EURO NCAP RESCUE – TERTIARY SAFETY ASSESSMENT

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Paper Number 23-0258

ABSTRACT

The European New Car Assessment Programme (Euro NCAP) has until recently concentrated on passive and active safety assessments. The organisation realised the need to address post-crash (tertiary) safety to improve the outcomes for those involved in vehicle crashes. In 2018 the Rescue working group was created and is supported by Euro NCAP's members, affiliated members and CTIF (International Association of Fire & Rescue Services). Industry also contributes with representatives from both the European Automobile Manufacturers Association (ACEA) and the European Association of Automotive Suppliers (CLEPA).

The first Rescue test and assessment protocol was published in early 2019 and from the start of 2020 the topic of Rescue was included in the overall star rating as part of the adult scoring area. The assessment for Rescue is divided into 3 areas:

1. Rescue – Rescue Sheets for the vehicle.
2. Extrication - Unlocking of automatic door locking, door opening forces & seat belt unbuckling forces.
3. Safety - Advanced eCall and Multi Collision Brake technology.

In June 2020 Euro NCAP launched the "Rescue App" available for Android and iOS users with support from CTIF and the car manufacturers. This free app gives access to ISO 17840 compliant rescue sheets for hundreds of vehicle models and is constantly updated.

Rescue services require detailed but easily understood information regarding the construction of individual vehicles to extricate trapped occupants as quickly and safely (for occupants and rescuers) as possible. This is becoming more important as vehicles become stronger, use different sources of power and are equipped with increasing numbers of safety devices and new features such as electric door handles. For this reason, Euro NCAP has planned further updates of requirements and will add new ones to be implemented in 2023 and 2026, including requirements related to vehicle submergence and battery safety.

INTRODUCTION

The remarkable progress in vehicle safety during recent years has been largely delivered through industry innovation, effective legislation, and consumer demand for safer vehicles. Combined with tangible advancements in road infrastructure and effective policies, to reduce driving under the influence and speeding, the development of a safer vehicle fleet has made Europe's road transport one of the world's safest. The European New Car Assessment Programme, Euro NCAP, provides motoring consumers with an objective and independent assessment of the safety performance of new vehicles on the European market. Thanks to its continuous evolution

and promotion of the newest, essential safety technology on offer, its five-star rating has been a driving force behind many vehicle safety improvements, in terms of active (primary) and passive (secondary) safety.

In recent years, Euro NCAP has recognised the need to expand into tertiary safety to improve the outcomes for occupants, post-crash. The first item that was identified as needing immediate improvement was Rescue information for first and second responders, in the form of so-called Rescue Sheets. As cars became better equipped to deal with crashes and mitigate the consequences for occupants, challenges for crash responders to extricate victims from the vehicle have increased. These challenges include obtaining access to the compartment, removing parts of the vehicle to allow safe removal of victims, dealing with potentially deployable safety systems, such as airbags or other pyrotechnic devices as well as managing fire or electrical risks.

To understand what could be done to address these growing challenges, Euro NCAP teamed up with International Association of Fire and Rescue Services, CTIF. This association stimulates the co-operation between the fire departments and other emergency services from all over the world. This organisation was created in 1900 and has 39 members, among them most European countries but also other countries like Japan, South Korea and the United States of America. CTIF has highlighted that Rescue Sheets provided by vehicle manufacturers varied in content and presentation where some may provide all the useful information clearly laid out, but others were missing vital information. More detailed Rescue information was commercially available, but not always affordable by (voluntary) firefighters. Almost all rescue information was only provided in one or two languages, i.e. German and/or English.

Hence, Euro NCAP added Rescue to their rating from 2020 onwards requiring vehicle manufacturers to provide full ISO 17840 compliant rescue sheets, initially in 4 European languages (English, German, Spanish and French). This would ensure that the data presented in these sheets is following the same format for all passenger vehicles and would help the first responders better understand the vital safety information on clearly presented concise rescue sheets. These sheets must contain important vehicle information to be used by first responders such as the presence and location of pyrotechnic safety devices like airbags and seat belt pretensioners, vehicle body materials, high voltage batteries and associated cabling, how to identify vehicle, secure and disable vehicle. It is a requirement for the format of these rescue sheets (sometimes called rescue cards) to follow *ISO standard 17840 Road vehicles — Information for first and second responders — Part 1: Rescue sheet for passenger cars and light commercial vehicles* (and Part 3 from 2023).

As part of a new Rescue assessment Euro NCAP also saw a need to look into the area of extrication, initially addressing the following areas: Post-crash checks of the unlocking of automatic door locking systems, measuring door opening forces and seat belt unbuckling forces. Requirements were put in place, and verified after the Euro NCAP crash tests, ensuring that first responders to the scene can effectively gain access to the vehicle and unbuckle occupants. Finally, the Rescue protocol encourages vehicle manufacturers to equip their vehicles with Advanced eCall and Multi Collision Brake technology (Figure 1).

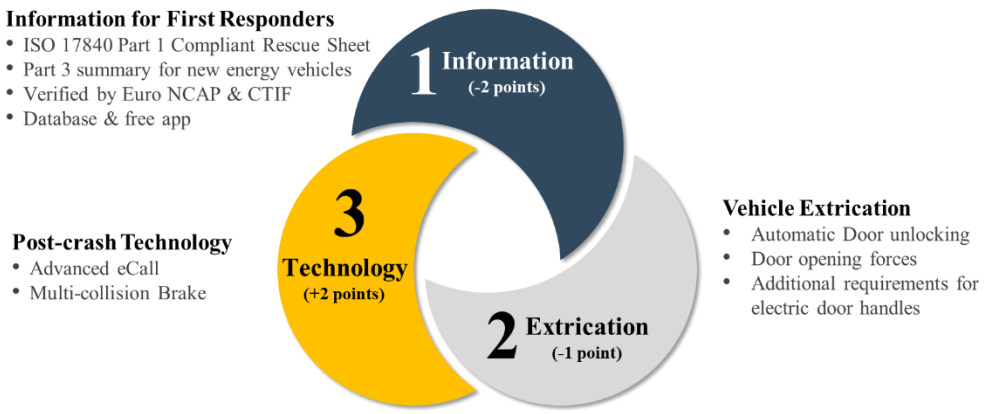

Figure 1: Rescue topics covered by Euro NCAP since 2020 [1].

Euro NCAP rating scheme currently has four areas of assessment: Adult occupant protection, child protection, vulnerable road user protection and safety assist. Rescue and extrication cannot easily be categorised in these boxes, but it was felt to be best placed under the Adult Occupant Protection (AOP) in the scoring scheme,

accounting for 2 points out of a total of 38 for this part of the assessment. A pre-requisite for the possibility of scoring these 2 points is that the vehicle manufacturer must supply ISO compliant rescue sheets for the assessed model.

BACKGROUND

What is Tertiary Safety?

Today when talking about vehicle safety it is generally divided into three areas:

1. Primary or Active Safety – This covers technology that helps the driver avoid a crash in the first place such as ESC, AEB, LSS etc.
2. Secondary or Passive Safety – This assumes you are having an accident and includes items to help the occupants during an impact such as a stable vehicle structure, seat belts, airbags and so on.
3. Tertiary or Post-Crash Safety – This covers the stage immediately after an impact looking at ways to improve the outcome for any vehicle occupants and, in the future, Vulnerable Road Users (VRU). Rescuers aim to act as fast as possible upon reaching the accident scene armed with information on the vehicle (Rescue Sheet) and information on the occupants and accident (eCall). Tertiary Safety also includes technology such as MCB (Multi-Collision Braking) which can help a vehicle avoid secondary impacts or at least reduce the impact speed if a second impact cannot be avoided.

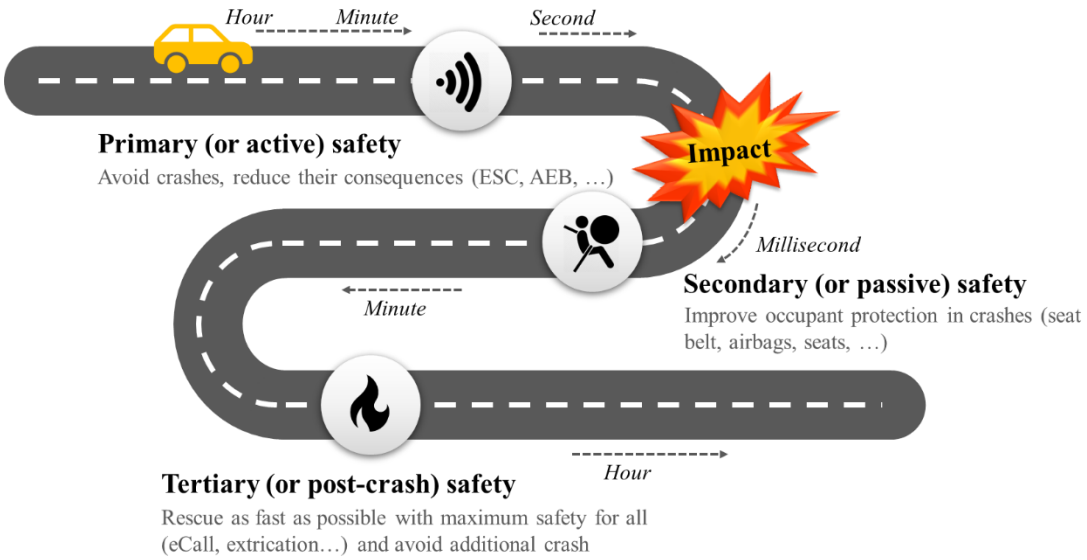

Figure 2: What is Tertiary Safety?

Why improvement is necessary in Tertiary Safety?

Worldwide, first responders face many common challenges when dealing with vehicle accidents:

- Vehicle identification / recognition – Not always easy for the first responder to identify what kind of vehicle or exact model and fuel source they are working on. To have the vehicle's identification information as soon as possible is critical for a successful road rescue operation, e.g. eCall can be a very efficient way to get the information quickly.
- Immobilisation, stabilisation – rescuers need to make the damaged vehicle safe and stable before working on it to not only protect the occupants but also themselves.
- Disable direct hazards, liquids, gases – rescuers should be able to easily disconnect any power source (high voltage) or fuel source (fuel tank, gas tank and so on). Approaching a new electric or hybrid vehicle can be quite different compared to dealing with traditional propulsion technology like gasoline or diesel. The energy stored in any vehicle could pose a risk to both the rescuers and to the public, and this creates a need for first and second responders to quickly find information which can guide them in how to proceed safely.

- Access to the occupants – The vehicle may pose problems for the first responders getting inside such as electric door handles and boot/trunk no longer working.
- Extrication risks posed by pyrotechnic components, inflators, preloaded springs, high strength zones, high voltage, battery pack, gas storage can be found in most passenger vehicles involved in accidents today.
- Fire & water submersion – The vehicle may be on fire when first responders arrive or there could be a risk of a fire starting when they are working on the vehicle. If vehicle enters water or is surrounded by rising flood waters, it is highly desirable for there to be systems that remain operable for some time, such as electric windows, to prevent occupants becoming trapped in the vehicle.

Work of ISO and the need for an ISO Rescue standard

In 2012 national body France made a proposal to develop an ISO standard for the uniform layout/format of rescue sheets for passenger vehicles. The new work item was approved, and the work was allocated to the existing Working Group 7 Traffic accident analysis methodology under ISO/TC22/SC12. PSA (now Stellantis), responsible for the French proposal became project leader. After several meetings and official voting within the ISO member countries ISO 17840:2015 Part 1 was first published in 2015 [2] and updated in 2022. Part 3, that defines the pictograms, was published in 2019 [3] and Part 4, that defines the diamond symbols, was published in 2018. The ISO standard 17840 can be used worldwide by public transport sector, fire and rescue services, automotive and heavy-duty vehicle sector, and consists of:

1. "Symbols" indicating which propulsion energy is used and where tanks, batteries, etc. are located in the vehicle.
2. "Rescue Sheets" (quick info about the construction of the vehicle) used by first and second responders.
3. "Emergency Response Guides" (ERGs) containing in-depth information (with the same headlines as the rescue sheets).

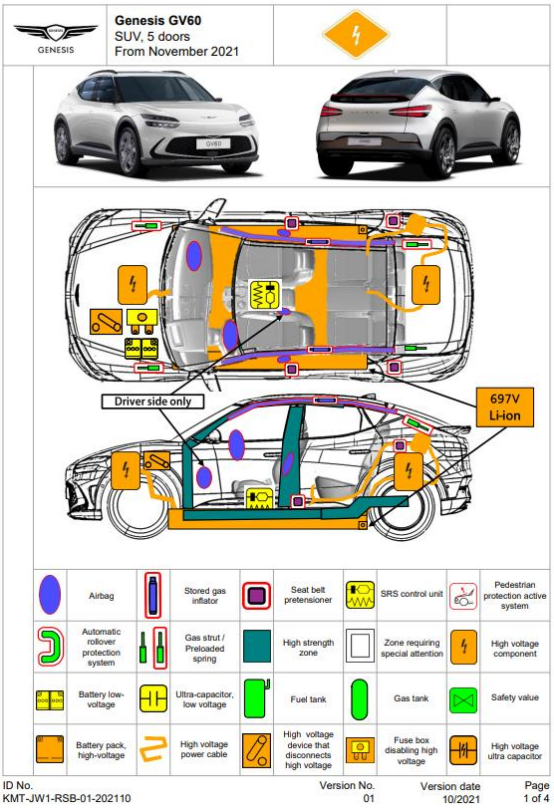

Figure 3. First page of Rescue Sheet for electric vehicle Genesis GV60 in accordance with ISO 17840 Part 1, showing ISO standardised symbols for batteries, airbags etc. Image courtesy of Genesis.

Euro Rescue App

As vehicles have become stronger, more complex and alternatively powered, it has become increasingly crucial that first responders know what they can and can't do at the scene of an accident. Intervention within the golden hour is critical and rescuers need quick and straightforward information regarding the construction of a vehicle to help safely remove persons from the wreck. For this reason, car manufacturers make so-called "Rescue Sheets" and "Emergency Response Guides" available.

Euro NCAP has, together with CTIF centralised the manufacturers' rescue sheets in an app, 'Euro Rescue'. The app can be downloaded freely and is available for Android & iOS. It can be used both online and offline, allowing rescuers to access the information even when there is little or no network coverage at the scene of the crash. The vehicle can be searched for in the app in a variety of different ways: by brand logo, brand name, model name, energy type or by scanning QR code on vehicle if present. For all cars assessed from 2020 onwards, Euro NCAP has verified the content and shared ISO-compliant rescue sheets and emergency response guides for new energy vehicles, via the Euro Rescue app. Euro Rescue was launched in English, French, German and Spanish. From 2023, the app and Rescue Sheets will be available in all European languages. The use of the app is not restricted to Europe: The Australasian New Car Assessment Program, (ANCAP SAFETY), the region's independent vehicle safety authority, also has an app 'ANCAP Rescue' based on Euro Rescue. The app is available for both iOS and Android operating systems and since its launch it has been downloaded over 200,000 times and contains over 1,500 Rescue Sheets. Looking at country ranking where it is most popular for downloading for the Android version the top countries are 1. Italy, 2. France, 3. Germany, 4. Spain, 5. UK and for iOS downloads 1. Germany, 2. UK, 3. France, 4. Italy, 5. US.

Feedback from CTIF from its rescuers using the app has been very positive so far: "The CTIF/Euro NCAP partnership started in 2018 has allowed, during the first 2020 roadmap, to highlight the need for rescue services to have a unique and freely accessible database of standardised rescue sheets. By releasing the Euro Rescue application in June 2020, Euro NCAP is actively contributing to the operational efficiency of rescue services in road accidents. With more than 200,000 downloads to this day, Euro Rescue shows the interest it generates among European rescue services but also worldwide. The integration of rescue sheets for trucks and buses as well as the identification of rescue sheets by the registration number are the next steps expected by CTIF, in order to make this application universal".

TEST & ASSESSMENT PROTOCOL *(current v1.2 until end of December 2022)*

The protocol [1] consists of the three areas of assessment: Rescue, Extrication and Post-crash Safety. Within these areas the following items are examined:

Rescue information - Information for First Responders:

<u>ISO 17840 Part 1 Compliant Rescue Sheet</u>

This Rescue Sheet is an operational Summary sheet for a vehicle produced for rescue services containing relevant information on vehicle hazards such as electrical systems, pyrotechnic devices, material location and properties (high strength steel etc), fuel storage location and properties etc. The Rescue Sheet is the main document that first and second responders use at the scene of an accident. The Euro NCAP vehicle inspectors will check the rescue sheets supplied by the vehicle manufacturer for ISO compliance. Availability and ISO compliance is a pre-requisite for scoring points for the Rescue assessment.

<u>Part 3 summary for new energy vehicles (ERG – Emergency Response Guide)</u>

The ERG is a template for more in-depth emergency response information to be used in combination with the Rescue Sheet for non-conventional engine vehicles. It is generally used by first and second responders as a source of information for training on non-conventional engine vehicles. (From 2023 onwards ERGs will be required for all vehicles assessed by Euro NCAP).

Euro NCAP stipulates [4] that The Rescue Sheet(s) must meet ISO 17840 Part 1 format (layout, order of information and pictograms) [2] and must include an Emergency Response Guide (ERG) following ISO 17840 Part 3 [3] and not exceed 4 pages (see example Figure 4).

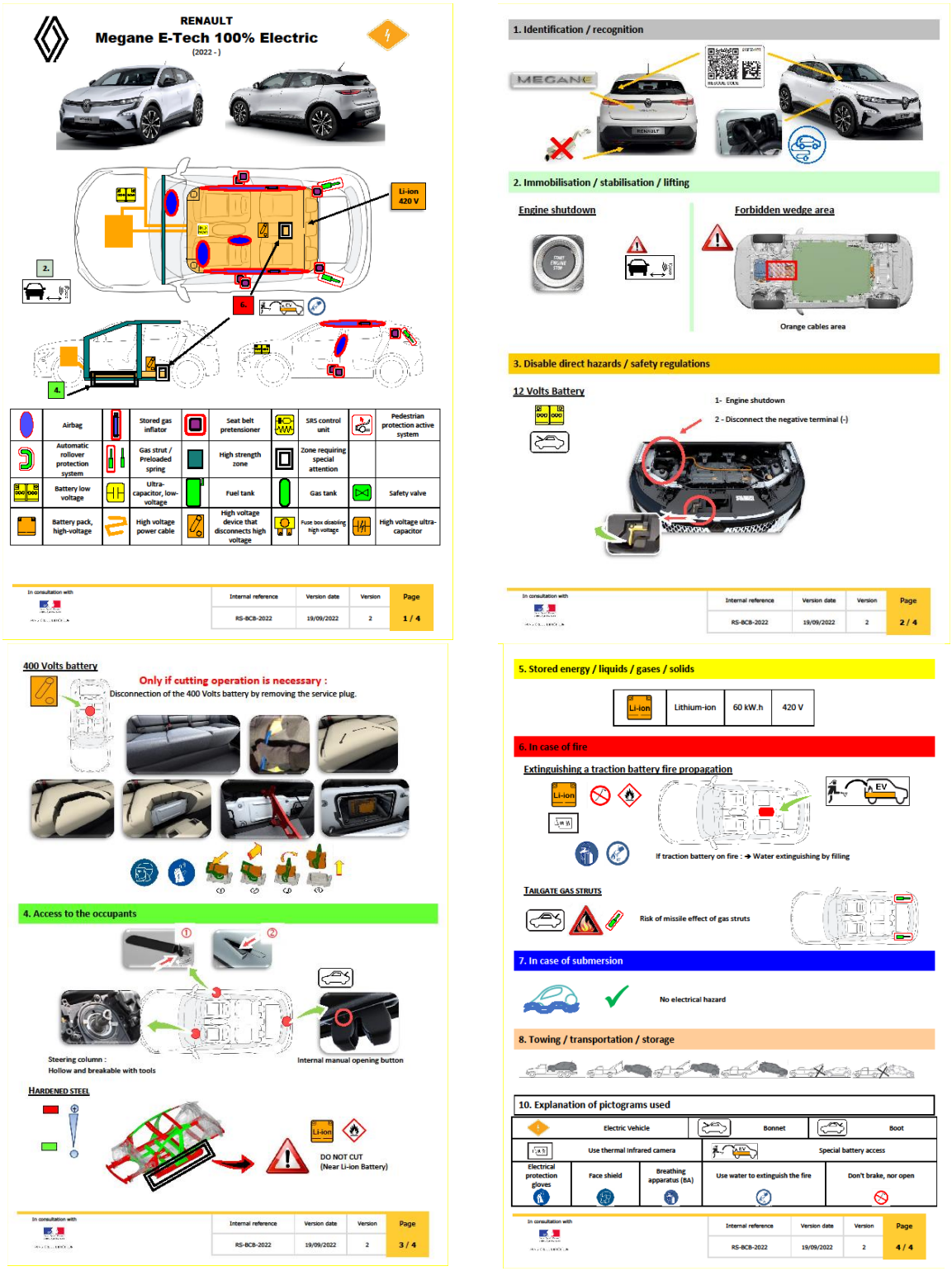

Figure 4. Rescue Sheet for electric vehicle Renault Megane E-Tech in accordance with ISO 17840 Part 1, including ERG information. Image courtesy of Renault.

Extrication - Tools to help intervention:

Automatic Door Locking (ADL)

As part of the extrication assessment Euro NCAP laboratories check the post-test status of a vehicle equipped with automatic door locking (which should automatically unlock post-impact).

Door Opening Forces

The door opening forces will be measured post-impact to ensure that in the real world first responders can access occupants quickly without having to use tools to open the doors.

Electric door handles and retracting door handles

Laboratories will check that electric door handles still function post-impact and will also look at door handles that sit flush with the vehicle body to ensure that these also function without any tools being needed or special operations required to use them after a crash (Figure 5).

Seat belt buckle unlatching

No extrication assessment would be complete without also dealing with the belted occupants and ensuring that the seat belt itself can be unlatched as normal to allow extrication of the occupant, also to ensure the occupant can free themselves from the belt and exit the vehicle when possible.

Figure 5. Example of recent door handle designs. Euro NCAP's assessment of post-crash safety includes a check that electric door handles still function post-impact.

Safety / Post-crash Technology - Technology supporting post-crash rescue:

Advanced eCall

eCall: This is a system fitted to a vehicle that sends an automatic message to an emergency call centre in case of a crash of the vehicle. eCall technology capable of sending advanced content, beyond what is legally specified (ECE 144), is referred to as eCall+ or Advanced eCall. Euro NCAP awards points to those vehicle manufacturers that go beyond this and includes extra data such as number of occupants, type of impact, vehicle orientation etc. (and in 2024 the severity of the impact using the Delta V of the vehicle).

Table 1. List of Advanced eCall parameters.

Parameter	**Mandated in eCall (ECE 144)**
Vehicle ID (VIN)	●
Propulsion type (energy storage)	●
Timestamp	●
Vehicle location	●
Vehicle direction	●
Number of occupants	○
Type of impact (front, side, rear)	○
Vehicle orientation (on wheels, on roof)	○
Crash severity/degree of potential injuries	○
Detection (water, smoke, ...)	○

Post-crash braking technology

Multi Collision Brake (MCB): This is a system fitted to a vehicle that applies the brakes to prevent or mitigate a subsequent impact when a vehicle has been involved in a collision of sufficient severity. In response to a primary collision with or without airbag deployment, information is sent to the braking system to decelerate the vehicle with the intention to bring the vehicle to a standstill. It must not be possible to deactivate the MCB by the driver. After a crash and the vehicle coming to a standstill it is allowed for the MCB to release the brakes in order to help first responders move the vehicle. The test procedure for the Multi Collision Brake technology consists of two parts: Part A) a destruction-free demonstration of braking caused by the MCB trigger signal and Part B) documentation showing that the MCB trigger signal is sent during a Frontal crash test.

UPDATES TO THE RESCUE PROTOCOL 2023

The 2020 protocol will be expanded in 2023 to include the following new items [5]:

New requirements on manufacturers to provide Rescue sheets to be in all EU languages (following technical bulletin 002) and for all models on sale (since 2020). Euro NCAP does not test every model available from a vehicle manufacturer and therefore with this new requirement it is anticipated that the availability of Rescue Sheets for an entire OEM's range will soon become the norm and also be more relevant for all EU first responders, being available in all EU languages rather than just 4 as was previously required by Euro NCAP. This is a pre-requisite for scoring points for Rescue in 2023.

Provide rescue information in the expanded ISO format (technical bulletin 030).
Euro NCAP will closely follow the work of ISO, and as standard 17840 is updated and improved Euro NCAP will also align its rescue sheet requirements with these ISO updates.

Provide Emergency Response Guide (ERG) to be available for all power sources, not just electric vehicles.
One unique ERG that covers all the cars from the same brand is accepted. It is possible for the OEM to produce just one ERG covering all models for a brand or one ERG for each model range, that is at the discretion of the OEM. In chapter 0 of the ERG the scope of the document should be mentioned – it should be clear which car models/energy types the ERG applies to. A penalty (-1 point) will be applied, where the ISO compliant ERG is not available for the tested vehicle.

EV and hybrid vehicle compliance with ECE regulations regarding electrical vehicle safety
With the increasing number of EVs on Europe's roads an additional post-crash check has been added to the Rescue assessment from 2023 onwards. After the official Euro NCAP crash tests a compliance check will be made to assess if the post-crash requirements from ECE R94, ECE R95, ECE R135 and ECE R137 for EVs and Hybrids have been met. A maximum -1 point penalty will be applied if the vehicle is not compliant.

Use of correct labels on vehicle, marking potential hazards and making it easier to identify relevant hazard as well as select the right equipment to disable car energy (electricity, CNG, H_2, etc). The making safe/disabling of on-board energy in vehicles (high-voltage electricity, pressurised or liquified gas etc) is a major challenge for the safe execution of emergency operations. As part of good practice, many vehicle manufacturers have taken the initiative to position stickers on vehicles, specifying for some, the type of energy on board, and for others the location and/or action to be carried out (e-plug handling, service plug handling, valve handling, isolation loop section etc), see Figure 6. In response to the increasing number of manufacturers' differing instructions on energy neutralisation and the absence of harmonisation of procedures, there is a need for OEMs to produce common markings and in turn aid rescuers attending the vehicle. A maximum -1 point penalty will be applied if hazards are not correctly marked on the vehicle.

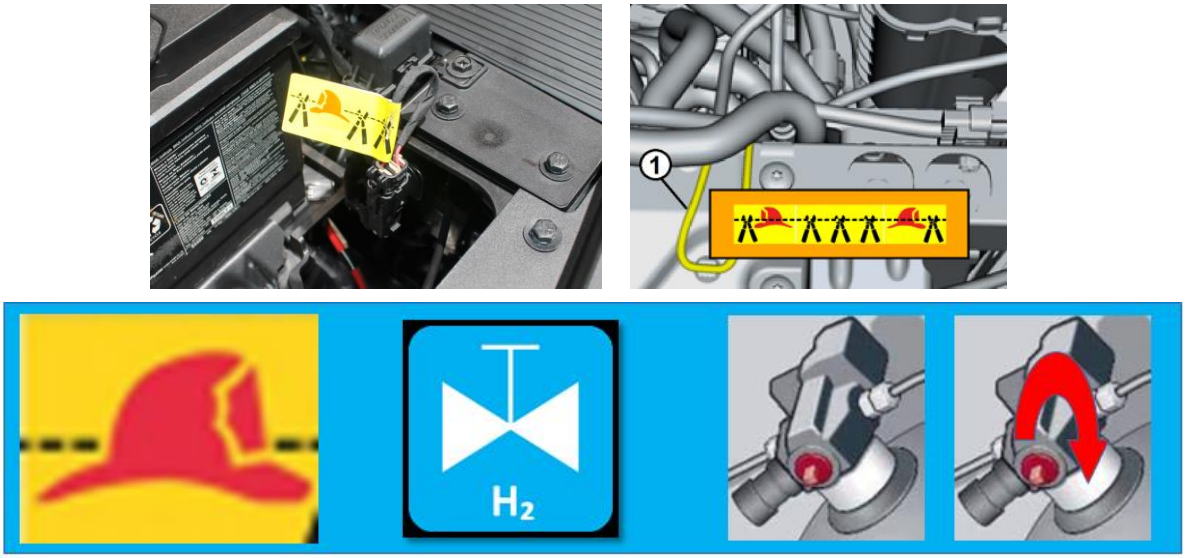

Figure 6. Examples of labels on vehicles showing rescuers where to cut / disable the vehicle.

Vehicle Submergence – windows and doors should still function as normal.
Vehicle submergence (vehicle entering a body of water or being surrounded by rising flood water for example) is thankfully a relatively rare occurrence on Europe's roads. However, when it does occur the outcome for the occupants is usually very serious. Therefore, Euro NCAP has introduced some simple requirements to ensure side windows can still be operated and side doors can still be opened during a submergence type incident to enable the occupants to help themselves and exit the vehicle in the early stages of submergence. The Euro NCAP test laboratory will perform the door check and the vehicle manufacturer shall provide a dossier covering the window opening/operation checks.

Advanced eCall and Third-Party Service eCall (TPS): new elements added such as hazard detection, multi-language communication etc.
Digital information sent out at the time of the crash could help Rescue Teams to be prepared for the intervention at the moment they receive the call. Information like the number of occupants, the direction of impact, severity of the impact could help rescuers to estimate the equipment necessary for their intervention. The early identification of the crashed vehicle through the e-Call makes it possible to establish a link with its Rescue Sheet and ERG which contains the essential information necessary for first responders. In order to score points TPS should be fitted as standard in all countries where the Euro NCAP star rating is applicable. If it is not allowed due to governmental laws / regulations to use the TPS eCall in a specific country, then only the legislative eCall needs to be applied.

Accuracy of Event Data Recorder (EDR) will be checked after the crash tests. Clear guidelines to be followed regarding eCall delta-V and location of impact following ASN1 format described in Euro NCAP *Technical Bulletin 040 eCall Additional Data Concept Triggering Incident v1.0.* (from 2024) [6]. An Event Data Recorder or EDR is a function or device installed in a vehicle that records technical vehicle and occupant information for a brief period of time before, during and after a collision, for the purpose of monitoring and assessing vehicle safety system performance. Euro NCAP wants to ensure that if a vehicle is sending EDR data that this data is actually accurate and providing useful information to the rescue services in order that they can send the relevant rescue teams and equipment. The data sent through the eCall system (Delta Vx in the frontal impacts, monitoring only for Vy in lateral impacts) must be within a tolerance of +/- 10km/h from the reference data measured by the test laboratory.

Overview of Updated 2023 Rating and Scoring
The 2023 overall rating spreadsheet extract in Figure 7 below shows that Rescue remains part of AOP area. From 2023 the points assigned to Rescue increase from 2 to 4 points.

	AOP (total 40 pts)	**COP (total 49 pts)**	**VRU (total 63 pts)**	**SA (total 18 pts)**
	Front MPDB (8)	Dynamic front (16)	Adult head form (6)	Occupant State (3)
	Front FW (8)	Dynamic side (8)	Child head form (6)	SAS (3)
	Side AMDB (6)	CRS installation (12)	Cyclist head form (6)	AEB/AES C2C Head-on (1)
	Side pole (6)	Vehicle based (13)	Leg form(s) (18)	LSS C2C (3)
	Far side (4)		*LSS PTW (3)	AEB/AES C2C Crossing (4)
	Whiplash F/R (4)		*AEB PTW (6)	AEB/AES C2C Rear (4)
	Rescue (4)		*AEB/AES Pe (7)	
			*AEB Reverse Pe (2)	
			*AEB/AES Cy (9)	
★★★★★	≥32 pts (80%)	≥39.2 pts (80%)	≥44.1 (70%)	≥12.6 pts (70%)
★★★★	≥24 pts (60%)	≥23.4 pts (60%)	≥31.5 (50%)	≥9 pts (50%)

Figure 7. Rating scheme for 2023, including the 4 points score for Rescue under AOP.

The breakdown of the points scoring in 2023 and 2024 is as follows: if for the tested vehicle, ISO compliant Rescue Sheet and ERG are available and meeting the requirements of Chapter 4 of the protocol, a maximum of 4 points can be scored:

- **1 point** if the vehicle is equipped with Advanced eCall (based on 112 eCall) in accordance with the requirements in Chapter 6 of the protocol:

  2023:

Potential number of occupants	0.50 points
Recent locations N1 & N2	0.50 points
Direction of impact & Delta V	0.00 points

  2024:

Potential number of occupants	0.33 points
Recent locations N1 & N2	0.33 points
Direction of impact & Delta V	0.33 points

- **1 point** maximum for Third Party Service eCall (TPS eCall) in accordance with the requirements in Chapter 6 of the protocol:

Multi-language communication	0.5 points
Hazard detection	0.5 points
Transfer of paired mobile number	0.5 points
Transfer of vehicle type	0.5 points

  Additional functions (subject to acceptance by Euro NCAP and CTIF) 0.5 points

- **1 point** Vehicle Submergence countermeasures in accordance with the requirements in Chapter 8 of the protocol

Door opening with vehicle 12V disabled	0.5 points
Window opening functionality	0.5 points

- **1 point** can be scored when the vehicle is equipped with Multi-Collision Brake technology in accordance with the requirements in Chapter 7 of the protocol. If these technologies are optional equipment they must meet the Vehicle Selection, Specification, Testing and Retesting (VSSTR) protocol fitment requirements to be awarded.

FUTURE WORK 2026 AND BEYOND

In November 2022, Euro NCAP published its strategic goals for the period up to 2030 [7]. The current rating scheme will be replaced in 2026 with a system identifying four phases of a vehicle accident: safe driving, crash avoidance, crash protection and post-crash safety. The final phase covers the tertiary safety assessment, which is now more logically placed in the rating scheme.

The starting point of the next development of the Rescue protocol is the situation in 2023 (up to and including 2025): the Euro Rescue app (Euro NCAP, 2022) offers post-crash rescue information in all European languages, greatly improving accessibility and ease-of-use for first responders across Europe, verifies easy extrication and has put incentives in place for post-crash technology.

Euro NCAP will closely follow the development of ISO 17840 and, where necessary, complement the standard. This is particularly true for (Lithium-Ion) battery electric, fuel-cell, and hydrogen cars, which pose specific safety risks to first responders, such as thermal runaway, battery reignition and stranded energy.

From CTIF real world experience disabling energy procedures are very different from one car manufacturer to another (different devices to use, different locations, with alternative option or not). Euro NCAP would like to make it easier for the first responders and the actions needed to disable energy within a vehicle.

It will also support the rollout of extended eCall functionalities, smarter blue light dispatching, and en-route support built on communication services. This includes intelligent eCall or dCall services, a system for dispatching doctors, based on calculations of probability of risk to driver and passengers. This calculation can be done either by the vehicle, which can then send the probability of injury with the e-Call message, or the PSAP can derive the injury probability, or urgency, from vehicle delta-v using a centralised and standardised method (such as the algorithm and parameters under review in ISO TC22/SC36/WG7) relevant to the European market.

Other supported advanced eCall services may include the inclusion of VRU accidents, such as pedestrians and bicycle, and automatic notification of thermal incidents, with or without the occurrence of a crash.

Looking to the future, it is possible that internal sensors could transfer live the images and vital life signs of injured persons, such as heart rate, breathing etc., taken from in-cabin sensors, allowing for instance an assessment of driver consciousness.

CONCLUSIONS

As first NCAP in the world, Euro NCAP has started to promote post-crash safety as part of its consumer protection programme. Building on the ISO work and experience of the vehicle industry and firefighters' community, Euro NCAP developed the first assessment protocol which came into force in 2020. To support first responders, it also launched the Euro Rescue application providing basic Rescue information for the European market. Since the introduction, further improvements have been made to the protocol and these will be applied from 2023. Euro NCAP's roadmap 2030 is paving the way for future work of Rescue, Extrication and Safety Group, in particular by focusing on accidents with vulnerable road users, on vehicles using new energy type and on improvement of digital information given by e-Call and in-vehicle sensors. Euro NCAP will continue to work with CTIF in parallel to promote best practice intervention procedures for first responders in Europe and all over the world, understanding that the most efficient organisation of rescue intervention is done at national and regional level.

REFERENCES

1. Euro NCAP Rescue, Extrication and Safety Test and Assessment Protocol v1.2 until December 2022
2. ISO17840-1:2022 Road vehicles — Information for first and second responders — Part 1: Rescue sheet for passenger cars and light commercial vehicles
3. ISO17840-3:2019 Road vehicles — Information for first and second responders — Part 3: Emergency response guide template
4. Euro NCAP Technical Bulletin 030 Rescue Sheet Guidelines v2.1
5. Euro NCAP Rescue, Extrication and Safety Test and Assessment Protocol v2.2 from January 2023
6. Euro NCAP Technical Bulletin 040 eCall Additional Data Concept Triggering Incident v1.0
7. Euro NCAP Vision 2030, A Safer Future for Mobility, November 2022.

ACKNOWLEDGEMENTS

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Appendix I

Rescue 2023 topics from vehicle rating spreadsheet

Rescue, Extrication & Safety		
RESCUE	**AVAILABILITY**	**COMPLIANCE**
ISO Compliant Rescue sheet		
Availble for Model tested - All EAA languages	PASS	PASS
Available for all other cars from OEM (launched 2020 onwards)	PASS	PASS
Emergency Response Guide for tested variant	PASS	
RESCUE ASSESSMENT	**0.000**	

EXTRICATION	**MPDB**		**FW**		**AE-MDB**		**POLE**	
	Driver side	**Passenger side**	**Driver side**	**Passenger side**	**Driver side**	**Passenger side**	**Driver side**	**Passenger side**
Automatic Door Locking (if applicable)								
Front								
Rear								
Automatic door locking assessment	**0.000**							
	Driver side	**Passenger side**	**Driver side**	**Passenger side**	**Driver side**	**Passenger side**	**Driver side**	**Passenger side**
Door opening forces - N								
Front								
Rear								
Door opening force assessment	**0.000**							
	Driver side	**Passenger side**	**Driver side**	**Passenger side**	**Driver side**	**Passenger side**	**Driver side**	**Passenger side**
Retracting door handles (if applicable)								
Front								
Rear								
Retracting door handles assessment	**0.000**							
	Driver side	**Passenger side**	**Driver side**	**Passenger side**	**Driver side**	**Passenger side**	**Driver side**	**Passenger side**
Seatbelt buckle unlatching - N								
Front								
Rear								
Seatbelt buckle unlatching assessment	**0.000**							
Compliance with ECE regulations re EV safety	PASS							
Identification of Direct Hazard Disabling Equipment	PASS							
EXTRICATION ASSESSMENT	**0.000**							

POST-CRASH TECHNOLOGY		
Advanced eCall		
Potential # of occupants	PASS	**0.33**
Recent vehicle locations N1 & N2	PASS	**0.33**
Direction of impact & Delta V	PASS	**0.33**
Advanced eCall assessment	**1.00**	
Third Party Service eCall		
Multi-language communication	PASS	**0.50**
Hazard detection	PASS	**0.50**
Transfer of paired mobile number	FAIL	**0.00**
Transfer of vehicle type	FAIL	**0.00**
Any new function	FAIL	**0.00**
Third party eCall assessment	**1.00**	
Vehicle Submergence		
Door opening check	PASS	**0.50**
Window opening check	PASS	**0.50**
Vehicle submergence assessment	**1.00**	
Multi Collision Brake		
Name	MCB	
Description in manual	PASS	**1.000**
Deceleration during activation	PASS	
Brake light activation	PASS	
Multi-collision brake assessment	**1.00**	
POST-CRASH TECHNOLOGY ASSESSMENT	**4.000**	

SUMMARY	
Rescue	**0.000**
Extrication	**0.000**
Post-crash technology	**4.000**

TOTAL RESCUE, EXTRICATION & SAFETY	**4.000**