

T-2 Kärevere Junction Traffic Safety Audit



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Maanteeamet

Oy Talentek Ab

T-2 Kärevere junction, traffic safety audit

Participants

The Traffic Safety Audit was initialised by Maanteeamet, represented by Reigo Ude. The audition was carried out by Klas Hytönen, MSc (CEng) of Oy Talentek Ab.

The site

The Kärevere junction on T-2 is situated in a large curve to the right in direction to Tartu. The elevation is light downhill in the same direction. The junction between the Tallinn-Tartu T-2 main road and T-41 secondary road is a three road junction with an additional access from a restaurant, which makes the junction a four road junction.

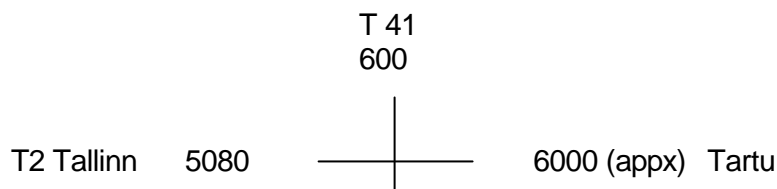
The T-2 main road has lanes for turning traffic to left and right in both directions. The directions are divided by road markings. There are acceleration lanes for adjoining traffic on the main road in both directions. At the end the acceleration lane and before turning lane in direction Tartu there are bus stops. The bus stop on the south west side has a passenger shelter.

The Kärkna road has a middle isle with kerbs, and painted isles dividing right turning traffic to and from the Kärkna road.

In the Tartu direction there are barriers due to road above ground level.

The traffic situation

Traffic volumes: (vehicles/average day)



The heavy vehicles are 22 % of the T2 traffic and 40 % of the T 41 traffic.

Volume data for the restaurant has not been available. The speed limit in the junction is 70 km/h. Pedestrians for the restaurant and the bus stops are crossing the T-2 road in the junction.

During the last 5 years five accidents are registered. Two of these are collisions between cars approaching from crossing roads, one is a frontal collision, one single and one pedestrian accident, which led to human injury.

Present problems, site analysis

The junction is very dangerous for pedestrians. Bus passengers must walk on car lanes to reach bus stops, no arrangements are provided. (Also possible cyclists passing the junction along the T-2 are at risk, which is very common in junction with turning and accelerating lanes).

This problem can be dealt with by separating the pedestrians from car traffic, or by shortening the distance pedestrians have to use the road.

Pedestrians crossing the T-2 must cross five lanes without rescue isle. The crossing distance is 18 m, which gives a crossing time of 12 s using pedestrian speed of 1,5 m/s which is the commonly used velocity for pedestrians in traffic signals when turning red. The wide turns to the Kärkna road prolongs the crossing, and allows vehicles the turn with relatively high speed.

In 12 seconds an approaching car going 70 km/h moves 230 m, and a car in 100 km/h (which is no underestimation of current speeds) 330 m. A pedestrian waiting to cross the road by the restaurant can observe the approaching vehicles over a distance of ca 250 m in both directions. The curve on T-2 in connection with the trees, signs and shelter hides the vehicles. The crossing is made even more difficult by the heavy traffic volume, that only provides short laps i the traffic stream.



T-2 towards Tartu. Visibility is limited by trees, signs and shelter

One must point out, that vehicle traffic entering and crossing the T-2 face the same problem.

There are four ways of solving the crossing problem:

- Separation (tunnel/bridge for ped-bike traffic)

- Decreasing vehicle speed to a safe level considering pedestrian injuries (pref 40 km/h, max 50 km/h)
- Shortening of crossing (narrowing of road by decrease of width/lanes, isles)
- Lengthening of laps between observed vehicles (by decreasing speed, lengthening of observing distance)

The frontal collision and the single vehicle accident indicates difficulties in positioning and adjusting the speed to the conditions. These accidents as well as the pedestrian accident occurred during the dark hours. There is no road lighting in the junction, which increases the difficulties.

The large number of lanes makes it difficult to choose the right one, especially when road markings are worn or there is snow. Furthermore the junction is in a long curve which requires good observing by the driver to keep in lane. On site there are marks of single accidents with turning vehicles (crashed guard rail). These accidents, which fortunately are less severe, are a result of too high turning velocities. This is probably due to the design, with large space in connection with the additional turning lane with isle by the centre isle, which then suddenly narrows to a normal lane on the Kärkna road. Turning velocities can also be too high because of the wide road which generally tends to increase speed.



T-41 Kärtna road.

The following measures deal with the above mentioned problem:

- Lighting of the road
- Separating opponent traffic directions (barrier, kerb)
- Increasing of lanes (are all lanes needed?)
- Sufficient marking of lanes (portals with lane signs, markings, marking nails)
- Support for adjusting speed (barriers, kerbs, isles)

The author of this report has a limited experience of the Estonian road traffic. The experience, however, includes notices of a traffic behaviour that is not very common in the Nordic countries. Overtaking seems to be rather common in junctions, which is a great hazard, and should be dealt with.

There are a number of property accesses along to T-2 within the junction area. Two on the Tallinn side, and one on the Tartu side, and two more just before/after the increase of lanes. Accesses within a junction tend to increase risks. Traffic using the accesses cause surprises when braking and appearing in unexpected places. There are furthermore some specific problems linked with the accesses:

The access to Liivaku: The acceleration lane towards Tallinn end just by the exit causing confusion

Access to Ehamaa: Lethal, unexpected left turn from T-2

Luige: Left turn to T-2 in complex spot, oncoming traffic don't know which lane a vehicle entering from Luige will choose. Bus at bus stop cuts visibility of cars coming from Tartu.

Sepa: Bus at bus stop cuts visibility of cars coming from Tallinn.

Accesses within the junction area should be closed and traffic arranged to the main junction. This also creates safe ped+bike paths to the properties.

The audition process

Site inspection was carried out 22nd February 2005.

Drawings to improve the junction, EA Reng 05.01.2005

Traffic volume data (2004)

Traffic accident data 2000-2004

The plan

The plan includes

- Isles for pedestrians crossing the T-2
- Re-arrangement of restaurant junction
- Pedestrian paths to bus stops and along Kärkna road
- Road lighting

The principles for improvement are right to a certain extent. Road lighting is a clear improvement of traffic safety. Also the pedestrian path/crossing arrangements aim to improvement, but the implementation needs developing.

Excluding the road lighting the traffic safety for the vehicle traffic is not improved, but rather endangered to same extent by putting obstacles in the shape of kerbs on the road.

Comments

A. Design that form a clear hazard, and should be improved before implementation

A1. The kerbs (ohutussaar) for the pedestrian crossing

The kerbs form a hazard because of lacking guidance for approaching vehicles. With three isles suddenly appearing, the information for choosing the right position/lane is very important, and has to be given in good advance. With speed limits up to 80 km/h norwegian and finnish studies indicate that kerb isles can be used safely providing that the approach is appropriate. A minor improvement would be direction information above the lanes in portals on the T-2 in both directions. In addition the isles should be prolonged over the distance where additional lanes are developed, so that traffic could first choose the right and natural side of the isle and then later the right lane.

A2. Left turn to restaurant

There are two reasons to change the design with a separate left turn before the actual junction. It is very difficult to ensure outgoing vehicles to choose the right exit, mistakes are guaranteed. It seems very natural to choose the right hand exit in all cases, which means also going to the Kärtna road or the T-2 towards Tallinn. It can also be difficult for left turning traffic from Tartu to notice left turning traffic from Kärtna and vice versa. This can lead to long vehicles turning to the restaurant blocking the road for those turning left from Kärtna. Furthermore it is not clear who has right of way – vehicle turning left from T-41 or vehicle turning left from T-2.

The idea of separated junction (X to 2 T) is good. The distance between the T-junctions should be longer, and to obtain good traffic safety on a relatively high speed road preferably of the right turn-left turn principle, where you only cross one main road traffic flow at a time.

A3. Property accesses

The property accesses of Liivaku, Luige and Sepa should be rearranged (see above) With the increase in traffic flows, which most certainly will occur considering the expectation of rapid economic development, the accesses will be more and more dangerous in time both for the T-2 traffic and also for the users of the accesses.

B. Design which form a minor hazard, changes should be considered

B4. Pedestrian paths

The width of the designed pedestrian paths is 1,5 m. This is too narrow for bikes to pass a pedestrian or to meet. It is also narrow for baby prams etc. (It would be convenient for cyclists on the T-2 to use the path to pass the junction, this is thou a small matter). The path of 1,5 m can also be too narrow to maintain. Space requirements for winter maintenance vehicles should be checked!

Notice! By redesigning the bus stops and placing them close to the junction, for instance outside the beginning of the acceleration lanes, the access paths would maybe not be needed at all!

B5. Pedestrian crossing on Kärtna road

According to Nordic standards, which states that crossings should not be placed 12-30 m from junction, the pedestrian crossing is in the right place. However, considering the relatively high speed a right from T-2 turning vehicle can have, and the restricted view due to the vegetation inside the curve, the pedestrian crossing may be hazardous. Preferably it should have an isle, but if the whole junction is redesigned, then the crossing place should be studied, too.

C. Check before implementation

C6. Traffic signs

The junction is complicated with many lanes. To avoid misunderstanding direction signs above the lanes is recommended (portal). The design does not indicate any target for the turning lanes to the restaurant. This may cause danger when drivers suddenly notice the premises, and try to get there using wrong lanes.

The placement of the direction signs to Kärtna coming from Tallinn is rather far away to the side.

The signs connected to the left turn from T-2 to the restaurant can create confusion:

- Sign 423 on the middle isle can be understood to allow passing in the T-2 direction on the left side of the isle
- Signs 421 and 422 incoming to restaurant seems inadequate, and only obstruct the view

STOP signs on T-41 and on access from the restaurant should be considered.

C7. Road lighting

The road lighting design does not correspond to the road design and traffic signs. The general principle is to light important details and obstacles by placing the light pole before these in the traffic direction.

- Light pole V20 is in the restaurant access
- V6 is behind the pedestrian crossing
- V7 is behind the direction sign
- V19 is behind the direction sign

Summary and suggestions

The design tends to make a complex situation even more complex. It does not solve one of the main problems in the junction, namely the separation of the opposite directions on the T-2. Neither does it deal with the property access problem, which will escalate rapidly with the increase of vehicle traffic.

One could discuss the need of all lanes in the junction. Giving turning traffic their own lanes usually increases speed, which is not desirable for pedestrians. In the present traffic situation the right turn lane to the restaurant and the acceleration lane from this could be cut out. However, the traffic in general is to increase fast, and some day they will be needed.

The separated right turns increases speed, and causes problems for pedestrians as shown above. One should be aware of the double effect on speed and less caution that separate right turn and turning/acceleration lanes together generates.

It is suggested that the junction is redesigned based on following principles:

- Speed limit should be kept at 70 km/h
- The T-2 directions are separated by kerb isle or barrier along the whole length of lane system
- Pedestrian crossings on T-2 and T-41 should have a middle isle of minimum 2,5 m width to keep bikes and prams
- Bus stops are placed at the very beginning of the acceleration lanes, and the straight going busses are allowed to use the right turning lanes for access to the bus stops
- Property accesses are rearranged
- The junction has road lighting
- Lane information is provided above each approaching lane