

ELECTRIC VEHICLE SAFETY RULES (G2178721)

DESCRIPTION AND OPERATION

FOREWORD

Every **Company** has a duty to make sure that it has in place adequate health and safety arrangements to protect persons from the inherent **Hazards** associated with its business activities.

These Electric Vehicle (**EV**) Safety Rules are used to cover work and activities undertaken on Electric Vehicles.

Every **Company Shall** therefore make a suitable assessment of:

- a) The risks to the health and safety of its **Employees** and/or contractors to which they are exposed whilst they are at work.
- b) The **EV** training qualifications held by their **Persons** required to work on **Electric Vehicles**.
- c) The access each **Person** has to Jaguar Land Rover workshop manual information on TOPlx.
- d) The access each **Person** has to **Approved** tooling and Jaguar Land Rover **Approved** Special Service Tools (SST).
- e) The access each **Person** has to **Approved** Equipment and Personal Protective Equipment (PPE) as required for work on **EV**. The **Company Shall** make sure this equipment and PPE used and complies with any local market legislation.
- f) The risks to the health and safety of **Persons** not employed and/or contracted to the **Company** of which could be exposed during business activities, in conjunction with any local market legislation.



NOTE:

All **bold** words within these Electric Vehicle (EV) Safety Rules have definitions within section 9.

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SECTION 1 - POLICY AND PRINCIPLES

1.1 Policy

These Safety Rules are designed to provide the necessary policy and procedures to enable **Persons** trained and authorised under these rules to safely perform servicing and repairs to Jaguar Land Rover **Electric Vehicles**.

Note: In addition, it is the responsibility of the **Company** to check and follow any local safety and electricity at work regulations in their individual market regions and comply.

Every **Company** has a moral and legal responsibility to make sure the health, safety and welfare of its **Employees** and /or contractors. **Employees and contractors** also have a responsibility to look after their own health and safety and the safety of others by virtue of their actions.

As a result, specific safe working procedures **Shall** be followed to make sure the safety of all staff and other persons not in the employment of the **Company** within the working vicinity.

1.2 Principles

The key principles of these **EV** Safety Rules are to manage and/or remove the identified risks to persons in the workplace, contractors and clients, repair and service personnel and vehicle operators.

These Safety Rules have structured levels of technician qualification and responsibility as detailed in Section 4 – Technician roles and responsibilities.

1.3 Electrical Vehicle Safety Rules

These **EV** Safety Rules set out the principles to be applied when working on **Electric Vehicles** where **Danger** exists from electrical energy sources that operate at **High Voltage (HV)**. These rules **Shall** be applied in the following circumstances when working on **HV Systems** where the electrical energy source has a nominal operating voltage in excess of 60V (AC or DC).

- When a **High Voltage (HV)** source is present on an **EV** (e.g. a high voltage battery), or an external power source is used.
- When an **EV** is being worked on

1.4 Defined Terms

Words which appear in Bold type in these Safety Rules are 'Defined Terms' and are listed in Section 9 – Terminology and Definitions.

SECTION 2 - GENERAL SAFETY PRECAUTIONS

2.1 Scope and Application

These **EV** Safety Rules **Shall** be applied to **EV High Voltage Systems** and associated equipment in conjunction with any local market legislation.

2.2 Information, Instruction and Training

Arrangements **Shall** be made by the **Company** to make sure:

a) That all Employees and/or contractors concerned are adequately informed as to -

- The risks to their health and safety as identified by risk assessment.
- The preventative and protective measures to be taken.
- Procedures to be followed in the event of serious and imminent **Danger**.
- The risks arising from the activities of any other employee in the workplace.

b) That all **Persons** concerned are informed and instructed as to the **EV Systems** which are affected by a particular operation or work (whether or not they are owned or operated by the **Company**) and which legal requirements, **EV** Safety Rules, related documents and procedures **Shall** apply.

c) That other persons, who are not **Employees** or contractors, but who may be exposed to **Danger** by the operations or work also receive correct information and instruction.

d) That the capabilities and competence of **Employees** or contractors are taken into account in allocating tasks.

e) That persons working on Electric Vehicles (EV) have completed Jaguar Land Rover Training for EV and are certified Persons (**EVIP, EVCP, EVAP and EVSAP**).

2.3 Objections

When any **Person** receives instructions regarding the operation of or work upon any **EV System**, and associated equipment, he/she **Shall** report any objections on safety grounds to the performing of such instructions to the **Person** issuing them, who **Shall** formally record this objection and then have the matter investigated, if necessary, referred to a higher authority before proceeding.

2.4 Duties

The **Company**, as an employer, has a duty to comply with the provisions of the health and safety legislation applicable and other relevant statutory provisions.

The **Company's Employees** and/or contractors also have a duty to follow any local safety and electricity at work regulations in their individual market regions and comply.

In addition to applicable statutory duties and any other duties separately allocated to them, all **Persons** who may be concerned with the operation of, or work upon, **EV Systems** and associated equipment **Shall** be conversant with, and comply with, those **EV Safety Rules** relevant to their duties and related documents and procedures. Ignorance of legal requirements, or of **EV Safety Rules** and related documents and procedures, **Shall** not be accepted as an excuse for neglect of duty.

If any person has any doubt as to any of these duties they **Shall** report the matter to a higher authority for advice before proceeding with work.

The term 'employee' **Shall** include **Persons** who are contracted to perform work for the **Company**.

2.5 General Safety and Requirements

In addition to all other requirements specified in these **EV Safety Rules** the safety of **Persons** at work **Shall** also be achieved by maintaining, at all times, General Safety at and in the vicinity of the place of work. Before work or testing commences the **Electric Vehicle Competent Person (EVCP)** in charge of the **Working Party** must make sure that safety precautions are taken to establish General Safety at and in the vicinity of the workplace. This **EVCP** must make sure that at all times during the work or testing that General Safety arrangements are maintained and that other work areas are not adversely affected by the activities for which he/she is responsible. The discharging of responsibilities for General Safety will be achieved as part of the normal pattern of management delegation and control by making sure that all activities are carried out in accordance with appropriate instructions and guidance.

2.6 General Requirements - Persons

Persons who are required to perform work on any **EV** irrespective of the nature of the work **Shall**, as a minimum requirement, comply with any local market legislative requirements for work on systems that operate at the voltages used on **HV Systems** and have successfully completed the JLR **Approved EVIP** e learning training course (for non EV system work) or have successfully completed the JLR approved training as an **EVCP**, **EVAP** or **EVSAP** for EV System work.

2.7 Use of Voltage Test Devices

Where voltage testing devices are used they **Shall** be of an **Approved** type and such usage **Shall** be in accordance with **Jaguar Land Rover workshop manual procedures**.

2.8 Treatment For Electric Shock

All **Persons** who may be concerned with the operation of, or work upon, **HV Systems**, and associated equipment, **Shall** be familiar with the emergency provisions at the place of work.

Note: It is the responsibility of the **Company** to check and follow any local safety legislation/guidelines for treatment of electric shock their individual market regions and comply.

**WARNING:**

IMMEDIATE AND SPEEDY ACTION IS NECESSARY

Free from Contact - Do not attempt to remove a person from contact with high voltage unless suitable insulated equipment for the system voltage are used for this purpose, use suitable insulated gloves, boots, mat, or insulated hook.

SECTION 3 - SAFETY PRECAUTIONS FOR WORK ON OR NEAR ELECTRIC VEHICLES

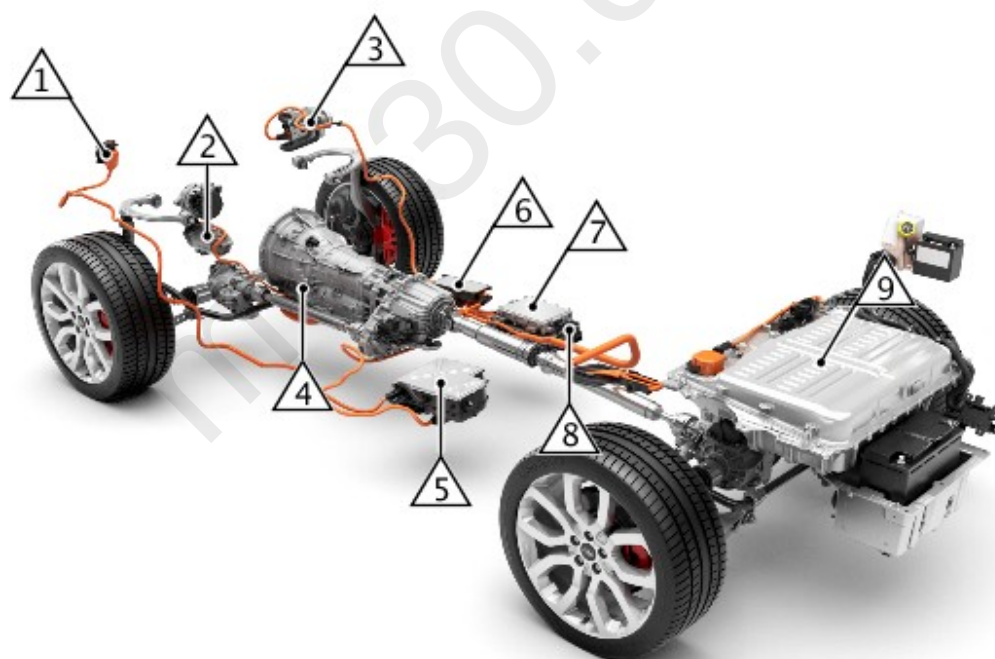
3.1 Use Safety Equipment and Wearing of Personal Protective Equipment (PPE)

Where any work under these **EV** Safety Rules and related documents and procedures takes place, appropriate safety equipment and protective clothing of an **Approved** type **Shall** be issued and used in accordance with local legislative requirements and Jaguar Land Rover **Approved** workshop manual procedures.

3.2 General Requirements

No **Person(s)** **Shall** undertake any work on **Electric Vehicles (EV)** with the vehicle connected to an external charge port using the home charging cable (Mode 2).

All **Components** within the **HV System** **Shall** be treated as **Live** unless they have been made safe in accordance with rule 3.2.1. The components listed in illustration E226422 below are considered to be part of the **HV System** for the Range Rover Sport (L494) PHEV 18MY and Range Rover (L405) PHEV 18MY, this includes the orange HV cables that connect each HV component. All 12 volt electrical harnesses connected to the highlighted HV components are **not** considered part of the **HV System**, therefore do not need to be made safe in accordance with 3.2.1 for any work or testing activities.



E226422

ILLUSTRATION NUMBER	COMPONENT NAME
1	High Voltage (HV) charge socket
2	HV Air Conditioning (AC) compressor

ILLUSTRATION NUMBER	COMPONENT NAME
3	HV booster heater
4	HV motor generator
5	HV Battery Charger Control Module (BCCM)
6	HV Junction Box (HVJB)
7	HV Direct Current-Direct Current (DC-DC) converter
8	HV inverter
9	HV battery

3.2.1 Work is not permitted on components which form part of the vehicle **HV System** or components associated with this system unless the **HV System** is **Powered Down** and isolated. The Approved JLR workshop manual procedure for **HV system power down** **Shall** be used, the key elements of the vehicle power down process are as follows:

- (a) All external electrical sources are disconnected from the vehicle.
- (b) Vehicle ignition turned off and keys removed more than 5 meters away.
- (c) All steps taken to isolate and lock off **HV System** components from all sources of energy by the use of a **Safety Locking Device**, from which the components may become **Live**, this includes both 12 volt systems and **HV System** connectors.
- (d) Verified that the **Isolated Component(s)** to be worked on is **Dead** by **Approved** methods of testing.
- (e) Released for work and the safety measures which have been put in place are clearly communicated to the **Working Party**, which includes the issue of a **Permit-to-Work (PTW)** which **Shall** not be issued unless the issuer and the recipient are fully conversant with the precise parts of the **HV System** to be worked upon, the nature and also the extent of the work to be completed in accordance with the **Approved** Jaguar Land Rover workshop manual procedures.

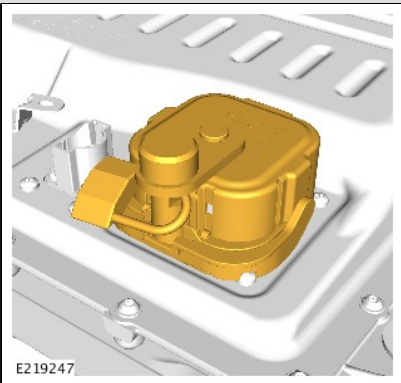
It is the duty of the **EVAP** issuing the **PTW** to make sure compliance with the above requirements.

3.3 Isolation of HV System Components

3.3.1 No **Power Down** or **Power Up** of any **HV** energy sources connected to a **HV System** **Shall** be initiated other than by the **EVAP** responsible for issuing or cancelling of the **Safety Document(s)** for the work on defined **EV System (s)**.

3.3.2 All points of the **HV system** that could become energized **Shall** have **safety locking devices** fitted.

The keys for such devices **Shall** be kept in a **Key Safe**.

EXAMPLE:	EXAMPLE:
A Safety Locking Device fitted to a High Voltage electrical connector on the battery, this safety locking device must be secured with an insulated padlock.	 NOTE: The key safe shall be permanently fixed at least 5 meters away from the work area of the electric vehicle. Example: An EV key safe, used to secure all vehicle keys and Safety Locking Device padlock keys. All keys Shall be locked within the EV key safe once the HV systems have been isolated from the HV battery by the Approved person. This process is covered within the Jaguar Land Rover Approved vehicle Power Down workshop manual procedure.
 E219247	 E216616

SECTION 4 - EV AUTHORISED PERSON ROLES AND RESPONSIBILITIES

4.1 General

4.1.1 It is the duty of all **Persons** who may be involved in controlling, operating, testing, working on or in the vicinity of **HV System** components, to implement and comply with the **EV Safety Rules**.

4.1.2 Ignorance of the relevant legal requirements and these **EV** Safety Rules **Shall** not be accepted as an excuse for neglect of duty. The responsibilities placed upon a person may include all or part of those detailed in these **EV** Safety Rules, depending on the role of the person.

4.1.3 All **Persons** will be trained and certified at the designated level of responsibility. In addition, it is the responsibility of the **Persons** to check and follow any local safety and electricity at work regulations in their individual market regions and comply.

4.1.4 When any **Person** receives instructions to perform work/testing he/she **Shall** report any objections in accordance with section 2.3 in these **EV Safety Rules**.

4.1.5 The **EVAP/EVSAP** is responsible for making sure that an **HV System** is **Powered Down** and the point of work is isolated from all forms of energy sources, this person has the following areas of responsibility:

a) Instructing all **Persons** in the working party of the safety precautions and issue of the **Safety Documents**.

4.1.6 **After completion of work:** acknowledging cancellation of **Safety Documents** and instructing actions to restore the **HV System** to service using the JLR approved workshop manual procedures.

a) '**Confirmation**': Receipt of **Safety Document(s)**; therefore confirming the execution of the required work is completed or terminated giving clearance of the **Safety Document**.

4.2 Persons

4.2.1 Electric Vehicle Informed Person (EVIP)



A person who has successfully completed the Jaguar Land Rover **Approved EVIP** Awareness Course and recognized by the **Company** as having sufficient competence to enable him or her to avoid any risk and/or hazard.

The **EVIP** will be authorised to perform specified duties dependent upon their individual competencies, these include working on all vehicle components, including 12 Volt systems that are not part of, or associated with the **HV System**. An **EVIP** must not work on any component that is part of the **HV System**.

The **EVIP Shall** comply with these **Electric Vehicles (EV)** Safety Rules when carrying out work, whether instructions are issued orally or in writing. **EVIPs Shall** use the JLR approved workshop manual procedures when working on an **EV**.

EVIP Responsibilities:

- Receive work instructions and perform work on **EV Systems**, excluding work on components within the **HV System** or work that directly affects the **HV system**, as directed by the JLR approved workshop manual procedures.
- Identify **EV** status and **HV System Components**.
- Perform work as specified in the work instruction in accordance with Jaguar Land Rover **Approved Workshop Procedures**.

- Stop work and consult with an **Electric Vehicle Authorised Person (EVAP)** or an **Electric Vehicle Competent Person (EVCP)** if the work activity has potential **Hazards** associated with a **High Voltage EV System**.

4.2.2 Electric Vehicle Competent Person (EVCP)



A **Person** who has successfully completed a Jaguar Land Rover **EVCP Approved** training course and recognized by the **Company** as having competence to enable him or her to avoid any risk and/or hazard.

EVCP Shall comply with these **EV** Safety Rules when carrying out work whether instructions are issued orally or in writing. **EVCP Shall** use JLR approved workshop manual procedures.

EVCP Responsibilities:

- Receive a **Permit-to-Work (PTW)**.
- Confirm their understanding of the **PTW**.
- Brief the **Working Party** if applicable.
- Receive instructions as part of the **Working Party** if applicable.
- Perform the designated work as detailed in the **PTW**.
- Make sure Jaguar Land Rover workshop manual procedures are followed at all times during any work on **EV Systems**.
- Co-ordinate the **Working Party**.
- On completion of the work, sign **PTW** clearance section.
- Enact the role of **Safety Accompanying Person** during the vehicle **Power Down** process.
- Enact the role of **Safety Accompanying Person** during any **Live Working** activities.
- Enact the role of **Assisting Person** during any **Live Working** activities.

4.2.3 Electric Vehicle Authorised Person (EVAP)



A **Person** who has successfully completed a Jaguar Land Rover **EVAP Approved** training course and recognized by the **Company** as having sufficient competence to enable him or her to avoid any risk and/or hazard.

Appointed by the **Company** and certified to perform specific duties which **Shall** include authority to issue and cancel **Permit-To-Work** certificates.

In addition to the responsibilities of an **EVCP**, an **EVAP** **Shall** have all of the following responsibilities.

EVAP Responsibilities:

- All those stated for an **EVCP**.
- Be the single Person-in-Charge controlling the Work being undertaken
- Perform a vehicle **Power Down** procedure to make **HV Systems** safe for work or testing.
- Confirm safety measures are in place.
- Prepare **PTW** for work on **HV Systems** or other **EV Systems** requiring a vehicle **Power Down**.
- Issue the **PTW** to an **EVCP** or themselves who then becomes the **EVCP**.
- Supervise the work if necessary.
- Cancel the **PTW** on completion of the work and confirm with the **EVCP** that the work is complete and correct before the **HV System Power Up** process.
- Perform a vehicle **Power Up** procedure to restore the **EV System** operation.

4.2.4 Electric Vehicle Senior Authorised Person (EVSAP)



A **Person** who has successfully completed a Jaguar Land Rover **EVSAP Approved** training course and recognized by the **Company** as having sufficient competence to enable him or her to avoid any risk and/or hazard.

 WARNING:

Before any **Live Working** activities are conducted this Person **Shall** have successfully completed a Jaguar Land Rover Live working training course that is specific for the work to be performed.

In addition to the responsibilities of an **EVAP**, an **EVSAP Shall** have all of the following responsibilities.

Responsibilities:

- All those stated for an **EVAP**.
- Be the single Person-in-Charge controlling the Work being undertaken
- Confirm safety measures are in place for **Live Working** activities.
- Prepare a **Live Work Certificate (LWC)** for work/testing on **HV System** components that are live and connected to the HV energy source.
- Issue the **Live Work Certificate (LWC)** for themselves as an **EVSAP**.
- Assume the role of **Person-In-Charge** when performing **Live Working** on **HV Systems**
- Perform all **Live Working** activities and supervise other members of the **Working Party** during work/testing on live **HV System** components.
- Cancel the **Live Work Certificate (LWC)** on completion of the work.

NOTE:

An EVSAP can resume the role of EVAP/EVCP; however, to perform the EVSAP role, the individual must have undergone training to the required EVSAP standard. Therefore an EVSAP may cover the responsibilities of an EVAP/EVCP, but an EVAP/EVCP may not cover the responsibilities of the EVSAP.

SECTION 5 - WORKSHOP SAFETY AND PREPARATION

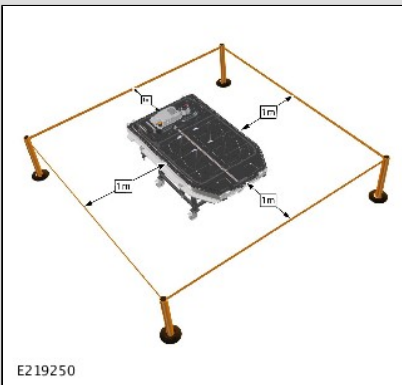
5.1 Segregation of work areas for work on HV systems and components

Where work activities are to be performed on **EV Systems** which have the capability of being connected or coupled to energy sources which could give rise to any risk and/or hazard, a designated work area **Shall** be established by the use of barriers and signage to denote the designated work area.

The designated working area must be in place before the Electric Vehicle **HV system** is powered down as per the Jaguar Land Rover workshop manual procedure.

The safety barrier must also display the 'Danger High Voltage' sign as detailed in section 5.2 of the **EV** safety rules or any specific warning wording as required by local legislation.

Only **Persons** who are directly associated with the work under the **Permit-to-Work (PTW)** or those who are signed onto the **Working Party** of a **Live Work Certificate (LWC)** are permitted to access the designated work area.

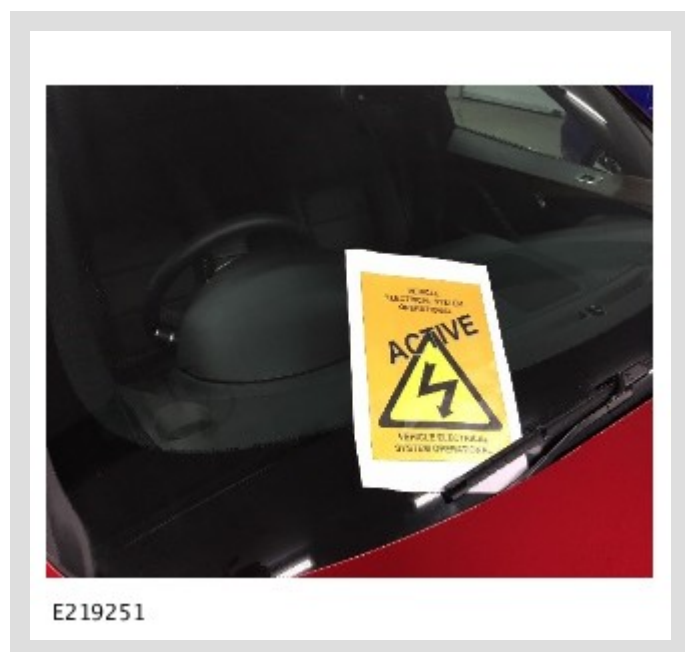
EXAMPLE:	EXAMPLE:
All EV that require work to be carried out on or in association with the HV System, must have the safety barrier positioned around the perimeter of the vehicle. The safety barrier must be a minimum of 1 meter away from the vehicle on all sides.	If the High Voltage battery is removed from the vehicle to have further work carried out, the safety barrier must be positioned around the perimeter of the HV battery. Work on the battery internal components is considered Live Working, therefore this area becomes the Live Working area that is controlled by an EVSAP under a Live Work Certificate. The safety barrier must be a minimum of 1 meter away from the HV battery on all sides.
 E219249	 E219250

5.2 Electric Vehicle (EV) Status Signs

Three types of signs **Shall** be displayed on an **EV** when presented for repair, maintenance or servicing. These signs indicate the operational status of the vehicle **HV system**.

The application and removal of **EV** status signs to vehicles when work is to be undertaken under a **Permit-to-Work**, is the responsibility of the **EVAP** responsible for issuing the **PTW**.

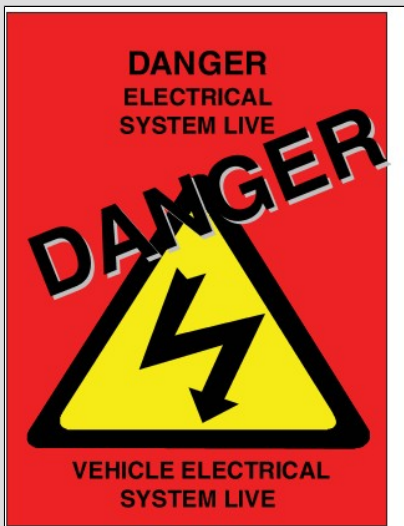
Whilst **EV** are within a workshop environment and can be subject to work/testing activities, appropriate signs **Shall** be displayed in the vehicle indicating it's status.

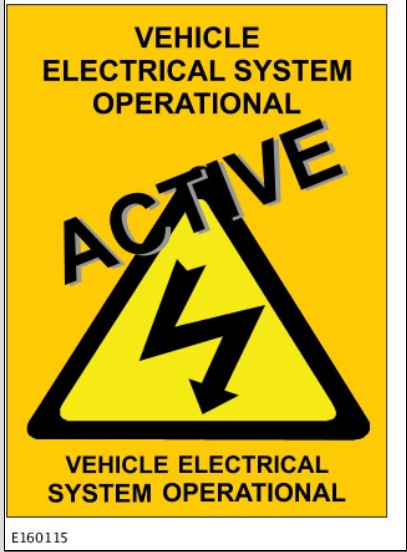


Example: The active vehicle status sign displayed on the windscreen of an Electric Vehicle (EV) is clearly visible to all **Persons**.

EV Status Signs

Whilst **Electric Vehicles** are subject to work activities, appropriate signs **Shall** be displayed on the vehicle indicating it's status.

DESCRIPTION:	SIGN:
A RED DANGER sign Shall be used if the vehicle fails a Power Down procedure and is placed in vehicle quarantine, as detailed in the Jaguar Land Rover workshop manual procedure. This sign may also be displayed in circumstances where an EV has sustained damage, or suspected damage to the HV System and the possibility exists of contact with Live HV System Components .	 E160529

DESCRIPTION:	SIGN:
An AMBER ACTIVE sign identifies that the EV systems are operational and ready to be used, provided that no other mechanical problem exists. This sign shall be presented on the windscreen of all EV when presented at a location for work activities.	
A GREEN SAFE sign identifies that the HV System is Powered Down and isolated from other EV systems and can be worked on or tested under a Permit-to-Work only.	
A Danger High Voltage sign shall be used on the work area safety barrier surrounding the HV energy source.	

DESCRIPTION:	SIGN:
	

All **Persons** who are required to perform any work or test activity on an **EV** will confirm that the displayed status is known, understood and appropriate for the work activity to be undertaken.

SECTION 6 - USE OF SAFETY DOCUMENTS FOR WORKING ON ELECTRIC VEHICLES (EV)

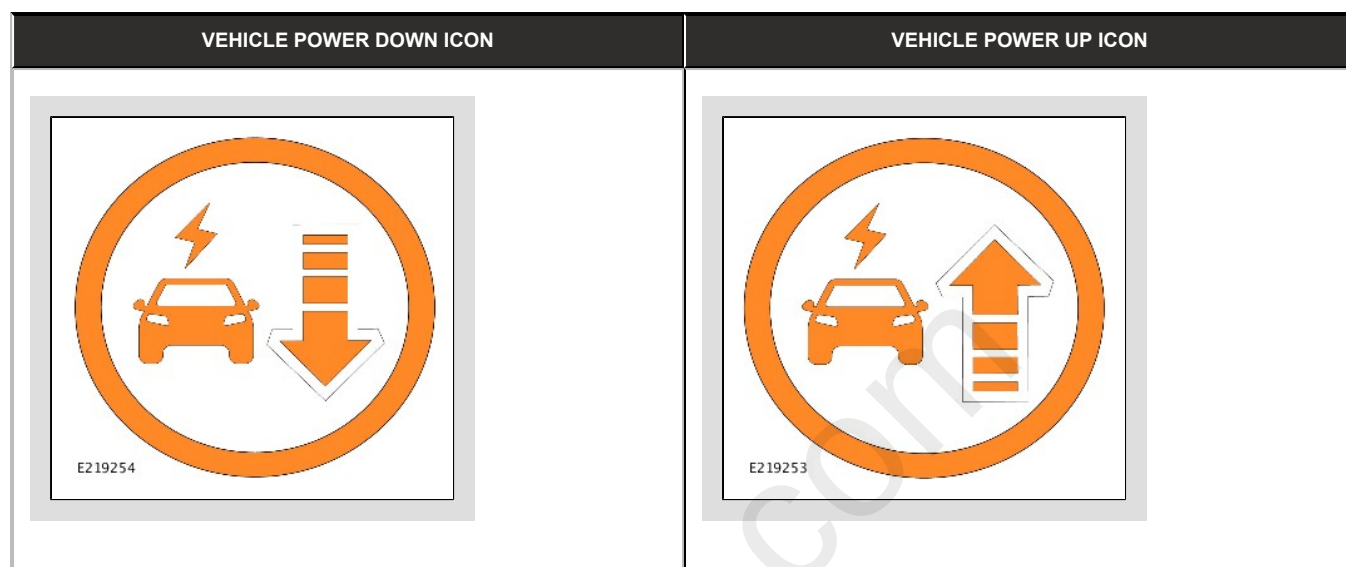
6.1 Guidelines for the completion of a Permit-To-Work (PTW)

6.1.1 Authority for Issue

The **PTW** can only be issued once the **HV System Power Down** procedure has been completed by the **EVAP** using the Jaguar Land Rover **Approved** workshop manual. The **PTW** document is reference within the **HV System Power Down** procedure and is printable via Jaguar Land Rover TOPIx.

The **PTW Shall** be completed and issued by an **single EVAP** only before any work/testing is performed on a **HV System** and/or mechanical components associated with an **HV System**. If the **HV System Power Down** and therefore the issue of a **PTW** can not be completed by the **EVAP** that began the procedure, the outstanding **PTW** must be cancelled- refer to section 6.1.6. For the work/testing on the vehicle to continue the new **EVAP shall** start the **HV System Power down** procedure again.

The following icons are used in the illustrations detailed in section 6.1.4 and 6.1.5 to represent the **Power Down/Up** procedure only to be performed by the **EVAP**.



6.1.2 Permit-to-Work Preparation

The **PTW Shall** be completed in accordance with the guidelines set out in **EV Safety Rules Procedure** – ‘Section 7 – Safety Rules Procedure for Work on Isolated **EV Systems**’, which requires the **EVAP** to record all relevant details on the **PTW** prior to issue.

6.1.3 Procedure for Issue and Receipt

The **EVAP** in charge of performing a **HV System Power Down** is required to complete sections 1,2, and 3 of the **PTW** at the beginning of the **HV System Power Down** procedure. This sections are:

Section 1 - Identification of vehicle to be worked on.

Section 2 - Description of work to be performed after the HV system power down.

Section 3 - Safety precautions in place before the HV system power down.

Once the **HV System Power Down** procedure is complete the **EVAP Shall** issue the **PTW** to an **EVCP** or themselves. The following sections Shall be completed:

Section 4 - Safety precautions in place before further work/testing on the vehicle. This section requires the **EVAP** to brief the recipient of the **PTW** regarding the safety precautions they have in place and detail the exact points of isolation introduced during the **HV System Power Down** procedure. This **Shall** be a physical walk around the vehicle with the recipient.

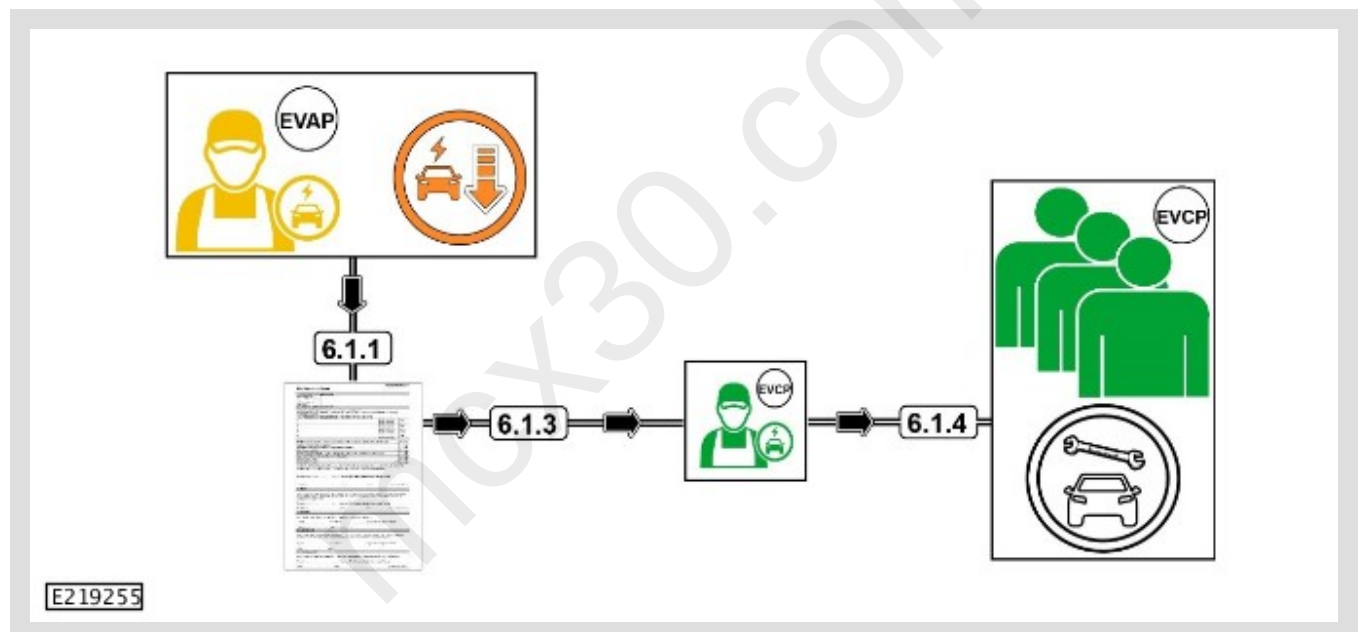
Section 5- Issue. This section requires a signature from the **EVAP** to confirm Section 4 is complete.

Section 6 - Receipt. This section requires a signature from the recipient (**EVCP**) confirming they are clear, have been briefed and understand the safety actions detailed in Section 4.

The recipient of a **PTW Shall** retain the **PTW** in their possession at all times whilst the work/testing is performed.

6.1.4 Working Party control - Section 7.

Where applicable the recipient of the **PTW Shall** also make sure that the **PTW** is properly explained to the other members of the **Working Party** in accordance with the **EV** Safety Rules, all members of the working party must be at least **EVCP** trained and signed onto Section 7 of the **PTW**. Once Section 7 is complete work on the vehicle can begin.

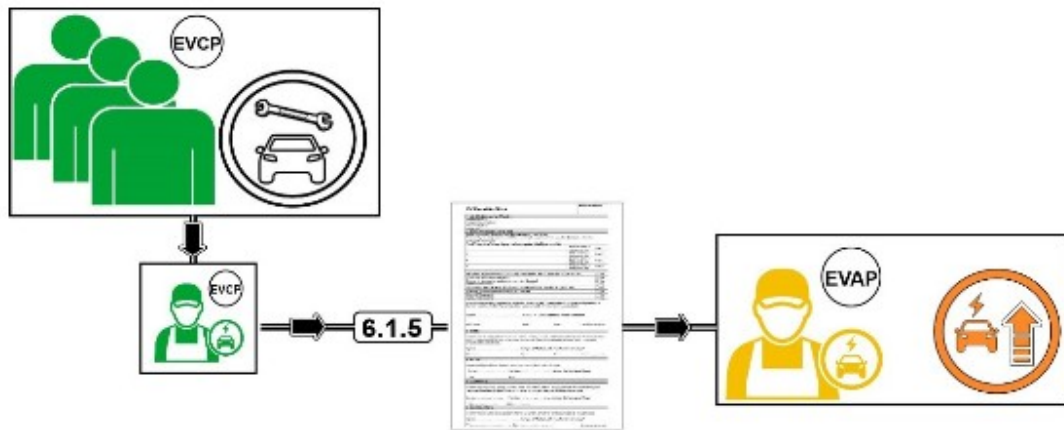


6.1.5 Procedure for Clearance - Section 8.

A **PTW Shall** be cleared and cancelled when the work detailed in Section 2 of the PTW is complete. Section 8 Shall be completed by the recipient of the PTW, a signature is required confirming that they and any persons within the **Working Party** have withdrawn from any work activities on the vehicle.

6.1.6 Procedure for Cancellation - Section 9.

The cancellation section of the **PTW Shall** be completed by the **EVAP** responsible for performing the **HV System Power Up** process, the **EVAP** must sign Section 9 to confirm the **PTW** is now cancelled and they will take responsibility of the vehicle from the **EVCP**.



E219256

6.1.6 Vehicle HV System Power Up - Section 10.

Section 10 requires the EVAP to confirm the vehicle is Powered Up and restored to normal operation.

Permit-To-Work format – Page 1

BATTERY, MOUNTING AND CABLES - INGENIUM I4 2.0L PETROL - PHEV

DESCRIPTION AND OPERATION

The Permit To Work (PTW) shall be completed by a single Electric Vehicle Authorised Person (EVAP) only.

COMPLETE SECTIONS 1,2 AND 3 BEFORE THE HIGH VOLTAGE SYSTEM POWER DOWN

SECTION 1: IDENTIFICATION OF VEHICLE TO BE WORKED ON

REPAIR ORDER NUMBER	VIN	DATE

SECTION 2: DESCRIPTION OF WORK TO BE PERFORMED AFTER HV SYSTEM POWER DOWN (completed by EVAP)

DESCRIPTION:

SECTION 3: SAFETY PRECAUTIONS IN PLACE BEFORE THE HV SYSTEM POWER DOWN (completed by EVAP)

STANDARD SAFETY PRECAUTIONS	
1: Correct EV Status signs displayed	☐ Yes
2: Company Emergency response procedures known and understood	☐ Yes
3: A suitably trained first aid person available onsite. This person must comply with local market legislation	☐ Yes
4: Approved JLR Diagnostic Equipment and Special Service Tools have been used	☐ Yes
5: Correct Personal Protective Equipment (PPE) available	☐ Yes
6: Workshop Safety Hook available	☐ Yes

I confirm that the above precautions have been performed and are adequate for the work/testing detailed in Section 2.

EV Authorised Person (EVAP) – Signed:

Print Name: Date: Time:

Safety Accompanying Person (Responsible for the safety hook during the vehicle power down-signed by an EVCP)

I confirm that I will be on standby to support the activity of High Voltage (HV) system power down. I understand my responsibilities as the Safety Accompanying Person and will perform this role in accordance with requirements detailed in the Jaguar Land Rover EV Safety Rules.

EV Competent Person (EVCP) – Signed:

Print Name: Date: Time:

COMPLETE SECTIONS 4,5 AND 6 AFTER THE HIGH VOLTAGE SYSTEM POWER DOWN

SECTION 4: SAFETY PRECAUTIONS IN PLACE BEFORE FURTHER WORK/TESTING ON THE VEHICLE (completed by EVAP)

Standard Safety Precautions

E237406

Standard Safety Precautions

STANDARD SAFETY PRECAUTIONS:	
1: HV System confirmed as Powered Down	☐ Yes
2: Correct SAFE EV Status signs displayed	☐ Yes
3: Permit-to-Work recipient is trained to a minimum level of EVCP	☐ Yes
4: Approved JLR Diagnostic Equipment and Special Service Tools have been used	☐ Yes

Safety Precautions taken in accordance with the EV Safety Rules

State exactly the safety measures which have been implemented during the HV system power down procedure to remove or control hazards to enable the work/testing to proceed.

1	.....	isolating or Safety Lock Device fitted	☐ Yes
2	.....	isolating or Safety Lock Device fitted	☐ Yes
3	.....	isolating or Safety Lock Device fitted	☐ Yes
4	.....	isolating or Safety Lock Device fitted	☐ Yes
5	.....	isolating or Safety Lock Device fitted	☐ Yes
6	.....	isolating or Safety Lock Device fitted	☐ Yes

SECTION 5: ISSUE (signed by EVAP)

I confirm that the points of isolation and safety precautions listed in Section 4 are in place and will remain in place until this Permit-To-Work (PTW) is cancelled; the HV system has been Powered Down and the appropriate safety equipment is available.

EV Authorised Person (EVAP) – Signed:

Print Name: Date: Time:

SECTION 6: RECEIPT (signed by EVCP)

I understand that the points of isolation and safety precautions listed in Section 4 are in place and will remain in place until this Permit-To-Work (PTW) is cancelled. I understand the work listed in Section 2 and accept my responsibilities under this Permit-to-Work.

EV Competent Person (EVCP) – Signed:

Print Name: Date: Time:

COMPLETE SECTIONS 7, 8, 9 AND 10 AFTER THE WORK IS COMPLETE

SECTION 7: WORKING PARTY CONTROL (all members of Working Party to sign)

NAME	BRIEFING RECEIVED	TIME ON	SIGNATURE	TIME OFF	SIGNATURE
.....	☐ Yes	.....	.....	.....	.....
.....	☐ Yes	.....	.....	.....	.....
.....	☐ Yes	.....	.....	.....	.....
.....	☐ Yes	.....	.....	.....	.....
.....	☐ Yes	.....	.....	.....	.....
.....	☐ Yes	.....	.....	.....	.....

SECTION 8: CLEARANCE (signed by PTW Holder)

I confirm that all persons working under this permit have withdrawn from, and warned not to perform any further work on any EV Systems.

☐ The work on the EV System defined in Section 2 is complete.

☐ The work on the EV System defined in Section 2 is **NOT** complete.

E242605

EV Competent Person (EVCN) – Signed:

Print Name: Date: Time:

SECTION 9: CANCELLATION (signed by EVAP)

☐ I confirm that this Permit-to-Work is cancelled and that the HV System is ready to be powered up.

☐ I confirm that this Permit-to-Work is cancelled and that the HV System is **NOT** ready to be powered up.

EV Authorised Person (EVAP) – Signed:

Print Name: Date: Time:

SECTION 10: VEHICLE POWER UP (signed by EVAP)

☐ I confirm that the HV System Power Up procedure was completed successfully and the EV operation is restored.

☐ I confirm that the HV System Power Up procedure was **NOT** completed successfully and the EV operation is **NOT** restored.

EV Authorised Person (EVAP) – Signed:

Print Name: Date: Time:

Comments:

.....
.....
.....
.....

E237407

6.1.7 Using a Permit To Work (PTW) within a JLR approved body repair center.

A **PTW Shall** be issued at a JLR approved body repair center for repairs that require work on the vehicle **HV System** in accordance with the approved JLR body repair procedure. This **PTW Shall** be issued by an approved **EVAP** as per the guidelines in 6.1.1, this person could be from a local JLR approved retailer if an **EVAP** is not available at the body repair center.

The **PTW** can only be closed by the **EVAP** once the vehicle **HV System** has been powered down by the **EVAP** and any work specified on the **PTW** on the **HV System** has been carried out by the **PTW** holder.

Where parts of the **HV system** are required to be removed to enable body repair it is acceptable to close the **PTW** once the **HV system** components have been removed for access.

 NOTE:

Lock offs used to isolate the HV system **MUST** be left in place for the duration of the vehicle repair.

Where parts of the **HV system** are required to be removed to enable body repair it is acceptable to close the **PTW** once the **HV system** components have been removed for access.

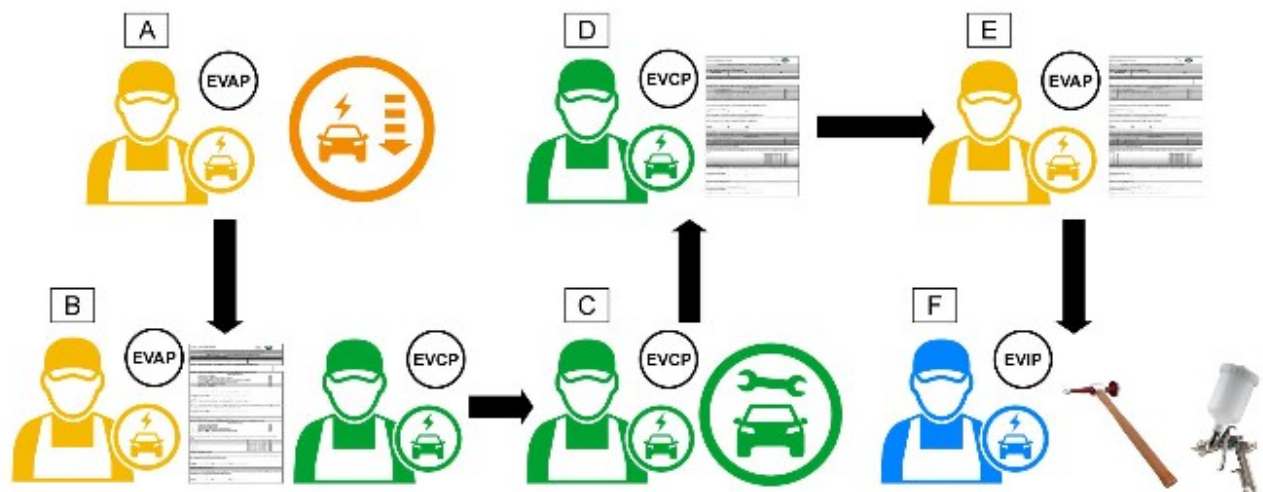
When the vehicle body repairs have been completed by the **EVIP** technician(s) another **PTW Shall** be issued by an **EVAP** for the installation of **HV System** components by an **EVCP** and the **HV System** Powered Up by the **EVAP**, at this point the **PTW** can be closed.



E252042

It is the responsibility of the JLR approved body repair center to inform the **EVAP** at a JLR approved retailer of the work required to be completed on the Electric Vehicle (EV). The **EVAP** must determine the work required for the repair, this may require **HV system** power down and removal of components associated with the **HV System**.

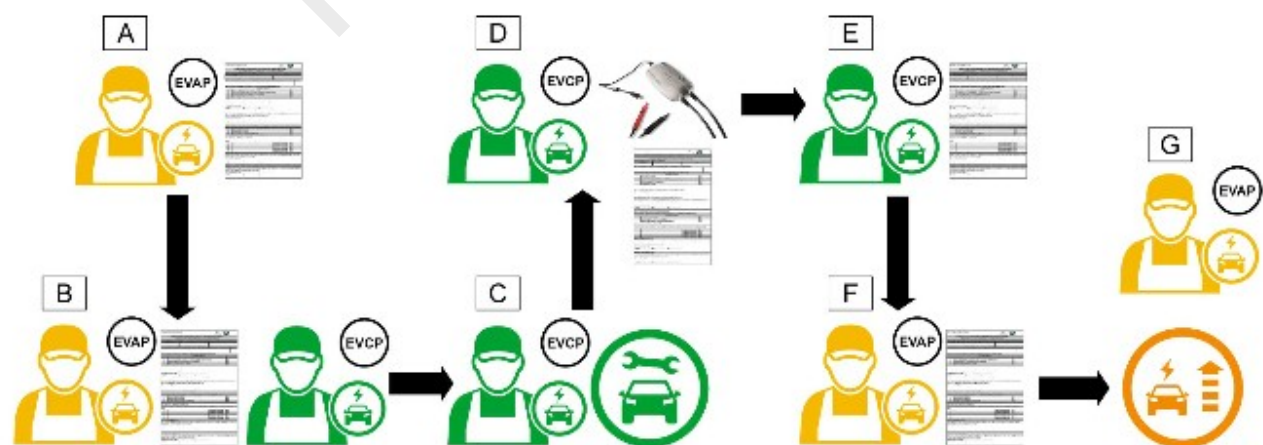
Process for an accident damaged EV requiring HV power down before body repair:



E249174

- 1 **EVAP** to power down EV.
- 2 **EVAP** to prepare **PTW** defining the work required and issue to **EVCP**, or himself/herself.
- 3 **EVCP** to complete the work as defined on the **PTW**.
- 4 **EVCP** to sign **PTW** Clearance section.
- 5 **EVAP** to sign **PTW** Cancellation.
- 6 **EVIP(s)** to complete the (body) vehicle repairs.

Process for an accident damaged EV requiring HV component replacement and HV System power up:



E249177

- 1 **EVAP** to reference the EV **PTW** written for the vehicle HV component removal process and create a **PTW** for the EV component replacement/installation and power up procedures.

2 EVAP to issue the **PTW** to the **EVCP** or himself/herself.

3 EVCP to complete the work as defined on the **PTW**.

4 EVCP to complete HV component bonding testing as required (see 'Component Bonding Testing' section 6.1.8).

5 EVCP to sign **PTW** Clearance section.

6 EVAP to sign **PTW** Cancellation.

7 EVAP to power up the **HV System** and complete the vehicle **Power Up** section of the **PTW**.

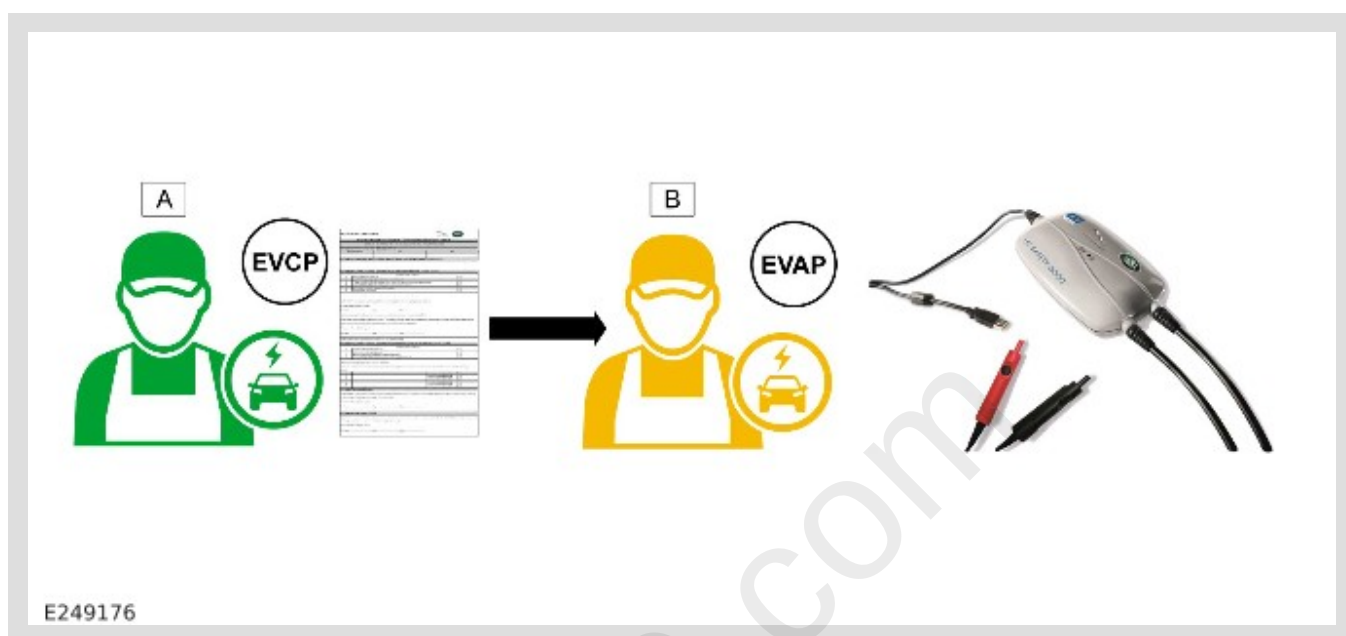
6.1.8 Component bonding test within the JLR approved body repair center.

Once the vehicle (body) repairs are completed by the **EVIP**, the **EVAP** shall raise a **PTW** defining the work/testing required for **HV System** component replacement/installation and vehicle power up:



A bonding test must be completed on all HV components that have been removed and installed or replaced during a repair. It is the responsibility of the **EVCP** to complete HV bonding testing as defined by the component procedures (TOPIx) listed on the **PTW**.

If the **EVCP** at the JLR approved body repair center does not have the correct equipment to complete the bonding test then a note must be made on the **PTW**, stating that a bonding test has not been completed. The retailer **EVAP** must then complete the bonding test before the vehicle is powered up.



1 **EVCP** noted 'Bonding test has not been completed' on **PTW**.

2 **EVAP** completes bonding test of HV components before completing the EV power up process.

WARNING:

Failure to complete a HV component bonding test will seriously compromise vehicle integrity and safety. In all cases bonding testing **MUST** be completed prior to HV power up.

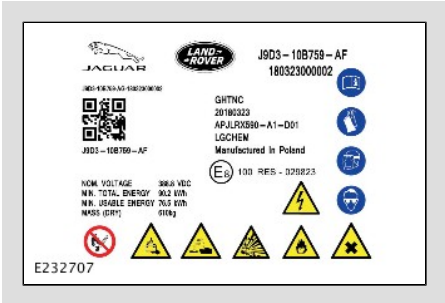
6.2 Guidelines for the completion of a Live Work Certificate (LWC)

6.2.1 All appropriate sections of the **LWC** must be completed prior to any work/testing being carried out.

6.2.2 The Components upon which work or testing is to be carried out **Shall** be easily identifiable. There may be circumstances where the temporary labeling of individual components may be necessary to satisfy this requirement.

6.2.3 A summary of the completion steps of the **LWC** are as follows:

LWC SECTION	GUIDELINES
Part 1	Repair order number- Provided by the retailer for the vehicle work
	VIN- Vehicle Identification Number
	Electric Vehicle Battery Number- As shown in the example image below

LWC SECTION	GUIDELINES
	
Part 2	Description of work- This should be a short detailed explanation of the work to be performed, for example: HV Battery module number 7 replacement Person-in-Charge- Name of the EVSAP in charge of performing the work/testing.
Part 3	Confirmation of Control Measures BEFORE commencing work on Live Components - Perform a detailed risk assessment of the proposed work activity Strike through with a single line any boxes where a risk does not exist and control measures are not required. Confirm with a Yes in the box where risks are identified and the correct measures have been taken. All parts of Part 2 must be completed.
Part 4	Additional precautions- confirmation is required against each requirement. The Person-In-Charge (EVSAP) must sign this section.
Part 5	Working Party Confirmation- All members of the Working Party must sign to confirm they understand the work/testing to be performed as detailed in Part 2, they have been briefed on the control measures in Parts 3 and 4 and that they understand their role and responsibilities during the work/testing on the Live HV system components. There must be a signature from the following persons: The EVSAP carrying out the work, this person will assume the role of the Person-In-Charge The EVCP performing the role of the Safety Accompanying Person outside the Live work area with the safety hook If required, an Assisting Person qualified to EVCP level to support the EVSAP during certain procedures- this requirement will be detailed in the Approved Jaguar Land Rover workshop manual procedures for the work/testing detailed in Part 1.
Part 6	The Working Party control section must be used to control the persons in and out of the Live Working activity. If there is a requirement for one of the Persons to leave the Working Party or join the Working Party during Live Working activities then they must sign this section and provide a time in and out.
Part 7	Upon completion of the work/testing under the LWC The Person-In-Charge (EVSAP) must make sure that ALL components are made safe, either through isolation or Safety Locking Device tooling where possible. It is not a requirement for all steps within the Approved Jaguar Land Rover workshop manual procedure to be complete before the LWC is cancelled. If at the end of the working day persons are required to leave the live work area then all components must be made safe and the LWC cancelled. A new LWC must be created to complete the work previously started. All members of the Working Party are briefed regarding the work completion and that no further work is permitted under this LWC. Cancel the LWC by all Persons who signed on the LWC in part 5 signing the 'Cancellation' section in part 6.
Additional Notes	If the components worked on cannot be rebuilt to their original state and further work is required then this information should be detailed in the additional notes section of the LWC.

Live Work Certificate (LWC)

E233774

SECTION 7 - SAFETY RULES PROCEDURE FOR WORKING ON ELECTRIC VEHICLE (EV) SYSTEMS

7.1. Purpose

This section of the **EV Safety Rules** sets out the principles and procedures to be followed when working/testing on components within an **EV System**. Work/testing on an component can be performed in two scenarios.

The component to be worked on is not part of the vehicle **HV System** and does not directly affect any part of the **HV System** during the JLR approved workshop manual procedure. In this situation the vehicle **HV System** is **not** required to be made safe using the JLR approved **HV System Power Down** procedure. Providing that the JLR approved workshop manual procedure for the component to be worked on does not request a **HV System Power Down** then work on the vehicle can continue as normal.

The component to be worked on is part of the vehicle **HV System** or one or more steps of the repair procedure directly affects part of the **HV System**. In this situation, the vehicle **HV System Shall** be made safe using the JLR approved **HV System Power Down** procedure. The requirement to **Power Down** the vehicle **HV System** is detailed in the JLR approved workshop manual procedure for the individual component.

7.2. Scope

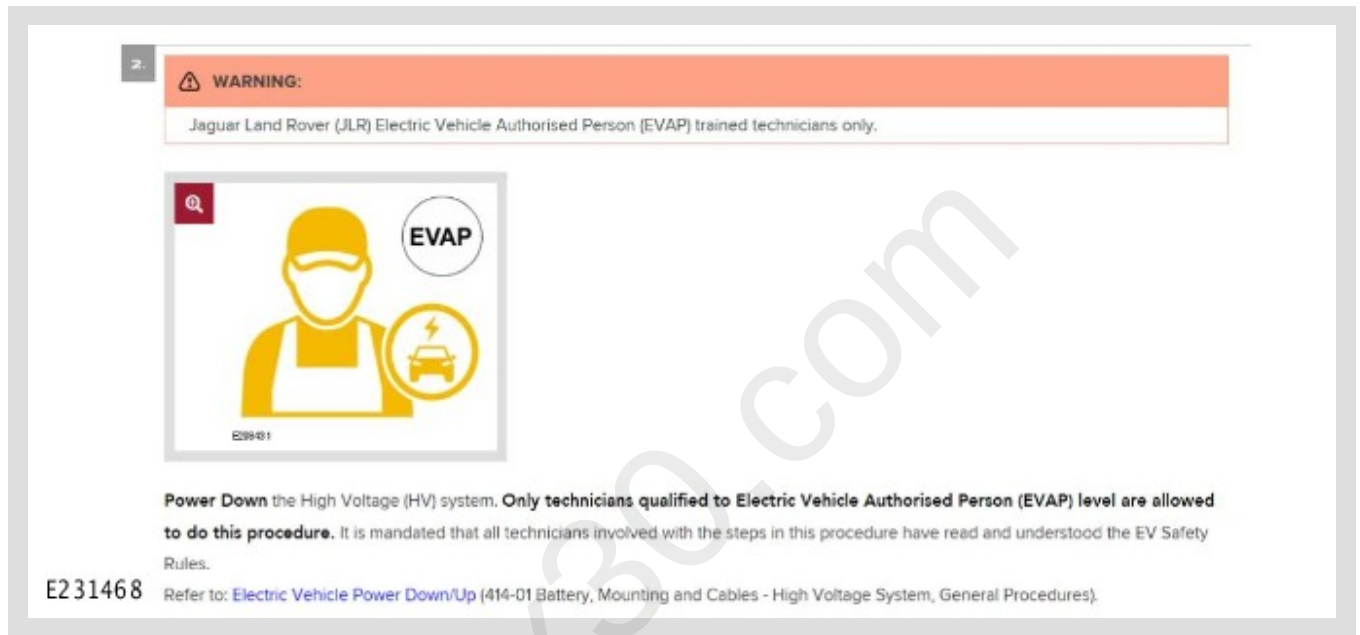
This **Safety Rules Procedure** apply to work or testing on components requiring a vehicle **HV System Power Down** in accordance with 7.1.2 of the **EV Safety Rules**:

- All work or testing on **EV System Components** mechanical and electrical.
- All **Persons** engaged to work or perform testing on **EV Systems**.

7.3 Identification

The **EV** on which work is performed **Shall** be readily identifiable using the **EV** system status signs - refer to section 5.2.

All JLR approved workshop manual procedures that require **HV System Power Down** are identified by the **EVAP** person icon and include to the **HV Power Down** procedure, as shown in illustration E231468.



7.4 Responsibilities

All **Persons** who perform work/testing on **EV Systems** have a duty to comply with this **Safety Rules Procedure**.

7.5 Dangers

The main **Dangers** to personnel working on **EV Systems** are electric shock, burns, chemical leakage and mechanical energy release arising from:

- Attempting to perform work/testing on **EV Systems** on a vehicle that has not been made safe using the JLR approved **HV System Power Down** procedure.
- Making contact with **EV System Components** which are **Live at High Voltage** during **Live Working** conditions.
- Short circuiting **EV** battery terminals or connections resulting in:
 - Arcing – causing burns
 - High intensity light resulting in temporary blindness
 - Sparks that may result in combustion

- Molten metal, causing burns
- Chemical spill or release

d) The physical conditions in which the work is performed.

e) Chemicals and fumes from other energy sources.

7.6 General Requirements for work/testing on EV Systems

Work or testing **Shall** not commence on any **EV System Component** which is connected to the **HV** electrical energy source operating at **HV** unless the **HV system** has previously been **Powered Down**.

The **HV System Shall** be made safe in accordance with Section 3 of these **EV Safety Rules**.

7.7 Personal Protective Equipment (PPE) requirements for vehicle HV System Power Down.



NOTE:

The first used date of the insulating gloves **must** be recorded.

7.7.1 **Persons** performing **HV System Power Down** procedures under this **EV Safety Rules Procedure Shall** be provided with and use **PPE** that is correct for the work activities to be undertaken. It is essential that the **PPE** conforms to the requirements of the Jaguar Land Rover **Approved** workshop manual procedures.

7.7.2 It is the responsibility of the **Persons** involved in the **HV System Power Down** procedure to check their own **PPE** for signs of damage and replace if required before and work/testing commences.

7.7.3 In addition to cotton based non flammable clothing, the minimum requirements of **PPE** for performing voltage safety checks during a **HV System Power Down** procedure **Shall** be as follows:

CLASS 0 PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR HV SYSTEM POWER DOWN PROCEDURES.	GUIDELINES
Class 0 - 1000 Volt insulated gloves  E227282	 NOTE: The boxes on the cuff of the insulating gloves are there to record the first use date. The 1000 Volt insulating gloves first use date Shall be recorded. The 1000 Volt insulating gloves Shall be worn at all times when performing a High Voltage (HV) system Power Down procedure unless stated otherwise in the Jaguar Land Rover Approved workshop manual. Before each use, the insulated gloves Shall be checked for damage and leaks by means of inflation. Make sure to follow the local legislated requirements for replacement frequency.
Leather protective over glove.	Where gloves are subject to mechanical damage eg. cuts, abrasion etc.,

CLASS 0 PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR HV SYSTEM POWER DOWN PROCEDURES.	GUIDELINES
 E227283	consideration should be given to the use of additional Leather protection gloves. The protective leather glove icon is displayed in certain steps of the Jaguar Land Rover Approved workshop manual procedure to indicate where protective leather gloves should be worn.
 E207634 Safety Glasses	Safety glasses Shall be worn at all times when performing a High Voltage (HV) system Power Down procedure unless stated otherwise in the Jaguar Land Rover Approved workshop manual.
 E230327 High Voltage Safety Hook	The High Voltage (HV) safety hook Shall be accessible to the Safety Accompanying Person during the HV system Power Down process.

7.8 Authorization of work activities

The **Company Shall** make sure that any work or testing to be performed on **EV Systems** is in accordance with section 2 of the **EV Safety rules**.

7.9 Making EV Systems safe for Work or Testing

An **EVAP Shall** be responsible for making **EV Systems** safe to work on or test.

The sequence for making safe and releasing **EV Systems** for work or testing **Shall** be as follows:

- a) A visual inspection **Shall** be performed to identify any **Hazards** that exist or may arise during the course of the work.
- b) From the visual inspection the **EVAP Shall**: Decide on the control measures that are needed before work or testing.
- c) Make sure that appropriate tools, equipment and **PPE** is available for the **Power Down/Up** of the **HV System**.
- d) Perform an **HV System Power Down** using the JLR approved workshop manual procedure.
- e) Prepare a **PTW** for the work/testing activity, in accordance with Section 6.1 of these **EV Safety Rules**.
- e) Issue the **PTW**, in accordance with Section 6.1 of these **EV Safety Rules**, to the **EVCP** in charge of the **Working Party**.
- f) Provide, where appropriate, **Supervision** to the **Working Party**, for any part of the work/testing.
- g) On completion of work/testing make sure that the **EVCP** in charge of the **Working Party** signs the 'Clearance' section of the **PTW** before the **EVAP** cancels the **PTW**.
- h) **EVAP** to remove safety measures and restore the **HV System** to normal operating mode.

7.10 Guidance on the preparation, issue and cancellation of PTW.

General requirements

- a) All entries on a **PTW Shall** be legible.
- b) A ball point pen or similar **Shall** be used to make sure that the originals and the copies are clearly defined.
- c) The **PTW Shall** not be issued until the **EV** system has been successfully **Powered Down** in accordance with the **Approved Workshop Manual**.
- d) All sections of the **PTW Shall** be completed. Where part of a **PTW** is not relevant then Not Applicable **Shall** be inserted.

e) A photocopy of the written **PTW** must be generated after Section 6 (Receipt) of the **PTW** has been signed by the **EVCP**. This copy **Shall** be stored in the appropriate **PTW** holding place within the **Company**. The copy is not to be altered after this point. The only exception to this is if the written **PTW** has been lost, in this instance the copy of the **PTW** can be cancelled, providing a **PTW** Surrender Form has been completed and attached to the **PTW** copy.

f) If any additional work has been identified after Section 6 of the **PTW** has been completed and a **PTW** copy has been generated, the following process **Shall** be adhered to:

- The **EVCP** who is the recipient of the **PTW** is to report the extra work required to the issuing **EVAP**.
- The issuing **EVAP** **Shall** check the **EV** and the extra work requested by the **EVCP**.
- After confirming the extra work requested by the **EVCP** is needed and safe to do so the detail of the extra work required **Shall** be detailed into Section 3 of the written **PTW**.
- A new photocopy of the written **PTW** is required and **Shall** be attached to the original photocopy held by the **Company**.

g) Any correction made must be such that the contents of the **PTW** remain legible.

Completion Details for **Permits-to-Work** must be in accordance with Section 6.1 of these **EV safety rules**.

7.11 **PTW** procedures for work/testing that exceeds a working day

Where a **PTW** is in force and the work has not been completed at the end of the working day, or at the end of a Shift, the **PTW** must be 'Cleared' and 'Cancelled' and a new **PTW** issued when the work is to be resumed.

The **EVAP** preparing the new **PTW** is responsible for making sure that all the required safety measures and **Safety locking Devices** are still in place on the **HV System**.

The **EVAP** who Issues the **PTW** is preferred to be the same **EVAP** all the way through the **PTW** process. Although a different **EVAP** can be used to perform the Cancellation and **Power Up** procedures at the end of the **PTW** process if necessary. The **EVAP** **Shall** sign for the sections they have individually completed on the **PTW**.

If a **PTW** issued is missing, an **EV PTW** Surrender Form **Shall** be completed and attached to the photocopied **PTW** which can then be cancelled.



NOTE:

Only an **EVAP** or Higher trained **Person** is permitted to complete an **EV PTW** Surrender Form.

If the recipient **EVCP** is missing, an **EV PTW** Surrender Form **Shall** be completed and attached to the written **PTW** which can then be cancelled.

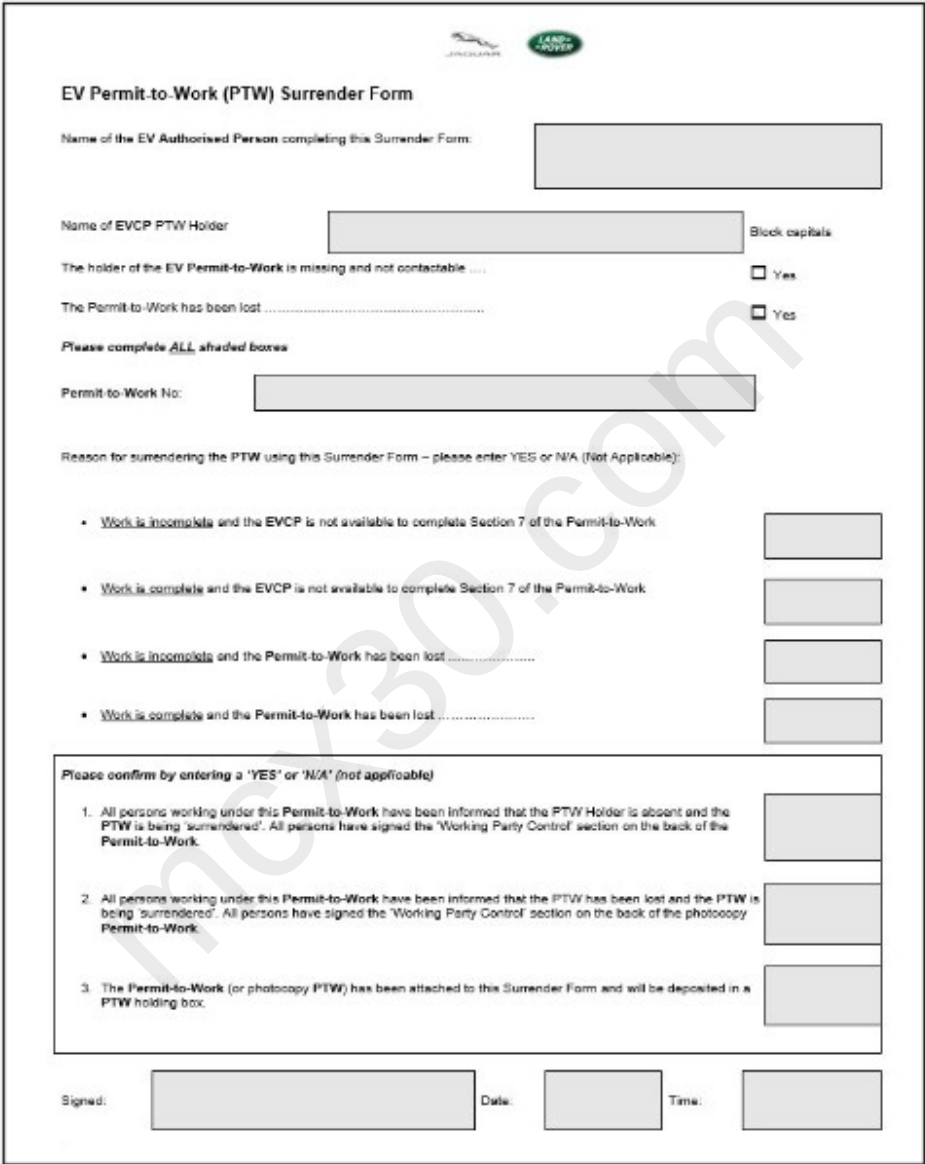
7.12 **EV-Permit-to-Work Surrender Form**

The Surrender Form is located within the Workshop Manual on TOPIx. The information entered into the form **Shall** determine:

a) The reason for completing the Surrender Form (Lost **PTW** or missing **EVCP PTW** Holder).

b) The current state of the **EV** work performed (complete or incomplete).

Once the **EV PTW** Surrender Form has been completed. The **PTW** Surrender Form **Shall** be attached to the photocopy or written copy (if available) of the **PTW**, and filed in the designated area by the **Company**.



The form is titled "EV Permit-to-Work (PTW) Surrender Form" and features logos for Jaguar and Land Rover at the top. It contains several sections for data entry:

- Name of the EV Authorised Person completing this Surrender Form:** A shaded box for the name.
- Name of EVCP PTW Holder:** A shaded box for the holder's name, followed by a "Block capitals" checkbox.
- The holder of the EV Permit-to-Work is missing and not contactable:** A checkbox labeled "Yes".
- The Permit-to-Work has been lost:** A checkbox labeled "Yes".
- Please complete ALL shaded boxes:** A section with four items, each with a shaded box for a response:
 - Work is incomplete and the EVCP is not available to complete Section 7 of the Permit-to-Work
 - Work is complete and the EVCP is not available to complete Section 7 of the Permit-to-Work
 - Work is incomplete and the Permit-to-Work has been lost
 - Work is complete and the Permit-to-Work has been lost
- Please confirm by entering a 'YES' or 'N/A' (not applicable):** A section with three numbered items, each with a shaded box for a response:
 - All persons working under this Permit-to-Work have been informed that the PTW Holder is absent and the PTW is being 'surrendered'. All persons have signed the 'Working Party Control' section on the back of the Permit-to-Work.
 - All persons working under this Permit-to-Work have been informed that the PTW has been lost and the PTW is being 'surrendered'. All persons have signed the 'Working Party Control' section on the back of the photocopy Permit-to-Work.
 - The Permit-to-Work (or photocopy PTW) has been attached to this Surrender Form and will be deposited in a PTW holding box.
- Signed:** A shaded box for the signature.
- Date:** A shaded box for the date.
- Time:** A shaded box for the time.

E2 19258

SECTION 8 -SAFETY RULES PROCEDURE FOR LIVE WORKING ON ELECTRIC VEHICLE HIGH VOLTAGE (HV) SYSTEMS

8.1. Purpose



NOTE:

Live working should only be undertaken when there is no reasonable alternative and it is safe to do so.

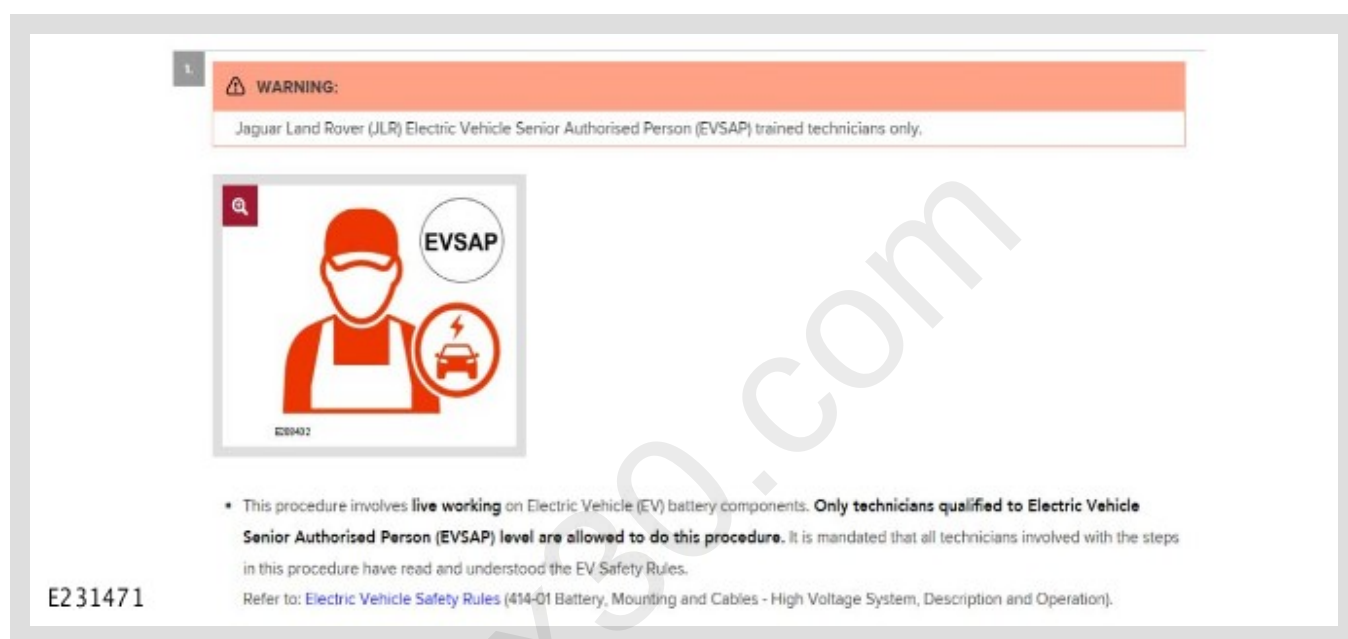
8.1.1 This section of the **EV Safety Rules** sets out the principles and procedures to be followed when working/testing on **HV** Battery internal components - this activity is classified as **Live Working**.

8.2 Scope

8.2.1 These principles apply for all work or testing on **HV** Battery internal components.

8.3 Identification

8.3.1 All JLR approved workshop manual procedures that require **Live Working** activities are identified by the **EVSAP** person icon and include reference to these **EV Safety Rules**, as shown in illustration E231471.



8.4 Responsibilities

8.4.1 The EVSAP who performs work/testing on **HV** Battery internal components within a **Live Work** area has a duty to comply with these **EV Safety Rules**.

8.4.2 All **Live work** performed under these **EV Safety Rules** Shall be under the control of an **EVSAP** who assumes the role of the **Person-in-Charge**.

8.5 Legal requirements applicable to work or testing activities under Live working conditions

8.5.1 The principles for compliance with local legal requirements that **Shall** be met by the company when working on **HV** Systems in the workplace, are set out within the 'Policy and Principles' section of the **EV Safety Rules**.

8.5.2 Where there is a requirement to perform work or testing activities on components operating under **Live** conditions, i.e. the component is connected to a **High Voltage** source of electrical energy, or in the case of batteries, has conductors, terminals or connections **Live** at **High Voltages**, then precautions **Shall** be applied to prevent **Danger** to **Persons** performing the work, or to other persons in the vicinity of the components being worked on or tested.

8.5.3 Whilst the preferred method of working will always be with the **Components** proved **Dead** or at a voltage less than the **HV** threshold (i.e. less than 60V AC or DC) and effectively **Isolated** from all sources of energy, it is recognized that work for specified service requirements in accordance with **Approved** procedure, may be performed with the components operating under **Live** conditions.

8.6 Danger

The main **Dangers** to **Persons** working/testing on **Live Components** are summarized as follows:

Electrical

- Accidental contact with **Live Components/Conductors** which are operating at **High Voltages**.
- Short circuiting battery terminals or connections resulting in:
 - Arcing – causing burns.
 - High intensity light resulting in temporary blindness.
 - Sparks that may result in combustion.
 - Molten metal being expelled – causing burns.
 - Chemical spill or release.
- Stored electrical energy in capacitors which may result in **High Voltages** to remain for a period after the equipment has been switched off.

Chemical

- Short circuiting battery terminals or connections resulting in:
 - Exposure to toxic/corrosive/explosive chemicals.
 - Chemicals and fumes from other energy sources present within the work environment.

Thermal

- Short circuiting battery terminals or connections resulting in:
 - Contact with substances or materials that contain stored thermal energy at Hazardous Temperatures.

8.7 Basic Requirements for Live Working on Components

8.7.1 The main **Dangers** associated with undertaking any work activity under this **EV** Safety Rules Procedure will fall into two categories:

- The **Dangers** from the **Components** being worked on or tested.
- The **Danger** from the environment in which the work or testing is being performed.

8.7.2 The primary means of achieving safety for **Persons** working under this **EV** Safety Rules Procedure will be by means of the following:

- 1 Clearly understanding the nature of the proposed work/test activity.
- 2 A specific Risk Assessment which clearly identifies the hazards associated with the proposed activity.
- 3 Implementing the necessary control measures to control or remove the quantified hazards.
- 4 Selection and use of the **Approved** Jaguar Land Rover workshop manual procedure.
- 5 Competence/ability to apply and work to the requirements of the Jaguar Land Rover **Approved** workshop manual procedure.
- 6 Selection and use of appropriate **Approved Personal Protective Equipment (PPE)**.
- 7 Selection and use of appropriate test equipment and tools.
- 8 Control over the access to and from the test area.

8.7.3 All work or testing on components **Shall** be performed within the confines of a **Live Working Area**, access to which **Shall** be limited to **Persons** who are trained and authorized under these **EV** Safety Rules.

8.7.4 The **Live Work Area** **Shall** have the Red 'Danger – Electrical System Live' Status sign displayed indicating the status of the **HV** Battery. The **Person-in-Charge** is responsible for making sure that the correct sign is displayed.

8.7.5 The wearing of **Personal Protective Equipment (PPE)** in test areas is mandatory and **Shall** be selected and used as specified in the Jaguar Land Rover workshop manual procedure.

8.8 Personal Protective Equipment (PPE) requirements for live working activities



NOTE:

Live working should only be undertaken when no reasonable alternative exists and it is safe to do so.

8.8.1 **Persons** performing work or testing activities under this **EV** Safety Rules Procedure **Shall** be provided with and use **PPE** that is correct for the work activities to be undertaken. It is essential that the **PPE** conforms to the requirements of the Jaguar Land Rover **Approved** workshop manual procedures.

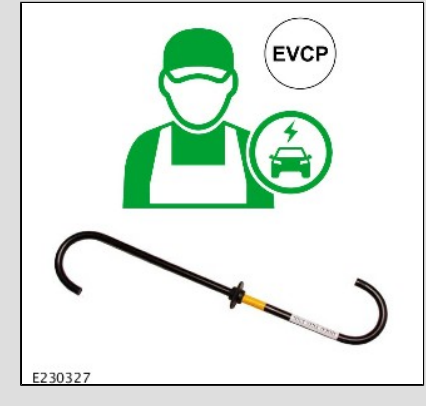
8.8.2 It is the responsibility of the **Persons** involved in the work/testing activities to check their own **PPE** for signs of damage and replace if required before and work/testing commences.

8.8.3 The minimum requirements of **PPE** for specific live working tasks **Shall** be as follows:

CLASS 1 & CLASS 0 PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR LIVE WORKING	GUIDELINES
Class 1 - 12.4 Cal High Voltage (HV) helmet.	The HV helmet Shall be worn at all times during Live Working situations unless stated otherwise in the Jaguar Land Rover Approved workshop manual.
	The visor must be in the down position and the hood of the fire retardant lab coat pulled over the top of the helmet to cover any exposed skin.

CLASS 1 & CLASS 0 PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR LIVE WORKING	GUIDELINES
 E227281	
Class 1 - 12.4 Cal fire retardant lab coat  E227284	The fire retardant lab coat Shall be worn at all times during Live Working situations unless stated otherwise in the Jaguar Land Rover Approved workshop manual. The lab coat must cover all areas of exposed skin and be worn with the hood over the top of the HV helmet.
Class 0 - 1000 Volt insulated gloves	 NOTE: The boxes on the cuff of the insulating gloves are there to record the first use date. The 1000 Volt insulating gloves first use date Shall be recorded.
	The 1000 Volt insulated gloves Shall be worn at all times during Live Working situations unless stated otherwise in the Jaguar Land Rover Approved workshop manual. Before each use, the insulated gloves shall be checked for damage and leaks by means of inflation.

CLASS 1 & CLASS 0 PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR LIVE WORKING	GUIDELINES
	
Leather protective over glove. 	Where gloves are subject to mechanical damage eg. cuts, abrasion etc, consideration should be given to the use of additional Leather protection gloves. The protective leather glove icon is displayed in certain steps of the Jaguar Land Rover Approved workshop manual procedure to indicate where protective leather gloves should be worn.
	The High Voltage (HV) safety hook Shall be held by the Safety Accompanying Person outside the Live Working Area for the duration of the Live Work activities.

CLASS 1 & CLASS 0 PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR LIVE WORKING	GUIDELINES
 High Voltage Safety Hook	

8.9 Diagnostic Test equipment

8.9.1 Test equipment used for work/testing on **Components** will fall into two categories:

- **Approved** voltage testing probes for proving the **Component(s)** are **Dead** (or at a safe level) and safe to work on.
- **Approved** test equipment for measuring, monitoring and recording values or data as part of the work or testing process.

8.9.2 Voltage Testing probes for proving **Components Dead** – Voltage Testing probes for proving **Components** are safe to work on or touch are specified in the Jaguar Land Rover **Approved** workshop manual procedure

8.9.3 Test equipment used for Diagnostic Testing (measuring, monitoring and recording values or data) will be selected and used in accordance with the Jaguar Land Rover **Approved** workshop manual procedure.

8.9.4 On each occasion, before use and before switching on, test equipment including portable leads and connecting devices, must be visually inspected to make sure that there are no physical defects that would endanger the user or others, or put equipment in service at risk due to inadvertent movement of test leads.

8.10 Insulated Tools and Equipment

8.10.1 Only **Approved** insulated tools and equipment as specified in the Jaguar Land Rover **Approved** procedures **Shall** be used whilst working on **Live Components** and **Shall** be inspected for suitability and condition prior to use.

8.10.2 **Approved** insulated tools and equipment which become damaged or unserviceable, **Shall** be taken out of use immediately and disposed of and replaced.

8.11 Pre-work Risk Assessments

8.11.1 The **EV SAP** **Shall** complete a pre-work risk assessment of the proposed work/test activity in order to identify the hazards that exist or may arise during the proposed work/testing activity. This **Shall** be completed using a **Live Work Certificate (LWC)**.

8.11.2 The identified **Hazards** arising out of these risk assessments **Shall** be fully considered and the safety measures required to control or remove these **Hazards** **Shall** be determined and applied before any work or testing is performed. Confirmation that control measures have been applied **Shall** be recorded in parts 3 and 4 of the **LWC**.



NOTE:

Guidance on the completion of the **Live Work Certificate** is detailed in Section 6.2 of this **EV Safety Rules Procedure**.

8.11.3 The single **EV SAP** is responsible for initiating and controlling all work activities.

8.11.4 The **EV SAP** completing a **LWC** **Shall** make sure the correct JLR workshop manual procedure is known, understood and applied to the intended work activity and that all **Persons** involved in the proposed work possess the correct Jaguar Land Rover training qualification to perform the work safely.

8.12 Controlling Persons involved in Live Working activities and Safety Precautions when Live Work Areas are left unattended

8.12.1 If the **Live Working Area** is required to be left unattended, even for short periods, the **EV SAP** **Shall** make sure that the **Live Work Area** is made safe. No exposed **Conductors** which are or could be **Live** should be accessible. **HV** batteries **Shall** have the manufacturers lid/cover installed with sufficient fixings to cover and internal **HV** components. All barriers and signage **Shall** remain in place until the work is complete and the **Live Work Certificate** is cancelled. All **Persons** must be withdrawn from the **Live Working Area** and the **Working Party** control section of the **Live Work Certificate** must be signed by the **Person-In-Charge (EV SAP)**. If the end of the working day is reached before the completion of work then the **Live Working Area** must be made safe and the **Live Working Certificate** cancelled, a new **LWC** **Shall** be created the following shift or working day to continue with the **Live Working** activities.

8.12.2 **Persons** are permitted to leave and join the **Live working activity** by using the **Working Party** control section of the **LWC**. The rules for each **Person** are as follows:

- The **Safety Accompanying Person (EVCP)** may leave the **Live Work** activity providing they sign the **Working Party** control section of the **LWC** and are immediately replaced with another **Safety Accompanying Person (EVCP)**. **Live Work** activities are **Not** permitted to continue if a **Safety Accompanying Person** is not present.

- The **Assisting Person (EVCP)** may leave the **Live Work** activity if they are no longer required and can return at any point providing the **Working Party** control section on the **LWC** is signed.
- The **Person-In-Charge (EVSAP)** may only leave the **Live Work** activity for a short period of time, they must sign the **Working Party** control section of the **LWC** and instruct all members of the **Working Party** to stop any **Live Work** activity and leave the designated **Live Work** area. During the absence of the **Person-In-Charge (EVSAP)** it is the responsibility of the **Safety Accompanying Person** to prevent unauthorized access to the **Live Work Area**. If the **Person-In-Charge** is required to leave the **Live Working** activity for longer periods of time or permanently then they must end the **LWC** by signing the **Clearance** and **Cancellation** section. Before the **Live Working** activity can continue a replacement **Person-In-Charge (EVSAP)** must be present and a new **Live Work Certificate (LWC)** issued by the **EVSAP**.

8.12.3 The **Safety Accompanying Person** positioned outside the **Live Working Area** Shall prevent unauthorized access, only the **Person-in-Charge** and the assisting person (if required) are permitted inside the **Live Working Area**.

8.13 Assistance whilst Work/Testing is in progress on Live Components

8.13.1 **Persons** performing work or testing activities under this **EV Safety Rules Procedure** can have assistance within the **Live Working Area** by an assisting **Person** in accordance with the **Approved** workshop manual procedure.

8.13.2 The **Assisting Person** Shall:

- Be a minimum **EVCP** Jaguar Land Rover trained **Person**.
- Clearly understand his/her role as an **Assisting Person**.
- Be under the instruction at all times of the **Person-in-Charge (EVSAP)** during **Live Working**.

8.14 Safety Accompanying Person whilst Work/Testing is in progress on Live Components

8.14.1 **Persons** undertaking work or testing activities under this **EV Safety Rules Procedure** Shall have a **Safety Accompanying Person** positioned outside the **Live Working Area** in accordance with the **Approved** procedure.

8.14.2 The **Safety Accompanying Person** Shall:

- Be a minimum **EVCP** Jaguar Land Rover trained **Person**.
- Be able to recognize **Danger** and, if necessary, render assistance in the event of an emergency.
- Clearly understand his/her role as a '**Safety Accompanying Person**'.
- Be aware of the procedure for requesting emergency assistance at the location where the work is performed.

8.14.3 The **Person-in-Charge** responsible for the work **Shall** make sure that the correct equipment is available to enable the **Safety Accompanying Person** to provide assistance in the event of an emergency. The verification of the availability of this equipment shall be recorded on the **Live Work Certificate**.

8.15 Completion of Live Work Certificate

8.15.1 Before any **Live Work/Testing** a **Live Work Certificate (LWC)** **Shall** be issued by the nominated **Person-in-Charge** responsible for the **Live Work/Testing** activity.

8.15.2 The **LWC** has 7 parts which **Shall** be completed before any work commences:

- 1 General Information
- 2 Work/Testing details
- 3 Confirmation of Control Measures BEFORE commencing work
- 4 Additional Precautions
- 5 Working Party Confirmation
- 6 Working party control
- 7 Live Work Certificate (LWC) clearance and cancellation

8.15.3 **Working party control**

Section 6 of the **LWC** is the **Working Party** control section and **Shall** be used throughout the **Live Working** activity to sign members of the party on or off the activity. **Persons** within the **Working Party** can sign off the **LWC** if breaks are required or the **Person** is required to be exchanged with another **Person** of the same or higher **EV** authorization.

Section 7 of the **LWC** **Shall** be signed after the **Live Working** activity has finished and the components have been either re-assembled to their original built state or left in a safe state so that conductors at **High Voltage (HV)** are not exposed. The **Working Party** are also instructed that the **Live Working** activity has finished and no further work is permitted, all members of the **Working party** **Shall** sign to confirm they understand. If the components worked on cannot be rebuilt to their original state and further work is required then this information should be detailed in the additional notes section at the end of the **LWC**.

SECTION 9 - TERMINOLOGY AND DEFINITIONS

D1. **Approved** - as specified in the Jaguar Land Rover workshop manual.

D2 **Assisting Person** - referred to within the **LWC** as an extra **Person** that is a minimum level of **EVCP** and required to help the **Person-in-Charge (EVSAP)** during certain procedure steps for **Live Working**- these steps are detailed in the Jaguar Land Rover **Approved** procedures.

D3. **Company (The)** – the organization or company, undertaking servicing and repair work on Jaguar Land Rover Electric Vehicles.

D4. **Component** – a part of the vehicle requiring service as detailed in the Jaguar Land Rover workshop manual procedures.

D5. **Danger**– a risk to health and of bodily injury.

D6. **Dead** – at zero voltage **and** disconnected from any Live System.

D7. **Electric Vehicle** - any vehicle equipped with an integrated high energy electrical source system or systems where the nominal design operating voltage is greater than 60V (DC or AC), defined in these **EV Safety Rules** as **High Voltage**.

D8. **Employee/Contractors - Persons** who are contracted to perform work for the **Company**.

D9. **EV** – an **Approved** abbreviation for Electric Vehicle.

D10. **EV Status** – A sign displayed on the vehicle windscreen, this identifies the state of the vehicle **HV** system to all **Persons**.

D11. **EV System** – Refers to all systems and components fitted to an **Electric Vehicle (EV)** that are not directly associated with the vehicle **HV System**.

D12. **HV System** – An individual electrical system which forms an integral part of an **Electric Vehicle (EV)**, which has a nominal operating voltage in excess of 60 Volts either direct (DC) or alternating current (AC)

D13. **Hazard** – a potential source of **Danger**.

D14. **High Voltage** – a voltage exceeding 60 volts AC or DC being associated with an **EV** electrical energy source forming part of an **EV System**.

D15. **Isolated** – disconnected from all sources of energy by an **Isolating Device** that is locked off and prevents any unauthorized connection of electrical connectors.

D16. **Isolating Device** – a device to **isolate** all sources of electrical energy, this could be **HV** or 12 Volt.

D17. **Key Safe** – a device of an **Approved** type for the secure retention of Keys for **Safety Locking Devices, and vehicle**.

D18. **Live** – Electrically charged.

D19. **Live Work Area**- A restricted area accessible to Persons authorized under this **EV Safety Rules** Procedure specifically for work/testing on Live Components

D20. **Live Working**- Work/testing on Components with the possibility of contact with Conductors that are Live at High Voltages

D21. **Live Work Certificate (LWC)** – a Risk Assessment certificate specifically for **Live Working** activity which specifies the work to be carried out, the Hazards which have been identified and risk assessed, and confirmation that appropriate control measures have been applied.

D22. **Persons**, being one of the following:

a) **Electric Vehicle Informed Person (EVIP)** – a **Person** who has successfully completed a Jaguar Land Rover ‘**EVIP** Technical Training Awareness course’

b) **Electric Vehicle Competent Person (EVCP)**- a **Person** who has successfully completed a Jaguar Land Rover ' **EVCP** training course'

c) **Electric Vehicle Authorised Person (EVAP)** – a **Person** who has successfully completed a Jaguar Land Rover ' **EVAP** training course'

d) **Electric Vehicle Senior Authorised Person (EVSAP)**– a **Person** who has successfully completed a Jaguar Land Rover ' **EVSAP** training course'

D23. **Permit-to-Work (PTW)** - a **Safety Document** of a format indicated in these **EV Safety Rules** specifying the safety measures which have been established and the work which is to be performed on **EV Systems**. This document is only applicable for work/testing on **EV Systems** that require an **HV System Power Down**.

Person-in-Charge - An **EVSAP** authorized to work under the **EV Safety Rules** Procedure responsible for work/testing activities on specified **Components** during **Live Working**.

D24. **Safety Locking Device** - a device used exclusively for locking-off the points at which the circuit can be energized and its key is unique.

D25. **Safety Rules Procedure** – a procedure which forms part of the **EV Safety Rules** which provides detailed guidance on the application of the **EV Safety Rules** and associated activities.

D26. **Safety Accompanying Person** - minimum **EVCP** trained and positioned outside the working area with the safety hook. During a vehicle **HV System Power Down** procedure this person is required to be in the vicinity of the **Power Down** activity with access to the safety hook, they are not required to be part of the activity. This person is also required to perform the same role during any **Live Working** activities, in these situations the **Safety Accompanying Person Shall** remain standing outside the **Live Working Area** for the duration of the activity in support of the **EVSAP** performing the **Live Work**.

D27. **Shall** – where “ **Shall**” is used in these **EV Safety Rules** with no qualification, this indicates a mandatory requirement with no discretion permitted and no judgement to be made.

D28. **Supervision** - Where another **Person** is either permanently or temporarily required at the location where work or testing is in progress to support the **EVAP** or **EVCP** in charge or performing the work.

D29. **Power Down** - the operation of **Isolating** all batteries, both High Voltage (HV) and 12V, from all **EV** systems. This **Shall** be by **Approved** methods of isolating an electrical circuit to make all **EV Systems** safe for work.

D30. **Power Up** - the operation to restore energy supplies upon completion of work/testing.

D31. **Working Party** – All **Persons** who are involved in the work/testing on a **HV system** component. This includes the **EVCP** who is the recipient of the **Permit To Work (PTW)** after a **HV System Power Down**. In the case of a **Live Working** activity this includes all **Persons** signed onto a **Live Work Certificate (LWC)**, therefore the **EVSAP** performing the work, the **Safety Accompanying Person** with the hook outside the **Live Working Area** and the **Assisting Person** required to support inside the **Live Working Area**.

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