

Rail Infrastructure – Maintenance and Investments



Analysis of the starting position

Prior to any potential decisions, a thorough analysis of the existing rail infrastructure is necessary from the perspective of future development. The following should be taken into account:

- Condition and expected life cycle of existing track and overhead contact systems.
- Existing and possible distances from track centre.
- Ratio of independent to dedicated lines.
- Efficiency of the existing supply of current for electric rails.
- Existing wheel/rail ratio (derailment safety, life cycle).
- Existing stop design and equipment.
- Insights regarding the construction of existing track and overhead contact systems.

Assessment of future needs

A plan for the intended development of local transport, also known as a “regional traffic plan,” has to be prepared in cooperation with the purchaser of local traffic services. The latter is normally the municipality of the existing administrative

centre. In terms of assessing existing infrastructure and gathering information about a district/population or existing and future traffic volumes, the following should be defined: a destination network, minimum standards for timetables, transport quality, vehicles and general infrastructure (i.e. stops, junction points and an uninterrupted route).

Various decisions need to be reached about infrastructure. For example, future traffic sharing between different types of public transport (e.g. urban rail, regional transport, city railways/trams and buses) will involve important decisions about the reconstruction, retention or closure of existing track sections.

Where existing tram networks and national railway lines run parallel services, the improvement of these railway facilities should take preference over an extension of municipal networks. This improvement will be dependent on the location of these lines to existing or expected catchment areas, which will have an impact on the repositioning of existing or achievable stops.

If appropriate, a mixed transportation system should be examined as an alternative. Little used sections of existing tram networks should be converted to bus transportation for the medium term, or, if required, maintained as operating tracks.

It is recommended that the development of a city railway system reflects the sections which are most frequently used.

City railway development

Important targets in the development of a city railway include significant improvements in comfort, operating reliability and travelling speed.

The tracking is to a large extent dependent on the regional traffic plan; it can be carried out either level-free (with underground or elevated railway sections) or at the same level as road traffic. Due to the high expenses and the difficult integration of level-free solutions into an existing system, the development of the city railway within the road area should normally be given preference. However, the following premises have to be taken into account:

Construction of a separate rail track: This can increase travelling speed, avoid traffic congestion, reduce the accident potential in terms of individual traffic and reduce the risk of accidents involving third parties and interruptions.

Light-signal systems: These have an influence on junctions and also reduce crossing possibilities, which guarantees an interruption-free ride.

Where it is not possible to separate the complete tracking system, acceptable results can also be achieved through "dynamic road area influencing". In this case, the city railway is operated as "group leader" in a jointly used road area by means of light-signal systems, where a structural separation to individual traffic still exists. The condition for this, however, is a general acceptance of light-signal systems at street crossings.

Construction of a traffic island with level-free access conditions (normally by using modern low-floor vehicles) accelerates the boarding and alighting of passengers, improves passenger comfort and reduces accident potential while servicing the stop. If space is limited, other forms of stops can be used instead, according to which the neighbouring roadway is raised or the track is brought close to the footpath.

Within these stopping areas particular significance has to be given to the connection points to other lines (including bus and railway transport). In this case, solutions should be found which enable short changing distances and times. An optimal solution would be a stop on the same platform. The routes have to take these particular burdens caused by associated bus traffic into account.

Prior to constructing the first platforms, a decision must be reached regarding the future planned width of the vehicle and a strategy must be conceived for their construction. For example, legal regulations need to be adhered to regarding the maximum distance between the vehicle and platform edge, and this could allow the widening of the vehicle only gradually or by means of special solutions. At the same time the maximum length of a train as well as any design requirements concerning the design of the platform (for disabled people, for example) must be determined.

In order to be able to determine the future operating and security system, first a decision is required as to whether the future city rail operation should be developed as train traffic control or as contact ride operation. In general, the contact ride operation is sufficient in case of extending the city rail within the existing road area. After all, in accordance with the German BO Strab which has been recognized in Europe in many cases,

it is possible to reach a speed of up to 70 km/h. In any case, however, the implantation of a computer aided operating control system (COCS), which assumes the future communication between the vehicles and an operating control centre, would be sensible. The COCS is able to record relevant data such as location and the degree of occupation of the vehicles, timetable behaviour and interruptions (faster reaction to interruptions, improved reliability) and can also be used to effect a significant improvement of passenger information. The associated passenger indicators can be installed later if required.

Overall network: City rail and remaining tram sections

Following the segmentation of the network into the above-mentioned sectors, certain changes will be required for all parts of the network (especially in the case of imminent renovation work). These changes are necessary to achieve network-wide use of new vehicles as well as an extensive improvement in passenger comfort over the longer term. These changes include:

- Expanding the distance between the centre of platforms to accommodate greater vehicle width.
- Marking free tracks (at least in access areas) of busy road crossings and giving priority to the tram through light-signal system.
- Redimensioning the supply of current for electric rails (i.e. substations, overhead lines, cables) to accommodate the significantly higher energy requirement of modern vehicles with their higher speed, weight etc. In the case of changes having to be made to existing single overhead lines, alternative forms of construction such as trolley wire should be examined with respect to the intended speed.

Even if existing overhead lines are not converted, ceramic insulators should at least be replaced by glass fibre or rubber insulators if the former start to fail. In addition, multiple insulation (the requirement in Germany is triple insulation) can guarantee the hazard-free maintenance of overhead lines without even breaking the current.

After an examination of the wheel/rail ratio, the gradual enlargement of the wheel-load distribution and the possible reduction of flat groove centrepieces will improve the life cycle of both vehicles and points systems. This change can also be affected through optimizing the transverse geometry of wheels and rails, although this requires a longer introduction period.

Wear-resistant materials should be used, especially for expensive system components such as points or crossings.

Examination of existing technologies for the maintenance and care of rail infrastructure systems (e.g. reprofiling, contract welding, riffle grinding, cleaning) can prolong the life cycle of the system.

Existing construction methods can be compared in terms of maintenance expense against the construction methods of other transportation companies. One factor to take into account here is possible increased loads through the co-use of rail lines by public service buses'.

Places of operation and workshops

From historical experience, larger transport services tend to have a comparatively large number of places of operation and workshops. For these firms, most buildings are in a poor state and require large investments for renovation and modernisation.

For the medium term, the most important rationalisation potential for public transport services lies in the re-design of the depot and a reduction in the places of operation. As a result, we can see that these firms should focus on the required minimum of locations where operations have to be carried out, and if possible these should all be located close to the main lines of the city's rail system.