



# Langsamverkehrsfreundliche Lichtsignalanlagen

**Installations de signalisation lumineuse favorables à la  
mobilité douce**

**Pedestrian and bicycle friendly traffic lights**

**Rapp Trans**

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## Summary

### Aim

How appealing a pedestrian route or a bike route is depends largely on the configuration of the intersections. It can be observed that a large share of both road user groups frequently violates the red light. While the specific reasons for that behaviour are unknown, it seems that the configuration of the intersection as well as the timing plan of the traffic light have an influence.

The aim of this research was to discuss reasons for the low acceptance of traffic lights by pedestrians and cyclists. Also potential problem solving approaches for a range of different situations improving the behaviour of pedestrians and cyclists are being proposed. The impact of some of these measures will then be evaluated by behavioural assessments.

### Approach

Domestic and foreign examples found in a literature review and internet research have been analysed. The different situations have been categorized into layout scenarios which are then explained in great detail. The layout scenarios were discussed by the working group during a workshop with experts. The research group was joined by additional traffic planners and members of the national, cantonal and municipal government (either being in charge of traffic lights or non-motorized traffic) to build the working group.

On a number of intersections in Basel and Zurich pilot trials including behavioural assessments have been conducted. Meanwhile an online survey questioning road users on their behaviour as pedestrians and cyclists at traffic lights was launched. Based on these three elements, workshop, pilot trial, and survey, impact and suitability of the model scenarios for Switzerland have been evaluated. In addition criteria and recommendations for an application of the model scenarios have been put together.

### Layout scenarios

For **pedestrian traffic** following layout scenarios have been designed:

- |  |   |
|--|---|
| Main strategy – intersection dependent | <ul style="list-style-type: none"> <li>• Exclusive pedestrian phasing with / without diagonal crossing</li> <li>• Concurrent phasing</li> <li>• Crossing in stages</li> </ul>                                 |
| Phase distribution                     | <ul style="list-style-type: none"> <li>• Permanent pedestrian green</li> <li>• Variable timing plan</li> <li>• Increased green phase</li> <li>• Green on request</li> <li>• Demand-driven priority</li> </ul> |
| Visual display of remaining phase time | <ul style="list-style-type: none"> <li>• Traffic light with / without countdown</li> </ul>  |

For **bicycle traffic** following layout scenarios have been designed:

- |               |   |
|---------------|---|
| Turning right | <ul style="list-style-type: none"> <li>• Right turn on red           <ul style="list-style-type: none"> <li>– with / without pedestrian crossing</li> <li>– with / without bicycle lane</li> </ul> </li> <li>• Separate turning lane without traffic light</li> <li>• separate traffic light for right turns</li> </ul> |
|---------------|---|

|                       |  |
|-----------------------|--|
| Turning left          | <ul style="list-style-type: none"> <li>• Indirect left turn with waiting area on lane coming from the right</li> <li>• Indirect left turn with separate turning lane on the far right</li> <li>• Direct left turn with additional central turning lane</li> <li>• Direct left turn with expanded bicycle lane</li> </ul> |
| Phase distribution    | <ul style="list-style-type: none"> <li>• Permanent cyclist green</li> <li>• Variable timing plan</li> <li>• Exclusive non-motorized traffic phasing</li> </ul>   |
| Further measures      | <ul style="list-style-type: none"> <li>• Leading bicycle green</li> <li>• Bicycle</li> <li>• Verbesserte Detektion</li> <li>• Grüne Welle</li> </ul>   |
| Accompanying measures | <ul style="list-style-type: none"> <li>• Handle on traffic light</li> <li>• Footboard</li> <li>• Trixi mirror (roadside bicycle safety mirror)</li> </ul>  |

### Online survey on behaviour

In the fall of 2013 an online survey has been conducted in the German-speaking as well as in the French-speaking parts of Switzerland to determine the reasons for regular violations of red lights. Two questionnaires concerning the influence of traffic infringements have been developed based on a literature review - one for cyclists and one for pedestrians. 568 people have responded to the questionnaire for pedestrians, 1'054 to the one for cyclists.

The most important findings concerning **pedestrians** are:

- Slightly more than half of the pedestrians decide whether to stop at a red light depending on the situation. Contributing factors to traffic infringements are light traffic, no other people being present, and a long red phase. Bad weather or the traffic lights having just turned to red are factors that inhibit traffic infringements.
- Two-thirds of pedestrians being interviewed are expecting a gain in time when violating the traffic light. The majority is aware of exposing themselves to a risk but unaware of exposing others to a risk with their behaviour.
- There are only little gender differences. Women are reporting a significantly higher awareness of the risk to themselves as well as to others. Between the German and French speaking part of Switzerland there is no difference in behaviour, but in the reported reasons for and expected results of their behaviour.

The most important findings concerning **cyclists** are:

- Almost half of the cyclists interviewed decide whether to stop at a red light depending on the situation. Contributing factors to traffic infringements are light traffic, no other people being present, and turning right.
- More than two thirds of the persons interviewed are expecting a gain in time as well as an increase in comfort when violating the traffic light. They are aware of exposing themselves to a risk and do not rate their behaviour as role model behaviour. They are also aware of annoying other road users with their behaviour.
- The compliance of women and cyclist of the German speaking part of Switzerland is higher than the one of men and of cyclist of the French speaking part.

## Behaviour assessments

Pilot trials with behaviour assessments have been conducted to evaluate the impact of a certain number of measures to improve the situation at traffic lights. Pedestrians and cyclists have been observed before as well as after implementing the measures. The following layout scenarios have been tested:

### Pedestrian traffic:

- Introduction of an exclusive pedestrian phase (Zurich)
- Exclusive pedestrian phase with pedestrian scramble (Basel and Zurich)

### Bicycle traffic:

- Right turn on red (three scenarios, Basel)
- Exclusive non-motorized traffic phase (Basel)
- Installation of small bicycle traffic lights (Zurich)
- Demand driven timing plan of traffic light (Zurich)

The analysis has shown, that:

- Turning right on red
  - has already been performed quite frequently before the changes but only rarely resulted in conflicts,
  - does not lead to a higher number of conflicts when turning right nor to a higher number of infringements in other directions. This holds true as long as certain factors (e.g. separate turning lane for cyclists, good vision, moderate pace) are observed,
  - has increased in use after the redesign.
- the permission for cyclists to use the exclusive non-motorized traffic phasing
  - has already been used frequently before permitting but only rarely lead to conflicts,
  - decreased the number of conflicts between cars and bicycles but increased the amount of conflicts between cyclists and pedestrians,
  - has been used increasingly after the redesign.
- there is a demand for pedestrian scramble.
- Installing small bike traffic lights does not change the behaviour.

## Recommendation

In agreement with the SVI advisory group a number of recommendations are made. The findings and recommendations for each measure are integrated in the description of the layout scenarios. An overview has been developed which layout scenario is suitable for which situation. In addition, the following general and legal recommendations have been made:

### Recommendation 1: Development of local concepts on how to consider non-motorized traffic at traffic lights.

A distinct and legitimate concept on pedestrian-friendly and bicycle-friendly measures at traffic lights is necessary to ensure a successful and fast implementation. Those measures have to be considered by the experts when executing the planning. They should also be known by the road users - at least their basic principles.

### Recommendation 2: Encouraging the exchange between the areas of traffic lights and non-motorized traffic

An internal transfer of know-how is necessary within the administration as well as a transfer of information concerning the general processes. In addition, the transfer of information concerning

this topic has to be encouraged between cantons and municipalities.

**Recommendation 3: Considering the topic in schooling and continuing education (colleges and symposiums)**

The concerns of non-motorized traffic have to be considered in schoolings on the construction and operation of traffic signals. Appropriate offers based on the existing concept on educational offers for non-motorized traffic should be developed.

**Recommendation 4: Developing communication concepts for projects on non-motorized traffic**

A better communication on improvements of traffic lights concerning non-motorized traffic is needed. This is especially necessary for measures which expect an active participation of road users.

**Recommendation 5: Allowing encounters between cyclists and pedestrians as well as between cyclists and motorised traffic**

For a long term view and to achieve additional experiences with other traffic and layout situations, it is recommended to proceed with the current pilot installations and extend them to other locations.

A revision of article 70 SSV is necessary concerning the legitimacy of amber flashing lights as a warning for permitted encounters. Especially recommended:

- Development of a legal basis to allow turning right on red without intervening with the timing plan of the traffic signal. This should include the standardization and definition of a static traffic sign.
- Development of a legal basis to allow conflicts between cyclists going straight on while pedestrians are crossing (introduction of an exclusive non-motorized traffic phasing, longer green phase for cyclists)

**Recommendation 6: Allowing pedestrian scramble on exclusive pedestrian phasing**

A revision of article 47 paragraph 1 VRV and development of a legal basis and signals is necessary to allow pedestrian scramble on traffic light operation.

## Further research needs

From a research perspective there is still a need for research on the following topics:

- Development and acceptance of encounters between pedestrians and bikers  
The pilot installations resulted in an increase of allowed encounters between cyclists and pedestrians. The observations showed that some pedestrians feel unsafe with these situations. Over time there was a tendency monitored that these encounters were better accepted. But this has not been assessed scientifically.
- Introduction of synchronized traffic lights for bike traffic  
Green waves for cyclist offer faster and more comfortable journeys. Their effect on the efficiency of the traffic system is not yet researched in-depth.
- Introduction of pedestrian scramble  
Diagonal crossings have been encountered at all intersections with an exclusive pedestrian phase. They were mostly not problematic. Further observations should be done in order to confirm the demand and to identify the factors which intersections are suited for the introduction of a pedestrian scramble.