**Solar PV and EESS NOS Development Consultation**

**Introduction**

Building Services Engineering (BSE) Skills[[1]](#footnote-1) Ltd has been contracted to research and develop a suite of National Occupational Standards (NOS) for those whose role includes working on the Installation and Maintenance of Solar PV and EESS across the UK.

**Draft NOS for Solar PV and EESS**

The following draft NOS have been developed by a team of UK industry experts (employers, training providers, trade associations, unions and other key UK stakeholders) to capture the TECHNICAL COMPETENCES associated with the role:

|  |  |
| --- | --- |
| **Ref** | **Title** |
| SPV01 | Install assemblies and enclosures for SPV and EESS systems |
| SPV02 | Install and connect SPV and EESS systems |
| SPV03 | Inspect and test SPV and EESS systems |
| SPV04 | Commission SPV and EESS systems |
| SPV05 | Identify and rectify faults in SPV and EESS systems |
| SPV06 | Maintain SPV and EESS systems |
| SPV07 | Develop, test and agree project designs for Solar PV systems |
| SPV08 | Develop, test and agree project designs for EESS  |

**How you can help**

As part of the development work BSE Skills Ltd must consult widely with employers, training providers and other key stakeholders to ensure the new NOS meets the needs of the sector across the UK. **We need your input and are asking you to:**

* **Read** through the NOS specifications provided (see **Appendix 1**) and provide feedback on **Page 2** by telling us in:
	+ Section 1: a little bit about yourself and your organisation (just the basics)
	+ Section 2: whether the NOS are fit for purpose (**FFP**) or could be improved (**CBI**) and what that improvement should be
	+ Section 3: anything further which is not accommodated elsewhere
* **Return** the completed consultation template **IN MICROSOFT WORD:**
	+ to Alan McDonald at alan.mcdonald7@ntlworld.com
	+ by noon on **FRIDAY 16 FEBRUARY**

**Section 1: About You**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | **Position (job title)** | **Organisation** | **Location (HQ in UK)** | **No. of (direct) employees** | **Email** |
|  |  |  |  |  |  |

**Section 2: Your feedback on the NOS (mark X in FFP or CBI column)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Ref** | **Title** | **FFP** | **CBI** | **Suggested Improvement (if relevant)** |
| **Performance Criteria** | **Knowledge/Understanding** | **Scope** |
| SPV01 | Install assemblies and enclosures for SPV and EESS systems |  |  |  |  |  |
| SPV02 | Install and connect SPV and EESS systems |  |  |  |  |  |
| SPV03 | Inspect and test SPV and EESS systems |  |  |  |  |  |
| SPV04 | Commission SPV and EESS systems |  |  |  |  |  |
| SPV05 | Identify and rectify faults in SPV and EESS systems |  |  |  |  |  |
| SPV06 | Maintain SPV and EESS systems |  |  |  |  |  |
| SPV07 | Develop, test and agree project designs for Solar PV systems |  |  |  |  |  |
| SPV08 | Develop, test and agree project designs for EESS  |  |  |  |  |  |

**Section 3: Additional Feedback/Detail**

|  |  |  |
| --- | --- | --- |
| **Q** | **Question** | **Response** |
| 1 | What should be added to the list of NOS? |  |
| 2 | What should be removed for the list of NOS? |  |
| 3 | Should we combine any of the NOS into a single NOS? |  |
| 4 | Other comments/feedback? |  |

Many thanks for participating in this project. Your personal data will be destroyed at the end of the project.

**Appendix 1: Solar PV and EESS NOS**

**Draft NOS for Installation and Maintenance of Solar PV and EESS systems**

**Consultation Version**

|  |  |  |
| --- | --- | --- |
| **Ref** | **Title** | **Page** |
| SPV01 | Install assemblies and enclosures for SPV and EESS systems | 4 |
| SPV02 | Install and connect SPV and EESS systems | 9 |
| SPV03 | Inspect and test SPV and EESS systems | 14 |
| SPV04 | Commission SPV and EESS systems | 20 |
| SPV05 | Identify and rectify faults in SPV and EESS systems | 24 |
| SPV06 | Maintain SPV and EESS systems | 30 |
| SPV07 | Develop, test and agree project designs for Solar PV systems | 36 |
| SPV08 | Develop, test and agree project designs for EESS  | 42 |

**SPV01: Install assemblies and enclosures for Solar PV and EESS systems**

**Overview**

This standard is for people who install assemblies and enclosures for electrical cables, conductors and wiring systems internally and externally for Solar PV and EESS systems.

The person carrying out this work must be able to comply with the procedures and methods for installing assemblies and enclosures for electrical cables, conductors and wiring systems 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.

They must know and understand the different types of assemblies and enclosures for electrical cables, conductors and wiring systems, the limitations, applications and the techniques for the positioning, fitting, fixing and connection of the assemblies and enclosures, including the components and accessories.

# Performance criteria - You must be able to:

1. confirm the suitability of the supply / supplies
2. confirm before work starts that the work location and work area can be accessed safely and has been checked for hazards that may present a risk to personnel on the site, and take appropriate action if a risk is present
3. produce a risk assessment and method statement for the work to be carried out, including the identification and use of personal protective equipment
4. verify that job information and documentation is current and relevant and that the plant, instruments, access equipment, tools required are fit for purpose
5. select assemblies and enclosures and confirm that they are:
* of the right type and size
* fit for purpose in accordance with the system design
1. confirm that the plans for locating, positioning and fixing the components and accessories of the selected assemblies and enclosures are in accordance with:
* the system design
* manufacturer instructions
1. comply with relevant industry practices and organisational procedures to ensure the co-ordination of site services and the activities of other trades
2. identify the means of electrical isolation for the AC and DC system where relevant prior to commencing installation work
3. complete the correct safe-isolation procedures to ensure the safe installation of the enclosures
4. measure and mark out the locations for fitting and fixing of selected enclosures / supports/ components and accessories in accordance with:
* the system design
* manufacturer instructions
1. fit, fix and connect the selected enclosures/ supports / components and accessories using the correct tools in accordance with:
* the system design
* industry recognised methods
* manufacturer instructions
1. confirm with the relevant people
* those necessary variations to the planned programme of work that may have the potential to introduce a hazard and/or impact
* on the installation work to be undertaken
* the correct actions to be undertaken to ensure that any variations to the planned programme of work will not introduce a hazard and have minimum impact on the installation work to be undertaken
1. implement organisational procedures for the safe transport and/or disposal of waste materials, substances and liquids in accordance with supplier and manufacturer instructions

# Knowledge and understanding - You need to know and understand:

1. the operation, applications, advantages and limitations of different Solar PV and EESS systems
2. the appropriate industry standards and regulations relevant to installing assemblies and enclosures
3. how to produce a risk assessment and method statement for the work to be carried out, including the identification and use of personal protective equipment, in accordance with:
* the system design
* organisational procedures
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
2. the applications, advantages and limitations of types of personal protective equipment
3. the applications, advantages and limitations of types of assemblies and enclosures
4. the industry recognised methods for determining the type and size of assemblies and enclosures
5. how to interpret diagrams and drawings for the Solar PV and EESS system to locate site services
6. how to interpret diagrams and drawings for the Solar PV and EESS system to identify the planned location of the assemblies and enclosures
7. the methods and techniques for fitting, fixing and connecting the selected assemblies and enclosures and their components and accessories in accordance with:
* the system design
* manufacturer instructions
1. the correct procedures for safe isolation for AC and DC systems
2. the organisational procedures for confirming with the relevant people the appropriate actions to be taken to ensure that any variations to the planned programme of work will not introduce a hazard and have minimum negative impact on the installation work to be undertaken
3. the methods for the safe transport and/or disposal of waste material, substances and liquids in accordance with suppliers’ and manufacturer instructions

# Scope - the contexts and circumstances which apply:

**Working environments (internal and/or external)**

* domestic
* non-domestic
	+ commercial
	+ industrial
	+ agricultural
	+ horticultural
	+ leisure and entertainment
	+ residential medical and care facilities
	+ public highways and parks
	+ public services establishments
	+ pre-1919 traditional/historic buildings

**Solar PV and Electrical Energy Storage System**

* Panels/arrays
* Panel support systems
* Charge controller
* Battery bank
* Inverter/power optimiser
* Power meter
* SMART controls/technology

**Site**

* new build construction – building or structure
* an existing building or structure

**Site services**

* electricity
* water
* gas
* oil
* drainage
* telecommunications
* data transmission either underground or overhead

**Organisation procedures**

* information management
* project management
* risk assessment
* risk management
* implementing and monitoring health and safety requirements and issues
* implementing and monitoring issues relating to the natural environment
* customer services
* emergencies
* communication with relevant people

**Plant**

* generators
* transformers for extra-low voltage powered hand-tools
* lifting equipment
* access equipment

**Assemblies**

* Junction boxes
* Combiner boxes
* Distribution boards and switchgear assemblies
* DC Isolators or string fuse enclosures

**Enclosures**

* PVC and steel conduit
* PVC and steel trunking
* cable tray
* basket and ladder systems
* ducting systems
* bus-bar trunking
* pre-fabricated conductor, cable and wiring systems

**Relevant people**

* customers/clients
* client representatives
* supervisors
* site/contract manager
* other contractors/trades
* members of the public
* work colleagues

**SPV02: Install and connect Solar PV and EESS systems**

**Overview**

This standard is for people who install and connect electrical cables, conductors, wiring systems, equipment, accessories and components for Solar PV and EESS systems.

The person carrying out this work must be able to comply with correct 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.

They must know and understand the different types of cables, conductors, wiring systems, equipment, accessories and components, their limitations, applications and the techniques for positioning, fitting, fixing and connection.

# Performance criteria - You must be able to:

1. confirm the suitability of the supply / supplies
2. produce a risk assessment and method statement for the work to be carried out, including the identification and use of personal protective equipment
3. verify that job information and documentation is current and relevant and that the plant, instruments, access equipment and tools are fit for purpose
4. select the associated equipment, accessories and components and confirm that they are:
* of the right type and size
* fit for purpose in accordance with the system design
1. select electrical cables, conductors, wiring systems and confirm that they are:
* of the correct size and type
* fit for purpose in accordance with the system design
1. comply with industry practices and organisational procedures to ensure the co-ordination of site services and the activities of other trades
2. identify the correct means of electrical isolation for the AC and DC system where relevant prior to commencing installation and connection work
3. complete safe-isolation as and when required to ensure the safe installation and connection of electrical cables, conductors and wiring systems and their associated equipment, accessories and components
4. install, fix and connect electrical cables, conductors and wiring systems and their associated equipment, accessories and components using the correct tools in accordance with the requirements of:
* the system design
* industry recognised methods
* manufacturer instructions
1. inspect and test the connections and joints of the electrical cables, conductors and wiring systems and their associated equipment, accessories and components to ensure they are of proper construction in terms of conductance, insulation, mechanical strength and protection, and ensure that they are identified correctly and clearly in accordance with the requirements of the Solar PV and EESS system
2. confirm with the relevant people:
* those necessary variations to the planned programme of work that may have the potential to introduce a hazard and/or impact on the installation work to be undertaken
* the correct actions to be taken to ensure that any variations to the planned programme of work will not introduce a hazard and have minimum impact on the installation to be undertaken
1. implement organisational procedures for the safe transport and/or disposal of waste material, substances and liquids in accordance with suppliers’ and manufacturer instructions

# Knowledge and understanding - You need to know and understand:

1. the operation, applications, advantages and limitations of different Solar PVand EESSsystems
2. the appropriate industry standards and regulations relevant to installing and connecting electrical cables, conductors, wiring systems, associated equipment, accessories and components
3. how to produce a risk assessment and method statement for the work to be carried out, including the identification and use of personal protective equipment, in accordance with:
* the system design
* organisational procedures
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
2. the applications, advantages and limitations of types of personal protective equipment
3. the applications, advantages and limitations of types of electrical cables, conductors, wiring systems, associated equipment, accessories and components
4. the industry recognised methods for determining the correct type, size and rating of electrical cables, conductors, wiring systems, associated equipment, accessories and components in relation to the Solar PV and EESS system design
5. how to interpret diagrams and drawings for the Solar PV to locate site services
6. how to interpret diagrams and drawings for the Solar PV to identify the planned location of the electrical cables, conductors, wiring systems, associated equipment, accessories and components
7. the methods and techniques for installing, fixing and connecting electrical cables, conductors, wiring systems, associated equipment, accessories and components in accordance with:
* the system design
* manufacturer instructions
1. the different types and methods of joining and connecting electrical cables, conductors, wiring systems
2. the applications, advantages and limitations of electrical cables, conductors, wiring systems
3. the correct procedures for safe isolation for AC and DC systems
4. the organisational procedures for confirming with the relevant people the appropriate actions to be taken to ensure that any variations to the planned programme of work will not introduce a hazard and have minimum negative impact on the installation work to be undertaken
5. the methods for the safe transport and/or disposal of waste material, substances and liquids in accordance with suppliers’ and manufacturer instructions

# Scope - the contexts and circumstances which apply:

**Working environments (internal and/or external)**

* domestic
* non-domestic
	+ commercial
	+ industrial
	+ agricultural
	+ horticultural
	+ leisure and entertainment
	+ residential medical and care facilities
	+ public highways and parks
	+ public services establishments
	+ pre-1919 traditional/historic buildings

**Solar PV and EESS system**

* Panels/arrays
* Panel support systems
* Charge controller
* Battery bank
* Inverter/power optimiser
* Power meter
* SMART controls/technology

**Site**

* new build construction – building or structure
* an existing building or structure

**Site services**

* electricity
* water
* gas
* oil
* drainage
* telecommunications
* data transmission either underground or overhead

**Organisation procedures**

* information management
* project management
* risk assessment
* risk management
* implementing and monitoring health and safety requirements and issues
* implementing and monitoring issues relating to the natural environment
* customer services
* emergencies
* communication with relevant people

**Plant**

* generators
* transformers for extra-low voltage powered hand-tools
* lifting equipment
* access equipment

**Electrical cable, conductors and wiring systems**

* thermosetting insulated cables including flexes
* single and multicore thermoplastic and thermosetting insulated cables
* flat profile cable
* earthed metallic cable
* single wire armoured cables
* armoured/braided flexible cables and cords
* data cables
* pre-fabricated conductor, cable and wiring systems
* fibre optic cable
* fire resistant cable
* bus-bar trunking

**Assemblies, equipment, accessories and components**

* arc fault detection devices (AFDDs)
* cable glands
* circuit breakers
* consumer units
* control devices – electrical; electronic; electro-mechanical
* control panels – alarms; emergency lighting; environmental control
* distribution boards and/or panels
* earthing protection
* fuses
* isolators
* luminaires
* micro-wind turbine control equipment
* motor control equipment
* socket-outlets
* solar photovoltaic panels – control equipment, components and accessories
* surge protection devices (SPDs)
* switches

**Relevant people**

* customers/clients
* client representatives
* supervisors
* site/contract manager
* other contractors/trades
* members of the public
* work colleagues

**SPV03: Inspect and test Solar PV and EESS Systems**

**Overview**

This standard is for people who inspect and test Solar PV and EESS systems and equipment.

The person carrying out this work must be suitably competent and able to comply with the processes and procedures for initial and periodic inspection and testing of a Solar PV and EESS system 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.

They must know, understand and apply the correct methods and procedures for the inspection and testing of Solar PV and EESS systems and equipment, including the:

* identification and use of the correct test equipment / instruments
* completion of the relevant certification / documentation
* recording of relevant data and information.

# Performance criteria - You must be able to:

1. confirm a suitable programme of work with the relevant people in accordance with organisational procedures
2. determine and obtain the resources required, as relevant, to undertake:
* initial verification inspection and testing
* periodic inspection and testing
1. select the correct test equipment / instruments to be used for carrying out the relevant tests
2. confirm that the test equipment / instruments are fit for purpose, accurate and have a current calibration certificate
3. conduct a visual inspection on the assemblies and enclosures for cables, conductors and wiring systems to confirm they are:
* located and secured correctly
* electrically and mechanically sound
1. conduct a visual inspection on the electrical cable, conductor and wiring systems to confirm they are:
* located and secured correctly
* identified and/or labelled correctly
1. conduct a visual inspection on the assemblies, equipment, accessories and components to confirm they are:
* located and secured correctly
* identified and/or labelled correctly
1. comply with industry practices and organisational procedures to ensure the co-ordination of site services and the activities of other trades affected by:
* the inspection process and procedures
* the testing process and procedures
1. identify the correct means of electrical isolation for both the AC and DC supplies prior to commencing the inspection and/or testing process
2. complete safe isolation procedures as and when required to ensure the safe inspection and testing of electrical cables, conductors and/or wiring system and the associated equipment, accessories and components
3. perform the tests in the correct sequence for initial verification testing to ensure safety and correct operation of the Solar PV and EESS system
4. undertake appropriate inspection sampling and perform the appropriate tests for periodic testing to ensure safe and efficient operation of the Solar PV and EESS system
5. comply with organisational procedures for:
* completion of the relevant certification / documentation
* the recording of relevant data and information
* informing relevant people
* addressing issues and problems identified

# Knowledge and understanding - You need to know and understand:

1. the operation, applications, advantages and limitations of different Solar PV and EESS systems
2. the organisational procedures to confirm a programme of work with the relevant people
3. how to determine and obtain the resources required, as relevant, to undertake:
* initial verification inspection and testing
* periodic inspection and testing
1. how to select the correct test equipment / instruments to be used for carrying our relevant tests
2. how to confirm that the test equipment / instruments are fit for purpose, accurate and have a current calibration certificate
3. the methods and procedures for conducting a visual inspection on the enclosures for cables, conductors and wiring systems to confirm they are:
* located and secured correctly
* electrically and mechanically sound
1. the methods and procedures for conducting a visual inspection on the electrical cable, conductor and wiring systems to confirm they are:
* located and secured correctly
* identified and/or labelled correctly
1. the methods and procedures for conducting a visual inspection on the equipment, accessories and components to confirm they are:
* located and secured correctly
* identified and/or labelled correctly
1. the industry practices and organisational procedures to ensure the co-ordination of site services and the activities of other trades affected by:
* the inspection process and procedures
* the testing process and procedures
1. the correct procedures for safe isolation for AC and DC systems
2. the methods and processes to carry out correctly the tests that ensure safety and efficient operation of the Solar PV and EESS system
3. the organisational procedures for:
* completion of the relevant certification / documentation
* the recording of relevant data and information
* informing relevant people
* addressing issues and problems identified

# Scope - the contexts and circumstances which apply:

**Working environments (internal and/or external)**

* domestic
* non-domestic
	+ commercial
	+ industrial
	+ agricultural
	+ horticultural
	+ leisure and entertainment
	+ residential medical and care facilities
	+ public highways and parks
	+ public services establishments
	+ pre-1919 traditional/historic buildings

**Solar PV and EESS system**

* Panels/arrays
* Panel support systems
* Charge controller
* Battery bank
* Inverter/power optimiser
* Power meter
* SMART controls/technology

**Organisation procedures**

* information management
* project management
* risk assessment
* risk management
* implementing and monitoring health and safety requirements and issues
* implementing and monitoring issues relating to the natural environment
* customer services
* emergencies
* communication with relevant people

**Resources**

* labour
* plant and equipment
* instruments
* finance
* IT
* materials and other consumables

**Site services**

* electricity
* water
* gas
* oil
* drainage
* telecommunications
* data transmission either underground or overhead

**Relevant people**

* customers/clients
* client representatives
* supervisors
* site/contract manager
* other contractors/trades
* members of the public
* work colleagues

**Tests (AC and/or DC)**

* continuity of protective conductors
* insulation resistance
* polarity
* earth fault loop impedance
* prospective fault current
* RCD operation
* phase rotation
* functional testing
* VOC tests
* ISC Test
* Irradiance
* Other as relevant (e.g. Thermal Imaging, IV Curve tracing etc)

**Enclosures for cables, conductors and wiring systems**

* PVC and steel conduit
* PVC and steel trunking
* cable tray
* basket and ladder systems
* ducting systems
* bus-bar trunking
* pre-fabricated conductor, cable and wiring systems

**Electrical cable, conductors and wiring systems**

* thermosetting insulated cables including flexes
* single and multicore thermoplastic and thermosetting insulated cables
* flat profile cable
* mineral insulated cables
* single wire armoured cables
* armoured/braided flexible cables and cords
* data cables
* pre-fabricated conductor, cable and wiring systems
* fibre optic cable
* fire resistant cable
* bus-bar trunking

**Assemblies, equipment, accessories and components**

* arc fault detection devices (AFDDs)
* cable glands
* circuit breakers
* consumer units
* control devices – electrical; electronic; electro-mechanical
* control panels – alarms; emergency lighting; environmental control
* distribution boards and/or panels
* earthing protection
* fuses
* isolators
* luminaires
* micro-wind turbine control equipment
* motor control equipment
* socket-outlets
* solar photovoltaic panels – control equipment, components and accessories
* surge protection devices (SPDs)
* switches

**Documentation**

* electrical installation certificates
* electrical installation condition reports
* minor electrical installation works certificates
* schedules of inspections
* schedules of circuit details and test results as required:
	+ PV Array test results
	+ PV Array Inspection Checklist
	+ MCS Certificate
	+ PV Array Frame Calculations (Wind/Structure)

**SPV04: Commission Solar PV and EESS systems**

**Overview**

This standard is for people who commission Solar PV and EESS systems and equipment.

The person carrying out this work must be able to comply with the processes and procedures for the commissioning and handing over of Solar PV and EESS systems and equipment 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.

They must know, understand and apply the correct methods and procedures for the commissioning and handing over Solar PV and EESS systems and equipment including the:

* identification and use of the correct test equipment / instruments
* completion of the relevant certification / documentation
* recording of relevant data and information
* identification and consideration of the customer’s need for Solar PV and EESS systems and equipment configuration
* planning of the resources required to carry out the commissioning process

# Performance criteria - You must be able to:

1. identify the customer/client’s requirements
2. plan the commissioning process
3. determine and obtain the resources required to undertake the process
4. ensure methods and organisational procedures are implemented correctly
5. verify that the customer/client’s requirements are met
6. resolve any problems identified
7. specify methods and organisational procedures which conform with customer/client requirements
8. confirm that conditions are suitable for commissioning to take place
9. complete the commissioning process
10. record and assess information in accordance with organisational procedures
11. ensure that the results are recorded in the appropriate information systems and passed to the relevant people
12. ensure that the Solar PV and EESS system and equipment is ready for hand over to the customer/client
13. identify and explain any variations
14. obtain customer/client acceptance of the Solar PV and EESS system and equipment in accordance with organisational procedures
15. ensure that all relevant documentation is correctly completed and recorded in the appropriate information systems in accordance with organisational procedures

# Knowledge and understanding - You need to know and understand:

1. the operation, applications, advantages and limitations of different Solar PV and EESS systems
2. the requirements for the commissioning process
3. the resources required to undertake the commissioning process
4. methods, organisational procedures and systems to:
* record and assess information
* ensure that the results are recorded in the appropriate
* information systems and passed to the relevant people
1. the correct methods and organisational procedures for implementing the commissioning process
2. conditions that are suitable to implementation
3. how to resolve any problems identified
4. how to ensure that the Solar PV and EESS system and equipment is ready for hand over to the customer/client
5. methods for providing clear and accurate information to relevant people
6. the organisational procedures for:
* notifying relevant people of any variations
* obtaining customer/client acceptance of the Solar PV and EESS system and equipment
* the completion of all relevant documentation
* recording of information and/or data in the appropriate information systems

# Scope - the contexts and circumstances which apply:

**Working environments (internal and/or external)**

* domestic
* non-domestic
	+ commercial
	+ industrial
	+ agricultural
	+ horticultural
	+ leisure and entertainment
	+ residential medical and care facilities
	+ public highways and parks
	+ public services establishments
	+ pre-1919 traditional/historic buildings

**Solar PV and EESS system**

* Panels/arrays
* Panel support systems
* Charge controller
* Battery bank
* Inverter/power optimiser
* Power meter
* SMART controls/technology

**Organisation procedures**

* information management
* project management
* risk assessment
* risk management
* implementing and monitoring health and safety requirements and issues
* implementing and monitoring issues relating to the natural environment
* customer services
* emergencies
* communication with relevant people

**Resources**

* labour
* plant and equipment
* instruments
* finance
* IT
* materials and other consumables

**Information**

* technical – design documentation; plans; installation specifications; equipment specifications; manufacturer data; manufacturer instructions; BIM data
* functional – operational instructions
* customer/client information – drawings; diagrams; user instructions; specifications
* contractual
* statutory consents
* health and safety
* environmental considerations

**The commissioning process**

* tests and testing
* verification
* configuration
* hand-over

**Equipment, accessories and components**

* arc fault detection devices (AFDDs)
* cable glands
* circuit breakers
* consumer units
* control devices – electrical; electronic; electro-mechanical
* control panels – alarms; emergency lighting; environmental control
* distribution boards and/or panels
* earthing protection
* fuses
* isolators
* luminaires
* micro-wind turbine control equipment
* motor control equipment
* socket-outlets
* solar photovoltaic panels – control equipment, components and accessories
* surge protection devices (SPDs)
* switches

**Relevant people**

* customers/clients
* client representatives
* site/contract manager
* other contractors/trades
* members of the public
* work colleague

**Documentation**

* electrical installation certificates
* electrical installation condition reports
* minor electrical installation works certificates
* schedules of circuit details and test results as required:
	+ PV Array test results
	+ PV Array Inspection Checklist
	+ MCS Certificate
	+ PV Array Frame Calculations (Wind/Structure)
	+ schedules of inspections
	+ operational instructions
	+ manufacturer instructions
	+ handover agreements

**SPV05: Identify and rectify faults in Solar PV and EESS systems**

**Overview**

This standard is for people who identify and rectify faults in Solar PV and EESS systems and equipment

The person carrying out this work must be able to carry out the processes and procedures for the identification and rectification of faults 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.

They must understand and apply the correct methods and procedures when identifying and rectifying faults in Solar PV and EESS systems and equipment, including:

* the identification and use of the correct test equipment / instruments
* how to identify and locate faults
* how to rectify the faults that are identified, located and diagnosed
* the completion of the relevant documentation
* the recording of relevant data and information.

# Performance criteria - You must be able to:

1. obtain clear and detailed information about the reported fault(s) and any components which need to be replaced from relevant:
* sources of information
* documentation
1. advise the relevant people clearly and accurately about the potential disruption and consequences of carrying out the processes and procedures for the identification and rectification of faults
2. confirm a suitable programme of work with the relevant people in accordance with organisational procedures
3. determine and obtain the resources required, as relevant, to undertake:
* the identification and location of the fault(s)
* the rectification of the fault(s)
1. select the instruments to be used
2. confirm that the instruments are fit for purpose and have a current calibration certificate
3. identify the means of electrical isolation for the AC and DC system prior to commencing the fault identification and rectification process
4. complete safe-isolation as and when required to ensure the safe fault identification and rectification in electrical cables, conductors and/or wiring system and the associated equipment, accessories and components
5. comply with industry practices and organisational procedures to ensure the co-ordination of site services and the activities of other trades affected by:
* the identification and location of the fault(s)
* the rectification of the fault(s)
1. identify, locate, diagnose and rectify faults
2. repair, remove and replace using the correct tools in accordance with industry recognised methods and procedures, as appropriate:
* electrical cables, conductors and/or wiring system
* equipment, accessories and components
1. ensure, if the fault(s) cannot be corrected immediately, the safety of the relevant:
* electrical cables, conductors and/or wiring system
* equipment, accessories and components
1. inspect and test, as appropriate and in accordance with industry recognised methods and practices the repaired and/or replaced:
* electrical cables, conductors and/or wiring system
* equipment, accessories and components
1. provide clear and accurate information to relevant people about the Solar PV and EESS system and equipment in terms of:
* hand over to the customer/client
* any variations to the original system and/or its equipment
* customer/client acceptance of the completed work in
* accordance with organisational procedures
* relevant documentation being completed and recorded in the appropriate information systems in accordance with organisational procedures

# Knowledge and understanding - You need to know and understand:

1. the operation, applications, advantages and limitations of different Solar PV and EESS systems
2. how to obtain clear and detailed information about the reported fault(s) and any components which need to be replaced from:
* relevant sources of information
* relevant documentation
1. the organisational procedures and industry practices when carrying out the processes for the identification and rectification of faults for:
* advising the relevant people about the potential disruption and consequences
* confirming a programme of work with the relevant people
* ensuring the coordination of site services and the activities of other trades affected
1. how to determine and obtain the resources required, as relevant, to undertake:
* the identification and location of the fault(s)
* the rectification of the fault(s)
1. how to select the instruments to be used
2. how to confirm that the instruments are fit for purpose and have a current calibration certificate
3. the correct procedures for safe isolation for AC and DC systems
4. the techniques to identify, locate, diagnose and rectify faults
5. how to repair, remove and replace in accordance with industry practices:
* electrical cables, conductors and/or wiring system
* equipment, accessories and components
1. how to ensure, if the fault(s) cannot be corrected immediately, the safety of the relevant:
* electrical cables, conductors and/or wiring system
* equipment, accessories and components
1. the methods and processes to inspect and test, as appropriate and in accordance with industry practices, the repaired and/or replaced:
* electrical cables, conductors and/or wiring system
* equipment, accessories and components
1. how to provide clear and accurate information to relevant people about the Solar PV and EESS system and equipment in terms of:
* hand over to the customer/client
* any variations to the original system and/or its equipment
* customer/client acceptance of the completed work in accordance with organisational procedures
* relevant certification / documentation being completed and recorded in the appropriate information systems in accordance with organisational procedures

# Scope - the contexts and circumstances which apply:

**Working environments (internal and/or external)**

* domestic
* non-domestic
	+ commercial
	+ industrial
	+ agricultural
	+ horticultural
	+ leisure and entertainment
	+ residential medical and care facilities
	+ public highways and parks
	+ public services establishments
	+ pre-1919 traditional/historic buildings

**Solar PV and EESS system**

* Panels/arrays
* Panel support systems
* Charge controller
* Battery bank
* Inverter/power optimiser
* Power meter
* SMART controls/technology

**Organisation procedures**

* information management
* project management
* risk assessment
* risk management
* implementing and monitoring health and safety requirements and issues
* implementing and monitoring issues relating to the natural environment
* customer services
* emergencies
* communication with relevant people

**Resources**

* labour
* plant and equipment
* instruments
* finance
* IT
* materials and other consumables

**Site services**

* electricity
* water
* gas
* oil
* drainage
* telecommunications
* data transmission either underground or overhead

**Relevant people**

* customers/clients
* client representatives
* site/contract manager
* other contractors/trades
* members of the public
* work colleagues

**Documentation**

* electrical installation certificates
* electrical installation condition reports
* minor electrical installation works certificates
* schedules of inspections
* schedules of circuit details and test results
* operational instructions
* manufacturer instructions
* handover agreements

**Electrical cable, conductors and wiring systems**

* thermosetting insulated cables including flexes
* single and multicore thermoplastic and thermosetting insulated cables
* flat profile cable
* earthed metallic cable
* single wire armoured cables
* armoured/braided flexible cables and cords
* data cables
* pre-fabricated conductor, cable and wiring systems
* fibre optic cable
* fire resistant cable
* bus-bar trunking

**Equipment, accessories and components**

* arc fault detection devices (AFDDs)
* cable glands
* circuit breakers
* consumer units
* control devices – electrical; electronic; electro-mechanical
* control panels – alarms; emergency lighting; environmental control
* distribution boards and/or panels
* earthing protection
* fuses
* isolators
* luminaires
* micro-wind turbine control equipment
* motor control equipment
* socket-outlets
* solar photovoltaic panels – control equipment, components and accessories
* surge protection devices (SPDs)
* switches

**Enclosures for cables, conductors and wiring systems**

* PVC and steel conduit
* PVC and steel trunking
* cable tray
* basket and ladder systems
* ducting systems
* bus-bar trunking
* pre-fabricated conductor, cable and wiring systems

**SPV06: Maintain Solar PV and EESS systems**

**Overview**

This standard is for people who maintain Solar PV and EESS systems and equipment.

The person carrying out this work must be able to carry out maintenance activities in accordance with proceduresandthe current versions of the appropriate industry standards and regulations, the specification; industry recognised working practices, the working environment and the natural environment.

They must understand and apply the correct methods and procedures for the maintenance of Solar PV and EESS systems and equipment, including:

* routine and non-routine maintenance
* the identification and use of the correct instruments
* how to identify and locate faults
* how to rectify the faults
* the completion of the relevant documentation
* the recording of relevant data and information.

# Performance criteria - You must be able to:

1. obtain clear and detailed information about the Solar PV and EESS system and equipment to be maintained from relevant:
* sources of information
* documentation
1. confirm a programme of work with the relevant people in accordance with organisational procedures
2. advise the relevant people clearly and accurately about the potential disruption and consequences of carrying out the maintenance activity
3. determine and obtain the resources required, as relevant, to undertake the maintenance activity
4. select the instruments to be used
5. confirm that the instruments are fit for purpose and have a current calibration certificate
6. identify the means of electrical isolation for the AC and DC system prior to commencing the maintenance activity
7. complete safe isolation as and when required to ensure the safe maintenance of electrical cables, conductors and/or wiring system and the associated equipment, accessories and components
8. comply with industry practices and organisational procedures to ensure the co-ordination of site services and the activities of other trades affected by the maintenance activity
9. carry out maintenance activity
10. repair, remove, replace and/or maintain using the correct tools in accordance with industry practices:
* electrical cables, conductors and/or wiring systems
* equipment, accessories and components
1. ensure, if the maintenance activity cannot be completed immediately, the safety of the relevant:
* electrical cables, conductors and/or wiring systems
* equipment, accessories and components
1. complete the specified maintenance activity in accordance with industry recognised methods and practices
2. inspect and test, as appropriate and in accordance with industry recognised methods and practices the repaired, replaced and/or maintained:
* electrical cables, conductors and/or wiring system
* equipment, accessories and components
1. provide clear and accurate information to relevant people about the Solar PV and EESS system and equipment in terms of:
* hand over to the customer/client
* any variations to the original system and/or its equipment
* customer/client acceptance of the completed work in accordance with organisational procedures
* relevant documentation being completed and recorded in the appropriate information systems in accordance with organisational procedures

# Knowledge and understanding - You need to know and understand:

1. the operation, applications, advantages and limitations of different Solar PV and EESS systems
2. how to obtain clear and detailed information about the Solar PV and EESS system and equipment to be maintained from relevant:
* sources of information
* documentation
1. the organisational procedures and industry practices when carrying out the maintenance activity for:
* advising the relevant people about the potential disruption and consequences
* confirming a programme of work with the relevant people
* ensuring the coordination of site services and the activities of other trades affected
1. how to determine and obtain the resources required to undertake the maintenance activity
2. how to select the instruments to be used
3. how to confirm that the instruments are fit for purpose and have a current calibration certificate
4. the correct procedures for safe isolation for AC and DC systems
5. the techniques for the maintenance of Solar PV and EESS systems and equipment including how to identify, locate, diagnose and rectify faults
6. how to repair, remove, replace and maintain, in accordance with industry practices:
* electrical cables, conductors and/or wiring system
* equipment, accessories and components
1. how to ensure, if the maintenance activity cannot be completed immediately, the safety of the relevant:
* electrical cables, conductors and/or wiring system
* equipment, accessories and components
1. the methods and processes to inspect and test, as appropriate and in accordance with industry practices the repaired, replaced and/or maintained:
* electrical cables, conductors and/or wiring system
* equipment, accessories and components
1. how to provide clear and accurate information to relevant people about the Solar PV and EESS system and equipment in terms of:
* hand over to the customer/client
* any variations to the original system and/or its equipment
* customer/client acceptance of the completed work in accordance with organisational procedures
* relevant documentation being completed and recorded in the appropriate information systems in accordance with organisational procedures

# Scope - the contexts and circumstances which apply:

**Working environments (internal and/or external)**

* domestic
* non-domestic
	+ commercial
	+ industrial
	+ agricultural
	+ horticultural
	+ leisure and entertainment
	+ residential medical and care facilities
	+ public highways and parks
	+ public services establishments
	+ pre-1919 traditional/historic buildings

**Solar PV and EESS system**

* Panels/arrays
* Panel support systems
* Charge controller
* Battery bank
* Inverter/power optimiser
* Power meter
* SMART controls/technology

**Organisation procedures**

* information management
* project management
* risk assessment
* risk management
* implementing and monitoring health and safety requirements and issues
* implementing and monitoring issues relating to the natural environment
* customer services
* emergencies
* communication with relevant people

**Resources**

* labour
* plant and equipment
* instruments
* finance
* IT
* materials and other consumables

**Site services**

* electricity
* water
* gas
* oil
* drainage
* telecommunications
* data transmission either underground or overhead

**Relevant people**

* customers/clients
* client representatives
* site/contract manager
* other contractors/trades
* members of the public
* work colleagues

**Documentation**

* electrical installation certificates
* electrical installation condition reports
* minor electrical installation works certificates
* schedules of inspections
* schedules of test results
* operational instructions
* manufacturer instructions
* handover agreements

**Electrical cable, conductors and wiring systems**

* thermosetting insulated cables including flexes
* single and multicore thermoplastic and thermosetting insulated cables
* flat profile cable
* mineral insulated cables
* earthed metallic cable
* single wire armoured cables
* armoured/braided flexible cables and cords
* data cables
* pre-fabricated conductor, cable and wiring systems
* fibre optic cable
* fire resistant cable
* bus-bar trunking

**Equipment, accessories and components**

* arc fault detection devices (AFDDs)
* cable glands
* circuit breakers
* consumer units
* control devices – electrical; electronic; electro-mechanical
* control panels – alarms; emergency lighting; environmental control
* distribution boards and/or panels
* earthing protection
* fuses
* isolators
* luminaires
* micro-wind turbine control equipment
* motor control equipment
* socket-outlets
* solar photovoltaic panels – control equipment, components and accessories
* surge protection devices (SPDs)
* switches

**Enclosures for cables, conductors and wiring systems**

* PVC and steel conduit
* PVC and steel trunking
* cable tray
* basket and ladder systems
* ducting systems
* bus-bar trunking
* pre-fabricated conductor, cable and wiring systems

**Information**

* technical – design documentation; plans; installation specifications; equipment specifications; manufacturer data; manufacturer instructions; BIM data
* functional – operational instructions
* customer/client information – drawings; diagrams; user instructions; specifications
* contractual
* statutory consents
* health and safety
* environmental considerations

**SPV07: Develop and agree project designs for Solar PV**

**Overview**

This standard is for those who manage the development and agreement of project design solutions for Solar PV systems.

The individual undertaking the work must be able to obtain and analyse information on project options and project design parameters and identify opportunities and constraints. They will be able to provide appropriate recommendations to enable agreement on the design and be able to l balance cost and quality and consider how they will be influenced by the agreed design solutions.

They will be able to prepare, review calculate and analyse proposed designs to identify the most appropriate solution. They must be able to present a compliant design to justify the choice in line with the project brief. They must also be able to discuss the choice of design and agree any changes with the client and record these changes. They will also be able to interpret how the overall design concept can be achieved and advise all relevant others on the implications and constraints of accepting, modifying or rejecting design proposals.

# Performance Criteria

1. access appropriate information about the project requirements and allocate adequate resources.
2. allocate research tasks where necessary, to relevant others.
3. analyse all research finding and develop detailed proposals
4. Develop the design concepts which meet the requirements of the clients brief.
5. communicate the detailed design options to relevant others
6. identify, with relevant others, the most appropriate solutions in terms of the project requirements and resources
7. identify and select tests which will give relevant information about how the design options to match the parameters of the project brief
8. present recommendations, proposals and design options and show how they are justified by the requirements of the project requirements and resources
9. inform relevant others of the implications and constraints of accepting, modifying or rejecting design proposals
10. agree and incorporate all final recommendations and requirements into the detailed design solution
11. confirm with relevant others what the recommended design solution will cost and how long it will take to implement
12. agree the detailed design solution with relevant others
13. complete and safely store all relevant documentation in accordance with organisational requirements
14. deal promptly and effectively with any problems within the scope and limitations of your own competence, responsibilities and accountability and report those which cannot be solved

# Knowledge & Understanding

1. the current legislation, guidelines, policies, procedures and protocols relevant to the design of Solar PV systems
2. the scope and limitations of your own competence, responsibilities and accountability as it applies to your job role
3. how to access and interpret all relevant work instructions and information
4. specific procedures for reporting issues which are beyond your competence, responsibilities and accountability
5. the system requirements information, options and design parameters which are relevant to the development of a project brief
6. how to identify those parts of a project which require detailed design
7. the factors, criteria and procedures which influence design and work activities, including resource availability
8. the types of documentation and methods to present research and design evaluation data and conclusions to relevant others
9. the design parameters, concepts and approaches and how to assess them against a project brief considering relevant factors, criteria and procedures
10. the resource implications of the different design options
11. the opportunities for and constraints on the use of environmental technologies
12. the different methods for communication around design
13. the implications of modifying a project brief
14. the types of design approaches that are likely to contribute to design ideas
15. how to sources information and ideas, where existing design options do not meet a project brief
16. how to develop design options
17. how to identify and use relevant design software packages
18. the types of tests which give relevant information about the design options
19. the different methods to refine and test design options
20. how to identify and reject design options which fail to meet the design parameters
21. the different techniques to record test results
22. the different methods to use to present recommendations, proposals, design options and associated information
23. the features and benefits of design solutions, including any environmental technologies
24. how recommendations, proposals and design options can be justified by the requirements of a project brief
25. what evidence may be valid to support changes to agreed criteria
26. the types of approaches to prompt relevant others to ask questions and make comments during a presentation
27. how to agree and record any amendments and variations from an original project brief
28. the different methods to inform relevant others about:
* how design concept proposals match criteria in a project brief
* a designer’s creative interpretation of a project brief and overall design concept
* implications and constraints of accepting, modifying or rejecting design proposals
* how much more advice, research and consultancy will be necessary to produce a detailed design which is acceptable
1. the costs involved in a detailed design solution
2. the organisational procedures for:
* communicating the use, safety and control of the system to relevant others
* confirming with relevant others those necessary variations to the planned programme of work that may have the potential to introduce a hazard and/or impact on the installation work to be undertaken
* confirming with relevant others the correct actions to be taken to confirm that any variations to the planned programme of work will not introduce a hazard and have minimum impact on the installation work be undertaken
* obtaining customer/client acceptance of the installed system and its associated equipment, accessories and components post work activity and how to deal with cases where acceptance is not received
* the safe transport and/or disposal of any waste material, substances and liquids in accordance with suppliers’ and manufacturers’ instructions and legislation
1. how to complete and safely store all relevant documentation in accordance with organisational requirements

# Scope (Based on MTCs)

**Relevant Technical Documents**

* Electricity at Work Regulations
* BS 7671
* BS 5839-6 and other relevant Codes of Practice
* Other Industry Guidance documents (including ENA)
* HSE Requirements and Guidance
* Relevant IET Publications e.g. Guidance Notes, IET On-Site Guide
* Construction Design and Management (CDM) Regulations
* Manufacturer’s instructions
* Client’s specification
* Relevant Parts of the Building Regulations and Approved Documents/Technical Handbooks

**Working environments (internal and/or external)**

* domestic
* commercial
* industrial
* agricultural
* horticultural
* leisure and entertainment
* residential medical and care facilities
* public highways and parks
* public services establishments
* pre-1919 traditional/historic buildings

**Solar PV System**

* Panels/arrays
* Panel support systems
* Charge controller
* Battery bank
* Inverter/power optimiser
* Power meter
* SMART controls/technology

**Site**

* new build construction – building or structure
* an existing building or structure

**Site services**

* electricity
* water
* gas
* oil
* drainage
* telecommunications
* data transmission either underground or overhead

**Organisation procedures**

* information management
* project management
* risk assessment
* risk management
* implementing and monitoring health and safety requirements and issues
* implementing and monitoring issues relating to the natural environment
* customer services
* emergencies
* communication with relevant people

**Plant**

* generators
* transformers for extra-low voltage powered hand-tools
* lifting equipment
* access equipment

**Assemblies**

* Junction boxes
* Combiner boxes
* Distribution boards and switchgear assemblies
* DC Isolators or string fuse enclosures

**Enclosures**

* PVC and steel conduit
* PVC and steel trunking
* cable tray
* basket and ladder systems
* ducting systems
* bus-bar trunking
* pre-fabricated conductor, cable and wiring systems

**Relevant people**

* customers/clients
* client representatives
* supervisors
* site/contract manager
* other contractors/trades
* members of the public
* work colleagues

**Specific Key Requirements**

* Client Information
* Notification to the distribution network operator (DNO) in accordance with relevant Energy Networks Association (ENA) Engineering Recommendation documents on completion of work
* Where required prior notification and/or permission from the District Network Operator (DNO) before installation can commence

**SPV08: Develop, test and agree project designs for EESS**

**Overview**

This standard is for those who manage the development and agreement of project design solutions for EESS.

The individual undertaking the work must be able obtain and analyse information on project options and project design parameters and identify opportunities and constraints. They will be able to identify and select resources which will balance cost and quality and consider how they will influence the design solutions.

They will calculate, analyse and carry out testing as necessary to identify the most appropriate solution. They must be able to present the recommended design to justify the choice in line with the clients project brief. They must also discuss the choice of design and agree any changes with the client and record these changes. They will also be able to interpret how the overall design concept can be met and advise all relevant others on the implications and constraints of accepting, modifying or rejecting design proposals.

# Performance Criteria

1. access current and relevant information about the project requirements and resources
2. allocate research tasks, as appropriate, to relevant others
3. analyse all research finding and develop detailed proposals including risk assessments
4. select, for further development by the project team, those design concepts which meet the requirements of the design brief and also resolve a number of opportunities and constraints on development
5. communicate the detailed design options to relevant others
6. identify, with relevant others, the most appropriate solutions in terms of the project requirements and resources
7. select tests which will give relevant information about how the design options match the parameters of the project brief
8. refine design options which meet the opportunities and constraints of the project requirements and resources and test them until their ability to meet the design parameters is established
9. reject any design options which fail to meet the design parameters and identify possible alternatives
10. present recommendations, proposals and design options and show how they are justified by the requirements of the project requirements and resources
11. assess and justify the features and benefits of the recommended design solution, including any environmental technologies selected for use
12. explain how the overall design concept can meet the opportunities and constraints in the project brief, the aesthetic requirements of the client and the project requirements and resources
13. inform relevant others of the implications and constraints of accepting, modifying or rejecting design proposals
14. agree and incorporate all final recommendations and requirements into the detailed design solution
15. confirm with relevant others what the recommended design solution will cost and how long it will take to implement
16. agree the detailed design solution with relevant others
17. complete and safely store all relevant documentation in accordance with organisational requirements
18. deal promptly and effectively with any problems within the scope and limitations of your own competence, responsibilities and accountability and report those which cannot be solved

# Knowledge & Understanding

1. the current legislation, guidelines, policies, procedures and protocols relevant to the design of EESS
2. the scope and limitations of your own competence, responsibilities and accountability as it applies to your job role
3. how to access and interpret all relevant work instructions and information
4. specific procedures for reporting issues which are beyond your competence, responsibilities and accountability
5. the system requirements information, options and design parameters which are relevant to the development of a project brief
6. how to identify those parts of a project which require detailed design
7. the factors, criteria and procedures which influence design and work activities, including resource availability
8. the types of documentation and methods to present research and design evaluation data and conclusions to relevant others
9. the design parameters, concepts and approaches and how to assess them against a project brief considering relevant factors, criteria and procedures
10. the resource implications of the different design options
11. the opportunities for and constraints on the use of environmental technologies
12. the different methods for communication around design
13. the implications of modifying a project brief
14. the types of design approaches that are likely to contribute to design ideas
15. how to sources information and ideas, where existing design options do not meet a project brief
16. how to develop design options
17. how to identify and use relevant design software packages
18. the types of tests which give relevant information about the design options
19. the different methods to refine and test design options
20. how to identify and reject design options which fail to meet the design parameters
21. the different techniques to record test results
22. the different methods to use to present recommendations, proposals, design options and associated information
23. the features and benefits of design solutions, including any environmental technologies
24. how recommendations, proposals and design options can be justified by the requirements of a project brief
25. what evidence may be valid to support changes to agreed criteria
26. the types of approaches to prompt relevant others to ask questions and make comments during a presentation
27. how to agree and record any amendments and variations from an original project brief
28. the different methods to inform relevant others about:
* how design concept proposals match criteria in a project brief
* a designer’s creative interpretation of a project brief and overall design concept
* implications and constraints of accepting, modifying or rejecting design proposals
* how much more advice, research and consultancy will be necessary to produce a detailed design which is acceptable
1. the costs involved in a detailed design solution
2. the organisational procedures for:
* communicating the use, safety and control of the system to relevant others
* confirming with relevant others those necessary variations to the planned programme of work that may have the potential to introduce a hazard and/or impact on the installation work to be undertaken
* confirming with relevant others the correct actions to be taken to confirm that any variations to the planned programme of work will not introduce a hazard and have minimum impact on the installation work be undertaken
* obtaining customer/client acceptance of the installed system and its associated equipment, accessories and components post work activity and how to deal with cases where acceptance is not received
* the safe transport and/or disposal of any waste material, substances and liquids in accordance with suppliers’ and manufacturers’ instructions and legislation
1. how to complete and safely store all relevant documentation in accordance with organisational requirements

# Scope (based on MTCs)

**Relevant Technical Documents**

* Electricity at Work Regulations
* BS 7671
* BS 5839-6 and other relevant Codes of Practice
* Other Industry Guidance documents (including ENA)
* HSE Requirements and Guidance
* Relevant IET Publications e.g. Guidance Notes, IET On-Site Guide
* Construction Design and Management (CDM) Regulations
* Manufacturer’s instructions
* Client’s specification
* Relevant Parts of the Building Regulations and Approved Documents/Technical Handbooks

**Working environments (internal and/or external)**

* domestic
* commercial
* industrial
* agricultural
* horticultural
* leisure and entertainment
* residential medical and care facilities
* public highways and parks
* public services establishments
* pre-1919 traditional/historic buildings

**Architectures**

* Packaged EESS
* Discrete component EESS
* Grid-connected without any other local generation sources
* Grid-connected with other local generation
* Grid-independent systems

**Power coupling modes**

* AC coupling
* DC coupling

**Key components**

* Batteries (for example)
	+ Lithium-ion
	+ Deep-cycle lead-acid
* Inverters
* Battery management systems (e.g. charge/discharge control equipment)
* DC-to-DC power conversion equipment
* Thermal management systems
* EESS controllers
* Monitoring and metering systems
* Independent earthing arrangement (where required)

**Operating modes**

* Island mode
* Grid-independent systems
* Uninterruptable power systems (UPS)
* Central power supply (CPS)

**Locations and protection of EESS:**

* Protection against electric shock
* Overcurrent protection
* Access to uninsulated conductors
* Access to battery cells or cell packs
* Overload and short-circuit protection
* Warning notices
* Battery isolation
* Fire detection and fire alarm

**Test methods for circuits into which EESS are connected:**

* Continuity of earthing and/or equipotential bonding conductors
* Insulation resistance test
* Polarity test
* Earth electrode resistance
* Earth fault loop impedance
* RCD test
* Functional tests

**Specific Key Requirements**

* Client Information
* Notification to the distribution network operator (DNO) in accordance with relevant Energy Networks Association (ENA) Engineering Recommendation documents on completion of work
* Where required provide prior notification and obtain permission from the Distribution Network Operator (DNO) before installation can commence
1. BSE Skills is a partnership of organisations from the electrical sector (SELECT), heating and plumbing sector (SNIPEF) and HVACR sector (BESA). To ensure UK-wide coverage we work in partnership with ECA (electrical) and APHC (plumbing and heating). [↑](#footnote-ref-1)