

WINTER SERVICE ON BICYCLE PATHS - NEW GUIDELINES AND EXPERIENCES IN GERMANY

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ABSTRACT

Bicycle traffic in Germany has grown extremely in recent years. Higher environmental awareness, electrical drives (E-Bikes) but also the influence of corona pandemic have accelerated this development. Many new bicycle paths have been built. New types of bicycle paths which are exclusively reserved for cyclists were developed and are established in many cities in Germany: Bicycle-Expressways („Radschnellweg“), Bicycle Zones („Fahrradzone“) and Bicycle Streets („Fahrradstraße“).

Bicycles are not only used for leisure, but more and more used for daily traffic, so the number of cyclists in winter time is growing strongly. However actual investigations of winter cycle traffic show that there is a very high accident and injury risk for cyclists on snowy and icy surfaces. Research projects show that a good winter maintenance can not only minimize these risks but also it can convince much more cyclists to use the bicycle also in winter time, which can reduce the environment impact of traffic strongly.

But a good winter maintenance on bicycle paths is not easy. It requires a special and good organisation and a special technical equipment. A new guideline in Germany gives detailed recommendations for the winter maintenance on bicycle paths, which means a strong change of strategies.

Snow removal and clearance of the cycle traffic areas is very logistical demanding. Especially the special bicycle lanes on the roadway are difficult to clear because the normal road winter maintenance cannot clear them, even often moves the snow onto the bicycle lanes. It is necessary to work out special removal plans for the bicycle winter maintenance and adjust them to the road winter maintenance. With powerful narrow-gauge vehicles the bicycle lanes are very good cleared by sweepers and then spread with minimal amounts of brine.

There are some cities which have changed their winter maintenance in this way. There can be seen a big success of this strategy: Bicycle paths are in an excellent state, more cyclists use their bicycles also in winter time, accident and injury risks are low, and the cyclists speak out good judgements in surveys. So germanwide winter maintenance on bicycle paths will be changed more and more in the next years.

1. BICYCLE TRAFFIC IN GERMANY

The bicycle was invented in Germany by Karl Drais in 1817, over 200 years ago. Over many years the bicycle was used mainly in the summer and for touristic and free time. In recent years bicycle is used more and more as an all day mean of transport for all reasons and every day, more and more also in winter time.

This big increase of bicycle traffic has many reasons: The actual rising environmental and health awareness, the corona crises and the development of new types of bicycles like pedelecs and E-Bikes. Politics have now detected the promotion of bicycle as an important issue. So in Germany in recent years more and more bicycle lanes are built or marked in the cities. New traffic rules introduced in 2020 in Germany give more rights to the bicycles and make it more comfortable and safe to drive.

Actual there are introduced new types of bicycle ways: Bicycle-Expressways („Radschnellweg“), Bicycle Zones („Fahrradzone“) and Bicycle Streets („Fahrradstraße“).



Figure 1 – New Bicycle-Expressway („Radschnellweg“) in Germany

Bicycle-Expressways are similar to motorways reserved only for cyclists, no cars or pedestrians are allowed. The width is enough for 4 cyclists, overtaking is possible everywhere. It is planned for fast cycle traffic between different cities or city quarters.

Bicycle Zones and bicycle Streets are streets which are reserved for the cycle traffic, which is the main traffic in these roads. Cars are only allowed as exceptions and have to be considerate of the cyclists.



Figure 2 – Bicycle Road as a new road type in Germany

The modal split of bicycle traffic was in 2018 around 12 % for whole Germany in average of all country and the whole year, spreading in the different areas and the year time. With this Germany is in the top level in Europe, and its sure that the numbers are actual significant higher.

2. BICYCLE TRAFFIC IN WINTER TIME

In former times bicycle was not much used in winter time. But this has changed in the last years. More and more inhabitants of the cities want to use their bicycle the whole year and often they do not have own cars.

But the problem is that many cities did not execute winter maintenance for bicycle lanes and areas, sometimes they move the snow from the car lanes to the bicycle areas. So its very difficult and dangerous to drive on snowy and icy conditions.



Figure 3 – Cyclists have a high risk of accidents in winterly road conditions

A research project in Germany has shown that in these cities where a good winter maintenance for bicycle areas is done the number of people who use their bicycle in winter

time is much higher than in other cities [2]. The decreases differ from 70 % with bad winter maintenance to only 10 % with good winter maintenance in comparison with summer traffic.

The research project also has analysed the risk for bicycle drivers on snowy and icy surfaces. They found out that the risk of downthrow and injury for cycle drivers is approximately 20 times higher than on dry or wet surfaces [2].

So winter maintenance is not only necessary for traffic safety of cyclists, it is also necessary to promote bicycle traffic in winter time. More bicycle traffic in winter time leads to reduction of pollution in the cities and to better environment.

3. LEGAL DUTY OF WINTER MAINTENANCE

In Germany there is a legal duty for spreading on main traffic roads with dangerous points. On bicycle lanes in former times there was no duty for spreading because there was no important traffic in winter time.

This has changed in the last years. German courts now see a duty for snow clearing and spreading on all bicycle lanes and ways with important traffic in winter time. And this must be done in the same time as the road winter maintenance, means in the morning before the main traffic begins.

So the German cities need not only do winter maintenance because of traffic safety and traffic policy, it is also necessary on main bicycle ways because of legal duty.

For the cities this is a difficult task because the bicycle winter maintenance needs a separate organisation with own trucks.

For this new task the German City Association has published a new Guideline with recommendations for the winter maintenance in bicycle areas, based on the actual research results and the experiences in cities with best practice [4].



Figure 4 – New German guideline for winter maintenance for cyclists

4. DETERMINATION OF A WINTER BICYCLE NETWORK

Winter maintenance for cyclists is necessary. But it's not possible to make winter maintenance on all bicycle paths and lanes. It is a difficult task to determine these bicycle areas where winter maintenance should be done.

Important is that the bicycle routes are continuous free without gaps and they must be cleared mechanically completely, independent of the type of the way (on the road, beside the road or independent of the road). This is often a problem because not all bicycle paths are wide enough or have enough bearing capacity for mechanical clearing. Or there are obstacles which shall block cars going on the bicycle path, but they block also the maintenance trucks.



Figure 5 – Barriers on the entrance of a bicycle street

The main bicycle network connects the main destinations for daily traffic like working places, shops, schools and universities. The winter network must be continuous over the whole city so it is possible to reach all city quarters with bicycle good and safe in winter time.

Important bicycle lanes or paths need not to be in the same sections where the important road network is. It can lead parallel through other roads, especially through bicycle roads.

5. SNOW CLEARANCE ON THE DIFFERENT TYPES OF CYCLE WAYS

5.1. Problems

The biggest problem of winter maintenance on bicycle routes is the snow clearance. The reason is that bicycle lanes are often on the side of the roads and the road winter maintenance moves the snow to the side to the bicycle lanes. The other problem is that the bicycle lanes and paths are often very small with no space to remove the snow.

So it is necessary to remove the snow from the bicycle lanes with separate trucks after the removal on the road, the operations of these trucks must be combined with each other. And the removal on the bicycle paths and lanes must be done with small vehicles to pass all narrow sections and obstacles.



Figure 6 – Removed snow from the road blocks the bicycle lane

5.2. Removal of Bicycle Expressways and Bicycle Streets and Zones

On Expressways and Streets or Zones for bicycles there is a legal duty for winter maintenance. But winter maintenance is not so difficult here because the width of these sections is wide enough (minimum 4 m). So winter maintenance can be carried out by normal maintenance trucks for the road winter maintenance. It is only the task of the winter maintenance planners to integrate these sections in the road winter maintenance routes even if the normal car traffic here is not so important.



Figure 7 – On Bicycle Streets snow must be removed by normal winter maintenance

5.3. Removal of bicycle lanes inside the normal roads

When the bicycle lanes are integrated in the normal roads winter maintenance depends on the width of the road. When the width is small and the snow plows are wide enough the snow can be cleared in one run by one truck. Premise for that is that the snow is cleared up to the right side of the bicycle lane so that road and bicycle lane is clear.

Normally the width of the plows is not wide enough so that the clearance of the bicycle lane must be done in a separate run by a special truck. This needs a good planning and adjustment of winter maintenance routes and operations.

A problem is that in recent time often bicycle lanes are not only marked with special markings and colours on the road, but also they are separated with special barriers. This brings enormous problems for the winter maintenance because the width is restricted and it's a big problem to leave the snow both for the road and for the bicycle lane.



Figure 8 – Separated lanes in the road are a big problem for removal of snow

5.4. Removal of separate bicycle paths

Removal of snow on separate bicycle paths must be done by separate small trucks. The only problem is that the width and the bearing capacity of these sections is enough so that the trucks can go through the whole sections.



Figure 9 – Good snow removal on a separate bicycle path beside the road

In Germany often bicycle paths beside the road are combined with pedestrian paths on the same area. This is a problem especially when the width is very small. Then it is very difficult to remove the snow by trucks.

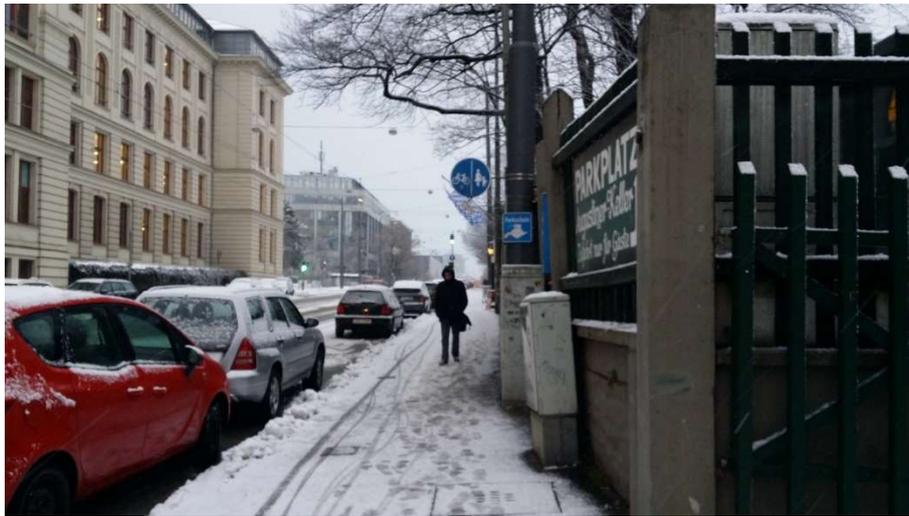


Figure 10 – Combined bicycle and pedestrian paths are problematic to remove

6. SPREADING TECHNIQUE

Up to now spreading on bicycle paths has been a big problem in Germany. In these cases where the cycle paths were spread at all politicians wanted only allow abrasive matters because of environmental aspects. A survey in 2018 lead to the result that over half of the cities use abrasive materials for spreading the bicycle paths in Germany.



Figure 11 – Abrasive spreading is enough for pedestrians but gives no good friction to cyclists

But experiences and research projects show that this is the most wrong technique of all. Abrasive matters can not bring enough friction for safe cycle ride, but they bring additional risks when the snow is gone lying on the dry surface (loose chippings). And it has been shown that the overall environmental balance of abrasive materials is not better than this of normal salt (sodium chloride).



Figure 12 – Loose chippings of abrasive matters on the bicycle path after spreading

So for traffic safety, economy and environment it is the best to spread bicycle paths with salt. The aim must be to use techniques which minimize the salt amount and spread it very exactly on the surface.

This leads to the conclusion that the best spreading technique for bicycle paths is spreading salt brine. To minimize the spreading amounts the best is a very intensive clearing of snow before spreading which can be reached with sweeping.



Figure 13 – Sweeping and spreading of brine is the optimal technique



Figure 14 – Result of brine spreading is a black dry surface which is optimal for cycling

With this technique it is possible with minimal amounts of salt to reach optimal conditions for cyclists to drive in winter times.

7. EXPERIENCES

In Germany in recent years some cities changed the practice of winter maintenance on bicycle areas. They sweep and spread brine on the main bicycle network.

A good example is the city of Hannover where the new system was installed in the last years. Comparisons show that the salt consumption was much lower than before, and at the same time the quality of the pavements is much better. Questionings of the cyclists show a very good satisfaction with the winter maintenance and with the condition of the bicycle paths. This leads not only to a higher traffic safety but also to a much higher percentage of cyclists which use their bicycle also in winter time. So it is a big contribution to better environment in the city.

The good experiences with this technique and the results of research projects have led to the recommendations in the new guideline. Actual more and more cities in Germany change their system and execute a better winter maintenance.

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