Section
E9B

Electric Vehicle Charging Systems

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E9B-1 ELECTRIC VEHICLE CHARGING SYSTEMS

This section details the requirements for electric vehicle charging systems and shall be read in conjunction with all other sections of this specification and the associated drawings.

Electric vehicle charging systems shall be provided to the external car park.

It shall be noted that this section of the specification covers the installation of charging equipment intended for plug-in electric vehicles (PEVs) complying with the BS EN 61851 series of standards.

E9B-2 DEFINITIONS

Refer to the standards / documents referenced within this section, Section 2E / Section 1B of this specification, Part 2 of BS 7671 and Appendix N of the IET Code of Practice for Electric Vehicle Charging Equipment Installation for further details regarding definitions, symbols and abbreviations.

Note the following definitions and abbreviations specific to this section: -

DEFINITIONS			
AC	Alternating Current	LPA	Local Planning Authority
ACD	Automatic Connection Device (Mode 4 – Pantograph Systems)	MD	Maximum Demand
APP	Application for Smart Device	OCPP	Open Charge Point Protocol
APEA	Association for Petroleum and Explosives Administration	Open-PEN	Open-circuit combined protective earth and neutral conductor fault
BEAMA	British Electrotechnical and Allied Manufacturer's Association	OZEV	Office for Zero Emission Vehicles
BNO	Building Network Operator	OSCP	Open Smart Charge Protocol
DC	Direct Current	PEI	Prosumer's Electrical Installation(s)
DNO	Distribution Network Operator	PEN	Protective and Neutral Conductor (Combined)
EI	Energy Institute	PME	Protective Multiple Earthing
ENA	Energy Networks Association	PPM	Planned Preventative Maintenance
EV	Electric Vehicle	RCBO	Residual Current Operated Circuit-Breaker with Integral Overcurrent Protection
EVCP	Electric Vehicle Charing Point	RCCB	Residual Current Operated Circuit-Breaker without Integral Overcurrent Protection
EVSE	Electric Vehicle Supply Equipment	RCD	Residual Current Device
FPA	Fire Protection Association	RFID	Radio Frequency Identification
FRS	Fire & Rescue Service	SoC	State of Charge
GPRS	General Packed Radio Service	SMMT	The Society of Motor Manufacturers and Traders Limited
GSM	Global System for Mobile communications	SMS	Short Message Service (Text messaging)
ICCB	In-Cable Control Box	SPD	Surge Protection Device
IC-CPD	In-Cable Control and Protection Device	SWA	Steel wire armoured
IDNO	Independent Distribution Network Operator	ToU	Time of Use

DEFINITIONS			
IET CoP for EVC	IET Code of Practice for Electric Vehicle Charging Equipment Installation	TT	Terre-Terre (Earthing system)
IP	Internet Protocol	V2G	Vehicle To Grid
IMD	Insulation monitoring device	V2H	Vehicle to Home
LAN	Local Area Network	V2X	Generic term for grid-connected vehicle as storage, encompassing V2G, V2H and/or other grid-connected storage applications
LMS	Load Management/Curtailment System	WPT	Wireless Power Transfer

Notes:

1) Abbreviation EV (Electric Vehicle) used within this specification is intended to include the terms plug-in electric (PEVs), plug-in vehicles (PiVs), full battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs) and range-extended hybrid electric vehicles/extended-range hybrid electric vehicles (REHEVs/ERHEVs).

E9B-3 REFERENCES TO OTHER SECTIONS OF THIS SPECIFICATION

This section shall not be read in isolation and must be read in conjunction with all other sections of this specification which define further requirements for the electrical installation.

Section 2E details the default requirements for electrical installation quality and materials which shall apply fully to this section of the specification.

E9B-4 STANDARDS APPLICABLE

Works shall be completed in accordance with all applicable industry standards. Some of the most relevant standards associated with this section are scheduled below: -

STANDARDS & DOCUMENTS	
BS 7671	IET Wiring Regulations – Requirements for Electrical Installations – Part 7 Special Installations or Locations – Particular Locations – Section 722 Electric Vehicle Charging Installations and Annex A722 (Informative) Guidance for TN systems where PME conditions apply
IET Code of Practice for Electric Vehicle Charging Equipment Installation	
APEA / IET Electric Vehicle Charging Installations at Filling Stations – Supplement to the Code of Practice for Electric Vehicle Charging Equipment Installation	
IET Guidance Note 7 – Special Locations – Chapter 20 Electric vehicle charging installations (currently not updated, superseded where necessary by the latest editions of the IET Wiring Regulations and the IET Code of Practice)	
BS 7430	Code of practice for protective earthing of electrical installations
BS 8300	Design of an accessible and inclusive built environment
BS EN 61558-2-4	Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1100 V – Particular requirements and tests for isolating transformers and power supply units incorporating isolating transformers
BS EN 61851	Electric vehicle conductive charging system
BS EN IEC 62196	Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles

STANDARDS & DOCUMENTS	
BS IEC 62955	Residual direct current detecting device (RDC-DD) to be used for mode 3 charging of electric vehicles
BS EN ISO / IEC 14443	Cards and security devices for personal identification – Contactless proximity objects
BS EN ISO / IEC 15693	Cards and security devices for personal identification – Contactless vicinity objects
PAS 79-1	Fire risk assessment – Premises other than housing – Code of practice
PAS 1899	Electric vehicles – Accessible charging – Specification
Alternative Fuels Infrastructure Regulations	
APEA/EI – Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations	
BEAMA – A Guide to Electric Vehicle Infrastructure	
ENA – Engineering Recommendation G12 – Requirements for the Application of Protective Multiple Earthing to Low Voltage Networks	
ENA – Engineering Recommendation G98 – Requirements for the connection of Fully Type Tested Micro-generators (up to and including 16 A per phase) in parallel with public Low Voltage Distribution Networks on or after 27 April 2019	
ENA – Engineering Recommendation G99 – Requirements for the connection of generation equipment in parallel with public distribution networks on or after 27 April 2019	
ENA – Engineering Recommendation G100 – Technical Requirements for Customer Export Limiting Schemes	
Department for Transport – Consultation Response: EV Charge points in Residential and Non-Residential Buildings	
EST – Charging Electric Vehicles	
FPA/RISC Authority – RC59 – Recommendations for fire safety when charging electric vehicles	
HM Government – Electric Vehicle Charging in Residential and Non-Residential Buildings	
OZEV – T0194 – Covered Car Parks – Fire Safety Guidance for Electric Vehicles	
Public Charge Point Regulations	
SMMT Environment – Electric Car Guide	
The Building Regulations – Approved Document S	
The Electric Vehicles (Smart Charge Points) Regulations	
Zurich – Risk Topics – Modern vehicle parking and electric vehicle charging	
All current and relevant APEA / EI, CHAdeMO, DNO, ENA / ESI, FPA and OZEV publications	
All standards, guidance and statutory regulations detailed within Appendix O of the IET Code of Practice for Electric Vehicle Charging Equipment Installation	
All standards, guidance and statutory regulations detailed within Section 2E-3	

Where the above standards refer to supporting documentation and standards these shall be fully complied with in all respects.

Where discrepancy is found between this specification, specialist quotations and the relevant standards, written clarification shall be obtained prior to submission of tender. Where a discrepancy has not been clarified prior to tender submission the most onerous requirements shall be included within the tender price.

E9B-5 DESIGN REQUIREMENTS

The Contractor shall employ an EVCP Specialist(s) to design, supply, install, test and commission the EVSE. Notwithstanding OZEV grants, the EVCP Specialist(s) must be an OZEV authorised installer and also an approved installer for the EVSE manufacturer.

E9B-6 FIRE SAFETY

EVSE and electrical infrastructure for future EVSE (e.g. builders work, trenching, ducting, signage etc.), shall only be installed in locations where a suitable and sufficient fire risk assessment has been undertaken by the Fire Advisor.

This is required by the IET CoP for EVC, FPA/RISC Authority RC59, OZEV T0192 Covered Car Parks Fire Safety Guidance for EVs and Zurich Risk Topics Modern Vehicle Parking and EV Charging.

The fire safety management strategy by the Fire Advisor shall consider practical passive, active and managerial control measures as part of the fire risk assessment, as require by the Regulatory Reform (Fire Safety) Order.

E9B-7 THE BUILDING REGULATIONS – APPROVED DOCUMENT S

Provision / number of EVCPs and future EVCP connection locations, must be provided in strict accordance with The Building Regulations – Approved Document S and LPA requirements.

The Building Regulations – Approved Document S requires EVCPs to meet the requirements of the IET CoP for EVC.

EVSE installed in Scotland must be provided in accordance with The Scotland Building Standards Division Technical handbooks.

E9B-8 THE ELECTRIC VEHICLES (SMART CHARGE POINTS) REGULATIONS

The Contractor / EVCP Specialist must provide a Statement of Compliance for all new EVCPs (and associated equipment) which details compliance with The Electric Vehicles (Smart Charge Points) Regulations.

E9B-9 PAS 1899 – ELECTRIC VEHICLES – ACCESSIBILITY CHARGING

Accessible public charging points shall be supplied and installed in strict accordance with PAS 1899 – Electric vehicles – Accessible charging – Specification.

The Contractor / EVCP Specialist must provide confirmation in writing from the manufacturer that EVSE complies with PAS 1899 – Electric vehicles – Accessible charging – Specification.

E9B-10 ELECTRICAL CONTRACTING CERTIFICATION SCHEMES

The Contractor / EVCP Specialist must have undertaken formal training in electrical vehicle charging installation (e.g. NICEIC Electric Vehicle Charging Course, or equivalent) and be registered with an appropriate certification scheme for the electrical installation works being undertaken.

E9B-11 SYSTEM OVERVIEW

EVCP shall be provided in accordance with the following: -

SYSTEM OVERVIEW				
CHARGING METHOD	**BILLING**	**AUTHENTICATION**	**COMMUNICATIONS**	**MOUNTING**
Mode 3 (AC – Fast Charge)	Payment	APP and Credit/Debit Card	GPRS/GSM	Floor

Notes: -

1) Further technical information is provided in the following sections.
2) EVSE shall only be installed in locations where a suitable and sufficient fire risk assessment has been undertaken by the Fire Advisor.
3) Fire risk assessment shall consider risk control measures for enclosed car parks (e.g. sprinklers, drainage, compartmentation, increased ventilation rates etc.).

SYSTEM OVERVIEW				
CHARGING METHOD	BILLING	AUTHENTICATION	COMMUNICATIONS	MOUNTING

4) Energy transfer activity shall be monitored and recorded for each individual user so that it can be charged accordingly (where required); consequently, an authentication and billing mechanism shall be provided that is compatible with EVSE specification.

5) The Contractor / EVCP Specialist(s) shall liaise with the Client and Engineer prior to commissioning to ensure any end-user / Cloud based management software is programmed / commissioned (including managed billing) in accordance with the Clients operational requirements.

EVSE infrastructure shall be provided in accordance with the following: -

ELECTRICAL INFRASTRUCTURE REQUIREMENTS					
NO. OF EVCP	LOCATION	PROTECTION AGAINST ELECTRIC SHOCK – EARTHING / FAULT DETECTION DEVICES (SEE NOTE 2)	POWER RATING PER EVCP	LOAD MANAGEMENT SYSTEM (LMS)	MAXIMUM DEMAND (SEE NOTE 3)
12 (6 bollards with twin socket outlets)	Outdoor Car Park	Fault Detection Device(s)	7.4kW (AC – Fast Charge)	X	88.8kW
2 (2 bollards with single outlet)	Outdoor Car Park	Fault Detection Device(s)	7.4kW (AC – Fast Charge)	X	14.8kW

Notes: -

1) EVSE shall be positioned and accessible in strict accordance with Approved Document S, IET CoP for EVC, BS 8300 and PAS 1899.

2) Further technical information is provided in the following sections (e.g. EVSE fault detection devices, dedicated TT earthing systems etc.); where LMS is to be employed reference shall be made to the LMS section within this specification.

3) Maximum demand prior to employment of any load management systems.

Infrastructure shall be provided for future EVCPs in accordance with the following: -

ELECTRICAL INFRASTRUCTURE REQUIREMENTS FOR FUTURE EVCPS			
NO. OF FUTURE EVCP	LOCATION	INFRASTRUCTURE SOURCE LOCATION	INFRASTRUCTURE REQUIREMENTS
50 (25 bollards with twin socket outlets)	Outdoor Car Park	Local Unit Panelboards	Internal cable support / containment systems, builders work, on-site trenching, ducting, backfilling and cable access chambers

Notes: -

1) Electrical infrastructure for future EVSE shall only be installed in locations where a suitable and sufficient fire risk assessment has been undertaken by the Fire Advisor, to verify the suitability of future locations.

2) Fire risk assessment shall consider risk control measures for enclosed car parks (e.g. sprinklers, drainage, compartmentation, increased ventilation rates etc.) for future EVCP locations.

ELECTRICAL INFRASTRUCTURE REQUIREMENTS FOR FUTURE EVCPS			
NO. OF FUTURE EVCP	**LOCATION**	**INFRASTRUCTURE SOURCE LOCATION**	**INFRASTRUCTURE REQUIREMENTS**
3) Future EVCP connection locations shall be positioned and accessible in strict accordance with The Building Regulations – Approved Document S, IET CoP for EVC, BS 8300 and PAS 1899.			
4) Future EVCP connection locations shall be provided to allow sufficient space for the following: - a) Future installation of electrical switchgear, LV feeder pillars and EVSE manufacturer LV feeder pillars. b) Access for installation and maintenance of the future EVCP. c) Future vehicle barriers to be installed around the EVCP location (minimum of 500mm).			
5) Future EVCP connection locations shall be clearly identified and labelled, with labelling / signage as follows: - a) Text shall read 'DEDICATED POSITION FOR ELECTRIC VEHICLE CHARGING POINT'. b) Each letter shall be 25mm high. c) Text shall be displayed over three lines. d) Signage shall measure 506mm by 194mm. e) Signage shall suitably weatherproof for its location. f) Signage positioned clearly visible to a person installing EVCP in the future.			
6) Final location of signage to be agreed prior to installation.			
7) Cable support / containment systems, builders work, trenching and ducting shall emanate from the infrastructure source location and be run to each individual future EVCP connection point location.			
8) Future EVCPs and associated cabling shall be capable of being installed without the need for further builders work.			
9) For indoor installations (e.g. indoor car parks), builders work shall be provided to enable the potential installation of busbar trunking systems in the future.			
10) Cable support / containment systems, builders work, trenching and ducting shall be provided in strict accordance with Section 2E of this specification. Cable ducts shall be provided with a draw rope / wire.			
11) Future location of EVCPs and future protective barriers must be agreed prior to installation.			

E9B-12 SCOPE OF WORKS

The scope of works shall include the following non-exhaustive items: -

1) EVSE
2) Protective barrier(s) to each EVCP.
3) LV feeder pillar(s).
4) EVSE manufacturer LV feeder pillar(s).
5) LV feeder pillar(s) / EVSE manufacturer LV feeder pillar(s).
6) District network operator (DNO) notification.
7) Statement of Compliance for The Electric Vehicle (Smart Charge Points) Regulations.
8) Confirmation in writing from the manufacturer that EVSE complies with PAS 1899 – Electric vehicles – Accessible charging – Specification.
9) All necessary: -
   a) Ethernet, Wi-Fi or GPRS/GSM communications and control interfaces.
   b) End-user / Cloud based management software.
   c) Metering for LMS (where required).

d) Programming and commissioning (including managed billing) of end-user / Cloud based management software.
e) Wiring accessories e.g. data outlets, un-switched fused connection units, double pole lockable key switches etc.
f) Power and signalling cabling.
g) Protective devices and surge protection.
h) Earthing and bonding.
i) Builders work, trenching, ducting, backfilling and cable access chambers to EVSE.
j) Builders work, trenching, ducting, backfilling and cable access chambers for future EVCP connections.
k) Cable support and containment systems.
l) Inspection, testing and commissioning.
m) Identification, notices and labelling.
n) O&M information.

It shall be noted the above lists are not exhaustive and reference must be made to all sections of this specification and the associated drawings.

All due allowances shall be made within the tender submission to ensure all power supplies, wiring accessories and associated equipment is provided for the electrical installation, with particular attention paid to electrical systems where the Contractor has design responsibility.

E9B-13 GENERAL INSTALLATION REQUIREMENTS

GENERAL

EVSE shall be designed, selected, installed, tested and commissioned in strict accordance with all relevant standards detailed within this section of the specification and corresponding manufacturer's information.

EQUIPMENT SELECTION

The location, size, finish and fixing detail of all equipment shall account for programme, architectural, structural and planning requirements present. Core system components shall be from a single manufacturer and updated with the most current firmware at the point of commissioning.

EVSE shall comply with The Electric Vehicles (Smart Charge Points) Regulations.

POTENTIALLY EXPLOSIVE ATMOSPHERES

EVSE shall not be installed in potentially explosive environments (e.g. where petrol vapour or other flammable/combustible gases are liable to be present).

No flammable or combustible material shall be stored within designated charging areas.

EVSE installed in the vicinity of a potentially explosive environment must be located outside the defined hazardous zone and positioned such that any EV connected to the EVSE will also be outside the hazardous zone.

Where hazardous installations, such as ignitable liquids storage, are present, EV charging points shall be separated from the edge of hazardous areas (Zone 1 or 2, ATEX) by a minimum of 10m. This minimum separation distance shall be extended for vehicles >5 metres long, to be equivalent to the full length of the vehicle, plus 5m.

PROTECTION AGAINST VEHICLE IMPACT & VANDALISM

Equipment shall account for environmental conditions with respect to water/dirt ingress (IP rating), corrosion resistance, impact (IK rating), likely vandalism and longevity for an anticipated 15-year lifecycle under a suitable PPM regime; details to be provided within the technical submittal.

Manufacturers proprietary protective barriers shall be provided to all bollard/floor standing EVCPs, as required by RC59 and insurance company requirements.

LOCATION OF EVSE, TRIP HAZARDS & VENTILATION/COOLING

EVSE shall be positioned adjacent to car parking spaces (and suitably accessible) in strict accordance with Approved Document S, IET CoP for EVC, BS 8300 and PAS 1899.

Where EVSE is associated with accessible parking spaces, clear access shall be provided for wheelchair users to operate the equipment, including ensuring the access to socket outlets and controls is not impeded by bollards (as required by PAS 1899 and BS 8300).

EVSE shall be positioned to minimise the likelihood of vehicle impact and typically be offset to the corner of applicable parking bay(s) to facilitate access, cater for a variety of vehicle inlet positions and minimise cable trip hazards. EVSE shall not inhibit or obstruct pedestrian footpaths, access routes, vehicle door openings (or similar).

Parking bays should include sufficient space to gain access to the vehicle, with a minimum 1200mm wide transition zone between parking bays for disabled users.

Enclosed charging areas must be free from storage, including waste materials, with a separation of at least 6m.

Sufficient space shall be provided around EVSE to allow for adequate ventilation, cooling and access (e.g. opening of doors or covers for inspection and maintenance) in strict accordance with manufacturers recommendations.

CO-ORDINATION

EVSE ducting/cabling shall be co-ordinated with all other services, underground utilities, drainage systems and root protection zones. Location of floor and wall mounted EVSE, feeder pillars and protective barriers must be agreed.

CABLE SUPPORT & CONTAINMENT SYSTEMS

The Contractor shall provide all necessary cable support and containment systems (internal cable tray and external ducting) for all power and signalling cabling associated with the EVSE installation. The cable support and containment systems shall be sized in strict accordance with BS 7671 and manufacturers' literature.

All cable support and containment systems shall be provided in strict accordance with Section 2E of this specification.

EARTHING & BONDING

Earthing and bonding shall be provided in strict accordance with the BS 7671 and the IET CoP for EVC.

EARTH ELECTRODES

Where required, earth electrodes shall be installed in strict accordance with BS 7671, BS 7430 and IET CoP for EVC.

CABLING & TERMINATIONS

Cabling, terminations and identification markers shall be in accordance with other sections of this document.

Non-standard cabling as defined within Section 2E of this specification and combined low voltage/data cabling (e.g. combined low voltage and data in a single armoured cable) shall not be used for EVSE installations.

Buried cabling shall be in provided in strict accordance with BS EN 50174-3, Appendix K of the IET CoP for EVC and Section 2E of this specification.

Where hard-wired EVSE communications are required, the EVCP(s) and/or LMS (where applicable) shall be connected to the LAN via concealed data points using secure RJ45 plug lock-in devices.

Information and communications cabling shall satisfy the fire performance requirements of BS 6701 and shall be separated/segregated from low voltage cabling in strict accordance with Section 2E of this specification.

Where fault detection devices utilize measurement earth electrodes, functional earthing conductors connecting the devices to measurement earth electrodes shall be pink in colour.

All power, signalling and earthing / bonding cabling shall be LSZH (LSOH, OHLS) with emissions of hydrogen chloride gas < 0.5%. All equipment and cabling shall be selected and installed in strict accordance with manufacturers' literature.

POWER SUPPLIES

EVSE shall be provided with dedicated circuit(s) independent to any other system or general power provision.

LIGHTNING PROTECTION SYSTEMS & SURGE PROTECTION DEVICES (SPDs)

SPDs must be provided to all electrical switchgear (e.g. low voltage switch boards, low voltage feeder pillars, MCB panel boards, MCB distribution boards etc.) serving external EVSE (e.g. EVCPs, low voltage feeder pillars/proprietary manufacturers feeder pillars including LMS etc.) due to lightning strike export potential.

Except where fibre optic cabling is used, all information and communications cabling for external EVSE must be provided with surge protection to BS EN 50174-3.

SPDs shall be selected and installed in accordance with the other relevant sections within this specification.

FIRE DETECTION & FIRE ALARM SYSTEMS

Enclosed car parks shall be provided with automatic fire detection/fire alarm systems in strict accordance with the requirements of the Fire Advisor. Fire detection/fire alarm systems shall be provided in strict accordance with BS 5839 and shall be monitored, either on-site (monitored 24/7) or by an off-site alarm receiving centre (ARC).

Enclosed car parks with mechanical smoke ventilation systems shall have automatic fire detection installed to activate the smoke ventilation system.

GROUNDWORKS

The Contractor shall provide all necessary TT earthing systems/electrodes, structural bases, on-site trenching, ducting, backfilling and cable access chambers for EVSE.

WARRANTY

EVSE shall be provided with a 3-year warranty as a minimum.

E9B-14 ELECTRIC VEHICLE SUPPLY EQUIPMENT

EVSE/EVCP shall be constructed and configured in accordance with the following: -

CONSTRUCTION					
MOUNTING	**EXTERNAL INFLUENCE**	**IMPACT**	**INGRESS PROTECTION**	**OPERATING TEMPERATURE**	**OPERATING HUMIDITY**
Floor	High Severity AG3 (minimum)	IK10 (minimum)	IP44 (minimum)	-20°C to 50°C	Up to 95% non-condensing

Notes: -

1) External influence classification as defined with BS 7671, impact rating as defined within BS EN 62262 and ingress protection as defined within BS EN 60529.
2) Where a publicly accessible EVSE is mounted wholly above 0.9m from the ground/finished floor, IK08 is acceptable, but IK10 is preferable.

ELECTRICAL CONFIGURATION					
POWER	**OUTPUT**	**SUPPLY VOLTAGE**	**CHARGING METHOD**	**CONNECTOR TYPE**	**TETHERED CABLE**
7.4kW	AC	230V	Mode 3 (AC – Fast Charge)	Type 2	✓

Notes: -

1) Manual isolation of all EVCPs for use by the fire and rescue service (FRS) in covered car parks, shall be provided to all firefighting entrances and adjacent to fire alarm panels/fire service information points.
2) Manual isolation of all EVCPs in covered car parks, shall also be provided to an agreed location with the Fire Advisor, for use by staff in 24/7 staffed car parks.
3) Each EVCP shall have a minimum nominal rated output of 7kW (before any load management/curtailment systems) and be a minimum of Mode 3 as required by Building Regulations – Approved Document S.
4) Mode 3 EVSE – Power rating is per connection point; dual units (where applicable) to be fully rated for each simultaneous connection e.g. twin 7kW EVSE to have a total power rating of 14kW.
5) Mode 3 EVSE must have at least one connector/plug or socket outlet complying with BS EN 62196, as required by the Alternative Fuels Infrastructure Regulations.
6) Mode 4 EVSE – Power rating is per EVSE unit e.g. 50kW EVSE with 2No. (or 3No.) connection points which has simultaneous/shared charging.

ELECTRICAL CONFIGURATION					
POWER	OUTPUT	SUPPLY VOLTAGE	CHARGING METHOD	CONNECTOR TYPE	TETHERED CABLE

7) Mode 4 EVSE shall be provided with the protective measure of electrical separation (IT system/earthing arrangement) in accordance with BS 7671, by incorporating an isolating transformer to BS EN 61558-2-4.

8) Earth leakage current monitoring (e.g. to detect the first earth fault and provide disconnection) to BS EN 61851-23 and/or an IMD to BS EN 61557-8 must be provided to Mode 4 EVSE.

9) Where separate power units (e.g. external power conversion equipment) supply multiple Mode 4 EVSE via a common transformer, each EVCP must still be supplied by its own separated secondary.

10) Control pilot function shall link the EV to control equipment within the EVSE.

11) Rate of charge to be regulated via control communication (control pilot function) and (where applicable) load management systems; the maximum rate of charge shall not exceed the EV onboard charger.

12) Electrical/mechanical interlock system shall be provided to prevent plug insertion/removal during operation. Vehicles must be immobilised when connected to EVSE.

13) Mode 3 connectors/plugs shall comply with BS EN 62196-2, Mode 4 connectors/plugs shall comply with BS EN 62196 and CHAdeMO standards (as applicable).

14) BS 1363 sockets for EV charging leads with ICCB/IC-CPD shall not be used.

E9B-15 ACCESSIBLE CHARGING POINTS – PAS 1889

Accessible public charging points shall be supplied and installed in strict accordance with PAS 1899 – Electric vehicles – Accessible charging – Specification.

Height of charging point features for accessible charging points shall be in accordance with the following: -

CHARGING POINT FEATURE	INSTALLED MINIMUM HEIGHT	INSTALLED MAXIMUM HEIGHT
Socket-outlet or fixed vehicle connector	800mm	950mm
Tethered charging cable connector handle (when in holster, height to bottom of handle)	800mm	950mm
Display screen or other visual interface (e.g. touchscreens, indicator lamps)	Bottom of screen/interface 800mm	Top of screen/interface 1300mm
	Bottom of interface aspects 800mm	Top of interface aspects 1200mm
Payment terminal (bottom edge)	800mm	1000mm

Notes: -

1) All EVSE/EVCPs shall comply with the above requirements, as PAS 1899 can be applied to charging points not in designated accessible bays.

2) The Contractor / EVCP Specialist must provide confirmation in writing from the manufacturer that EVSE/EVCPs comply with PAS 1899 – Electric vehicles – Accessible charging – Specification.

For accessible public charging points for designated accessible bays: -

1) Spacing in front of the EVSE shall be at least 1200mm to enable access for wheelchairs users, with a reach distance for operating the EVCP (e.g. controls, payment terminals etc.) of no more than 220mm.

2) Checklists of good practice guidance within Annex E of PAS 1899, for the installation of charging points with accessibility requirements shall be used/followed.

The Contractor / EVCP Specialist shall confirm compliance with PAS 1889 in the checklists provided in Appendix III.

E9B-16 COMMUNICATIONS

EVSE/EVCP communications shall be in accordance with the following: -

1) The Electric Vehicles (Smart Charge Points) Regulations.
2) APP authentication (where applicable) to provide 15-minutes of non-authenticated charge to enable smart devices to obtain Wi-Fi or GPRS/GSM communication coverage.
3) RFID readers (where applicable) to be integrated within EVSE.
4) All necessary infrastructure and control interfaces shall be provided for Ethernet (TCP/IP LAN), Wi-Fi or GPRS/GSM communications (where applicable).
5) Where GPRS/GSM communications are utilised, the EVCP Specialist(s) shall undertake a survey/assessment of signal strength and quality to ensure EVSE will function reliably. If signal strength and quality is not sufficient it shall be brought to the attention of the Engineer immediately in writing.
6) Communication via OCPP and OSCP standards is preferred (where applicable).
7) In the event that user authentication communication system(s) are lost, EVSE shall revert to unrestricted energy transfer.
8) Where Ethernet (TCP/IP LAN) and/or Wi-Fi communications are utilised, Firewall configuration shall be fully considered.

E9B-17 PME SUPPLIES

PROTECTION AGAINST ELECTRIC SHOCK

EVSE fed from PME earthing arrangements must be provided with earthing and bonding in accordance with BS 7671 and the IET CoP for EVC, to prevent the risk of electric shock associated with open-circuit PEN conductor faults.

Mode 4 EVSE shall be treated as Mode 3 EVSE with regards to PME supplies/protection against electric shock, reference shall also be made to Appendix J of the IET CoP for EVC.

Several installation options for PME supplies given within BS 7671 for protection against electric shock, however the following are not deemed practical or permitted by this specification for the installation of EVSE: -

1) Provision of isolating transformers or other means of electrical separation.

   (Note: Mode 3 only, Mode 4 EVSE will include isolating transformers and must be supplemented with fault detection devices and/or dedicated TT earthing systems to comply with the IET CoP for EVC).
2) Converting the entire installation to a TT earthing system.

INSIDE BUILDINGS

EVSE installations may be connected to PME earthing arrangements when they are located within an internal/enclosed car park (e.g. underground car park, fully enclosed indoor multi-storey car park etc.).

OUTSIDE BUILDINGS

For outdoor installations, EVSE (shall include fault detection devices (e.g. open-PEN protective devices) as detailed within IET Regulation 722.411.4.1 indents (iii), (iv) or (v). Where alternative fault detection devices are provided to indent (v), they shall not result in a lesser degree of safety to those detailed within indents (iii) and (iv).

FAULT DETECTION DEVICES

When EVSE fault detection devices are used, additional bonding downstream of the protective devices shall not be installed to parts or conductors connected to a PME earthing system, as this will defeat the open-PEN protection.

Where fault detection devices are provided for three-phase EVSE, if measurement earth electrode(s) are required they shall be provided in accordance with Annex A722 of BS 7671 and Appendix H of the IET CoP for EVC.

Measurement earth electrodes must be installed in strict accordance with manufacturers' recommendations.

Fault detection devices providing disconnection of live and protective conductors as detailed within IET Regulation 722.411.4.1 indents (iii), (iv) or (v), are required to provide isolation.

For on-street installations fed from a dedicated DNO cut-out/supply within an LV feeder pillar, the Contractor / EVCP Specialist must verify if the aforementioned detection devices are permitted by the DNO.

Where these devices are not permitted by the DNO dedicated TT earthing systems must be provided in strict accordance with the DNO requirements.

Fault detection devices shall not be used in PEIs that operate in island mode and dedicated TT earthing systems must be provided.

DEDICATED TT EARTHING SYSTEM INSTALLATIONS

Where fault detection devices cannot be provided as part of the EVSE by the manufacturer, the inclusion of LMS impedes the correct functionality of devices) or they are not permitted by the DNO, a dedicated TT earthing system installation shall be provided to the EVSE (subject to a simultaneous contact / formal risk assessment).

TN-S SYSTEMS

TN-S installations shall be regarded as TN-C-S/PME unless N-E separation can be verified back to the source and it is guaranteed by the DNO that it will not be converted to TN-C-S as part of future network upgrades.

Where EVSE installations are part of a guaranteed TN-S system of an installation, the EVSE may be connected to the earthing arrangements whether the EVSE is installed internally/enclosed or outdoors. Earthing and bonding arrangements must meet the requirements of BS 7671 for a TN-S system.

E9B-18 SIMULTANEOUS CONTACT ASSESSMENT / FORMAL RISK ASSESSMENT

Formal risk assessment shall be undertaken by the Contractor / EVCP Specialist where dedicated TT earthing arrangements are required for the Modes 3 and 4 EVSE (e.g. manufacturers EVSE does not include detection devices in accordance with BS 7671) and the installation is in the vicinity of an installation using a different earthing system e.g. TN-C-S system (PME supply).

The Contractor / EVCP Specialist shall complete the appropriate risk assessment form as required by IET Code of Practice and Electrical Contractor Certification Schemes, to verify that contact is not possible between the EVSE / vehicle being charged and any exposed-conductive-parts or extraneous-conductive-parts connected to the other earthing system.

Where the risk assessment indicates that it is not considered safe to provide a TT earthed outdoor EVCP and/or to charge a TT earthed EV at the indicated location, it shall be brought to the attention of the Engineer immediately in writing.

Appendix V of this section provides a model risk assessment form for commercial and industrial installations, however where applicable the model forms from the IET Code of Practice for dwelling, on-street and fuel filling installations shall be used. Risk assessment forms provided by Electrical Contracting Certification Schemes are deemed acceptable. All entry boxes must be completed and contain accurate information.

E9B-19 DEDICATED TT EARTHING SYSTEM INSTALLATION – SUBJECT TO RISK ASSESSMENT

Dedicated TT earthing systems for EVSE that are separated from the PME earthing systems are only acceptable where all of the following conditions apply: -

1) There is no possibility of simultaneous contact between exposed- and/or extraneous-conductive-parts of the TT earthing system and those of the TN-C-S (PME) earthing system or any other nearby earthing system.
2) Earth electrode zones of TT earthing systems must not overlap the zone of any buried metalwork connected to the TN-C-S (PME) earthing system.
3) In the event of a fault in the supply PEN conductor, buried metalwork connected to the TN-C-S (PME) system does not unduly influence the potential of the ground adjacent to the vehicle.

Typically, EVSE shall be installed at locations where the exposed-conductive-parts of the EVSE and the EV on charge are at least 2.5m from: -

1) Other structures with exposed metalwork that are either connected to true earth or to any other electrical earthing system; and
2) Any extraneous- or exposed-conductive-parts of any other item of electrical equipment.

E.g. lighting columns, street furniture, CCTV columns, car park / information machines or similar equipment etc.

In addition, TT earth electrodes must be adequately separated below ground from the following connected to a TN-C-S (PME) earthing system: -

1) PME earth electrodes.
2) Supplementary earth electrodes for equipment supplied by the PME earthing system.
3) Exposed-conductive-parts of equipment supplied by the PM earthing system.
4) Metallic sheaths of cables.
5) Exposed-conductive-parts of installations supplied by the PM earthing system.

TT earth electrodes shall also be adequately separated from metallic service pipes for water/gas, metallic parts of fuel oil tanks (and the associated pipework), structural steelwork of buildings and any other below ground metallic parts.

The separation distance below ground shall be at least 2.5m and in strict accordance with the guidance provided Appendix G of the IET CoP for EVC. However, DNOs may require separation in excess of this value and this must be verified by the Contractor / EVCP Specialist with the local DNO.

Dedicated TT earthing systems shall be provided as necessary to either external LV feeder pillars, EVSE manufacturer LV feeder pillars or EVCPs, dependent upon the wiring configuration of the external EVSE.

Supply cabling (including SWA and protective conductors) serving EVSE shall be insulated upon entry to external LV feeder pillars, EVSE manufacturer LV feeder pillars or EVCPs, dependent upon the wiring configuration of the external EVSE.

The resistance of electrodes to earth shall not exceed 100 Ω; this is to account for the fluctuation of ground conditions within the 200 Ω limit of BS 7671 and the IET CoP for EVC. The resistance of earth electrodes to the EVCP earth terminal shall not exceed 1 Ω.

Warning signage 'ELECTRIC VEHICLE CHARGING EQUIPMENT – TT system adopted for charging equipment circuit. Do not connect to the PME earth' shall be provided at the origin, metering position (if remote from the origin) and at the designated point of isolation for the EVSE supply.

TT earthing systems for Mode 4 EVSE shall be provided in strict accordance with Appendix J of the IET CoP for EVC and manufacturer's literature.

E9B-20 RESIDUAL CURRENT DEVICES

Unless supplied by a circuit using the protective measure of electrical separation, each EVCP must be individually protected by a 30mA RCD (RCCB/RCBO) with switched neutral and the rated operating time shall not exceed 40ms at 5 IΔn. Except where provided as part of the EVSE equipment, protection against DC fault currents shall be provided by the following RCD types: -

1) Type B, or
2) Type A or Type F in conjunction with a residual current detecting device (RDC-DD) complying with BS IEC 62955 as appropriate to the nature of the residual and superimposed currents and recommendations of the EVSE manufacturer.

RCD protection is not required for electrically separated Mode 4 EVSE DC charging systems, on either the primary or secondary, however the EVSE must incorporate means of detection of first fault, either through earth fault leakage detection to BS EN 61851-23 and/or IMDs to BS EN 61557-8.

Mode 4 EVSE without electrical separation shall be provided with RCD protection for the AC supply, RCD protection is not required to the DC output to EVs.

Overcurrent protection devices(s) shall be selected in strict accordance with EVSE manufacturers requirements.

E9B-21 DISTRICT NETWORK OPERATOR (DNO) NOTIFICATION

The EVCP Specialist(s) shall ensure the EVSE installation is notified to the DNO as follows: -

1) Where maximum demand is less than or equal to 13.8kVA – Notification shall be within 28 days of installation directly to the DNO through the email addresses detailed on the ENA website, or
2) Where maximum demand is greater than 13.8kVA – Notification shall be in advance of installation.

Maximum demand inclusive of all connected loads on the DNO supply.

Where load management/curtailment is used, ENA Engineering Recommendation G100 has provision for notification to state conformity to G100. This notification shall be made after installation.

DNO notification shall be undertaken for V2X installations under ENA Engineering Recommendations G98 or G99.

E9B-22 LOSS OF SUPPLY & SECONDARY POWER SUPPLIES

EVSE shall not operate where there is loss of primary DNO power supply and shall not be connected to a secondary power supply (e.g. standby generator, standby utility supply etc.).

E9B-23 RFID COMMUNICATIONS

Contactless RFID communications (where required) shall incorporate the following minimum features: -

RFID SPECIFICATION				
FORMAT	**PROTOCOL**	**FREQUENCY**	**DATA ENCRYPTION**	**UNIQUE ID NUMBER**
Card	Manufacturer dependent	13.56MHz	128-bit	✓

Notes: -

1) RFID protocols shall be compliant with ISO IEC 14443 (Type A or B) and/or ISO IEC 15693.
2) Each portable RFID device shall be assigned a unique identity for used authentication; these shall be of a quantity agreed with the Contract Administrator.
3) A below the line cost shall be provided for the purchase of additional RFID devices.

E9B-24 SMART DEVICE APP

Smart device applications (where required) shall incorporate the following minimum features: -

APP SPECIFICATION					
OPERATING SYSTEM	**CHARGE STATUS**	**ENERGY TRANSFER METERING**	**REMOTE START/STOP**	**PAYMENT MANAGEMENT**	**COST**
Apple iOS and Google Android (Native Support)	✓	✓	✓	✓	Free Download No Subscription

Notes: -

1) Mobile phone/tablet application subject to site-specific user authentication requirements.
2) Non iOS and Android platforms shall be supported where native applications are not available (e.g. web-based browser, SMS or similar).

E9B-25 FUEL FILLING STATIONS (WHERE APPLICABLE)

Where EVSE is installed within fuel filling stations: -

1) Final circuits supplying EVSE shall be controlled by the forecourt emergency switching system.
2) EVSE must be interlocked with the filling station controls for lighting and signage, so that power is removed from EVSE when the forecourt is closed.
3) Only TT earthing systems shall be used.
4) Only EVSE with tethered cabling shall be used.
5) Parking spaces shall be located so that EVs cannot be charged in the hazardous area. The hazardous area comprises temporary and permanent hazardous zones associated with filling stations and ancillary services.

Where a separate DNO supply is provided for EVSE within fuel filling stations: -

1) Labelling shall be provided on EVSE to indicate that it is not controlled by the filling station main switch, and,

2) There is no possibility of simultaneous contact between exposed- and/or extraneous-conductive-parts of different earthing arrangements.

Firefighters switches shall be provided in strict accordance with BS 7671.

EVSE installations shall be provided in strict accordance with APEA / IET Electric Vehicle Charging Installations at Filling Stations – Supplement to the Code of Practice for Electric Vehicle Charging Equipment Installation and APEA/EI – Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations.

E9B-26 TECHNICAL SUBMISSIONS

Prior to procurement or installation on-site, technical submissions shall be provided for the following: -

1) 'Checklist for arrangements prior to installation' within Appendix II of this section of the specification.
2) Formal risk assessment for protection against electric shock and simultaneous contact (where dedicated TT earthing systems are required).
3) Statement of Compliance for The Electric Vehicle (Smart Charge Points) Regulations.
4) Confirmation in writing from the manufacturer that EVSE complies with PAS 1899 – Electric vehicles – Accessible charging – Specification.
5) Technical specification for all cabling, equipment and components to be installed (e.g. EVCPs, barriers, EVSE LV feeder pillars, load management systems etc.).
6) Technical specifications for all end-user / Cloud based management software (including managed billing).
7) Project specific schematics and wiring diagrams; generic manufacturers' details will not be accepted.
8) Layout drawings detailing the locations of all equipment.
9) Maintenance requirements.

The time allowed for comment by the Engineer shall be as detailed within section 1B of this specification.

E9B-27 DIAGRAMS AND DOCUMENTATION

Diagrams and documentation shall be provided in strict accordance with the IET CoP for EVC and The Electric Vehicle (Smart Charge Points) Regulations.

Clear and concise hazard information should be provided at the agreed FRS entrance point. An information-box (including plans/layouts) for the FRS shall be provided which shall include locations of EV charging points, facilities for their electrical isolation, fire main outlet location and position of thermal imaging cameras (if provided).

Information regarding other fire safety systems (e.g. smoke ventilation systems, fire suppression/sprinklers etc.) shall also be provided (where applicable).

E9B-28 INSPECTION, TESTING AND COMMISSIONING

EVSE shall be inspected, tested and commissioned in strict accordance with the IET CoP for EVC, EVSE manufacturer's recommendations and the standards detailed earlier within this specification as appropriate.

EVSE installed within fuel filling stations shall also be inspected, tested and commissioned in strict accordance with APEA/IET Electric Vehicle Charging Installations at Filling Stations and APEA/EI Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations.

The electrical installation works associated with the EVSE shall be inspected and testing in strict accordance with BS 7671 and Section 2F of this specification. All circuits / test results shall be recorded on the 'Schedule of circuit details / Schedule of test results' provided within the Electrical Installation Certificates).

Formal witnessing of testing and commissioning shall be undertaken in strict accordance with Section 2F of this specification.

EVSE shall be subjected to functional testing to verify that it functions correctly and has been properly installed in accordance with the IET CoP for EVC and EVSE manufacturer's recommendations.

Where controls are provided from filling station emergency switching systems, it shall be verified that they are operational and function correctly.

EVSE installations shall be inspected and tested in accordance with the recommendations of the IET CoP for EVC: -

1) Insulation resistance tests: -

a) All cables of the fixed installation shall be tested during installation, prior to connection of live conductors for the first time (but after connection of protective conductors) at the relevant voltage, usually 500 V d.c. for 400/230 V systems; and

b) Following connection in the installations, during initial and periodic verification, tests shall be undertaken between coupled live conductors and Earth, at 250 V d.c.

The minimum value of insulation resistance in both cases shall be 1 MΩ.

2) Earth electrode tests: -

a) Earth electrodes shall be tested before the installation is energised and if the installation is re-energized following additions or modifications, particularly to the earthing arrangement.

b) Earth electrode tests are also required where earth electrodes are provided for Mode 4 EVSE that incorporates separation (Refer to Appendix J of the IET CoP for EVC.

c) Test method E2: Measurement using dedicated stakeless or clamp-based earth electrode tester utilising the 'two clamp method' from IET Guidance Note 3 – Inspection & Testing shall be used.

The resistance of electrodes to earth shall not exceed 100 Ω; this is to account for the fluctuation of ground conditions within the 200 Ω limit of BS 7671 and the IET CoP for EVC. The resistance of earth electrodes to the EVCP earth terminal shall not exceed 1 Ω.

3) Testing at Mode 3 EVSE socket-outlets or tethered cable vehicle connectors: -

a) Prospective fault current, earth fault loop impedance and functional testing of RCDs at the vehicle outlets/connectors of EVSE.

b) 'Vehicle simulator' and appropriate test equipment and test probes, clips leads shall be used. (Commercial versions of test equipment which provide a BS EN 62196-2 Type 2 socket-outlet and/or shrouded 4mm test equipment sockets can be used).

c) Vehicle simulators shall be used in accordance with EVSE manufacturer's instructions for both the simulator and EVSE.

d) Vehicle simulators may also be used to check the operation of RDC-DDs to BS IEC 62955 for fault finding purposes or where functional tests are specified in EVSE manufacturer's literature.

4) Determination of earth fault loop impedance and prospective fault current in PEIs.

5) RCD testing (upstream/downstream method where 'cascaded' RCDs have insufficient, or no, selectivity between an upstream and downstream RCD).

Test equipment shall be provided in strict accordance with the test equipment requirements of Section 2F of this specification and the IET CoP for EVC.

The Contractor / EVCP Specialist(s) shall liaise with the Client and Engineer prior to commissioning to ensure any end-user / Cloud based management software is programmed / commissioned (including managed billing) and all EVSE is fully functional on completion of the works, in accordance with the Clients operational requirements.

Upon completion the system(s) shall be demonstrated to the Engineer and the Client. The Contractor / EVCP Specialist shall provide training to the Client until they fully understand the operation of the system.

The Contractor / EVCP Specialist(s) shall complete the checklists provided in Appendices III and IV: -

1) Checklist for physical installation requirements.

2) Checklist for electrical installation requirements.

All entry boxes must be completed and contain accurate information.

The above checklists are for commercial and industrial installations, however where applicable the checklists from the IET Code of Practice for dwelling, on-street and fuel filling installations shall be used. Checklists provided by Electrical Contracting Certification Schemes are deemed acceptable.

The Contractor / EVCP Specialist(s) shall complete the checklists provided in Annex E of PAS 1899 for the installation of charging points with accessibility requirements.

Commissioning certification shall be provided to verify the correct installation and operation of the EVSE. The commissioning certification and as-installed drawings for the EVSE shall be included within the O&M manual.

APPENDIX I – CHECKLIST FOR ARRANGEMENTS PRIOR TO INSTALLATION

ARRANGEMENTS PRIOR TO INSTALLATION – COMMERCIAL AND INDUSTRIAL INSTALLATIONS				
IET CODE OF PRACTICE REFERENCE	**CHECK**	**YES**	**NO**	**N/A**
4.2	Are there any hazardous zones where flammable/combustible gases may be present?			
4.2	Have the boundaries of any hazardous zones been identified?			
4.2	Can the installation be carried out so that the charged vehicle, cable and connectors are outside of the hazardous area when charging?			
3.2	Is metering adequate for the intended use and billing model?			
3.3, 8.1.3	Is the existing supply adequate for the additional demand?			
8.1.2	Has the earthing arrangement of the incoming power supply been established?			
	Are the existing earthing and bonding arrangements compliant with BS 7671?			
8.2.3	Is the supply PME (TN-C-S) or a TN-S public supply?			
8.2.3	If PME (TN-C-S), have precautions necessary to prevent danger in the event of an open-circuit neutral been identified and addressed?			
5.1.2, 5.3.3, 8.2.1 and Appendices F, G and H	If a TT earthing system is being provided for the charging equipment, has a simultaneous contact and earthing arrangements assessment been carried out?			
3.6	Has mobile network coverage of the proposed installation and location been checked? *Note: Some EVSE manufacturers have specific requirements for the generation of mobile technology.*			
3.7	Has the installer reviewed the installation instructions provided by the charging equipment manufacturer?			
3.8	Has planning permission been granted for the charging equipment installation?			
3.10	Have the details of the proposed installation been discussed and agreed with the client?			
	Have any necessary repairs to the existing installation been agreed with the client?			
5.6 and 8.5	Has the correct type of RCD been selected in relation to the charging equipment (Type B for Mode 3 or Mode 4 charging equipment, unless the equipment has in-built DC residual current protection then; Type A or Type F may be acceptable)?			

NOTES

1) All entry boxes on the checklist must be completed.

2) '✓' shall indicate 'YES', 'NO' or 'N/A as necessary.

APPENDIX II – CHECKLIST FOR PHYSICAL INSTALLATION REQUIREMENTS

PHYSICAL INSTALLATION REQUIREMENTS – COMMERCIAL AND INDUSTRIAL INSTALLATIONS				
IET CODE OF PRACTICE REFERENCE	**CHECK**	**YES**	**NO**	**N/A**
4.2	Has the charging equipment been installed outside any hazardous zones where flammable/combustible gases may be present?			
4.2	Have precautions been taken to ensure the charged vehicle, cable and connectors are outside the hazardous area when charging?			
4.3	Has the charging equipment been installed in an optimum location with respect to the intended vehicle parking position?			
4.4	Has the charging equipment been installed in a location to minimize the likelihood of vehicle impact damage?			
	If no, have protective barriers been provided?			
4.5	Are the main operating controls, displays and any socket-outlets at an appropriate height?			
	Have the requirements of PAS 1899 been met?			
	Have you made sure there are no changes of level between the vehicle and EVSE controls			
4.6	Is there sufficient space around the charging equipment to open all doors and covers?			
4.7	Is there sufficient space around the charging equipment for ventilation and cooling purposes?			
4.6	Have all trip hazards been considered and, where possible, avoided?			
4.8	Have any BS 1363 socket-outlets intended for EV charging been labelled as EV connecting points, and checked to see that they are marked 'BS 1363/EV' on the rear in accordance with BS 1363-2?			

NOTES

1) All entry boxes on the checklist must be completed.
2) '✓' shall indicate 'YES', 'NO' or 'N/A as necessary.

APPENDIX III – CHECKLIST FOR ELECTRICAL INSTALLATION REQUIREMENTS

ELECTRICAL INSTALLATION REQUIREMENTS – GENERAL				
IET CODE OF PRACTICE REFERENCE	**CHECK**	**YES**	**NO**	**N/A**
	Prior to installation checklist to hand and satisfactorily completed?			
5, 8	Installation design to hand?			
	Design section of electrical installation signed?			
	Pre-work survey of installation carried out, including: • Rating and condition of existing equipment? • Suitability for additional load? • Earthing and bonding?			
	Pre-work tests of installation carried out, including: • Earth continuity, polarity and insulation resistance? • Earth fault loop resistance? • Operation of RCDs?			
	Defects in existing installation identified and notified to the client: • Those affecting the new installation? • Those not affecting the new installation?			
	Order to repair defects in existing installation affecting the new installation received?			
	Equipment to be worked on isolated?			
	Precautions taken to prevent inadvertent energizing?			
	Installation carried out?			
9	Testing			
9	Electrical Installation Certificate to hand, with preliminaries complete, including signatures for design?			
9	Installation isolated and precautions to prevent inadvertent switching on taken?			
9	Preceding testing, inspection carried out on disconnected installation?			
9	Inspections carried out as per BS 7671 Schedule of Inspections?			
9	Schedule of Inspections completed?			
9	Dead tests carried out as required by BS 7671 prior to energizing, and appropriate parts of the test schedule completed?			
9	Remaining tests carried out as required by BS 7671 after energizing, and appropriate parts of the test schedule completed?			
9	Electrical Installation Certificate completed complete with schedule of inspections and schedule of test results?			

ELECTRICAL INSTALLATION REQUIREMENTS – GENERAL				
IET CODE OF PRACTICE REFERENCE	**CHECK**	**YES**	**NO**	**N/A**
9	Copy of certificates issued to the person ordering the work?			
9	Customer advised in writing of any defects in the electrical installation not rectified?			
9	Competent person scheme provider notified of completion?			
9.3	Correct operation of the charging equipment demonstrated to the client?			
9.4	Client provided with the instruction manual for the equipment and informed of any maintenance requirements?			
11	DNO notification form for the installation submitted via the Energy Networks Association website and, for V2X capability, post-installation notification to the DNO in accordance with G98/G99?			

NOTES

1) All entry boxes on the checklist must be completed.

2) '✓' shall indicate 'YES', 'NO' or 'N/A as necessary.

APPENDIX IV – SIMULTANEOUS CONTACT – RISK ASSESSMENT

Installation where PME supply and vehicle charging equipment to be installed outdoors where a TT system is proposed to be adopted for charging equipment only. Refer to Simultaneous Contact Assessment section within this specification.

RISK ASSESSMENT D1 IET STANDARDS	
NAME AND ADDRESS OF CLIENT	**INSTALLATION ADDRESS**
Name and address of client .... Postcode.....	**Installation Address** .... Postcode.....
Supply taken from, e.g. main intake, office unit z, store	....
Location of EV charging equipment considered in this risk assessment, (approximate distance to reference points)	....
STEP	**RECORD**
Step 1 Identify the hazards (a) Does the building from which the charging supply is to be obtained have a PME supply? (b) Is the vehicle charging equipment to be installed outdoors? (c) Is a TT system to be adopted for the main installation and vehicle charging equipment?	Yes/No Yes/No Yes/No *If the answer to all three of the above questions is Yes, the hazard will be:* In the event of an open-circuit neutral in the PME supply system, all conductive-parts connected to the main PME earthing terminal, e.g. any exposed- or extraneous-conductive-parts that may be directly, or indirectly, or otherwise connected to this earthing terminal, may become raised to a dangerous voltage relative to true Earth.
Step 2 Simultaneous contact – decide who might be harmed and how	Any person who can simultaneously touch any conductive-parts or conductor that might be connected to the main PME earth terminal of the building, e.g. a water tap, or metallic gas/water or fuel pipe, or metallic conduit, or item of Class I electrical equipment, such as an outside light, switch or socket-outlet, or a boiler flue, or structural steel work, etc., AND the vehicle being charged OR any other conductive-parts or conductor that might be directly or indirectly or otherwise connected to the TT earth terminal of the vehicle charging equipment.

STEP	RECORD
Step 3 Simultaneous contact – evaluate the risks and decide on precautions	
(1) Is it possible to simultaneously touch any conductive-parts or conductor that might be connected to the main PME earthing terminal AND the vehicle being charged OR any conductive-parts or conductor that might be connected to the TT earth terminal of the vehicle charging equipment? NB: All possible locations and positions of the vehicle on charge, and the charging lead and connector, must be considered here.	Yes/No *If the answer to 1 is No, retain the following text; if yes, delete the following text:* 'THIS RISK ASSESSMENT SHOWS THAT IT IS NOT CURRENTLY NECESSARY TO TAKE ANY PRECAUTIONS TO PREVENT RISK OF SIMULTANEOUS CONTACT BETWEEN ANY CONDUCTIVE-PARTS OR CONDUCTOR THAT MIGHT BE CONNECTED TO THE MAIN PME EARTHING TERMINAL AND THE VEHICLE BEING CHARGED OR ANY CONDUCTIVE-PARTS OR CONDUCTOR THAT MIGHT BE CONNECTED TO THE TT EARTH TERMINAL OF THE VEHICLE CHARGING EQUIPMENT. THE CUSTOMER HAS BEEN INFORMED IN WRITING THAT A FURTHER RISK ASSESSMENT MUST BE UNDERTAKEN TO CHECK WHETHER THE CHARGING EQUIPMENT WILL REMAIN SAFE TO ENERGIZE AND/OR USE IF THIS SITUATION CHANGES.'
(2) If the answer to question (1) is Yes, can this simultaneous contact be reliably prevented, e.g. by fitting an insulation section into any pipe or conduit, or replacing any item of Class I equipment with Class II equipment, or by providing a permanent barrier or enclosure, or by applying permanent insulation, etc.?	Yes/No *If the answer to question 1 and question 2 are both Yes, record here the essential precautions required to prevent the possibility(ies) of simultaneous contact identified by question (2):* .... *And* THE CUSTOMER HAS BEEN INFORMED IN WRITING THAT THE CHARGING EQUIPMENT WILL BECOME UNSAFE TO ENERGIZE AND/OR USE IF THE PRECAUTIONS LISTED ABOVE ARE REMOVED OR OTHERWISE BECOME INEFFECTIVE. *If the answer to question 1 is Yes and the answer to question 2 is No, retain the following text here (otherwise delete):* 'THE RISK ASSESSMENT SHOWS THAT IT IS NOT CONSIDERED TO BE SAFE TO PROVIDE A TT EARTHED OUTDOOR VEHICLE CHARGING POINT AT THE CHOSEN LOCATION AND/OR TO CHARGE A TT EARTHED EV AT THE CHOSEN LOCATION. THIS HAS BEEN MADE KNOWN TO THE CUSTOMER IN WRITING.'

STEP	RECORD
Step 4 Separation of earthing systems – decide who might be harmed and how	Any person who may be touching the vehicle being charged OR any other conductive-parts or conductor that might be directly or indirectly or otherwise connected to the TT earth terminal of the vehicle charging equipment, under either of the following conditions: (a) Buried metalwork connected to the PME earthing system is not adequately separated from earth electrode(s) or buried metalwork connected to the TT earthing system, in accordance with Table H1 of the IET Code of Practice; or (b) The potential of the ground on which they are standing is subject to rise of earth potential during a PME neutral conductor fault, as described in Appendix G, Clause G5 of the IET Code of Practice
Step 5 Separation of earthing systems – evaluate the risks and decide on precautions Is adequate separation of the TT earthing system available, and the risk of return of PME touch voltage assessed to be negligible?	Yes/No *If the answer to this question is No, retain the following text here (otherwise delete):* 'THIS RISK ASSESSMENT SHOWS THAT IT IS NOT CONSIDERED TO BE SAFE TO PROVIDE A TT EARTHED OUTDOOR VEHICLE CHARGING POINT AT THE CHOSEN LOCATION AND/OR TO CHARGE A TT EARTHED EV AT THE CHOSEN LOCATION. THIS HAS BEEN MADE KNOWN TO THE CUSTOMER IN WRITING.'
Step 6 Record your findings and implement them If the precautions are inadequate, is it less of a risk to convert the complete installation to TT?	All precautions required by step 3 completed. Signature..... Date carried out.....
Step 7 Review the assessment and update if necessary	To be reviewed whenever further work is carried out on the installation, including any inspection and testing.