Relation between the Draft Scenario and the research result

Proposed below scenarios in AEBS-12-11

Scenario 1: Left turn or Right turn at the intersection

Scenario 2: Right turn or Left turn of a forward vehicle

Scenario 3: Passing each other at a curved road

Scenario 4: Curved road with guard pipes and a stationary object

Scenario 5: Straight road on which a pedestrian is walking

Scenario 6: Lane change due to road construction

Scenario 7: Left turn or Right turn of another vehicle on the opposite lane

Scenario 8: Lane change on a straight road with guard pipes and a stationary pedestrian target

Scenario 3, 5, 7, 8

In these scenarios, positions of the ego vehicle and objects are geometrically determined by the road shape and the position of the object.

Scenario 1, 2, 4, 6

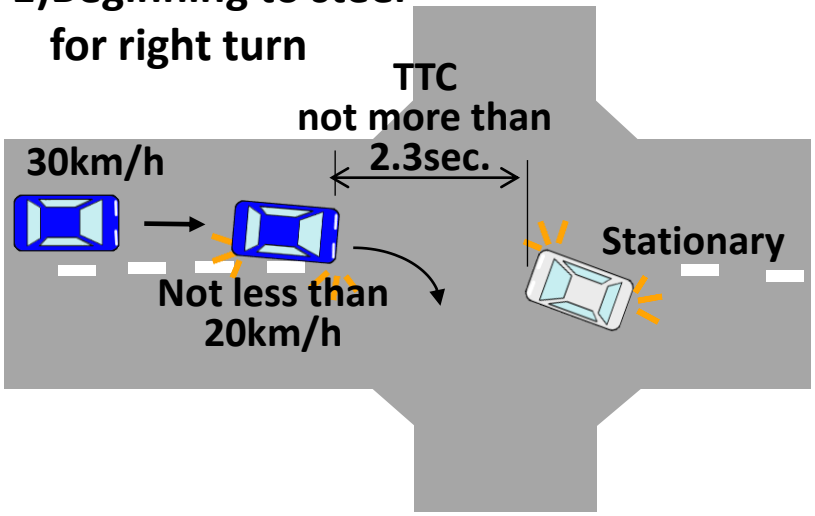
In these scenarios, positions of the ego vehicle and objects are not geometrically determined, these scenarios are determined based on **the driver's behavior**.

This document shows the relation between the proposals of the parameters in the draft scenario 1, 2, 4 and 6, and the research results of the driver's behavior.

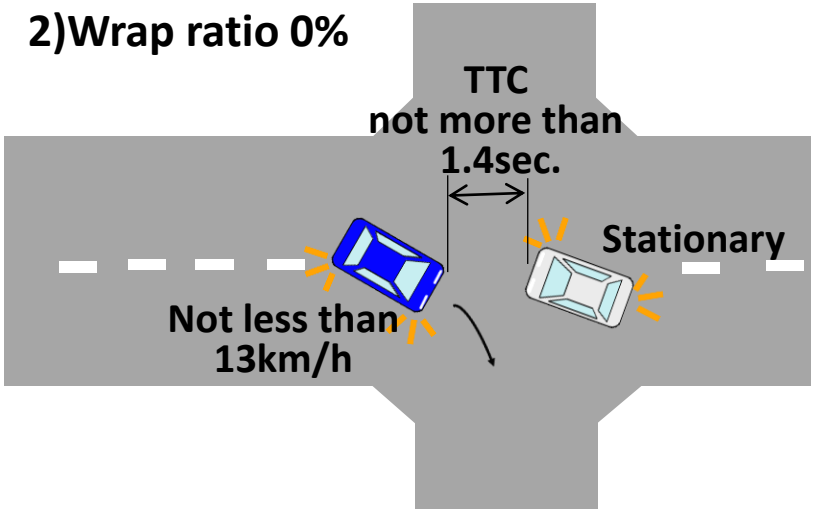
Relation between the Draft Scenario and the research result

Draft Scenario 1

1)Beginning to steer for right turn



2)Wrap ratio 0%



Test vehicle Related vehicle

Scenario 1: Left turn or Right turn at the intersection

The subject vehicle drives at a speed of [30] km/h (with a tolerance of +0/-2 km/h) toward the intersection, and decelerates by braking to a speed of **not less than [20] km/h** at a point where the subject vehicle begins to steer left / right, and the TTC to the oncoming vehicle is **not more than [2.3] seconds**. When the subject vehicle turns left or right in the intersection, the speed is reduced to **not less than [13] km/h**, and then drives at a constant speed. The TTC to the oncoming vehicle is **not more than [1.4] seconds** at when the wrap ratio between the subject vehicle and the oncoming vehicle becomes 0%.

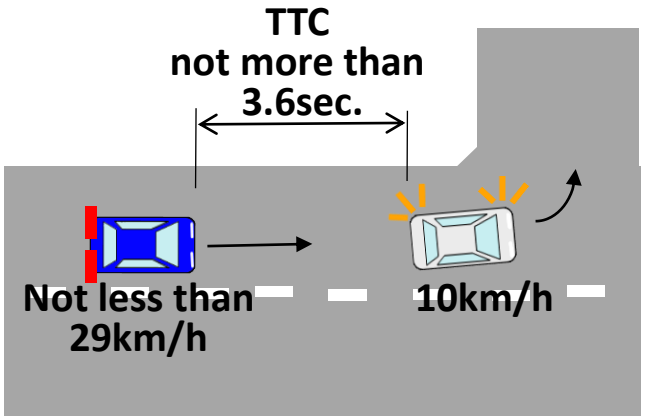
Research result: Driving behavior of normal drivers

	Speed (25%ile - 75%ile)	TTC (25%ile - 75%ile)	Brake pedal operation
1)	12～20km/h	2.3～3.0 sec.	Observed (all of data)
2)	7～13km/h	1.4～2.0 sec.	Not observed (73% of data)

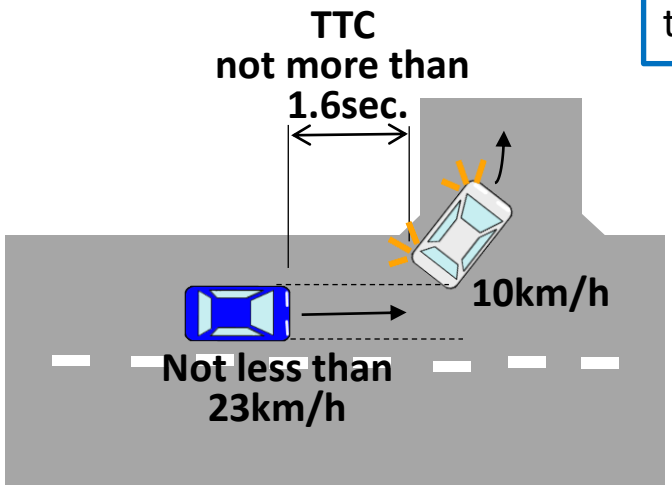
Relation between the Draft Scenario and the research result

Draft Scenario 2

1)Beginning of left turn (related vehicle)



2)Wrap ratio 0%



Test vehicle Related vehicle

Scenario 2: Right turn or Left turn of a forward vehicle

Both the forward vehicle and the subject vehicle drive at a speed of [40] km/h (with a tolerance of +0/-2 km/h) on the straight road. The forward vehicle decelerates by braking to a speed of [10] km/h (with a tolerance of +0/-2 km/h) in order to turn right or left at the corner, and the subject vehicle also decelerates by braking to keep appropriate distance with the forward vehicle. At when the forward vehicle begins to turn right or left, the speed of the subject vehicle is **not less than [29] km/h** and the TTC to the frontal vehicle is **not more than [3.6] seconds**. After that, the subject vehicle decelerates to a speed of **not less than [23] km/h**, and then drives at a constant speed. The TTC to the forward vehicle is **not more than [1.6] seconds** at when the wrap ratio between the subject vehicle and the oncoming vehicle becomes 0%.

Research result: Driving behavior of normal drivers

	Speed (25%ile - 75%ile)	TTC (25%ile - 75%ile)	Brake pedal operation
1)	22～29km/h	3.6～5.4 sec.	Observed (97% of data)
2)	16～23km/h	1.6～3.2 sec.	Not observed (all of data)

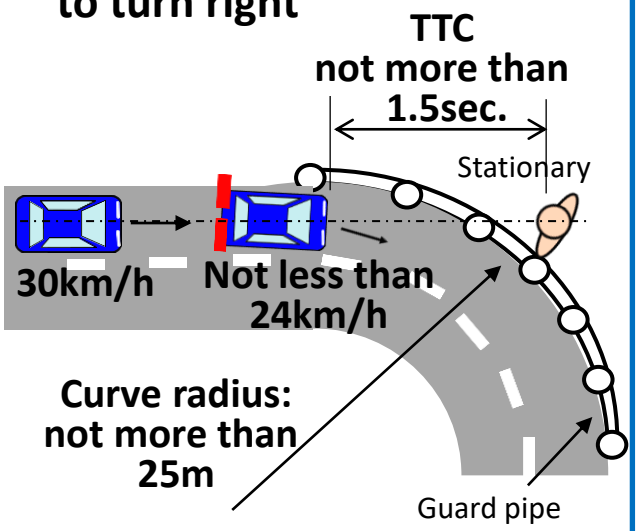
Relation between the Draft Scenario and the research result

Draft Scenario 4

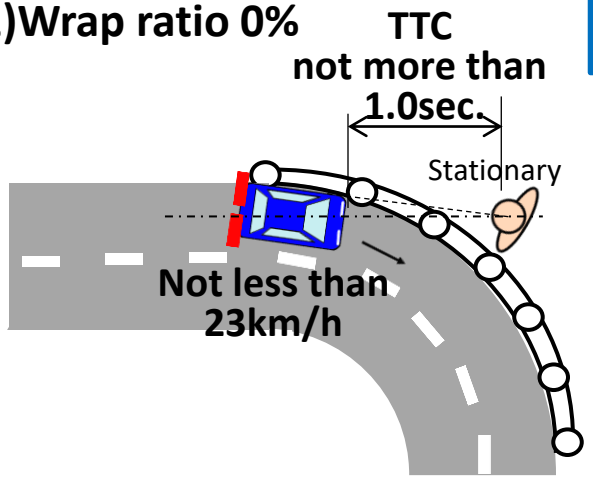
Scenario 4: Curved road with guard pipes and a stationary object

The subject vehicle drives at a speed of [30] (with a tolerance of +0/-2 km/h) km/h toward the curve of which the radius is not more than [25] m at the outer side of the road, and decelerates by braking to a speed of **not less than [24] km/h** at a point where the subject vehicle enters the curve. The TTC to the stationary vehicle or a stationary pedestrian target is **not more than [1.5] seconds** at when the subject vehicle begins to turn in the curve. In the curve, the subject vehicle drives outer lane than the centre of the road. After that, the subject vehicle continue to turn in the curve at a constant speed of **not less than [23] km/h**. The TTC to the stationary vehicle or a stationary pedestrian target is **not more than [1.0] second** at when the wrap ratio between the subject vehicle and the stationary vehicle becomes 0%, or at when the offset ratio* between the subject vehicle and the centre of the pedestrian target becomes -100%.

1)Beginning to steer to turn right



2)Wrap ratio 0%



Test vehicle Pedestrian target

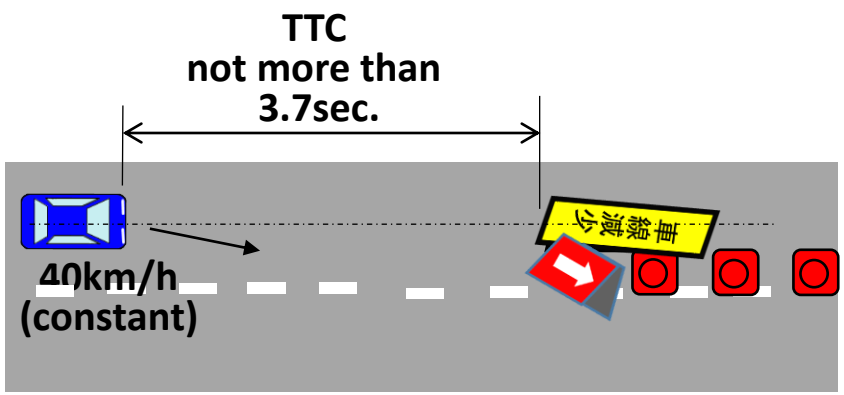
Research result: Driving behavior of normal drivers

	Speed (25%ile - 75%ile)	TTC (25%ile - 75%ile)	Brake pedal operation
1)	19～24km/h (Both objects)	1.5～1.7 sec. (Pedestrian target)	Observed (87% of data)
2)	18～23km/h (Pedestrian target)	1.0～1.3 sec. (Pedestrian target)	Observed (57% of data)

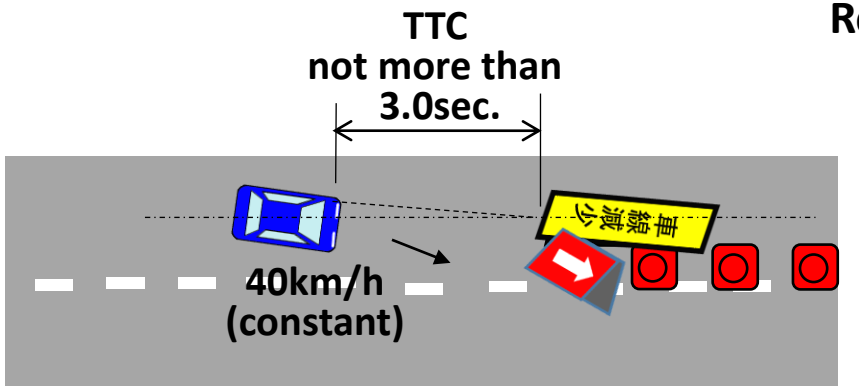
Relation between the Draft Scenario and the research result

Draft Scenario 6

1)Beginning to steer for lane change



2)Offset ratio -100%



Test vehicle

Scenario 6: Lane change due to road construction

The subject vehicle drives a straight road at a speed of [40] km/h (with a tolerance of +0/-2 km/h), and begins to steer in order to change the lane in front of the signboard which notifies reducing the lane. No other vehicles approach the subject vehicle. The TTC to the signboard is not more than [3.7] seconds at when the subject vehicle begins to steer. During changing the lane, the speed of the subject vehicle is constant, and the TTC to the signboard is not more than [3.0] seconds at when the offset ratio between the subject vehicle and the centre of the signboard becomes -100%.

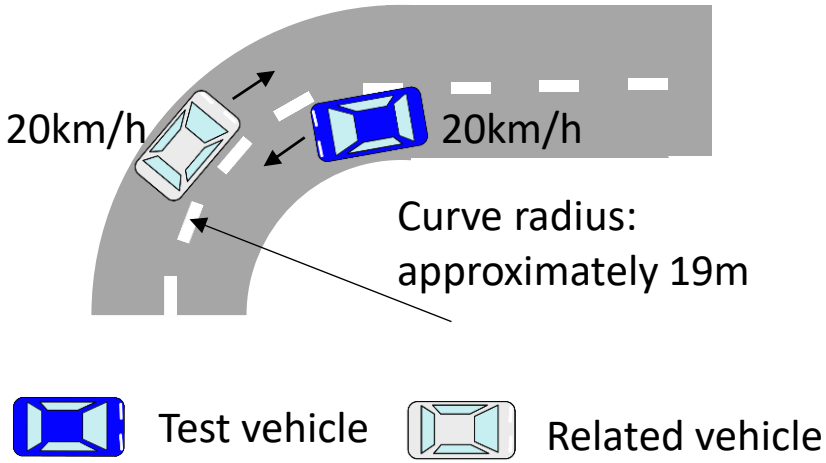
Research result: Driving behavior of normal drivers

	Speed (25%ile - 75%ile)	TTC (25%ile - 75%ile)	Brake pedal operation
1)	37～41km/h	3.7～4.7 sec.	Not observed (79% of data)
2)	35～41km/h	3.0～3.7 sec.	Not observed (75% of data)

Appendix

Remind from AEBS-10-03

Draft Scenario 3



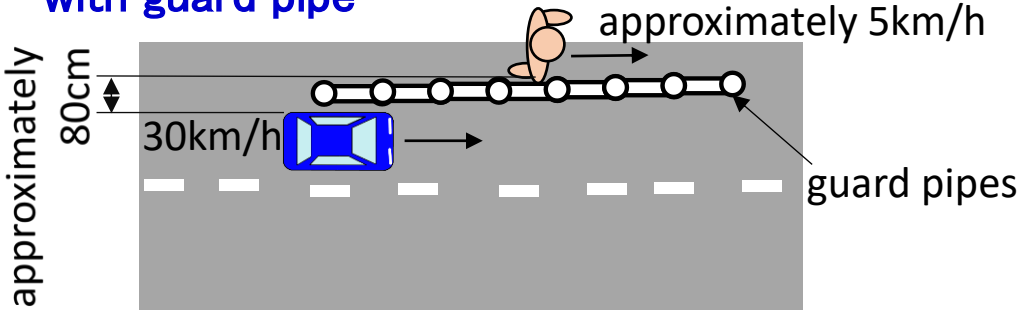
- The test vehicle and the related vehicle pass the small radius curve each other.
- The test vehicle turns left, and the related vehicle turns right. The two vehicles approach in the middle of the curve.
- The speeds of both the test vehicle and the related vehicle are 20km/h (one condition).

Appendix

Draft Scenario 5

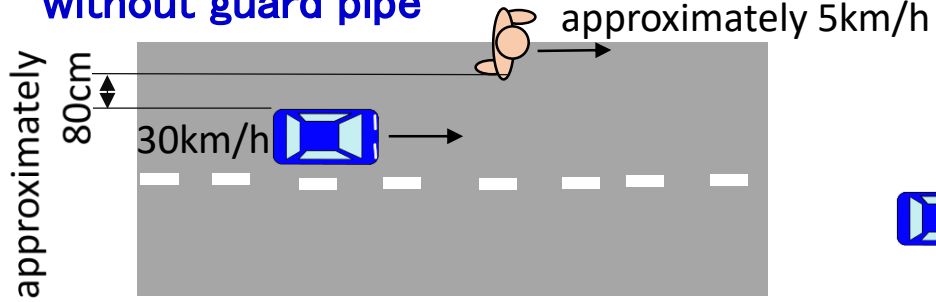
Remind from AEBS-10-03

with guard pipe



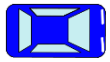
- Distance between the left side of the test vehicle and the guard pipes is approximately 50 cm.
- The pedestrian walks along the guard pipes. The distance between the left side of the test vehicle and pedestrian is approximately 80 cm.

without guard pipe



- The distance between the left side of the test vehicle and pedestrian is approximately 80 cm (same as "with guard pipe" condition).

- The test vehicle (going straight) passes the pedestrian which is walking left side of the test vehicle.
- The directions of walking of the pedestrian are the same direction as the test vehicle and opposite direction as the test vehicle (two conditions)
- The speed of the test vehicle is 30km/h (one condition)

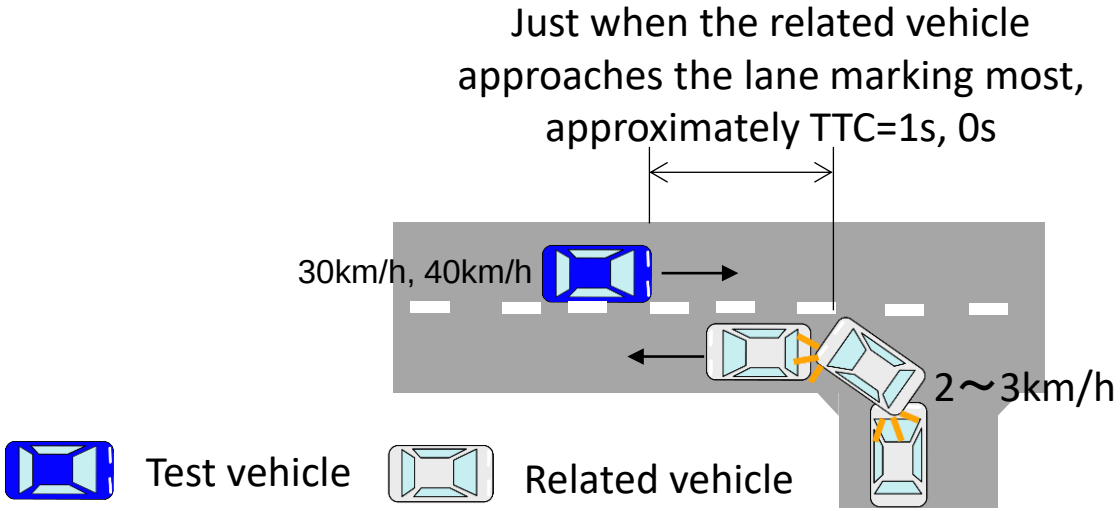

Test vehicle


Real pedestrian

Appendix

Remind from AEBS-10-03

Draft Scenario 7



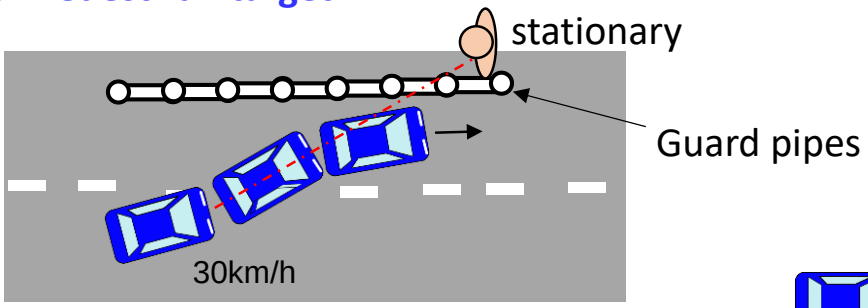
- The test vehicle runs straight, and the related vehicle turns left and comes into the opposite lane.
- During the left turn of the related vehicle, the corner of the vehicle slightly touches the lane marking, but it doesn't cross the lane marking.
- Regarding the condition of TTC between the test vehicle and the related vehicle just when the related vehicle approaches the lane marking most, it is approximately 1s and 0s (two conditions).
- The speeds of the test vehicle are 30km/h and 40km/h (two conditions).

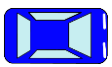
Appendix

Remind from AEBS-10-03

Draft Scenario 8

with Pedestrian target*




Test vehicle


Pedestrian target

*The condition of "without Pedestrian target" is also carried out.

- The test vehicle changes the lane from the right side to the left side.
- The guard pipes are located at the roadside of the left lane.
- In the condition of "with pedestrian target", the pedestrian target is located in front of the center line of the test vehicle just when changing the lane.
- The speed of the test vehicle is 30km/h (one condition).
- Regarding the condition of steering input, normal steering input and slightly rapid steering input are carried out (two conditions).