



PRINCIPLES FOR **AUTONOMOUS VEHICLES ON CITY STREETS**

Principles for Autonomous Vehicles on City Streets

NACTO and our member agencies – 100 cities and transit agencies across the U.S. and Canada – believe that an autonomous future is centered on people and restoring life to our streets. In this vision, new mobility technology adapts to our cities as the complex places that they are, making them safer, vibrant, and more inviting – instead of forcing our cities to fit into a one-size-fits-all technology that requires streets and cities to be the same everywhere.

NACTO's [previous work](#) expressed optimism for this technology, balanced with the urgency for clear, forward-thinking federal, state, and local policies necessary for an autonomous future to center humans in our cities. Since that time, the landscape of automated vehicle policy and technology has continued to evolve. Multiple companies are currently conducting large-scale testing and deployment of AV fleets in cities across the country. These AV fleets arrived with much fanfare and expansive corporate promises: a once-in-a-generation opportunity to solve the traffic safety crisis on U.S. streets that will also expand mobility options, including for people with disabilities, and deliver goods more efficiently and sustainably.

Yet, these benefits are difficult to imagine based on cities' experiences today. Even as AV robotaxis have received considerable investment from private industry and public attention, fleets of AVs have created outsized new safety, congestion, and equity concerns that cities are struggling to contain. Residents experiencing these direct negative impacts turn to their city leaders, but cities lack the legal authority to respond. Despite the clear need for a role in overseeing AV operations in their local neighborhoods, cities are too often excluded from regulatory efforts with private industry at the state and federal levels.

When done right, autonomous vehicles offer an opportunity to make streets safer, increase access to transportation for underserved communities, and increase American competitiveness in the international market. When done haphazardly, incorporating AVs and AV testing into our streets will make our cities less safe, less equal, and more congested.

It's in everyone's interest – from the family heading to soccer practice to the American automotive industry – that the best and safest technologies are on the market. As AV technology develops, we must all work together closely to ensure that safety stays at the forefront of decision-making.

NACTO's principles for AVs on city streets position cities — and their residents — for a successful integration of AVs into urban transportation systems. By taking proactive steps now, the U.S. Department of Transportation can provide the foundation for a thriving autonomous vehicle industry that is sustainable, guarantees safety, and secures enduring success in a competitive global market by incentivizing the development and adoption of the best and safest technologies reflective of American innovation and know-how.

Principles for Autonomous Vehicles on City Streets

- Expect safety excellence from AV operators
- Empower cities as stewards of AVs in urban areas
- Ensure equity, affordability, and accessibility

Principle #1: Expect safety excellence from AV operators

Recommendation 1a: The National Highway Traffic Safety Administration (NHTSA) should issue strong safety-focused FMVSS for AVs within the next two years that address the design, construction, and performance of vehicles. In the absence of such standards, federal guidance or regulations should not preempt state and local jurisdictions from enacting interim safety standards.

Comprehensive, NHTSA-issued performance standards must be a prerequisite for AVs to test on public roads, provide passenger service, or deploy commercially on public streets.

Cities rely on NHTSA Federal Motor Vehicle Safety Standards (FMVSS) standards of vehicle design and construction and minimum safety and performance thresholds to address scenarios likely to occur on city streets. However, AV manufacturers are currently self-certifying the safety performance of their vehicles without minimum federal standards in place. This lack of regulation poses unacceptable safety risks. **NACTO member city staff have documented instances of AVs being unresponsive to clear signs of emergency operations such as fire trucks stopped with their lights on and public safety personnel directing traffic.**

For example, in August 2023, San Francisco's Fire Department Chief testified before the California Public Utilities Commission that since the beginning of 2023, driverless cars interfered with emergency situations at least 55 times by running over fire hoses, blocking fire station driveways, and obstructing first responders. San Francisco overall documented more than 600 reported self-driving vehicle incidents from June 2022 to June 2023 believing these to be a fraction of incidents experienced on the road. More recently on June 19 in Phoenix, Arizona, police officers pulled over a malfunctioning Waymo vehicle that was driving into oncoming traffic, operating erratically and compromising the safety of drivers and emergency responders.

Documented behaviors such as stalling in the middle of the road or erratic AV movements can cause gridlock and obstruct traffic flow on city streets without recourse by emergency responders. These incidents add to response times, which can be the difference between life and death for patients in ambulances and people waiting to be rescued from fire. NACTO member city staff have also observed AVs picking up and dropping off passengers in the middle of the street rather than pulling to the curb. This not only blocks transit and vehicle traffic on the street but also creates unsafe conditions for others traveling on the street and for passengers attempting to enter or leave the vehicle. These scenarios can block streets used by first responders to reach emergency scenes and reduce travel speeds on heavily used public transit routes, impacting public transit ridership.

Without federally-developed industry standards, each AV manufacturer has created unique emergency situation protocols and signage for their vehicles. As a result, first responders have to learn, recall, and perform a variety of actions to disengage or remove a vehicle and contact a human while actively responding to an emergency, putting the responders at additional risk. The federal government needs to create a requirement for AV manufacturer consistency to alleviate the burden on first responders and allow them to respond to incidents in a timely manner. Such regulations should be developed in consultation with city officials and first responders.

Federal and state regulators should ensure that AVs can detect and respond to on-road scenarios, including work zones and inclement weather, without creating new hazards. AVs must also be able to detect and respond to pedestrians of all ages and abilities and people riding bikes, motorcycles, e-scooters, wheelchairs, and other assistive mobility devices. Government licensing agencies do not conduct driving or vision tests for AVs, leaving cities with no choice but to trust AV companies' safety self-certification methods without any robust government or third-party validation.

AV safety performance standards should include:

- **Competency in handling scenarios likely to occur on city streets**, such as: safely pulling over for emergency lights and sirens, public safety personnel directing traffic by hand, infrastructure in various conditions, inclement weather, and unpredictable actions by motor vehicle drivers, bicyclists, motorcyclists, e-scooter riders, pedestrians, and animals.
- **A “vision test” or “driving test” to confirm AVs are capable of accurately identifying and responding to common roadway occurrences in complex urban environments**, including detecting and responding appropriately to LED signals and dynamic signage, bicyclists, motorcyclists, e-scooter riders, and pedestrians of all races, ethnicities, and mobility levels. This also needs to consider different lighting and weather conditions.
- **Standardized emergency response protocols, procedures, and signage** for AVs, including operational disengagement and vehicle removal procedures and instant two-way communication with someone who has situational awareness of the vehicle.
- **Existing international automotive safety standards**, including [ISO 26262](#)¹, [ISO 21448](#)², and [UL 4600](#)³.

¹ ISO 26262 is an international standard for functional safety of electrical and/or electronic systems that are installed in serial production road vehicles (excluding mopeds).

² ISO 21448 addresses safety considerations that extend beyond the vehicle's functional aspects. For instance, a self-driving car might operate perfectly within its defined parameters but encounter unforeseen issues when entering a new operational domain, such as extreme weather conditions or complex urban environments.

³ UL 4600 addresses the ability of autonomous products to perform safely and as intended without human interaction.

NHTSA should develop automated driving safety metrics and performance standards. U.S. DOT leadership should support a significant increase in NHTSA's capacity to do so, including funding to support state and local collaboration with specific testing pilots.

Recommendation 1b: U.S. DOT and FHWA should revisit the new Part 5 of the Manual on Uniform Traffic Control (MUTCD) related to AVs.

AVs should be designed to work in current real-world conditions and not require streets to be reconfigured for their use. The difference between AV needs and human needs has not been clarified, but the most recent update of the MUTCD provides an entirely new chapter that purports to guide states and cities where AVs are operating. The section is completely unfounded and based on a still nascent technology that is being piloted and evaluated without a clear understanding of its impacts.

Part 5 absolves AV companies of the responsibility to build vehicles that keep road users safe within the existing transportation network. Instead, it directs cities and states to adjust their designs to meet the needs of AVs.

U.S. DOT and FHWA need to lay out a clear research pathway to support any MUTCD standards and guidance, including through a formal experimentation process. Cities should not be financially responsible for investing in updates to city-owned and managed infrastructure to make it easier for AVs to operate.

Principle #2: Empower cities as stewards of AVs in urban areas

Recommendation 2a: A new stakeholder group should be organized to bring together cities, states, U.S. DOT, and private industry. Federally funded industry groups should be required to include representation from cities when developing engineering and technology standards for AVs and other mobility technologies.

Both the positive and negative impacts of AVs are experienced at the local level, but the city staff who represent local needs and interests are often left out of conversations among stakeholders, including other government agencies.

Developing clear and consistent standards and a level playing field for AV companies goes beyond the involvement of federal, state, and private industry. The most effective regulation will come from the input of cities that regularly experience operational and implementation impacts since vehicles operating on city streets raise unique local concerns.

Cities need a centralized way to engage with private industry AV operators and their governmental counterparts at the state and federal levels. Cities often work in isolation from others and interact only with the specific AV companies operating in their communities.

U.S. DOT's Transforming Transportation Advisory Committee (TTAC) has been a welcome forum for bringing together transportation industry stakeholders to provide input into the future of transportation policy. NACTO's AV Working Group has also worked to establish partnerships between cities, research organizations, and AV operators. However, these groups are not resourced to tackle national AV policy and the necessary rules and regulations to support cities and the AV industry.

U.S. DOT can and should convene and organize stakeholders from the public and private sectors to discuss AV policy and co-create standards to make streets safer, increase access to transportation for underserved communities, and increase American competitiveness in the international market.

Federally funded industry groups must include representation from cities when developing engineering and technology standards for AVs and other mobility technologies that will be deployed on city streets. The federal government already funds industry organizations, such as the Society of Automotive Engineers (SAE), that work with private industry to establish engineering and technology standards for mobility. Cities that host robotaxi fleets are not part of these organizations, despite having staff with professional expertise and perspective necessary for the successful development of autonomous driving standards.

Recommendation 2b: Cities must have the ability and tools to enforce local traffic, parking, and curb management laws for AVs operating on city streets.

The preemption of city authority by state and federal governments over the testing and deployment of commercial AV fleets prevents cities from addressing safety, equity, and congestion concerns.

The federal government has authority over the vehicle's design, construction, and performance, states manage licensing and registration, and cities develop and enforce local traffic laws. However, AVs, when deployed as a fleet, are not operationally the same as traditional vehicles, given the absence of a human driver. Blanket preemption over the undefined “performance” of AVs could prevent cities from safely and appropriately managing their streets.

Cities are responsible for managing curb space and balancing the competing demands for this valuable public space. AV operators are another user interested in what happens at the curb that needs to be regulated locally. Picking up passengers in front of a bus stop and not obeying local parking signs and regulations create additional challenges and are not aligned with city policies aimed at balancing curbside uses across multiple user groups.

Cities must not be restricted in their ability to enforce local traffic laws and develop regulations for AV fleets operating on local streets. Three major U.S. cities — Las Vegas, Phoenix, and San Francisco — have reported being unable to write moving violation tickets if there's no driver, raising questions about civil liability. In Arizona, for example, the city instead is directed to give tickets to the company that owns the vehicle — a challenging and often infeasible task.

Recommendation 2c: Standards for AV testing on public roadways should require mandatory reporting to local, state, and federal agencies of all AV-involved collisions and safety incidents.

Current AV safety data requirements do not capture all vehicle-related incidents. AV companies are also not providing cities with important information about their operations on local streets and are not using established data reporting tools that protect privacy.

NHTSA has statutory authority to require companies to share data on injury, death, or property damage. However “violations of the safety envelope” and incidents that did not end in a “crash” but did involve downstream individuals are not accounted for in the current NHTSA Standard General Order (SGO). For example, a vehicle that shuts down in the middle of a street, blocking first responders from being able to reach an individual whose life is threatened need not be reported, despite the possibility of injuries or deaths due to traffic crashes involving or adjacent to AVs operating on city streets. Manufacturers are not required to submit data on how many AVs are operating on the road or the miles they've traveled.

Cities need basic information regarding commercial AV operations on city streets to manage their transportation networks. Without basic trip information such as the number of vehicles, vehicle miles traveled per trip, location, status, and ride history, cities cannot accurately assess whether AVs are helping or hindering their city's transportation goals, and making streets more or less safe. While the SGO data provides valuable insight into AV crashes on a monthly basis, cities need access to more frequent trip-level data to make decisions about managing the city's transportation networks. Many of NACTO's member cities already ingest large amounts of trip-level data for other modes of transportation.

NHTSA should update the SGO-imposed requirements on companies to report any incident in which an automated vehicle encounters any significant deviation from expected performance including malfunctions, degradations, remote human interventions, clustering and connectivity incidents, or reversions to minimal-risk conditions. Reporting requirements should be expanded to include any additional data deemed necessary to more accurately track and analyze the fitness of those vehicles to safely operate on public roads. This includes the potential for unexpected behavior to result in a crash or to pose serious safety threats to road users, and safety threats or interruption of normal operations to transportation, public service, and emergency response workers.

Further, NHTSA's requirements should extend to provide trip-level data to cities directly, thus allowing them to monitor compliance with local traffic laws and regulations, evaluate safety effects, and measure AV operations against city goals. This uniform set of trip-level data should not collect personally identifiable information via a standardized platform such as the Open Mobility Foundation's Mobility Data Specification ([MDS 2.0](#)) MDS 2.0 already includes the ability to add information from fleets of AVs operating as a Transportation Network Company.

Principle #3: Ensure equity, affordability, and accessibility

Recommendation 3a: Cities must have the authority to enact equity-focused requirements for commercial AV services and are not preempted from doing so through local and state licensing for operations.

If unregulated, commercial AV fleets will not prioritize equitable access for low-income people and people with disabilities and could create new negative externalities. **Without intervention, AV fleets could exacerbate transportation inequities and encourage increased single-occupancy vehicle travel that creates congestion, undermines public transit, and hampers economies.** Private AV operators, aiming to maximize profit, could also charge rates that are unaffordable to residents with few other transit options.

The business model for commercial AV fleets includes deadhead miles and single-occupancy rides, similar to existing ride-hail operations that have significantly increased the volume of traffic on local roads. This additional volume of traffic is difficult – and sometimes impossible – to manage through traditional means such as traffic signal optimization. As a result, cities are implementing other congestion-mitigation measures such as HOV and bus-only lanes, restricting vehicle travel on certain streets, and congestion-pricing zones.

If cities are preempted from restricting the operation of commercial fleets of AVs, they could potentially increase congestion to a level that stalls all traffic, require travel on restricted roads where residents desire a lower volume of traffic, and delay transit and emergency operations. Geofencing to restrict AV access around important special events, emergencies, and construction within cities is a critical tool that must be developed alongside AV deployment.

Innovative permit, pilot, and demonstration programs with strong equity requirements that discourage single-occupancy travel, ensure access for disadvantaged communities and people with disabilities, and have affordable rates for low-income riders can help cities ensure commercial AVs will be accessible to people who need them the most. For example, Seattle and Bellevue’s joint Strategic Vision for Automated Vehicles identifies methods that commit to equitable distribution of AV benefits and ongoing monitoring of AV impacts, including public outreach and education, mapping locations of AV service offerings, and developing key performance indicators to evaluate the equitable distribution of AV commercial service.

Cities must be able to manage the new negative externalities that could arise with the introduction of commercial AV fleets, including idling and siting large infrastructure facilities in low-income communities. Already, cities have experienced AV companies developing their AV

fleet charging facilities in low-income neighborhoods, introducing noise, exhaust, and new traffic in places where those same companies are not offering any commercial AV service.

Recommendation 3b: U.S. DOT, through NHTSA, should require that the design of new autonomous vehicles intended for passenger service, including novel vehicle designs, be accessible for people who use assistive mobility devices such as wheelchairs.

Market forces alone will not compel commercial AV companies to develop and deploy wheelchair-accessible vehicles.

A critical part of equitable AV commercial service is access for people who use mobility devices such as wheelchairs. Currently, very few commercial AVs are wheelchair accessible, leaving people who use a mobility device unable to access their services. Transportation Network Companies (TNCs) are currently required to provide wheelchair-accessible vehicles in jurisdictions such as [California](#), [New York City](#), and [Chicago](#). As AVs replace human-operated vehicles, cities must be able to ensure accessibility requirements apply to AVs operating as TNCs.

Recommendation 3c: U.S. DOT should clarify which existing federal funding programs support AV public-private pilot projects and provide funding for deployment and operations.

It's in the public's interest to have safe vehicles operating on public rights of way – and for their transportation options to be reliably available month after month and year after year.

NACTO members such as Grand Rapids, Michigan, [Detroit](#), [Jacksonville, Florida](#), and [Columbus, Ohio](#) have publicly funded their AV deployments, putting themselves in control of the procurement of private services. This allows for greater transparency around data collection and reporting. It ensures that local community goals and the desires of private AV operators are aligned. Ultimately, this helps support and advance the best and safest technologies.

Unfortunately, current AV grant opportunities are spread out over different federal agencies and initiatives, with varying deadlines and application processes. Inconsistent and unpredictable funding hampers city efforts to provide reliable, lasting transportation operations in partnership with AV operators.

The Center for Excellence on New Mobility and Automated Vehicles could be a centralized place to identify funding opportunities. U.S. DOT could also publish clear guidance around available funding sources for cities looking to contract with AV operators, similar to the spreadsheets developed for active transportation projects and for addressing legacy highways.