

## Draft Proposal for Category [C1] requirements

### **Consolidated document (including homework) after the 13<sup>th</sup> session**

(Text (neutral) was agreed by the delegates in the 13<sup>th</sup> session, text highlighted in yellow, is still tbd.)

#### I.Proposal

*Insert a new paragraph 2.4.13. and 2.4.14., to read:*

- 2.4.13.** A ‘lane change procedure’ in case of Category [C1] starts when the direction indicator lamps are activated with deliberate action of the driver and ends when the direction indicator lamps are deactivated. It comprises the following operations:
1. Activation of direction indicator lamps with a deliberate action of the driver
  2. Lateral movement towards the lane boundary
  3. Lane change manoeuvre
  4. Deactivation of direction indicator lamps
  5. Resumption of the lane keeping function

**Remark: C1 to clarify**

- 2.4.14.** A ‘lane change manoeuvre’ is deemed
1. to start when the outside of the tyre of the vehicle’s front wheel closest to the lane markings has touched the inside edge of the visible lane marking to which the vehicle is being manoeuvred.
  2. to end when the rear wheels of the vehicle have fully crossed the lane marking

*Insert a new paragraph 5.6.3, to read:*

*Reservation for ACSF of category B2.*

*Insert a new paragraph 5.6.5, to read:*

- 5.6.5.** Special Provisions for ACSF of Category [C1]  
Any system of Category [C1] ACSF shall fulfill the following requirements.

**5.6.5.1.** General

- 5.6.5.1.1.** A vehicle equipped with an ACSF Category [C1] shall also be equipped with an ACSF of Category B1 complying with the requirements of this regulation.

**5.6.5.2. Activation/deactivation of the ACSF Category [C1] system**

**5.6.5.2.1** The system status shall be default off at the initiation of each new engine start/run cycle performed by the driver.

At the time of the first system activation after a new engine start/run cycle performed by the driver, a disclaimer shall be provided to inform the driver of their duty to monitor the traffic and road conditions prior to and throughout the lane change procedure.

**5.6.5.2.2.** The vehicle shall be equipped with a means for the driver to activate (standby mode) and deactivate (off mode) the system. The same means as for Category B1 may be used.

**5.6.5.2.3.** The system shall only be activated (standby mode) after a deliberate action of the driver.

[Activation by the driver shall only be possible on roads where pedestrians and cyclists are prohibited and which are equipped normally with a physical separation that divides the traffic moving in opposite directions and which have at least two lanes in the direction the vehicles are driving. This may be achieved with the use of e.g. navigation map data or road sign recognition.]

[In the case of road section classification change from a road where Category [C1] use was permitted before, to a type of road where Category [C1] is [not/no longer] allowed, the system shall be switched off, as soon as the system has detected this]

**Homework:** CPs to clarify their position and make a proposal

**Homework:** OICA to clarify the concept

**5.6.5.2.4.** It shall be possible to deactivate the system (off mode) at any time by a single action of the driver. Following this action, the system shall only be able to be reactivated (standby mode) by a deliberate action of the driver.

**5.6.5.2.5.** Notwithstanding the requirements above it shall be possible to perform the corresponding tests in Annex 8 on a test track.

**Homework:** Whoever has an idea... How can tests be performed "Off highway"?

**5.6.5.3. Overriding**

Steering by the driver shall override steering by the system. The steering control effort necessary to override the directional control provided by the system shall not exceed [30/50] N.

**Homework:** OICA to propose values for M/N vehicles until next meeting

The system may remain activated (standby mode) provided that priority is given to the driver during the overriding period. The means to override the ACSF shall be indicated in the system information data.

**5.6.5.4. Lateral acceleration**

**The lateral acceleration induced by the system during the lane change manoeuvre:**

- shall not exceed  $1 \text{ m/s}^2$  in addition to the lateral acceleration generated by the lane curvature, and
- shall not cause the total vehicle lateral acceleration to exceed the maximum values indicated in tables of paragraph 5.6.2.1.3.

**The moving average over half a second of the lateral jerk generated by the system shall not exceed  $5 \text{ m/s}^3$ .**

**5.6.5.5. HMI**

**5.6.5.5.1. Unless otherwise specified, the optical signals described in 5.6.5.5. shall all be different from each other (e.g. different symbol, colour, blinking, text).**

**5.6.5.5.2. When the system is in standby mode (i.e. ready to intervene), an optical signal shall be provided to the driver.**

**5.6.5.5.3. When the lane change is aborted, in accordance with 5.6.5.6.8., the system shall clearly inform the driver about this system status by an optical warning signal and additionally by an acoustic or haptic warning signal. In case the abortion is initiated by the driver, an optical warning is sufficient.**

**5.6.5.5.4. A system failure shall be signalled to the driver by an optical warning signal. However, when the system is manually deactivated by the driver, the indication of failure mode may be suppressed.**

**If a system failure occurs during a lane change manoeuvre, the failure shall be signaled to the driver by an optical and an acoustic or haptic warning.**

**5.6.5.5.5. The system shall provide a means of detecting that the driver is holding the steering control and shall warn the driver in accordance with the warning strategy set out for Category B1.**

5.6.5.6. Lane change procedure

5.6.5.6.1 The initiation of a lane change procedure of an ACSF of Category [C1] shall only be possible if an ACSF of Category B1 is already active.

**Remark: Is this the correct position?**

5.6.5.6.2. The lane change procedure shall start immediately after the manual activation by the driver of the direction indicator to the intended side for the lane change. The lane change procedure can only start by the deliberate action by the driver.

**Homework: Whoever has an idea... How can we do the wording better?**

5.6.5.6.3. The system shall inform the driver that the lane change procedure is ongoing.

5.6.5.6.4. [The lane change procedure shall start upon the deliberate action of the driver but the lane change manoeuvre shall not be initiated before a period of 3s of flashing of the direction indicator lamps.

The system may delay initiation of the manoeuvre for a period not exceeding [10] seconds after the deliberate action of the driver to confirm the traffic condition specified in paragraph 5.6.5.2.12.4. In this case the system shall inform the status to the driver. If the manoeuvre has not begun with this [10] seconds the execution of the procedure shall be cancelled.]

**Remark: should be defined, when sensor range is fixed**

*When the lane change procedure starts, the vehicle shall keep its lane until the lane change manoeuvre starts and the direction indicator lamps shall flash between 3 and 10s before the lane change manoeuvre can start.*

5.6.5.6.6. The lane change manoeuvre shall be completed in less than

- 5 s for M1, N1 vehicle categories,
- 10 s for M2, M3, N2, N3 vehicle categories.

5.6.5.6.7. The direction indicator shall remain active throughout the whole period of the lane change manoeuvre and shall be deactivated by the system no later than 0.5 seconds after the resumption of Category B1 control as described in paragraph 5.6.5.6.8. below.

“old 5.6.5.2.8” When the lane change procedure starts, the ACSF of category B1 shall be suspended, and the ACSF of category [C1] shall carry on the lane keeping function of ACSF of category B1, until the lane change manoeuvre starts. Once the manoeuvre is completed, ACSF of category B1 shall automatically resume.

**Check where this info is now in the document!**

5.6.5.6.8. [The lane change procedure shall be aborted at least when one of the following situation occurs:

- the system detects an imminent critical situation (vehicles within the safety distance),
- the system is overridden or switched off by the driver
- the system reaches its boundaries (e.g. lane markings are not detected)
- The system has detected, that the driver is not holding the steering control (If, at the start of the lane change manoeuvre the driver is not holding the steering control, the lane change shall be canceled),
- Manual deactivation of the direction indicator lamps shall be possible for the driver at any time and stop the lane change procedure.
- the lane change manoeuvre has not begun within the [10] s of flashing of the direction indicator lamps.]

**Homework** OICA to add, what is missing

5.6.5.7. Safety distance requirements

5.6.5.7.1. The vehicle with ACSF Category [C1] shall not carry out any lane change manoeuvre or shall abort an already started manoeuvre if an overtaking vehicle is within the safety distance to the rear ( $S_{d_{Rear}}$ ) and the safety distance to the left and to the right (side). In both cases the system shall clearly inform the driver about the system status by an optical warning signal and additionally by an acoustic or haptic warning signal.

5.6.5.7.2. The safety distance to the rear ( $S_{d_{Rear}}$ ) of the ACSF Category [C1] system shall be calculated according to the following formula:

[ *tbd.* Delegates prefer a dynamic formula reflecting  $\Delta V$  ]

5.6.5.8. Sensor requirements

5.6.5.8.1 The minimal detection range to the rear ( $S_{Rear}$ ) of the ACSF Category [C1] system shall be calculated according to the following formula:

[ *tbd.* Delegates prefer a dynamic formula reflecting  $\Delta V$  ]

5.6.5.8.2. The minimal detection range to the left and to the right (side) of the ACSF Category [C1] system shall be at least 6 m (see drawing) measured from the medium longitudinal centerline of the vehicle equipped with ACSF of Category [C1]

Drawing to be added

**Homework** OICA to provide drawing

1

**5.6.5.2.12.5.** After each vehicle new engine start/run cycle performed by the driver, the ACSF Category [C1] function shall be prevented from performing a lane change maneuver until the system has detected, at least once, a moving object at a distance greater than [x] m.

**5.6.5.2.12.6.** The ACSF Category [C1] shall be able to detect blindness of the sensor (e.g. due to accumulation of dirt, ice or snow). The ACSF Category [C1] shall be prevented, upon detection of blindness, from performing a lane change maneuver. The status of the system shall be signaled to the driver not later than on the initiation of the lane change maneuver. The same warning as the one specified in paragraph **5.6.5.2.6.** (*system failure warning*) may be used.

**5.6.5.2.12.8.** For the purpose of type approval, the ACSF Category [C1] shall be able to detect a vehicle of category L3, [with a RCS of a minimum [x] sqm 1),] approaching from the rear on the adjacent lane at a distance of at least [x] m.

1) this requirement is based on a radar sensor. If other technology is used, equivalent criteria shall be agreed between the manufacturer and the Technical Service. 1

**Remark:** is this the right place?

**Requirement for homologation test with “damping material” tbd.**

**5.6.5.9.** System information data

**5.6.5.9.1.** Following data shall be provided together with the documentation package required in Annex 6 of this regulation to the Technical Service at the time of type approval.

**5.6.5.9.1.1.** The conditions under which the system can be activated and the boundaries for operation (boundary conditions). [The vehicle manufacturer shall provide values for  $V_{smax}$ ,  $V_{smin}$  and  $a_{ysmax}$  for every speed range as mentioned in the table of paragraph **5.6.2.1.3.** of this Regulation.]

**Homework** D to propose new wording

**5.6.5.9.1.2.** Information about how the system detects that the driver is holding the steering control.

**5.6.5.9.1.3.** The means to override and to abort or cancel.

**5.6.5.9.1.4.** Information about how the failure warning signal status and the confirmation of the valid software version related ACSF performance can be checked via the use of an electronic communication interface.

**5.6.5.9.1.5.** Documentation about which system software version related ACSF performance is valid. This documentation shall be updated whenever a software version was amended.]

**5.6.5.9.1.6** [Documentation with pertinent information on the sensor range over lifetime. The sensor range shall be specified such way that any influence on deterioration of the sensor shall not affect the fulfillment of paragraph **5.6.5.2.12.2.** and **5.6.5.2.12.3.** of this regulation.]

**5.6.5.10.** The vehicle with ACSF Category [C1] shall be tested in accordance with relevant vehicle test(s) specified in Annex 8 of this Regulation. [For driving situations not covered by the tests of Annex 8, the safe operation of the ACSF shall be demonstrated by the vehicle manufacturer on the base of Annex 6.]

*Insert a new paragraph 3.3 in Annex 8, to read:*

*Reservation for tests of ACSF Category B2 Systems.*

*Insert a new paragraph 3.5 in Annex 8, to read:*

**[ 3.5. Tests for ACSF Category [C1] Systems**

<< Tests to be developed after the discussion of technical requirements >>

**3.5.1. Lane change functional test (Respecting also ay-requirements)**

**3.5.1.1 . Overtaking test (similar FU3?)**

**3.5.1.2. Returning to the “old” lane**

**3.5.2. Abort of lane change test (similar FU2?)**

**3.5.3. Overriding test**

**3.5.4. Deactivation test**

**3.5.5. Sensor performance test (L3-vehicle)**

**3.5.5.1 Homologation test (incl. performance test with “damping material”)**

**3.5.5.2 “engine start/run cycle test” ]**

**Homework** OICA to provide proposals for the tests