

Draft Proposal for category [C1] requirements

Based on document ACSF-11-03-Rev.2 (Draft Proposal for category C requirements)

- Modifications from ACSF-11-03-Rev.2 are marked **blue**.

Formating could be improved

I. Proposal

Consistency with para 2.3.4.1.4.

- 2.4.13.1 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 cat B1 resumes the direction indicator lamps are deactivated~~. It comprises five operations:
1. Activation of direction indicator lamps **with a deliberate action of the driver**
 2. **Assisted lateral movement towards the lane marking which the driver intends to cross** ~~Starting driving towards the lane~~
 3. Lane change manoeuvre
 4. [Resume the lane keeping function by CAT B1
 5. ~~Deactivation of direction indicator lamps~~]

Not chronological order

Item 5: the end of the maneuver should be automatic, but this wording mandates the driver to deactivate the DI.

Justif: tip blinking, the procedure should not end when the DI are deactivated. It should end when the B1 is reactivated

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. Any vehicle equipped with an ACSF CAT [C1] shall also be equipped with an ACSF of category B1 specified in paragraph 5.6.2.
- 5.6.5.1.2. The system shall be active (~~deliver automatic steering~~) only after a deliberate action of the driver and if all conditions for operation of the system are fulfilled.
- 5.6.5.1.3. 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 CAT B1 may be used. It shall be possible to deactivate the system at any time by a single action of the driver. Following this action, the system

shall only become active again as a result of a deliberate action by the driver.

- 5.6.5.1.4. It shall be designed to ensure that the activation of a system of Category [C1] is only possible on roads where pedestrians and cyclists are prohibited and which have a physical separation or continuous solid lane marking that divides the traffic moving in opposite directions and which have at least two lanes in the direction the vehicles are driving, at least two lanes for the direction the vehicles are travelling in the same direction. This may be achieved with the use of e.g. navigation digital map data or road sign recognition.

The vehicle shall be equipped with a means to detect the roads designed to incorporate a physical separation between the opposite directions of traffic and where pedestrians and cyclists are prohibited. It shall be possible to activate ACSF Category C only when the means has detected that the vehicle is being driven on a road as described above (e.g. by using information from on-board map data or from the road sign recognition system, etc).

The vehicle manufacturer shall clearly indicate in the driver's manual that the intended use of the function is limited to roads with physical separation of the direction of traffic.

- 5.6.5.1.5. 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 50 N.

The system may remain active 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.

- 5.6.5.1.6. The lateral acceleration induced by the system during the lane change manoeuvre:

- shall not exceed [1 m/s²] 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 m/s³.

The lane change manoeuvre shall be completed in less than

- 5 s for M1, N1 vehicle categories,

Lane changes at high speed need more than 5 seconds: Industry request at least 8 seconds (5 seconds are ok until 130 km/h)

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

- 5.6.5.1.7 The direction indicator shall be switched off no earlier than on completion of the lane change manoeuvre. This does not permit the use of the tip blinking as proposed in red above

- 5.6.5.2. ACSF of Category [C1] operation

- 5.6.5.2.1 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.

- 5.6.5.2.2 Unless otherwise specified, the optical signals described in 5.6.5.2. shall all be different from each other (e.g. different symbol, colour, blinking, text). (Comment: Should be considered when finalizing the document)

- 5.6.5.2.3. If the system is **in the lane change procedure active** an optical signal shall be provided to the driver. **This proposal is acceptable as it has the same meaning**
- 5.6.5.2.4. When the system is in standby mode, an optical **warning** signal shall be provided to the driver.
- 5.6.5.2.5. When the system reaches its boundary conditions set out in paragraph 5.6.5.3.1.1. of this Regulation (e.g. the specified maximum lateral acceleration $a_{y_{smax}}$), the system shall continue to provide assistance and shall clearly inform the driver about this system status by an optical warning signal and additionally by an acoustic or haptic warning signal. **Warnings to the driver should be kept to a minimum.**
- 5.6.5.2.6. A **system failure which prevents the is no-longer function to properly perform as a lane change manoeuvre of Category [C1]** 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.
- 5.6.5.2.7. [During the lane change procedure and in the speed range between 10 km/h or V_{smin} , whichever is higher, and V_{smax} , it shall provide a means of detecting that the driver is holding the steering control.

~~When the system detects that the driver is not holding the steering control, an optical warning signal shall be provided. This signal may be the same as the signal specified below in this paragraph.~~

~~The optical warning signal shall indicate to the driver to place their hands on the steering control. It shall consist of pictorial information showing hands and the steering control and may be accompanied by additional explanatory text or warning symbols. This signal may be the same as the signal specified in paragraph 5.6.2.2.5 of this regulation.~~

While executing the lane change procedure/manoeuvre, the means of detecting that the driver is holding the steering control of the ACSF of category B1 described in 5.6.2.2.5. shall remain active. This includes also the warning signals.

If, at the start of the lane change manoeuvre the driver is not holding the steering control, the lane change shall be canceled.] **This is addressed by Para 5.6.5.2.11.2.**

Homework: UK to rework

~~after a period of no longer than 1 second the driver is not holding the steering control, at least the hands or steering control in the pictorial information provided as optical warning signal shall be shown in red and an acoustic warning signal shall be provided.~~

~~The warning signals shall be active until the driver is holding the steering control, or until the system is deactivated, either manually or automatically.~~

- 5.6.5.2.8. Any lane change manoeuvre shall be completed, unless the system detects an imminent critical situation, is overridden by the driver or does not detect the lane markings anymore.

The lane change manoeuvre shall be aborted if at least one of the following situation is detected:

- the system detects an imminent critical situation (as described by the manufacturer in the system information data),
- [the system is overridden by the driver]
- the system reaches its boundaries (e.g. lane markings are not detected)

either - or

5.6.5.2.9. ~~After the second deliberate action of driver according to 5.6.4.2.11.5.1., ACSF of category B1 lane keeping function shall be temporarily in stand by mode. 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 be activated again.~~

5.6.5.2.10. The vehicle with ACSF category [C1] shall be tested in accordance with relevant vehicle test(s) specified in Annex 8 of this Regulation. ~~In addition, in order to comply~~ Compliance with 5.6.4.1. and 5.6.4.2., for the 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.

Proposal by EC to be checked by UK

5.6.5.2.11. HMI requirements

5.6.5.2.11.1 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, 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.]

Homework J: make a new proposal for wording

(comment: Language of the market shall be considered in the final version)

5.6.5.2.11.2. A lane change procedure shall not start if ACSF of category B1 has detected that the driver is hands-off the steering control.
Homework: UK rework together with 5.6.4.2.7

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

Homework OICA: check, what is necessary to define with regard to hierarchy of the status and warning signals.

5.6.5.2.11.4. Any single lane change **manoeuvre procedure** shall be initiated only if commanded by **a two subsequent deliberate actions** of the driver, **within an interval of maximum [10]s.** **The deliberate action of the driver to start the lane change procedure shall be the manual activation of the direction indicator lamps to the intended side for the lane change.**

Homework F: Check, whether 10s are acceptable

~~**5.6.4.2.11.4.1.** The first deliberate action of the driver to start the lane change procedure shall be the manual activation of the direction indicator lamps to the intended side for the lane change.~~

~~5.6.4.2.11.5.1. The second deliberate action of the driver to start the lane change manoeuvre shall be a manual steering input in the direction of the deliberate lane change with a required steering input to the driver of more than the steering control effort necessary to override the directional control provided by the corresponding ACSF of category B1~~

~~Homework UK with support of OICA: look which value is appropriate~~

~~Homework OICA: check wording with regard to the value of the steering effort for the "mod." B1~~

~~Alternatively, the second action may be achieved by the operation of a separate manual control provided that this can be achieved without the driver removing their hands from the steering control.~~

5.6.5.2.11.5. The lane change **manoeuvre procedure** shall **directly** start upon the **second** 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.

Homework D: Rework mentioning, that 2nd action is only possible after 3 seconds

The system may suspend the manoeuvre for less than [10] seconds to confirm the traffic condition specified in para. 5.6.5.2.12.4. In this case the system shall inform the status to the driver.

5.6.5.2.11.6. The lane change manoeuvre shall not be initiated if the direction indicator lamps are deactivated **manually**.

5.6.5.2.12. Sensor requirements

5.6.5.2.12.1. The vehicle with ACSF category [C1] shall be equipped with means to monitor the driving environment, to recognise other road users at the side and the rear of the vehicle. The vehicle shall not carry out a lane change manoeuvre if a collision with a vehicle at the side or at the rear of the vehicle is imminent, **and** the vehicle shall abort an already started lane change manoeuvre and return to the initial lane if a collision with a vehicle at the side or at the rear of the vehicle is imminent. **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.**

~~[A range of 8m to the side and 46m to the rear of the vehicle has to be monitored by the system.]~~

<<Please refer to the explanation of the Blind Spot Area in doc ACSF-11-04. After Discussion a sketch for the determination of the range shall be inserted into the test requirements.>>

~~The vehicle shall indicate to the driver if a vehicle is at the side or at the rear of the vehicle by an optical warning signal.~~

This sensor requirements are deemed to be satisfied if the tests for Category [C1] as specified in Annex 8 are met.

5.6.5.2.12.2. The minimal distance to detect vehicles **detection range** to the rear (S_{Rear}) of the ACSF category [C1] system shall be calculated according to the following formula:

$$1) S_{Rear} = [(\Delta v_{max}) * (2.5 + 1)]$$

where:

Δv_{max} = *initial speed difference between the minimum design speed vehicle equipped with ACSF of category [C1] and [130 km/h] as the maximum speed of vehicle approaching vehicle from behind, measured in m/s.*

2) In case of Δv_{max} is less than 50 km/h, Δv_{max} deems to be 50km/h.

- 5.6.5.2.12.3. The minimal detection range to the left and to the right (side) of the ACSF category [C1] system shall be at least 5 m from the side of the vehicle (measured from the medium longitudinal centerline of the vehicle equipped with ACSF of category [C1])
- 5.6.5.2.12.4. The system has to ensure that under normal operating conditions neither the vehicle itself nor other road users at the side and at the rear of the vehicle will be negatively affected during the ACSF operation.
- 5.6.5.2.12.5. In case the system does is not fulfill the requirement ~~capable of recognizing other road users in the entire range of~~ paragraph 5.6.5.2.12.2. and 5.6.5.2.12.3, under any ~~normal~~ driving conditions, the system shall indicate this to the driver by an optical warning signal and shall not perform any lane change manoeuvre.

5.6.5.3. System information data

- 5.6.5.3.1. 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.
 - 5.6.5.3.1.1. 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;
 - 5.6.5.3.1.2. Information about how the system detects that the driver is holding the steering control.

Homework all: anybody who sees a need for changes shall make a proposal.

- 5.6.5.3.1.3. The means to override and to abort or cancel.
 - [5.6.5.3.1.4. 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.]
 - [5.6.5.3.1.5. Documentation about which system software version related ACSF performance is valid. This documentation shall be updated whenever a software version was amended.]

Comment: to be reviewed in the final version

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
- 3.5.2. Abort of lane change test
- 3.5.3. Blind spot test

Homework J + D: Document to be prepared for 12th session after the meeting in NL
26. April
