Unit 204E: Understand how to install enclosures for electrical cables, conductors and wiring systems

# Delivery guide

Unit information

This unit covers the knowledge and skills for the installation of enclosures for electrical cables, conductors and wiring systems internally and externally for electrical systems. Learners will gain the key knowledge and understanding of electrical systems and circuits and their requirements.

The learner must be able to comply with the procedures and methods for installing enclosures for electrical cables, conductors and wiring systems in accordance with current versions of the appropriate industry standards and regulations, the specification, industry recognised working practices, the working environment and the natural environment.

Learners will know the different types of enclosures for electrical cables, conductors and wiring systems, their limitations, applications and the techniques for the positioning, fitting, fixing and connection of the enclosures, their components and accessories.

Learners may be introduced to this unit by asking themselves questions such as:

* What types of circuits supply electrical loads?
* What is meant by earthing?
* What are the different types of wiring systems used?

**Guidance**: within this unit learners will know the main relating requirements of the *IET On-Site Guide*.

Learning outcomes

1. Understand the operation, applications, advantages, and limitations of different electrical systems
2. Understand the appropriate industry standards, regulations and requirements relevant to installing enclosures
3. Understand the applications, advantages, and limitations of types of enclosures

Suggested resources

British Standards

* BS 7671:2018/A1:2020. Requirements for Electrical Installations. IET Wiring Regulations.

Website

* [YouTube | GSH Electrical Channel](https://www.youtube.com/channel/UCgtbE9w_d-u2AvPp3WBlPfQ)

Textbooks

* *IET On-Site Guide (BS 7671:2018) (Electrical Regulations)*. 7th edition. London: Institution of Engineering and Technology.

ISBN 978-1-78561-442-2

* Tanner, P. (2018) *The City & Guilds Textbook: Book 1 Electrical Installations for the Level 3 Apprenticeship (5357), Level 2 Technical Certificate (8202) & Level 2 Diploma (2365)*. London: Hodder Education. ISBN 978-1-51043-224-6

| **Learning outcomes** | **Criteria** | **Delivery guidance** |
| --- | --- | --- |
| 1. Understand the operation, applications, advantages, and limitations of different electrical systems | * 1. The types and requirements of typical circuits | * Learners to be able to describe the types and requirements of typical circuits, including: * lighting circuits * ring final socket circuits * standard radial final socket circuits * standard circuit arrangements for loads and equipment * components of lighting and power circuits * division of an installation into circuits * polarity requirements for circuits * general requirements of isolation and switching. * See *The City & Guilds Textbook: Book 1 Electrical Installations for the Level 3 Apprenticeship (5357), Level 2 Technical Certificate (8202) & Level 2 Diploma (2365)*, Ch3, Part 5. |
| * 1. Earthing systems and earthing and protective conductors | * Learners to be able to describe the characteristics of TN-S, TN-C-S, and TT. * Learners to know how protective conductors are connected to the different earthing systems. * Learners to understand the purpose of earthing and protective conductors used for protection. * Learners to understand the components providing automatic disconnection of supply including exposed and extraneous conductive parts. * Learners to understand the earth fault loop impedance path for different earthing systems. * Learners to understand the general requirements for the installation of main protective bonding. * Learners to be able to explain the difference between earthing and bonding. * See *The City & Guilds Textbook: Book 1 Electrical Installations for the Level 3 Apprenticeship (5357), Level 2 Technical Certificate (8202) & Level 2 Diploma (2365)*, Ch3. |
| * 1. Devices used for safety and protection in electrical systems | * Learners to know the reasons for overcurrent and using protection. * Learners to know of protective devices including BS 3036:1958 fuses. * Learners to know the different types of circuit breakers. * Learners to be able to explain type B, C and D circuit breakers. * Learners to be shown residual current devices (RCDs) and residual current circuit breakers (RCBOs) and to be able to explain their use. * Learners to be able to explain the distribution network operator (DNO) cut out device. * Learners to have an awareness of SPDs and AFDDs. * See *The City & Guilds Textbook: Book 1 Electrical Installations for the Level 3 Apprenticeship (5357), Level 2 Technical Certificate (8202) & Level 2 Diploma (2365)*, Ch3. |
| 1. Understand the appropriate industry standards, regulations and requirements relevant to installing enclosures | * 1. Industry standards and regulations | * Learners to be able to define an enclosure by reference to BS 7671:2018/A1:2020. * Learners to understand how an enclosure provides basic protection. * Learners to understand that BS 7671:2018/A1:2020 is the principal Industry Standard for electrical installations and that the *IET On-Site Guide* is for simpler interpretations. |
| * 1. How to produce a risk assessment and method statement for the work to be carried out | * Learners to be able to explain the 5-step approach to risk assessments. * Learners to be able to define a risk. * Learners to be able to define a hazard. * See *The City & Guilds Textbook: Book 1 Electrical Installations for the Level 3 Apprenticeship (5357), Level 2 Technical Certificate (8202) & Level 2 Diploma (2365)*, Ch1. * Learners to be able to explain method statements and to know where they are used. |
| * 1. How to verify that job information and documentation is current and relevant and that the plant, instruments, access equipment and tools are fit for purpose | * Learners to understand job specification requirements. * Learners to know the latest amendments to documentation. * Learners to understand work schedules. * Learners to know how to check access equipment records for safety checks carried out, such as safety of ladders and safe working load (SWL) of lifting equipment. * Learners to know how to perform everyday checks on power tools, instruments and hand tools, for damage and fitness for use. * See *The City & Guilds Textbook: Book 1 Electrical Installations for the Level 3 Apprenticeship (5357), Level 2 Technical Certificate (8202) & Level 2 Diploma (2365)*, Ch4 and Ch5. * Learners to know of the Prefabricated Access Supplier and Manufacturers Association (PASMA) and Mobile Elevating Work Platform (MEWP) requirements. |
| * 1. The applications, advantages, and limitations of types of personal protective equipment | * Learners to know the types, applications and advantages of Personal Protective Equipment (PPE) for different jobs. * Learners to know the responsibilities of the employer and employee with respect to PPE. * Learners to know that PPE does not eliminate all the risks and hazards associated within the workplace. * Learners to know the limitations of PPE. * See *The City & Guilds Textbook: Book 1 Electrical Installations for the Level 3 Apprenticeship (5357), Level 2 Technical Certificate (8202) & Level 2 Diploma (2365)*, Ch1. |
| 1. Understand the applications, advantages, and limitations of types of enclosures | * 1. The applications, advantages, and limitations of types ofenclosures | * Learners to understand applications, advantages and limitations of enclosures including: * conduit (PVC and metallic) * trunking (PVC and metallic) * cable tray and basket * ladder systems * ducting * modular wiring systems * busbar and lighting track systems. * Learners to understand how to protect equipment from the installation environment. * Learners to understand that an enclosure can prevent electric shock. * Learners to understand that an enclosure can limit propagation of an explosion. |
| * 1. The industry recognised methods for determining the type and size of enclosures | * Learners to know the BS 7671:2018/A1:2020 requirement for enclosures, such as that required for consumer units in new installations. * Learners to recognise the industry standard of IP codes to determine types of enclosures for specific locations. * Learners to know what material the enclosure is to be manufactured from. * Learners to know the physical size required to install a new consumer unit, i.e. the need to determine: * what the current requirements of the main switch are * the number of circuit breakers * the number of RCDs or RCBOs * whether SPDs are required * how many spare ways are required for expansion. * Learners to understand the importance of fire barriers with respect to containment, as wiring systems pass through floors, walls, roofs, ceilings, partitions or cavity barriers (refer to BS 7671 527.2). * Learners to know about Arc Fault Detection Devices (AFDDs). |
| * 1. How to interpret diagrams and drawings to locate site services and identify the planned location of the enclosures and equipment | * Learners to be able to understand and interpret: * types of building drawings * plans or layout drawings * schematic (block) diagrams * wiring diagrams * circuit diagrams. * See *The City & Guilds Textbook: Book 1 Electrical Installations for the Level 3 Apprenticeship (5357), Level 2 Technical Certificate (8202) & Level 2 Diploma (2365)*, Ch3. * Learners to be familiar with graphical symbols used in diagrams and drawings, including: * switches: one-way, two-way, intermediate and pull * lighting points: incandescent, fluorescent and wall mounted * socket outlets: switched and unswitched * fused connection units: both switched and unswitched * consumer control units * cooker control units * integrated meter (kWh meter) * fuses and circuit breakers. |
|  | * 1. The methods and techniques for fitting, fixing, and connecting the selected enclosures and their components and accessories in accordance with: * the electrical system's design * manufacturers' instructions | * Learners to know different types of fixings for enclosures and accessories, including: * anchor bolts * plastic plugs and woodscrews * plasterboard fixings. * Learners to understand the importance of following the system design for fixings. * Learners to understand the importance of following manufacturers’ instructions, especially where methods and techniques for fitting, fixing and connecting are stipulated * Learners to be familiar with conduit and trunking adaptors, including Conlock-style accessories. |