

CONFLICT STUDIES AT TWO  
JUNCTIONS IN AUSTRIA

The summary report of the  
Finnish and the Swedish teams

Research report 515

## CONFLICT STUDIES AT TWO JUNCTIONS IN AUSTRIA

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## 1 BACKGROUND

This study is part of a bigger one which is dealing with the transit traffic from West Germany to Turkey and Yugoslavia through Austria. The whole study is sponsored by Bundesanstalt für Strassenwesen (BAST) in West Germany and performed by Kuratorium für Verkehrssicherheit (KfV) in Austria.

KfV performed behaviour observations at various locations and road stretches. The Finnish and the Swedish teams were invited by the KfV to perform a before and after study at two junctions located within KfV:s study stretches. The ICTCT ( International Committee of Traffic Conflict Techniques) calibration study was made in the Trautenfels junction approximately at the same time as the after studies.

## 2 PURPOSE OF THE STUDY

The purpose of the before and after study was to evaluate the effects of the safety measures implemented during the summer of 1985. The safety measures were originally to be decided according to the results of the before observations. The Austrian officials implemented some of the recommended measures.

Further measures were to be recommended after the completion of the whole study.

The Finnish and the Swedish teams performed conflict observations separately. The observations were supposed to be made on the same weekdays both in the before and after studies. This did not work out because of the ICTCT calibration study, in which the Finnish team took part while making the after observations.

Both teams made their individual reports concerning the before and after study /3,4,5,6 /. The results are summarised in this report.

### 3 OBSERVATION TECHNIQUES

Both teams applied their own conflict technique./1/ In addition the Swedish team counted the traffic volumes from the minor roads and the number of drivers against red in Trautenfels. The Finnish team counted all traffic flows in samples and registered "unwanted behaviour", e.g. violations against the traffic rules and crossing the road outside the marked zebras.

Both teams had two observers on location. The observation periods are presented in table 1.

Table 1. The observation periods of the both teams.

Team	Location	Date	Weekday	Time
Swedish	Kellerberg	14.5.1985	Tuesday	14.00-21.00
		15.5.1985	Wednesday	07.00-14.00
	Trautenfels	17.5.1985	Friday	14.00-21.00
		18.5.1985	Saturday	07.00-14.00
Finnish	Trautenfels	14.5.1985	Tuesday	14.00-21.00
		15.5.1985	Wednesday	07.00-21.00
	Kellerberg	17.5.1985	Friday	14.00-20.00
		18.5.1985	Saturday	07.15-14.00
Swedish	Trautenfels	10.9.1985	Tuesday	13.00-20.00
		11.9.1985	Wednesday	07.00-14.00
	Kellerberg	13.9.1985	Friday	13.00-20.00
		14.9.1985	Saturday	07.00-14.00
Finnish	Kellerberg	10.9.1985	Tuesday	13.00-20.00
		11.9.1985	Wednesday	07.00-14.00
	Trautenfels	13.9.1985	Friday	13.00-20.00
		14.9.1985	Saturday	07.00-10.30 13.00-17.00

The after studies were halted at 8 pm because of darkness.

On Saturday the 14th of September in Trautenfels during the after studies the observing hours were meant to be from 7.00 to 14.00 but because one leg of the intersection was closed from 10.30 to 13.00, the real observing hours were from 7.00 to 10.30 and from 13.30 to 17.00.

Each observer worked in one hour periods with a break of 30 minutes between, so that for every third half an hour there were two observers and at the other times one observer.

#### 4 RESULTS OF THE STUDY IN TRAUTENFELS

##### 4.1 Description of the junction and it's safety measures

- The intersecting roads are B146/308/B145,75 (Schladming - Liezen)
- Signal controlled, rural junction
- Speed limit: 50 km/h
- Separated right turning lanes in three approaches (non-signalized)
- Petrol station, grocery store, post and bank in connection to the junction
- Cycle time: 100 seconds
- Blinking green at the end of the green phase
- Large proportion of heavy vehicles (20 %)
- Few pedestrians and bicyclists
- Good sight distances

In figure 1 is a chart of the Trautenfels junction. The description and the chart are according to the before situation.

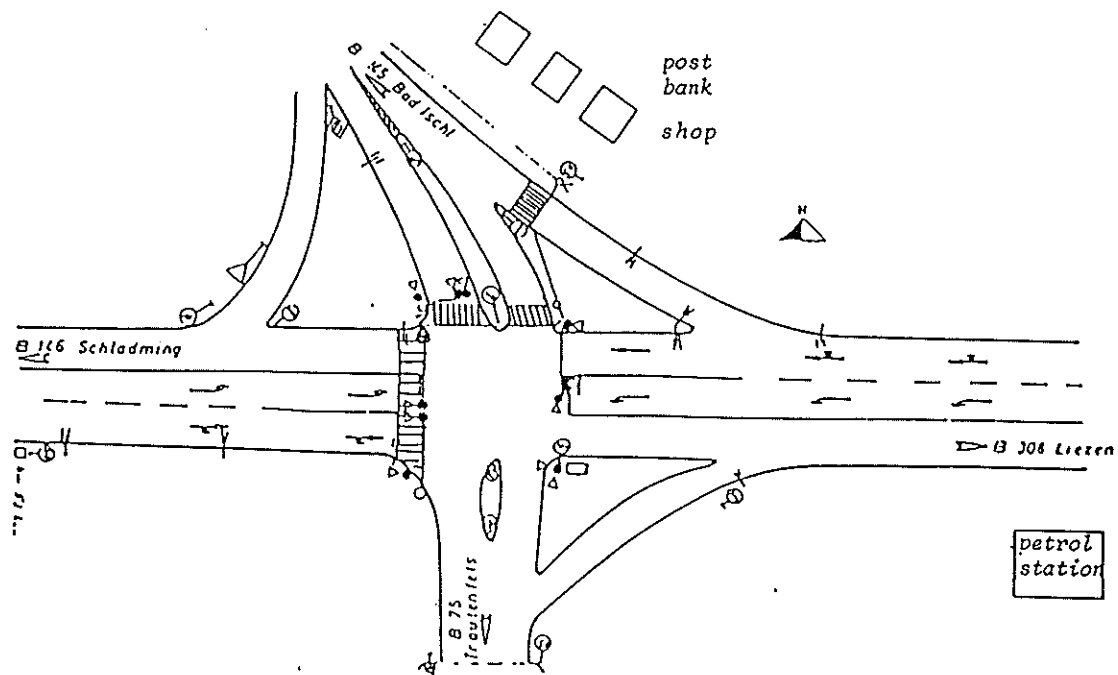


Figure 1. The Trautenfels junction during the before study.

The countermeasures made in Trautenfels after the before studies in May are:

- Improvement of signposting by installing larger guideposts on both sides of the roads from all 4 directions /2/.
- 70 km/h speed limit sign 100 m in front of the junction on both sides of the road from all 4 directions /2/.
- Announcement of the traffic light 250 m in front of the junction on both sides of the road from all 4 directions by eye catching 150 cm - edge- traffic signs /2/.
- The signs from all 4 directions announcing the traffic light 250 m in front of the junction should be equipped with a blinking light in the yellow field of the symbolized traffic light /2/.
- On the way going from Trautenfels to Bad Ischl there was a line painted on the road just before the ramp coming from the direction of Liezen.

#### 4.2 The results of the Finnish team

The number of conflicts observed by the Finnish team was:

before	16	after	35
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The conflict chart presenting the locations and the types of the conflicts during the before and the after observations is in appendix 1. The increase in conflicts was due to the increase of traffic volumes. The numbering of traffic flows in the Trautenfels junction is presented in figure 2.

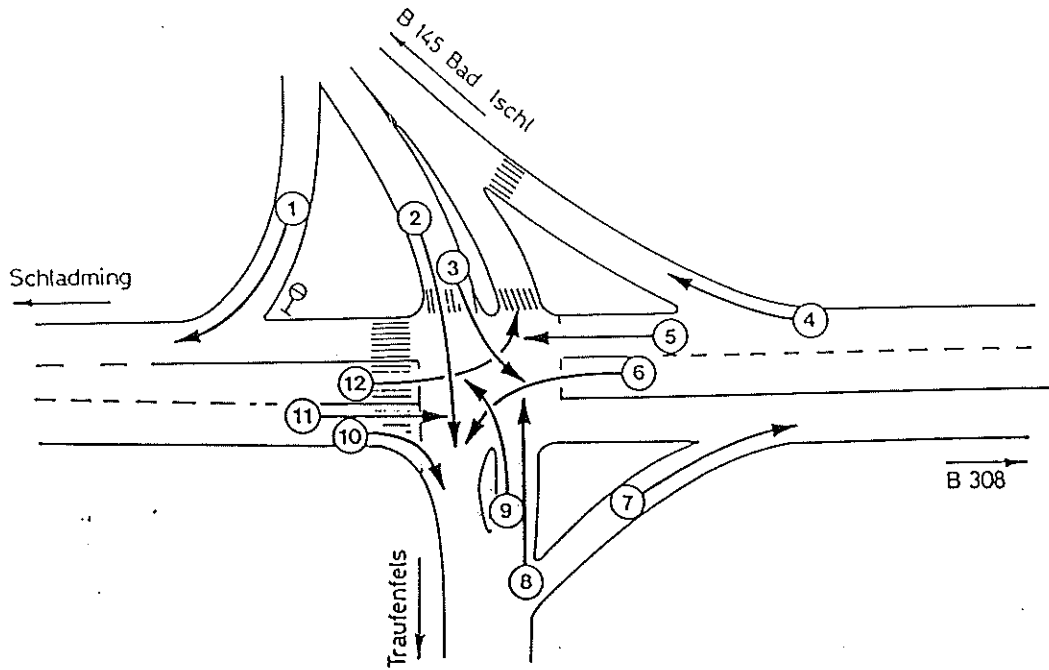


Figure 2. The numbrering of traffic flows in the Trautenfels junction.

The traffic volumes during the field observations are presented in table 2.

Table 2. The traffic volumes in the Trautenfels junction during the field observations (28 h).

The number of traffic flow	Traffic volumes (4-wheeled vehicles)	
	Before	After
1	290	410
2	520	480
3	1340	1800
4	1070	1820
5	2140	5150
6	590	820
7	510	810
8	460	420
9	5	40
10	20	20
11	1880	3540
12	240	420
Total	9065	15730



In the main directions during the after observations the traffic volumes were about twice as high as during the before observations (flows number 5 and 11). Most of the traffic volumes had increased clearly. This explains the increase of conflicts in the junction.

#### 4.3 The results of the Swedish team

The before and after study gave the following results in recorded conflicts:

BEFORE	AFTER
18	18

Number of conflicts

Exactly the same number of conflicts are recorded at the two studies. The volumes have been calculated from traffic counts during the observation periods. The only major difference concerns the traffic in direction west (Salzburg). Traffic volumes in this direction had increased by about 25 %. Reservations must be done for variations between different weekdays when the counts were carried out.

The conflict studies indicate that no improvement of traffic safety has been obtained. The clusters of conflicts seem to be the same in the after study as before. The majority of conflicts occur between vehicles. Bicyclists and pedestrians are quite few. The increased traffic volumes on the main road do not influence the results as these flows are not involved in any conflicts. One obvious problem that is not solved by the countermeasures is the weaving conflicts between right turners from east (Liesen) on the ramp and straight on going cars from Trautenfels. The priority rules

are not clearly interpreted by drivers.

The second main problem that is unsolved is linked to left-turners. This problem is partly linked to visibility problems caused by other vehicles, not primarily involved in conflicts.

The conflict charts of the before and after studies are in appendix 2.

#### 4.4 Summary of the results

The conflict studies of the both teams show that the conflict risk during the after observations was about the same as during the before observations.

Traffic volumes had increased, more on Friday - Saturday than on Tuesday - Wednesday. This difference is one explanation for the increased number of conflicts recorded by the Finnish team. Because of the clear increase of traffic volumes on the main road the conflicts with the vehicles on the main road had also increased. During the first part of the after observations, Tuesday - Wednesday, when the Swedish team carried out their conflict observations the traffic volumes were not as high as during the weekend.

The conflicts between right turning vehicles on the ramp from B308 and the vehicles from Trautenfels still remain. Also conflicts between left-turners from Bad Ischl and straight going vehicles from Trautenfels were observed during both the before and the after observations.

The high speeds of the vehicles on the main road are a problem. The speeds even increase during the evening when the traffic signals are blinking yellow.

## 5 RESULTS OF THE STUDY IN KELLERBERG

### 5.1 Description of the junction and it's safety measures

- Rural conditions (B100, Spittal - Villach)
- The junction is the "main entrance" to the village (88 inhabitants)
- Speed limit: 100 km/h
- Traffic volumes much higher on the main road
- Fairly large proportion of heavy vehicles (11 % on a count of the Swedish team, friday afternoon)
- Both horizontal and vertical curves in connection to the junction produce poor sight distances
- Construction of a new road in the vicinity produces some occasional traffic
- Overtaking lane north of the junction, both directions
- "No" pedestrians or cyclists
- Overtaking prohibited through the junction (on the main road)

In figure 3 is a chart of the Kellerberg junction. The description and the chart are made according to the before situation.

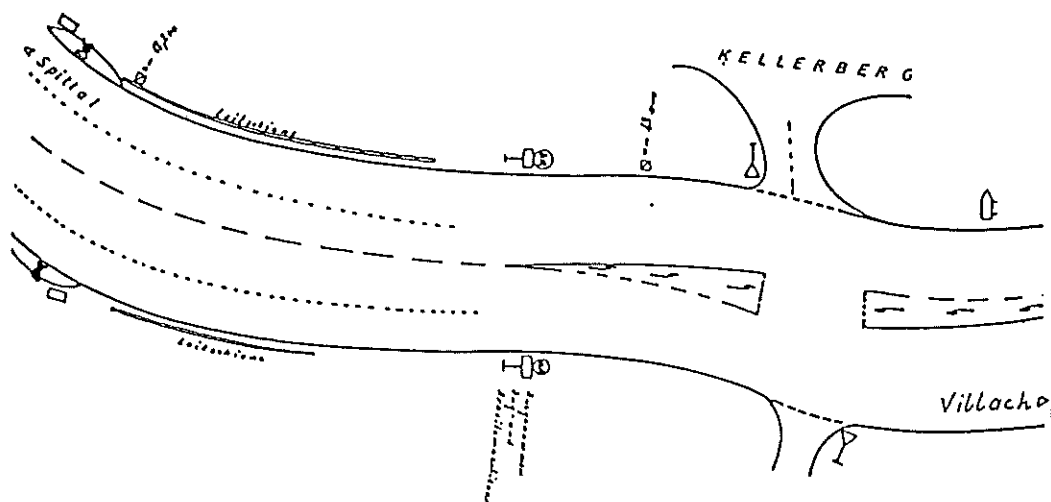


Figure 3. The Kellerberg junction during the before study.

The countermeasures made in Kellerberg after the before studies in May are:

- Road markings which draw the drivers' attention and make them aware in time of the end of the possibility for overtaking before the junction area (arrows on the left lane pointing to the right lane) /2/.
- Traffic signs at the right side of the road combined with the request "allow others to move into your lane in front of your car" /2/.
- Shortening of the left turning lane and installation of a longer painted traffic island before the left turning lane /2/.
- The leg leading to the motor way construction site had been lined with a kerb on both sides after the before studies.

## 5.2 The results of the Finnish team

The number of conflicts observed by the Finnish team was:

before 15      after 15

The conflict chart presenting the locations and the types of the conflicts during the before and after observations is in appendix 3. The number of conflicts remained the same. The numbering of traffic flows in the Kellerberg junction is presented in figure 4.

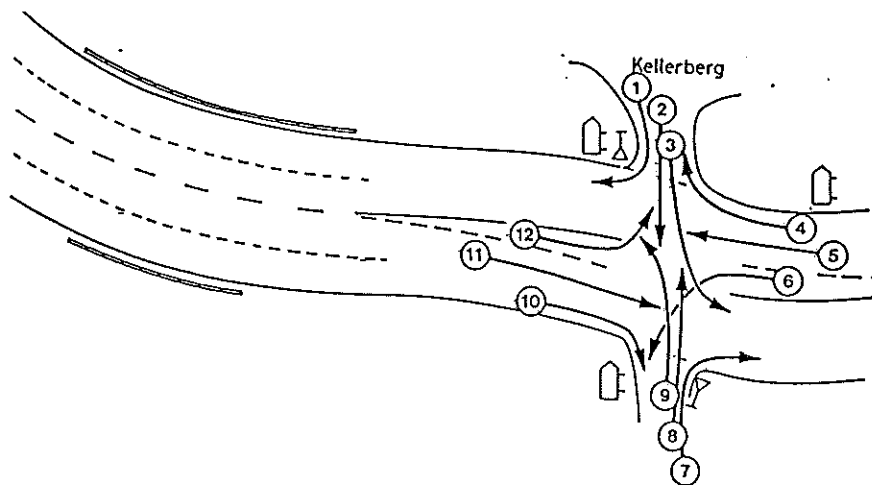


Figure 4. The numbering of traffic flows in the Kellerberg junction.

The traffic volumes during the field observations (before 13 hours and after 14 hours) are presented in table 3.

Table 3. The traffic volumes in the Kellerberg junction during the field observations (13 + 14 h).

The number of traffic flow	Traffic volumes (4-wheeled vehicles)	
	Before (13 h)	After (14 h)
1	15	63
2	6	4
3	85	113
4	84	156
5	4740	9350
6	7	13
7	13	11
8	9	6
9	9	9
10	8	15
11	5350	7100
12	11	39
Total	10337	16879

In the main directions (flows number 5 and 11) the traffic volumes had increased clearly. There were also clearly more vehicles coming from the village of Kellerberg during the after observations. Although there were more traffic during the after observations the amount of conflicts remained the same. The most common type of conflicts was during the both observation periods the right angle conflict between the flows number 3 and 11.

### 5.3 The results of the Swedish team

The before and after study in the Kellerberg intersection gave following results:

BEFORE	AFTER
16	12

Number of conflicts

The results indicate a reduction in the number of conflicts. This reduction is emphasized by the fact that traffic volumes had increased significantly in the after study.

The conflict study and the volume counts indicate together that traffic safety at the intersection is improved.

BEFORE	AFTER	DIFFERENCE
South North (13526)/(12556)	South North (20166)/(29096)	South North (+49 %)/(+130 %)

The great difference between the two directions is probably due to tourists returning from southern Europe.

Together the results of the conflict study and traffic volumes indicate a considerable improvement of the traffic safety.

Unfortunately the before and after-studies had to be carried out on different weekdays. Activities at the construction site created more local traffic during weekdays (when the before study was carried out) than on Saturdays (when parts of the after study was carried out).

The conflict results shown above are, however, adjusted due to this difference. This is done by excluding conflicts with lorries involved.

The conflict charts of the before and after studies are in appendix 4.

#### 5.4 Summary of the results

The results of both teams show an increase of traffic safety in the Kellerberg junction. Even if the traffic situation was quite different for both teams during the before and after observations the results show a reduction of conflict risks (SF,S) and a reduction of occurred conflicts (S).

Traffic volumes on the main road had clearly increased, especially on Friday - Saturday.

Rear-end and right-angle conflicts still seem to be a problem in the junction. The manoeuvre type is different depending on which weekday the observations were carried out. A new conflict type was detected by both teams, conflicts between right-turners from Kellerberg and vehicles coming from north on the main road (Bl00). The explanation for this new type of conflicts is the increase of traffic volumes in both directions.

Speeds (and the variations of speeds) are still too high in the junction area.

### 6 CONCLUSIONS

#### 6.1 Trautenfels

The implemented measures at the Trautenfels junction, focused on improved signing, did not create any major changes.

The main safety problems detected by both the teams during the before study were still present at the after study. Therefore it seems obvious that the measures that were implemented didn't have had any great impact on driver behaviour.

The main safety problems were in both the before and after study:

- high speeds of cars on the main road Liezen - Schladming,
- complicated junction,
  - a) confusion regarding where to turn
  - b) confusion regarding priority rules
- poor location of the zebras.

The implemented measures have to be looked upon as a justified first step to try and increase car-drivers' attention. They must, however, be complemented by other measures. It is the belief on the two teams that the countermeasures proposed by them after the before study are still valid. These proposals are:

1. Rumble-strips on the main road approaches. This is an inexpensive measure that can be designed so that speeds are reduced.
2. Reconstruction of the entire intersection:
  - Change to an "ordinary" x-junction.
  - Include all flows in the signal-control.
  - Install traffic-actuated signals including separate left-turning phases. Today there is both hardware and software available that for instance makes it possible to reduce the number of vehicles present in the dilemma zone when the signal turns to yellow.

A complete reconstruction is of course much more expensive. In the long run it may, however, be cost-



effective.

3. If reconstruction is not considered the following measures are proposed as a substitute:

- The priority rule at the end of the right-turning ramp from the main road should be changed.
- Left-turners should be guided by painted markings on the road. This should include painted yield-signs (especially relevant for left-turners from Bad Ischl).
- The stop sign at the right-turn from Trautenfels should be replaced by a yield sign (and marking on the road).
- Sight conditions should be improved by removing obstacles from some of the traffic islands.
- Relocation of the zebras from the western side to the eastern side of the intersection.

The two main road approaches to the intersection are very different. The west one is "simple" in the sense that it is easy to detect the relevant information about directions, etc. The east approach on the other side is "filled" with irrelevant information" concerning petrol stations, cafeteria, etc. This environment creates confusion and may be causing late decisions regarding turning, stopping for red light, etc. A co-operation with the involved companys is necessary in order to solve this problem.

## 6.2 Kellerberg

The countermeasures implemented in Kellerberg were obviously more safety-beneficial than those implemented in Trautenfels. The former are also much more in line with the proposals from the two teams.

The new road-markings together with the new sign, informing

about the end of overtaking possibilities seem to be effective in reducing rear-end conflicts. Overtaking in the intersection areas has been reduced in direction south (Villach).

Unfortunately overtaking increased in the opposite direction. This indicates that the signs, informing about "overtaking-possibilities in 500 m", are misleading the car-drivers so that they start overtaking at the start of the left-turning lane before the intersection, believing that they had reached the overtaking lane.

When the implemented countermeasures are compared to the proposed ones by the two teams there is only one major measure that is not implemented, namely a speed-limit of 70 km/h or 80 km/h through the intersection. The two teams still believe that a speed-limit, in combination with the implemented measures, would increase safety even more.

The remaining conflicts are caused by:

- high speeds (incl variation in speed),
- poor sight conditions from the side roads.

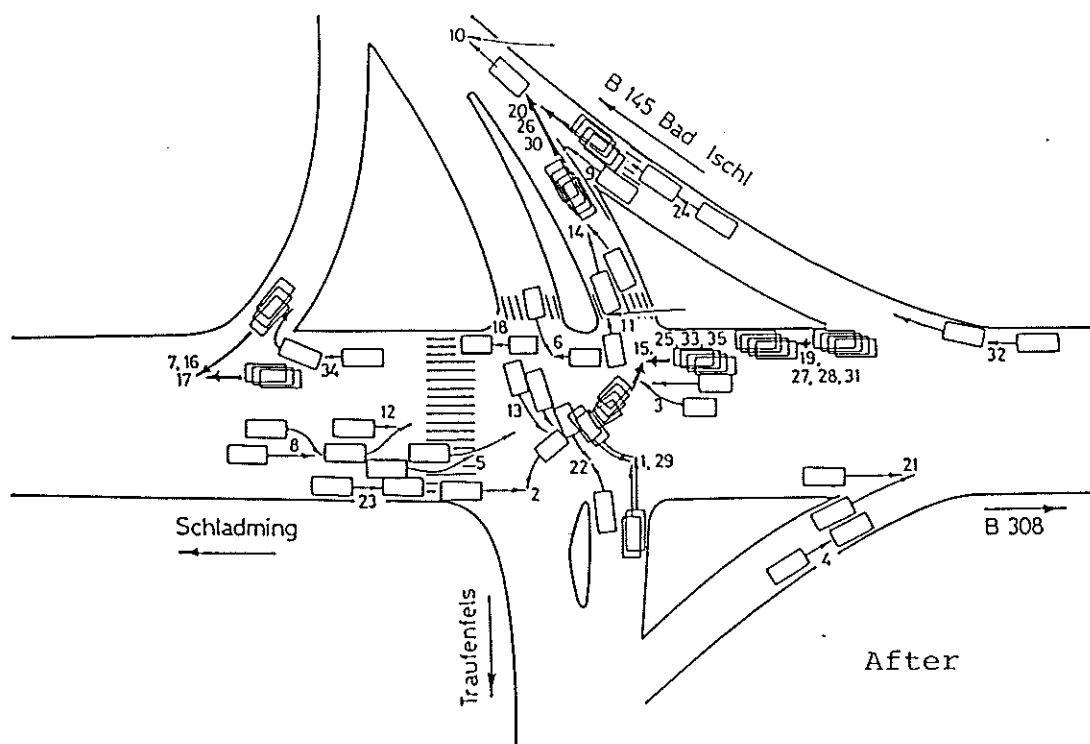
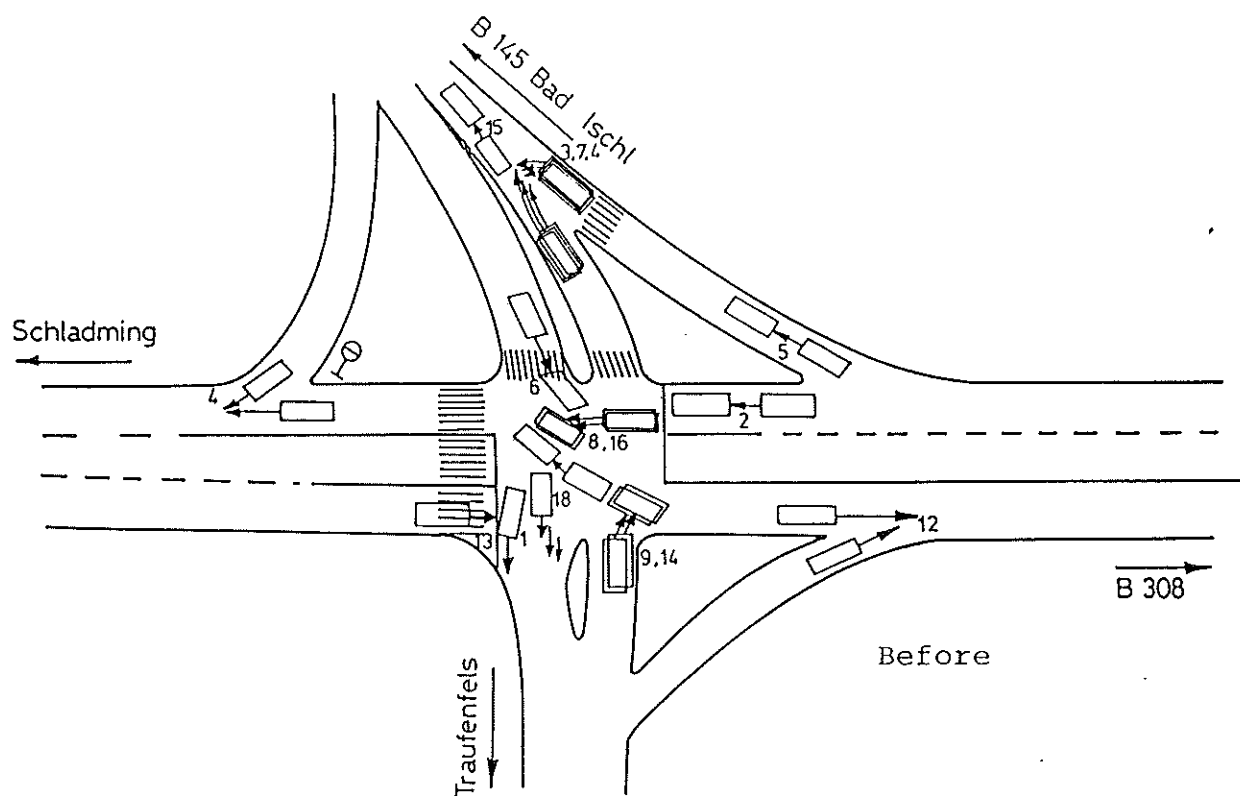
The proposed speed-limit therefore seems to be highly relevant.

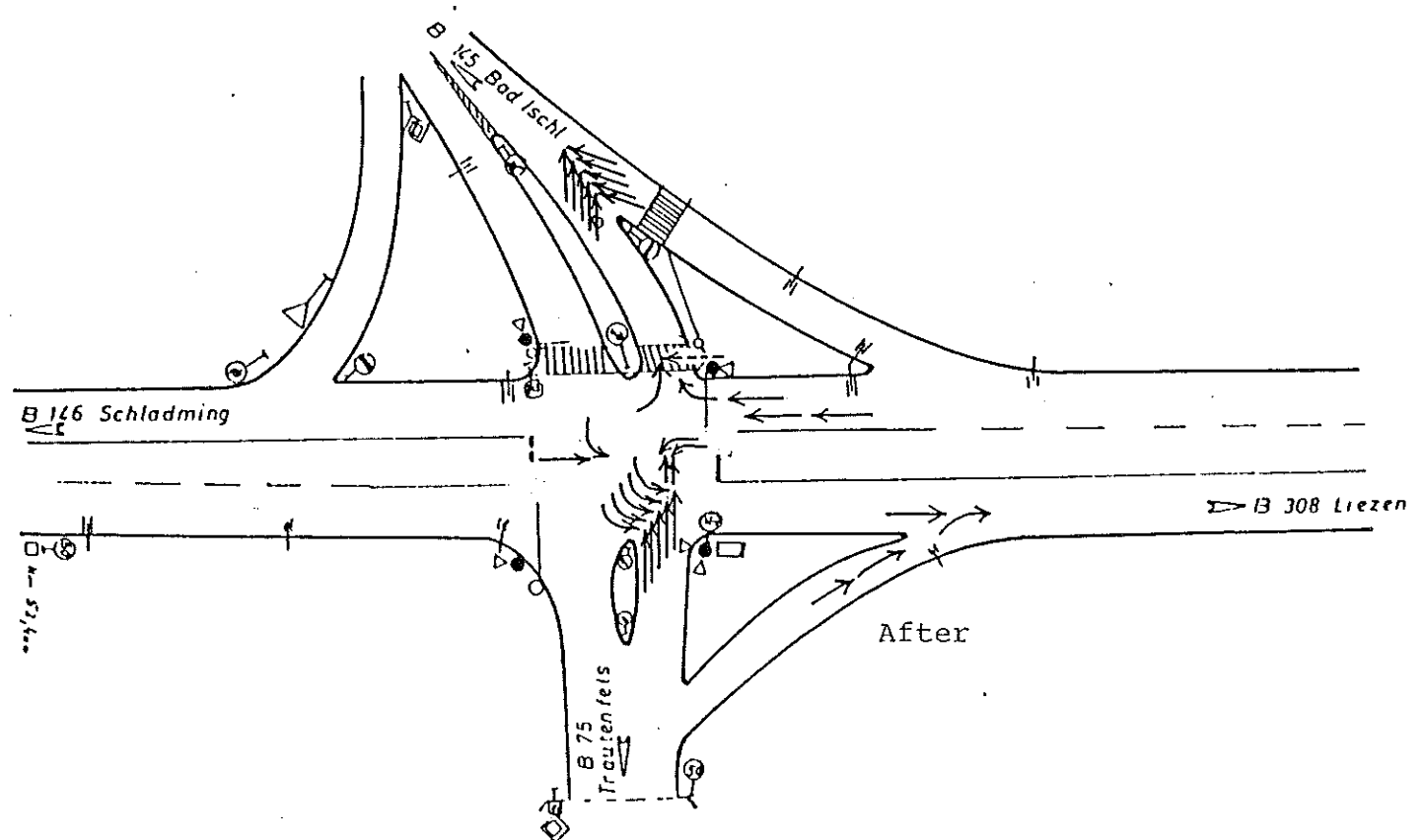
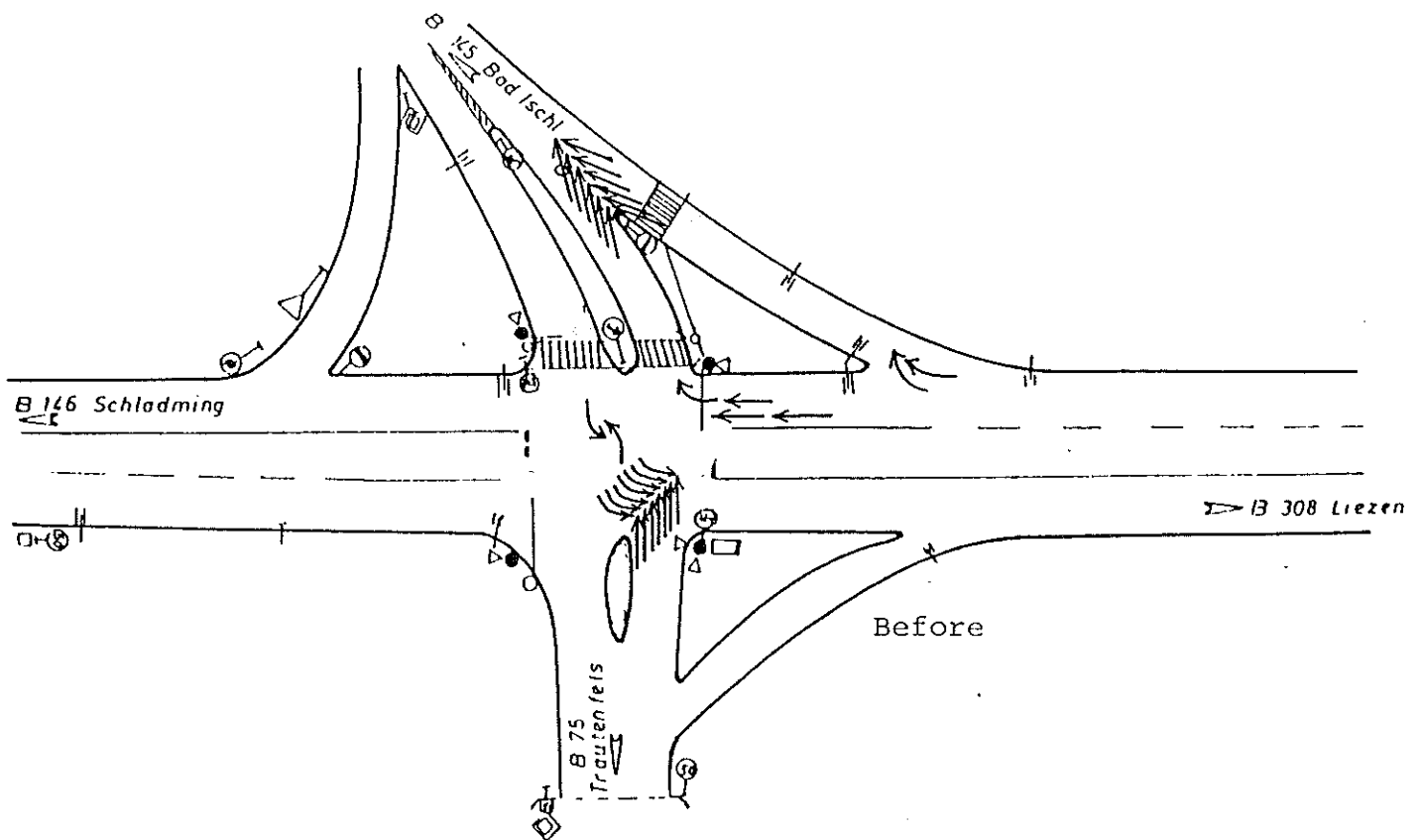
In addition the two teams want to propose the following two changes:

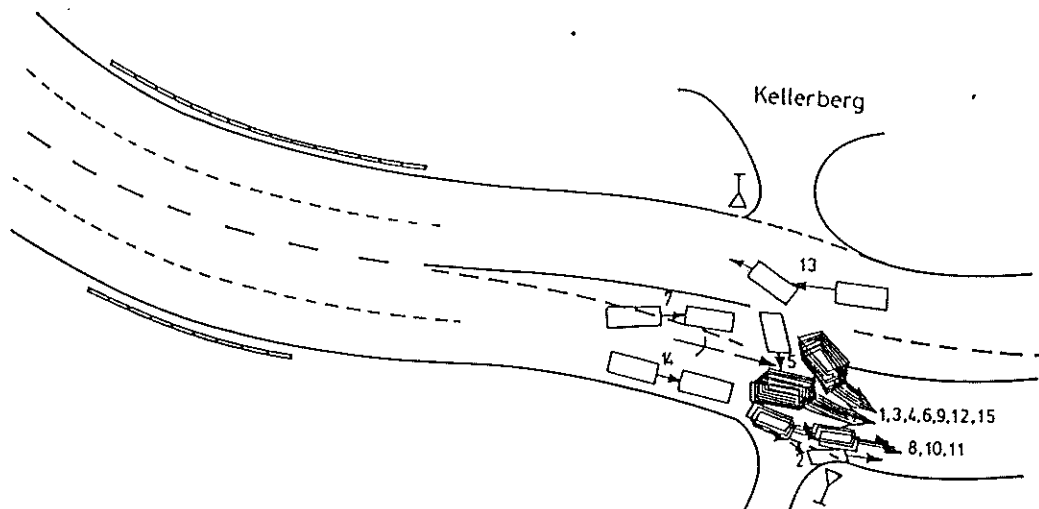
- 1) The sign that is informing about overtaking possibilities should be removed and replaced by a warning sign informing about the intersection ahead. This should be completed by a painted line indicating that overtaking is prohibited through the intersection.
- 2) Obstacles that are obstructing the view from the side roads should be removed.

## References

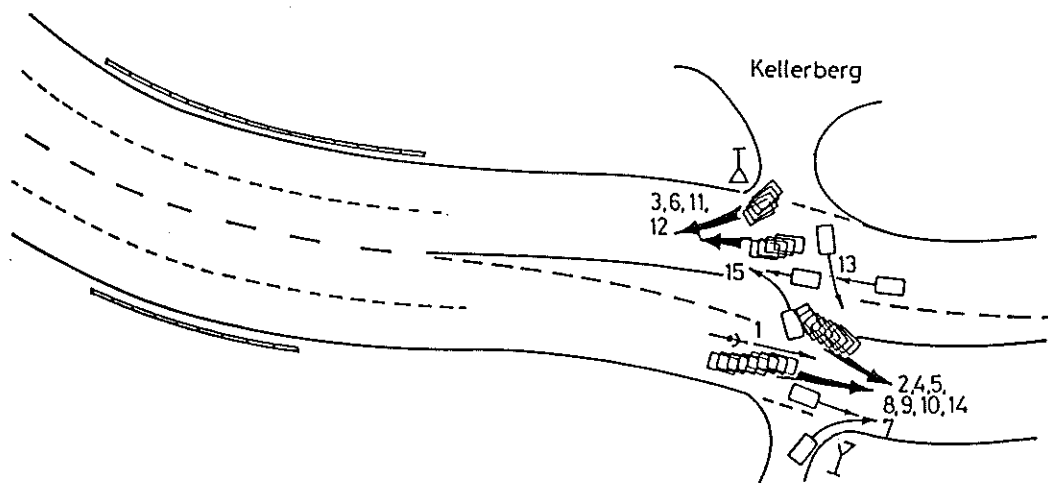
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3. Conflict studies at two junctions in Austria, The results of the before observations by the Finnish team. VTT 1985.
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Before



After

