



General Electrical Safety Protocol

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Document Owner: VP EHS	Applies to: Devon, US	Doc ID: 121117618
Revision Date: 7/7/2020	Review Cycle: Every 3 Years	Effective: 12/17/2018

1. ABOUT THIS PROTOCOL

Purpose	The protection of employees, contractors and other from potential electrical hazards.
Objective	This Devon Energy Protocol establishes minimum safe work practices and electrical safety management requirements.
Scope	This protocol defines electrical safety requirements, which covers general safety, bonding & grounding, overcurrent protection & procedures, contractor participation, and equipment labeling.
Applicability	<p>This protocol applies to all Devon (US) employees working near electrical equipment or hazards. Trouble shooting, live electrical work, and other tasks performed by qualified individuals is covered in Devon’s Qualified Electrical Safety Protocol.</p> <p>Contractors will have their own document that meets or exceeds Devon’s protocol.</p>
Variances	See section 7.3
Superseded Documents	Electrical Safety Protocol



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3. ROLES

Division/Business Unit Leadership	Reinforce adherence to this protocol and provide resources for application of the protocol.
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Line Supervisor	Understand how this protocol applies to personnel in their area of responsibility. Ensure employees have training, skills, knowledge and understanding to comply with this protocol. Check periodically to ensure the requirements of this protocol are being met.
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Environmental, Health, and Safety	Provide technical resources and tools for protocol application. Monitor compliance through the audit process.
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Devon Employees	Adhere to the requirements of this protocol. Identify and report gaps in this protocol. Complete required training.
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Contract Company Representative	Comply with regulatory requirements and follow the Devon EHS protocols.
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4. PROTOCOL PREREQUISITES

4.1 PROTOCOL OVERVIEW

This protocol sets the general requirements for electrical safety covering the employee’s responsibilities to conduct work in a manner minimizing exposure to potential electrical hazards. This includes use of electrical power tools, extension cords, equipment labeling, work and travel clearance of power lines, over current devices, and electrical installations. The protocol establishes that qualified persons will be the only individuals working on or making repairs to electrical equipment 50 volts or greater. Live electrical work, troubleshooting, and specific safety requirements for qualified persons is covered in a different protocol.

4.2 APPLICABLE STANDARDS

- OSHA 29 CFR 1910 Subpart S, Electrical
- Devon Hot Work Protocol
- Devon Energy Isolation Protocol

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5. PROTOCOL

5.1 ELECTRICAL SAFETY REQUIREMENTS

Step	Required Action	Role
5.1.1	Assign only Qualified Person(s) to work on or near exposed energized parts of electrical equipment that operate at voltage of 50 volts or more to ground.	Supervisor
5.1.2	Report all electrical hazards to the supervisor.	Employee
5.1.3	Use ladders with non-conductive side rails (e.g., fiberglass) around electrical service.	Employee
5.1.4	Do not remove, modify, destroy, or render interlocks inoperable.	Employee
5.1.5	Avoid contact with electrical power lines, including downed power lines.	Employee
5.1.6	Stand to the side, use an open hand, and turn your head away when operating or closing a disconnect switch.	Employee

5.2 PORTABLE ELECTRIC TOOLS & EQUIPMENT

Step	Required Action	Role
5.2.1	Use portable electric tools with a GFCI when working in: <ul style="list-style-type: none"> Wet or damp locations In a confined space 	Employee
5.2.2	Follow the Devon Hot Work Protocol when using portable electric tools on tanks, lines, vessels, in compressor stations, or other areas where flammable gases and vapors may be present. This includes electrically classified areas.	Employee
5.2.3	Use UL rated portable electric tools and equipment that are double insulated or grounded through a third wire.	Employee

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5.2.4 Inspect all electric tools and equipment before each use for defects and evidence of possible internal damage (e.g., deterioration, inadequate insulation, defective cords, etc.). Tag and remove from service damaged electrical tools and equipment until repaired or replaced. Plugs on the ends of extension cords can be replaced with a UL rated plug. Employee

Note: Taped splices in electric cords are not considered properly repaired and must be removed.

5.2.5 Isolate equipment per the Energy Isolation Protocol. Employee

5.2.6 Handle portable electric tools and equipment in a manner that does not cause damage or harm. Employee

5.2.7 Do not carry energized equipment with fingers placed on the trigger. Employee

5.2.8 Do not raise or lower equipment by the power cord. Employee

5.2.9 Use dry hands when plugging or unplugging portable equipment. Employee

5.3 EXTENSION CORDS

Step	Required Action	Role
5.3.1	Use extension cords to provide temporary power only. Surge protectors and power strips are NOT considered extension cords and may not be connected in series or used in place of extension cords. Temporary electrical cords will not be used as permanent installations.	Employee
5.3.2	Visually inspect cords prior to use. Look for defects and evidence of possible internal damage. Remove from service if there is damage to the cord, until the cord is repaired and tested.	Employee
5.3.3	Do not use extension cords for raising or lowering equipment.	Employee
5.3.4	Protect cords from damage (e.g., rubber covers, tape, etc.) when in use where cords can be pinched or severed.	Employee



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5.3.5 Do not fasten extension cords with staples or hang in a manner that could damage the outer jacket/insulation. Employee

5.3.6 Cover extension cords by a cord protector or tape to the floor when they extend into a walkway. Employee

5.3.7 Do not reel, coil, or gather extension cords that are energized. Employee

5.3.8 Do not remove the ground prong or alter extension cords. Employee

Note: Removing the ground prong prevents proper connection with the ground circuit.

5.4 OVERCURRENT PROTECTIVE DEVICES

Step	Required Action	Role
5.4.1	Do not reset tripped breakers more than once per day. A qualified electrician must be contacted to investigate the origin of the overcurrent if the problem continues.	Employee
5.4.2	Communicate feeder and branch circuit breaker trips to the line supervisor.	Employee
5.4.3	Determine what caused the breaker to trip, which includes examining the equipment, before re-energizing the circuit by examining both the equipment and the circuit before making any appropriate repairs.	Qualified Person
5.4.4	Examine the connected equipment if the operation of the device was the cause of the fault condition.	Qualified Person
5.4.5	Use insulated fuse puller rated for the voltage to remove or install fuses.	Qualified Person

Note: Fuses equal to or greater than 50 volts will be changed by qualified personnel.

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5.5 PULL, JUNCTION, & SPECIALIZED UTILITY BOXES

Step	Required Action	Role
5.5.1	Design and maintain the area around electric panels so personnel are not required to stand in water while operating switches.	Supervisor / Employee
5.5.2	Keep spaces around panels, disconnects, and switchgear clear of objects. A minimum of 36 inches of clearance is required around equipment. ¹	Supervisor / Employee / Qualified Person
<p>Note: Minimum clear distance may be 2.5 feet for installations built before April 16, 1981.</p> <p>Note: Systems over 600 V require additional clearance distances. Consult OSHA 1910.303(h)(5) for additional details.</p>		
5.5.3	Mark equipment and circuit disconnects legibly to indicate the equipment or circuit. Additionally, "ON" and "OFF" will be clearly distinguishable.	Qualified Person

5.6 BONDING AND GROUNDING

Step	Required Action	Role
5.6.1	Verify bonding and grounding for portable generators, equipment, raceways, tanks, cable trays, and enclosures are maintained to ensure electrical continuity.	Employee
5.6.2	Ensure all stranded metal and metal equipment on location is bonded together and grounded to a single continuous system unless otherwise specified.	Supervisor
5.6.3	Ensure a bonding cable is attached prior to loading tank trucks with flammable material.	Supervisor



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5.6.4 Ensure all metal and nonconductive containers (e.g., barrels, totes, cans, buckets, etc.) will be bonded to the filling system using a bonding cable when filled with flammable material. Supervisor

5.7 WORK & TRAVEL CLEARANCE OF OVERHEAD POWER LINES

Step	Required Action	Role
5.7.1	Do not park temporary equipment or store material underneath or within 15 feet of energized power lines.	Supervisor / Employee
5.7.2	Ensure cones, goal posts (see Appendix A), or other warning markers are installed 15 feet from the energized electric lines running across or parallel to the work site.	Supervisor
5.7.3	Use non-conductive tag lines to guide and position suspended loads. Tag lines must be of sufficient length to keep workers out of fall path.	Employee
5.7.4	While in transit, a minimum four-foot clearance for overhead powerlines is required for any equipment with a boom, mast or rotating arm. If the powerline is greater than 50 kV, add 4 inches for every 10 kV. ²	Employee

Note: Only qualified electrical employees may use tools such as hot sticks to move or de-energize overhead electrical lines.

5.7.5 While in transit, vehicles, equipment, and loads need to maintain an appropriate clearance distance to energized overhead power lines. Identify powerlines along the route closer than the minimum clearance listed below. Supervisor

Voltage Range (phase to phase)	Minimum Clearance
0 – 300 V	1 foot
301 – 750 V	2 feet
751 – 15,000 V	3 feet
15-50 kV	4 feet
50 kV and up	4 feet plus 4 inches for every 10 kV



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If proper clearance cannot be maintained, the line must be de-energized and/or raised by a qualified, licensed electrician, or an alternate route must be identified and used. If the line cannot be raised or de-energized, and the alternate route is not available, a risk assessment with written approval from the responsible Devon Operations Manager and notification to the Operations Vice President and EHS Manager is required prior to proceeding.

Note: Drilling has a Rig Move Hazard Mitigation Procedure which addresses line clearance for vehicles, equipment, and loads in transit.

Note: Only qualified electrical employees may use tools such as hot sticks to move or de-energize overhead electrical lines.

5.7.6 While operating on site, de-energize overhead electrical lines when any equipment with a boom, mast or rotating arm is planned to come within 10 feet of electrical lines up to 50 kV (voltages exceeding 50 kV see chart below.) Operator

If the line cannot be de-energized, a risk assessment with written approval from the responsible Devon Operations Manager and notification to the Vice President and EHS Manager is required prior to proceeding.

The PIC must be onsite when individuals are working within 10 feet of energized overhead power lines.

For overhead power lines greater than 50kv the distance chart below must be followed³:

50kV to 200kV	15ft (4.6m) Clearance
200kV to 350kV	20ft (6.1m) Clearance
350kV to 500kV	25ft (7.6m) Clearance
500kV to 750kV	35ft (10.7m) Clearance
750kV to 1000kV	45ft (13.7m) Clearance
Over 1000kV	Minimum clearance distance must be established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.

5.7.7 Stop work if unsafe conditions are present. Employee

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5.8 EQUIPMENT LABELING

Step	Required Action	Role
5.8.1	Ensure electrical equipment is equipped with the manufacturer's name, trademark, or other descriptive marking.	Employee
5.8.2	Ensure electrical disconnects (e.g., fuse box, breaker panel, enclosure, etc.) are labeled to identify what equipment/location they serve.	Supervisor
5.8.3	Ensure equipment that starts automatically is labeled with a sign that reads, "Danger: Equipment Starts Automatically".	Supervisor
5.8.4	Ensure personnel are adequately warned about electrical hazards using safety signs and symbols. Accident prevention tags will be used where necessary.	Supervisor
5.8.5	Mark entrances to rooms and other guarded locations containing exposed energized parts with warning signs forbidding unqualified persons to enter (e.g., Danger, Do Not Enter, Authorized Personnel Only, Qualified Persons Only).	Supervisor
5.8.6	Label equipment (e.g., transformers, switch gear, panel boxes, motors, generators) operating at or above 600 volts with a danger label. The label will include the voltage of the equipment. "Danger High Voltage – XXX Volts"	Supervisor

5.9 ELECTRICAL AREA CLASSIFICATION REQUIREMENTS

Step	Required Action	Role
5.9.1	Ensure hazardous areas are classified by their hazard class, division, and group using existing facility drawings, engineering, and API RP 500 & NEC, Article 500. All electrical equipment installed in an area that handles flammable gasses or liquids shall be evaluated for hazardous classification requirements.	Supervisor / Employee



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5.9.2 Ensure electrical equipment, lighting, and wiring methods in hazardous classified areas meet NEC Article 500 for such installation. Supervisor

Note: Equipment rated for Division 1 areas may be installed in Division 2 areas of the same class and group.

5.10 PROCUREMENT & DESIGN

Step	Required Action	Role
5.10.1	Ensure switches, controllers, and circuit breakers are able to be mechanically locked out in the off position for energy isolation.	Supervisor
5.10.2	Ensure that electrical cabinet doors rated for 600 volts or greater have either lock or interlocks.	Supervisor

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6. TERMS AND DEFINITIONS

Bonding / Bonded	The joining of metallic parts to form an electrically conductive path that ensures electrical continuity.
Bonding Cable	A cable used to bond tank trucks or other metal and nonconductive containers (e.g., barrels, totes, cans, buckets, etc.) to the filling system in order to reduce static electricity hazards when filling with flammable material. The bonding cable material must include a wire with a clamp(s) having hardened steel points that will penetrate paint, corrosion products, and accumulated material using either screw force or a strong spring.
Class I Area	Area where flammable gases or vapors are, or may be, present in the air qualities sufficient to produce explosive or ignitable mixtures.
Class I, Division 1 Area	Location in which ignitable concentrations or flammable gases or vapors are expected to exist under normal operating conditions or where faulty operation of equipment or processes might simultaneously release flammable gases or vapors and also cause failure of electrical equipment.
Class I, Division 2 Area	Location in which flammable gases or vapors may be present, but normally are confined within closed systems: are prevented from accumulating by adequate ventilation, or the location is adjacent to a Division 1 location from which ignitable concentrations might occasionally be communicated.
Grounded	Connected (connecting) to ground or to a conductive body that extends the ground connection.
Qualified Person	One who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify the hazards and reduce the associated risk. ⁴

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7. DOCUMENT MANAGEMENT

7.1 REVISION DETAILS

The following are the specific changes made to this Protocol during the latest revision:

Section	Changes Made	Reasons for Change
5.6.4	Added “using a bonding cable” to step language.	Clarify bonding cable will be used for the bonding of nonconductive containers when filled with flammable material.
5.7.6	Added “while operating on site” to step language.	Clarify the step applies to work taking place on site as described in the MLR Protocol.
6.0 Terms and Definitions – Bonding Cable	Added definition of bonding cable.	Define what a bonding cable is.

7.2 APPROVAL

This procedure has been approved by:

Name	Title
Garrett Jackson	VP, Operations & EHS

7.3 SEEKING AND APPROVING VARIANCES

- 7.3.1 A risk assessment with written approval from the responsible Devon Operations Manager and notification to the Operations Vice President and EHS Manager is required for a variance on step 5.7.5.
- 7.3.2 A risk assessment with written approval from the responsible Devon Operations Manager and notification to the Operations Vice President and EHS Manager is required for a variance on step 5.7.6.
- 7.3.3 Follow the variance process in the EHS Document Control and Records Management Protocol.

7.4 RELATED DOCUMENTS

Document Name
Rig Move Hazard Mitigation Procedure



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[Hot Work Protocol](#)

[Energy Isolation Protocol](#)

Available Through IHS Engineering Workbench

[Oklahoma City](#)

[Field Office](#)

API RP 500 – Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2

NFPA 70 – National Electrical Code

NFPA 70E – Standard for Electrical Safety in the Workplace

7.5 CITED DOCUMENTS

Reference #	Citation or Source
1	1910.303(g)(1)(vi)(8)
2	1910.333(c)(3)(iii)(A)
3	29 CFR 1926.1408(h)
4	NFPA 70 E – Article 100 - Definitions

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8. ADDITIONAL RELATED INFORMATION

8.1 TRAINING AND CERTIFICATION REQUIREMENTS

Non-Qualified Operational employees will need to be trained in the following areas:

- The dangers of live electricity.
- Authorization to enter MCC Rooms, Electrical Substations to conduct inspections, maintain proper housekeeping, perform LOTO functions, etc.
- The need to ensure that all electrical equipment can be accessed at all times (36" clearance).
- Employees will receive additional training on how to reset equipment (only perform task within 24-hour period) and shut off equipment at the electrical disconnect.
- Are not to use damaged extension cords, power hand tools, and are to report all damaged electrical equipment to their immediate Supervisor (e.g., exposed wiring, open and/or damaged junction or breaker boxes, etc.).

Frequency – Initial Only

Supervisors overseeing electrical staff need the following training

- Understand how to review and audit ESA/Live Electrical Permit
- Understand the difference within each Hazard Rating Classification (HRC1-4)

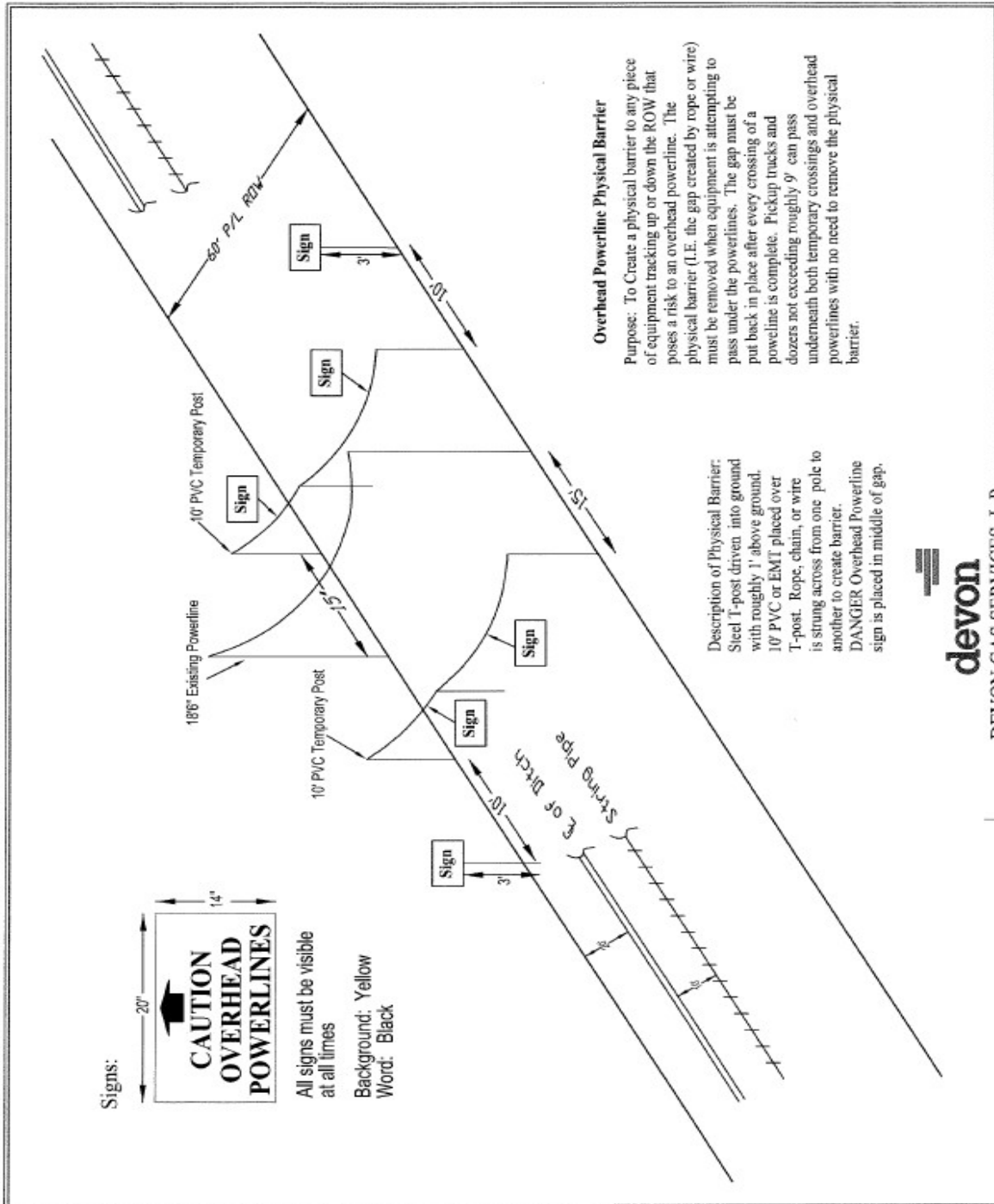
Non-Qualified employees working around exposed energized equipment. (For example, SCADA or automation techs working on equipment <50 V, but exposed to voltages > 50 V.)

- Trained in and familiar with any electrical related safety practices not specifically addressed in the General Electrical Safety Protocol which are necessary for their safety including the following:
 - Skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment.
 - Skills and techniques necessary to determine the voltage of exposed live parts.

Note: Training requirements for qualified electricians are listed in the Qualified Electrical Safety protocol.

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APPENDIX A: PHYSICAL BARRIER EXAMPLE FOR ELECTRICAL LINES





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ATTACHMENT A: APPROVAL, REVIEW, AND MODIFICATION HISTORY

Revision Number	Approved/Revised /Reviewed By	Approval/Revision /Review Date	Description (Initial Approval, Revision, or Review along with further details of revision if needed)
00	Jim Farrell	12/17/18	<ul style="list-style-type: none">Initial Approval
01	Garrett Jackson	7/7/2020	<ul style="list-style-type: none">Added "using a bonding cable" to step 5.6.4 to clarify a bonding cable will be used for the bonding of nonconductive containers when filled with flammable material.Added "while operating on site" to step 5.7.6 to clarify the step applies to work taking place on site as described in the MLR Protocol.Added definition of bonding cable to section 6.0.