Motional

Hyundai Ioniq 5 Platform
First Responder Interaction Plan

V 1.0

Introduction

The purpose of this document is to provide first responders with information needed to safely interact with an Ioniq 5 outfitted with a Motional Automated Driving System (ADS).

This guide is meant for first responders to identify a Motional ADS-equipped Ioniq 5, safely disengage the autonomous system, and understand important safety considerations

Contents

Emergency Contact Information

The point(s) of contact for all vehicle-related incidents are vehicle operators. Each vehicle will always have at least one certified vehicle operator.

In the event vehicle operators are not able to act as the Motional point of contact, first responders may contact Motional at:

Boston, MA

Steven Santangini	(617)-961-2107
Jonathan Dailey	(412)-960-0137

Las Vegas, NV

Jake Walters:	(702) 218-4688
Ashley Craig:	(248) 925-0943

Pittsburgh, PA

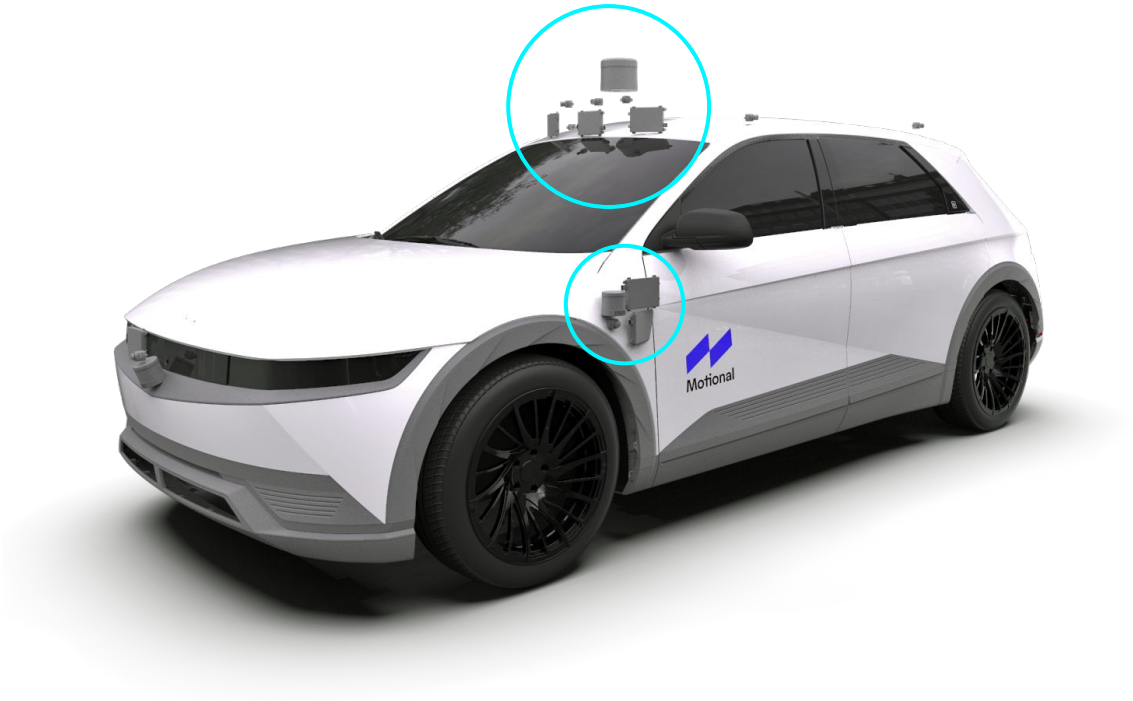
Jonathan Dailey:	(248) 251-6369
Justin Williams:	(248) 953-7412

Singapore

Matthias Sapuan:	+65 9107 8660
Joseph Batchelor:	+65 8158 1832

Vehicle Identification

The Motional autonomous vehicle is a modified Hyundai IONIQ 5 Electric Robo-Taxi. AVs are distinguished from typical vehicles by the addition of sensors on top of the vehicle and on its sides. Some vehicles are easily identified by “Motional” decals on both sides of the vehicle. Individual vehicles are identified by license plate(s) and other jurisdiction-specific identifiers, such as "Self-Driving Vehicle" decals.



Vehicle Registration and Insurance

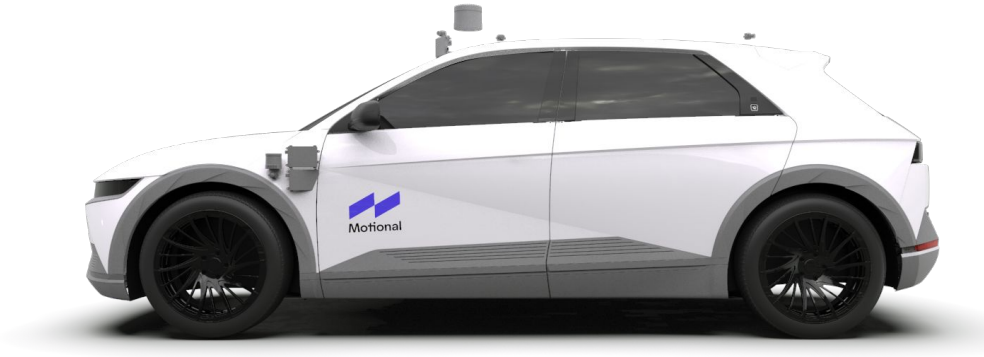
Vehicle registration and insurance information will be located in the passenger glove compartment.

Autonomous Capabilities

The Motional Automated Driving System is capable of controlling the steering, throttle, and brake, as well as various other vehicle functions while operating within designated, pre-mapped areas.

When the Motional Automated Driving System is generating control inputs to the vehicle without manual input, the vehicle is said to be in autonomous (auto) mode.

When the Motional Automated Driving System is disengaged, the vehicle can be driven normally.

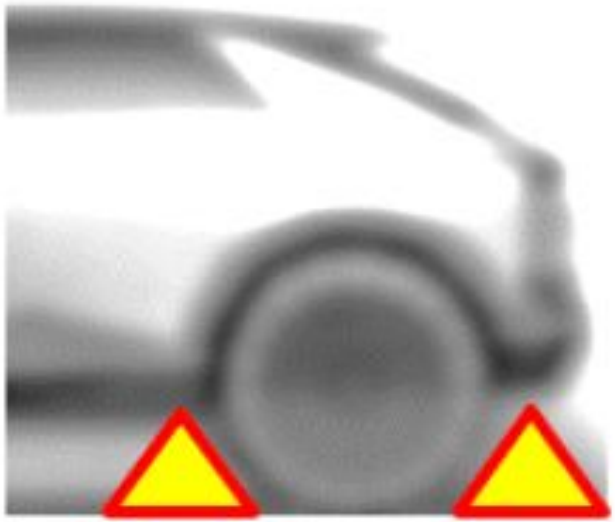


Disengaging the Motional Automated Driving System

Immobilize

- Approach the vehicle from the sides and stay away from the front or rear.
- This must be done first to prevent any accidental movement that can endanger the emergency response personnel and any crash victims.
- Due to the vehicle not having a combustion engine, it can sometimes appear to be off because of the absence of the engine noise.

After the vehicle is immobilized, proceed to the following pages to disengage autonomous mode.

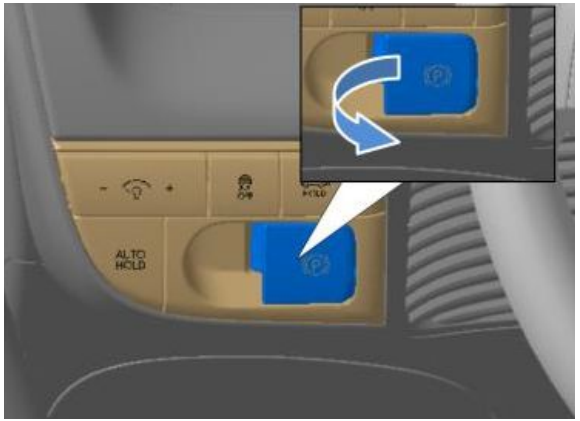


Chock the Wheels

Excerpt from Hyundai guide. Equipping the vehicle with Motional ADS does not affect thes considerations.

Shift and Parking Brake Indicators

- The gear shift is located behind the right side of the steering wheel (when straightened).
- The vehicle is in park when the P is illuminated red.
- The vehicle automatically turns on the parking brake when the vehicle is in park **and** any door is open. This is indicated by a red parking brake icon at the bottom left of the cluster.
- To set the parking brake, pull the button as shown in the photo.

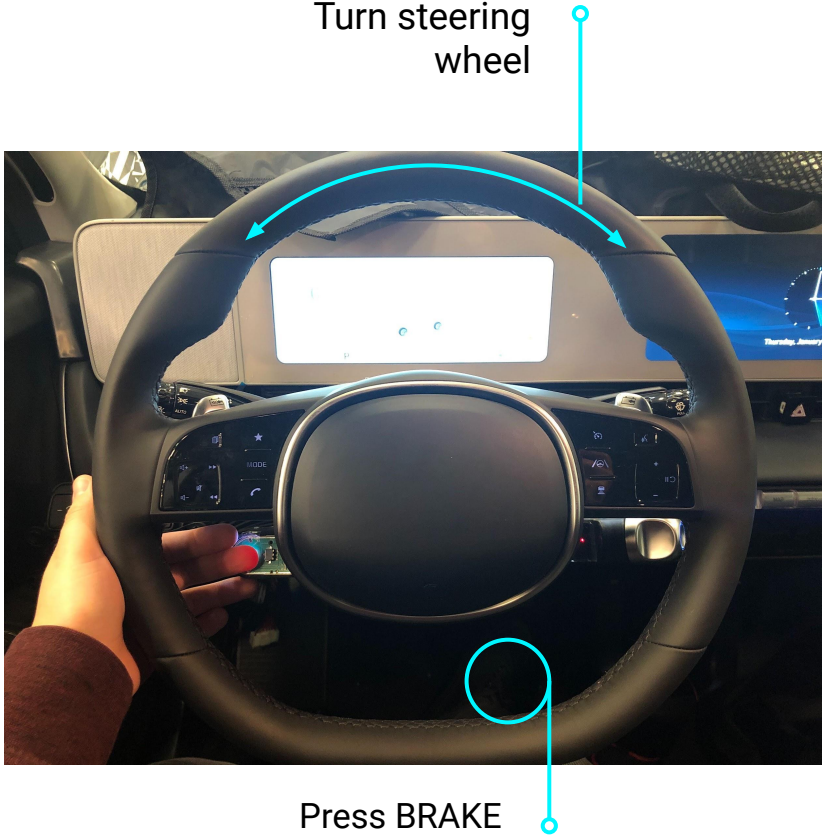


Excerpt from Hyundai guide. Equipping the vehicle with Motional ADS does not affect these considerations.

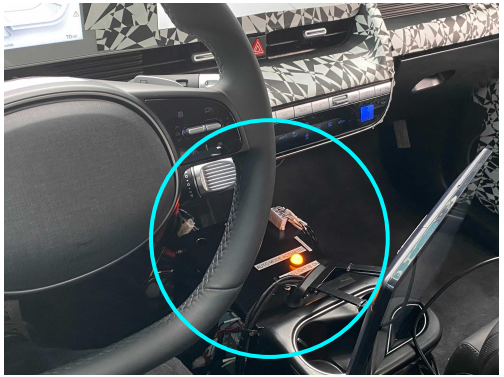
Disengaging Autonomous Mode

Autonomous mode can be disengaged by any of the following actions:

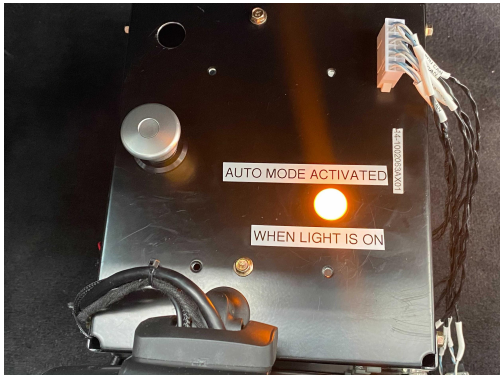
- pressing the brake pedal
- pressing the throttle pedal
- manually turning the steering wheel



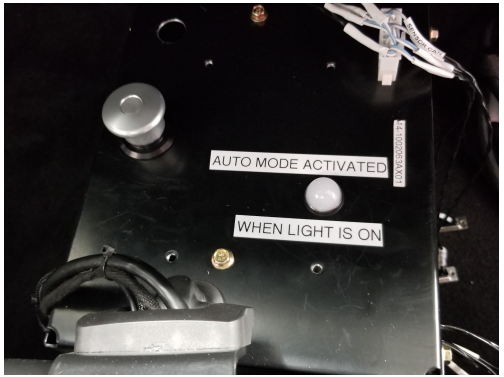
Verifying Autonomous Mode Disengagement



An LED light indicates if Autonomous Mode is engaged or not. It is located in the center of the vehicle, to the lower, right side of the steering wheel



Autonomous Mode is activated when the light is on



Autonomous Mode is disengaged when the light is off

Turning the Vehicle Off

Turn the vehicle off by pressing the ignition button, located to the right of the steering wheel.

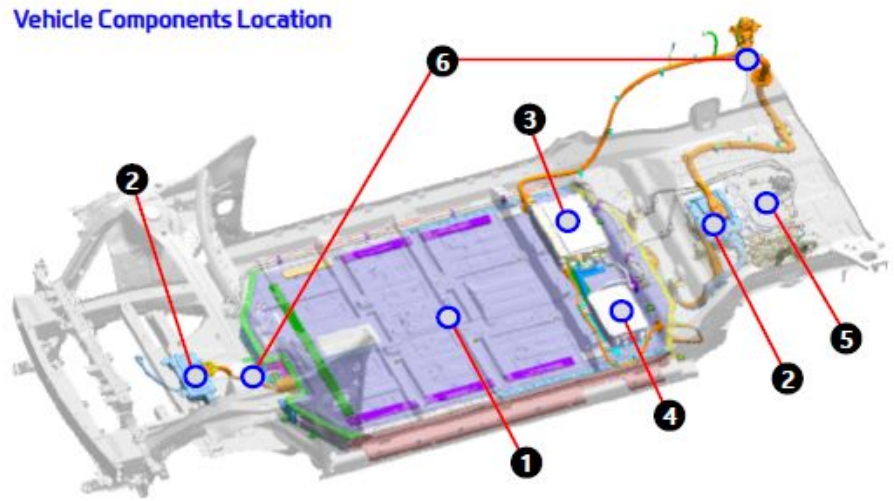
If the READY light is illuminated, the vehicle is on.

If the READY light is NOT illuminated, the vehicle is off.

In the event that the ignition switch does not turn off the vehicle, disconnect the negative 12V battery cable located in under the hood on the passenger side of the vehicle to further prevent the risk of accidental restart. See page 19 for more information.

Vehicle Electrical and Passenger Restraint Systems

OEM Vehicle Electrical Systems



1	High voltage battery	
2	High-voltage Junction box	
3	ICCU (OBC + LDC)	
4	Aux LDC	
5	Drive System	Motor
		EV Transmission
		Inverter
6	High-Voltage Cable	

⚠ WARNING Electrocution Risk!

- Never cut or disconnect the high voltage orange cabling and connectors without first disabling the system by removing the High voltage cut-off Switch.
- Exposed cables or wires may be visible inside or outside the vehicle. Never touch the wires, cables, connecters, or any electric components before disabling the system, to prevent injury or death due to electrical shock.

Failure to follow these instructions can lead to death by electrical shock.

Excerpt from Hyundai guide. Equipping the vehicle with Motional ADS does not affect these considerations.

Additional Electrical Systems

⚠WARNING **Electrocution Risk!**

- Never cut or disconnect the high voltage orange cabling and connectors without first disabling the system by removing the High voltage cut-off Switch.
- Exposed cables or wires may be visible inside or outside the vehicle. Never touch the wires, cables, connecters, or any electric components before disabling the system, to prevent injury or death due to electrical shock.

Failure to follow these instructions can lead to death by electrical shock.

High-Voltage Electrical Isolation

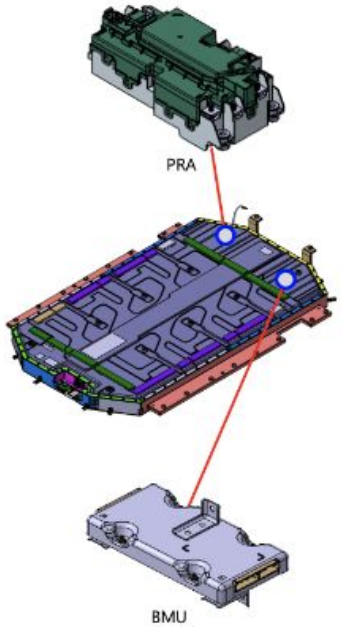
Unlike the 12V electrical system that is grounded to the vehicle's chassis, the NE Electric Robo-Taxi's high-voltage electrical system is designed to be isolated from the vehicle.

Regulation of High-Voltage Electrical Current

The Power Relay Assembly (PRA) is mounted rear side of the High-Voltage Battery Pack Assembly and controls the high-voltage power circuit between the High-Voltage Battery and the Electric Power Control Unit.

High-Voltage Safety System

There are multiple safety systems incorporated into the NE Electric Robo-Taxi. The system that protects the High-Voltage Electrical System is called the Battery Management Unit (BMU). The BMU is located beside the Power Relay Assembly and measures several parameters to maintain the optimal performance of the High-Voltage Battery. In addition, if a system fault occurs, the BMU turns off the PRA to protect the system.



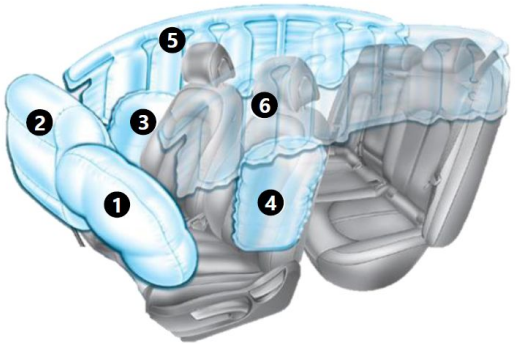
Excerpt from Hyundai guide. Equipping the vehicle with Motional ADS does not affect these considerations.

Passenger Restraint Systems

Airbag

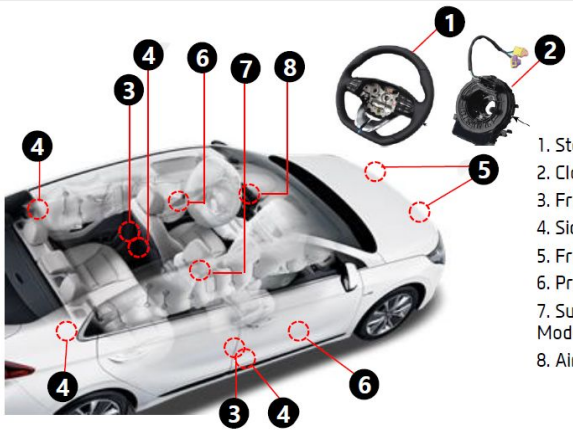
Six airbags are installed in the NE Electric Robo-Taxi as shown below. Before starting any emergency procedure, make sure the vehicle ignition is turned off, disconnect the negative cable from the 12V auxiliary battery to prevent accidental deployment of airbags.

Number	Name	Location
1	Driver's front airbag	Driver side
2	Passenger's front airbag	Passenger side
3, 4	Side airbag	Driver / Passenger side
5, 6	Curtain airbag	Driver / Passenger side



Excerpt from Hyundai guide. Equipping the vehicle with Motional ADS does not affect these considerations.

Additional Systems



1. Steering Wheel
2. Clock Spring
3. Front Seat Belt Pretensioner (FBPT)
4. Side Impact Sensor (GSIS)
5. Front Impact Sensor (FIS)
6. Pressure Side Impact Sensor (PSIS)
7. Supplemental Restraint System Control Module (SRSCM)
8. Airbag Warning Lamp

* The actual image of vehicle differ from the illustration

Seat Belt Pretensioners

The ΠE Electric Robo-Taxi is equipped with seat belts with pretensioners. When the seat belt pretensioners are activated in a collision, a loud noise may be heard and fine dust, which may appear to be smoke, may be visible in the passenger compartment. These are normal operating conditions and are not hazardous. The seat belt pretensioner assembly mechanisms may become hot during activation and may need several minutes to cool after they have been activated.

Sensors and Control Module

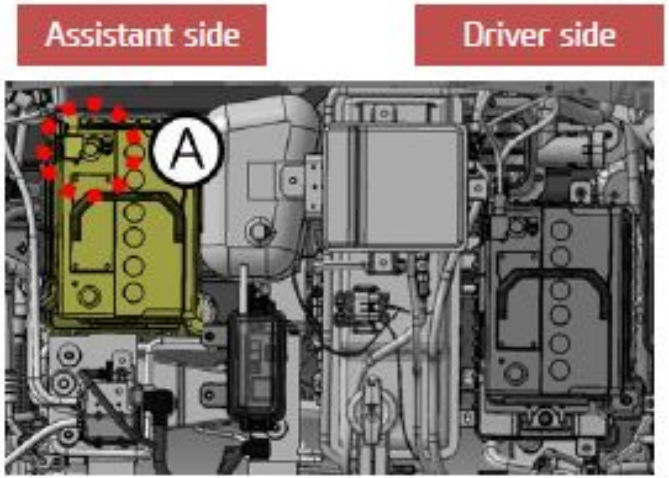
The airbags and pretensioners are managed by the SRS Control Module, or SRSCM, which is located below the front of the center console. In addition, there are four side impact sensors : two conventional accelerometer sensors in the B-pillars, and two pressure sensing sensors inside of the front door modules. Their locations are illustrated in the image below.

Excerpt from Hyundai guide. Equipping the vehicle with Motional ADS does not affect these considerations.

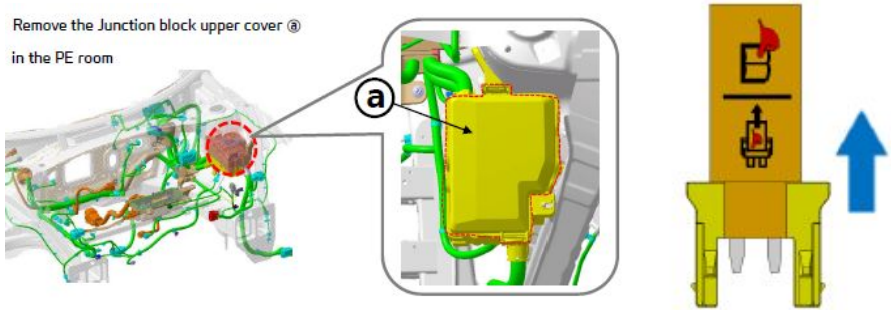
OEM Electrical Power Disengagement

Refer to pg. 15 for diagram

1.Disconnect the negative 12V battery cable (A).



2.Remove the High voltage cut-off Switch located in the low voltage junction block.



Excerpt from Hyundai guide. Equipping the vehicle with Motional ADS does not affect these considerations.

High-Voltage Battery Damage and Fluid Leaks

In the event of a damaged HV Battery assembly or a gel electrolyte leak first responders should be aware of how to mitigate.

- Cease all smoke, spark, flame activity around the vehicle.
- Electrolyte solution is a skin irritant.
- Do not touch or step on the spilled electrolyte.
- If electrolyte leak occurs, wear appropriate solvent resistant PPE and use oil, sand, or a dry cloth to clean up the spilled electrolyte. Be sure to adequately ventilate the area.

Move to a well-ventilated location for fresh air and wash mouth with water.

See a doctor immediately.

Excerpt from Hyundai guide. Equipping the vehicle with Motional ADS does not affect these considerations.

Situational Safety Considerations

Wet Location and Firefighting

Submersion

Some emergency responses can involve a submerged vehicle. A ΠE Electric Robo-Taxi that is submerged does not have high-voltage component on the vehicle's body or framework. It is safe to touch the vehicle's body or framework if there is no severe damage to the vehicle, whether it is in water or on land.

In the event the vehicle is submerged or partially submerged, remove the vehicle from the water before attempting to disable the vehicle. Drain the water from the vehicle. Use one of the methods described in sections of page 10 to 12 to disable the vehicle.

⚠WARNING

- If severe damage causes high-voltage components to become exposed, responders should take appropriate precautions and wear appropriate insulated personal protective equipment.

Failure to follow any of these instructions may result in serious injury or death by electrocution.

Excerpt from Hyundai guide. Equipping the vehicle with Motional ADS does not affect these considerations.

Vehicle Fire

After Initial Emergency Response Procedures have been applied, Firefighting Procedures may begin. Hyundai recommends that each response team follow their own department's standard operating procedures for fighting vehicle fires in combination with the ΠE Electric Robo-Taxi specific details that are covered in this section.

Firefighting Operations

If the high-voltage battery pack is either involved in or at risk of being involved in a fire in a ΠE Electric Robo-Taxi, strict cautions must be taken while conducting firefighting operations due to following reasons:

- Lithium-ion Polymer batteries contain gel electrolyte that can vent, ignite, and produce sparks when subjected to temperatures above 300°F.
- May burn rapidly with a flare-burning effect.
- Even after the high-voltage battery fire appears to have been extinguished, renewed or delayed fire can occur.
  - Use a thermal imaging camera to ensure the high voltage battery is completely cooled before leaving the incident.
  - Always advise second responders that there is a risk of the battery re-igniting.
  - Fire, submersion or a collision that has compromised the high voltage battery, always store it in an open area with no exposures within 50 feet.
- A burning battery could release hydrogen fluoride, carbon monoxide, and carbon dioxide gasses. Use ΠIOSH/MSHA approved full-face self-contained breathing apparatus (SCBA) with full protective gear.

Even if the high-voltage battery pack is not directly involved in a vehicle fire, approach the vehicle very carefully.

Extinguishers

- Small fires that high voltage battery is not involved : Extinguish fires using a ABC extinguisher for an electric fire.
- Fires that the high voltage battery is involved or the high voltage battery is heating : Extinguish fires using large and sustained amount of water to cool the high voltage battery. Do not extinguish fire with a small amount of water. Firefighters should not hesitate to pour large amounts of water on the vehicle.

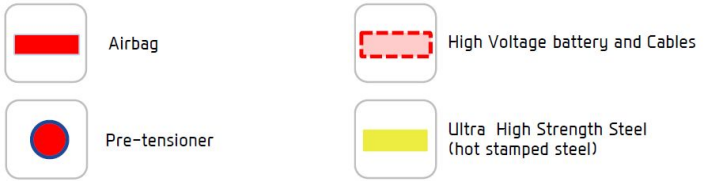
Extrication and Passive Restraint Devices

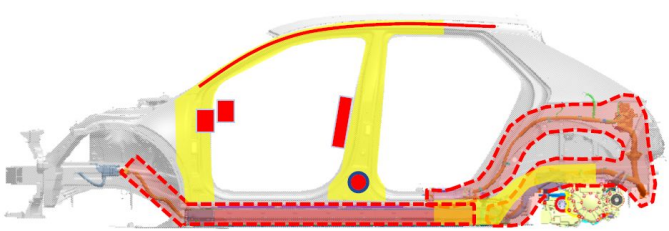
Extrication procedure

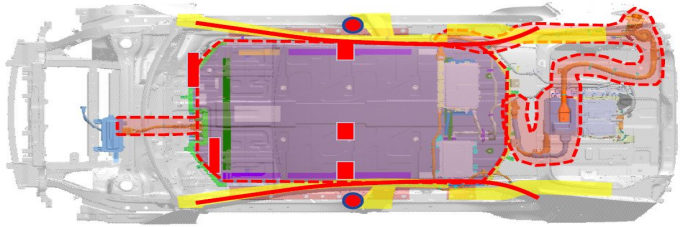
When responding to an incident involving the ΠE Electric Robo-Taxi , we recommend that the first responders follow their organization's standard operating procedures for assessing and dealing with vehicle emergencies.

When the first responders cut the vehicle, they should always pay special attention to airbag system, orange colored high voltage cables and other high voltage components as below image to avoid damage to parts which may increase the risks of explosion.

Yellow marked zone is Hot stamped steel. So this zone can not be cut with general tools.





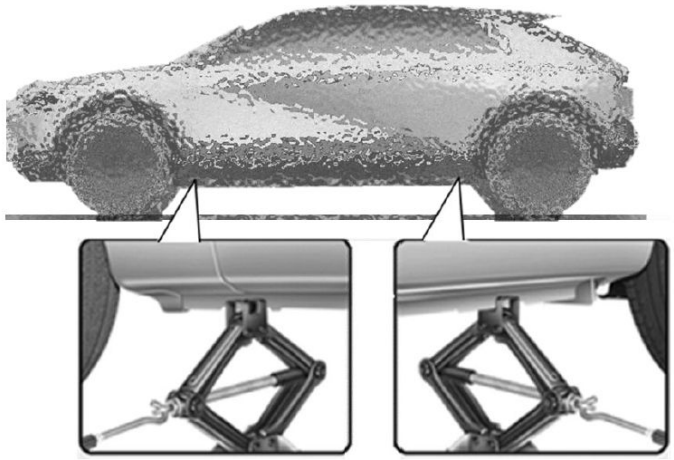


Excerpt from Hyundai guide. Equipping the vehicle with Motional ADS does not affect these considerations.

Recommended Lift Points

Vehicle Stabilization

Use standard stabilization (cribbing) points, as shown. Always be sure to connect to a structural member of the vehicle and avoid placing cribbing under high voltage cables, fuel lines a areas not normally considered acceptable.



* The actual image of vehicle may differ from the illustration

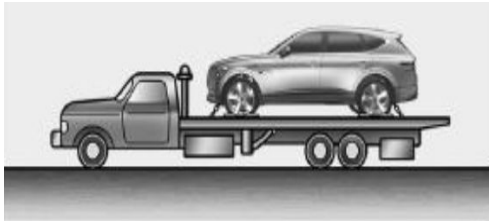
Excerpt from Hyundai guide. Equipping the vehicle with Motional ADS does not affect these considerations.

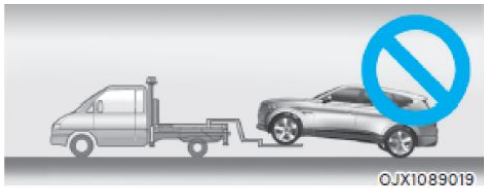
Towing Procedure

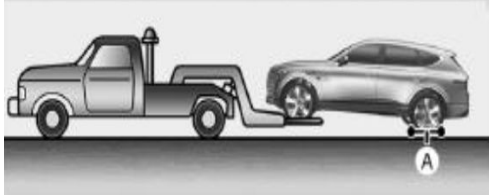
A Motional employee will contact our preferred towing company on site.

When possible, tow the car with all four wheels off the road using a flatbed.

Prior to towing, ensure that the parking brake is off. See page 9 for details.







If a flatbed is not available, the vehicle should be towed with the front wheels off the ground.

In all cases, please exercise precaution to avoid damaging external sensors.