

Unit 034

Forming and assembling electrical cable enclosure and support systems

Level: 2

Credit value: 13

NDAQ number: 500/9514/6

Unit aim

This unit covers the skills and knowledge needed to prove the competences required to form and assemble electrical cable enclosure and support systems such as conduit, trunking and traywork systems. It will prepare the learner for entry into the engineering or manufacturing sectors, creating a progression between education and employment, or it will provide a basis for the development of additional skills and occupational competencies in the working environment.

The activities will include the forming and assembly of metallic and non-metallic systems, and will cover the selection of the appropriate materials, cutting and bending/forming the appropriate pieces that make up the enclosure. The learner will need to assemble the prepared pieces, using a range of connection devices, and to position, align and secure them in the correct locations, using the specified/appropriate techniques, wall/screen penetration and fastening devices.

The learner's responsibilities will require them to comply with health and safety requirements and organisational policy and procedures for the cable enclosure forming and assembly activities undertaken. The learner will need to take account of any potential difficulties or problems that may arise with the activities, or with the tools and equipment used, and to seek appropriate help and advice in determining and implementing a suitable solution. The learner will work under a high level of supervision, whilst taking responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide an understanding of their work, and will enable them to apply appropriate cutting, bending forming and installation techniques and procedures safely. The learner will understand the forming and assembly methods and procedures used, and their application, and will know about the various enclosure systems and components used to produce the assemblies, to the required depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when carrying out the assembly and installation activities, especially those for handling long lengths of conduit or trunking. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcomes

There are **two** learning outcomes to this unit. The learner will be able to:

1. Form and assemble electrical cable enclosure and support systems
2. Know how to form and assemble electrical cable enclosure and support systems

Guided learning hours

It is recommended that **65** hours should be allocated for this unit, although patterns of delivery are likely to vary.

Details of the relationship between the unit and relevant national standards

This unit has been derived from national occupational standard Performing Engineering Operations Unit No. 34: Forming and assembling electrical cable enclosure and support systems (Suite 2)

Support of the unit by a sector or other appropriate body

This unit is endorsed by Semta.

Assessment

This unit must be assessed in a work environment and must be assessed in accordance with the 'Common Requirements for National Vocational Qualifications (NVQ) in the QCF' which can be downloaded from Semta's website:

http://www.semta.org.uk/training_providers__awarding/national_occupational_standard/qca_assessment_requirements.aspx

Additional assessment requirements have been published by Semta. These additional assessment requirements are set down in Semta's Performing Engineering Operations Level 2 unit assessment strategy which can be downloaded from Semta's website:

http://www.semta.org.uk/training_providers__awarding/national_occupational_standard/qca_assessment_requirements.aspx

Unit specific additional assessment requirements:

In order to prove their ability to combine different cable enclosure forming and assembly operations, at least one of the cable enclosure and support systems produced must be of a significant nature, and must contain a minimum of four of the features listed in assessment criteria 1.9.

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Outcome 1

Form and assemble electrical cable enclosure and support systems

Assessment Criteria

Practical skills

The learner will be able to:

1. work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines
2. carry out all of the following during the electrical cable enclosure forming and assembly activities:
 - adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations
 - follow job instructions and assembly/installation drawings at all times
 - ensure that the electrical cable enclosure system is kept free from foreign objects, dirt or other contamination
 - return all tools and equipment to the correct location on completion of the installation activities
3. form and assemble the following types of electrical cable enclosures/support systems:
 - metal conduit systemsPlus one more from the following:
 - non-metallic conduit systems
 - non-metallic trunking systems
 - metal trunking system
 - traywork systems
4. plan the assembly and installation of the cable enclosure system before they start
5. obtain the correct tools and equipment for the cutting, forming and assembly operations, and check that they are in a safe and usable condition
6. out and form the cable enclosure components to the required size and shape, using appropriate tools and techniques
7. construct cable enclosures/support system components, to include carrying out all of the following:
 - selecting the correct type and size of conduit, trunking or traywork (with regard to number of cables and climatic conditions)
 - cutting the materials to the correct lengths (taking into account allowances for bends or joints required)
 - removing all burrs and sharp edges
 - producing external threads on conduit
 - producing or fabricating bends, up to and including 90 degrees
 - producing or fabricating bends over 90 degrees
 - making tee/multiple junctions in trunking/traywork (where applicable)
 - producing or fabricating offsets
 - producing or fabricating bridge/saddle sets
8. assemble the cable enclosure system, using the appropriate connectors

9. assemble cable enclosure/support systems that include all of the following:
 - bends/elbows (solid or inspection type)
 - boxes (such as circular or square, terminal or multi branch)
 - horizontal runs
 - vertical dropsPlus three more from the following:
 - straight connectors/couplings
 - tee pieces (such as solid or inspection type)
 - reducers
 - conversion units and adaptors
 - cross over units (such as bridge or saddle sets)
 - off sets
10. mount and secure the cable enclosure components safely and correctly to meet the specification requirements
11. apply all of the following installation methods and techniques:
 - marking out the location of the trunking, traywork or conduit
 - positioning and securing the trunking, traywork or conduit using mechanical fixings
 - drilling and preparing holes for the trunking, traywork or conduit
 - levelling and alignment of the wiring enclosures and components
19. check the completed assembly to ensure that all operations have been completed, and that the finished assembly is secure and meets the required specification
20. check the completed assembly, to include carrying out all of the following:
 - checking for level and alignment
 - checking that all connections are secure
 - checking that sufficient supports are used and that they are correctly spaced
 - checking that correct outlets are used (such as for sockets, switches, light fittings, wire junction and inspection fittings)
21. produce cable enclosure/support systems in accordance with one or more of the following standards:
 - BS 7671/IEE wiring regulations
 - other BS and/or ISO standards
 - company standards and procedures
22. deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve
23. leave the work area in a safe and tidy condition on completion of the forming and assembly activities

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Outcome 2

Know how to form and assemble electrical cable enclosure and support systems

Assessment Criteria

The learner will be able to:

1. describe the specific safety practices and procedures that they need to observe when forming and assembling cable enclosure/support systems (including any specific legislation, regulations or codes of practice for the activities, equipment or materials)
2. describe the hazards associated with forming and assembling cable enclosure/support systems, and with the tools and equipment used (such as using bending and forming equipment, handling long lengths of pipe and trunking, using solvents and adhesives), and how they can be minimised
3. describe the importance of wearing appropriate protective clothing and equipment, and keeping the work area safe and tidy
4. describe the interpretation of circuit and wiring diagrams, and specifications used for the installation (including BS and ISO schematics, wiring regulations, symbols and terminology)
5. describe the various types of electrical cable enclosure and support systems used, and their typical applications
6. describe the factors to be taken into account when choosing metallic or non-metallic systems, and the effects of ambient temperatures within conduit and trunking systems
7. describe the marking out lengths to be cut, taking into account any allowances (such as for bending, screwing, gluing)
8. describe the methods of holding workpieces without damaging them (such as the use of a pipe vice)
9. describe the tools and equipment used in the cutting, bending and forming operations (such as the use of conduit bending machines, threading equipment, hot air torches and bending springs)
10. describe the methods of producing bends and sets in conduit materials (such as 90 degree bends, offsets, bridge sets)
11. describe the methods of bending plastic conduit (such as using hot air guns and springs)
12. explain how to produce fabricated bends in trunking and traywork section material (such as bends, Tee junctions, double and saddle sets)
13. describe the methods of forming screw threads on ends of conduit, and of using appropriate tools to remove all sharp edges and burrs
14. describe the various fittings used to assemble conduit, trunking and traywork systems (including screwed fittings, cemented fittings, straight connectors, bends, Tees, inspection fittings, light, power and control outlet boxes)
15. describe the importance and use of inspection fittings (such as elbows and junction boxes)
16. describe the things to look for when checking finished components/installations (such as dimensional checks, position and angle of bends/sets, out of alignment, loose connections, insufficient supports, damaged threads, deformed pipe around area of bend, burrs and sharp edges that could damage cables, ensuring that trunking lengths are free from swarf or other obstructions before connecting into the system)
17. explain how to join the system components (such as using screw fittings, cemented fittings, fabricated components, nuts and bolts)
18. explain how to check alignment of components (including use of plumb bobs, levels and by visual means)

19. describe the methods of supporting and securing the components (such as position and spacing of supporting brackets and devices, using pipe clips, saddles and supports)
20. describe drilling masonry, and the types and application of masonry fixing devices used in installation work
21. describe the need to ensure that components are clear of services (such as gas water or electricity) before drilling walls
22. describe the problems that can occur with the installation operations, and how these can be overcome
23. explain when to act on their own initiative and when to seek help and advice from others
24. describe the importance of leaving the work area in a safe and clean condition on completion of the assembly/installation activities (such as returning tools and equipment to its designated location, cleaning the work area, and removing and disposing of waste)