

Description of the measure and main outcomes expected

Mannheim and rnv are committed to making public transport easily accessible, safe, clean, and pleasant. We regularly refurbish and upgrade PT stops to ensure barrier-free access for people with reduced mobility, including those using wheelchairs, wheeled walkers, and strollers. Due to limited additional resources, rnv is looking for innovative solutions to enhance PT stops beyond legal and practical requirements. The goal of the measure is to draft, discuss, and pilot new components to improve the overall attractiveness and functionality of PT stops, focusing on three sub-measures.

The first sub-measure, MAN_04_01, involves introducing additional digital services at PT stops to enhance user experience and passenger information. The second sub-measure, MAN_04_02, addresses climate change-related adaptations, e.g. by adding greenery and shading to reduce direct sunlight and heat during the summer. The third sub-measure, MAN_04_03, aims to develop a comprehensive building standard for rnv's tramway PT-stops, ensuring best practices in accessibility, comfort, and multifunctionality while streamlining planning and construction processes.

The expected outputs of these sub-measures include the development and piloting of concepts for digitalized PT stops; addresses climate change-related adaptations like greening and shading; the establishment of platform building standards to be applied in future projects.

Preparation of the measure

The project began with the selection of suitable pilot locations, hence public transportation stops where the measure can be carried out. Following this, a user needs assessment was conducted internally, which included gathering insights from a serious game to compile a detailed list of desired features for the public transport stops.

Main areas of convergent or divergent ideas from Serious Game Mannheim

- Digital passenger information must be easily visible and should also be available (in specific cases) inside buildings. The rail replacement service could also be displayed in the building on the screen of the digital passenger information, as well as the corresponding direction of travel.
- Traffic lights should not have long waiting times at PT stops where there is no direct access.
- The entrance area at the stop where access to the tram is easier and provides more space should be marked accordingly.
- The PT stop environment is very important for passengers' comfort and sense of security. Bakers, kiosks and a lively environment have a positive effect on the passengers' feeling of safety and comfort.
- The greening of PT stops is defined as one of the most important cross-aspect measures. Furthermore, cleanliness is defined as the least important aspect.

Regarding **MAN_04_01** (*additional digital services*), research on best-practice among other PT-operators was conducted and potential technical solutions were identified. Internally, relevant use-cases and functionality were gathered and prioritized. A first test run is currently being conducted at the Mannheim central train station (s. figure 20). Due to a large-scale renovation scheme currently going on along the main railway line between Mannheim and Frankfurt, a complex rail replacement concept including the detour of some lines and the cancellation and bus replacement of many others. This situation required dynamic information which currently are provided through

mobile screens. This test does not feature interactive functions yet but just the dynamic display of real-time information.



Figure 1 Test-run of dynamic, digital passenger information

MAN_04_02 (*climate change-related adaptations*) focuses on the development of conceptual solutions for various climate change-related adaptations e.g., what can be greened was successful. Hence, the completion of diverse greening projects in the Mannheim were carried out.

MAN_04_02_01 (Masts): Thanks to the impetus provided by the prototypes masts that were greened, 72 masts in Mannheim have already been greened (s. figure 21). Once these have reached their target growth height, approx. 350m² of greenery could be created.



Figure 2 Picture of mast with greening elements at Mannheim Castle

MAN_04_02_02 (PT stop): Various greening measures have been included in the planning of the modernization of the PT stop "*Platz der Freundschaft*" in Mannheim (s. figure 22). These include the optimisation of the platform width to create a green strip, vertical greening of the fence system and the integration of a climbing element for plants. The planning for the planting is currently in progress.

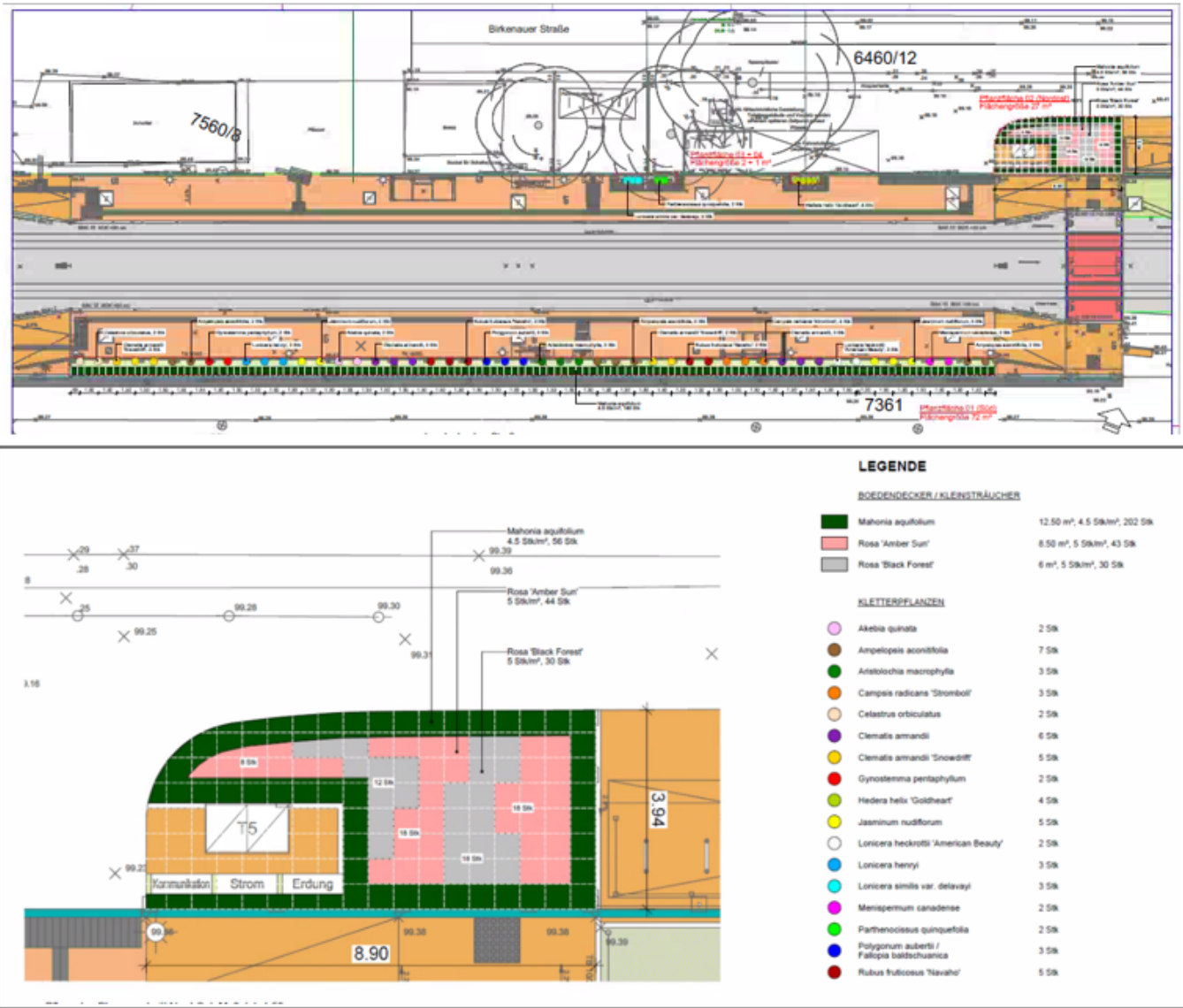


Figure 3 Planting plan "Platz der Freundschaft" Mannheim

Sub-measure **MAN_04_03 (building standard)** started with the identification of all relevant stakeholders involved in the design and construction of public transport stops to ensure a holistic view beyond the initial planning processes. Once the initial outline of the scope and focus of the standard had been decided, specialized working groups started to work on different topics, ranging from technical and legal aspects to construction methods and materials. The concept therefore involves following aspects: Abbreviations and definitions, platforms (requirements for accessibility, quality of stay, distances between stops, principles & testing of performance), transfer points, platform heights, inclinations, platform lengths/widths/accesses, stopping positions), Actual guidance systems, drainage, railway structure, platform equipment, passenger shelter, traffic signs, passenger information, rubbish bins, barriers, lighting, control cabinets, empty pipework, earthing, redesign of existing platforms, greening, documentation.

Extracts from the standard platform concept

Arrangement of the side platforms:

The arrangement of the platforms must be adapted to the local, spatial and operational conditions. As a rule, the platforms at the operating stations should be arranged parallel and at the same height (s. figure 23).

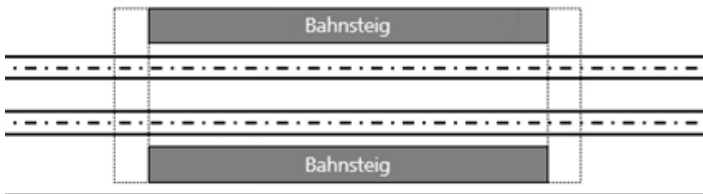


Figure 4 Illustration shows arrangement of platforms.

At complex junctions in the BOStrab area, priority for the railway cannot be guaranteed (s. figure 24).

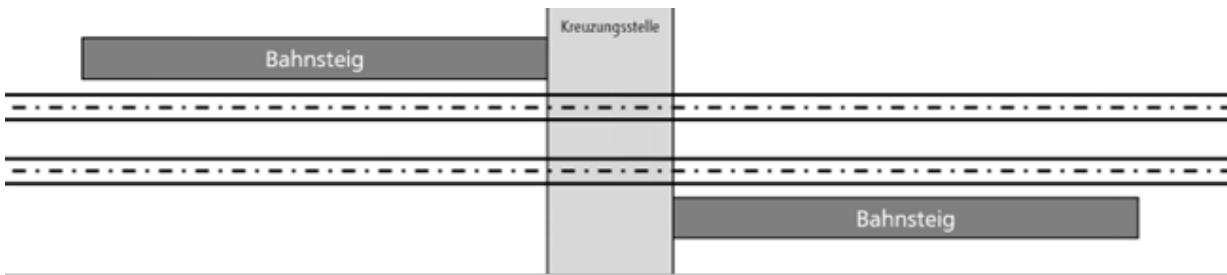


Figure 5 Illustration shows complex junctions in the BOStrab area

At railway junctions, optimised platform arrangements should be examined. For example, a star-shaped arrangement of platforms at track triangles should be examined (s. figure 25).

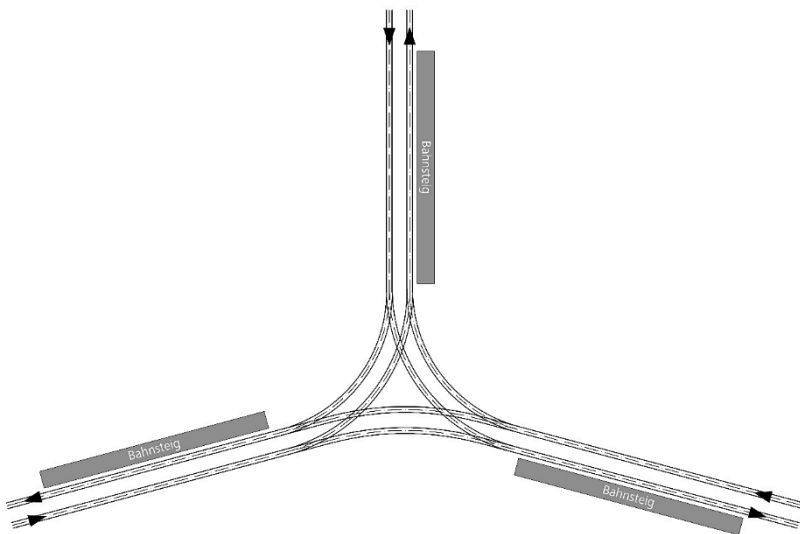
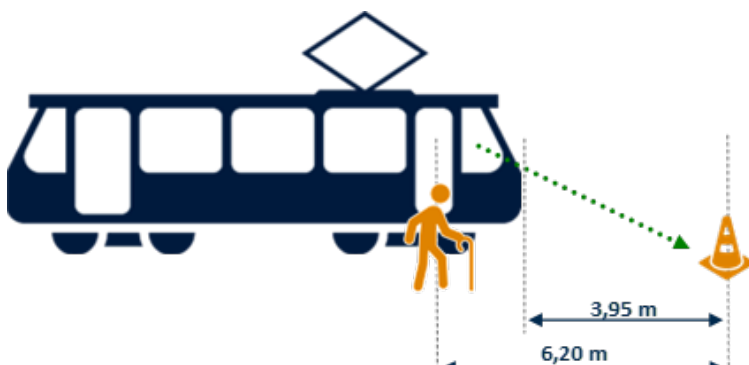


Figure 6 Illustration star-shaped Arrangement of Plattform

Stopping positions:

The stopping position defines the point at which the head of the vehicle comes to a halt at the start of the platform (s. figure 26). Ensuring an unrestricted view for the driver of danger points and signals directly in front of the stopping position.



The recommended minimum distance from the danger point to the centre of the communication field is 6.20 m. This results in the stopping position (top of the vehicle) for the most unfavourable vehicle type, which is 3.95 m in front of the danger point, as shown in the following illustration.

Figure 7 Illustration shows the recommended minimum distance from vehicle to the danger point

Challenges & Mitigations

The Implementation of additional digital services at PT stops (MAN_04_01) poses significant challenges due to numerous technical and financial hurdles and barriers, complicating the integration and deployment process. At this point it is unclear if the initial scope of the digital services can be implemented within the scheduled timeframe. This is due to the significant rise in cost estimates over the last year (e.g. hardware, required software adjustments but especially construction/ wiring/ installation). Together with recent budget constraints the cost-benefit ratio of the project decreased. To counter these developments, the topic will be brought up in front of the steering committee to either ensure full support for the project, or, as a worst case, to put the implementation on hold.

Next steps towards implementation

(MAN_04_01, additional digital services) Next, the project focuses on identifying and acquiring necessary equipment and interfaces, notably including interactive screens for enhanced user engagement. After that, the procurement process is initiated with the publication of tenders, outlining specific criteria for the awarding of contracts. Detailed requirements for the backend of software systems for digitalized stops are going to be specified, ensuring seamless integration and functionality. The development of this solution includes the integration of existing systems and data into the new outlet. Those changes will be carried out by the rnv IT-team itself. On top of that, some form of content management system is needed, to stage the information provided and configure the user interface. This will be either done by adapting existing CMS to the new requirements through our service provider, or by procuring a CMS for this specific purpose. Once equipment is procured, installation should follow, ensuring that all materials are operational and meet required standards. Safety assessments are rigorously conducted to verify that all installed equipment is secure and meets safety regulations, prioritizing user well-being. The procurement process will therefore be part of the implementation process.

(MAN_04_02, climate change-related adaptations) After the successful implementation on the pilot sides, the gained experience will be utilized to roll-out further greening measures throughout our public transport network. Planning the first façade greening at a railway substation until the end of 2024.

(MAN_04_03, building standard) Over the next months, the building standard for platforms will be finalized.