Unit 305E: Understand how to install and connect electrical cables, conductors, wiring systems and equipment

# Delivery guide

Unit information

This unit covers the knowledge and understanding for the selection, installation and connection of electrical cables, conductors, wiring systems, equipment, accessories and components for electrical systems.

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

Their skills will cover the different types of cables, conductors, wiring systems, equipment, accessories and components, their limitations, applications and the techniques for their positioning, fitting, fixing and connection.

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

* What types of cables are used?
* How are cables installed?
* Why is designing a circuit important?

Learning outcomes

1. Understand the applications, advantages and limitations of types of electrical cables, conductors, wiring systems, associated equipment, accessories and components
2. Understand the industry-recognised methods for determining the type, size and rating of electrical cables, conductors, wiring systems, associated equipment, accessories and components in relation to the electrical system’s design
3. Understand how to install and connect types of electrical cables, conductors, wiring systems, associated equipment, accessories and components

Suggested resources

Textbooks

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

ISBN 978-1-7856-1442

* Tanner, P. (2018) *The City & Guilds Textbook: Book 2 Electrical Installations for the Level 3 Apprenticeship (5357), Level 3 Advanced Technical Diploma (8202) & Level 3 Diploma (2365)*. London: Hodder Education.

ISBN 978-1-5104-3225-3

Websites

* [Electrical Apprentice | Homepage](https://electricalapprentice.co.uk/)
* [YouTube | GSH Electrical Channel](https://www.youtube.com/channel/UCgtbE9w_d-u2AvPp3WBlPfQ)
* [YouTube | How to Strip the Ends of MICC Cable Using a Joy Stripper, Rotary Stripper, Key (Pyro or MI Cable)](https://www.youtube.com/watch?v=IujQEj8hQoc)
* [YouTube | How to Make off a SWA Cable Gland (Steel Wire Armored Cable) Step By Step Demonstration](https://www.youtube.com/watch?v=WQuoQvppvRQ)

British Standards

* BS 7671:2018+A1:2020. *Requirements for Electrical Installations. IET Wiring Regulations*.
* BS EN 60309-1:1999+A2:2012. *Plugs, socket-outlets and couplers for industrial purposes. General requirements*.

| **Learning outcomes** | **Criteria** | **Delivery guidance** |
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| 1. Understand the applications, advantages and limitations of types of electrical cables, conductors, wiring systems, associated equipment, accessories and components | * 1. The applications, advantages and limitations of electrical cables | * Learners to understand the applications, advantages and limitations of electrical cables for single and multicore thermosetting and thermoplastic PVC insulated cables, including: * flexible cables * polyvinyl chloride (PVC)/PVC flat-profile cable * sheathed and unsheathed mineral-insulated copper cable (MICC), cross-linked polyethylene-insulated aluminium conductor armoured cable (XLPE) and polyvinyl chloride steel-wire armour (PVC SWA) cables * armoured/braided flexible cables * data cables and fibre optic cables * fire performance cables * cable glands. * Learners to practise stripping and installing cable types, such as: * PVC/PVC flat-profile cable * PVC insulated singles in containment * MICC and SWA cables. * Learners to be shown YouTube demonstration videos of MICC cable termination and SWA cable termination (see Suggested resources). |
| * 1. The requirements of industrial plugs, sockets and couplers | * Learners to understand the requirements of industrial plugs, sockets and couplers. * Learners to recognise the common industrial plugs, sockets and couplers used at 110V, 230V and 400V (see BS EN 60309-1:1999+A2:2012). * Learners to recognise the colour coding of the common industrial plugs, sockets and couplers used at 110V, 230V and 400V. |
| 1. Understand the industry-recognised methods for determining the type, size and rating of electrical cables, conductors, wiring systems, associated equipment, accessories and components in relation to the electrical system’s design | * 1. How to determine the size and rating of electrical cables (basic single-phase circuits to non-reactive loads) | * Learners to understand how to determine the size and rating of electrical cables for basic single-phase non-reactive loads. * Learners to understand the term ‘diversity’ and how it is applied to the maximum demand of an electrical system (see the *IET On-Site Guide*, Appendix A). * Learners to use tabulated data to select the size and rating of a cable by identifying and using circuit design techniques, including selection of the protective device and applying rating factors Ca, Cg, Cf, Ci. * Learners to refer to the worked example of good practice shown in Tanner, *Book 2*, Ch 5, and to reference and use the *IET On-Site Guide*, Ch 7 and Appendix F. * Learners to understand the term ‘voltage drop’ for a circuit, to know the maximum values for lighting and power circuits and to know how to confirm that a circuit meets the requirements in accordance with BS 7671:2018+A1:2020. |
| 1. Understand how to install and connect types of electrical cables, conductors, wiring systems, associated equipment, accessories and components | * 1. The methods and techniques for installing and fixing electrical cables, conductors, wiring systems, associated equipment, accessories and components in accordance with: * the electrical system’s design * manufacturers’ instructions | * Learners to understand how to install and connect types of electrical cables, conductors, wiring systems and their associated equipment, accessories and components. * Learners to recognise the methods used to fix and support cables used in buildings and structures in accordance with BS 7671:2018+A1:2020 and the *IET On-Site Guide*, Appendix B. * Learners to recognise the methods used to fix the associated equipment and accessories in accordance with the system design, following manufacturer’s instructions. |
| * 1. The different types and methods of terminating and connecting electrical cables and conductors | * Learners to understand the different types and methods of terminating and connecting electrical cables and conductors, such as: * screwing * crimping * soldering * compression * insulation displacement. * Learners to know how to confirm that the methods used for terminating and connecting are electrically and mechanically sound. |