Rialtas na hÉireann
Government of Ireland

zevi
Zero Emission
Vehicles Ireland

# Universal Design Guidelines for Electric Vehicle Charging Infrastructure

May 2024

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## Accessibility Statement

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**Email:** info@zevi.gov.ie

# Acronyms

| | |
|---|---|
| **ABA** | Architectural Barriers Act |
| **AC** | Alternating Current |
| **ADA** | Americans with Disabilities Act |
| **AFIR** | Alternative Fuels Infrastructure Regulation |
| **BSI** | British Standards Institution |
| **CBC** | California Building Code |
| **CEUD** | Centre for Excellence in Universal Design |
| **CPO** | Charge Point Operator |
| **CRC** | Central Remedial Clinic |
| **CRPD** | Convention on the Rights of Persons with Disabilities |
| **DC** | Direct Current |
| **DDAI** | Disabled Drivers Association Ireland |
| **DFI** | Disability Federation of Ireland |
| **DMURS** | Design Manual for Urban Roads and Streets |
| **DOJ** | Department of Justice, U.S. |
| **DPO** | Disabled Persons Organisation |
| **DSA** | Division of the State Architect |
| **DWI** | Disabled Women Ireland |
| **EC** | European Commission |
| **EN** | European Standards (Euronorm) |
| **EU** | European Union |
| **EV** | Electric Vehicle |
| **I.S.** | Irish Standard |
| **ICT** | Information and Communications Technology |
| **IEC** | International Electrotechnical Commission |
| **IEVA** | Irish Electric Vehicle Association |
| **IPA** | Irish Parking Association |
| **ISO** | International Organisation for Standardisation |
| **IWA** | Irish Wheelchair Association |
| **kW** | Kilowatt |
| **NCBI** | National Council for the Blind of Ireland |
| **NDA** | National Disability Authority |
| **NEVI** | National Electric Vehicle Infrastructure, U.S. |
| **No.** | Number |
| **NTA** | National Transport Authority |
| **OZEV** | Office for Zero Emission Vehicles, UK |
| **PAS** | Publicly Available Specification |
| **PTV** | Pendulum Test Value |
| **QR** | Quick Response |
| **RFID** | Radio-Frequency Identification |
| **S.I.** | Irish Statutory Instrument |
| **TII** | Transport Infrastructure Ireland |
| **VVI** | Voice of Vision Impairment |
| **ZEVI** | Zero Emission Vehicles Ireland, Department of Transport |

# Definitions

### Accessibility
Accessibility refers to the design and provision of products, services, and environments that are usable and accessible to people with disabilities, the elderly, and those with different needs, to ensure they have equal opportunities and can participate fully in society.

### Charging Bay
A charging bay is a designated area or space where electric vehicles can be parked and connected to a charging station.

### Charging Point
A charge point is a fixed or mobile interface that allows for the transfer of electricity to an electric vehicle. It is only capable of charging one electric vehicle at a time, although it may have multiple outlets in order to accommodate different connector types.

### Charging Pool
A charging pool consists of one or more charging stations at a specific location, including (in some instances) the dedicated parking spaces adjacent to them.

### Charging Station
A charging station is a physical installation for the charging of electric vehicles. Every station has a theoretical maximum power output, expressed in kW. Every station has at least one charge point that can serve only one vehicle at a time. The number of charge points at a charging station determines the number of vehicles that can be charged at that station at any given time. Where more than one vehicle charges simultaneously at a charging station, the maximum power output is distributed to the different charge points. As a result, the power provided at each individual charge point is lower than the overall power output of that station.

### Connector
Electric vehicle charging connectors are the end-point physical interfaces that are fixed on the charging cable and get attached to the electric vehicle to facilitate charging.

### Fast Charging
Fast charging involves high-power charging stations, typically delivering around 50 kW or more. These chargers use direct current (DC) and can rapidly charge an electric vehicle's battery to 80% or more within 30 minutes to an hour.

### Interoperability
Interoperability, in its widest sense, is the ability of computer systems or software to exchange and make use of information. In the case of the electric vehicle charging infrastructure, achieving an interoperable ecosystem means that the available information and payment options allow any user to easily charge any model of electric vehicle at any charging station.

# Definitions

### Just Transition
Just Transition is a vision-led set of principles, processes, and practices that seeks to ensure that the substantial benefits of a green economy transition are shared widely, while also supporting those who stand to lose economically – be they countries, regions, industries, communities, workers or consumers.

### Kerb Drop
A kerb drop is a sloped area of the pavement at the edge of a sidewalk or pedestrian walkway that allows people with disabilities or mobility impairments to access the roadway safely and easily.

### Light Passenger Vehicles
Classified as M1 type, these motor vehicles are designed for the passenger transportation, equipped with at least four wheels and a maximum seating capacity of eight passengers, in addition to the driver's seat.

### On/off-Street Charging
On-street charging refers to electric vehicle charging infrastructure that is installed on public roads or streets, usually in the form of a roadside charging station. Off-street charging, on the other hand, refers to charging infrastructure that is located in areas such as car parks or garages.

### Parallel On-street Parking
Parking bays where vehicles are parked back to front with their orientation parallel to the kerb.

### Perpendicular Parking Bays
Parking bays where vehicles are parked side by side with their orientation perpendicular to the kerb.

### Quasi-home Charging
A charging setup for electric vehicles that is not fully equivalent to traditional home charging but shares some characteristics with it. While not directly connected to personal residences, quasi-home charging provides convenient and accessible charging options for EV owners in proximity to their homes. (Where a fully accessible electric vehicle charging bay is required, a process will be put in place to request one).

### Radio Frequency Identification Cards
Radio Frequency Identification cards serve as a means of authentication and identification when using an electric vehicle charging station.

# Definitions

### Road Users
Road users refers to any individuals that use public roads or motorways, including pedestrians, cyclists, drivers, passengers, and any other means of transportation that uses the road network.

### Slow Charging
Slow charging refers to lower power charging methods, often ranging from 3 kW to 7.4 kW, commonly found in residential settings and workplaces. These chargers use alternating current (AC) and may take several hours or overnight to fully charge an electric vehicle's battery.

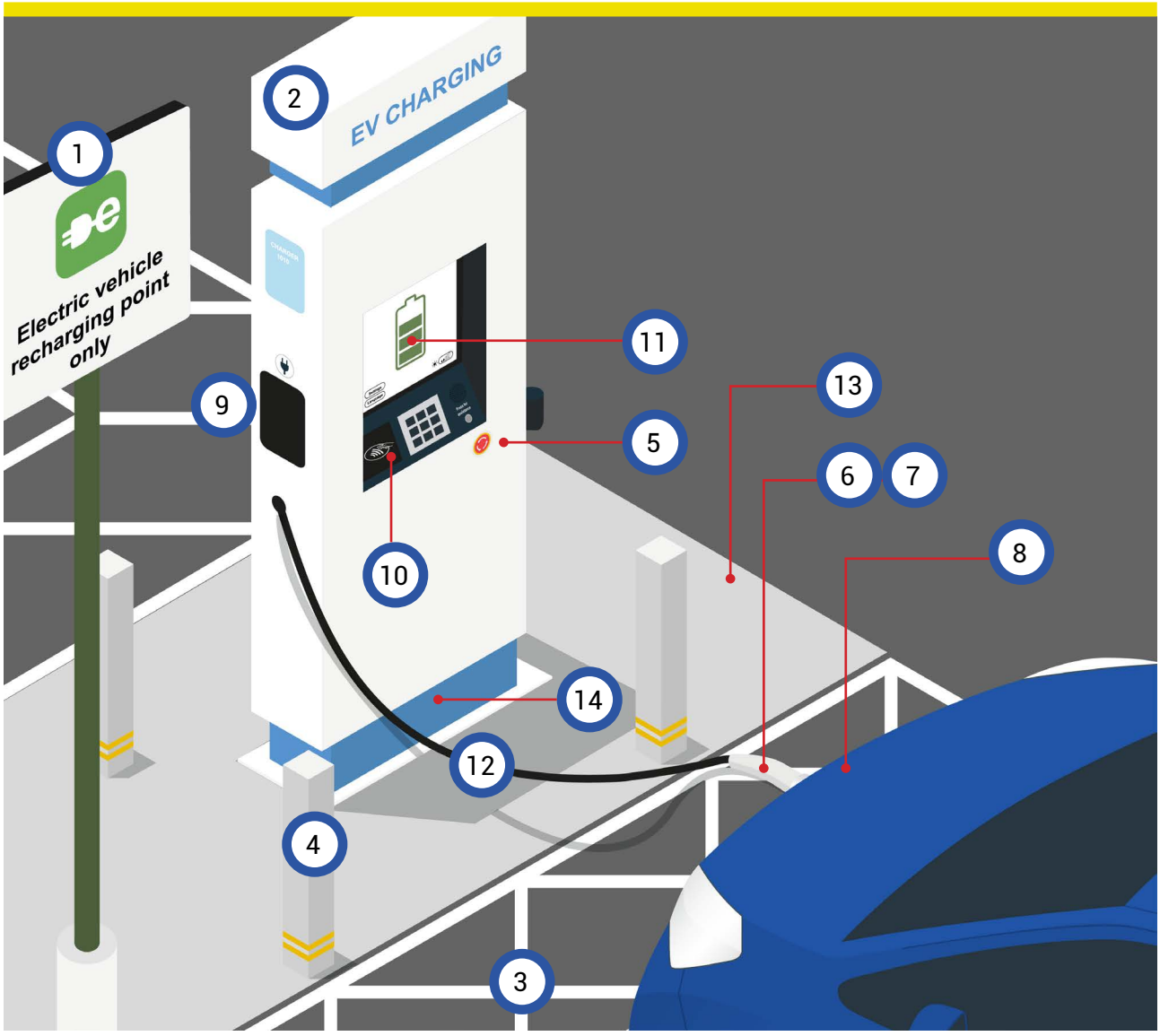
### Tethered/Non-Tethered Cables
Tethered cables are built-in charging cables that are permanently attached to the charging unit, allowing users to connect them directly to their electric vehicles for charging. Non-tethered cables (user-owned) are charging cables that users bring with them and connect to the charging station's connector in order to charge their electric vehicles.

### Universal Design
Universal Design is the process of designing and composing an environment so that it can be accessed, understood, and used to the greatest extent possible by all people, regardless of their age, size, ability or disability. This includes public places in the built environment such as buildings, streets or spaces that the public have access to; products and services provided in those places; and systems that are available including information and communications technology.

### Universally Designed Charging Station
A universally designed charging station is one that has been designed to ensure it can be used easily, safely and comfortably, without any physical, cognitive or technological barriers, by everyone.

# Definitions

## Charging Station - Key Components




1. Signage
2. Charging Station
3. Road Markings
4. Bollard
5. Assistance Button
6. Plug
7. Plug Handle
8. Electric Vehicle Inlet
9. Socket Outlet
10. Payment System
11. Screen
12. Cable
13. Kerb Drop
14. Footwell

# Foreword

## I am pleased to share the finalised Universal Design Guidelines for Electric Vehicle Charging Infrastructure.

These Guidelines have been revised following extensive consultation with various stakeholders, including industry experts, government agencies, disability associations, electric vehicle (EV) charging user groups and the public, and I would like to take this opportunity to extend my gratitude to everyone who has contributed towards their development.

This collaborative approach has produced an inclusive set of Guidelines that take into consideration the unique needs of different communities and environments and provide a comprehensive framework that will facilitate the roll-out of accessible, user-friendly, and efficient charging infrastructure across the country.

The publication of the Universal Design Guidelines is another important step forward in our commitment to creating an inclusive and sustainable future as we embrace the global transition to clean, electric transportation.

As we continue to decarbonise our transport sector, demand for EVs continues to rise, and it is vital that we ensure we have an infrastructure in place that is accessible for all.

This will be a key factor going forward in relation to the substantial level of funding that the Government has committed to over the coming years.

These Guidelines provide recommendations on the design, placement and information provision of EV charging infrastructure. Each of these elements plays an important part in ensuring that charging an EV is universally accessible and that no one is left behind in the transition to sustainable transport. These Guidelines also reflect lessons learned from international best practice.

In working together to implement these Guidelines, we are not only investing in our infrastructure but also in our people. A truly inclusive and accessible EV charging infrastructure network will empower individuals, communities, and businesses to embrace electric mobility, fostering economic growth and reducing our dependence on fossil fuels. This will allow us to accelerate our shift to cleaner alternatives and most importantly, support a just transition.

**Eamon Ryan**
Minister for Transport

# 1. Introduction

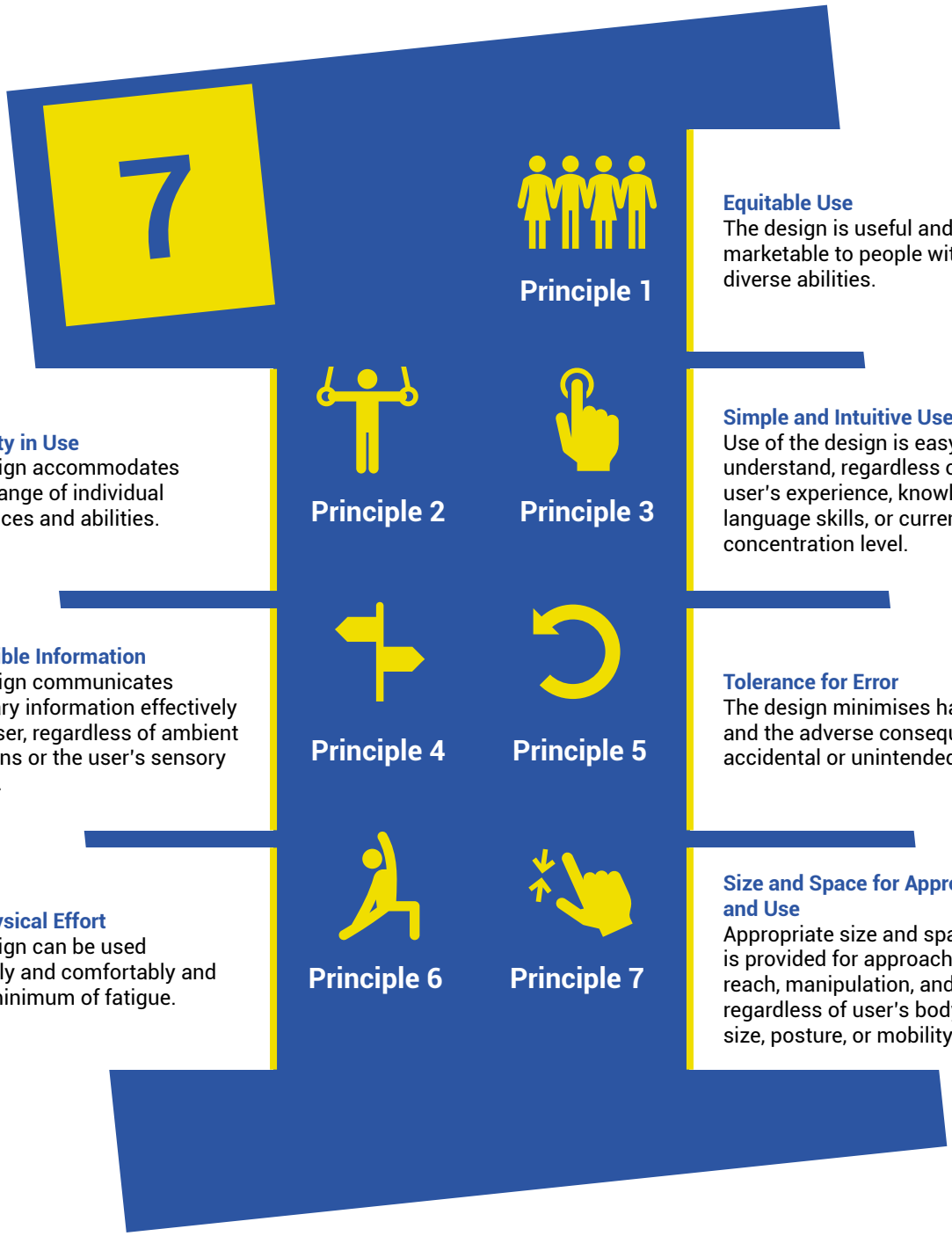
Zero Emission Vehicles Ireland (ZEVI), an office of the Department of Transport, has developed the Universal Design Guidelines for Electric Vehicle (EV) Charging Infrastructure (also referred in this document as 'the Guidelines' or 'the Universal Design Guidelines') to support the National Electric Vehicle Charging Infrastructure Strategy 2022-2025 and its commitment to delivering a national EV charging network across the country.

## What is Universal Design?

According to the National Disability Authority (NDA) Centre for Excellence in Universal Design (CEUD), Universal Design is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people, regardless of their age, size or disability. This includes public places in the built environment such as buildings, streets or spaces that the public have access to; products and services provided in those places; and systems that are available including Information and Communications Technology (ICT).

The CEUD is a state funded centre dedicated to promoting Universal Design with a wide range of design guidance information available on their website. The CEUD recommends the adherence to the '7 Principles of Universal Design' illustrated on the next page, which were developed in 1997 by the North Carolina State University. The purpose of these Principles is to guide the design of environments, products and communications.

## 7 principles of Universal Design:



## Why are the Universal Design Guidelines required?

The public network of EV chargers should be accessible to everyone. In Ireland, there are currently no specific guidelines that provide Universal Design recommendations for the design, installation and operation of EV charging infrastructure.

To address this issue, Universal Design Guidelines for EV Charging Infrastructure have been developed. These Guidelines aim to make EV charging infrastructure accessible to all users, summarising key considerations when designing, installing and operating EV charging infrastructure, including:

- the design of the charging station;
- the accessibility of the site; and
- the information and communications to inform users before, during, and after a charging session.

## How were the Universal Design Guidelines developed?

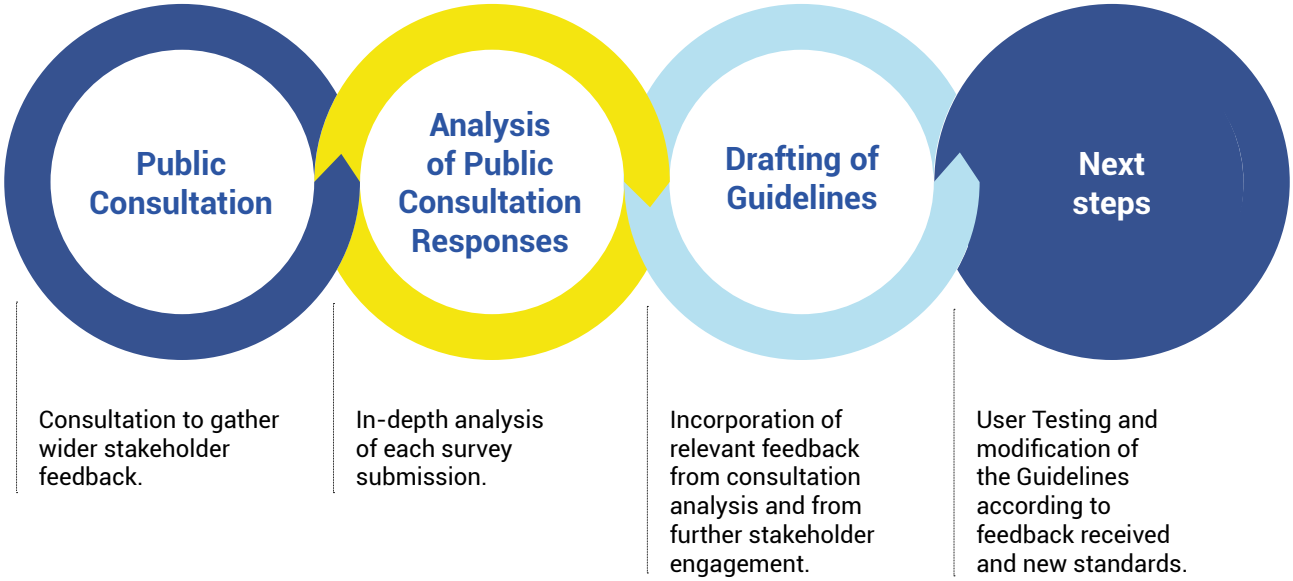
To develop the Guidelines, Zero Emission Vehicles Ireland (ZEVI) progressed through two phases:

1. Initial review, stakeholder engagement and publication of the Guidelines: during this phase, ZEVI reviewed national, international and industry best practices (see **Appendix A** for case studies and **Appendix B** for the reviewed documentation) for EV charging infrastructure. ZEVI engaged with a diverse group of stakeholders prior to publishing the draft of the Universal Design Guidelines on the 30th of June 2023;
2. Analysis of public consultation responses, further engagement and drafting of the Guidelines: in the second phase, following the publication of the Guidelines, ZEVI held a public consultation with the objective to gather feedback, opinions and insights from the public and relevant stakeholders regarding the proposed content outlined in the Guidelines. An in-depth analysis has been carried out to ensure that relevant input received is captured and utilised to update the contents of these Guidelines.

Stakeholder engagement was crucial along the entire process, and ZEVI worked with subject matter experts, EV user groups, disability associations (with a particular focus on Disabled Persons Organisations), and other stakeholder groups (see **Appendix C** for a full list) to develop this document.

As part of the commitment to ensuring the relevance and application of these Guidelines, ZEVI will carry out a process of user testing in the next months following the publication of the Universal Design Guidelines. The user testing will involve interviewing real users as they interact with EV charging infrastructure in a variety of locations, settings and under different environmental conditions. Following the process of user testing, the Guidelines will be modified accordingly if required. The update of the Guidelines will be an iterative process through which the contents will be refined where appropriate and in accordance with new standards, regulations and emerging technologies.

For more information on the public consultation, please refer to the **Public Consultation Summary Report.**




## How do the Universal Design Guidelines inform implementation?

These Guidelines encourage anyone associated with the installation or operation of the EV charging infrastructure to adopt the Universal Design principles but recognise there may be real-world limitations in some instances. In locations such as quasi-home charging at on-street neighbourhood charging stations to serve the needs of residents, not all the recommendations proposed in these Guidelines may be achievable. Further guidance in relation to Site Selection and Design at these locations and the appropriate infrastructure and mitigation measures to be adopted will be provided to local authorities.

These Guidelines are not legally binding but are provided as technical assistance to help entities design, install and operate EV charging infrastructure that is accessible for everyone. However, European Standards (EN), Irish Standards (I.S.), and Irish Statutory Instruments (S.I.) should be adhered to when applicable.

To facilitate the deployment of accessible charging infrastructure, supplemental minimum standards may be developed to support the implementation of some of the Guidelines' recommendations where existing European Standards (EN), Irish Standards (I.S.) and Irish Statutory Instruments (S.I.) do not exist.

# 2. Topics Covered

These Guidelines provide clear direction to those involved in the manufacturing, procurement, installation, and operation of the EV charging infrastructure. They present recommendations for the design of the charging station, the accessibility of the site, and the information and communications needed to inform users before, during, and after a charging session.

The Guidelines focus on accessible electric vehicle (EV) charging infrastructure (fast and slow) for light passenger vehicles and aim to ensure that charging stations are designed to be inclusive for all users.

## The Guidelines have been structured according to the following headings:

### Charging Station Design

This includes the design and component specifications of accessible charging station infrastructure (e.g., cable length, plug handle, socket cover) and their immediate surroundings.

### Site Design

This includes the physical aspects of the environment surrounding the charging station including its location, placement and spacing of the charging station.

### Information and Communications

This includes the information and communications (physical and digital) a user has access to before, during, and after a charging process.

In the future, additional considerations may need to be made to accommodate changing regulations and technological advancements in the charging space. Appendix D provides further information about potential innovations that may have implications for these Guidelines.

# 3. Roles and Responsibilities

## There are several stakeholders involved in the manufacturing, procurement, installation and operation of the charging infrastructure.

Those whose job it is to procure accessible charging infrastructure should ensure that the charging infrastructure is procured and installed in accordance with accessibility requirements, aligning with the 7 Principles for Universal Design, in accordance with these Guidelines.

Other stakeholders, including those involved in the manufacturing, installation, funding, energy and connection, and operation of the charging infrastructure, should also act upon the Guidelines where they are able to positively influence the accessibility of the charging infrastructure. Key stakeholders and their roles are set out below – it should be noted that not all of these roles are mutually exclusive – in some cases one organisation may take more than one of the stakeholder roles as set out below.

## Key stakeholders

**Funders**
Those responsible for providing the necessary financial support for the development, installation, and maintenance of universally accessible charging infrastructure.

**Installers**
Those responsible for the proper, safe, and compliant installation of charging infrastructure, ensuring that the equipment is accessible and functional for all users, while also providing necessary maintenance and support.

**Operators**
Those responsible for managing and maintaining the charging infrastructure, ensuring its reliability and accessibility, optimising user experience, and providing customer support.

**Procurers**
Those responsible for identifying high-quality charging equipment and services to ensure these meet all necessary standards and regulations.

**Manufacturers**
Those responsible for designing and producing reliable, efficient, and user-friendly charging equipment that meets regulatory standards.

**Regulators**
Those responsible for establishing and enforcing policies and standards that promote the development, installation, operation and accessibility of reliable and safe charging infrastructure.

**Energy Providers**
Those responsible for managing grid capacity and ensuring interoperability of equipment and data.

# 4. Standards and Best Practices

As part of developing the Universal Design Guidelines, ZEVI reviewed relevant European Standards (EN), Irish Standards (I.S.), Irish Statutory Instruments (S.I.), national and international best practice guidelines, and research regarding the Universal Design of electric vehicle (EV) charging infrastructure. These documents, in addition to the invaluable feedback from the public consultation, have informed the framing of the recommendations proposed in this document across Charging Station Design, Site Design and Information & Communications.

The Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure (also known as AFIR) proposes minimum accessibility requirements to ensure interoperability and ease of use of charging infrastructure across Europe. The AFIR as well as other European Standards, Irish Standards and Irish Statutory Instruments related to these Guidelines will form the minimum basis for legislative Universal Design standards for EV charging infrastructure in Ireland.

As stated above, the Universal Design Guidelines are not legally binding, but are provided as technical assistance to help entities design, install and operate EV charging infrastructure that is accessible for everyone. After each recommendation, references to the most relevant sections of the appropriate European Standards, Irish Standards and/or Irish Statutory Instruments for the particular recommendation have been provided.

In addition to the European Standards, Irish Standards and Irish Statutory Instruments, national and international best practices have been provided for each recommendation. Where relevant, detailed specifications extracted from these best practice documents are referenced to reinforce the recommendations in this document. Some examples include:

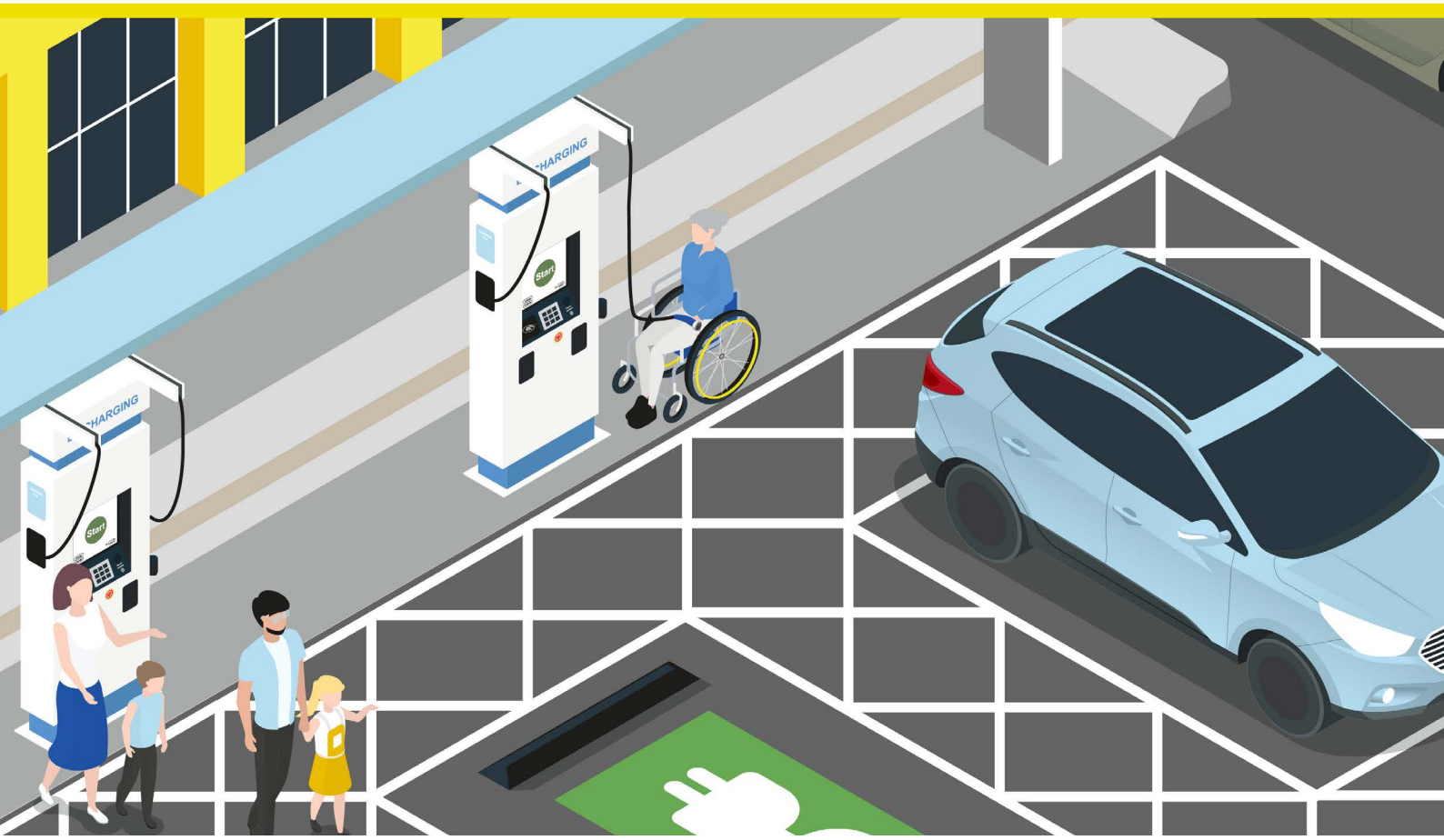
- **Building for Everyone:** A Universal Design Approach;
- **Design Manual for Urban Roads and Streets** (DMURS);
- **VVI Planners' Checklist for Accessible Streetscapes** – Voice of Vision Impairment;
- **Irish Wheelchair Association's Best Practice Access Guidelines**;
- **Street Furniture - NCBI Position Statement**; and
- **PAS 1899: 2022** (United Kingdom).

A full list of the relevant documentation can be found in Appendix B.

# 5. Understanding User Needs

Understanding the experiences and accessibility requirements of different users with regards to electric vehicle (EV) charging infrastructure has been a major component of the development of these Guidelines. In order to visualise real user needs and help embed a user mindset in the decision-making process, five personas have been developed with their own journeys and interactions with EV charging infrastructure. These have been adapted from the personas presented in the Electric Vehicle Charging Infrastructure Strategy 2022 -2025 to highlight various user needs.

Personas are fictional profiles that represent specific characteristics of both current and potential future users of the EV charging network. These profiles have been developed from an understanding of some of the challenges that users face today and to help contextualise the Guidelines. Each persona's needs have been informed by existing research and by the feedback obtained during the stakeholder engagement process. A more detailed description of each persona's key user requirements is included in Appendix E.



## These personas have been developed from an understanding of some of the challenges that users face today and to help contextualise the Guidelines.





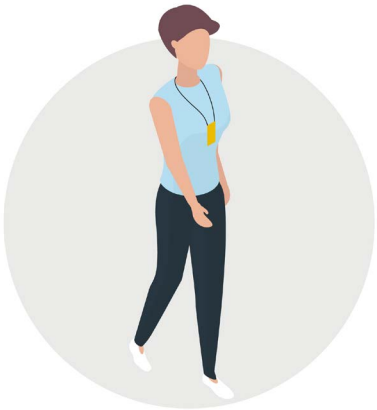
### The Jacksons, Tourist Family

John and Janet Jackson are on holidays in Ireland with their two young children. They have rented an EV for the first time to travel around the country, both to cities and to rural areas. They drive every day during their trip and are not familiar with the Irish EV charging system. They want to be able to:

- Easily identify locations and monitor availability where they will be able to charge their EV;
- Have access to user information such as price and charging speed at different stations; and to
- Easily park their vehicle with enough space to fully open the doors allowing them to safely help their kids in and out of a child seat.

### Tara Traynor, Taxi Driver

Tara drives a taxi for a living. She drives her EV around her local town and occasionally has to travel longer trips to other towns during the day. During busy periods she also picks up a few night shifts. Tara wants to be able to:



- Check the availability of charging stations on the go;
- Monitor the charging status from her phone while she is away from her car taking a break; and to
- Feel safe charging her car, particularly at night.

### Ruairi Reynolds, Rural Commuter

Ruairi decided to purchase a second-hand EV which he uses to do the weekly grocery shopping, to go to work and to bring his daughter to extracurricular activities. He lives in Cavan and travels mostly at peak times in the morning and the evening. Ruari wants to be able to:

- Have certainty of the correct functioning of the charging process without needing to rely on audio cues that he might not be able to hear;
- Have access to responsive assistance in case an issue arises during the charging process; and to
- Not worry about the charging process requiring much physical strength, especially after his recent back injury.

### Rachel Murphy, Retired Urban Dweller

Rachel lives in Clonmel and owns her own EV. She usually travels to visit her brother in Waterford, and to specialist medical appointments in Cork. She is a wheelchair user and needs to make sure that facilities are accessible to her before using them, including checking the availability of accessible charging bays and level access to buildings. She wants to be able to:

- Comfortably reach the charging station screen, handle and cable;
- Move around the parking space without encountering obstacles or kerbs; and to
- Avoid being exposed to the rain while exiting her car and accessing nearby amenities.

### Caroline Connolly, Car Sharer

Caroline has recently signed up to a car-sharing app. To commute she usually relies on cycling and public transport, but she has decided to move apartments, so she needs a car to transport her belongings across the city. She also uses the shared car to do short trips around her area to shop for home furnishings. Caroline wants to be able to:

- Easily identify EV charging bays to charge the car;
- Feel safe charging the EV without worrying about tripping over the cable or slipping and to feel secure in her personal safety; and to
- See clear instructions to confidently charge the vehicle and pay on an ad hoc basis at different charging stations regardless of the provider.

# 6. Universal Design Guidelines

The following section sets out the Universal Design Guidelines under the headings: 6.1 Charging Station Design, 6.2 Site Design, and 6.3 Information and Communications. These Guidelines provide general recommendations that should be taken into consideration during the procurement design and implementation of electric vehicle (EV) charging infrastructure to deliver accessible charging infrastructure to a wide range of users.

To ensure clarity for implementation, these Guidelines focus on bays equipped with charging facilities, as opposed to parking bays without charging which adhere to a different set of standards and regulations.

ZEVI's ambition is for all charging infrastructure in Ireland to be universally accessible for all. Therefore, these Guidelines do not provide separate recommendations for charging bays designated for disabled person's parking card holders. Disabled persons should be able to access any charging station in the country. However, as noted above in '2. Topics Covered', in locations such as quasi-home charging at on-street locations, not all the recommendations proposed in these Guidelines may be achievable. In circumstances such as these, the need for a universally designed EV charging bay for residents who require it (e.g. disabled person's parking card holders) should be identified and addressed appropriately.

It is important to note that best environmental sustainability practices should be prioritised in the installation of EV charging infrastructure. Incorporating photovoltaic panels and renewable energy sources can significantly reduce carbon emissions associated with EV charging. It is also advisable to carefully consider the lifecycle of materials and charging stations, opting for those with low environmental impact and ensuring durability for long-term sustainability. Additionally, integrating smart technologies to optimise energy usage and minimise light pollution can further enhance the eco-friendliness of EV charging networks.

## 6.1 Charging Station Design

- Charging Station Component Height;
- Plug Handle;
- Cable Weight and Rigidity;
- Cable Length;
- Charging Station Socket and Connector;
- Charging Station Socket Cover;
- Charging Station Screen;
- Payment Methods;
- Charging Station Detection;
- Charging Station Walking Aid Holder;
- Emergency Stop Button;
- Component Labelling; and
- Charging Station Footwell.

## 6.2 Site Design

- Charging Bay Dimensions;
- Charging Bay Positioning;
- Ground Surface Materials;
- Ground Surface Height Differences;
- Removing Obstacles;
- Access to Amenities;
- Weather Protection;
- Safety Considerations;
- Lighting;
- Site Access;
- Impact Protection; and
- Site Maintenance.

## 6.3 Information and Communications

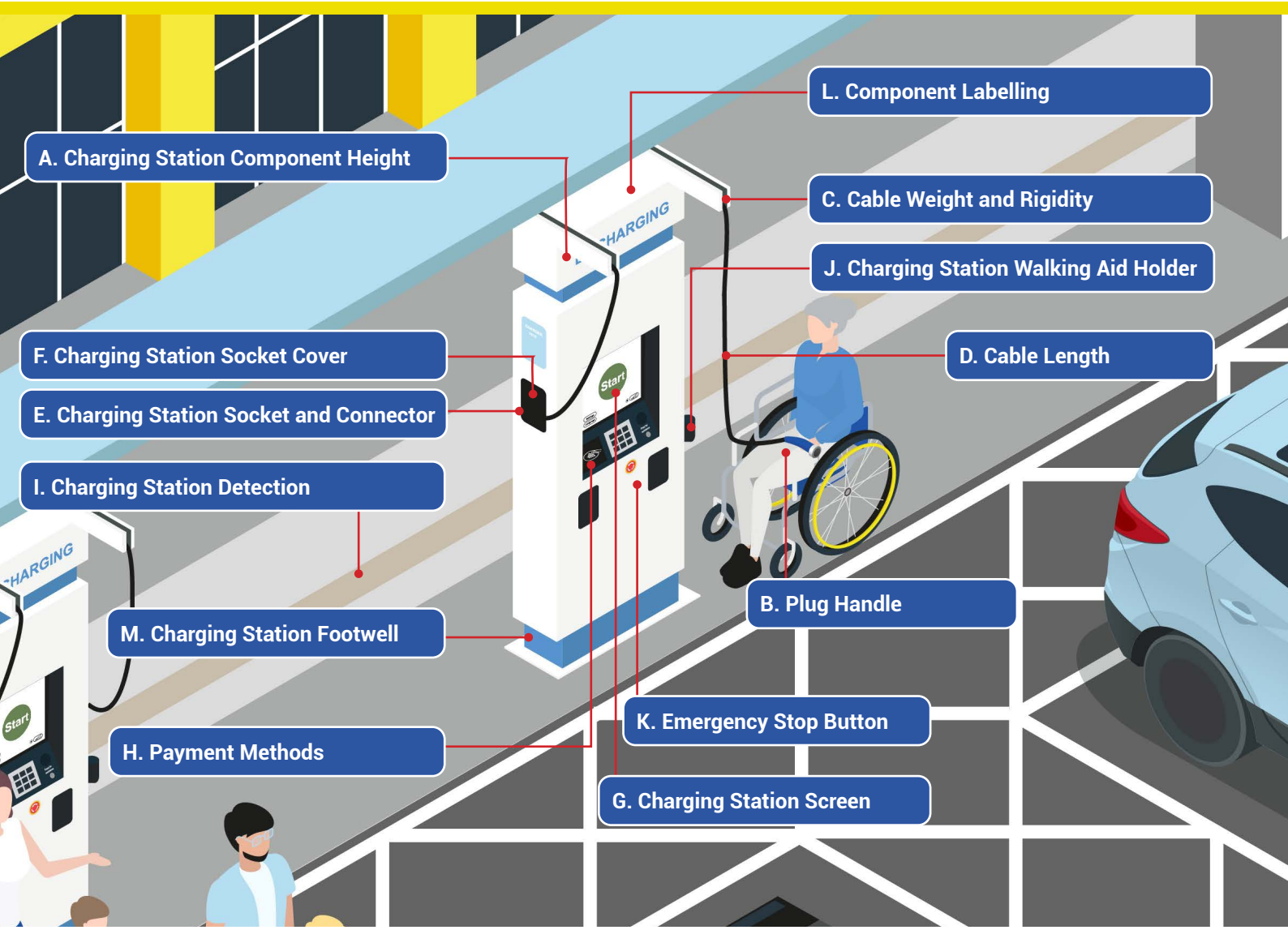
- Online Charging Station Information;
- Charging Station Digital Interface;
- Mobile Applications;
- Navigation Signage;
- Charging Station User Information;
- Charging Bay Signage;
- Road Markings;
- Charging Session Feedback;
- Access to reliable assistance;
- Broadband connection; and
- Interoperability.

## 6.1 Charging Station Design

This section covers aspects related to the Universal Design of the charging station components. These Guidelines will ensure a cohesive and consistent design approach is taken to charging stations across Ireland making them easy to use. This section will also help manufacturers and procurers of charging infrastructure in identifying minimum user requirements for charging station hardware.

Each of the elements listed below has been identified as playing an important role in ensuring that an electric vehicle (EV) charging station is easy to use. For each of the elements, e.g. plug handle, ZEVI has proposed a recommendation based on European Standards (EN), Irish Standards (I.S.), Irish Statutory Instruments (S.I.), national and international best practice and research. Each recommendation is accompanied by corresponding references to these standards and research sources.

### Elements for Charging Station Design



## A. Charging Station Component Height

The height of any element that needs to be reached by hand, including the socket, payment method, and screen, should accommodate users with varying height requirements and mobility aids. Components should be placed within reach (between 0.9 metres and 1.2 metres). To ensure the optimal height of the charging station components, the nature of the ground level, such as an inclined road, should be considered.

Standards and Statutory Instruments

**Directive (EU) 2019/882** of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services **(European Accessibility Act)**.

**S.I. No. 636 of 2023** EU Accessibility Requirements of Products and Standards Regulation 2023, Schedule 1, Part 1, Paragraph 2(h).

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 13 User interface, controls and switches and Section 20 Transport facilities:

- Paragraph 13.3.3 Reaching and using controls and user interfaces;
- Paragraph 13.4.2 Location and height of controls and switches;
- Paragraph 20.10 Service Stations;
- Paragraph 20.10.1 Rationale; and
- Paragraph 20.10.2 General.

National and International Best Practice

The **Irish Wheelchair Association's Best Practice Access Guidelines** recommends a common reach zone between 0.9 metres and 1.2 metres.

## B. Plug Handle

The plug handle of the charging station should be light, ergonomic, resistant and easy to grip without slipping. This may include considerations around surface finish and handle design. For both tethered and non-tethered cables there should be an option to grip the plug handle with one or two hands without relying on strength or dexterity. The plug receptacle on the charging station should be ergonomically designed to ensure ease of use.

Standards and Statutory Instruments

**Directive (EU) 2019/882** of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services **(European Accessibility Act)**.

**S.I. No. 636 of 2023** EU Accessibility Requirements of Products and Standards Regulation 2023, Schedule 1, Part 7, Paragraph 3(g).

**I.S. EN IEC 62196-1:2022** Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles - Part 1: General requirements:

- Paragraph 16 General construction;
- Paragraph 25 Flexible cables and their connection;
- Paragraph 26 Mechanical strength; and
- Paragraph 33 Vehicle drive over.

National and International Best Practice

**Designability's Design Guidance for Accessible Electric Vehicle Charging** recommends a handle that can be held in different ways (e.g., one-handed/both hands).

## C. Cable Weight and Rigidity

The weight and rigidity of the cable must be manageable for people of all physical abilities and statures. The weight of the charging cable may increase significantly if the charging station has a high-power output (especially for fast charging). In such cases, it is important to include a cable management system.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR)**, Recital (38).

**Directive (EU) 2019/882** of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services **(European Accessibility Act)**.

**S.I. No. 636 of 2023** EU Accessibility Requirements of Products and Standards Regulation 2023, Schedule 1, Part 7, Paragraph 3(g).

National and International Best Practice

The **PAS 1899:2022** recommends that the force required to lift a cable suspended in the air, with a length of 4 metres, should not exceed 60 Newtons (measure of force).

**Designability's Scoping and Discovery Report for Accessible Electric Vehicle Charging** suggests a cable weight of approximately 3 kilograms.

## D. Cable Length

The tethered cable should be long enough to reach any type of vehicle parked with its inlet located as close as possible to the charging station. Providing space around the vehicle (as recommended in Charging Bay Positioning) will resolve issues related to cable length. A cable management system (e.g., overhead cable support) should be implemented for all fast chargers and in instances where the cable is excessively long or heavy. Adapting charging stations to incorporate emerging technologies like wireless charging is further recommended as it will address concerns related to cable weight and length.

Standards and Statutory Instruments

**Directive (EU) 2019/882** of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services **(European Accessibility Act)**.

**S.I. No. 636 of 2023** EU Accessibility Requirements of Products and Standards Regulation 2023, Schedule 1, Part 7, Paragraph 3(g).

National and International Best Practice

The **Einfach laden ohne Hindernisse** recommends that a charging station with a tethered cable should have a cable management system in place to avoid the cable forming an obstacle on the ground and reducing the force required to handle cable.

The **PAS 1899:2022** recommends that the length of the charging cable should not exceed 7.5 metres.

## E. Charging Station Socket and Connector

The charging station socket should be easy to see and stand out visually for the users. It should also clearly indicate the plug type and orientation. Tilting the socket upwards at a slight angle can help taller users see the socket without compromising use for seated users. The connection force for inserting and removing the charging cable, both from the charging station and from the EV, should be accommodating to all users.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR)**, ANNEX II: Technical specifications, Paragraphs 1.1 and 1.2.

**I.S. EN IEC 62196-1:2022** Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles - Part 1: General requirements.

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 5 Diversity of users and design considerations.

National and International Best Practice

The **PAS 1899:2022** recommends that the connection force, where possible, should be limited to a maximum of 15 Newtons (measure of force).

## F. Charging Station Socket Cover

Socket covers, including a hinge in socket cover door, push down socket cover, or slide up socket cover, should be designed with user needs in mind. Where a socket cover is present, users should be able to easily open the socket cover and insert the connector using the same hand.

Standards and Statutory Instruments

**I.S. EN IEC 62196-1:2022** Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles - Part 1: General requirements.

National and International Best Practice

**Designability's Design Guidance for Accessible Electric Vehicle Charging** recommends that if a socket cover is needed, the user must be able to open it easily and insert a connector using one hand.

## G. Charging Station Screen

The charging station screen should be suitably positioned to ensure readability from both a seated or fully upright position, even under adverse weather conditions. Additionally, the charging station screen should ensure ease of use for all users. Where provided, buttons and controls on the charging station should be tactilely and visually distinguishable, including night-time functionality. Remote screens (see Mobile Applications) can also be used as an additional option to act as the user interface.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR),** Recital (38).

**Directive (EU) 2019/882** of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services **(European Accessibility Act)**.

**S.I. No. 636 of 2023** EU Accessibility Requirements of Products and Standards Regulation 2023, Schedule 1, Part 1, Paragraph 2(h).

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 13 User interface, controls and switches, Paragraph 13.2.3 ICT screen position.

**I.S. EN 301549:2021** Accessibility requirements for ICT products and services.

National and International Best Practice

The **Einfach laden ohne Hindernisse** recommends that the buttons and controls on a charging station are tactilely distinguishable and visually differentiated from the background and underlay. Additionally, the screen interface should provide sufficient visual contrast and brightness in different light condition, and charging station should be illuminated in a way that all controls can be recognised and operated even in the dark.

The **PAS 1899:2022** recommends that the screen interface should be tilted at an angle between 0 degrees and 20 degrees upwards from the vertical plane towards the user of the charging station.

## H. Payment Methods

Versatile and user-friendly ad hoc payment methods should be provided to accommodate a range of user needs and make the process as simple and fast as possible. To ensure a seamless costumer experience, plug and charge functionalities should be considered **(see Appendix D)**. The use of card readers that require the physical insertion of a card should be avoided in favour of contactless card readers or payment by scanning a QR code. Where this is unavoidable, a tactile number pad should be included. Payment should also be supported through mobile applications for those users who wish to download the provider's app.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR)**, Article 5: Recharging infrastructure, Paragraph 1.

National and International Best Practice

The **PAS 1899:2022** suggests that consumers can rely on a familiar payment method across charging station networks including Radio Frequency Identification (RFID) cards, a contactless payment card and/or a smartphone application.

## I. Charging Station Detection

The charging station should be placed in such a way that it does not obstruct sightlines for other road users and can be safely operated. To ensure that the charging station is not an obstacle and that it is easily detectable by road users, it should have adequate indicators in place, such as lighting and differential surfacing. Using consistent and contrasting colours for the charging station, its components and surrounding environment can enhance user friendliness. Components that may stick out should be clearly demarcated. Charging stations can serve as important way finders on large open parking spaces for people with visual impairments. Furthermore, charging station locations should be integrated in digital navigation aids.

Standards and Statutory Instruments

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 5 Diversity of users and design considerations, Section 6 Wayfinding and Section 7 Access in the outdoor environment:

- Paragraph 5.3 Key areas for accessibility and usability of the built environment;
- Paragraph 6.1 Wayfinding, orientation, and navigation;
- Paragraph 6.3 Visual contrast; and
- Paragraph 7.1.15 Obstacles on accessible routes.

National and International Best Practice

**Voice of Vision Impairment's Planners' Checklist for Accessible Streetscapes** recommends the imaginative use of street furniture on wide streets as useful landmarks or orientation to overcome the difficulties faced by visually impaired pedestrians on footways wider than three metres. It also recommends that street furniture on kerbed footpaths should align consistently along a line just inside the curb edge.

**The National Disability Authority's Building for Everyone: A Universal Design Approach,** highlights the important role of street furniture design principles in urban aesthetics and functionality. To enhance visibility and safety, the NDA recommends including visual contrast, avoiding grey posts, highlighting free-standing elements, ensuring continuous furniture to ground level, and preventing obstructions. Furthermore, items attached to posts should face the direction of travel so that they do not interfere with the line of movement.

**NCBI's Position Statement on Street Furniture** highlights that people who are visually impaired often use permanent street furniture as a wayfinding tool to support independent travel, in addition to its practical purposes. If designed to be accessible and located appropriately, it can be used as a landmark or boundary on a route. Street furniture can also provide acoustic or visual references as an aid to orientation and navigation.

The **Irish Wheelchair Association's Best Practice Access Guidelines** recommends any street furniture provided should not intrude into the circulation route and should be clearly detectable by design and contrast against the background. Street furniture which can assist with route identification should be located in a line along or set back into the pavement or approach route.

## J. Charging Station Walking Aid Holder

Incorporating a walking aid holder to the charging station provides a convenient space for users to rest walking sticks or crutches. This facilitates the charging process as it allows users to use their hand(s) to grab the plug handle. The holder can also be used to hang excess cable, which can help the user manage a non-tethered cable easier. However, the holder should not obstruct the cable's ability to be pulled out.

National and International Best Practice

**Designability's Design Guidance for Accessible Electric Vehicle Charging** recommends and j cu" f gxgmqr gf "c"r tqvqv{ r g"y kvj "c"y cmmpi "ckf "j qnf gt0

## K. Emergency Stop Button

Fast-charging stations should feature a covered, clearly labelled, and easily identifiable emergency stop button. This button should be readily accessible in case of an emergency, allowing users to promptly halt the charging process. To prevent the activation of the emergency stop button during non-emergency situations, clear instructions around its appropriate use should be displayed. The provision of an auto-reset system will be confirmed following further consultation with charge point operators and following user testing.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR)**, Recital (39).

**Directive (EU) 2019/882** of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services **(European Accessibility Act)**.

**S.I. No. 636 of 2023** EU Accessibility Requirements of Products and Standards Regulation 2023, Schedule 1, Part 1:

- Paragraph 1(a); and
- Paragraph 2(h).

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 5 Diversity of users and design considerations, Paragraph 5.2.4 Physical abilities and characteristics.

National and International Best Practice

The **PAS 1899:2022** recommends an emergency stop button on the charging station.

## L. Component Labelling

Clear, readable and consistent labelling of key features on the charging station, including the connection type, payment system, and emergency stop button should be included. Charging stations should also be numbered to be clearly identified by users.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR),** Article 19: User information, Paragraph 5.

**Directive (EU) 2019/882** of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services **(European Accessibility Act)**.

**S.I. No. 636 of 2023** EU Accessibility Requirements of Products and Standards Regulation 2023, Schedule 1, Part 1, Paragraph 1(a).

**I.S. EN 17186:2019&LC:2019** Identification of vehicles and infrastructures compatibility – Graphical expression for consumer information on EV power supply.

National and International Best Practice

The **PAS 1899:2022** recommends a clear label to indicate the type of connector.

## M. Charging Station Footwell

A space for knee and toe clearance should be provided at the base of the charging station to accommodate users of wheeled mobility devices.

Standards and Statutory Instruments

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 5 Diversity of users and design considerations and Section 13 User interface, controls and switches:

- Paragraph 5.3.8 Accessible and usable equipment and facilities; and
- Paragraph 13.3.2 Manoeuvring space.

**Building Regulations - Technical Guidance Document M 2022 - Access and use.**

National and International Best Practice

The **Irish Wheelchair Association's Best Practice Access Guidelines** recommends a footwell giving 300mm height clearance for wheelchair footplates to the base of the charging point to allow a person using a wheelchair to have a front-on close approach to the charging point.

## 6.2 Site Design

This section covers aspects related to the Universal Design of the environment around the charging station. These Guidelines will assist planners, designers and installers of electric vehicle (EV) charging infrastructure in developing more universally designed spaces. This section will enhance the user experiences of both EV drivers and passengers as well as other road users.

Each of the elements listed below has been identified as playing an important role in ensuring that an EV charging station is easy to use. For each of the elements, e.g. charging bay dimensions, ZEVI has proposed a recommendation based on European Standards (EN), Irish Standards (I.S.), Irish Statutory Instruments (S.I.), national and international best practice and research. Each recommendation is accompanied by corresponding references to these standards and research sources.

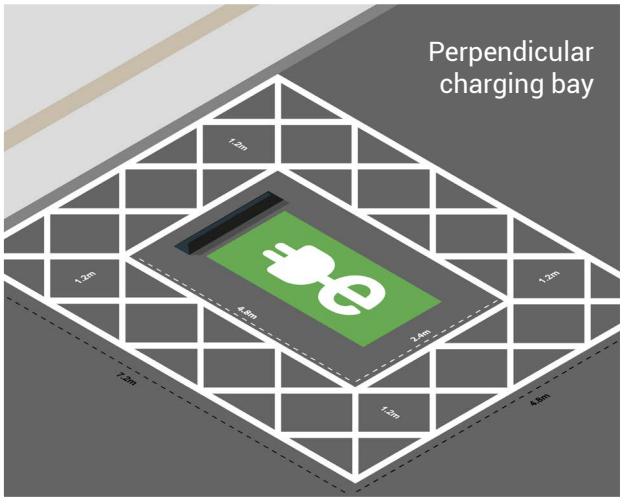
### Elements for Site Design

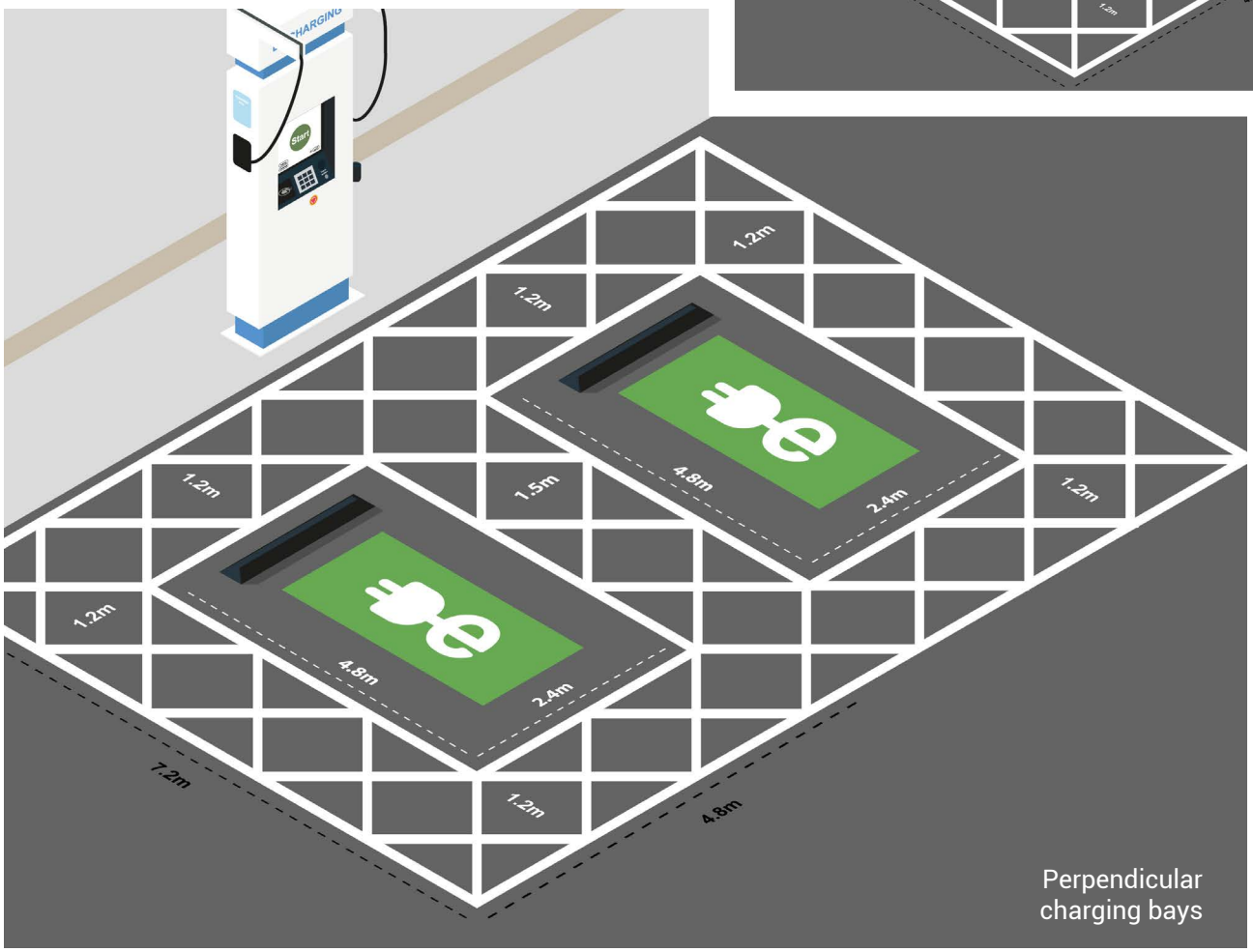
## A. Charging Bay Dimensions

The charging bay should be designed to accommodate all users to get in and out of their vehicles, move around the vehicle safely, access the charging station, and park comfortably. The proposed dimensions should not have any negative impact on existing footpaths or cycle lanes. This recommendation addresses the most common types of parking: perpendicular and parallel parking. These two examples can help inform design of other parking types.

### (A1) Perpendicular charging bay

To ensure universal access, the perpendicular charging bay's dimensions should be 4.8 metres by 7.2 metres, which includes a 1.2 metres access zone on both sides, in front and behind each bay. Where possible the 1.2 metres access zone should be increased to a 1.5 metres access zone between the charging bay and the charging station. For side-by-side charging bays, an appropriate access zone (1.5 to 1.8 metres) between charging bays should be provided.

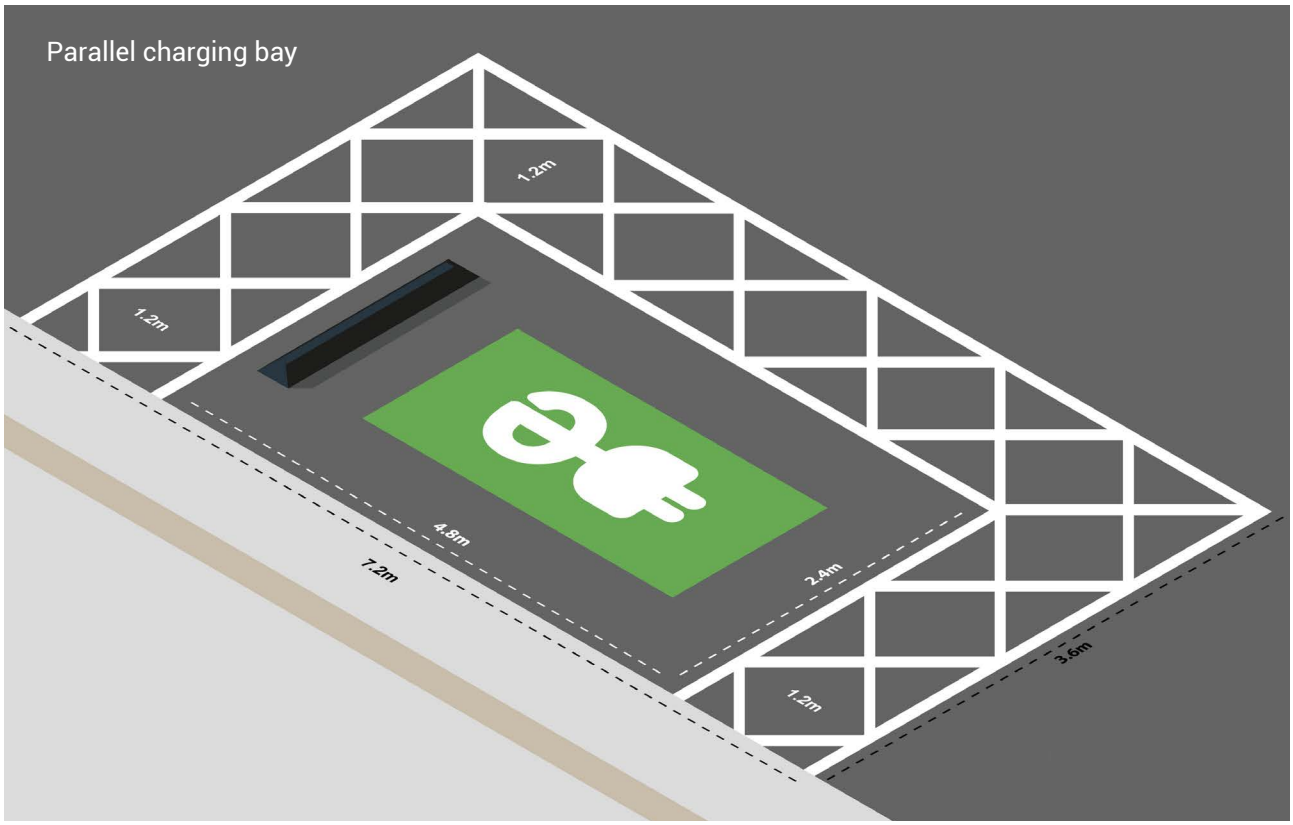


### (A2) Parallel charging bay

To ensure universal access, the parallel charging bay's dimensions should be 3.6 metres by 7.2 metres, which includes a 1.2 metres access zone in the front, back, and along the roadside of the charging bay.

Where the space permits, the access zone of 1.2 metres around the charging bay should be increased to 1.5 metres.




Standards and Statutory Instruments

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 8 Boarding points/Set-down points and Section 20 Transport facilities:

- Paragraph 8.5 Design of designated accessible parking space; and
- Paragraph 20.10 Service stations.

**Traffic Signs Manual.**

National and International Best Practice

The **Irish Wheelchair Association** suggests all charging stations for EVs should include a standard designated accessible charging bay with level access to charging equipment and including a 1.2 metres, but preferably a 1.5 metres, access zone between the vehicle and the charging station, to allow sufficient space for a person who is a wheelchair user to manoeuvre and gain access to the charging equipment and to the vehicle connection point.

The **PAS 1899:2022** recommends a minimum barrier of 1.2 metres between the vehicle and the charging station. A minimum space of 1.8 metres would enable a wheelchair to turn through a 180° angle.

## B. Charging Bay Positioning

The charging bay should be in an area where there is enough space for manoeuvring while parking. This will make it easier for users to park their vehicles and access the charging point. Where required, the charging bay should incorporate a designated queuing area, complete with clearly visible signage, to ensure safety while awaiting the charging process. If there is a charging station that serves multiple charging bays, it should be located in the middle between both bays, outside of the 1.2 metres access zone.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR)**, Recital (38).

National and International Best Practice

**Motability's Scoping and Discovery Report: Accessible EV Charging**, recommends the site design should consider varying vehicle socket location, therefore providing ample space for different parking orientations to safely manoeuvre and charge the vehicle.

## C. Ground Surface Materials

The charging station must be installed on a flat, stable, and non-sloping surface with adequate grip. Differential surfacing should be applied in the immediate vicinity of the charging station to inform orientation and presence of the obstacle. An appropriate slope of 1:40 should be provided underneath the charging station to ensure adequate drainage, and water drainage facilities should be in place to prevent puddles from forming around the charging station.

Standards and Statutory Instruments

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 8 Boarding points/Set-down points, Paragraph 8.9 Surface.

**Building Regulations Technical Guidance Document M 2022 Access and Use:**

- 1.1.3 Access Routes;
- 1.1.3.1 General (j);
- 1.1.3.1 General (k); and
- 1.1.5 On–Site Car Parking (i).

National and International Best Practice

**Design Manual for Urban Roads and Streets (DMURS),** Advice Note 2 Materials and Specifications.

**The Irish Wheelchair Association** recommends that the bays should be on firm and level surfaces with a maximum crossfall of 1:50. Avoid the use of inappropriate materials such as gravel, sand, cobbles, etc.

The **National Disability Authority's (NDA's) Building for Everyone: A Universal Design Approach** recommends a dry friction coefficient (surface friction) between 35 and 45 (PTV).

The **Einfach laden ohne Hindernisse** recommends that the access areas around the charging station are firm, even, can be rolled over with low vibration, and are slip-resistant for barrier-free use.

**The PAS 1899:2022** recommends that the gradient should not be steeper than 1:50.

## D. Ground Surface Height Differences

The charging station should be positioned on the same level as the charging bay to allow for easy access. However, where height differences are unavoidable, disabled access such as kerb drops and ramps built following existing regulations should be provided. Drainage infrastructure should not be placed in a way that it inhibits access to the charging station. The charging station should not have any negative impact on existing footpaths or cycle lanes.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR),** Recital (38).

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 8 Boarding points/Set-down points: Paragraph 8.8 Access from parking space to an adjacent higher pedestrian path.

**Building Regulations - Technical Guidance Document M 2022 - Access and use.**

National and International Best Practice

The **Irish Wheelchair Association's Best Practice Access Guidelines** recommends installing a kerb with a slip resistant surface with a minimum width of 1.2 metres and a gradient no steeper than 1:12.

The **Irish Wheelchair Association's Best Practice Access Guidelines** recommends a common reach zone between 0.9 metres and 1.2 metres.

The **Einfach laden ohne Hindernisse** recommends a maximum longitudinal slope of 3% (1:33) and transverse slope of 2% (1:50).

The **Swedish Accessible Charging Station manual** suggests it is important to remove as many obstacles as possible, such as different surface levels.

## E. Removing Obstacles

Obstacles around the charging station should be removed. Any infrastructure such as wheel stops, bollards, safety barriers, drainage, or kerbs should be placed appropriately to allow adequate access to the charging station and avoid being an obstacle for other road users. Unmanaged cables (tethered or untethered) are a trip hazard and should not form an obstruction for other road users, including on footpaths and cycling lanes.

Standards and Statutory Instruments

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 7 Access in the outdoor environment, Paragraph 7.1.1 Rationale.

National and International Best Practice

**Design Manual for Urban Roads and Streets (DMURS).**

The **Irish Wheelchair Association's Best Practice Access Guidelines** recommends that street and pavement clutter should be avoided.

The **PAS 1899:2022** suggests that there should be no obstacles in front of the charging station, so that the reach distance is 0 metres.

## F. Access to Amenities

Charging stations should be installed as close as possible to any available amenities in the immediate vicinity, such as shops, toilets, cafes, or other services. Universally designed public seating in the vicinity of the charging station may be provided where this does not cause obstruction to individuals. Additionally, pedestrian crossings should be strategically placed near the charging stations to enhance safety for all road users.

Standards and Statutory Instruments

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 5 Diversity of users and design considerations:

- Paragraph 5.3 Key areas for accessibility and usability of the built environment; and
- Paragraph 5.3.3 Accessible and usable approach to a building.

National and International Best Practice

The **PAS 1899:2022** recommends building the charging station as near as possible to the amenities.

## G. Weather Protection

Adequate weather protection around the charging station and along access routes to nearby amenities or facilities would enhance user comfort. Weather protection should cover the charging station up to the vehicle's inlet, to ensure that adverse weather conditions have minimal impact on the user experience.

Standards and Statutory Instruments

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 7 Access in the outdoor environment:

- Paragraph 7.1.10 Headroom on accessible route; and
- Paragraph 7.1.15 Obstacles on accessible routes.

**Building Regulations - Technical Guidance Document M 2022 - Access and use.**

National and International Best Practice

The **ADA Accessibility Standards** recommends installing weather protection, security and adequate lighting at parking spaces.

## H. Safety Considerations

Ensuring a safe and secure charging environment is essential for all users. Charging should be in the most highly trafficked sections of a car park to facilitate passive surveillance and a feeling of safety for users. Sightlines to other users and nearby amenities should also be considered and charging infrastructure should be placed near facilities. Clearly visible security cameras with a direct view of the charging stations can help deter crime.

National and International Best Practice

The **PAS 1899:2022** recommends security cameras should be provided in the vicinity of public charging stations and particularly in the vicinity of public charging stations located at designated accessible parking bays. Security cameras should be visible such that it is obvious that an area containing public charging stations is protected by the security cameras and should be maintained in good working order for monitoring and maintenance.

## I. Lighting

Adequate and consistent lighting following relevant standards throughout different parts of the day is crucial. This will allow all users to safely navigate the environment surrounding the charger, use the equipment, and access the routes between the charging stations and nearby amenities. Furthermore, it is important to align the provision of lighting with environmental constraints, such as minimising light pollution.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR)**, Recital (39).

**Directive 2009/125/EC** of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products.

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 6 Wayfinding and Section 7 Access in the outdoor environment:

- Paragraph 6.3.4 Lighting and wayfinding; and
- Paragraph 7.1.14 Lighting on accessible routes.

**DN-LHT-03038** Design of Road Lighting for the National Road Network.

National and International Best Practice

The **Irish Wheelchair Association** suggests access routes to car and multi-purpose vehicle bays should be adequately illuminated with a recommended 150 lux level.

The **PAS 1899:2022** recommends lighting should be provided in the environment surrounding public charging station, to enable safe use of the charging station, as well as routes from the public charging station to any nearby venues or amenities.

## J. Site Access

Barriers or time restrictions that would prevent access to the charging station at any time of the day should be avoided (e.g., height restrictions). Measures should also be in place to ensure accessibility of ticketing machines within a closed/barrier-controlled parking area to prevent these becoming a barrier to using the charging station.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR),** Recital (12).

National and International Best Practice

The **Federal Highway Administration's National Electric Vehicle Infrastructure Standards and Requirements** recommends for the majority of stations to be accessible 24 hours per day, 7 days per week.

## K. Impact Protection

To ensure the safety and protection of the charging station from potential vehicle impact damage, impact protection measures such as wheel stops and/or bollards should be installed in high-risk areas. However, it is crucial to ensure that these measures do not obstruct road users or create obstacles for users to access and use the charging station (see Removing Obstacles). Additionally, they must be in contrast with the surrounding environment to avoid reflecting the light.

Standards and Statutory Instruments

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 7 Access in the outdoor environment:

- Paragraph 7.1.15 Obstacles on accessible routes (g);
- Paragraph 7.2 Street furniture;
- Paragraph 7.2.2 General (c);
- Paragraph 7.2.5 Contrast; and
- Paragraph 7.2.8 Bollards.

National and International Best Practice

The **PAS 1899:2022** recommends a distance between any impact protection barriers and a public charging station should not exceed 0.22 metres. The height of impact protections barriers should not exceed 0.6 metres.

The **PAS 1899:2022** recommends bollards should have a diameter not exceeding 0.1 metres and they should be at least 1 metre from the ground level. The minimum distance between bollards centres should be of 1.4 metres. The bollards should be located no more than 0.3 metres away from the charging station (either forward or to the side).

The **PAS 1899:2022** recommends where a wheel stop is installed within a designated accessible off-street parking bay, the installation of the wheel stop is provided with a minimum 0.9 metres clearance from the front of the parking space to the wheel stop (not including the access zone), and with a wheel stop of maximum width of 1.8 metres.

## L. Site Maintenance

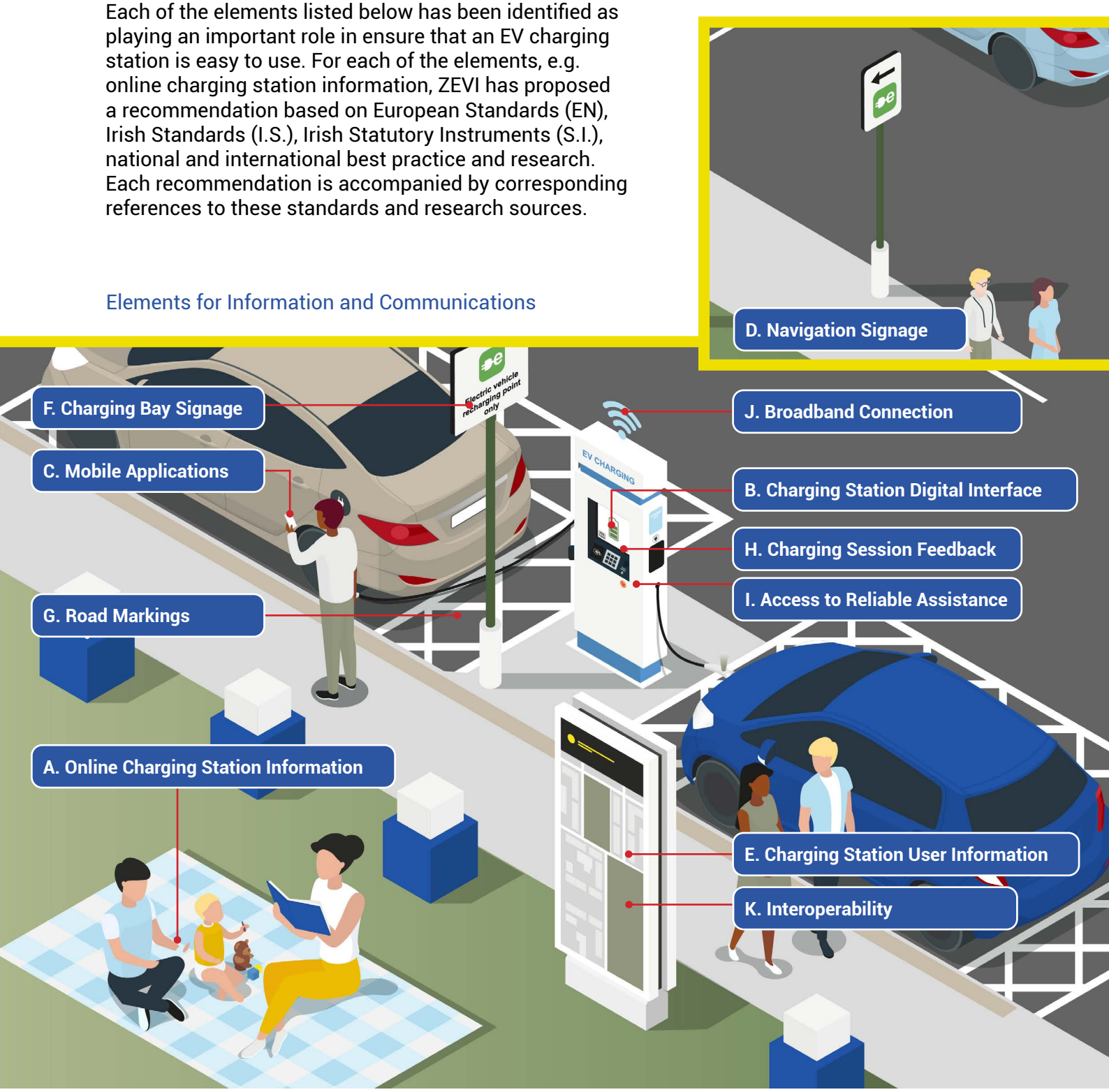
Charge point operators have a duty of care to ensure the safe and accessible use of the charging stations. Operators should ensure that EV charging infrastructure is kept in proper working condition throughout its commercial lifetime, and the quality and accessibility of charging stations maintained.

## 6.3 Information and Communications

This section covers aspects related to the information and communication associated with the electric vehicle (EV) charging process. These Guidelines will contribute to improving user awareness and experience before, during and after recharging. Additionally, this section will support charge point operators and government organisations in ensuring that clear, consistent and accessible information is available to the public.

Each of the elements listed below has been identified as playing an important role in ensure that an EV charging station is easy to use. For each of the elements, e.g. online charging station information, ZEVI has proposed a recommendation based on European Standards (EN), Irish Standards (I.S.), Irish Statutory Instruments (S.I.), national and international best practice and research. Each recommendation is accompanied by corresponding references to these standards and research sources.

### Elements for Information and Communications



## A. Online Charging Station Information

Providing dynamic and up-to-date information about charging stations remotely gives users greater confidence that they can use the stations before driving to the location. Some key considerations include the exact location of the charging station, booking options, power output, accessibility, charging costs, available payment types, charger availability, operational status, vehicle compatibility, language on the display and nearby facilities. This information should be publicly available and free of charge.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR),** Article 20: Data provisions.

National and International Best Practice

The **PAS 1899:2022** suggests that the provision of data and information regarding the locations and characteristics of public charging stations can assist drivers to plan their journeys in advance.

## B. Charging Station Digital Interface

Appropriate technology should be adopted to provide a seamless user experience. The charging station digital display should provide clear and simple instructions at every step of the charging process. The **text size** and buttons should be readable to all users, and visuals should be displayed in a high-contrast format, including commonly recognised symbols and images, where appropriate. Instructions should be in layperson's terms and **language options** should be available. Speech-based navigation and screen reader mode should be integrated to aid the user through the charging process. The interface should be integrated into a mobile application for those users who wish to download the provider's app.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR),** Recital (38).

**Directive (EU) 2019/882** of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services **(European Accessibility Act)**.

**S.I. No. 636 of 2023 EU** Accessibility Requirements of Products and Standards Regulation 2023.

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 13 User interface, controls and switches.

**I.S. EN 301549:2021** Accessibility requirements for ICT products and services.

National and International Best Practice

**Designability's Design Guidance for Accessible Electric Vehicle Charging** recommends that visual instructions, including in a smartphone app, should have clear layout, good contrast and large enough information to be read from the appropriate distance, following best practice in information design. When writing text instructions, consider that not everyone will have English as a first language, or be literate, so use symbols alongside text as an additional format. Be consistent and group information together to make it easier to take in.

## C. Mobile Applications

Mobile applications are a common way to support the charging process and improve the user experience by providing access to information before, during and after a charging session. Remote feedback during the charging process can help users avoid the need to repeatedly exit or return to their vehicle to check on the charge status or stop the charging process. To ensure access for all users, including foreign travellers, the app should be made available without any restrictions on download. Mobile applications, however, should not be a requirement to carry out the charging process.

Standards and Statutory Instruments

**Directive (EU) 2019/882** of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services **(European Accessibility Act)**.

**S.I. No. 636 of 2023** EU Accessibility Requirements of Products and Standards Regulation 2023.

National and International Best Practice

The **Einfach laden ohne Hindernisse** recommends that all functions of the charger (except charging cable) should be controllable via mobile application on a smartphone.

The **Federal Highway Administration's National Electric Vehicle Infrastructure Standards and Requirements** recommends information on publicly available EV charging infrastructure locations, pricing, real-time availability, and accessibility should be available through mapping applications.

## D. Navigation Signage

Clear, visible, and consistent signage should be displayed to help users locate charging stations, for instance, at the entrance of a car park.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR)**, Article 3: Targets for recharging infrastructure dedicated to light-duty electric vehicles, Paragraphs 6 and 7.

**Official Languages Act 2003.**

**Traffic Signs Manual.**

National and International Best Practice

**Designability's Design Guidance for Accessible Electric Vehicle Charging** recommends providing clear, consistent navigation signage from a site entrance to charging stations.

## E. Charging Station User Information

Key information should be provided to users by a combination of signage, digital display and via a mobile application, for users who wish to download the application. This includes information on how to use the charging station, whether parking charges apply, charging prices, connector and socket type, charging speed, customer service contact, correct use of the emergency stop button and potential time limits and overstay fees. Charging stations should also be numbered to be clearly identified by users, as recommended under Component Labelling.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR):**

- Article 19: User information; and
- Article 20: Data provisions.

## F. Charging Bay Signage

To ensure that users are well-informed, signage at the charging station should include clear and comprehensive information about the charging bay. Signage should be installed at an appropriate height and supplement road markings.

Standards and Statutory Instruments

**I.S. EN 17210:2021 & LC:2021** Accessibility and usability of the built environment, Section 6 Wayfinding, Paragraph 6.6 Signage.

**Traffic Signs Manual.**

National and International Best Practice

The **Swedish Accessible Charging Station manual** suggests it is important that information about the charging is clear and easy for everyone to understand. Position the information so that it can be read by both seated and standing users of different heights.

## G. Road Markings

Road markings should indicate the boundaries of both on-street and off-street charging bays. To differentiate with regular parking bays, the **standardised** white 'EV' symbol on a green background should be prominently displayed. The surrounding access zone should be hatched in white.

Standards and Statutory Instruments

**Traffic Signs Manual.**

National and International Best Practice

**Design Manual for Urban Roads and Streets (DMURS).**

## H. Charging Session Feedback

Feedback during the charging process can help communicate to users what stage in the charging process their vehicle is at, provide confirmation that various actions were successful (e.g., when the connector is plugged in successfully, when the connector is ready to unplug, etc.), and confirm that the payment process was successful. Additionally, the charging station should provide clear next steps in case that the charging process fails (e.g., the next available charging station). Where light cues are used, these should be consistent across charge point operators and clearly visible even in daylight. These Guidelines recommend using three different colours to represent the three main charging stages: "operational," "charging is complete," and "possible issue", and a flashing light during the "charger in use" stage. Supplementary audio cues should be included to enhance inclusivity, and vibration cues should be avoided.

Standards and Statutory Instruments

**Directive (EU) 2019/882** of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services **(European Accessibility Act).**

**I.S. EN 301549:2021** Accessibility requirements for ICT products and services.

National and International Best Practice

The **PAS 1899:2022** points to research that recommends the following colours for the different operational stages: green indicates the device is operational; blue indicates the device is in use; red indicates the device is non-operational; and blue flashing indicates charging is finished.

## I. Access to Reliable Assistance

24/7 responsive assistance should be available via phone, text, voice command or a help button when in-person service is not available. Assistance should also be available through the provider's app for those users who wish to download it. Open channels should be in place for misuse reporting. Customer support should be accessible to all users and a customer service number should be clearly displayed on or near the charging station. Contact information for local emergency services should also be clearly displayed.

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR)**, Recital (39).

National and International Best Practice

The **PAS 1899:2022** suggests additional assistance at service areas should be provided.

## J. Broadband Connection

The charging location should have adequate broadband or mobile phone coverage to accommodate the use of mobile applications during the charging process.

National and International Best Practice

**Designability's User engagement report for Accessible EV charging** specifies smartphone apps may be unreliable for payment if adequate mobile phone signal is not available. This could be mitigated by providing mobile phone hotspots at the charging station.

## K. Interoperability

Charging stations should be interoperable in line with national and EU regulations. This means that all EV users should have the ability to use different charging stations regardless of the network operator. This provides users flexibility and convenience when charging their vehicles, as they can access a wide range of charging infrastructure without facing compatibility issues or restrictions. A separate data strategy is being developed by ZEVI to meet data related obligations as laid out under Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure (AFIR).

Standards and Statutory Instruments

**Regulation (EU) 2023/1804** of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure **(AFIR)**:

- Article 5: Recharging infrastructure;
- Article 20: Data provisions; and
- Article 21: Common technical specifications.

**I.S. EN ISO 15118-20:2022&LC:2022** Road vehicles – Vehicle to grid communication interface – Part 20: 2nd generation network layer and application layer requirements.

**I.S. EN IEC 63110-1:2022** Protocol for management of electric vehicles charging and discharging infrastructures - Part 1: Basic definitions, use cases and architectures.

**I.S. EN IEC 63119-2:2022** Information exchange for electric vehicle charging roaming service - Part 2: Use cases.

# 7. Next Steps

The Universal Design Guidelines provide a continuing framework for expanding access to more inclusive charging infrastructure across Ireland.

To ensure accessible electric vehicle (EV) charging infrastructure, and build on these Guidelines, the following actions are now proposed:

## User Testing

Undergo user testing following the publication of the Universal Design Guidelines. The user testing will involve interviewing real users as they interact with EV charging infrastructure.

## Republish Guidelines

Modify the Guidelines if necessary and republish them based on the feedback obtained through the user testing.

## Iterative Review of the Guidelines

Update the Guidelines as an iterative process through which the contents will be refined where appropriate and in accordance with new European Standards, Irish Standards, Irish Statutory Instruments, regulations and emerging technologies.

## Acknowledgements

ZEVI would like to give a special thank you to all the people who shared their knowledge and experience to inform the development of the Universal Design Guidelines. ZEVI is looking forward to continuing to engage with you in the next phases.

**Zero Emissions Vehicles Ireland**
Leeson Lane,
Dublin 2,
Ireland
D02 TR60

**Email:** info@zevi.gov.ie

# Appendix A
# **Case Studies**

**Universal Design Guidelines for Electric Vehicle Charging Infrastructure**

# Appendix A – Case Studies

As part of the process to identify international best practices, case studies from various countries were examined to gain insights into existing charging infrastructure. By including practical examples, this study aims to provide tangible evidence of potential ways to implement accessible charging stations. Please find a selection of case studies below.

## GRIDSERVE Electric Forecourt Norwich, UK (2022)


### Background

The GRIDSERVE Electric Forecourt in Norwich is a state-of-the-art charging facility for EVs. It offers 36 charging bays, including fast and accessible charging stations, with a user-friendly screen interface and card reader. The facility also provides different payment methods, including contactless, and a management system to avoid cable obstructions on footpaths. The charging bays are conveniently located near amenities, and the environment is well-lit for user safety. The facility also provides 24/7 support with a dedicated hotline.

### Key Learnings

- The facility provides covered parking, although it does not include sheltered access to amenities.
- The dimensions of the disabled charging bays are adequate, and the facility offers disabled access in and around the building.
- The environment is well-lit, enhancing the user experience and providing a sense of safety.

## Designability Charging Unit Prototype, UK (2022)

### Background

The Designability Charging Unit Prototype is an innovative design aimed at improving accessibility for EV charging for disabled users. The prototype includes a range of features such as easy-to-use interfaces, high visibility, and tactile elements to aid users with visual impairments. The unit's height and placement of the cable are adjustable to cater to different heights, and the charge socket is angled to make the connector easier to plug in. The unit's design also provides adequate space for disabled parking charging and ensures that there are no obstructions in the surrounding area. The prototype has undergone extensive testing and feedback to ensure it meets the needs of its users, making it a promising solution for accessible EV charging.

### Key Learnings

- The design of the handles is ergonomic, allowing users to handle the charger plug with ease.
- The cable management system can carry the weight of the cable, reducing the likelihood of accidents and making it easier for users to handle the cable.
- The screen interface, although relatively small, is simple and easy to use, providing a user-friendly experience.

## EvoEnergy HyperHubs, Monks Cross Park and Ride, York, UK (2022)

### Background

The City of York, in collaboration with Evo Energy, has established a HyperHubs charging station near Monks Cross Park and Ride in York. The facility features 30 fast charging points, 4 rapid charging points, and 4 ultra-rapid charging points.

### Key Learnings

- Obstacle-free charging bays with easy door access ensuring accessibility of the charging stations.
- A simple screen interface, card reader, and RFID reader at an accessible height caters to the needs of both standing and sitting users.
- Charging cables are not heavy and are positioned in a way that does not create obstacles, which contributes to a more inclusive and user-friendly charging experience.

# Appendix B
# **Reviewed Documentation**

**Universal Design Guidelines for Electric Vehicle Charging Infrastructure**

# Appendix B – Reviewed Documentation

## Standards and Statutory Instruments

The table below provides an overview of the relevant European Standards, Irish Standards and/or Irish Statutory Instruments.

Publications followed by an asterisk (*) require purchase.

| Publication | Document Type | Author | Region Year | Description |
|---|---|---|---|---|
| Building Regulations - Technical Guidance Document M 2022- Access and use | Irish Regulations | Department of Housing, Local Government, and Heritage | Ireland 2022 | This document outlines regulations related to access and use for both dwellings and non-dwellings. It covers various aspects, including entrances, circulation spaces, sanitary facilities, and more. |
| Design of Road Lighting for the Strategic Motorway and All-Purpose Trunk Road Network (TII Publication Title) DN-LHT-03038 (TII Publication number) | TII Standard | Transport Infrastructure Ireland (TII) | Ireland 2012 | This standard contains requirements and guidance for the design of road lighting systems on the National Road network. The lighting on Regional and Local roads that form part of a National Road scheme shall also be developed in accordance with this standard. |
| Directive (EU) 2019/882 of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services (European Accessibility Act) | Directive | European Parliament and Council of the EU | European Union 2019 | The Directive aims to enhance the proper functioning of the internal market by harmonising accessibility requirements for certain products and services across EU Member States. By eliminating barriers to the free movement of accessible products and services, it increases availability and improves access to relevant information. |
| Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products | Directive | European Parliament and Council of the EU | European Union 2009 | This Directive establishes a framework for minimum eco-design requirements that energy-consuming goods must meet before they can be used or sold in the EU. It aims to enhance environmental sustainability by setting performance and information requirements for almost all categories of physical goods placed on the EU market. |
| I.S. EN 301549:2021 Accessibility requirements for ICT products and services* | Standard | National Standards Authority of Ireland | Ireland 2021 | This standard sets forth functional accessibility requirements applicable to information and communication technology products and services. Specifically, it addresses accessibility aspects related to websites and mobile applications. The standard ensures that these digital platforms are designed to be inclusive and usable by all, including people with disabilities. By providing a clear evaluation methodology and test procedures, it facilitates public procurement within Europe. |
| I.S. EN 17186:2019&LC:2019 Identification of vehicles and infrastructures compatibility – Graphical expression for consumer information on EV power supply* | Standard | National Standards Authority of Ireland | Ireland 2019 | This standard establishes uniform identifiers for EV power supply. It focuses on creating a consistent graphical expression for consumer information related to compatibility between charging stations, cable assemblies, and EVs in the market. By defining size, shape, colour, and label location, it enhances user understanding and accessibility. |

| Publication | Document Type | Author | Region Year | Description |
|---|---|---|---|---|
| I.S. EN 17210:2021 & LC:2021 Accessibility and usability of the built environment* | Standard | National Standards Authority of Ireland | Ireland 2021 | This document sets out functional requirements for the accessibility and usability of the built environment. It aims to inform those that design, procure and build environments for both private and public settings that are inclusive, sustainable, and meet policy and legislation requirements. The standard follows Universal Design principles to facilitate equitable and safe use for a wide range of users, including persons with disabilities. |
| I.S. EN IEC 62196-1:2022 Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles* | Standard | National Standards Authority of Ireland | Ireland 2022 | This standard establishes uniform identifiers for EV power supply. Specifically, it focuses on creating a consistent graphical expression for consumer information related to compatibility between charging stations, cable assemblies, and EVs in the market. By defining size, shape, colour, and label location, it enhances user understanding and accessibility. |
| I.S. EN IEC 63110-1:2022 Protocol for management of electric vehicles charging and discharging infrastructures - Part 1: Basic definitions, use cases and architectures* | Standard | National Standards Authority of Ireland | Ireland 2022 | This document provides definitions, use cases, and architectural considerations for managing EV charging and discharging infrastructure. It outlines the general requirements for establishing an e-mobility ecosystem, including communication flows among various e-mobility actors and data flows with the electric power system. |
| I.S. EN IEC 63119-2:2022 Information exchange for electric vehicle charging roaming service - Part 2: Use cases* | Standard | National Standards Authority of Ireland | Ireland 2022 | This standard specifies roaming use cases of information exchange between EV charging service providers, charge point operators (CPOs) and clearing house platforms through roaming endpoints. |
| I.S. EN ISO 15118-20:2022&LC:2022 Road vehicles – Vehicle to grid communication interface – Part 20: 2nd generation network layer and application layer requirements* | Standard | National Standards Authority of Ireland | Ireland 2022 | This standard specifies the communication between the EV, including battery EV, and plug-in hybrid EV, and the EV supply equipment. This document defines the communication messages and sequence requirements for bidirectional power transfer. It furthermore defines requirements of wireless communication for both conductive charging and wireless charging as well as communication requirements for automatic connection device and information services about charging and control status. |
| Official Languages Act 2003 | Act | Government of Ireland | Ireland 2003 | This document aims to ensure the improved provision of public services through the Irish language. It is intended to promote the use of Irish for official purposes in the State and sets out the duties of public bodies in relation to the official languages of the State (i.e., Irish and English). |
| Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure (AFIR) | Regulation | European Parliament and Council of the EU | European Union 2023 | This Regulation establishes mandatory national targets leading to the deployment of alternative fuels infrastructure in the European Union (EU) for road vehicles, trains, vessels and stationary aircraft. The Regulation also establishes common technical specifications and requirements regarding the information to vehicle users for the provision of data and payment requirements. |
| S.I. No. 636 of 2023 EU Accessibility Requirements of Products and Standards Regulation 2023 | Regulation | Office of Public Works | Ireland 2023 | This regulation outlines requirements aimed at ensuring accessibility for products and services. |
| Traffic Signs Manual | Manual | Department of Transport (DoT) | Ireland 2019 -2022 | This document provides details of the traffic signs which may be used on roads in Ireland, including their layout and symbols, the circumstances in which each sign may be used and rules for positioning them. |

## National and International Best Practices

The table below provides an overview of some relevant national and international best practice guidance and research.

| Publication | Document Type | Author | Region Year | Description |
|---|---|---|---|---|
| Accessible Charging: A Guide for Accessible Charging Inputs from Sweden, Switzerland, USA and Germany | Technical Guidance | Swiss Paraplegic Association and European Spinal Cord Injury Federation | Switzerland 2022 | This document provides a summary overview of multiple national accessibility requirements for EV charging infrastructure. This includes Switzerland, Sweden, USA and Germany. |
| Accessible Charging Stations: Practical advice on designing inclusive charging stations | Technical Guidance | Region Jämtland Härjedalen and BioFuel | Sweden 2022 | This guide helps installers of charging stations in Sweden to design EV charging infrastructure in a more accessible way and to choose equipment that is easy to use. |
| Americans with Disabilities Act (ADA) | Standards | U.S. Department of Justice (DOJ) and the Department of Transport | United States 2010 | The Americans with Disabilities Act (ADA) sets accessibility standards for places of public accommodation, commercial facilities, and state and local government facilities in new construction, alterations, and additions. The standards are based on minimum guidelines set by the U.S. Access Board. |
| Building for Everyone: A Universal Design Approach | Technical Guidance | National Disability Authority (NDA) | Ireland 2012 | This document provides comprehensive best practice guidance on how to design, build and manage buildings and spaces so that they can be readily accessed and used by everyone, regardless of age, size ability or disability. |
| Design Manual for Urban Roads and Streets (DMURS) | Technical Guidance | Department of Transport, Tourism, and Sport, | Ireland 2013 | This document aims to transform streets from mere traffic corridors into vibrant spaces where people want to live and spend time. DMURS emphasises highly connected streets that allow easy walking and cycling to key destinations, safety and comfort for pedestrians and cyclists of all ages, and the creation of attractive and lively communities. It replaces existing national design standards and is mandatory for all road authorities in urban areas (except where specified). |
| Design Recommendations for Accessible Electric Vehicle Charging Stations | Technical Guidance | U.S. Access Board | United States 2022 | The ADA and ABA Accessibility Standards contain requirements applicable to EV charging stations, and regulated entities must ensure that they are accessible to and usable by individuals with disabilities. The document also addresses the accessibility of user interfaces and payment systems that may be considered in information and communication technology. |
| Design considerations for electric vehicle charge points | Technical Guidance | Office for Zero Emissions Vehicles (OZEV) | United Kingdom 2022 | This document builds on the learnings from the charge point design concept project and outlines design considerations for organisations installing charge points. It aims to help organisations think through the role of design in creating a positive experience for both consumers and those using the wider environment, such as pedestrians. |
| Design Guidance: Accessible EV Charging | Technical Guidance | Designability | United Kingdom 2022 | This document compiles extensive evidence concerning the inaccessible elements of current public EV charging and proposes detailed descriptions of their developed prototypes to illustrate the impact of good and bad design on real people. The guidance is aimed at anyone involved in, or responsible for, planning, procuring, designing, manufacturing, or installing public EV charging points. |

| Publication | Document Type | Author | Region Year | Description |
|---|---|---|---|---|
| Einfach laden ohne Hindernisse (nationale-leitstelle.de) | Technical Guidance | Nationale Leitstelle Ladeinfrastruk tur | Germany 2023 | The document provides guidelines on barrier-free charging infrastructure for tendering, commissioning, and regulating/ administrating institutions as well as for manufacturers and operators of charging infrastructure. The guidelines will serve as a basis for the development of accessibility requirements for public charging infrastructure in Germany. |
| Electric Vehicle Charging Stations | Technical Guidance | Division of the Sate Architect (DSA) | United States 2020 | The report discusses accessibility regulations for EV charging stations in California. It outlines requirements for the location, accessibility, and operability of EV charging stations in accordance with the Americans with Disabilities Act (ADA) and California Building Code (CBC). |
| Electric Vehicle Charging Infrastructure for People Living with Disabilities | Research Report | Ricardo Energy & Environment (commissioned by Motability) | United Kingdom 2020 | This report examines the accessibility challenges that disabled people are expected to face with existing EV charging infrastructure; the scale of these issues; and how they might be solved. The findings included key considerations on disabled users and charging point technology aimed at solving the identified issues with the charging points. |
| Enable Report | Research Report | UK Power Networks in collaboration with Ricardo and Motability | United Kingdom 2022 | This report explores available data and evidence to identify the needs of disabled motorists with respect to on-street charging, the location of disabled bays and the impact of their electrification on the UK charging network. The key findings, recommended the action plan for UK Power Networks and potential for further trials were presented to local authorities, charge point operators and other interested stakeholders. |
| Guidelines for Electric Vehicle Charging Infrastructure on Council Land | Technical Guidance | City of Parramatta | Australia 2022 | The guidelines outline the principles for planning EV charging infrastructure on public land and to support the selection of the correct type of infrastructure at the right location. This provides guidance for the provision, installation, management, maintenance, and removal of EV charging infrastructure on public land in the City of Parramatta Local Government Area. |
| Irish Wheelchair Association's Best Practice Access Guidelines | Technical Guidance | Irish Wheelchair Association | Ireland 2020 | The guidelines set the standard for accessibility in Ireland across construction, housing, public amenities, retail, tourism, hospitality and sport. They urge those involved in planning, building and design to adopt them so that all people with disabilities can live the life they choose. |
| National Electric Vehicle Infrastructure Standards and Requirements | Standards | Federal Highway Administration | United States 2023 | The National Electric Vehicle Infrastructure Standards and Requirements mandates minimum specifications for EV infrastructure projects, funded under the National Electric Vehicle Infrastructure (NEVI) Formula Program, and construction of publicly accessible EV chargers under certain statutory authorities. The regulations encompass the installation, operation, and maintenance of EV charging infrastructure, data submission format and schedule, network connectivity, as well as publicly available information regarding EV charging infrastructure locations, pricing, availability, and accessibility through mapping applications. |
| PAS 1899:2022 | Standards | Motability and OZEV | United Kingdom 2022 | PAS 1899:2022 is an accessibility standard developed by the British Standards Institution (BSI). It provides essential specifications for designers, procurers, and installers to create accessible public charge points for EVs. |

| Publication | Document Type | Author | Region Year | Description |
|---|---|---|---|---|
| Rollstuhlgerechte Ladeplaetze | Technical Guidance | Die Schweizer Fachstelle | Switzerland 2021 | This guidance document supports planners and operators in choosing a suitable concept for planning and implementing accessibility. |
| Scoping and Discovery Report -Accessible EV Charging | Research Report | Motability and Designability | United Kingdom 2021 | This report outlines the scoping and discovery work carried out by Designability in preparation for a future phase of user engagement, as part of their project with Motability to make EV charging accessible for disabled drivers, passengers, and pedestrians. The research focused on the usability of current EV charging infrastructure and hardware, identifying groups within the disabled population who should be prioritised in user testing, aspects of charging components and built environment to prioritise, and types of infrastructure to consider when proposing potential design solutions and guidance. |
| Street Furniture - NCBI Position Statement | Technical Guidance | Vision Ireland (formerly NCBI) | Ireland 2022 | This statement outlines the NCBI position on street furniture. Street furniture serves various purposes, including providing seating for pedestrians, directing people to places of interest through signage, and offering bus shelters for waiting travellers. When thoughtfully designed and appropriately placed, street furniture can enhance the streetscape and support independent travel for people who are blind or have vision impaired. It can serve as a wayfinding tool, a landmark, or an acoustic and visual reference for orientation and navigation. |
| User Engagement Report - Accessible EV Charging | Research Report | Motability and Designability | United Kingdom 2021 | Designability conducted user engagement research with 87 Motability Scheme customers to gather detailed insights into their experiences and views on the EV charging process, public charging provision, and related topics. |
| VVI Planners' Checklist for Accessible Streetscapes – Voice of Vision Impairment | Technical Guidance | Voice of Vision Impairment (VVI) | Ireland 2024 | This checklist is based on the principles set out in VVI's 'Manual of Accessible Planning for Pedestrians', with some recent additions which have resulted from the lived experience of VVI members. It is based on the Human Rights approach, including the principles of universal access, and lays out key considerations for disability-proofing streetscapes and other built environment. |

# Appendix C
# **Stakeholder Engagement**

**Universal Design Guidelines for Electric Vehicle Charging Infrastructure**

# Appendix C – Stakeholder Engagement

Stakeholder engagement has played a crucial role in the development of the Universal Design Guidelines for EV Charging Infrastructure. The purpose of this engagement has been to:

- Involve key stakeholders from the early stages in the development of the document;
- Gather additional information on EV charging infrastructure requirements based on user experiences and needs; and
- Obtain feedback and agreement on the content of the Guidelines.

The stakeholder engagement process has been divided into two main phases: engagement prior to the public consultation and engagement afterwards.

## Phase 1: Stakeholder Engagement Pre-Public Consultation

The initial input has been collected through interviews with representatives of identified organisations and by distributing a survey among Disabled Persons Organisation (DPOs) and disability associations, and charge point operators.

The following is the full list of stakeholders who were engaged, either through calls, surveys, or both:

### National Stakeholders

Irish Electric Vehicle Association (IEVA)
NTA Transport Users Advisory Group
NTA Community Pillar
Dún Laoghaire-Rathdown County Council
Irish Parking Association (IPA)

### International Accessibility Experts

Motability UK
Charge Safe

### Disabled Persons Organisations (DPOs) , In accordance with the Convention on the Rights of Persons with Disabilities (CRPD).

Voice of Vision Impairment (VVI)
Disabled Women Ireland (DWI)
Irish Deaf Society
National Platform of Self-Advocates
Invisible Disability Ireland

## Disability Associations

Disabled Drivers Association of Ireland (DDAI)
Irish Wheelchair Association (IWA)
Chime - National Charity for Deafness and Hearing Loss
Disability Federation of Ireland (DFI)
Central Remedial Clinic (CRC)
Vantastic
Galway Centre for Independent Living
Age Friendly Ireland
National Council for the Blind of Ireland (NCBI)

## Charge Point Operators (CPOs)

POWERSUB
Evbnb.ie
IONITY
ChargePoint
Q-Park Limited
APCOA Parking Ireland Limited
TSG Ireland
Ecars
Maverick EV Services
Fastned
EasyGo (CarCharger EV Limited)
Randridge Darkin Charging Solutions
Local Power Ltd
Circle K
GlenEV Technologies
ePower
Applegreen Electric
Flowbird Smart City
Gocharge
Go Eve Ltd
SSE
Weev
Blink Charging
EC Charging
Other (anonymous in survey)

## Stakeholder Engagement Process Pre-Public Consultation

The stakeholder engagement process pre-public consultation has consisted of four stages:

**1. Stakeholder identification:** a list of relevant stakeholders was identified. For this project, stakeholders are defined as any individual or group that:

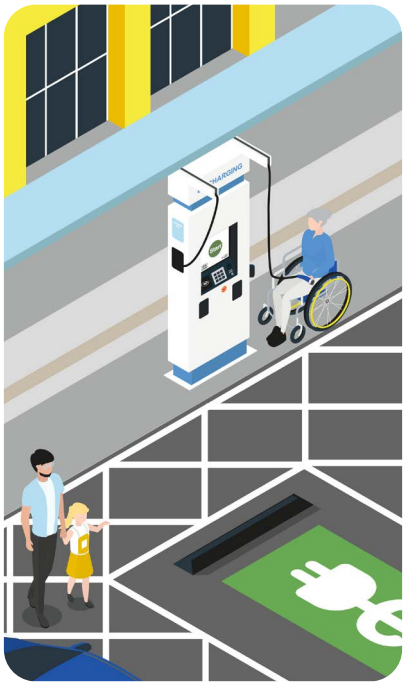
- May have an interest and/or influence in relation to the project;
- May have information and/or resources needed for the project; and
- Could be affected by or benefit from the project's delivery or outputs, directly and/or indirectly.

**2. Early stakeholder engagement:** individual calls with an initial group of stakeholders were set up (including DPOs, Irish disability organisations, other national stakeholders, and international accessibility experts) to raise awareness for this work, gather information on similar projects carried out internationally and obtain initial input on the accessibility requirements of different user groups.

**3. Second round of stakeholder engagement:** individual calls with a second group of stakeholders were set up (DPOs, Irish disability organisations and other national stakeholders) to obtain direct feedback on the content of the Guidelines and finalise the document before going to public consultation. Some of the stakeholders contacted in this phase had previously engaged with ZEVI as part of the early stakeholder engagement stage.

**4. Survey distribution:** a survey to DPOs and Irish disability associations was developed and distributed to further inform the content of the Guidelines. The survey allowed priority areas to be identified across Charge Point Design, Site Design and Information and Communications in EV charging infrastructure for user groups with different accessibility requirements. In addition, a survey was circulated among Charge Point Operators to identify their current awareness of Universal Design requirements for charging infrastructure.

## Pre-public Consultation Survey Results

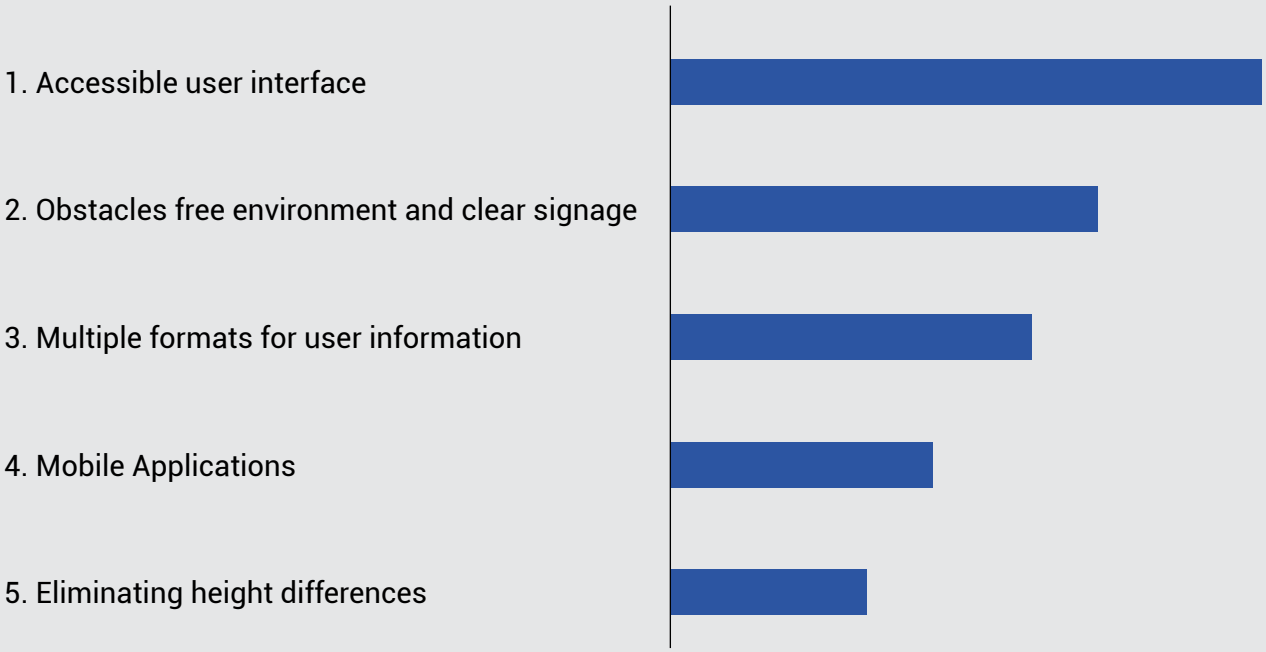


**DPOs and Irish disability associations**
Between the 22nd of March 2023 and the 7th of April 2023, a survey was distributed among DPOs and Irish disability associations to capture respondents' insights on their accessibility requirements regarding EV charging infrastructure and thus inform the development of these Guidelines.

In total, 43 responses were received from individuals with diverse accessibility needs. The respondents included both individuals who had previously charged and EV and individuals who had not.

Respondents were asked to rank (from 'Extremely important' to 'Extremely not important') how significant they considered different elements across Charging Station Design, Site Design and Information and Communications for them to be able to access and use an EV charge point.

## Top 5 Accessibility Concerns according to the DPOs and Irish Disability Associations survey



It was found that the accessibility of the user interface (e.g., used for payment, monitoring charging process, etc.) is the most prevalent concern for accessing and using EV charging infrastructure. The second most prevalent accessibility concerns were signage to navigate to the charging station (e.g., wayfinding, signage in the car park, etc.) and reducing obstacles in the environment around the charging station (e.g., bollards, bump stops, street furniture). The third most important accessibility concern respondents raised was the benefit of multiple formats for user information (e.g., voice instructions, visual displays). This was followed by having access to mobile applications for public charge points (e.g., for locating available charge points, to monitor charging process, etc.) and lastly eliminating height differences at the charging site (e.g., kerbs).

**Charge Point Operators (CPOs)**
Between the of 29th of March 2023 and the 25th of April 2023, a survey was circulated among CPOs to identify which aspects of accessibility they find most challenging to implement, what measures they have in place to facilitate accessibility of their charging stations and any additional suggestions to inform the development of the Guidelines.

In total, 25 responses were received from different CPOs.

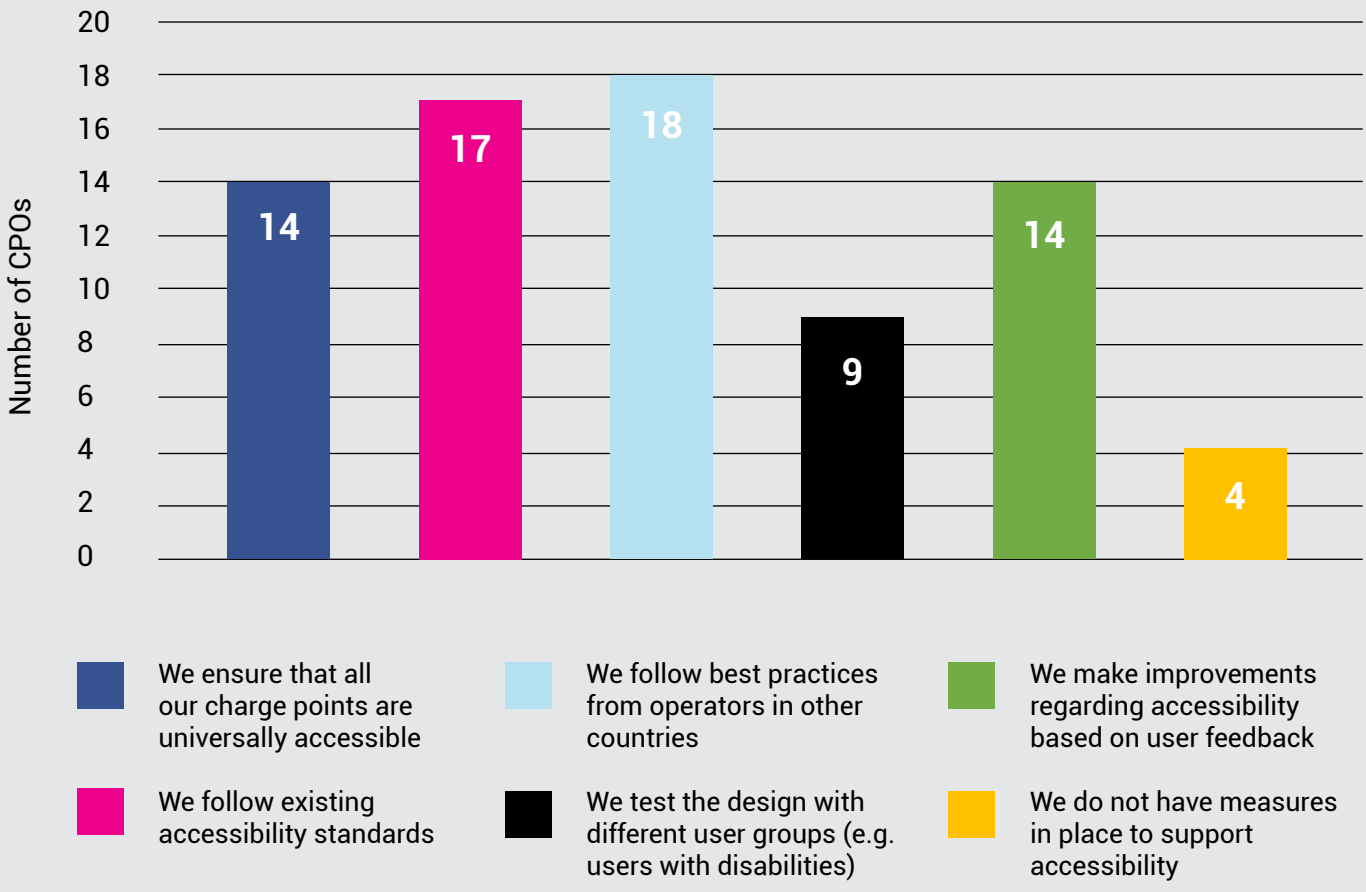
Generally, charge point operators perceived accessibility to be an important aspect of providing charging infrastructure. On a scale of one to five (one being low and five being high), on average charge point operators rated the importance of accessibility to be 4.44 out of 5.

When asked what the most challenging aspects to implement accessible charging infrastructure were, charge point operators responded that, on average, their primary concern was availability of adequate car parking space. This was followed by site accessibility requirements, charge point design constraints, and lastly, signage and information provision.

When asked which measures charge point operators had in place to support the accessibility of charging infrastructure in Ireland, the majority mentioned that they followed best practices from operators in other countries, while the minority stated that they do not have any measures in place to support accessibility.

## Measures in place to support accessibility by CPOs according to CPO survey.

Which of the following measures do you have in place to support the accessibility of your Electric Vehicle Charging Infrastructure (EVCI) in Ireland?

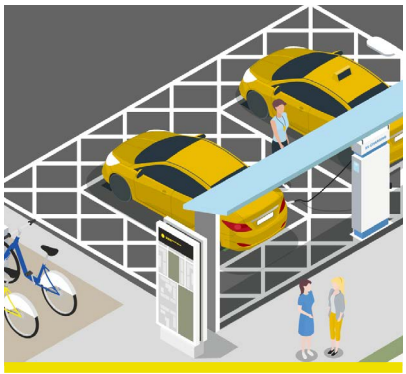


## Some further recommendations from charge point operators to enhance the accessibility of charging infrastructure included:

Avoid reverting to last generation access tools and incorporate new international standards such as 'Plug and Charge' (see Appendix D).

Where possible, harmonise with existing standards including the ADA in the U.S. and the PAS 1899:2022 in the UK.

Provide grant aid to ensure accessible charging infrastructure.



Facilitate diverse and interoperable payment methods.

Provide public parking spaces that accommodate both heavy duty vehicles and accessible vehicles.

Have a minimum of one accessible charging station available at every charging pool.


Make universally designed and accessible charging spaces available to all drivers to avoid empty bays.

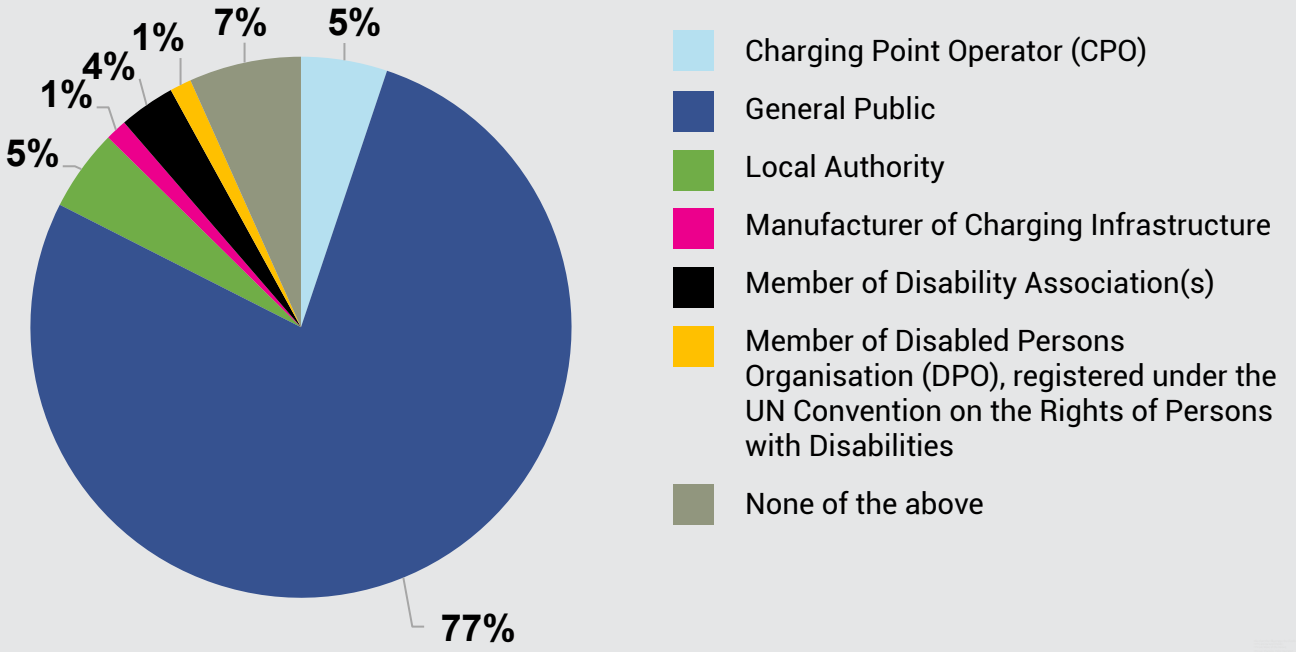
## Phase 2: Stakeholder engagement post-public consultation

ZEVI held a public consultation on the Guidelines with the objective to gather insights from the public and relevant stakeholders regarding the proposed content outlined in the Guidelines. An in-depth analysis has been carried out to ensure that the relevant input received is captured and utilised to update the contents of the Guidelines.

In total, ZEVI received 388 survey responses and 13 email responses from various user groups.

The survey user groups are presented in the pie chart below.

### Distribution of Total Survey Respondents by User Group




For more information on the public consultation, please refer to the **Public Consultation Summary Report.**

Following the public consultation, further input has been collected through meetings with the following organisations:

- National Disability Authority
- Department of Transport, in relation to Traffic Signs Manual and additional signage
- Local authorities

# Appendix D
# **Innovation in Charging**

**Universal Design Guidelines for Electric Vehicle Charging Infrastructure**

# Appendix D – Innovation in Charging

**In this section, some key innovations in charging are highlighted that may have significant implications for EV charging infrastructure users. As technology evolves, the Universal Design Guidelines for EV Charging Infrastructure will need to accommodate changes in the charging experience.**

**Battery Swap Technology:** Battery swap technology can improve the accessibility of EV charging infrastructure by providing more options for charging. Battery swap services can allow EV drivers to quickly exchange their depleted battery for a fully charged one, reducing charging time and eliminating range anxiety.

**Dynamic Wireless Charging:** Dynamic charging technology enables EVs to charge wirelessly while driving on the road, making charging more accessible for long-distance travel. This technology has the potential to eliminate the need for traditional charging infrastructure along highways and other major roads, making EV adoption more feasible and accessible.

**High-Power Charging:** High-power charging technology enables faster charging times for EVs. With high-power charging stations, EVs can be charged in a matter of minutes, making it more convenient for drivers on long journeys by reducing waiting times.

**Improved Battery Technology:** Battery technology advancements can have significant implications for EV charging infrastructure accessibility. Improved battery technology can increase the range of EVs, reducing the need for frequent charging.

**Inductive Charging:** This allows EVs to be charged without the need for cables, by using a wireless charging pad that is placed on the ground. Inductive charging would provide a more seamless and convenient charging experience for EV drivers, as they can simply park their vehicles over a wireless charging pad and the charging process will begin automatically.

**Lamppost Charging Station:** The lamppost charging station is an EV charging point integrated into existing street furniture, minimising both the physical and visual impacts on the urban streetscape. These innovative charging solution addresses accessibility barriers and enhance the convenience of EV charging for urban residents with on-street parking.

**Mobile Charging Units:** Mobile charging units are portable charging stations that can be brought to EVs that need a charge, making charging more accessible in remote or hard-to-reach areas. These units can be particularly useful in areas where fixed charging infrastructure is not available. These solutions can help address the challenge of vehicles parked in EV charging bays after having completed their charge and the impact of these occupied spaces on the availability of chargers.

**Plug and Charge:** Plug and charge is a technology that allows EV drivers to simply plug in their vehicle and start charging without the need for any additional steps such as authentication or payment. This can improve accessibility for those who may not be tech-savvy or may have difficulty using payment systems. It can also potentially reduce charging times and improve the overall charging experience.

**Robotics:** Robotics refers to the use of machines and robots to automate the process of charging EVs. This can lead to more efficient and faster charging times, as well as reduced costs for charging infrastructure. It can also potentially improve accessibility for those with physical disabilities who may have difficulty plugging in and unplugging the charging cable.

# Appendix E
# **Personas**

**Universal Design Guidelines for Electric Vehicle Charging Infrastructure**

# Appendix E – Personas

## The Jacksons, Tourist Family

**Age:** 42, 42, 8, 4
**Location:** Wild Atlantic Way

**Descriptor:** John and Janet Jackson and their two young children are on holidays in Ireland. They have rented an EV for the first time to travel around the country, both to cities and to rural areas. They drive the car every day during their trip.

**User needs:**

- Online charging station information: When travelling, John and Janet get a bit nervous about where they will be able to charge the vehicle. Being able to locate available charging stations in advance at their planned destinations is essential for them as they are not familiar with the EV charging system in Ireland.
- User information: When they get to the charging station, being able to see clear user information such as the price of charging and charging speed, makes the process seamless and convenient.
- Charging bay dimensions: For John and Janet, the charging space should be wide enough to safely open the doors fully on both sides of the vehicle to help their children in and out the car while staying clear from surrounding traffic.

## Tara Traynor, Taxi Driver

**Age:** 55
**Location:** Skibbereen, Cork

**Descriptor:** Tara drives a taxi for a living. She drives her EV around her local town and occasionally has to travel longer trips to other towns during the day. During busy periods she also picks up a few night shifts.

**User needs:**

- Check availability of charging stations: Tara wants to make sure that she always has a full charge to avoid turning down potential clients. Although she has access to home charging, being able to locate available charging stations multiple times during the day at different locations helps her reliably charge her vehicle on the go.
- Monitor charging status through a mobile application: Having remote feedback on her phone allows her keep track of her car's charging status while stretching her legs away from the vehicle. This allows her to use her time more efficiently so that she can get back to the car as soon as the charge is complete.
- Feeling safe: Since Tara sometimes works late at night, security at charging stations is extremely important. Tara finds charging stations with good lighting, security cameras and nearby amenities feel safer and more welcoming.

## Ruairi Reynolds, Rural Commuter

**Age:** 33
**Location:** Virginia, Cavan

**Descriptor:** Ruairi decided to purchase a second-hand EV which he uses to do the weekly grocery shopping, to go to work and to bring his daughter to extracurricular activities. He lives in Cavan and travels mostly at peak times in the morning and the evening.

**User needs:**

- Visual feedback: Ruairi uses hearing aids so when charging the vehicle, he cannot rely on audio feedback. Visual cues on the well-lit screen and charging station such as the green light around the cable when the connector is plugged in successfully help him navigate the charging process.
- Access to reliable assistance: Since Ruairi does not have access to home charging, he relies on the public network of charging stations. Because of his schedule, he tends to charge his EV outside of peak hours. Considering there are not many charging stations in his area, a phone number clearly displayed on the charging station ensures that he can access assistance via text in case something goes wrong during the charging session. This makes him feel confident that he will not be left stranded.
- Weight of cable: Ruairi recently injured his back which makes light, manoeuvrable cables and smooth connectors easier for him to charge his car without needing excessive force. Having the option to hold the plug handle with both hands is particularly helpful.

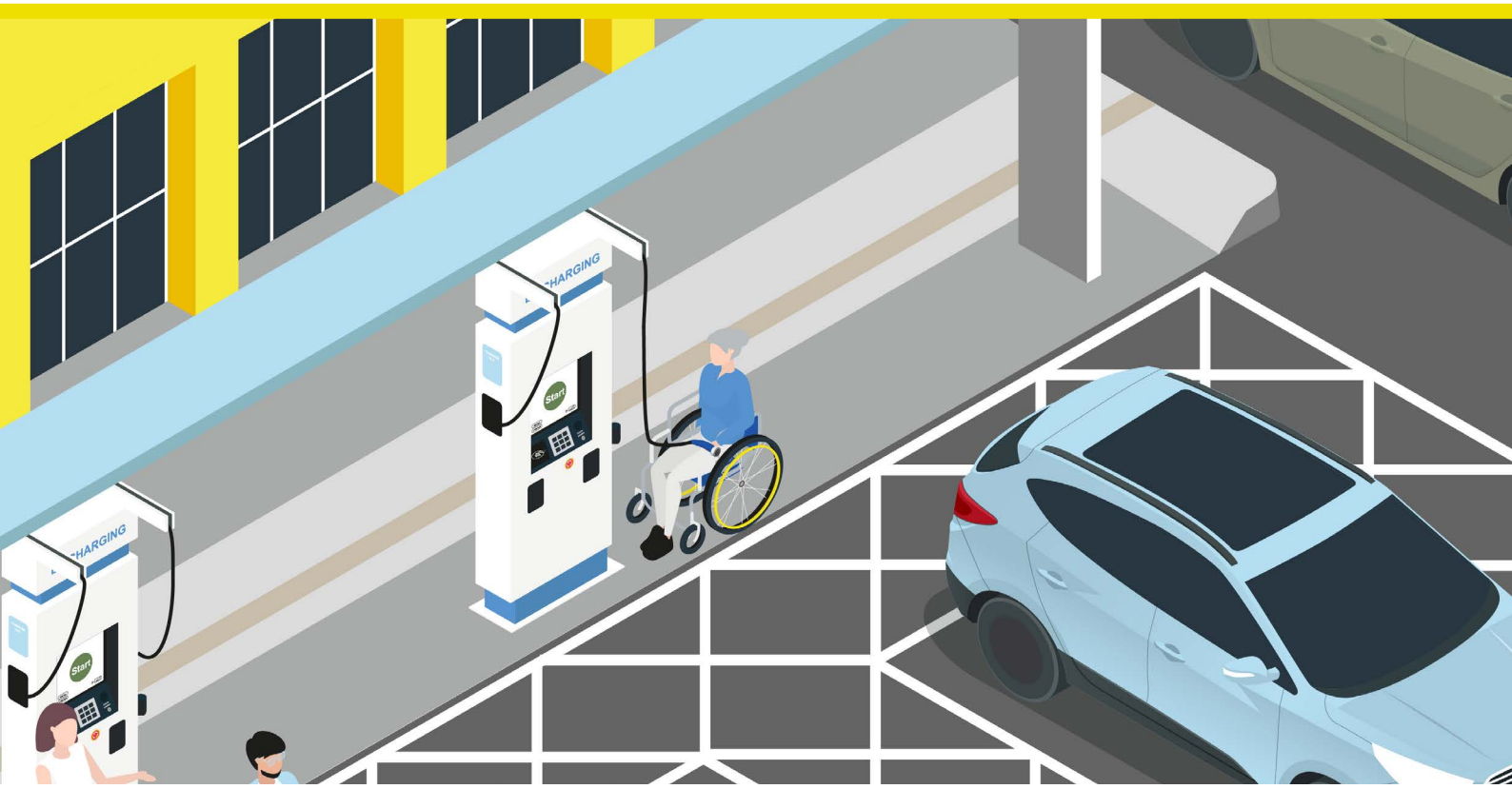
## Rachel Murphy, Retired Urban Dweller

**Age:** 67
**Location:** Clonmel

**Descriptor:** Rachel lives in Clonmel and owns her own EV. She usually travels to visit her brother in Waterford, and to specialist medical appointments in Cork. She is a wheelchair user, so she needs to make sure that facilities are accessible to her before using them, including checking the availability of accessible charging bays and level access to buildings.

**User needs:**

- Charging station height and screen: For Rachel, being able to reach the plug handle, interact with the screen and make the payment while remaining seated in her wheelchair is essential. An appropriate angle of the screen is highly useful to her as sun glare sometimes obstruct the visibility of the screen.
- Ground surface height differences and absence of obstacles: Dropped kerbs allow Rachel to move around the space with her wheelchair and get access to the charging station. The presence of kerbs would make it impossible for her to charge her vehicle independently. Another main aspect is that the impact collision bollards are installed close to the charging station, in a way that still allows her to be at a suitable reach distance from it.
- Weather protection: While visiting her doctor in Cork, Rachel charges her car in the medical facility's large car park. Because of the distance between the charging bay and the entrance to the clinic, having an overhead canopy shelters her from the rain along the access route.



## Caroline Connolly, Car Sharer

**Age:** 28
**Location:** Dublin

**Descriptor:** Caroline has recently signed up to a car-sharing app. To commute she usually relies on cycling and public transport, but she has decided to move apartments, so she needs a car to transport her belongings across the city. She also uses the car to do short trips around her area to shop for home furnishings.

**User needs:**

- Easily identify EV designated charging bays: When charging at larger EV charging stations in retail parks, Caroline finds upright signage and road markings such as the EV symbol particularly helpful, as she can easily see where she can charge the car.
- Cables and ground surface: Caroline is six months pregnant and fears tripping on untangled cables or other potential obstacles. Being able to easily manage the excess cable, for instance resting it on the walking aid holder incorporated on the side of the charging station, helps her charge her EV without any risks of falling. She also feels more secure when the ground surface is flat and slip resistant.
- Charging station digital interface and ad hoc payment methods: Being new to EVs, Caroline finds clear and simple step-by-step instructions on the charging station digital interface extremely helpful to ensure that she is charging the vehicle correctly. The possibility of being able to charge and pay at the different charging stations on an ad hoc basis, regardless of the provider, allows her to feel confident wherever she decides to go.

Rialtas na hÉireann
Government of Ireland

zevi

Zero Emission
Vehicles Ireland

**Address:** Leeson Lane, Dublin 2, Ireland, D02 TR60

**Email:** info@zevi.gov.ie