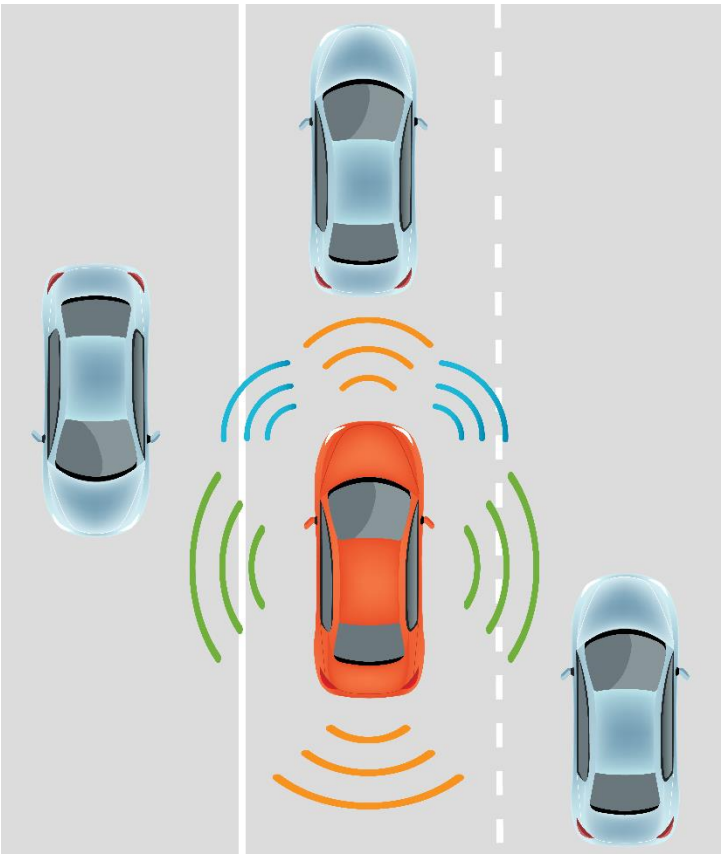
Federal Public Service
Mobility and Transport

Autonomous vehicles



Code of Practice
for testing in Belgium

This Code of Practice for testing in Belgium is based on ‘The Pathway to Driverless Cars: A Code of Practice for testing’ compiled by the ‘UK Department for Transport’ in July 2015.

We thank our partners for their cooperation in drawing up this document: the regional authorities of Flanders (Vlaamse overheid), Wallonia (Service Public de Wallonie) and Brussels (Gewestelijke Overheidsdienst Brussel – Service public régional de Bruxelles); the sector federations Agoria and Febiac; and the Belgian Institute for Road Safety.

The Code of Practice will be implemented in close consultation with the regional authorities and the road authorities. Based on the pilot projects proposed, some amendments to this Code are possible.

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1. Introduction

1.1. The present Code regulates the testing of automated vehicles in a real world environment in Belgium.
In concrete terms, tests of this nature may take place on condition that the vehicle is used in accordance with the road traffic legislation and providing a test driver is present, or, in certain specific cases, minimally a test operator, who takes responsibility for the safe operation of the vehicle.

1.2. It is up to the manufacturer or the testing organisation to ensure that innovative technologies for automated or fully automated vehicles are developed and tested thoroughly before being brought onto the market. Much of this development can be done in test laboratories or on dedicated test tracks and proving grounds. However, to ensure that these technologies are capable of 'safe behaviour' in the various situations that may present themselves, they will need to be subjected to controlled testing in a 'real world environment' also. Thus, the testing of new automated vehicle technologies on public roads or in other public places should be facilitated whilst care must be taken that these tests are designed and conducted in order to minimise potential risk.

1.3. This Code of Practice has been published to help manufacturers and/or testing organisations intending to test these technologies in real conditions. This Code of Practice provides clear guidelines and recommendations to maintain safety during this testing phase.

1.4. The present Code of Practice does not contain any actual rules of law but has been developed to promote responsible planning and carrying out of tests. Testing organisations shall use this Code in conjunction with detailed knowledge of the statutory, regulatory and technological framework.

2. Object, scope and definitions

Object

2.1. This Code of Practice provides guidelines for organisations wishing to conduct testing of driver assistance and partially or even fully automated vehicle technologies on public roads or in other public places within Belgium. The present Code lists the minimum conditions the competent authorities expect to be respected in order to guarantee road safety and minimise potential risks. 'Minimum conditions' means that additional conditions may be imposed for specific applications which may vary according to the Region covered by the application.

2.2. It is expected that careful testing will contribute to the well-planned development of automated vehicles which, when operated in 'automated mode', will display exemplary driving behaviour, improving the safety of all road users, and reduce emissions and traffic congestion.

Scope

2.3. This Code of Practice is intended for the following applications:

- The testing of driver assistance and partially or even fully automated vehicle technologies on public roads or in other public places in Belgium (see hereafter: as of SAE level 1).
- The testing of a wide range of vehicles, from smaller automated pods and shuttles, through to more conventional road vehicles such as cars, vans, busses or lorries.

Definitions

2.4. For the purpose of this documents, the following definitions shall apply:

Automated vehicle (see categories 1 to 4 in the table below with specification as to the level of automation)

2.5. A vehicle requiring the presence of a driver, ready to take manual control at any time. In certain situations however, the vehicle can offer an 'automated mode', allowing the driver to disengage from driving and possibly to undertake other tasks.

Automated vehicles offer an automated mode under certain specific driving conditions, such as motorway cruising or driving at low speed. As the technology develops, it is expected that these vehicles may be able to drive in automated mode in ever more complex driving conditions.

Fully automated vehicle (see category 5 in the table below with specification as to the level of automation)

2.6. This means a vehicle that no longer requires a driver. The vehicle is designed in such a way that it can safely complete journeys without the intervention of a driver, in all traffic, road and weather conditions any competent human driver is able to operate a vehicle in.

In fully automated vehicles, occupants will be able to engage in tasks other than driving for the entire journey. Fully automated vehicles may still offer a full set of controls to allow the driver to resume manual control if he so wishes.
(Comment: for testing purposes, this Code of Practice requires that a fully automated vehicle has the facility to resume manual control at any time.)

Table: Level of automated driving for road vehicles, SAE International

SAE level	Name	Execution of steering and acceleration/ deceleration	Monitoring of driving environment	Fallback performance of dynamic driving task	System capability (Driving modes)
0	No automation	Human driver	Human driver	Human driver	n/a
1	Driver assistance	Human driver and system	Human driver	Human driver	Some driving modes
2	Partial Automation	System	Human driver	Human driver	Some driving modes
Automated driving system (“system”) monitors the driving environment					
3	Conditional Automation	System	System	Human driver	Some driving modes
4	High automation	System	System	System	Some driving modes
5	Full automation	System	System	System	All driving modes

Source: SAE International and J3016, 2014

Testing organisation

2.7. A testing organisation is any institution or person wishing to test (new) driver assistance and/or partially or even fully automated vehicle technologies on public roads or in other public places in Belgium. The testing organisation submits the application and bears full responsibility for the tests to be conducted.

Test driver

2.8. A test driver is the person who is seated in the vehicle in a position where he is able to control the vehicle's speed and direction using manual controls at any time.

Test operator

2.9. A test operator is the person who oversees testing of an automated vehicle. The test operator must not necessarily be seated in the vehicle but must at all times be able to override the automated operation of the vehicle, especially when there is no test driver in the vehicle.

Test assistant

2.10. A test assistant assists the test driver or test operator with the testing, for example by monitoring the information relayed via screens or other information systems designed to provide feedback and by observing the reactions of other road users.

3. General requirements

Safety requirements

3.1. Responsibility rests with the testing organisation for ensuring that all tests planned meet the relevant legislation and that the vehicles involved are roadworthy, meet all the relevant vehicle requirements and can be used in a way that is compatible with the road traffic legislation prevailing in Belgium (see Section 5).

In addition, testing organisations shall:

- ensure that test drivers and test operators hold the relevant driving licences and have received the appropriate training (see Section 4);
- conduct a (prior) risk analysis of any tests proposed and develop appropriate risk management strategies (with documentation in support);
- be aware of the possible impact of these tests on other road users, and, on that account, conduct trials on private property before embarking on any tests on the public road or in other public places - so as to manage the risks and their possible consequences as best as possible;
- allow representatives of the competent authorities to attend the tests, whether conducted on private property, the public road or in other public places – inter alia, to convince them that all reasonable measures have been taken to as best as possible assess any conceivable risks and to minimise their consequences.

Where tests on the public road or in any other public places are considered, an application form will have to be completed.

3.2. The responsibility for the safe and orderly testing of the technologies in question on the public road or in any other public places invariably rests always with the testing organisations. The mere compliance with the present guidelines does not by definition mean that all reasonable steps to minimise risks have been taken.

3.3. Testing on the public road shall invariably require the presence of a test driver.
As a minimum, a test operator shall be present in cases where tests are conducted in public places other than on the public road (and on private property accessible to the public), providing the vehicle does not exceed a speed of 30 km/h.

3.4. Where the vehicle also carries passengers, the testing organisation (or test driver) is obliged to inform them about the tests and of the fact that the vehicle is a prototype beforehand.

Insurance

3.5. All statutory requirements in matters of insurance apply. Anyone conducting tests with automated vehicles on public roads or in other public places must be covered by appropriate insurance and also satisfy the other statutory requirements (a copy will need to be submitted).

Competent authorities

3.6. Testing organisations must engage with the competent transport and road authorities with responsibility or competence for the test location (the federal and regional authorities, the road authority and the police).

3.7. Any specific infrastructure requirements that are considered necessary within the framework of the tests, including traffic signals, will need to be put in place as agreed with the road authority/authorities.

3.8. Testing organisations shall compile a report after each test on the public road or in any other public place. Where necessary, they shall propose any changes that may be required for risk management purposes. This report shall be discussed with the relevant authorities (the federal and regional authorities and the road authority respectively).

Engagement

3.9. Communication-related initiatives shall be coordinated with the competent authorities (the federal and regional authorities, the road authority and the police) with regard to:

- a clarification of the nature and details of the planned tests;
- where appropriate, the possible consequences of these tests for other road users, including the measures that have been taken to mitigate any risks;
- any and all 'instructions' that may be issued to onlookers.

Testing organisations are also welcome to coordinate with the authorities if they wish to inform the public of the potential benefits of automated vehicles.

3.10. Once the necessary permits have been obtained and no less than 3 working days prior to the start of the trials, the testing organisation shall notify the police by e-mail of the times and locations of the test drive and of the registration data of the test vehicles at the following address: dga.dao.inbox@police.belgium.eu and with cc to: dga.dah.dir.srt@police.belgium.eu

4. Requirements for test drivers, test operators and test assistants

Requirements for a test driver/operator overseeing the tests

4.1. The testing of automated vehicles on the public road shall be done in the presence of a suitably trained test driver or, in any other public places (providing the vehicle does not exceed the speed of 30 km/h), a test operator. Details with regard to the required driving licence and training are set out in sections 4.5 to 4.10.

4.2. The test driver or test operator is responsible for the safe operation of the vehicle at all times, whether the vehicle is in manual or automated mode. The test driver and test operator must be familiar with and understand the systems under test, including their capabilities and limitations, and must be able to anticipate the need to intervene and resume manual control when necessary.

4.3. The test driver or operator must have been duly authorised by the testing organisation to fulfil the role in question. Testing organisations shall have robust risk management, process and training procedures in place for test drivers and test operators, and shall ensure that the aforesaid persons hold the appropriate driving licence.

4.4. Those entrusted with testing are expected to have knowledge of article 8.3 of the Royal Decree of 1 December 1975 concerning General Regulations on the road traffic police and the use of the public road, applicable to the use of prototype vehicles on public roads. This article reads as follows:

"Any driver must be capable of steering and have the required physical ability and the necessary knowledge and driving ability.
He shall at all times be able to perform the necessary manoeuvres and be in continuous control of his vehicle […]."

Licence requirements

4.5. The test driver or test operator must hold the appropriate category of driving licence for the vehicle under test. This applies even if the vehicle's ability to operate entirely in automated mode is being tested. It is strongly recommended that the licence holder also has several years' experience of driving the relevant category of vehicle.

4.6. Where a prototype vehicle that cannot easily be categorised is under test, the nearest equivalent conventional category of licence shall apply. In the event of doubt, the competent authority must be contacted for confirmation.

4.7. The testing organisation shall take due care in its selection and guidance of test drivers and test operators. Testing organisations are expressly advised not to use persons whose driving history indicates that they may increase the possible risks.

Test driver or test operator training

4.8. Testing organisations shall develop and implement procedures to ensure the competency of test drivers and test operators. Test drivers and test operators need skills over and above those of drivers of conventional vehicles, and/or in normal conditions. For example, it is important to ensure that they have an excellent understanding of the capabilities and potential limitations of the technologies under test and are able to assess and, where possible, control the risks associated therewith. It is also recommended that they get the opportunity to familiarise themselves with the characteristics of the vehicle and technologies under test, preferably through extensive tests on closed roads or test tracks.

4.9. Test drivers and test operators must be familiar with the modalities of the automated systems under test, and be aware of the situations in which they may have to intervene. Training should cover potentially hazardous situations that may be encountered, and the appropriate action to be taken at that moment in time - including safely resuming manual control.

4.10. Training shall also include switching between conventional, manual mode and automated mode and vice versa. It is vital that those conducting the tests are fully aware of the mode in which the vehicle is operating and of the manner in which control is passed between the test driver or test operator and the vehicle.

Test driver and operator working hours

4.11. Test drivers and operators shall remain alert and ready to intervene if necessary throughout the test period.

4.12. Testing organisations shall develop robust procedures to ensure that test drivers and test operators are sufficiently alert to perform their task and do not suffer fatigue. Measures could include setting limits for the amount of time that test drivers or operators perform their duties per day, and the maximum duration of any one test period.

Test driver/operator behaviour

4.13. Testing organisations shall implement clear rules regarding test driver and test operator behaviour and ensure that these are known and understood.

4.14. These rules shall include a ban on the use of alcohol and drugs.

4.15. **All existing laws with regard to driver behaviour prevailing in Belgium continue to apply, even if the vehicle is operated in automated mode.**
The highway code can be consulted at the following websites:
(in Dutch:) http://wegcode.be/wetteksten/secties/kb/wegcode
(in French:) http://code-de-la-route.be/textes-legaux/sections/ar/code-de-la-route
A summary is available at the website of the European Commission:
http://ec.europa.eu/transport/road_safety/going_abroad/belgium/index_en.htm

4.16. Test drivers and test operators should be conscious of the way they are perceived by other road users, for example continuing to maintain gaze in directions appropriate for normal driving.

Test assistants

4.17. Depending on the nature of the tests being conducted and the vehicle involved, testing organisations may deploy a test assistant.

For instance, if the vehicle is a conventional car which has been adapted to include functions related to automated technologies, a test assistant can assist the test driver by monitoring information displayed on screens or via other feedback systems.

5. Vehicle requirements

General vehicle requirements

5.1. Any organisation wishing to test automated vehicle technologies on the public road or in other public places must ensure that the vehicles under test can be used in a way that is compatible with the road traffic legislation prevailing in Belgium.

5.2. The vehicle must meet the national requirements set out in the Royal Decree (RD) of 15 March 1968 or the European requirements as set out in Directive 2007/46/EC.
Test vehicles must also correspond to the rules on technical inspection, as stipulated by the RD of 15 March 1968 concerning General Regulations on technical requirements for motor vehicles, their trailers and their safety accessories.
(in Dutch:) http://www.wegcode.be/wetteksten/secties/kb/tech
(in French:) http://code-de-la-route.be/textes-legaux/sections/ar/reglement-technique-des-vehicules

Experience with technologies under test

5.3. Organisations wishing to test automated vehicles on the public road or in other public places shall demonstrate that the vehicles and/or technologies have been adequately tested on closed roads or test tracks beforehand.

5.4. As part of their risk management procedures, these organisations shall determine whether the tests were successful enough to proceed with testing on the public road or in other public places without posing additional risks to road users. Testing organisations shall keep an audit report and present it to the competent authorities.

5.5. Vehicle sensor and control systems should be sufficiently developed to be capable of appropriately responding to all types of road users which may be encountered during the test in question. The organisations shall in particular be mindful of the most vulnerable road users such as disabled people, people with visual or hearing impairments, pedestrians, cyclists, moped riders, motorcyclists, children and horse-riders.

Data recording

5.6. Automated vehicles under test should be fitted with a data recording device that is capable of recording data from the sensor and control systems linked to the automated functionalities, including other information associated with the vehicle’s movements.

5.7. As a minimum, this device should record the following information:

- whether the vehicle is operating in manual or automated mode;
- the speed of the vehicle;
- steering commands and activation;
- braking commands and activation;
- activation of the vehicle's audible warning system;
- the location of the vehicle (on the roadway);
- the operation of the vehicle's lights and indicators;
- sensor data concerning the presence of other road users or objects in the vicinity of the vehicle;
- remote commands that (may) influence the vehicle's movements (where applicable).

Where some of the aforesaid elements are irrelevant within the framework of the proposed tests, or cannot be recorded, the testing organisation shall explain this on the application form.

5.8. These data should allow one to establish who or what was controlling the vehicle at the time of an incident. The data shall be securely stored and, in the event of an incident, be provided to the official bodies upon request. Testing organisations are expected to fully cooperate with the competent authorities in the event of an investigation into an incident.

5.9. In addition, it may be useful to fit vehicles under test with a video and audio recording system. However, this device should not be considered as an alternative to the data recording requirements specified in section 5.7.

Data protection

5.10. Testing is likely to involve the collection and/or processing of personal data. Where data are collected about the behaviour or location of individuals in the vehicle allowing those individuals to be identified, the activity comes within the scope of the Data Protection Act of 8 December 1992.
The testing organisation, and by extension all the persons involved, shall ensure that the data protection legislation is complied with, including the requirement that the personal data are used fairly and lawfully, kept securely and for no longer than necessary.

5.11. A (prior) assessment of the impact on privacy of the proposed tests and/or the procedures implemented is not a legal requirement but can be useful in terms of helping a project comply with the data protection legislation. An assessment like this can be developed flexibly and proportionally, depending on the complexity of the test.

Cyber security

5.12. As stated in section 4, a test driver or test operator shall oversee the movements of the vehicle under test at all times so that manual control of the vehicle can be safely resumed whenever necessary.

5.13. Nevertheless, manufacturers providing vehicles, and other organisations supplying parts for the tests, need to ensure that all prototypes of automated controllers have appropriate levels of security built into them to ward off any risk of unauthorised access.

5.14. Testing organisations and/or other entities involved are advised to adhere to and apply the security principles as set out in Standard IEC 61508, or equivalent on software trustworthiness, as best as possible.

Process for transition between automated and manual modes

5.15. An important part of the safety of automated vehicle testing is the management of the transitions from manual control to automated mode and, in particular, from automated mode back to manual control.

5.16. The system used shall:

- be straightforward and easily understood by the test driver or test operator;
- ensure that the test driver or test operator can establish clearly whether the vehicle is in manual or automated mode;
- ensure that the test driver or test operator is given appropriate and ample warning to resume manual control of the vehicle whenever necessary;
- allow the test driver or test operator to quickly and easily resume control of the vehicle whenever necessary.

5.17. Ensuring minimal transition periods between manual and automated modes, with the least possible risk, forms an important part of the vehicle development process and the organisation of the envisaged tests.
It therefore goes without saying that this aspect must be developed and tested on closed roads or test tracks before any tests on the public road or in any other public places are conducted.

Failure warning

5.18. Prior to the start of any test drive, the test driver or test operator shall check the proper functioning of the system under test, including the proper functioning of the emergency procedures put in place.

5.19. In the event of a malfunction or failure of the automated driving systems under test, the test driver or test operator must be notified by means of an audible signal which may be accompanied by a visual warning.
The emergency procedure(s) put in place are activated and, if necessary, the test must be aborted or the vehicle safely parked on the side. Testing shall not be resumed until such time as the system is demonstrably operational again.

5.20. The vehicle's automated braking and steering systems shall be designed in such a way that, in the event of failure, manual braking and steering remains possible.

Software versions

5.21. Automated driving systems will require the interaction and the correct functioning of several computers and/or electronic control modules. It is essential that:

- all software versions and revisions used during testing are documented and recorded;

- all software versions and revisions have been extensively and demonstrably tested (reporting) before being deployed on the public road or in other public places.
  Tests of this nature will typically start with lab tests or test bench simulations before the software is incorporated into the vehicles and tested on closed roads or test tracks. Tests shall not be conducted on the public road or in other public places until such time as the various possible scenarios have been successfully run through.