CITY OF TORONTO TRANSPORTATION SERVICES

Guidelines for Submitting a Work Zone and Law Enforcement Interaction Plan to the City of Toronto

For Participants in the Ontario Ministry of Transportation's Automated Vehicles Pilot Program who are conducting Driverless Testing in Toronto

December 18, 2020

1 INTRODUCTION

What is the City of Toronto's Testing Response & Incident Preparedness (TRIP) system?

The City of Toronto Interdivisional Working Group on AVs has developed a Testing Response & Incident Preparedness (TRIP) system to ensure that the City, its first responders and law enforcement are prepared for Automated Vehicle testing (including Driverless Testing). Internal to the City, TRIP is an administrative system and series of response protocols to better manage the arrival of this technology on Toronto streets.

How does Automated Vehicle testing and Driverless Testing occur in Ontario?

First launched in 2016, the Ontario Ministry of Transportation's Pilot Project - Automated Vehicles allows testing of level 3, 4 or 5 automated vehicles on Ontario roads, including in the City of Toronto.

In January 2019, the Ministry of Transportation created a new stream for Driverless Testing, created as part of the Ontario Pilot Project. Prior to these amendments, a human driver was required to be in the vehicle at all times during testing.

As a result of these amendments, there are new application requirements set out by the Ministry for Applicants who wish to conduct Driverless Testing. The Applicant must alert the impacted municipality in writing prior to testing to advise where the Driverless Testing will take place and provide a Work Zone and Law Enforcement Interaction Plan, in writing and prior to testing, to the Ministry of Transportation, municipalities, and relevant authorities such as law enforcement and first responders. This plan must explain how the vehicle will interact with police and Emergency Vehicles, how the vehicle will react to construction zones and how the vehicle will interact with police and construction personnel on public roads. The Ministry may also begin to require annual reporting from Participants, but under the current requirements, these reports will not be provided to municipalities.

Who and what are these guidelines for?

To ensure that the City and its first responders and law enforcement are prepared for testing on Toronto streets, the City of Toronto is providing guidance to Participants in the Pilot Project who plan to conduct Driverless Testing in the City of Toronto. This document describes the contents that the City of Toronto expects Participants to include in their Work Zone and Law Enforcement Interaction Plans submitted to the City.

The documentation to be submitted to the City should contain:

2 SIGNOFF

2.1 Corporate Officer or Director Responsible

a) Contact information – signing officer or director

Name
Title
Signature

3 GENERAL INFORMATION

3.1 Participant information

a) Participant (Legal Name)

b) Organization type (original manufacturer, technology company, academic or research institution, manufacturer of parts, systems, equipment or components for automated driving systems)

c) Contact information – Toronto operations

i. Name
Position
Telephone Number
Email
Business Address

d) Date of Participant's first participation in the AV Pilot Program

e) Is the Participant currently licensed by the City of Toronto under Toronto Municipal Code, Chapter 546, Licensing of Vehicles-for-Hire? (Yes/No) (if Yes, please provide licensing number)

f) Copy of insurance certificate

3.2 Vehicle information

a) Number of Vehicles prepared for testing

b) Vehicle identification number(s)

c) Make and model

d) Year of manufacture

e) License plate number(s)

f) Is this vehicle converted with an aftermarket kit? (Yes/No) (if Yes, please describe)

g) Is the vehicle a shuttle? (Yes/No) (if Yes, please describe)

h) Vehicle fuel source

i) Has the Participant applied for an exemption for the Vehicle under the *Canada Motor Vehicle Safety Act*? (Yes/No)

3.3 Carrying passengers and cargo

a) Will the Vehicle carry passengers who are members of the public? (Yes/No)

i. If Yes, will the Participant charge a fare to passengers? (Yes/No)
If Yes, what is the maximum number of passengers the Vehicle is designed to carry?
If Yes, does the Vehicle comply with accessibility standard CSA D409-16?

b) Is the Vehicle designed to for the specific purpose of transporting cargo? (Yes/No)
    i. If Yes, what is the maximum cargo weight the Vehicle can transport?

3.4 Vehicle automation capabilities

3.4.1 Identify the highest Society of Automotive Engineers (SAE) driving system automation level (1-5) at which the Vehicle is anticipated to operate on Toronto streets

3.4.2 Describe the Operational Design Domain (ODD) of the Vehicle including the circumstances in which the Vehicle will be able to operate in Automated Mode, including, but not limited to, any constraints related to road types, weather, speed restrictions, and traffic conditions.

3.4.3 Identify the agent responsible for the Dynamic Driving Task (DDT) under the different circumstances identified in 2.3.2.

4 SAFETY AND SECURITY SYSTEMS

4.1 Approach to ensure safety

a) Describe how the Vehicle is designed and programmed to ensure safe operations while in Automated Mode, including:
    ii. Describe the mechanism to prevent operation in Automated Mode when circumstances exceed the ODD,
    iii. Describe how the operational approach prioritizes the safe flow of surrounding traffic (vehicles, cycles, pedestrians),
    iv. Describe how the Vehicle minimizes risk to other road users when reacting to circumstances at the boundary of, or that exceed, the ODD,
    v. Describe the Vehicle's Object Event Detection and Response (OEDR) capabilities that enable safe and appropriate actions to be taken when subjected to day-to-day traffic conditions, as well as unexpected events.

b) Describe how the Vehicle is equipped with safety systems with appropriate redundancies that continuously monitor system performance, perform fault detection, hazard analysis, signal any malfunctions, and ultimately take corrective actions or revert to a minimal risk condition when needed. Elements may include:
    i. Emergency hatches
    Tools to break a window
    Emergency buttons
    Fire extinguisher

c) Describe how human oversight will be provided at all times during operation and the role and location of any humans conducting this function.

d) Describe how the Vehicle communicates, during operation in Automated Mode and under manual control, to
    i. the Operator, for example when the Operator must take control of the DDT,
    ii. passengers, if applicable, and
    iii. other road users, under normal and emergency situations.

e) Describe how the Vehicle is equipped with adequate active and passive safety features to protect occupants and other road users, and mitigate injuries and damages in the event of a collision or system failure.

f) Describe how the Vehicle will be brought to a safe state following a collision or system failure, and will convey safety critical information to passengers (if applicable), first responders, and law enforcement.

4.2 Approach to Ensure Cybersecurity

a) Describe the design and mitigation strategies that have that been developed to protect the Vehicle from cyber security threats.

b) Describe the programs, plans, and/or operating procedures that have been established to manage cyber events.

4.3 Approach to Ensure Privacy

a) Will the Participant be collecting Personal Information in carrying out testing under the AV Pilot Program? (Yes/No)

b) Describe design and mitigation strategies that have been developed to protect data privacy.

c) Describe the programs, plans, and/or operating procedures that have been established to manage a privacy breach.

5 WORK ZONE INTERACTION

5.1 Interaction with work zones and other road closures

5.1.1 Describe how the Vehicle will detect and classify a work zone.

5.1.2 Describe how the Vehicle will detect a road closure.

5.1.3 Describe how the Vehicle will behave in the following contexts:

a) Work zones

b) Partial road closures

c) Full road closures

5.1.4 In particular, specify whether and under what conditions the Vehicle will continue to operate in Automated Mode in a work zone or road closure scenario.

6 LAW ENFORCEMENT INTERACTION AND EMERGENCY PLANNING

6.1 Emergency Planning

6.1.1 Describe the programs, plans, and/or operating procedures that have been established by the Participant to manage emergencies and incidents, including collisions and system failure.

6.1.2 If available, provide copies of the programs, plans, and/or operating procedures described in 5.1.1.

6.2 Vehicle Identification

6.2.1 Describe how law enforcement and first responders can identify the Vehicle (e.g. a sign, decal, or logo or other identifiers).

6.2.2 Describe how law enforcement and first responders can identify the mode of the Vehicle (e.g. Automated Mode)

6.2.3 Describe the location of:

a) Sensors

b) Fueling ports

c) Any other devices that are not on a standard vehicle

6.3 Communication Protocols

6.3.1 Provide the contact information for relevant individuals to be contacted during a collision or law enforcement or emergency situation

6.3.2 Describe the mechanism and steps to contact the relevant individuals in 5.3.1, which may include:

a) 24-7 hotlines

b) Contact buttons in the Vehicle

6.3.3 Describe the role of the relevant individuals in 5.2.1 during a collision or law enforcement or emergency situation

6.3.4 Describe the communication protocol during a collision or law enforcement or emergency situation between the Participant and the following entities: Toronto Police, Toronto Paramedics, Toronto Fire, Province of Ontario, City of Toronto, media

6.4 Behavioral protocols

6.4.1 Describe how the Vehicle and Operator will respond to law enforcement and emergency personnel and vehicles:

a) In the case of a collision involving the Vehicle

b) In the case of a collision involving other road users nearby

c) In the case of law enforcement or Emergency Vehicles approaching from any direction

6.4.2 Describe how the Vehicle and Operator will comply with existing bylaws and emergency services protocols/standard operating guidelines:

a) In the case of a collision involving the Vehicle

b) In the case of a collision involving other road users nearby

c) In the case of law enforcement or Emergency Vehicles approaching from any direction

6.4.3 Provide the anticipated Participant response times during a collision or law enforcement or emergency situation

6.5 Emergency and law enforcement response procedures

Typically, on a collision scene: Police are primarily responsible for public/scene safety, enforcement, and investigation. Paramedics are responsible for the assessment, treatment and transport of patients. Fire Services assists with scene safety, performs emergency vehicle extrication/deactivation (if needed), and some roadway clean-up.

6.5.1 Situation assessment

a) Describe how to assess the condition of the Vehicle from a distance

b) Describe how to assess the condition of the Vehicle from nearby

6.5.2 Communication

a) Describe how law enforcement and first responders can communicate with the Operator in a law enforcement or emergency situation

6.5.3 Returning the Vehicle to a safe state

a) Describe how to disable the engine remotely or from the exterior

b) Describe how to disable the ADS remotely or from the exterior

c) Describe how to apply or disable the brakes and ensure the Vehicle remains in a fully-stopped condition

d) Describe how to safely disable electrical power to the Vehicle, including location and details of any high voltage electrical components

6.5.4 Getting passengers to safety

a) Describe how to access/operate emergency exits on the Vehicle, including locations of the emergency exits and a description of their use and operation

b) Describe how to open the doors and trunk

c) Describe how to cut open the Vehicle (including cut locations)

d) Describe how to extricate passengers from the Vehicle

6.5.5 Moving the Vehicle to a safe location

a) Describe how to lift the Vehicle

b) Describe how to tow the Vehicle

6.5.6 Firefighting

a) Describe how to use water and other liquid based fire suppressants on the Vehicle

b) Describe how to manage chemical/battery fires

c) Describe how to manage any high voltage batteries during an emergency

6.5.7 Other scenarios

a) Describe how to safely pull over the Vehicle, including in case of a traffic incident

b) Describe how to manage the Vehicle in case of flood or water damage

c) Describe how to manage any toxic components/hazardous materials used in or mounted on the Vehicle, and identification of any toxic components/hazardous materials

6.6 Post-incident Protocols

6.6.1 Describe the actions that will be taken by the Participant after a collision or law enforcement or emergency situation, which may include:

a) Sharing incident data generated by the Vehicle with the Ministry of Transportation, the City, and other authorities
b) Submitting a collision report to the Ministry of Transportation
c) Additional reporting to the Ministry of Transportation under the Automated Vehicles Pilot Program (O. Reg. 306/15)
d) A post-incident report, situation analysis, debrief, and description of lessons learned to be provided to the Ministry of Transportation, the City, and other authorities

7 OPERATOR TRAINING

7.1 Operator training

7.1.1 Describe the training and/or certification program the Participant has established for Operators.

7.1.2 Describe how the Participant ensures ongoing training for its Operators.

7.1.3 Describe the process the Participant uses to ensure Operators are fit for duty.

8 INFORMATION TO SUPPORT PARTICIPANTS

8.1 Requested information on work zones

8.1.1 Identify any information or data that could be provided by the City of Toronto to support the Participant's planning for interaction with work zones.

8.2 Requested information for emergency preparedness

8.2.1 Identify any information or data that could be provided by the City of Toronto to support the Participant's planning for emergency situations.

9 UPDATING THIS PLAN

9.1 Annual updates

9.1.1 Participants should submit an updated plan to the City of Toronto on an annual basis.

9.1.2 Participants should notify the City of any amendments to the plan as needed if practices and protocols change.

10 DEFINITIONS

"Applicant" means an organization that has applied to the Ministry of Transportation to participate in the Automated Vehicles Pilot Program and that plans to operate its test Vehicles in Toronto.

"Automated Driving System (ADS)" means the hardware and software that are collectively capable of performing the entire Dynamic Driving Task on a sustained basis, regardless of whether it is limited to a specific Operational Design Domain (ODD); this term is used specifically to describe a level 3, 4, or 5 driving automation system. (source: SAE J3016).

"Automated Mode" means when the Vehicle is engaged in the DDT.

"AV" means automated vehicle

“City” means the municipal government of the City of Toronto.

"Driverless Testing" means testing wherein full human oversight in testing vehicles can be provided by a passenger in the vehicle or by remote monitoring

"Dynamic Driving Task (DDT)" means all of the real-time operational and tactical functions required to operate a vehicle in on-road traffic, excluding the strategic functions such as trip scheduling and selection of destinations and waypoints, and including without limitation: Lateral vehicle motion control via steering (operational); Longitudinal vehicle motion control via acceleration and deceleration (operational); Monitoring the driving environment via object and event detection, recognition, classification, and response preparation (operational and tactical); Object and event response execution (operational and tactical); Maneuver planning (tactical); and Enhancing conspicuity via lighting, signaling and gesturing, etc. (tactical). (source: SAE J3016)

"Emergency Vehicle" means a vehicle such as police cars, fire trucks, ambulances, or other vehicles used by law enforcement or first responder personnel to respond to a traffic violation or emergency situation. The Ontario *Highway Traffic Act* stipulates how other road users must respond to Emergency Vehicles.

"Participant" means an organization that has been approved by the Ministry of Transportation to participate in the Automated Vehicles Pilot Program and that plans to operate its test Vehicles in Toronto.

"Personal Information" means recorded information about an identifiable individual, including,

a) information relating to the race, national or ethnic origin, colour, religion, age, sex, sexual orientation
or marital or family status of the individual,
b) information relating to the education or the medical, psychiatric, psychological, criminal or employment history of the individual or information relating to financial transactions in which the individual has been involved,
c) any identifying number, symbol or other particular assigned to the individual,
d) the address, telephone number, fingerprints or blood type of the individual,
e) the personal opinions or views of the individual except if they relate to another individual,

f) correspondence sent to an institution by the individual that is implicitly or explicitly of a private or confidential nature, and replies to that correspondence that would reveal the contents of the original correspondence,

g) the views or opinions of another individual about the individual, and

h) the individual's name if it appears with other personal information relating to the individual or where the disclosure of the name would reveal other personal information about the individual; ("reassignments personnels").

Personal information does not include information about an individual who has been dead for more than thirty years (according to the *Municipal Freedom of Information and Protection of Privacy Act*).

"Operator" means an employee of the Vendor who is responsible for overseeing and maintaining the safety of the Vehicle's operations at all times when the Vehicle is providing the Automated Shuttle Service or otherwise moving (e.g. travelling from the service route to the storage facility after service). The role of the Operator is to be a human driver, performing in real-time all or part of the DDT and/or DDT fallback for a particular vehicle, as required. The role of the Operator further includes: conducting scheduled and unscheduled maintenance and inspections; parking, storing, and ensuring charging of the vehicle; and collecting performance data to be included in weekly reports to City and Project Partners.

"Operational Design Domain (ODD)" means the Operating conditions under which a given driving automation system or feature thereof is specifically designed to function, including, but not limited to, environmental, geographical, and time-of-day restrictions, and/or the requisite presence or absence of certain traffic or roadway characteristics. (source: SAE J3016).

"Original Equipment Manufacturer (OEM)" means the organization that manufactured the vehicle(s) that provides the Automated Shuttle Service. The OEM may or may not be the Vendor.

"Vehicle" means the Vehicle used by the Participant for Automated Vehicle testing.

"Work Zone & Law Enforcement Interaction Plan" means a document outlining how the vehicle will interact with police and Emergency Vehicles, how the vehicle will react to construction zones and how the vehicle will interact with police and construction personnel on public roads, as requested by the Ontario Ministry of Transportation in the Automated Vehicles Pilot Program Application Form.