any associated detection and alarm systems.
Informational Note: "Natural ventilation" implies there are no mechanical mechanisms. Maintenance includes activities such as inspection and removal of any obstructions to natural air flow.

240.2 Eye and Body Wash Apparatus.
Eye and body wash apparatus shall be maintained in operable condition.

Article 245 Portable Electric Tools and Equipment
245.1 Maintenance Requirements for Portable Electric Tools and Equipment.
Attachment plugs, receptacles, cover plates, and cord connectors shall be maintained such that the following criteria are met:

(1) There are no breaks, damage, or cracks exposing energized conductors and circuit parts.
(2) There are no missing cover plates.
(3) Terminations have no stray strands or loose terminals.
(4) There are no missing, loose, altered, or damaged blades, pins, or contacts.
(5) Polarity is correct.

Article 250 Personal Safety and Protective Equipment

250.1 Maintenance Requirements for Personal Safety and Protective Equipment.

Personal safety and protective equipment such as the following shall be maintained in a safe working condition:

(1) Grounding equipment
(2) Hot sticks
(3) Rubber gloves, sleeves, and leather protectors
(4) Test instruments
(5) Blanket and similar insulating equipment
(6) Insulating mats and similar insulating equipment
(7) Protective barriers
(8) External circuit breaker rack-out devices
(9) Portable lighting units
(10) Temporary protective grounding equipment
(11) Dielectric footwear
(12) Protective clothing
(13) Bypass jumpers
(14) Insulated and insulating hand tools

Quiz Questions

86) How many items are listed that equipment and installations in hazardous locations are required to comply with?
A) 9
B) 8
C) 5
D) 6

87) What does the term “Natural ventilation” mean?
A) There are positive mechanisms for air flow
B) There are mechanical mechanisms for ventilation
C) There are no positive mechanisms air flow
D) There are no mechanical mechanisms for ventilation

88) What type of condition are eye and body wash apparatus required to be maintained in?
A) A sanitary condition
B) A safe condition
C) Operable condition
D) All listed answers

89) How many required items are listed for attachment plugs, receptacles, cover plates, and cord connectors to be maintained in?
A) 9
B) 8
C) 5
D) 6

90) How many items are specifically listed for personal safety and protective equipment to be maintained in a safe working condition?
A) 10
B) 9
C) 5
D) 14

250.2 Inspection and Testing of Protective Equipment and Protective Tools.
(A) Visual.
Safety and protective equipment and protective tools shall be visually inspected for damage and defects before initial use and at intervals thereafter, as service conditions require, but in no case shall the interval exceed 1 year, unless specified otherwise by the applicable state, federal, or local codes and standards.
(B) Testing.
The insulation of protective equipment and protective tools, such as items specified in **250.1(1)** through **250.1(14)**, that is used as primary protection from shock hazards and requires an insulation system to ensure protection of personnel, shall be verified by the appropriate test and visual inspection to ascertain that insulating capability has been retained before initial use, and at intervals thereafter, as service conditions and applicable standards and instructions require, but in no case shall the interval exceed 3 years.

250.3 Safety Grounding Equipment.
(A) Inspection.
Personal protective ground cable sets shall be inspected for cuts in the protective sheath and damage to the conductors. Clamps and connector strain relief devices shall be checked for tightness. These inspections shall be made at intervals thereafter as service conditions require, but in no case shall the interval exceed 1 year.

250.4 Test Instruments.
Test instruments and associated test leads used to verify the absence or presence of voltage shall be maintained to assure functional integrity. The maintenance program shall include functional verification as described in 110.8(E).

Article 300 Introduction
300.1 Scope.
Chapter **3** covers special electrical equipment in the workplace and modifies the general requirements of Chapter **1**.

Introduction300.3 Organization.
Chapter 3 of this standard is divided into articles. Article 300 applies generally. Article 310 applies to electrolytic cells. Article 320 applies to batteries and battery rooms. Article 330 applies to lasers. Article 340 applies to power electronic equipment. Article 350 applies to research and development (R&D) laboratories. Article 360 applies to safety-related requirements for capacitors.

Article 310 Safety-Related Work Practices for Electrolytic Cells
310.1 Scope.
The requirements of this article shall apply to the electrical safety-related work practices used in the types of electrolytic cell areas.
Informational Note No. 1: See Informative Annex L for a typical application of safeguards in the cell line working zone.
Informational Note No. 2: For further information about electrolytic cells, see NFPA 70, National Electrical Code, Article 668.
Informational Note No. 3: For further information about electrical safety-related work practices in electrolytic cell lines, see IEEE 463, Electrical Safety Practices in Electrolytic Cell Line Working Zones.

310.2 Definitions.
For the purposes of this article, the definitions that follow shall apply.

Battery Effect.
A voltage that exists on the cell line after the power supply is disconnected.
Informational Note:
Electrolytic cells can exhibit characteristics similar to an electrical storage battery and a shock hazard could exist after the power supply is disconnected from the cell line.

Safeguarding.
Safeguards for personnel include the consistent administrative enforcement of safe work practices. Safeguards include training in safe work practices, cell line design, safety equipment, PPE, operating procedures, and work checklists.

310.5 Safeguarding of Employees in the Cell Line Working Zone.
(A)(1) General.
Each task performed in the electrolytic cell line working zone shall be analyzed for the likelihood of arc flash injury. If there is a likelihood of personal injury, appropriate measures shall be taken to protect persons exposed to the arc flash hazards, including one or more of the following:
(1) Providing appropriate PPE [see **310.5(D)(2)**] to prevent injury from the arc flash hazard
(2) Altering work procedures to reduce the likelihood of occurrence of an arc flash incident
(3) Scheduling the task so that work can be performed when the cell line is de-energized

Quiz Questions

91) What is the maximum interval where a visual inspection of safety, protective equipment and protective tools is required to be conducted?
A) 1 year
B) 6 months
C) 3 years
D) 3 months

92) What is the maximum interval where the inspection of insulation for equipment and protective tools, such as items specified in **250.1(1)** through **250.1(14)** is required to be conducted?
A) 1 year
B) 6 months
C) 3 years
D) 3 months

93) What is the maximum interval where the inspection of personal protective ground cable sets, clamps, and connector strain relief is required to be conducted?
A) 6 months
B) 1 year
C) 3 years
D) 3 months

94) What section includes a description of functional verification?
A) 110.8(D)
B) 110.8(F)
C) 110.8(G)
D) 110.8(E)

95) What does chapter 3 in this information cover?
A) Special operation systems in the workplace
B) Special conditions in the workplace
C) Special electrical equipment in the workplace
D) Modern low voltage equipment in the workplace

96) What does Article 350 in this information apply to?
A) Safety-related requirements for capacitors
B) Research and development (R&D) laboratories
C) Safety-related requirements for inductors
D) Batteries and battery rooms

97) What does informative Annex L cover in this publication?
A) Battery rooms
B) Electrolytic cells
C) Electrical Safety Practices
D) Typical application of safeguards in the cell line working zone

98) What best defines a voltage that exists on the cell line after the power supply is disconnected?
A) Hysteresis
B) Battery Effect
C) Eddy current
D) Copper effect

99) What can safeguards for personnel include?
A) Work checklists
B) Cell line design
C) Safety equipment
D) All listed answers

100) What is each task performed in the electrolytic cell line working zone required to be analyzed for?
A) The likelihood of arc flash injury
B) Voltage potential
C) PPE requirements
D) All listed answers