

Dear Colleague,

As many of you know, the International Organization for Standardization has accepted our proposal that there be an ISO standard drafted for *operating automated vehicles and devices at curbs (kerbs) and sidewalks*. A draft scope and purpose have been submitted, and our first committee meeting is scheduled for spring, 2020.

The draft formal name for this project is “*Sidewalk and Kerb Behaviour for Automated Vehicles: Arriving, Stopping, Parking, Waiting, and Loading*”, and is currently filed as: ISO/TC204/WG19/TR4448 with Bern Grush as its Project Leader. Technical Committee (TC) 204 is Intelligent Transport Systems.

Operating the sidewalk and curb is distinct from:

- *Coding the curb* (identifying and mapping — inventory — of what is at the curb), and
- *Managing the curb* (determining the use, purpose, rules, and permissions — i.e., regulating the activities at the curb).

Today *operating the sidewalk and curb* is handled through schedules, markings, signage, pricing, and regulated enforcement of activities at the curb). Each of these activities are currently mediated by a human who may be parking, waiting, riding, walking, sitting, standing, loading, delivering, removing garbage, plowing snow, washing windows, etc. at the sidewalk or curb. Furthermore, such humans may be using a wheelchair, have diminished hearing or vision or be otherwise disabled.

It is expected that soon, in addition to all these activities, operating at the curb will include robotic vehicles such as robotaxis and devices such as sidewalk drones, that will arrive, stop, park, wait and load under sensor, effector, and software control. Often unaccompanied by human passengers or attendants, these machines will need to be prioritized, scheduled, queued, bumped, and requeued regardless of the presence of human oversight, and all without blocking crosswalks, bicycle lanes, no stopping areas, or transit stops. These machines will need to communicate with each other, signal in ways that humans can interpret for safety, negotiate/grant right-of-way, move at appropriate speeds that will vary with circumstances, pass objects within given

tolerances and many more behaviours that we humans take for granted among ourselves when using sidewalks and curbs, including when we commit minor infractions that we are less likely to tolerate in the case of these machines.

Such blockfaces, when busy, will each be like a tiny, high-turnover, airport terminal. Hence the purpose of ISO TR4448.

Intended use cases for this standard might include:

Realtime assignment of loading bays to passenger vehicles and/or goods vehicles • Sharing/segregating slots among goods and people • Expressing/communicating time-allocations • Operational tolerances (times and distances) • Expressing/communicating speed limits on sidewalks • Adjusting tolerances, speeds, distances, limits • Expressing/communicating dynamic limits • How close may a drone pass a static entity? A machine entity? A human? • Handling peak demand for loading bays • How to queue • When can machines block traffic? • Pacing machines in traffic to arrive just-in-time (queuing in-motion) • Waiting in holding areas • Double parking • Holding at origin until a slot is assigned • Circling until a slot opens • Multiple sidewalk drones swarming within one blockface • Multiple drones queuing at an intersection • Priority-boarding/off-boarding system (e.g., one is carrying perishables).

The deliverable from this project is a set of associated, ISO standards that cover operations at the curb, the sidewalk and integrated systems that require mechatronic access to both, such as

delivery vehicles with embedded sidewalk drones that handle the final few meters. The deliverable also includes all terminology, data definitions, metrics, and cross references to related coding and management standards such as for parking and parking pricing, and other curb/sidewalk activities such as transit stops, bicycle storage, garbage bins, and many others. Wherever existing standards and definitions exist, they will be incorporated to maximize consistency with existing systems.

In order to complete this work, we are seeking **sponsorships** from each of several stakeholders. Sponsors have the opportunity to review quarterly drafts and recommend general or specific changes and additions that suit a sponsor's expectations regarding operating at curbs and on sidewalks as automated vehicles and devices are permitted to be mixed with humans and non-automated vehicles. Our effort on this Standard serves the direct interest of our sponsors, in their intention to guide and anticipate the curb and sidewalk of 2025 onward. In addition, specific, dependent, benefits accrue to Sponsors, as follows:

Accessibility: It is critical that ACA/ADA/EAA needs are understood and voiced in the context of all stakeholder interests. We believe that if accessibility concerns are tabled and addressed at the outset, we can develop a highly-inclusive standard that manufacturers, planners, operators, and BIAs can use to maximize system acceptance.

City or Regional Government: Matching zoning with Sidewalk and Curb expectations. Use pricing. Behavioral enforcement. Governance for BIAs. Guidance for planning. Governments need to influence and know standards in advance due to long planning cycles.

Logistics Firms: Scheduling, reservation, and queueing systems. Lobbying for slots, their dimensions, clearance, and schedules — especially lobbying for loading-area management reform in advance of the competition with passenger loading automation. Collaborative scheduling among carriers. Shared local storage and last-block distribution systems. Robot design, investment, procurement, operation, and use-planning. Scenarios. Training. Staffing.

OEM and Tier 1 Automobile Manufacturers: to anticipate numerous designs and capabilities regarding sensors, vehicle trim and accessory dimensions and any audio-visual cues to passengers or surrounding people and machines. Door design for access. Opportunity to promote the readiness of their vehicles to operate in mechanized environments in service of human mobility and safety.

Sidewalk-drones and Micromobility Operators: Makers of sidewalk-drones, bikes, scooters, and other mobility devices automated or not, need to manage and operate these devices for both people and goods within new environments of mixed automation. They need to influence and anticipate standards.

Taxi, Ridehailing, Microtransit operators: The owner/operators of such fleets would be influenced by such standards, especially at the curb and in some cases on the sidewalk. They need to influence and anticipate standards.

Urban Planners: Anticipate and perhaps lobby for new regulatory regimes for curb and sidewalk — especially modifications to *Complete Streets*. Design for Access.

Further information is available on request from bern@harmonizemobility.com. You will receive a detailed project description, and a founding sponsorship description and application.

Thank you,
Bern Grush
Chief Innovation Officer
Harmonize Mobility Inc.

Purpose and justification of the proposal

The purpose and justification of this work item is five-fold:

1. Safety and conflict-avoidance. As the number of innovative types of mobility vehicles and devices, automated or non-automated enter into common use, the potential for spatial conflicts for arriving, stopping, parking, waiting, or loading and navigational conflicts when passing, crossing, or overtaking can be expected to grow with the number and variety of such vehicles and devices. These conflicts are already very common and cumbersome at many kerbs and on many sidewalks. As increasing numbers of such vehicles and devices can be expected to operate without on-board human operators or even proximate human control, and potentially without the lane-markings that guide on-street vehicles, machines that operate at kerbs and on sidewalks, and sometimes both, must interact with each other and with human-operated vehicles and devices. This requires a set of agreed and tightly-communicated behaviours and guidelines for real-time resolution and those behaviours and resolutions require terminology, taxonomy, categorizations, and architecture.
2. Planning. Some projects to re-format and reorganize streets, kerb or sidewalks will need to build and shape these spaces to be workable for vehicles and devices whose operating characteristics may be different, or differently constrained, than would be vehicles and devices under human operational control. Such planning activities need guidelines and those guidelines need common terminologies, taxonomies, categorizations, and architectures. They will also need more detailed metrics and design parameter descriptions that follow in a later Part. These metrics and parameters are out of Scope for Part 1.
3. Commercial. Some kerbs and sidewalks can be expected to be used more heavily by commercial vehicles (taxis, shuttles, trucks, sidewalk drones, etc.) each with various automated capabilities. These would be loading and unloading passengers and goods. The use of automated (no human operator) machines for these activities, means forward-planning will be required. Such forward planning will need reservation systems operating in near real-time. The design of such reservation systems requires the terminologies, taxonomies, categorizations, and architectures of Part 1.
4. Operations. In general, kerbs and sidewalks form an interface between (among) people who are residing or trading at buildings at or near these kerbs or sidewalks. People and goods who arrive or depart with the help of vehicles and devices, automated or not, or simply on foot, expect to be able to arrive and depart in a timely manner without finding a pathway or loading facility blocked and without unexpected long waits. These spaces need to be managed in a reasonably smooth and coordinated fashion. To agree to methods for this management, the terminologies, taxonomies, categorizations, and architectures of Part 1 are required.
5. Legal, liability, and insurance. Any kerb or sidewalk is a public space shared by many classes of users including local residents, vendors, visitors, shoppers, whether able-bodied or not. Any conflict that causes bodily harm, financial loss, or other harm or perceived harm may be subject to legal action. Hence a common understanding and description for these spaces is necessary to assign or determine liability for legal and insurance purposes. This common understanding and description requires the terminologies, taxonomies, categorizations, and architectures of Part 1.