



AUTOMATED VEHICLE TESTING GUIDANCE



TESTING IN PENNSYLVANIA

Under existing Pennsylvania law, the driver of any vehicle is a natural person who drives or is in actual physical control of a vehicle. Currently during Highly Automated Vehicle (HAV) testing, a licensed driver is required to be seated in the driver's seat with the ability to intervene in situations where the Automated Driving System (ADS) experiences a system interruption or other problem rendering the ADS unable to safely perform the dynamic driving task and the vehicle is unable to come to a minimal risk condition on its own.

Under existing law, unoccupied and/or remote testing on trafficways is prohibited.

NOTICE OF TESTING

Prior to testing on Pennsylvania trafficways, an HAV Tester shall submit a Notice of Testing application through the PennDOT website <https://penndot.gov/av>.¹ The application will require submission or confirmation of the following information:

1) Tester Information

- a) Tester Name
- b) Address
- c) Mailing Address (if different from Address)
- d) Principal Point-of-Contact for Testing
 - i) Name
 - ii) Title
 - iii) Telephone Number
 - iv) Email Address

2) Vehicle Information (List All Applicable Vehicles Testing)

- a) License Plate Number
- b) Jurisdiction of Issuance
- c) VIN Number, if applicable²
- d) Year, Make & Model
- e) Engine Type (are Gasoline, Diesel, Electric, Propane, Hybrid, Natural Gas, Compressed Gas, Flex Fuel, or Other)
- f) Proof of Current Registration
- g) Vehicle accessibility
 - i) State whether vehicle is wheelchair accessible. If applicable, list any wheelchair accommodations including a ramp or lift for entry and restraints for securing wheelchair.
 - ii) If applicable, list any vehicle amenities

for drivers or passengers with disabilities not covered in 2.g.i.

3) Safety Driver Information (List All Applicable Employees, Contractors, and Designees)

- a) Legal Name (First, Middle, Last)
- b) Driver License Number
- c) State or Country Issued
- d) Training Completion Date
- e) Enhanced Performance Driver Training Completion Date, if applicable

4) Passengers – The Tester shall identify whether the HAV provides rides to members of the public.³

If the Tester is providing rides to members of the public, the Tester shall provide PennDOT the following information:

- a) A copy of any Terms and Conditions that a passenger agrees to when riding in the HAV, if applicable.
- b) Information on training and/or guidance related to passenger safety, if applicable.
- c) Information how the Tester ensures the safety driver and secondary safety associate stay focused on driving task and not become distracted due to passengers in the vehicle.
- d) State if the services are free to passenger or if a fare is charged.
- e) Identify zip code(s) where services are provided.
- f) Describe how the HAV provides feedback to passengers during the trip (e.g., mobile app or auditory alerts), if applicable.

5) Location Information

New Testers – Provide a list of counties and, if applicable, first and second class cities where testing is expected to occur over the life of the Authorization⁴. **If testing will only occur on limited access trafficways, only provide the trafficway.**

Existing Testers Renewing Their Authorization

- List of zip codes where testing is currently occurring. In addition, the Tester shall provide a list of Counties and, if applicable, first and second class cities where additional testing is expected to occur over the life of the Authorization, if known.⁵ If testing will only occur on limited access trafficways, only provide the trafficway.

¹ If the submitting Tester is not the Developer of the ADS, the Tester shall provide a letter from the Developer confirming that all information contained within the Notice of Testing regarding their ADS hardware and software is accurate as stated.

² Vehicle taken directly from an Original Equipment Manufacturer's assembly line, used for testing, and then immediately disposed of may not have a VIN Number.

³ Members of the public does not include government officials, members of the media, or those employed by the Tester or their family members, or otherwise affiliated with the Tester

⁴ The life of the Authorization is 1 year

⁵ Testers should only include counties and first and second class cities where testing is not currently occurring.

6) Applicant Acknowledgements

- a) When required by federal law, the HAV (i) has been certified in accordance with federal regulations in 49 C.F.R. part 567 as being in compliance with applicable federal motor vehicle safety standards and bears the required certification label, or (ii) bears labels referencing any exemption granted under applicable federal law.
- b) That any HAV titled and registered in Pennsylvania complies with the requirements of 67 Pa. Code Chs. 175 and 177, relating to required safety and emissions inspections, as required, and the requirements of Chapter 17 of Title 75 of the Pennsylvania Consolidated Statutes, relating to financial and insurance responsibilities.
- c) The Tester has taken reasonable steps (e.g., controlled testing in simulation, closed track or on-road) to ensure the HAV is capable of operation within the parameters of the Operational Design Domain (ODD).
- d) That HAV is capable of operating in compliance with all applicable traffic and motor vehicle laws and can obey traffic control devices within its ODD.⁶
- e) If Original Equipment Manufacturer (OEM)-equipped Advanced Driver Assistance Systems (ADAS) are active, that the ADS and ADAS can appropriately function together as intended by the Tester.
- f) That during testing a safety driver will be present in the driver's seat of the HAV and is either in immediate physical control of the HAV or is actively monitoring HAV operations and can take over immediate physical control during operation.
- g) That a secondary safety associate is present in the vehicle (in the forward passenger seat if installed in the vehicle⁷) unless the Tester complies with Section 8 – Testing with a Single Safety Driver.
- h) That the HAV can safely alert the safety driver, when applicable, that the safety driver must take control back of the HAV.

- i) That the HAV has a mechanism to engage and disengage the ADS that is easily accessible to the HAV safety driver, and a means for the secondary safety associate, or an Emergency Service Responder, to disengage the ADS, if necessary.
- j) That the HAV has an audio signal or visual display inside the vehicle to indicate when the ADS is engaged.
- k) That the HAV is equipped with a means to store operational data before a collision occurs⁸. The data shall be made available to PennDOT and applicable law enforcement agencies upon request in the event a reportable crash occurs⁹.
- l) That the Tester has considered and implemented reasonable measures, which may include industry standards, best practices, company policies, or other methods, to mitigate cybersecurity risk.
- m) That all safety drivers and secondary safety associates have successfully completed the HAV tester's safety driver training program.
- n) That quality controls are deployed and monitored to ensure the acknowledgements checked above are implemented, adhered to and measured to ensure safe operation.
- o) That PennDOT will share the Notice of Testing and the Semi-Annual Data Collection Form upon request of any municipality where testing will be occurring.¹⁰
- p) That PennDOT will share Crash Reporting with any applicable municipality.
- q) That PennDOT will share the contents of Section 9 - Emergency Service Responder Plan with any applicable Emergency Service Responder.¹¹

7) Safety and Risk Mitigation Plan or NHTSA Voluntary Safety Self-Assessment:

Safety and Risk Mitigation Plan - The Safety and Risk Mitigation Plan is operator focused and aims to ensure that the Tester has a program to ensure driver training that encompasses both traditional driver performance expectations and proper driver-HAV test vehicle interaction.

⁶ The Tester is encouraged to coordinate with law enforcement, municipalities, and PennDOT when developing the ADS to address traffic laws that involve discretionary judgement, if there are questions on what constitutes an action.

⁷ The secondary safety associate may be located in a seat other than the forward passenger seat if the Tester can explain how there is no impact to communications with the safety driver.

⁸ At a minimum, the HAV should have the capability to store what the HAV observed and how the HAV reacted to the information.

⁹ Such request shall specify the type of data that is being requested, shall be narrowly construed to include only relevant information, and shall be provided within a reasonable time in a reasonable format.

¹⁰ A Tester may provide PennDOT with a redacted Notice of Testing and Semi-Annual Data Collection Form to be shared with municipalities. Testers should only redact information they deem confidential and/or a trade secret. PennDOT will instruct municipalities to treat such documents as confidential.

¹¹ When sharing contents with Emergency Service Responders, PennDOT will advise that the information should be treated as confidential.

- a) A Safety and Risk Mitigation Plan shall include, at a minimum¹²:
- i) A general overview of the intended ODD for testing including:
 - (1) Physical Infrastructure (e.g., roadway types)
 - (2) Operational Constraints (e.g., speed limit or traffic conditions)
 - (3) Objects (e.g., roadway users and non-roadway users obstacles/objects)
 - (4) Connectivity (e.g., remote fleet management system).
 - (5) Environmental Conditions (e.g., weather, particulate matter, and illumination)
 - (6) Zones (e.g., geo-fencing and school/work zones)
 - ii) A description of how the ADS is disengaged.
 - iii) A description of the methods to ensure continued functionality of the software and hardware systems.
 - iv) A description of the criminal background and driver record checks required by the Tester for safety drivers.
 - v) A description of safety driver training program that includes a description of:
 - (1) How the tester informs HAV safety drivers of any relevant HAV-related operational issues, including, but not limited to, any operational limitations of the ADS and the safe operating parameter(s) for the given ODD for the conditions under which the HAV is tested on trafficways, including, but not limited to:
 - (a) Safety driver knowledge of HAV operations
 - (b) Safety driver's decision-making process when driver manually disengages ADS system
 - (c) Safety driver's knowledge of functionality and/or limitations of safety features originally equipped by the OEM.
 - (2) Measures to prevent driver fatigue/inattentiveness/carelessness, including but not limited to:
 - (a) Distracted Driving avoidance techniques
 - (b) Fatigue and Wellness Awareness
 - (c) Drug and Alcohol Impairment Awareness. This includes both prescribed and unprescribed controlled substances.
- (3) A description of the safety measures in place in case of an ADS disengagement, regardless of the reason for the disengagement.
- (4) A description of the tester's driver training program and how that program addresses:
- (a) Confirmation of Basic Driving Skills including, but not limited to,
 - (i) Basic Vehicle Operation
 - (ii) Visual Search
 - (iii) Night Operations, if applicable
 - (iv) Hazard Perception
 - (v) Responses to Vehicle Malfunctions
 - (vi) Responses to Sudden Emergencies
 - (vii) Responses to Driving Distractions
 - (viii) Responses to an Aggressive Driver
 - (ix) Responses to Adverse Weather Conditions
 - (x) Post-Crash Procedures
 - (xi) Interactions with Vulnerable Highway Users
 - (b) Basic knowledge of Vehicle Controls/Instruments/Safety Components (c) Basic Trip Procedures, including, but not limited to:
 - (i) Pre-trip Inspection Outside the Vehicle
 - (ii) Pre-trip Preparation Inside the Vehicle
 - (iii) Trip Planning
 - (iv) Post-trip Procedure
 - (c) Divided visual and mental attention tasks particular to the operation of HAV.
- (5) A description of how refresher training is conducted.
- NHTSA Voluntary Safety Self-Assessment

¹² NHTSA – A Framework for Automated Driving System Testable Cases and Scenarios.

- b) A Tester may provide PennDOT with a Voluntary Safety Self-Assessment as established by NHTSA in the 2017 Voluntary Guidance for Automated Driving Systems, Section I.¹³

8) Testing with a Single Safety Driver (if applicable)

Testers requesting the use of a single safety driver must submit a Single Safety Driver Testing Plan (“SSD-TP”) for the PennDOT’s review.

Single Safety Driver Testing Plan (“SSD-TP”)

The SSD-TP must demonstrate that the skills, knowledge, and abilities gained by the safety driver through the training and operating procedures implemented by the tester to address any safety risks associated with removing the secondary safety associate. The SSD-TP should include, at a minimum:

- A description of any operating procedures that differ from standard operating procedures (i.e. two associates in the vehicle).
- A description of safety driver qualifications established by the Tester.
- Safety Case(s) for specific situations within the ODD.
- A description of any enhanced driver training beyond what is outline Section 7.
- A description of auditing procedures implemented by the Tester.
- A description of applicable performance and conformance monitoring metrics.

Single Safety Driver - Minimum Requirements

A single safety driver may only operate a HAV if they meet the following criteria:

- Driving Record
 - o No convictions for driving a vehicle under the influence of alcohol within the last 3 years.
 - o No convictions for refusing to submit to chemical testing of blood or breath within the last 3 years.
 - o No convictions for driving a vehicle while under the influence of a controlled substance within the last 3 years.
 - o No convictions for leaving the scene of an accident within the last 3 years.
 - o No convictions for committing a felony involving the use of a vehicle within the

last 3 years.

- o No convictions for causing a crash involving death or personal injury while driving a vehicle within the last 3 years.
- o No conviction for causing a crash involving damage to unattended vehicle or property while driving a vehicle within the last 3 years.
- o No convictions for driving a vehicle while their driving privilege was suspended, revoked, cancelled or recalled or while subject to disqualification of an out-of-state service order within the last 3 years.
- o No convictions for using a vehicle to commit a felony within the last 3 years.
- o No convictions of a serious traffic violations within the last 3 years.

- HAV Operating Experience¹⁴

- o 200 hours of total HAV operating experience in the vehicle(s) or class of vehicle(s) for which the safety driver is licensed and will be operating for testing purposes.
 - A minimum of 100 hours of operating experience must have occurred on public roads.
 - If an operator is transitioning from a personal HAV vehicle to a HAV commercial motor vehicle, an additional 40 hours of operating experience is needed in the new vehicle.
- o 30 hours of nighttime HAV operating experience, if operations will be performed during nighttime conditions, in vehicles for which the safety driver is licensed and will be operating for testing purposes.
- o 30 hours¹⁵ of inclement weather HAV operating experience, if operations will be performed during inclement weather conditions, in vehicles for which the safety driver is licensed and will be operating for testing purposes.

Safety Case

If any of the following situations fall within the Tester’s ODD¹⁶ and a single safety driver will be within the HAV, the Tester shall provide PennDOT a safety case for review that addresses the following items, if applicable.

- Testing within an Active Work Zone

¹³ The Voluntary Safety Self-Assessment must contain all the required information from Section 7(a) - “Safety and Risk Mitigation Plan.” The Tester may choose to provide PennDOT a supplemental document containing the required information in place of updating the Voluntary Safety Self-Assessment.

¹⁴ HAV Operating experience occurs when the ADS is engaged and a secondary safety associate is present.

¹⁵ The Tester shall use their best judgment when determining if conditions meet the definition of inclement weather.

¹⁶ If one of the prescribed situations are within the ODD, but the safety driver disengages the ADS by policy, the Tester shall provide a statement stating such in replacement of a safety case.

- Testing within an Active School Zone.
- Testing within an Emergency Response Area.
- Testing on Snow-Covered trafficways.
- Testing around Vulnerable Highway Users.
- Testing within Tunnels.

Enhanced Driver Training - Minimum Requirements

The Tester shall provide an outline of the training curriculum, a description of what is required to “pass,” and a description of the qualifications of the individual(s) overseeing the training.

Auditing Minimum Requirements

In addition to being reviewed by PennDOT, the SSD-TP shall be audited for conformance by a 3rd party¹⁷ or an Independent Review Entity established by the Tester.

Performance and Conformance Monitoring Metrics and Methodology - Minimum Requirements

The Tester shall:

- Implement a metric to evaluate driver attentiveness.
- Describe methodology to monitor the efficiency of remote monitoring of the safety driver.
- Implement a metric that is intended to evaluate safe driving behaviors for a HAV with a single safety driver.

The tester shall provide metrics to PennDOT one (1) month after implementing the SSD-TP and then semi-annually as part of the “Semi-Annual Collection Form”.

9) Emergency Service Responder Plan

The Emergency Service Responder Plan should provide the necessary information for emergency service responders to safely address an incident involving the HAV. The Emergency Service Responder Plan shall include, at a minimum:

- a) How to identify the vehicle (e.g., branding);
- b) How to secure the vehicle (e.g., disengaging the ADS);
- c) Location of vehicle registration and proof of insurance;
- d) Extrication considerations;
- e) Towing considerations;
- f) Firefighting considerations

- g) Post-crash considerations; and
- h) Any additional considerations, if applicable.

TESTING AUTHORIZATION PROCESS

Upon receipt of the Notice of Testing application, PennDOT shall have ten (10) business days to approve, decline, or request clarification. If approved, PennDOT shall provide the Tester with an “Authorization Letter” which is valid for a year, with annual renewals¹⁸. If clarification is needed, PennDOT shall outline where additional information is necessary. The Tester shall have thirty (30) days to respond to PennDOT. Upon receipt of the additional information, PennDOT shall have ten (10) business days to approve, decline, or request clarification on the updated application.

If declined, PennDOT shall provide a written explanation to the Tester providing the reasons why the application was declined and provide an opportunity to meet with PennDOT. The Tester may resubmit until authorization is granted.

MODIFICATION TO NOTICE OF TESTING

After receiving the “Authorization Letter,” the HAV Tester shall notify PennDOT if there are material changes in the testing program or if there are material modifications to the ODD such that the submitted Notice of Testing no longer accurately or adequately describes the scope of the testing program.

SUSPENSION OR REVOCATION OF AUTHORIZATION

PennDOT may suspend or revoke testing authorization where any act or omission of the Tester or one of its agents, employees, contractors, or designees makes the conduct of HAV testing on trafficways by the Tester an unreasonable risk to the public based on PennDOT’s reasonable determination. Reasons for temporary suspension or revocation includes, but is not limited to:

1. A determination that the Tester falsified any responses in the “Notice of Testing” application;
2. A Tester’s HAV is involved in a crash that results in serious bodily injury or death;
3. The Tester’s HAV shares proprietary ADS software with any HAV that is involved in a crash that results in serious bodily injury or death; or

¹⁷ A 3rd Party shall include both non-affiliated organizations (e.g., a company that specialized in AV safety assessments) and affiliated organization that are separate legal entities (e.g., parent organizations).

¹⁸ Renewals shall be initiated by the Tester.

4. The Tester fails to disclose any known violations of reasons 2, or 3.

Reinstatement of Testing Authorization - Upon the suspension or revocation of authorization, the Tester shall be entitled to request reinstatement. PennDOT may consider any actions taken by the Tester to correct deficiencies, if any, that caused the suspension or revocation or evidence that the safety driver or the ADS, if in operation, was not at fault in the incident that led to the suspension or revocation of authorization.

TEMPORARILY RESTRICTING TESTING

PennDOT and, if applicable, the Pennsylvania Turnpike Commission (PTC), reserve the right to request Testers temporarily prohibit or restrict testing on select trafficways or statewide during certain circumstances. PennDOT or the PTC shall notify the HAV Tester, with as much notice as practicable, about how, where, and when testing should be prohibited or restricted. To the extent practicable, PennDOT or the PTC shall contact all applicable Testers to explain the reasons for the restriction prior to issuance and will consider any specific Tester proposals to continue safe operations during the restriction period. When HAV Testing is no longer prohibited on a trafficway, PennDOT and/or the PTC shall notify the HAV Testers within one (1) business day.

Restrictions do not apply to HAV being manually operated by the safety driver.

1. Emergencies - During emergencies, HAVs will only be prohibited if there are active restrictions for other classes of vehicles. To ensure safety, all ongoing testing should be concluded before the date and time specified in the notice.
2. Special Events – Includes, but not limited to, dignitary visits, major conventions/summits, and superload movements. Only special events with potential dynamic closures and/or safety/security concerns will be considered for temporary prohibition or restricted testing. PennDOT or PTC shall provide at least one (1) days’ notice to the HAV Tester. To the extent possible, PennDOT and the Pennsylvania Turnpike Commission shall attempt to provide three to five (3 to 5) days’ notice.
3. Safety Concerns – Includes, but not limited to, complex and/or irregular work zone patterns. PennDOT shall maintain a list of trafficways where testing is prohibited and notify HAV

Testers three (3) business days in advance of the list changing.

A local municipality or operating agency may request a temporary prohibition or restriction on the testing of an HAV for emergencies, special events or safety concerns, as defined above, by contacting PennDOT. PennDOT shall consider the request, and if PennDOT determines that the requested prohibition or restriction is necessary and justified to address a safety concern, PennDOT will notify the HAV Tester within the allotted window of time.

PennDOT recommends that the HAV Tester contact PennDOT or the PTC prior to testing to learn current trafficway conditions. PennDOT or the PTC can offer the HAV Tester a data feed of reported incidents and construction events.

COMMERCIAL VEHICLE RESTRICTIONS

The following selected vehicles are not permitted to operate with the ADS engaged:

1. Vehicles carrying hazardous materials as defined in the Federal Motor Carrier Safety Regulations (49 CFR Subchapter B);
2. Vehicles carrying oversize or overweight loads;
3. Vehicles carrying fluids (e.g., tankers, concrete trucks);
4. Vehicles carrying pipes, lumber, or similar types of loose loads;
5. Vehicles carrying livestock;
6. Automobile and boat transporter combinations (traditional and stinger-steered);
7. Truck and pole combinations;
8. Double and triple trailer combinations;
9. Lowboy tractor/trailer combinations (loaded and unloaded); and
10. Saddle mount or saddle mount with full mount combinations.

SEMI-ANNUAL REPORTING

To document and measure the impact of HAV testing in Pennsylvania, PennDOT must collect certain data/information from all Testers. On a semi-annual basis, the HAV Tester will provide the following information to PennDOT through the “Semi-Annual Collection Form” found in Appendix A and on the PennDOT website www.penndot.gov/av:

- Approximate miles traveled by ADS-engaged HAVs in Pennsylvania.
- Type of roadway where the majority of testing occurred¹⁹.

¹⁹ Testers should use the county Federal Functional Class maps. Maps can be found at <https://www.penndot.gov/ProjectAndPrograms/Planning/TrafficInformation/Pages/County-Functional-Class-Maps.aspx>

- o Interstate Highways and Other Freeways and Expressways
- o Arterial, Collector, and Local roadways within an Urban Boundary, including both small and large boundaries.
- o Arterial, Collector, and Local roadways outside of an Urban Boundary, including both small and large boundaries.
- Zip code(s) where HAVs were tested on public trafficways.
- Approximate number of employees in Pennsylvania involved with HAV testing.
- If applicable, the approximate number of new jobs created in Pennsylvania because of HAV testing.
- If applicable, the approximate number of new facilities constructed, purchased, or rented in Pennsylvania because of testing.
- Information regarding the number of times the following elements were encountered within the ODD:^{20 21}
 - o Active Work Zones
 - o Active School Zones
 - o Active Emergency Response Vehicles
 - o Snow-Covered Trafficways
 - o Tunnels

The initial “Semi-Annual Collection Form” should be submitted to PennDOT on either June 1st or December 1st, ensuring less than six (6) months of testing has occurred before submission. Subsequent forms should only include information on testing that occurred since the last submission. If the Tester chooses to complete a physical form, it should be mailed to: PennDOT Office of the Secretary, Commonwealth Keystone Building, 400 North Street 8th Floor, Harrisburg, PA 17120.

CRASH REPORTING

The Tester shall forward an initial notification of the occurrence of any reportable crash in Pennsylvania involving an ADS-engaged HAV on trafficways within a reasonably practicable timeframe, but in no case to exceed two (2) hours of being informed of any crash.

Notifications required under this section shall be reported to the appropriate 24/7 center:

- Department of Transportation’s Statewide Traffic Management Center:
 - o 717-346-4400
 - o RA-PDSTMC@pa.gov
- Pennsylvania Turnpike Commission’s Traffic Operations Center:

- o 866-332-5889
- o dutyofficer@paturndpike.com

The Tester will provide, to the extent possible:

- Name of HAV Tester
- General location of the crash
- Approximate date and time of the crash
- To the extent known, the severity of the crash
- Tester Point-of-Contact during the investigation.

As the investigation progresses, the Tester shall keep PennDOT and the PTC, when applicable, abreast of new information as it becomes available.

HAV DATA - OPTIONAL

Testers are encouraged to make data available to researchers and the general public. Compliance with this section has no bearing on the approval of the Notice of Testing. However, it is PennDOT’s belief that the sharing of data will help accomplish the core mission of these Testing Guidance – the safe testing and deployment of highly automated vehicles.

If possible, PennDOT encourages Testers to share:

- Data from testing in Pennsylvania
- Data from:
 - o Testing within an Active Work Zone
 - o Testing within an Active School Zone
 - o Testing within an Emergency Response Area
 - o Testing on Snow Covered trafficways
 - o Testing around Vulnerable Highway Users
 - o Testing within Tunnels
- Data from an HAV that, when under ADS control, encountered a scenario that would be considered an edge case.

²⁰ Should include qualitative reporting about the overall vehicle performance when encountering the elements.

²¹ Reporting can be submitted as part of a written report or through a meeting PennDOT. The meeting should occur within ten (10) working days of the data reporting deadline.

GLOSSARY OF TERMS

“Advanced Driver Assistance Systems (ADAS).”

Systems designed to help drivers with certain driving tasks (e.g., staying in the lane, parking, braking, avoiding crashes, reducing blind spots, and maintaining a safe space cushion)

“Automated Driving System (ADS).” The hardware and software that is collectively capable of performing the entire dynamic driving task on a sustained basis for a Highly-Automated Vehicle.

“Crash.” For purposes of required reporting for Highly Automated Vehicle testing, a crash involving either serious bodily injury (as defined in 18 PA.C.S. § 2301) to or death of any person; or damage to any vehicle involved to the extent that it cannot be driven under its own power in its customary manner without further damage or hazard to the vehicle, other traffic elements, or the trafficway, and therefore requires towing.

“Developer.” A natural person, firm, copartnership, association or corporation who builds or creates hardware and software applications utilized in an ADS.

“Driver.” A natural person who drives or is in actual physical control of a vehicle.

“Dynamic Driving Task.” The operational (steering, braking, accelerating, monitoring the vehicle and trafficway) and tactical (responding to events, determining when to change lanes, turn, use signals, etc.) aspects of driving, but not the strategic (determining destinations and waypoints) aspect of the driving task.

“Edge Case.” A situation that occurs only at an extreme operating parameter.

“Emergency.” Those conditions that by investigation may be found, actually or likely, to:

1. Affect seriously the safety, health or welfare of a substantial number of citizens of the Commonwealth or preclude the operation or use of essential public facilities.
2. Be of such magnitude or severity as to render essential state supplementation of municipal efforts or resources exerted or used in alleviating the danger, damage, suffering, or hardship faced.
3. Have been caused by forces beyond the control of man; by civil disorder, riot, terrorism or disturbance; or by factors not foreseen or not known to exist when technological processes were put into place

“Emergency Service Responder.” An individual acting in an official capacity as police officer, sheriff, deputy sheriff, firefighter, fire police, fire marshal, rescue personnel, ambulance personnel, towing and recovery personnel, hazardous material response team member or emergency medical service personnel.

“Emergency Response Area.” The area in which emergency service responders render emergency assistance to individuals on or near a roadway or a police officer is conducting a traffic stop or systematic check of vehicles or controlling or directing traffic as long as the emergency vehicle is making use of visual signals meeting the requirements of Title 75, Chapter 45, Subchapter D.

“First Class City.” A city containing a population of one million or over.

“Highly Automated Vehicle (HAV).” A motor vehicle equipped with an ADS that can operate in high or full automation and where the ADS is engaged or in operation. This definition encompasses automated vehicles equipped with ADS considered to be Level 3, 4 or 5 under SAE J3016.

“Inclement Weather.” For the purpose of this guidance, unfavorable weather or road conditions which include, but is not limited to:

1. Snow covered trafficways until pavement has been plowed full width,
2. Icy pavements until highways has been cindered or salted.
3. Rain, fog, snow storm or other atmospheric conditions which restrict visibility to less than 1,000 feet.
4. If applicable, winds sufficient to cause the wheels of a 53’ trailer to deflect more than 6 inches from the path of the wheels of the drawing vehicle.

“Independent Review Entity.” A board, committee, organizational unit, or individual within or associated with the Tester who has the ability to halt operations due to safety concerns and/or authority to require modifications in the Tester’s “Single Safety Driver Testing Plan” to ensure safe testing.

“Minimal Risk Condition.” A condition to which a user or an ADS may bring a vehicle after performing the DDT fallback in order to reduce the risk of a crash when a given trip cannot or should not be completed.

“Municipality.” As defined in the Pennsylvania Constitution, “. . . a county, city, borough, incorporated town, township, or similar unit of government . . .” (Article IX, Section 14, The Constitution of Pennsylvania).

“Nighttime.” The period between sunset and sunrise.

“Original Equipment Manufacturer (OEM).” The original manufacturer of the vehicle used by a Tester.

“Operation.” The driving of an HAV on a trafficway for the purpose of testing an ADS.

“Operational Design Domain (ODD).” The HAV Tester’s definition of the conditions in which the ADS, or the differing automated components thereof, is intended to operate with respect to roadway types, geographical location, speed, range, lighting conditions for operation (day and/or night), weather conditions, and other operational domain constraints, including a description of how the ADS provides for object and event detection and response under of normal driving scenarios, expected hazards (e.g., other vehicles, pedestrians), and unspecified events (e.g., emergency vehicles, temporary construction zones) that could occur within the operational domain.

“Person.” A natural person, firm, co-partnership, association, or corporation.

“Safety Case.” A structured argument, supported by a body of evidence, that provides a compelling, comprehensible and valid case that a system is safe for a given application in a given environment.

“Safety Driver.” An individual employed by or otherwise affiliated with an HAV Tester who has successfully completed the Tester’s safety driver training program and can take immediate manual or remote control of the HAV.

“Safety and Risk Mitigation Plan.” Plan developed by an HAV Tester to provide adequate safety in case of ADS failure. The plan should contain no proprietary information regarding the ADS.

“Second Class City.” A city containing a population of two hundred and fifty thousand and under one million.

“Secondary Safety Associate.” An individual who qualifies as a Safety Driver and is present in HAV to provide support, guidance, relief or other support services to the Safety Driver, as per a Tester’s Safety and Risk Mitigation Plan.²²

“Serious Traffic Violation.” Violations include excessive speeding (15 mph or more above the posted limit), reckless driving, improper or erratic lane changes, following a vehicle too closely and traffic offenses committed in connection with fatal traffic accidents.

“Snow Covered.” Accumulation of snow or slush regularly found on the pavement surface.

“Tester.” A natural person, firm, copartnership, association or corporation who will conduct testing of an HAV.

“Trafficway.” The entire width between property lines or other boundary lines of every way or place of which any part is open to the public for purposes of vehicular travel as a matter of right or custom.

“Vulnerable Highway User.” Any of the following who is lawfully on a trafficway

- A pedestrian
- An individual on a pedalcycle.
- An individual on a motorized pedalcycle.
- An individual on an animal.
- An individual on an animal-drawn vehicle.
- An individual on an electric personal assistive mobility device.
- An individual with a mobility-related disability on a self-propelled wheelchair or on an electrical mobility device operated by and designed for the exclusive use of an individual with a mobility-related disability.
- An individual on a nonmotorized self-propelled transportation device.
- An individual on a motor-driven cycle.

“Work Zone.” The area of a trafficway where construction, maintenance or utility work activities are being conducted which is properly signed as a work zone in accordance with PennDOT regulations, policies and publications.

²² The Secondary Safety Associate is not required to have a Commercial Drivers License (CDL) if the HAV is a commercial vehicle. However, they must hold a valid Class C drivers license.

APPENDIX A - Semi-Annual Data Collection Form

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SEMI-ANNUAL DATA COLLECTION FORM

TO DOCUMENT AND MEASURE THE PROGRESS OF HAV TESTING IN PENNSYLVANIA, PENNDOT MUST COLLECT FUNDAMENTAL DATA FROM ALL HAV TESTERS.

A SUBMITTER INFORMATION

Full Name:			
Company/Agency:			
Mailing Address:			
City:		State:	Zip Code:
Phone:	Email:	Date:	Reporting Period:

B DATA COLLECTION QUESTIONS

1. Indicate the approximate miles traveled by ADS-engaged HAVs in PA (select one):

<input type="checkbox"/> 1 to 999 miles	<input type="checkbox"/> 10,000 to 14,999 miles	<input type="checkbox"/> 25,000 to 29,999 miles
<input type="checkbox"/> 1,000 to 4,999 miles	<input type="checkbox"/> 15,000 to 19,999 miles	<input type="checkbox"/> 30,000+ miles
<input type="checkbox"/> 5,000 to 9,999 miles	<input type="checkbox"/> 20,000 to 24,999 miles	<input type="checkbox"/> No on-road testing

2. Indicate where the majority of testing occurred (select one):

- Interstate Highways and Other Freeways and Expressways
- Arterial, Collector, and Local roadways within an Urban Boundary, including both small and large boundaries
- Arterial, Collector, and Local roadways outside of an Urban Boundary, including both small and large boundaries
- Equal testing

3. List the Zip Codes where HAVs were tested on public trafficways:

4. Indicate the approximate number of employees in Pennsylvania involved with HAV testing (select one):

<input type="checkbox"/> 1 to 19 Employees	<input type="checkbox"/> 40 to 59 Employees	<input type="checkbox"/> 40+ Jobs
<input type="checkbox"/> 20 to 39 Employees	<input type="checkbox"/> 60 to 79 Employees	<input type="checkbox"/> No Change Since Previous Submission

5. Indicate, if applicable, the number of new jobs created in Pennsylvania as a result of HAV testing in the last 6 months (select one):

<input type="checkbox"/> 1 Facility	<input type="checkbox"/> 2 to 4 Facilities	<input type="checkbox"/> 5+ Facilities	<input type="checkbox"/> No Change Since Previous Submission
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6. Provide information regarding the number of times the following elements were encountered within the ODD:

- Active Work Zones
- Active School Zones
- Active Emergency Response Vehicles
- Snow-Covered Trafficways
- Tunnels

Comments:

C PERFORMANCE AND CONFORMANCE MONITORING METRICS AND METHODOLOGY

1. Metric to evaluate driver attentiveness:

2. Describe methodology to monitor the efficiency of remote monitoring of the safety driver:

3. List safe driving behaviors for a HAV with a single safety driver metric:

CONFIDENTIALITY

To the extent that PennDOT may be furnished or given access to knowledge, information, data, compilations of data, customer-identifying information, reports, and documents that are confidential, trade secrets of, and proprietary to the Tester (i.e., information not in the public domain) including, but not limited to, information about and on the Tester's products, customers, and business operations and strategy ("Confidential Information"), PennDOT will not disclose the Confidential Information, except to employees, affiliates, agents, or professional advisors who need to know it and who have agreed in writing (or in the case of professional advisors are otherwise bound) to keep it confidential. PennDOT will ensure that those people and entities will use the Confidential Information only to exercise rights and fulfill obligations under this Agreement, and that they keep it confidential. PennDOT is required to comply with the Act of February 14, 2008 (P.L.6, No.3), as amended, known as the Right-to-Know Law, unless otherwise exempted.

