Participants

Project manager: Lena Lingqvist
Editorial group: Lena Lingqvist, Henrik Rundquist, Anna Undén

Other participants: Lotta Palmlund, Tinna Prather Persson Ingemar Johansson, Anna Hansson, Sten Hallberg/United log, Ola Rydell, Jan Hjalmarsson, Carl-Johan Engström, Per Hurtig, Björn Södergren, Erik Lindberg, Catharina Danckwardt-Lillieström, Sofia Lindblad, Peter Huledal, Göran Andersson, Karin Malmquist, Tove Jonstoij (journalist)

Graphics and layout: Elin Pääjärvi
Cover: Triangeln Station, Malmö. Photo Kasper Dudzik
Translation: MBP
English version layout processing: Ellen Forsberg

Title: Railway Stations - Planning Manual
Publication date: 2018-02-20
Publication number 2018:052
ISBN: 978-91-7725-244-3
Publisher: The Swedish Transport Administration
Liaison officer: Lena Lingqvist
Head of assignment: Lena Lingqvist
Distributor: Swedish Transport Administration, Borlänge 78189, Telephone: +46 (0)771 921 921

Swedish version

Title: Stationshandbok
Publication date: 2012-11-30
Publication number: 2012:226
ISBN: 978-91-7467-420-0
Content

Introduction

1. Preface ....................................................... 8
1.1 Purpose .................................................. 10
1.2 Target group ............................................. 10
1.3 Delimitation ............................................. 10
1.4 Reading instructions ................................. 10
1.5 Station, transport hub and transfer point .............. 11
1.6 The station – a function under transformation .......... 12
1.7 The Swedish Transport Administration’s remit and roles .......... 13
1.9 For further reading ..................................... 17

Natural light penetration above escalators creates visual contact between ground level and stairwell, Trianglen Station, Malmö
A Station, Part by Part

8. On the platform .................................82
  8.1 Platform features .................................. 84
    8.1.1 Platform zoning .................................. 86
    8.1.2 Shelter ........................................ 87
    8.1.3 Seating ......................................... 88
    8.1.4 Lighting ........................................ 89
    8.1.5 Usability for the disabled ....................... 91
    8.1.6 Material ........................................ 91
    8.1.7 Miscellaneous fixtures ........................... 92
  8.2 Platform geometry ............................... 93
    8.2.1 Platform length .................................. 93
    8.2.2 Platform width ................................... 94
    8.2.3 Platforms and track geometry .................. 96
    8.2.4 Platform height .................................. 96
    8.2.5 Platform slope ................................... 97
  8.3 A platform's position and location .............. 97
    8.3.1 Side platform .................................... 97
    8.3.2 Island Platform ................................... 98
    8.3.3 Multiple platforms ................................ 99
  8.4 The free space .................................... 100
  8.5 Safety in the platform environment ............ 100
  8.6 Underground platforms .......................... 102
  8.7 For further reading ................................ 103

9. Connections ....................................... 104
  9.1 Underpasses and overpasses ...................... 104
    9.1.1 Ramp and staircase ............................. 108
    9.1.2 Lift and Escalator .............................. 109
    9.1.3 Embedded passages, stairs and lifts .......... 111
    9.1.4 Lighting and natural light ..................... 111
    9.1.5 Seating, usability and material .............. 112
  9.2 Plane transition .................................. 112
    9.2.1 Loitering on the tracks ....................... 114
  9.3 For further reading ................................ 115

10. Information, safety and security ............... 116
    10.1 Transport information .......................... 118
      10.1.1 Information needs ............................. 119
      10.1.2 Information carrier ............................ 119
      10.1.3 Range and position ............................ 122
      10.1.4 Analysis and Planning ........................ 122
      10.1.5 Information node .............................. 123
      10.1.6 Meeting point for escorts .................... 123
    10.2 Safety and security ............................ 124
      10.2.1 Staffing and monitoring ...................... 125
      10.2.2 Assault and sabotage ........................ 126
    10.3 For further reading ............................. 127

11. Arrival ............................................ 128
    11.1 Features for arrival ............................ 130
      11.1.1 Car parking and waiting ...................... 130
      11.1.2 Bicycle parking ............................... 131
      11.1.3 Bus landing .................................. 132
      11.1.4 Usability for the disabled ................... 133
    11.2 For further reading ............................. 133

12. Service ........................................... 134
    12.1 Waiting features ............................... 136
      12.2 Passenger service features.................... 136
        12.2.1 Purchase of tickets .......................... 136
        12.2.2 Toilets .................................... 137
        12.2.3 Staffing, luggage and escort .............. 137
        12.2.4 Services for cyclists and motorists ....... 137
    12.3 Features of commercial operations ........... 137
    12.4 For further reading, Chapters 8-12 .......... 138
1. Preface

Travel has increased and the manner of travel has changed. At a station, passengers encounter public transport. A station’s overall quality as a visited environment, transfer point and an integral part of the city is crucial in attracting more public transport passengers.

Planning, designing and building station environments is a complex task, in which extensive technical systems must work together with the surrounding environment. Many stakeholders with different responsibilities must also work together toward common goals. The fact that attractive stations are a success factor for rail travel is also the economic justification for the fact that everyone working in a station environment, from the train operator to the kiosk owner, should contribute to the whole.

Both as a community developer and as a developer and manager of the station facility, the Swedish Transport Administration plays a crucial role in the development of pleasant station environments. This applies to both existing and new facilities.

This handbook constitutes a part of the Swedish Transport Administration’s development of expertise in the planning and design of stations. This part, which is the first of two, is aimed primarily at our own employees, but also at other stakeholders participating in work on stations.

The subject field is broad, and for the reader who is already a specialist within one subject area, the book will hopefully provide useful knowledge about some additional subject area.
Example of a station integrated in an urban environment, Trianglen Station, Malmö
1.1 Purpose
Much has already been written about the planning and design of stations. This may include technical issues related to railway-specific functions, such as in the Swedish Transport Administration's handbooks and standards, a station's functional structure in advice and guidelines, issues concerning design for individuals with disabilities or, on a completely different level, reports discussing stations in community planning. However, it is difficult to find examples where both the overall planning issues and concrete design issues are described together.

This manual is an attempt to describe a complex entity in a single document. The book does not claim to be complete in every area, and it is not a traditional handbook, but is intended to broadly highlight the many issues concerning stations and their design.

In a continued work, an account will be given of the Swedish Transport Administration as a community developer, the transfer point as a general transport hub, various station types and consistently implemented design programmes, as well as dimensioning of functions.

The manual aims to:

- Provide guidance and knowledge within the broad range of issues involved in station planning with a focus on issues within the remit of the Swedish Transport Administration
- Serve as an instrument that enables the Swedish Transport Administration to be a competent and active stakeholder in station planning
- Highlight the perspective of passengers as a precondition for planning
- Promote a consensus in the Swedish Transport Administration on key quality issues in station environments

1.2 Target group
The handbook’s principal target group is the Swedish Transport Administration’s employees who work on station issues in a broad sense: planning, project management, procurement, design, management etc. It can also provide information for the likes of municipal planners working on station issues based on the municipality’s area of responsibility. Other stakeholders such as consultants and property owners may also benefit from the handbook.

1.3 Delimitation
The book concentrates on the station and its vicinity as part of a transport system from the passenger’s perspective. The entirety of railway planning, with transport operation issues or as a technical facility, is not included in the handbook. Cargo handling in station facilities is not included either. The basis for the descriptions is the entirety a station facility comprises, but with a focus on the Swedish Transport Administration’s remit for platforms and grade-separated junctions etc.

1.4 Reading instructions
The focus of this book is on the prerequisites for station design and on more specific design issues from town planning level to the various sub-functions within the facility. The content in this handbook is divided into three parts. The first part covers prerequisites and starting points for station planning. The second part describes a station’s organisation and integration with the surroundings. The third part is
a concrete review of a station's various parts illustrated with examples of solutions. Its arrangement allows a reading where overall planning can easily be connected to real examples in a station environment – an interplay between overarching issues and detailed issues.

1.5 Station, transport hub and transfer point

In everyday language, for many the word ‘station’ means the same as a station building located next to the railway. But a station is strictly defined as a place in the railway system where a journey begins or ends, or where the passenger switches between modes of transport.

Therefore, the manual uses ‘Station’ as a collective term for all forms of transfer points, transport hubs etc. found in public transport. A station is considered more of a place, an area – not just a station building. There are a number of concepts in the subject area, which also appear in the book:

- Station facility – the physical facility found within a station needed to sustain the entirety of the station's function
- Station function – the collective function that a station offers the passenger as part of a journey
- Station building – the building adjacent to a station, which houses one or more functions, such as a waiting area. These are becoming less common in modern stations.
- Transfer point – a station with transfer opportunities to the same or other modes of transport.
- Transport hub – a transfer point that also has an extended range of services in addition to services for the journey.
1.6 The station – a function under transformation

The station as a function and facility undergoes constant change. The passenger’s behaviour in the context of many and rapid transfers, for example, and the need for services and information etc., have changed the conditions for design.

Station function becomes more complex, requiring effective connections for changing trains and between modes of transport, high-capacity set-down/pick-up zones, and access to fast services. This function is expanding and becoming more complex. Station functions’ contribution to the vicinity or district’s development has also increased.

At the same time, parts of the station facility, previously seen as a matter of course, are disappearing. Since the inception of the railway, the classic station building has been the main symbol and focal point for the railway station and sometimes for the district. Station functions are now moving out so that they are naturally located in the path of passenger flow. Ticket machines, waiting areas and services in the modern station may instead be located on
the platform or in communication areas, and many culturally/historically significant station buildings are put to other uses.

1.7 The Swedish Transport Administration’s remit and roles

Based on an overarching transport mode and societal perspective, it is the remit of the Swedish Transport Administration to create conditions and take responsibility for the long-term infrastructure planning, construction and operation of railways.

Transport policy objectives form the basis of the Swedish Transport Administration’s task. It is the obligation of the Swedish Transport Administration to endeavour to achieve its objectives and be responsible for the execution of the national plan for Sweden’s transport system. It is also the Swedish Transport Administration’s obligation to promote the development of public transport and contribute to growth and development potential throughout the country. This is done both in its role as a competent manager of infrastructure, and as a participant in and support for community planning in cooperation with other stakeholders. To achieve this, the Swedish Transport Administration plays several roles, not only as an owner and manager of the infrastructure, in which a station is included, but also as a promoter and supporter of the development of the transport system.

As an infrastructure stakeholder, the Swedish Transport Administration is responsible for the construction, operation and maintenance of railways. In station environments, this means that the Swedish Transport Administration owns, and has direct responsibility for developing and managing tracks, platforms and platform interconnections bringing passengers to and from the train. This is a part of the rail network’s main system. There has been confusion as regards division of responsibilities between the Swedish Transport Administration and other stakeholders. For this reason, areas of responsibility have been clarified and set out in the ‘Viewpoints on responsibility at transfer points’ decided by the DG (see also TRV 2011/33294). Some points are:

- The Swedish Transport Administration shall have full control over the main system and its connections to the supporting system.

- The Swedish Transport Administration and a transport operator can enter into functional requirement agreements concerning functions for passengers etc. on platforms and platform interconnections.

- Waiting functions for passengers shall be sub-leased to transport operating companies (rail, bus, other) calling at the transfer point. Sub-leases should be given on competition-neutral and non-discriminatory terms.

- Fixtures on platforms are owned and managed by the Swedish Transport Administration. Investments can be undertaken together with other stakeholders.

- The support system (the facilities for passenger services outside of the main system) is not the responsibility of the Swedish Transport Administration.
Responsibility (ownership or contract) for connections to platforms may be via grade separations above or below the track to the train. Sometimes these also have a purpose other than leading to the train, and this entails a shared responsibility with other responsible stakeholders.

Other stakeholders are responsible for set-down/pick-up zones, station buildings not on platforms, service functions etc., but the Swedish Transport Administration needs to have influence over the entire passage system, including the manner, in which platforms are connected to ancillary transport infrastructure. The Swedish Transport Administration shall have the opportunity to influence and participate actively together with other stakeholders to create well-functioning and attractive transfer points. The Swedish Transport Administration is responsible for traffic information fixtures at railway stations: dynamic and fixed signs, speakers, clocks etc. It shall gather and disseminate knowledge and information, work for progress, and cooperate with other stakeholders. When responsibility is shared and no particular organisation has principle responsibility, it is important for the Swedish Transport Administration to serve as a driving force and act with expertise in a broader area in the context of station issues.

1.8 Other stakeholders

Many functions within the station facility and parts of planning are managed by authorities other than the Swedish Transport Administration. These are various public and private stakeholders, organisations and specific projects, which, in different ways, are active in and around a station and thereby influence it. A brief description of some of the stakeholders follows:

**Regional Public Transport Authorities** (Regionala Kollektivtrafik Myndigheter, RKM) was formed pursuant to the new Public Transport Act valid from 1 January 2012. RKM has a strategic responsibility for regional public transport. Previously, such a role was held by the transport authorities. The authority also has the responsibility of establishing regional transport service programmes, strategic documents, which deal with the likes of transfer points (in the sense of stations, bus terminals and bus stops) that must be accessible for individuals with disabilities. The transport service programmes must also deal with such issues as the demand for, and access to set-down/pick-up areas at transfer points.

**The National Board of Housing, Building and Planning** is an administrative authority that handles issues concerning physical environment, construction and management of buildings etc. The Swedish Transport Agency formulates regulations and checks compliance.

**Municipalities** are responsible for connecting roads and pedestrian and cycle paths, and also for set-down/pick-up areas and parking. Sometimes they are the owners of station buildings and have an interest in transfer points as a component of the local area’s development.
Jernhusen AB is a state-owned real estate company, which, on commercial terms, develops, manages and owns real estate, and provides property-related services and other services connected to station areas. It currently owns approx. 60 station buildings. A number of station buildings are owned by private property owners.

Samtrafiken is a service development company for transport operating companies and passengers. Its primary objective is to make the use of public transport simpler, more accessible and reliable mainly by providing the sector with expertise and data concerning travel in Sweden. This is done by, inter alia, providing Res-Plus, timetables, Resrobot and Ledsagningsportalen. Samtrafiken is collectively owned by 36 transport operating companies.

The Swedish Association of Local Authorities and Regions (Sveriges Kommuner och landsting, SKL) is an interest group for the regional public transport authorities (RKM). It focuses on strategic political interest representation/lobbying as well as supporting its members in the exercise of their authority as government agencies.

The Swedish Public Transport Association (Svensk Kollektivtrafik, SK) is the service organisation of its members which are county transport companies and regional public transport authorities. It supports and represents its members in operational issues and contributes, through various programmes and monitoring systems, to the development of public transport in collaboration with other organisations, as well as disseminating knowledge and experience. The Swedish Public Transport Association’s responsibilities include the sector-wide quality and perception survey, Kollektivtrafikbarometern, the environment and vehicle database, FRIDA and the Statistics Portal.

The Swedish Association of Swedish Train Operating Companies represents active train operators in Sweden and, as an industry body, promotes professional interests common to commercial railway services. The association has 28 members, and its activities are managed through Sveriges Tågoperatörer Service AB which is a company entirely owned by the association. The train operating companies monitor the sector’s development through compiled statistics, reports and public inquiries concerning the sector etc.

Partner collaboration in order to double public transport usage X2AB (doubling company) drives an effort within the public transport sector aiming to double the public transport market share. Projects with a bearing on public transport and transfer points have been carried out within the framework of the doubling project. Among other things, guidance applying to principles of access to, and pricing of transfer points have been developed. Regional public transport authorities, county transport operators and transport operators run joint development projects through X2AB. The national sector organisations behind the doubling project are the Swedish Public Transport Association, the Swedish Bus and Coach Federation, the Swedish Taxi Association, the Association of Train Operating Companies and the Swedish Association of Local Authorities and Regions, and the Swedish Transport Administration.
Some project examples:

‘The Pleasant City’ is a collaborative project between Jönköping, Norrköping and Uppsala municipalities and the National Board of Housing, Building and Planning, the Swedish Transport Administration and the Swedish Association of Local Authorities and Regions. The project deals with current planning issues based on a number of sub-projects in the three municipalities.

‘Stations for Everyone’ in the prioritised public transport network. A public transport network, in which individuals with disabilities have the possibility of travelling, will be implemented in the country. The government has given this task to the Swedish Transport Administration etc. The network includes 150 stations which must be adapted for individuals with disabilities. ‘Stations for Everyone’ is a Swedish Transport Administration project, in which these measures are being implemented. Even at other stations, which are not included in the prioritised network, these measures are being carried out during reconstruction or new construction.

‘Attractive Stations’ has, as a pilot project, devised forms of collaboration between stakeholders at transfer points. Jernhusen, the Swedish Public Transport Association, Samtrafiken, SKL and the Swedish Transport Administration have been participants in this pilot work. This form of collaboration can now be used in regular operations for management of stations.
1.9 For further reading

Transport policy objectives

KOLL framåt

The Swedish Transport Administration’s instructions

The Swedish Parliament’s disability policy goals

Attractive Stations

Stations for Everyone

General Principles for Access and Pricing of Transfer Points – A Guide
2. The passenger

Station planning is based on accumulated expertise that is found assembled in guidelines and handbooks etc. But what do we know about passenger needs and their evaluations?

Passengers have different needs depending on who they are, their journey type and how much time they spend at a station. The rising number of commuters who move through a station as rapidly as possible must be able to be get along with leisure passengers or pensioners who cannot find their way around equally as well and have a need for services.

General knowledge concerning the manner, in which passengers travel and their existing needs, is acquired through surveys. When planning a station, one way of gaining more knowledge is to conduct passenger surveys. This has become a way to provide input both on a general level and in various concrete projects.

This chapter outlines the needs of various passenger categories and what to keep in mind regarding surveys.
Normal day in public transport, commuter train passengers at Stockholm Central Station
2.1 What passengers think
In order to increase the use of public transport, the essential requirements of both existing and potential passengers must be met. A well-functioning station is often seen as a ‘hygiene factor’, something one would expect to work. Not meeting basic quality requirements may mean that passengers choose to travel by car or plane.

Surveys show that the passengers needs can be divided into basic requirements and added values. Basic requirements for the passenger concern a station’s functionality, safety and security. This functionality comprises things that make the visit to a station efficient and convenient: for instance, the walkways are sufficiently wide, there is seating, there are shelters on the platform, traffic information is satisfactory etc. In addition to the basic requirements, there are added values which, to varying extents, have variable significance depending on passenger categories. Examples of added values are a wider range of services, restaurants, shops etc.

The operator’s role is important, since it naturally has a great interest in providing and accommodating passenger/customer needs at a station. The new Public Transport Act stipulates that infrastructure owners must clearly show what is contained in a station. The Swedish Transport Administration must, accordingly, present their ‘offerings’ to the operator and passenger.

2.2 Performing surveys
In the effort to create planning frameworks and develop guidelines, passenger surveys have become increasingly important. They may be general, where the conclusions are valid for many stations, or specific and thus tailored to the conditions and passenger categories that characterise a particular station. In the Swedish Transport Administration’s work with establishing design principles, generalizable results have been used.

When should existing knowledge be relied upon, and when should a new survey be carried out? One should always build on that which is generally established, but there may be specific stations, for which surveys must be carried out: e.g. the needs of the passengers at that particular station.

As in all surveys, it is important to know what you want to investigate – ‘ask a silly question, get a silly answer’ – and to be aware of the difficulty of reaching the potential passenger who, for various reasons, has opted out of using public transport.
2.3 Passenger categories

Passengers can be divided into various categories depending on how often they travel, how much they pay, the purpose of their journey, how long the journey is etc. These are factors that are important to station organisation and design. The more time spent at a station, the more the need for additional services and content increases.

The regular passenger:

- Commuter travel has increased and means a large percentage of passengers are well accustomed to travel and to travelling often. The increase in commuting is due to enlarged employment regions: the choice of place of residence in relation to place of work is ‘freer’. The journey is made to and from work or college/school.

- Official or business travel, travel to and from customers, to meetings etc. for the purposes of work.

- Personal work and business trips – travel over longer distances to work and college/school, but not in the same definition as commuters.

The infrequent passenger:

- Leisure travel has shifted into more differentiated travel. People travel to more, and different destinations, such as sports and music events, friends, summer and winter tourism etc.

- Visits to hospitals and other public institutions. Where public services are centralised, travel to these increases.
With fewer and larger regions, the need to be able to move over longer distances for work, studies, housing and medical care increases. An enlarged regional labour market has been made possible by better and more developed public transport. This means that the passenger and travel have evolved a great deal recently. Mainly regional but also inter-regional rail transport have seen a large increase. Generally speaking, the proportion of commuters has increased, when compared with other passenger categories. Commuting is also done over longer distances and inter-regionally. Today’s passengers often conduct their journeys using several modes of transport and in a more varied manner than before. The increase is mainly related to work journeys, which has also generated an increase in business and service trips. There has been a significant increase in long-distance, inter-regional travel in recent years.

The more varied manner of travelling means that a station needs to be designed and adapted to handle all types of journey, both commutes and more long-distance journeys, as well as the passenger needs that arise.

For leisure journeys, there may, for example, be a need for space for skis and bicycles on platforms, larger luggage storage and information in other languages.

For a large proportion of regular passengers, the need is to get directly and quickly to the train as they spend very little time at the station. While a station should work for these passengers only passing through, it must also meet the requirements of passengers who spend more time at the station, and who, to some extent, have other needs. They want to be able to buy a ticket, get information, use the internet, sit and wait, use the toilets and perhaps buy a newspaper.

Business passengers

Individuals with disabilities
Among both regular passengers and infrequent passengers, there are various passenger groups, which have needs that must be addressed in a station environment. Many seniors and individuals with disabilities are travelling more and more. Accordingly, there is a greater need, for example, for more seating along the route through a station facility. Passengers with small children need to be able to get around with a pushchair, use baby-changing facilities and have the possibility to heat food in a microwave. For children travelling alone, it is important to have obvious meeting places where adults can pick them up or drop them off.

Issues of accessibility and usability apply to all categories and groups. Design requirements are set out in laws, regulations and guidelines, which are described further in the next chapter.

2.4 For further reading


3. The accessible station

The concept of accessibility has a broad and general meaning. Making public transport accessible entails an approach that both deals with issues on an overall planning level to locate a station correctly and operate it effectively, and on a detailed level to design a station environment so that everyone can get around.

Following regulatory documents on accessibility for individuals with disabilities is a self-evident requirement. In the planning work, however, consideration must be given to how a station facility as a whole integrates with, and connects to the surrounding environment. In this way, stations and public transport truly become accessible, reachable and useful to all.

This chapter reflects on integrated approaches and briefly describes the regulations and guidelines currently in force.
Tactile tiles together with contrast marking form clear tactile guide paths and make it easier for passengers with disabilities, Eslöv Station.
3.1 A station accessible on all levels

Transport policy is one of the instruments that is making the country more accessible. The aim of the Government’s transport policy objectives and functional objectives is for the transport system’s design, function and use to help provide basic accessibility with good quality and usability, and to contribute to the development potential in the country.

The concept of accessibility encompasses many aspects. It can be seen as different systems that should work together to achieve easy accessibility.

- The physical location and design – the planning chain from location to the specific design of the facility
- Transport operation – the range of travel routes, frequency of service etc.
- The passenger’s characteristics – the needs and demands of different passenger categories

Railways and stations should, in a convenient manner, integrate with their environs: in other words, be easily reachable and not form barriers and obstacles in the local environment. A good station location with coherent links results in an increase in the perception of closeness. This favours the establishment of both businesses and homes in a station's immediate environs.

In the long-term, a station can contribute to urban development and shift urban focal points. Through its construction, the entire station facility should be orientable, traversable and easy to use, and comply with legal and regulatory requirements applicable to measures for individuals with disabilities.
A carefully thought-out overall design also significantly reduces the need for additional measures with extra signage, different markings, supplementary ramps etc. This approach connects to the concept of ‘Design for everyone’, in which the idea is for a product, a service or an environment to be designed in a manner that does not focus measures on special solutions and benefits and improves usability for as many people as possible, regardless of their different requirements. This is also a rational economic approach that helps to increase the customer base for public transport.

3.2 National regulations

In order to make it accessible and reachable in a broad sense, a station should be designed so that it is usable for all. Regulations and guidelines are found in both national and EU directives.

For people with disabilities, a well thought-out, integrated environment with few obstacles to ease and independence of movement in the environment is crucial. It must be possible to use the environment easily.

In addition to creating an integrated environment, stations and transfer points in their basic functions, construction and design should comply with the requirements and regulations regarding disabilities that society imposes on a station’s function and physical design.

The government aims to adapt Sweden’s public spaces and public transport for individuals with disabilities. This means, for example, that legislation has been tightened. On 1 July 2001, the section (Chapter 17, Section 21 a, PBL, Law 2001:146) in the Planning and Building Act on easily eliminated obstacles came into force. “In buildings with premises, to which the public has access, and in public spaces, easily eliminated obstacles to the accessibility and the usefulness of the premises and the places for persons
with limited mobility or orientation capacity shall be removed to the extent required by provisions issued.”

New regulations have been developed for public spaces for conditions prevailing in Sweden. The National Board of Housing, Building and Planning, the agency responsible for the regulation of public spaces in Sweden, drew up the regulations for the Act.


- *Easily eliminated obstacles*, BFS 2003:19 HIN1 apply to existing facilities and HIN2 BFS 2011:13

- *The Swedish Transport Administration’s advice and guidelines – Guidance for design of the physical environment for people with disabilities* is based on the national regulations HIN and ALM and apply to railway stations. One endeavour is that the system of rules that govern the physical design of public spaces should be as uniform as possible. (The document has been updated with respect to TSI etc.)
### 3.3 EU regulations, TSI

Previously, the railway was built according to national regulations and requirements. The new European regulations aimed at harmonising railways throughout Europe in order to reduce the railways’ costs and to increase competitiveness and to enable trains to run between the different member states without any technical problems are now also applicable in Sweden. TSI (Technical specifications for interoperability) apply to railways, but not to tramways and the underground.

The particular TSI for individuals with disabilities are set out in the EU directive:

- **TSI relating to persons with reduced mobility in the trans-European conventional and high-speed rail system** (2008/164/EC) which regulates physical features in a station facility.

TSIs are comprehensive and apply in full to new constructions and reconstructions and, with certain restrictions, to other physical measures in existing station facilities. They concern accessibility to all public areas within the infrastructure controlled by the railway company, infrastructure or station manager. TSI compliance should be reviewed by an externally certified NoBo (notified body). TSI has a very broad definition of the term ‘disabled’, which refers to all people who have difficulty when using trains or associated infrastructure. In addition to what is defined as a disability, travel with children, with heavy luggage, senior citizens, pregnant women, people of small stature (including children) and people with communication problems (including foreign people with difficulty understanding the language) are also included.

For many features, the TSI new construction requirements are more comprehensive than national legislation. A main focus of the TSI is to create an obstacle-free route to and from the train that all groups of people with disabilities can freely get around on. The obstacle-free route should link many areas/functions/services.

The TSI also regulate features that are not included in the national requirements of the National Board of Housing, Building and Planning. Some examples include the protected zone’s construction, tactile guide paths, traffic information, and the platform’s fixtures for shelters and seating. These features are, however, dealt with in the Swedish Transport Administration guidelines.

TSI are extensive, open to interpretation and both general and detailed, which means that one must familiarise oneself with them. TSI also leave some issues open for national legislation. For these reasons, the *TSI must be implemented in the Swedish Transport Administration’s own guidelines. *An update is in progress and will presumably be complete in June 2013.
3. THE ACCESSIBLE STATION
3.4 For further reading

'Easier without obstacles', The National Board of Housing, Building and Planning, 2005.

'Accessibility in public places', BFS 2004:15 ALM 1 and BFS 2011:5 ALM 2 which apply to new construction.

BFS 2003:19 HIN 'Easily eliminated obstacles' (for existing facilities) and HIN2 BFS 2011:13

The National Board of Housing, Building and Planning building regulations (BBR)
The National Board of Housing, Building and Planning national regulations for disabilities; ALM for new construction and HIN 1 and 2 for the measures in an existing environment.

The Swedish Rail Administration advice and guidelines – Guidelines for design of the physical environment for disabled people. (The foundation for the advice and guidelines are the regulations and general guidelines of the National Board of Housing, Building and Planning.)

TSI relating to accessibility of the Union’s rail system for persons with disabilities and persons with reduced mobility (1300/2014/EC)

Technical Specifications for Interoperability (TSI) specify what is required to meet the essential requirements of Directive 96/48/EC and Directive 2001/16/EC which were merged in Directive 2008/57/EC.

The Planning and Building Act (Plan- och bygglagen, PBL)
4. The framework of the process

Planning for a station, new construction or reconstruction, is based on the requirements of the Planning and Building Act, PBL, and follows the formal planning process that the Swedish Transport Administration works under in accordance with the law concerning the construction of railways. It is a planning system that is based on the entire railway facility and its technical nature with all the requirements and restrictions that the function entails.

However, a station, the connection point with the surroundings and the part of the facility that constitutes the public space have a more complex planning prerequisite. Whilst the railway engineering functions must be determined, a station constitutes an urban issue and a construction issue, in which a transnational approach and more planning issues must be accommodated than those that normally govern the purely technical railway facility.

A station, as a customer environment with strict quality criteria and as a public space in the city, requires the interaction of many stakeholders. The municipality, public and private property owners, transport authorities, transport operating companies, parking and taxi firms, and private traders are examples of parties with different requirements and needs in a station environment. A successful approach does not only involve the management of formal planning arrangements. Informal forms of cooperation also play a major role in creating a comprehensive approach and achieving shared objectives.

This chapter describes the formal planning processes and several key aspects of station planning.
Sketch and concept development workshops with participants from different areas of expertise are a good working method to explore issues as broadly as possible at an early stage.
4.1 The Swedish Transport Administration’s planning

The Swedish Transport Administration is responsible for ensuring that long-term infrastructure and financial planning of measures on the railway and the national road network are managed within the scope of a national plan. County administrative boards, regional governments or municipal cooperation bodies develop, thereafter, county plans for the regional transport infrastructure.

From 1 January 2013, new infrastructure legislation concerning railway land-use planning came into force. It involves a simplified procedure, in which the former three stages – pre-investment study, investigation and plan – will be replaced by an integrated plan preparation process which, for all but the simplest projects, concludes with the creation of a railway plan.

For projects started under previous regulations, there are systems for carrying out a transition process so that they can be completed in accordance with the new procedure. Before land-use planning begins, a preliminary study involving an unconditional general transport analysis using the four-stage principle is performed.

4.1.1 Selection of measures with the four-stage principle

Action-choice study is an umbrella term that replaces gap analyses, concept studies, feasibility studies and route studies. It concerns the selection of measures for a more efficient transport system, and solving problems and meeting needs that contribute to sustainable community development with cost-effective measures.

All forms and combinations of measures as well as all modes of transport should be studied before any are selected and a project is created. The process, which provides an approach for the selection of measures, should include exchange of information with the public, interest groups and other interested parties.
The Swedish Transport Administration uses the four-stage principle, which means that, in the first instance, the possibility of influencing transport demand and selection of means of transport is investigated. In the second instance, solutions that entail a more efficient use of existing infrastructure are selected. In the third instance, it becomes necessary to reconstruct and improve existing infrastructure. Only in the fourth instance are new construction and major reconstruction measures selected. Costs and relevant effects and consequences should be assessed for different action plans.

- **Stage 1 – Rethink**
  Measures that affect the demand for transport and selection of means of transport

- **Stage 2 – Optimise**
  Measures that provide more efficient utilisation of existing infrastructure and vehicles

- **Stage 3 – Rebuild**
  Limited reconstruction measures

- **Stage 4 – Build new**
  New investments and major reconstruction measures

### 4.1.2 Plan preparation

If the analysis according to the four-stage principle has resulted in a proposed measure to rebuild or build a new railway, the land-use planning process commences. The Swedish Transport Administration has identified five plan preparation types to illustrate that the planning process may look different, based on different degrees of complexity and consequences.

- **Plan preparation type 1**
  The type includes small and uncomplicated measures at the existing facility. No plan is developed and no alternative locations for the project are available. A prerequisite is that there is only marginal environmental impact and another is that land can be accessed on a voluntary basis. Examples of projects that may be subject to this plan preparation type are platform extensions.

- **Plan preparation type 2**
  The type includes projects deemed by the county administrative board as not posing a significant environmental impact. Accordingly, an environmental impact assessment (EIA) is not required. In addition, there are no alternative locations for the project.

- **Plan preparation type 3**
  The type includes projects deemed by the county administrative board as representing a significant environmental impact. Accordingly, this requires an EIA. This plan preparation type is used in cases where no alternative location is available. However, alternative designs may be found. Examples of projects that may be subject to this plan preparation type are double track extensions.

- **Plan preparation type 4**
  The type includes projects deemed by the county administrative board as representing a significant environmental impact. Accordingly, this requires an EIA. This plan preparation type is used in cases where both location alternatives and design options are available, and the project is not deemed to require an admissibility test. Examples of projects that may be subject to this plan preparation type are railways for which alternative corridors are available.
• Plan preparation type 5
Projects deemed by the county administrative board as posing a significant environmental impact. Accordingly, this requires an EIA. This plan preparation type is used in cases where both location alternatives and design options are available. Admissibility testing will be required. Examples of projects that may be subject to this plan preparation type are complex projects with multiple corridors or projects that may affect areas with high values.

Throughout planning, consultation is an on-going process. The consultation may comprehend many different kinds of activities: e.g. information material, telephone contacts, written viewpoints, and personal or public meetings. Public consultation meetings are customary elements in the consultation process, but do not constitute the entire consultation.

The railway plan, which concludes plan preparation types 2-4, presents a detailed design and location of the project, including how much land needs to be requisitioned.

It may not run counter to the municipality’s city plan, which is legally binding and often established at the same time as the railway plan. The plan is normally ratified by the Swedish Transport Administration. Interested parties can appeal the decision to the government. The county administrative board must approve the EIA included in the plan. A conceptual design document is created for the railway plan, which includes the railway engineering system with all planning and design prerequisites, all fixtures and all measures. All costs should be included, and the document constitutes the basis for a cost estimate. For major road and railway projects – plan preparation type 5 – the government will conduct an admissibility test, pursuant to Chapter 17 of the Environmental Code.
The types of projects that may need to be tested are those that have a major impact on the environment, are complex and controversial with alternative routes, and where there are strong and irreconcilable interests to weigh against each other. The government decides which projects shall undergo admissibility testing.

4.1.3 Construction phase
The Swedish Transport Administration then develops the final building document and the project’s final technical design. This must conform to the railway plan. Only slight deviations are permitted. Should larger deviations or amendment be made in the project, it may become necessary to change the plan or create a new one, including seeking new permits from the county administrative board. The Swedish Transport Administration establishes an environmental management plan, which then governs the enterprise.

4.2 Municipal planning
The Planning and Building Act, PBL, stipulates the railway’s relation to municipalities’ structure and land-use planning. In a new PBL, valid from 2 May 2011, the city plan process has been simplified. One amendment is that there may be more than one responsible authority in the same city plan, which reduces the need for multiple plans in, for example, a station area. The building permit assessment process should be able to go faster. The requirements for accessibility and usability should be included in the assessment.

4.2.1 Structure plan
Each municipality must have a current structure plan, which covers the entire municipality. The structure plan provides guidance for decisions on the use of land and water areas, and how the built environment should be developed and maintained. The structure plan is not binding for authorities or individuals.

4.2.2 Detailed structure plan
The purpose of a detailed structure plan (DSP) is to provide a comprehensive picture of the needs and prerequisites for development of a limited area within the area of the structure plan. A DSP focuses both on a short and longer-term perspective, and is an important foundation for the work on city plans.

4.2.3 City plan
The regulation of land use and of the buildings within the municipality is effected through city plans. A city plan may cover only a limited part of the municipality.
For limited areas of the municipality not covered by a city plan, area regulations may be adopted, if necessary, to allow the purpose of the structure plan to be achieved or to ensure that national interests pursuant to Chapter 3 or 4 of the Environmental Code are met.

4.2.4 Building permit/building document
With an established city plan, the construction of, for example, new residential and commercial areas and new infrastructure can be assessed. If developed plans comply with the alternative and do not run counter to the specifications of the city plan, a building permit can be issued. To control the construction process, building documents are developed.

4.3 Regional public transport planning
Today regional planning is not implemented in a uniform manner across the country. An example from Stockholm is the Regional Development Plan, RUFS, which is a comprehensive strategic endeavour for long-term, sustainable development. The Regional Development Plan, RUFS, is referred to during land-use planning, where public transport provides an important function and the proposed regional structures have an influence on the development of station locations.

A new public transport law entered into force on 1 January 2012. Each county should have a regional public transport authority, which will draw up, and decide on a regional transport service programme that will be the platform for the development of public transport. The programme should be long-term, strategic, based on a passenger perspective and overarching in terms of transport mode.

In order to design attractive and efficient public transport and to facilitate transfers between modes, the transport service programme should take into account national, regional and local objectives, plans and programmes, and be coordinated with the municipal community planning and the planning of infrastructure at local, regional and national level. The Swedish Transport Administration will, for example, provide regional public transport authorities with advice and support in the design of the transport service programmes referred to in the Public Transport Act.

4.4 Other aspects of the planning process
The formal planning processes are primarily governed by a number of laws and follow a given basic structure. The Swedish Transport Administration will, on the basis of their responsibility for both the national and regional transport infrastructure, execute its planning so that it is linked with regional and municipal community planning. This means that the Swedish Transport Administration is involved in many formal and informal planning processes between which there must be coordination and connection.

In order to be really successful, a project requires effective forms of cooperation, both formal and informal, between all the stakeholders involved. Leadership, ambition, accountability and common objectives that are specific and tailored to the unique situation characterise successful project results. The Swedish Transport Administration must be a competent and active stakeholder early in the broad working process that is initiated when a station project begins to be concretised in the formal planning.
4.4.1 Operational readiness
Station projects originating from the Swedish Transport Administration’s planning have often had ample time to mature in various regards. They are part of a long-term plan, and many issues that lie further along the time horizon, capacity for example, have already been investigated. An increasing number of station projects, however, are brought to the fore by various urban development projects that may be initiated within a tight time frame when the economy is favourable and market players capture the moment.

The Swedish Transport Administration must have operational readiness to set up a project organisation and become an active party early when the opportunity arises to boost public transport. That other stakeholders’ interests can help to promote good station design is an opportunity to be exploited, which requires early involvement.

4.4.2 Contracts
The Swedish Transport Administration, the municipality, the property owners concerned and transport authorities/the regional public transport authority constitute, in most cases, the core group that should ultimately agree on the objectives, design, division of roles/responsibilities and costs. Contracts between the various parties are a prerequisite for the implementation of the project, and beginning agreement discussions early brings the important issues to the table. Starting to discuss the difficult issues concerning contracts too late in the planning process can topple many propitious ambitions and increase the cost of the project.

At the same time, it is advantageous to distinguish between discussions of objectives and financing discussions. Formulating and illustrating common objectives first, before the various undertakings are finally determined, contributes to openness to new ideas and creative solutions. The form of contracts may advantageously follow project development by encompassing letters of intent or framework agreements early, which leaves room for reconsideration and development in order to encompass financial and implementation contracts in later phases. In complex station projects, responsibility is shared and must be clarified in terms of financing, ownership, operation, management etc. The Swedish Transport Administration endeavours to ensure that contractual arrangements become more uniform across the country and more clearly based on the administration’s limits of liability.

4.4.3 Careful programming
A station facility affects many people. Principally the passenger, of course, who is the customer, but also many stakeholders – from transport operators and service functions to suppliers and waste management companies – who should be able to perform their jobs in the best manner. Careful programming, even in a small station, requires knowledge from many different sources to be combined in an integrated solution.

For complete station environments, Programme Documents, as they are called in construction, should be applied. In other words, the technically onerous aspects concerning the railway, including platforms, bridges etc. should not be separated from all the other aspects, which together form a station environment. The scope of the normal railway plan and the conceptual design document are not sufficient to deal with the whole station environment from the perspective of the passenger.
The programming should demonstrate how the Swedish Transport Administration’s basic and auxiliary functions have been incorporated (see Chapter 7).

The programming phase must be given time so that all functions can be both explored, and developed into new solutions that are not merely repeated from previous projects. The soft parameters for the likes of comfort requirements and a station’s character are difficult to describe, but must still be developed and determined in the programming phase.

4.4.4 Strategic design plan – quality in execution

The strategic design plan is also an important instrument with respect to contracts. It is also a way to rank qualities for the stage that always arises – when to save money. Saving judiciously requires an understanding of what is essential for overall quality, and what can be sacrificed, while providing a reasonable saving. A station environment is a public space in the city and is used by many people, often. Requirements for high quality in execution and function need to shape the process from plan to project design.

Strategic design plans are the most important tool both to make qualities concrete and to communicate them so that the parties can come to (and enter into) an agreement.

The quality requirements should, consequently, be safeguarded in the design and construction. It is here that continuity in the organisation is put to the test. Execution must comply with the strategic objective when it comes to the crunch.
4.4.5 Process management throughout the project

Planning, design and construction processes are extensive and time-consuming, which means that the time from idea to finished facility usually spans many years. A major challenge is maintaining the continuity of expertise, attitudes and ways to collaborate, as individuals change frequently.

In processes with many stakeholders and controlled by the configurations of the planning systems, space for informal ways to work, collaborate and build common approaches are also needed. Building a common set of values, for example by jointly visiting reference stations early in a project, is a way to start the long planning process.

One way to strengthen synergies is to designate a single process manager to represent the interests of all parties (the Swedish Transport Administration, the municipality, property owners, transport operators etc.) in the management of daily work. Such a role can also slip over borders between the various planning stages and thereby strengthen continuity.

External communication to promote a positive Illustration of the project to the public and others concerned is essential for creating acceptance for the disturbances that the project execution often causes. At the same time, this information is equally important internally in order to promote a sense of ownership.

It is in fact through the communication between individuals, not party representatives, that work is performed. Planning from the outset so that the various stages with different staffing overlap temporally is a way of maintaining continuity.

Consultation meeting for the Götlaland line in Aneby

External communication to promote a positive Illustration of the project to the public and others concerned is essential for creating acceptance for the disturbances that the project execution often causes. At the same time, this information is equally important internally in order to promote a sense of ownership.
4.5 Management

The passenger's experience of a station is greatly influenced by how concern for the environment is perceived. Therefore, it is not only important that it is well designed from the beginning, as overall impression is largely determined by how well the environment has withstood ageing and how it has been looked after both long-term and on a daily basis. The basic level for maintenance and servicing include, for example, the function of lifts and escalators, cleaning of platforms and station area, graffiti removal and replacement of broken platform furnishing and lighting.

Proper design of the various components of a station environment also facilitates maintenance, allows costs to be kept low and makes it easier to maintain a desired level of quality.

Even at the early planning phase for new constructions and reconstructions, it is important to consult on the maintenance of the station and manage this in contracts, so that passengers are not affected by the 'boundaries' between different stakeholders.

The question of liability between the different stakeholders in a station must be clear before the management phase and documented, preferably by contract, with allocation and demarcation of responsibility. This clarifies who owns and is responsible for the operation of a station's various parts.

Selection of solutions should be based on life-cycle costs; not only on the investment costs. Material and product selection must be based on the experience of the station management at the Swedish Transport Administration and from an overall perspective on what works in different types of environments.

Incorporating demanding maintenance measures, which later risk failure in day-to-day operations, can be avoided through smart solutions, such as grade separations, which can be designed with good accessibility without lifting devices.

Management principles are longevity and robustness. In order for passengers to be able to rely on station function, management should be carried out in an integrated and analogous manner across the country. Consistent quality must be offered regardless of which station environment is encountered.
4.6 For further reading

‘The four-stage principle for planning – for sustainable measures in the transport system.’ The Swedish Association of Local Authorities and Regions, order no. 5107

‘The four-stage principle – Background and application examples.’ The Swedish Transport Administration, 25 September 2012

‘Planning systems for transport infrastructure.’ Government Bill 2011/12:118

‘Strategic design plans within the Swedish Rail Administration – a guidance document.’ 2005

‘More effective planning – Guidance for on-going projects.’ The Swedish Transport Administration, 15-10-2012

‘Advice for strategic design plans and design work at various stages.’ Swedish National Road Administration, Publication number: 2009:161, 12-22-2009
5. A station in the city

A station is an important place in the town or city, as it attracts new establishments and contributes to forming the structure of the urban area. The railway, which has historically been an engine of urban growth, remains so and is now growing in importance in modern, interconnected public transport.

Modern planning and urban development entail exploiting the full potential of a station as a destination point, a destination in itself, and not just for the journey. This helps to strengthen dense urban growth and counteract the urban sprawl that creates greater dependence on cars.

It is increasingly apparent that a station has become a place that lives in symbiosis with factors other than transport functions, and thus is an increasingly important element in an urban context, especially in smaller communities. Development pressure on major towns and cities should be qualified somewhat in order to balance commercial functions against transport-related functions, while the need for revitalisation of small towns requires stimulation.

A pleasant station environment contributes to increased travel by public transport. However, this objective is undermined if a station environment is neither attractive nor functional, or is too far away. It is, therefore, in the interest of the Swedish Transport Administration to contribute to favourable development within a station’s environs – not least when disused railway yards can be converted to another use.

This chapter explains how the city and station cooperate, as well as issues, in which the Swedish Transport Administration can be an important stakeholder.
Uppsala Central Station has taken advantage of the central location in the city and serves as a link between city districts on both sides of the railway. In front of the new extension, a square with seating has been constructed. Design by Tema Landscape Architects.
5.1 Public transport and urban development

The railway has historically been an engine of urban growth, and stations have become important places for cities and in cities. Station location in older cities has often led to a shift in the city’s focal point towards the station, a manifestation of the railway’s role in urban development. The cities that arose as a result of the extension of the railway could be planned with a station’s location in the heart of the city, grouped with other official landmark buildings such as the church and town hall.

In contemporary urban planning, standard plans cannot be established as was done in the late 19th century. Today, urban development is more about how a host of various forces can work together in order for effective and sustainable urban structures to be developed. The city’s attractiveness is determined by how housing, work, enterprises, recreation and communication together can form a balanced whole. Public transport plays a crucial role and Swedish Transport Administration is one of the major stakeholders. The major investments involved in rail extensions often entail a shared responsibility in the development of municipalities, especially in small municipalities with limited planning resources.

Functional boundaries between long-distance, regional and local transport are increasingly being relaxed. An increasing number of transport operation systems can be integrated, regardless of whether they are on the road, on the railway, in the air or on a ship. New travel
patterns will develop as a consequence of this, and they will become important bases for land-use planning where a station’s surroundings are concerned.

5.1.1 Station proximity
The railway is an important part of the public transport network that binds together districts in the network into strong regions. A station, the transfer point’s location, becomes very important for the network to function. A station in a central location with increased opportunities to use other transport systems provides extended range. For people with disabilities, a centrally located station – requiring few transfers and with proximity to destination points – is essential for them to be able to use the transport system.

In most cases, a station is centrally located in the urban area in the traditional manner, but may also be outside the urban area in a central location in relation to travel patterns and networks of different transport modes. For example, a station outside the urban area can be a central point for car commuters.

Workplaces, education or housing in the immediate vicinity and in the region around a station generate various types and amounts of travel. Employment and visitor-intensive businesses and strategic destinations such as hospitals and higher education institutions located within 600 metres of a station exert a large effect on travel by public transport. One example is Umeå East, which has its entrance right next to the regional hospital's entrance. Workplaces near a station have the greatest effect on the selection of mode of transport. Distance and services have a bearing on selection of different modes of transport to the train:

- Walking and cycling have great relevance up to 0.5–3 km, as does access to bicycle parking
- Buses have relevance for connecting journeys over 2 km
- For car journeys, available parking and fees are important, especially in smaller towns.

Oversized railway yards and connecting areas, which railway operations previously required, can now be developed to fulfil other functions. This provides opportunities for a more efficient use of land located in the vicinity of a station. A station is more integrated with its surroundings if a new building is added, for example, a new attractive locality, or any enterprise that facilitates travel and which allows a station to be perceived as closer and safer.
5.1.2 Link in the city
A railway line in the city often represents an obstacle, if it does not run entirely through tunnels. The effect is dependent on what is known as traversability and also on the need to traverse (how many want to get across it) and ability to do so (age distribution and other characteristics of those who want to get across). Grade-separated junctions in the correct locations and numbers, and with an attractive design, can solve this.

A station, however, can be a link in the city, a connection point not only to trains but also between buildings on either side of the railway. A well-organised station, with grade-separated connections that are inviting and easily accessible, results in greater freedom of movement, greater safety and more efficient connections for everyone moving through a station and transport environment. New stations can be purposefully planned to weave together parts of the city. The city’s street network can become a natural part of the pattern of movement both to a station and a component over or under the railway.

5.1.3 Hub in the city
The location of a station often constitutes an important hub and point of orientation in the urban area. In addition to its function as a transfer point, the area around a station, where many people move around, is important. A range of both public and private enterprises and services increases the importance of the site around a station. It facilitates the passenger’s weekday journey and gives rise to favourable synergistic effects.

A library and diverse commercial provisions increase attractiveness and activity throughout the day. An internet café can be used by commuting high school students to do homework, while also providing a meeting place in the neighbourhood. Examples can, of course, be found in major towns and cities, but even in smaller towns active planning is taking place to develop possibilities. A station may be one of several functions in the same facility. This places particularly high demands on clarity and accessibility in order to clarify the transport function in relation to commercial functions. In other words, it is important to separate and organise the various functions in relation to each other.

5.1.4 Distance to buildings
Generally, a new building is not allowed within a range of 30 metres from the railway. Such a distance provides space for emergency operations and allows for some noise reduction, as well as allowing some expansion of the railway facility. Activities and areas not sensitive to disturbance, such as parking, storage, vegetation or where people only remain temporarily, may be situated within 30 metres of the centre of the track.

These guidelines represent significant constraints on the development of buildings within a station environment, and various studies are underway which, with a broader approach, examine new models for risk-benefit assessment. The objective is to make full use of the favourable communications location that a station provides and see it as an opportunity for the development of a diverse and sustainable city.

5.1.5 Railway noise emissions
Train traffic is a major source of noise and often results in demands for measures next to the railway or in adjacent buildings. The measures may include switching to windows with a higher than average sound transmission class.
Noise reduction barriers may help limit the problem. The barriers provide the best sound-damping effect when placed near the sound source or near those affected. A wide track area necessitates, therefore, very high barriers to provide the intended sound-damping effect. In such situations, the damping of sound must be balanced against any unwanted visual screening of the railway line. A noise-reduction barrier reinforces the railway’s obstacle effect. Due to the noise (among other things), it is very difficult to achieve a pleasant housing environment within 30–50 metres from a railway line, despite use of protective measures. Noise-reducing measures may be needed at distances of up to several hundred metres from the railway.

5.2 Station and surroundings

A station’s character and function vary widely. In which surroundings is a station located, how great is the demand for travel and of what kind, how is a station positioned on the site? The major town or city, suburb, small town and rural areas provide entirely different prerequisites for a station’s design and character.

5.2.1 The major town or city

A station in a major town or city often forms its own central location, often just outside the city’s true centre. Large streams of traffic and important interchange points between different types of public transport in a limited space cause such stations to gradually develop into very complex environments with their own urban life.

The actual number of passengers is, therefore, not a crucial factor in making a station an intense and crowded site. In major towns and cities, stations often have a classic, wide station concourse – a hall. The quintessential entrances and façades, which face the important side of the city, also belong to the period architecture.
The density of a major town or city implies constraints, primarily for transferring to a private car, and the chances of car parking may be limited for both short- and long-stay parking as well as for quick drop-off. Even the important connection to buses can be affected by the lack of space and become more widespread through the surrounding city streets or in highly compressed bus terminal solutions.

5.2.2 The suburbs
The suburban station is dependent on its proximity to a more central location in the region. The flow of transport can be as large as in a medium-sized town’s station, but its significance as a central point of the district and the attraction of additional functions is not as self-evident. Previously, many of these locations were more independent towns, but gradually grew together into a larger regional whole. Alternatively, they are newer urban formations often in relatively widely dispersed settlement patterns.

In conurbations, combined local and regional/remote stations are being updated. For example, in Stockholm there are commuter rail stations, also combining regional/long-distance services, which act as their own major city station for the surrounding urban area and in terms of passenger numbers, while maintaining the character of a small-town station. This is a development, which will probably continue.

5.2.3 The central district and smaller town
A small-town station often has a more central location than one in a major town or city. Many small towns have even come into existence due to a railway extension, and cohesive centres with a railway station, a park, a hotel and administration buildings are not uncommon. The architecture often has a smaller scale than
in the major city, but is archetypal and a major function of the townscape.

Many station buildings in small towns only have the most necessary functions. A declining customer base is not enough to sustain extended station operations. Many station buildings have been sold and given new functions unrelated to travel. For the infrequent passenger, it is unclear when these buildings lost both their practical and symbolic function. Cultural/historical assets need to be safeguarded and included in station planning.

At the same time, stations in other districts are given a new lease of life as a result of the expansion of regional routes with high commuter traffic. Examples include towns along the new Svealand line and Mälaren line.

A station in a small town is not only targeted towards the town’s residents, but also to the region. The transfer to a regional bus service is an important function that also usually requires large areas near the platform environment. Short- and long-stay parking is, therefore, also important.

5.2.4 Small villages and rural areas

The simplest type of station is a platform with basic traffic information, basic comfort, without a station building or services. In smaller districts, this is a common environment for many passengers, and even small measures could mean significant improvements in the perceived qualities of safety and comfort. Transfers to the bus usually take place nearby and are thereby efficient. The need for parking for commuters is growing, and sometimes it is this that leads to the new location of a station. Läggesta station on the Svealand line is an example of this – a modern rural station with a large catchment area, ample parking and many commuters among the passengers.
5.2.5 Peripheral stations
A newer type of station is the peripheral station, which can also be viewed as a more peri-urban variant of the rural station. Newly laid tracks are adapted for high speeds resulting in large curve radii and problems with adaptation and intrusion into existing built-up areas. The solution is to place a station outside the urban centre. For example, Sodertalje South, which is the town's long-distance train station, lies in an industrial environment with no direct connection to the centre.

Peripheral stations are established as important transfer points primarily for buses and cars, but are ‘placeless’ in their relation to the local environment and, in this respect, are similar to airports. This placelessness means that a station lacks the coherently formed urban area around it and lacks the genuine benefit the railway confers – reaching a destination directly, in the middle of the city. Peripheral stations generate less travel, especially local/regional journeys. The basis for the range of services decreases, since only a very few non-passengers contribute to the customer base. As a design issue, new demands are placed on how identity and recognition can be managed in these peripheral locations. As an urbanisation issue, it raises questions about how these ‘non-places’ will interact with their surroundings and contribute to mindful urban development.

5.3 A station’s location
How a station is located in height in relation to its surroundings creates obvious differences in accessibility, character and function. A station at ground level, but with good visibility, level crossings and without any impact on the city’s topography has been the tradition. But now increased safety demands, with grade-separated passages for instance, and the problems of conflict with already established urban environments are making stations below ground or on a bridge increasingly common.
5.3.1 Stations at ground level
A station location at ground level is one that we, through experience, regard as natural. It often has a station building at street level alongside. The connection to a station is comprehensible and visible, albeit not always functional.

A side platform fronting the town allows straightforward set-down/pick-up, and it is an advantage if bus transfers can take place on same plane directly across the platform. Usually there are multiple platforms, in which case crossing becomes an obstacle. Level crossings are becoming increasingly rare. Those that remain are provided with boom barriers or other security arrangements. A grade-separated connection involves two height displacements, under and over the railway.

Many older station buildings have been adapted or supplemented in order to connect to grade-separated connections. A consequence of this is that passengers can wait closer to the platforms.

5.3.2 Stations on a bridge
The laying of new track is often accompanied by the construction of long bridge passages or tunnels due to alignment requirements or as a measure to avoid conflict in the landscape. In these cases, a station can be placed on a bridge many metres above the surrounding land.

Clear advantages of this are the reduction of the effect of obstacles at ground level and the fact that the location of that station is easily accessible from many directions. But difficulties lie in achieving good integration with the urban environment station (especially in smaller districts), and a passenger environment on the platform, which is often exposed to wind and feels isolated.
A station located on a bridge requires the combined station-bridge construction to be designed to allow it to become an integral part of the urban environment in more central locations, or to establish its own periphery with character in more outlying areas. The disadvantage is that the desired intensity of city life never presents itself (despite large streams of passengers), if there is an absence of urban qualities. Södertalje South is one example demonstrating these difficulties. Station locations on bridges in smaller communities can also dominate the area because of their scale, which is larger than the scale of the surroundings.

Among the benefits are the fact that the bridge location automatically provides good advertising for the station, and the good opportunities for creating effective transport solutions, weather-protected set-down/pick-up zones, parking and waiting areas below it.

5.3.3 Underground stations

New stations in major cities are increasingly being built below ground. This is another way to avoid conflict with existing buildings and a way to create good opportunities for transfers. There are many examples of built and, in particular, planned underground stations: City Tunnel Malmö, Helsingborg Central, Arlanda Central, City Tunnel in Stockholm and Gothenburg West Link.

An underground station cannot present itself as obviously as a traditional station. In order to find the train easily when above ground, the entrance should be marked clearly and be a focal point for staircases, escalators and lifts. Lifts are becoming an increasingly important means of transport when station depths become greater and passengers have a lot of luggage that can then be taken on a luggage trolley all the way to train door. Lifts increase the number of transport routes, which in turn reduces congestion and improves safety.
An important design aspect is, if possible, to establish a visual contact between ground level and the platform area. This creates a viewable connection between the underground platforms and what happens above ground. Being able to anticipate the target destination as soon as one starts one’s movement up or down gives a sense of control and security. In addition, allowing the penetration of daylight is very important for the environment.

An underground station provides opportunities to exploit the land, both in the station’s location and along the connecting stretches of railway.

A station’s environs can be exploited in a deliberate manner to increase public transport’s share of passenger traffic. Development over time shows that in underground stations, this is placing increasing demands on security, air quality etc. This also leads to significant additional costs and greater restrictions on goods traffic.

Natural light penetration creates visual contact with the plane above, Hyllie Station, Malmö
5.4 For further reading

*Station environs*, County Administrative Board of Skåne/Skånetrafiken/Region Skåne/Swedish Transport Administration

*Risk and benefit*, Swedish Transport Administration publication 2010:074

*The pleasant city*

*K2020 Strategic objective for Public Transport in the Gothenburg region*

*TRAST, ‘Transport for an attractive city.’* – a planning document formulated in collaboration between the Swedish Rail Administration, the Swedish National Road Administration, the National Board of Housing, Building and Planning, and the Swedish Association of Local Authorities and Regions describing, for example, how a locally adapted municipal public transportation strategy can be developed.
6. Station groups and flows

A well-functioning station environment means that it provides functions, fixtures and comfort tailored to the type of station and passenger and to the number of passengers. However, views on what the right fixtures and design are vary greatly both geographically and among the approaches of various station stakeholders.

Increased diversification of the organisation of transport, stakeholders and passenger types is also associated with the greater demands placed on a station. In order for the Swedish Transport Administration to translate the requirements in different levels of design and fixtures, it has subdivided the country’s stations according to the following parameters: passenger numbers, size of the urban area and the number of bus routes that call at a station. This constitutes the basis for station classes.

For a well-functioning station, this largely concerns designing for different flows, primarily for passengers, but also for vehicles and goods, in and through the station facility.

By way of introduction, this chapter describes how the grouping is carried out and how it should be used. It then describes factors, which are important to consider in terms of passenger flows.
Passenger streams and flows in and through a station vary according to hour of the day. Picture taken during rush hour on Stockholm Central’s commuter train platforms.
6.1 Station subdivision

The functional requirements, which are imposed on a station, depend largely on a station's size, pressures and type of transport operation. A station should provide a reasonable quality of design, fixtures and service/service levels relative to its size and function. As an infrastructure manager, the Swedish Transport Administration should also be able to show clearly what is included in the infrastructure: in other words, what is offered to their customers. This can be done in, inter alia, the Swedish Transport Administration's Network Statement. This is the Swedish Transport Administration's presentation of deliveries to railway companies and other clients in the railway sector and describes its offered services.

Demands, needs and expectations concerning, for example, which fixtures are available, increase with diversification in terms of organisation of transport, stakeholders, passenger types as well as the nature of the stations.

In order, uniformly and clearly, to translate and describe requirements and prerequisites, it is necessary to divide the country's stations into different groups based on some form of objective quantitative criteria.

A subdivision of stations can be based on parameters such as passenger numbers, size of the municipality/district, number of trains per day or type of transport operation. The method in the Swedish Rail Administration's handbook BVH 726* ‘Working method for grouping stations’ is based on the parameters of: number of boarding passengers, the number of urban area inhabitants and the number of bus routes that call at a station. The purpose of using the number of bus routes is the fact that it indicates the burden a station carries as a public transport hub, while potential travel volumes are indicated by the size of the urban area. *To be updated.

<table>
<thead>
<tr>
<th>Group assignment parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of boarding passengers*</td>
<td>Urban area inhabitants</td>
</tr>
<tr>
<td>&gt; 30 000</td>
<td>or</td>
</tr>
<tr>
<td>&gt; 3000</td>
<td>or</td>
</tr>
<tr>
<td>&gt; 1000</td>
<td>and/or</td>
</tr>
<tr>
<td>&gt; 200</td>
<td>or</td>
</tr>
<tr>
<td>&lt; 200</td>
<td>or</td>
</tr>
</tbody>
</table>

Table of station classes *A review of the thresholds shall be done

RAILWAY STATIONS - PLANNING MANUAL - STATION ORGANISATION AND CONTEXT - 6. STATION GROUPS AND FLOWS
The thresholds are important so that the subdivision is as reasonable as possible. For each station’s placement in a group, it is always important to assess whether it is justified, for example on the basis of local knowledge. A station can also belong to some special case. Such cases are described in the handbook’s final chapter. The basis for classification upon which BVH 726* is built is deemed to be generally applicable and remaining valid over time. *To be updated.

Passenger volumes (in this case the number of boarding passengers per day) that are as current as possible are an important parameter for useful and reliable classification. The pressures of the various stations are related to the number of passengers. At present, data on passenger volumes is difficult to collect, and the data quality varies from one railway company to another.

Fundamentally a station should achieve a certain level of functionality from an overall perspective. This level is related to the use of, and pressure on a station. In order to address these requirements easily, the country’s stations have been grouped into five station classes.

Station classes can be considered as an instrument for systematic, seamless and unified management, as functional level is related to station class.

The system should provide stability and sustainability, in respect of what a well-functioning station or transfer point of a certain size contains and how it is constructed, and contribute to a more efficient infrastructure system.

The method for subdividing into classes must also be seen as an aid available for use by all stakeholders managing station environment-related issues in order to facilitate daily work. This may apply during planning new construction and reconstruction of stations, during management, and during drafting of services and rate discussions.

The system is also based on the definition of the basic functions, which are relevant for each station class: in other words, the standard a particular station should have. These basic functions are found in varying degrees in the country’s stations and should match the level that the passenger may expect. Basic functions for different station classes facilitate the realisation of functional and uniform station facilities. (See Chapter 7)

The grouping can be used as a classification of the country’s stations; in other words, which group and thus what standard a particular station should maintain. However, it is important that deliberation and assessment are carried out on a case-by-case basis. In the case of a major reconstruction or new construction of a station, passenger volume forecasts should be used.
6.2 Flows

A fundamental prerequisite for a station’s construction is that it can handle the flows in question: primarily of passengers, but also the flows arising from other functions within the station area. Train, car and bus movements present constraining geometrical prerequisites, but it is how the movement pattern provides viewability, accessibility and ease for the passenger that is crucial to the final perceived value of a station environment which, in turn, affects the willingness to travel from a station. Minimising walking time within a station is important for the passenger’s illustration of a simple journey.

Naturally, complexity differs markedly between, say, Stockholm Central Station and a small rural station. Therefore, the issue’s significance in station design varies. But basically the same aspects must always be managed. The passenger’s obvious focus is reaching his or her target destination, and signage is the primary means for allowing this orientation, but even shapes of spaces, sound, light transmission and smell function as carriers of information about that which lies beyond what is currently visible.

6.2.1 The wait – the visit

The time that the passenger spends at a station consists mainly of waiting. Ideally, a station should be sheltered from the climate, be calm and offer recreation. Regardless of which type, it should always provide the best traffic information so that the passenger’s control over their journey is not lost. The spaces and environments for passengers to wait in are often components of spaces for passenger flows. When the conflict between these functions increases, both cease to work – one can neither get around nor remain still. Being at a station often involves various forms of meeting: both wanted, such as meeting an arriving friend or family member; and unwanted, such as when forced to wait together with a stranger in the darkness.
6.2.2 Orientation – view

A person in motion perceives the surrounding environment in a completely different way from a person sitting still. They focus, read and register that which is essential in terms of progressing further to a place other than where they are at that moment. In order for both movement and waiting to work satisfactorily, good orientation and a view of a station’s various parts are needed. It is easy to lose one’s sense of security, if one does not know where one is or how to go further. Being able to move quickly and find one’s way simply increase one’s sense of security. Good signage is, of course, always a requirement, but through successful station architecture, the possibility of getting one’s bearings and finding one’s way becomes a matter of course.

A larger station often has larger flows. It is important to spread passenger streams over a larger area and for a station to have, for example, several entrances, to which passengers with various destinations can easily find their way without excessive mixing of the flows. In a smaller station, it is more important to concentrate passenger flows into fewer boarding/disembarkation points.

6.2.3 Flows – noticed when they do not work

A flow, for example, of people, vehicles and/or material, is a consequence of how the functions included in a process have been linked together and dimensioned. Although the process in itself appears to be simple with few functions included, the flow can be complex depending on how it has been organised, controlled and structured.

Primary and secondary flows can be considered first:

Primary Flows:
- Passenger flows from various set-down/pick-up zones to platforms/departing trains through functions critical for the journey.
- Passenger flows from arriving trains to various connections for travelling further or for the termination of the journey.
- Service flows necessary for supporting transport.

Secondary flows:
- Individuals visiting a station for other purposes, e.g., to meet or drop-off a passenger
- Other visitors, e.g., customers at restaurants, shops, kiosks etc.
- Supply flows: goods to restaurants, shops, kiosks.
6.2.4 Objectives and prerequisites

When designing a functioning flow, it is important to be aware of the objectives and priorities, upon which the work is based from the very start. In the case of a station area, this is a particularly important point, as there are many and various types of stakeholders involved:

- Passengers
- Train operators
- Property owners
- The municipality
- The Swedish Transport Administration (the state)
- External commercial stakeholders

When many different parties must together achieve the objective of a development, they need to agree on the meaning of a number of key concepts in order to avoid sub-optimisations and bottlenecks. Some of these include:

- Transport operation: volume and frequencies
- Connections and alternatives
- Necessary functions: traffic and services
- The standards that apply, e.g. maximum waiting times for ticket machines, m² per passenger in various functions.
- A station area’s/building’s prerequisites and possibilities from the perspective of flows
- Development plans, expansion and flexibility
- Robustness: how many disturbances must be able to be handled during a certain time period

These other flows are, in certain cases, completely divided as regards the resources/functions they use and when in the day/week they occur. In other cases, the flows are the same to varying degrees. For example, both passengers and other station visitors eat lunch in the same restaurant at approximately the same time. A customer entering a station just to visit a kiosk does not use the ticket machines, but uses the same pathway as a train passenger.

Already here, we can see that several seemingly simple functions can generate flows that can be highly complex to analyse for project planning or dimensioning. Careful, well-informed preparations should be made when starting to design flows so as to achieve as far as possible the effective primary flows intended, while simultaneously providing conditions for attractive secondary functions.
6.2.5 People flows
Efforts to improve flows are underway within various enterprises in contemporary society. There is, however, a large difference between planning and controlling material flows compared to flows of people.

One of the biggest differences is that in many contexts, there are attempts to create steady flows for easier control. For passenger flows this is not at all possible to the same extent.

In general, people flows generate a greater need to dimension resources in accordance with peak situations: for example, in cases where people are connected to timetables.

Characteristics of people flows:

• Large variations in flow (linked partly with passenger’s needs and to timetables) throughout the day, week and year

• Passengers move freely between different functions and areas and do not always follow flow paths defined for the process.

• The time it takes to perform various actions varies greatly between different people.

• Individuals make demands on environment, services, convenience and security.

• The entire flow is characterised by considerable dynamism.

In creating effective and efficient flows of people in a complex system of processes, this dynamic aspect is an important factor.

This can be exemplified by what can happen around a ticket machine, as different passengers take varying amounts of time to buy their ticket, and by the fact that the time of passengers’ arrival at the machine varies. Queues and crowds form very easily here, and this illustrates that it is important to recognise at an early stage which people flows and routes can be expected in order to be able to design functions, areas, communications and space in a manner that works for all flow phases.

6.2.6 Integrated approach
It is very common for different functions in a process to be designed and dimensioned individually, without regard to what happens either before or after the function in question. Increased demands on efficiency, rationality and services, as well as the fact that travel, in many respects, has changed character collectively place greater demands on efficient flows. To succeed with these challenges, the entire flow must be studied and the affect the different elements have on the whole must be understood.

• Orientation: Uncertainty is created when a passenger does not know where he/she should go to purchase tickets or get on the train. Functions should be designed and located so as to allow an intuitive and natural flow of passengers who have different objectives for their activity.

• Separation: Particular attention should be given to avoiding situations where one activity prevents or impedes another. Movement, queuing and waiting should be kept separate so that they do not interfere with each other.
• Prioritise primary flows: The goal is to enable coherent flows that work for different types of passenger, keeping in mind station area’s explicit objectives.

It is not wrong to have primary and secondary flows, but it requires good planning of the total operation.

The pressure on a station’s various functions and areas, and what constitutes a pressure, vary greatly throughout the day and for different station types. The pressure profiles for different stations, of course, differ greatly depending on timetables, station type, location, season etc. In order to create efficient flows, it is important to proceed from the traffic, which a station area serves: not only in terms of volume, but also in terms of the time of day, on which it occurs, in conjunction with other traffic, type of passenger etc. How do the various flows cooperate and integrate with each and what conflicts and synergies do they create?

Calculating and obtaining a general picture of the flows are necessary not only for dimensioning and designing correctly and understanding what can be used jointly, but also for not over dimensioning.

As the conditions and volumes are constantly changing, it is necessary not to become dependent on a single factor for the flow, but to retain reasonable flexibility. Certain changes cause no problems at all. Generally describing the management is difficult, as there are such diverse conditions for different stations. However, one aspect is important: simplicity.

Simple solutions are usually easier to adapt to altered conditions that are more sophisticated.

• Creating an efficient and rapid flow is generally important, but perhaps especially so in station types where the proportion of commuting passengers is large.

• The fact that passenger flows are linked to a departure time makes it important for capacity to have the necessary functions. Otherwise passengers could miss their train and incur additional costs, or might have to amend their own planning in a less than optimal manner.

• If a station area is to offer its passengers good services and ultimately encourage greater use of public transport, presumably many functions must be sized to accommodate close to maximum pressure.

• It is always the function with minimum capacity in relation to passenger flow that sets the limits of the total flow.
6.2.7 Typical bottlenecks and potential areas:
The parking of vehicles: the parking area as such can be properly dimensioned to accommodate the necessary volume of cars. However, the problems usually arise in the entrances and exits to the area.

- If secondary service flows are mixed with passenger flows, it may cause problems in terms of accessibility.

- Other connecting public transport, such as buses or trains, often provides greater passenger volumes at the same time, making it important, for example, to plan entrance functions to avoid congestion and unnecessary waiting. Even escalators and lifts can become limiting.

- With all passengers taking the same route, many critical areas are burdened unnecessarily. If passengers, depending on type, can immediately use ‘their’ functions and route, then the overall pressure is reduced.

- A regular commuter with a monthly season ticket arriving just before departure should not be compelled to pass shops, waiting areas, queues and ticket machines, but should be able to get directly from where s/he was set down to the platform easily and quickly. This will benefit both passengers and the area of a station.

- Through well-adapted connections from other public transport, good planning and coordination of the various flows, superfluous needs for waiting areas can be avoided and also facilitate and simplify things for the passengers.
• Ample capacity for ticket sales/ticket machines is an important part of an efficient flow. As this is a central element of the primary flow, it should be located in direct connection to the main flow (set-down/pick-up zone to platform).

• Information for passengers is key for enabling them to get their bearings and travel conveniently and safely. It is also a support for a station area to achieve efficiency in its enterprise, in its flows and for the passenger.
6.3 For further reading

**BVH 726 Working method for grouping stations**

**Swedish Transport Administration’s report – Station structure, basic functions and classification**

Clear information and ticket machines in connection with routes, but to the side, Triangle, Malmö
7. Zones and functions

The passenger perceives the well-functioning station as a coherent environment where all areas and functions have found their natural place where they are needed most. How it is arranged differs from one station to another, but it is possible to trace an underlying pattern that can be described as a station’s building blocks or zones: arrivals, services, communications and platform – parts making the whole.

On the next level, a station’s various functions, which can be in one or more of the zones, can be described.

This chapter describes a station’s zones briefly and is followed by an introduction to basic functions, which are then discussed further in Chapters 8–12.
Commercial operations, ticket services, waiting areas and communication routes all blend in the same area at Stockholm Central Station.
7.1 A station’s basic structure

Most passengers do not want to wait or transfer more than necessary, and therefore demand a logically organised station with easy and quick orientation.

During waiting times or service disruptions, the need for other functions or activities that can facilitate the journey become more important. A station should be the natural place to link together the various sections of a single journey.

To form a well-functioning link in a journey, the basic functions at a station must produce as great a benefit to the passenger and the community as possible. The physical structure of transfer points, the activities and services that a station can offer must go hand-in-hand and be effected in correlation. Basic functions often have the character of stationary physical installations that cannot easily be differentiated according to different needs and demands.

During the design process, great emphasis should be placed on the functions that create a coherent structure and rationale that allow passengers easily, seamlessly and safely to get to the train, wait and switch between different modes of transport. Walking times should be minimised, which is why platforms in relation to grade-separated passages are an essential function and part of a station facility.

The well-functioning station consists of many building blocks that must be assembled into a functional and well-designed environment. In bygone times a station was synonymous with a station building. Today, an entire area is included. A station area should, however, have a clear focal point: a main entrance that facilitates orientation and helps to tie the functions together into a well-considered whole.

7.2 Station zones

In the construction of a station, it is important to consider the logical pattern of movement of different types of passenger. One of the determining factors is the passenger’s familiarity or unfamiliarity with travel, which generates different needs and therefore different demands on a station environment. A logical and simple station environment structure, where the proximity between transport modes provides a view and understanding of how a station must be used, is very important.

By describing a station in four zones, which are almost always found, regardless of the station’s size and type, one can understand the form and context. Each one should function individually, but above all work together to form a satisfactory whole. The transition between the parts should be perceived as natural and smooth.

These four zones are:

- Arrival zone
- Service areas
- Communication zone
- Platform

In the ideal situation, during new construction, the requirements for function and design of each part are, at best, fulfilled. Most often, however, renovation and modernisation projects make sensible trade-offs between competing desires based on all the constraints that reality offers.
The arrival and platform area are often well-defined areas within a station. Communication zones and service areas do not always stand out as distinguishable parts within a station’s area.

7.2.1 Arrival zone
The arrival zone is the outer area where a station and its surroundings meet: a station’s set-down/pick-up zone. The area often includes bicycle parking, a bus stop/bus terminal, tram stops, a taxi rank, a set-down and pick-up point for private cars and parking, and footpaths from these functions toward the trains. In some cases, the area also includes a road for service traffic to the platforms and trains.

The set-down/pick-up zone for a station by different modes of transport must run as smoothly and efficiently as possible. This may mean that the station is deliberately built so that set-down/pick-up can be done on both sides of the station. For example, a station may be divided into a main side with a set-down/pick-up zone and bus stop, and a secondary side with supplementary set-down/pick-up zone and car parks.

Subdivision improves the possibility of accommodating functions for the entire journey, even in cramped urban environments. This facilitates the district’s traffic and movement patterns around the station, but is also important for the individual passenger’s own, rapid selection of route to the train.

For the regular passenger, additional short-cuts can be an effective way of distributing the flows at multiple points and reducing lead times. On the other hand, for the infrequent passenger, great clarity – a focal point in the set-down/pick-up zone – is important: where to get off the bus, where to pick up a luggage trolley, where to go to the trains etc.
A coherently organised set-down/pick-up zone does not need to be signposted to any great extent.

In stations with transfers between trains and buses directly across the platform, the set-down/pick-up zone Is adjacent to the platform without intermediary service and communication areas, providing straightforward, rapid walking and travel routes.

Historically, parks or station forecourts were often constructed outside the station building. They still fulfill a function today by announcing the set-down/pick-up zone and exposing the station location to the surroundings. This is all the more true if a station area lacks a main entrance.

7.2.2 Service areas

There are services that, to varying degrees, are directly related to a journey. There are also functions that are not necessary, but offer the passenger added value in connection with his or her journey. Primary functions are ticket sales, ticket machines, information desks, traffic information, toilets and waiting areas. Secondary functions are luggage storage, kiosks, eateries, cash machines, bureaux de change, car rental, hotels and shops. Only pedestrian traffic should be found within the service area. This also applies to all communication areas up to, and between the functions.

A station building, which many formerly equated with the station itself, provides the site with an identity as a destination point, but is, in addition to this, primarily for service functions. For stations without a station building, the service provision may just be a place for a ticket machine. Today, however, there are also large stations without a station building, but with an extensive range of services. The services, which stations of various sizes should specifically have, are described in Chapters 8–12. Within the service area, passengers should
chiefly find primary but also secondary services, because primary service functions should be located right next to the main thoroughfares and intersections, while the secondary service functions can be located on other walkways at the station. At larger stations, there is often an interest in integrating more extensive commerce, culture and other types of secondary services in the station environment, which means that the primary transport function can end up in the background. This places greater demands on an active planning dialogue so that both rail passengers and other visitors are able to receive the best possible performance and overall experience. At major stations, separation of passenger services and commercial services on different floors works out well. The grouping of functions affords good integration.

7.2.3 Communication zone
A communication zone connects set-down/pick-up zones with platforms, sometimes via the service area. A communication area stands out most distinctly as a demarcated zone where there are grade-separated walkways or bridges to reach the platform. In larger stations, the communication area often forms a complex structure with many connections, underpasses, bridges etc. In small rural stations, the communication area may only be a short pedestrian area between the set-down/pick-up road and side platform. With strict requirements for accessibility for all passenger groups, a communication zone’s design, with visual clarity, light and lighting, shallow gradients, lifts, escalators and generously sized stairways, is critical to a station’s overall function.

A station should be organised with a structural clarity, both in terms of communications and space, so that it comes across as comprehensible and accessible as possible.

7.2.4 Platform
Platforms are located closest to the tracks. One can board, and alight from local trains, regional trains and long-distance trains, and in some cases, directly change to bus or tram. Here, waiting space should also be provided in the proximity of trains, enabling the passengers a good view of the trains running currently. In principle, only pedestrians are allowed to move on platforms. However, the required service traffic should also be allowed to circulate in some parts of the area.

With short transfer times and a more streamlined public transport design around the whole journey, more time is spent waiting on a platform, close to the trains. As a result, more service functions are required even here, and the demand for shelter and comfort has increased. Furnishing, fixtures and services must not impair the accessibility of walkways or security.
in the protected area. For this reason, in the planning phase, platforms should be organised into zones - protected area, pedestrian zones accommodating fast as well as slow passengers, furnished zones for seating, shelters in the waiting areas, and transport information, so that the space for circulation is as free as possible.

Platform dimensions (and fixtures) are also largely determined by the different demands for personal safety, and geometrical requirements. See BVS 1586.26.

The fixtures required are also governed by EU regulations for the disabled - see also Chapter 8.

7.3 Station features

Station environments around the country are often designed and equipped differently in each case. With a liberalised transport market, transfer points should be managed with a uniform and operator-neutral perspective. To ensure a level of functionality for each station, the Transport Administration has a system of basic features linked to the five station groups presented in the previous section.

The basic features provided at various stations are a result of overall assessment, balancing of the needs and expectations of the passengers and railway companies. They are also determined by regulations (both national and international), safety factors (such as skidding risk, running on the track and risk of suicide), and the management’s perspective (such as upkeep, snow clearance and maintenance).

The basic features are designed on the basis of a basic offer, to which additional features can be added. It is rather a long-term goal to meet the latter, as a varied supply throughout the country, or merely as ancillary services. With various parties in charge, there is also room for the responsible parties to make special efforts in the station, resulting in different station environments throughout the country. The point is that the entire station facility should achieve a certain level of quality from the holistic perspective of the passenger. (See the Transport Administration’s report ‘Station building, basic features and classification’).

Stations have varied structures: from the simplest with one platform outside a small community to the complex, integrated ones with several transport modes. Today, we also have a great variation in terms of the types of passengers. The range extends from the rare remote passenger to the one travelling short distances daily (commuter). A station needs to accommodate the needs of all these passengers.

In addition to the rule-governed, societal demands, which each operator is required to meet (e.g. route markers, ramps and safety measures), there are needs and expectations from a wide range of features that help to make a journey smooth, easy and comfortable.

The features can be divided into the following groups:

The Transport Administration’s responsibility
Table 1 Platform features
Table 2. Features of the grade-separated connections
Table 3. Features of the information hub
Table 4. General features of the transfer point
Table 5. Possible TrV services
### Other operators

Table 6. Access and station building features

Table 7. Passenger service features

Each table shows what a basic feature is (X). Most features are governed, to varying degrees, also by TSIs (Technical Specifications for Interoperability), which are designed to meet the requirements of the EU directive and safety parameters. The colour codes indicate the allocation of responsibility. Some features are provided at multiple locations in the station environment. Therefore, transport information is compiled in the chapter on information and safety (10).

<table>
<thead>
<tr>
<th>Table 1. Platform features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On platform</strong></td>
</tr>
<tr>
<td>Platform roof</td>
</tr>
<tr>
<td>Waiting area including fixtures</td>
</tr>
<tr>
<td>Shelters including fixtures</td>
</tr>
<tr>
<td>Seating</td>
</tr>
<tr>
<td>Lighting</td>
</tr>
<tr>
<td>Location of ticket/validation machine</td>
</tr>
<tr>
<td>Gates/demarcation at the end of the platform</td>
</tr>
<tr>
<td><strong>Dynamic transport information</strong></td>
</tr>
<tr>
<td>Clock</td>
</tr>
<tr>
<td>Loudspeaker</td>
</tr>
<tr>
<td>Platform sign</td>
</tr>
<tr>
<td>Warning: passing train</td>
</tr>
<tr>
<td>Display or equivalent for real-time information about rail services</td>
</tr>
<tr>
<td><strong>Permanent signage</strong></td>
</tr>
<tr>
<td>Station name</td>
</tr>
<tr>
<td>Track number sign</td>
</tr>
<tr>
<td>Directional signage</td>
</tr>
<tr>
<td>Carriage location signs</td>
</tr>
</tbody>
</table>

X = Basic feature - basic package to be included in each group

TSI = Feature that is controlled by the TSI (Technical Specifications for Interoperability), EU Directive
The functional requirements can comprise some additional features that may be regarded as quality improvement measures. The basic requirements should match a guaranteed level that a passenger can expect at a transfer point of a certain size. At the smallest transfer points, it seems reasonable, for instance, to have a certain ground level comprising a bench, transport information, clock, lighting, bicycle racks and, optionally, a shelter. At the biggest transfer points, it is reasonable for the ground level to include a wealth of information and passenger services.

<table>
<thead>
<tr>
<th>Station Group</th>
<th>Governed by TSI</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade-separated connection incl. rises/descents*</td>
<td>Embedded if above the tracks</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>Important from a management perspective. Designed for good vision, safety and security by using, for instance, glazed sides.</td>
</tr>
<tr>
<td></td>
<td>Integrated stairway and lift package</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>Important from a management and security perspective.</td>
</tr>
<tr>
<td></td>
<td>Staircase</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Ramps that are designed for more than 3 steps should be completed with a staircase and vice versa.</td>
</tr>
<tr>
<td></td>
<td>Lifts that connect the ground level with the platform on a separate level</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>Until the provision of a lift is made, a ramp should be provided instead.</td>
</tr>
<tr>
<td></td>
<td>Ramp between the different levels, and ground/platform unless staircase + lift</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>Gradient up to 1:20. At least one obstacle-free entrance/passage to/from the platform</td>
</tr>
<tr>
<td>Escalator</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>Depends on the station's function and location, if it is a major transfer point, the height difference (more often at the bridge than the tunnel), or capacity of the rise. Should be embedded. Should be handled restrictively due to difficult operation in the platform environment.</td>
</tr>
<tr>
<td>Location of ticket/validation machine</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seating</td>
<td>TSI</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent signage</td>
<td>Tactile track number sign</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sign-boards, including signage to substitute transportation</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Dynamic transport information</td>
<td>Display or equivalent for real time information on the train traffic</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sign at the entrance and at the stairway/lift to the platforms</td>
<td>TS</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>If there are upturns/downturns to more than two platforms from the street connection.</td>
</tr>
</tbody>
</table>

Table 2. Features of the grade-separated connections
Local conditions should always be taken into consideration during the construction or refurbishment of a transfer point. At transfer points in places with colder climates, a heated waiting space may be needed, even at relatively small stations. An additional local factor may be stations with seasonal traffic or a lot of tourists and long-distance passengers, which could mean supplementing with additional fixtures such as traffic information in English, lockers and luggage carts.

Considering a station facility as a whole, we can split the individual sub-features and describe them separately. Sometimes, they are often provided at one place in a station such as a meeting point for escort, whereas sometimes a feature makes up a system throughout a station facility: for instance, directional signage. Responsibility for the financing, operation and maintenance of the different parts of a station or interchange points is shared by several operators.

<table>
<thead>
<tr>
<th>Station Group</th>
<th>Permanent signage</th>
<th>Dynamic transport information</th>
<th>Train times</th>
<th>Digi-talker/Interactive terminal</th>
<th>Clock</th>
<th>Loudspeaker</th>
<th>Real-time information about connecting regional buses/local public transport</th>
<th>Meeting point for escort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Node</td>
<td>Tactile, contrast orientation map (over the station area)</td>
<td>Display or corresponding real-time information about the rail traffic</td>
<td>TSI x x x</td>
<td>TSI x x</td>
<td>x x x x</td>
<td>x x x</td>
<td>x</td>
<td>x x x</td>
</tr>
<tr>
<td>Group 5 does not need to have a separate info-hub, it is provided at the platform</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governed by TSI</td>
<td>TSI</td>
<td>TSI</td>
<td>TSI</td>
<td>TSI</td>
<td>TSI</td>
<td>TSI</td>
<td>TSI</td>
<td>TSI</td>
</tr>
<tr>
<td>Kommentar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TrV is responsible for outdoors. The property owner is responsible for indoors. Development of a simplified version is in progress. Can be excluded in the distinct commuter rail stations in group 3. Responsibility for permanent signage is allocated to respective property owners.

Unclear at present, earlier via coordinated public transport

In the form of the so-called billboard in group 1 and possibly also 2

Only on the platform in group 5

Table 3. Features of the information hub

<table>
<thead>
<tr>
<th>Station Group</th>
<th>Transfer point, General</th>
<th>Measures for usability by the disabled</th>
<th>Emergency telephone number</th>
<th>Surveillance camera</th>
<th>Patrolling</th>
<th>Fixed patrolling (full time)</th>
<th>Substitute transportation services</th>
<th>Loudspeakers at the bus stop enabling TLC to provide information to the rail passengers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governed by TSI</td>
<td>1 2 3 4 5</td>
<td>x x x x</td>
<td>x x x x</td>
<td>x x</td>
<td>x x</td>
<td>x</td>
<td>x x x x</td>
<td>x x x x</td>
</tr>
<tr>
<td>Kommentar</td>
<td>Includes a variety of design requirements to be implemented such as route markers for the visually impaired (see BV Advice and guidelines)</td>
<td>Available at all stations. Goes to the contractor procured by the ownership</td>
<td>Requirements vary from place to place and are not associated with the group. Assumes that the organisation/routine is in charge of handling illustrations.</td>
<td>Is expensive. Requirements vary, but are not always associated with the group. The waiting room is always locked manually to ensure that the last train has departed and no one is locked up. Unlocking usually happens automatically.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. General features of the transfer point
Since the Swedish Transport Administration is responsible for platforms and platform connections (the way to and from the train), the administration is responsible for all stations. For the smaller stations, regional transport, RKM (Regional Public Transport Authorities), and the municipalities may also be responsible. For the bigger stations, a variety of players and stakeholders are involved. This ensures that there is a clear need for a consistent and basic range of features, services and management for the development of a station.

The key is that in spite of having several responsible parties, the whole is characterised by a cross-sectoral approach based on the passenger’s needs. Thus, uniformity in the standard as well as the design, can be enhanced. Interface for the responsibility areas, and collaboration forms that are prominent, are important in this regard.

<table>
<thead>
<tr>
<th>Station Group</th>
<th>Governed by TSI</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible TrV services</td>
<td>Vending machine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>To technically enable the deployment.</td>
</tr>
<tr>
<td></td>
<td>Station host - help with ticket purchase, orientation and more.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emergency on the platform</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advertisements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inductive loop in the station building</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Possible TrV services

<table>
<thead>
<tr>
<th>Station Group</th>
<th>Governed by TSI</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger service</td>
<td>Luggage carts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>May be needed even on a smaller station, if it has long walkways, and is frequented by international travellers, is adjacent to the ferry terminal or other tourist destinations such as ski resorts.</td>
</tr>
<tr>
<td></td>
<td>Ticket machines</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Escort</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>TrV responsibility ends in December 2012</td>
</tr>
<tr>
<td></td>
<td>Map of the place with important phone numbers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rental/cycles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Payphones</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ATM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7. Passenger service features
### Station Group

<table>
<thead>
<tr>
<th>Station Group</th>
<th>Governed by TSI</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access</strong></td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Short-term parking/public parking space</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Disabled persons’ parking space</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Kiss-n-ride</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Commuter parking</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Park and ride system at local train stations around major cities, and parking spaces for daily commuters at regional stations in smaller districts. Should include places reserved for carpool.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-stay parking /Valet Parking</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Parking for several days for instance for long-distance train passengers and infrequent passengers. Fees may apply, and be operated by commercial operators.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cycle parking</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>The ratio of number of spaces to the number of passengers is 0.1 basic standard and 0.2 target standard.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closed and monitored cycle parking</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Assumes financing/commercial player.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local bus-stop with sign</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Shelter and/or canopy at bus stop</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Benches in waiting areas</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Taxi stand with sign and phone</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Telephone number of the taxi service</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Clock</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>In smaller stations if the platform clock is not visible from the waiting areas.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real-time information on the connecting train/regional bus at the local bus terminal</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Directional signage</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Indication signs at important operations in the arrival area</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><strong>Fixed information</strong></td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>General map of the station</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Measures for usability by the disabled</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Includes a variety of design requirements to be implemented, for instance, route markers for the visually impaired. (See the BV Advice and guidelines)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Station building</strong></td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Waiting hall</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Toilets, with at least one for the disabled, and a changing table</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Ticket booth</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Luggage boxes</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Also other groups of tourists/seasonal traffic or many long-distance passengers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>If there are no cafés, Pressbyrån stores or the like in close proximity to the station area. If possible, due to the weather, provision of electricity.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaps</td>
<td>TSI</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

Table 6. Access and station building features

The following chapters (8-12) describe the logic behind the sub-features of a station, and illustrate them with concrete examples. The description is largely based on the Swedish Transport Administration’s report ‘The structure of a station, basic features and classification’.

#### 7.4 For further reading

*The Transport Administration’s report ‘The structure of a station, basic features and classification’.*

*BVS 1586.26 ‘Platforms - Geometrical requirements for new constructions and refurbishment.’*
8. On the platform

A platform has become increasingly important for travel. Waiting on a platform is not a goal in itself, as the transfer time in a journey is to be kept as short as possible. However, the space that is closest to the train is often a place to wait, especially for many older or luggage-laden passengers. Most travellers want to see the track/location, from which the train/bus departs, so a platform often becomes a natural waiting place. Another reason is the reduction of alternative waiting areas, eateries etc.

A platform should, therefore, allow efficient, safe boarding, alighting and waiting, and provide the passenger with necessary information.

A carefully designed and managed platform realm is crucial for creating a safe, positive experience for the passenger. From the basic feature table that completes the previous chapter, it is apparent that a platform and its fixtures is the Administration’s responsibility (in blue). In the chapter on the following pages, the parts of the table are described in detail.
Platform design with dyed yellow concrete floors renders prominent and coherent spaces. Regional train platforms at Arlanda.
8.1 Platform features

A platform, as a feature and a physical element, is one of the most important building blocks in the creation of a functioning, and transparent entity.

Accessing a platform and train through more ways than one (via smaller secondary entrances) allows the passenger to choose the way, regardless of the direction from which he/she comes, thereby considerably shortening the way to the train and the journey. The ability to choose the route also provides security to the passenger. More entrance routes are good for regular passengers, however for infrequent ones, a main entrance is more important.

The entrance to a platform may be throughout its entire length if there is a side platform, or may be concentrated at a point, a main entrance, if there is an central platform. The design of entrances affects the integration of a station with its surroundings.

Platform areas are large-scale facilities. With lengths of several hundred metres, they make up a significant part of the urban structure, and provide space for passengers to circulate and wait. Platforms, especially the side platforms that are in direct contact with the surroundings, often lack a clear identity. Where does a station end or bend, and where can the passenger expect to find operations and comfort? The asphalt on a platform integrates with the asphalt on the parking lots, roads, bus stops and cycle parking. A platform can be identified as a separate place, and thus a station often conveys a feeling of care and security, resulting in a positive experience of the place. A platform area can be provided with such an identity, for instance, by means of:

- a canopy over the whole or parts of the platform that holds the extended area together
• low walls enclosing the station area (if there is a side platform)

• provision of the shelter as a back against the surrounding, an enclosure

• built elements on the platform, including the likes of lifts and stairways

Depending on whether a station has an central platform and/or side platforms, there is an opportunity to split a station area into smaller sections, tailored to the station’s scale. Shelters, benches, lighting, and information should be integrated into the design to provide a station with an identity, and to provide comfort for the travellers. A platform provides a blend of many features and happenings. Firstly, the passenger must be able to wait, transfer, get information, and move quickly and slowly. In addition, the train production, to some extent, also takes place here. A platform has a different meaning depending on whether it is part of a larger complex railway system, or a small one with only one platform.

The width of a platform is significant for all activities (zoning), and features (stairs, lifts, furn-
ishing etc.) must be accommodated without compromising safety and security. A generous width is balanced against the use of land: the wider the platform, the wider the track area.

The width of a platform is determined by:

• the maximum permitted speed

• pedestrian areas for passengers

• the number of passengers

• the presence of vehicular traffic

• the existence of objects and fixtures on the platform (obstruction)
8.1.1 Platform zoning

The **protected area** is a safety feature, and should always be provided on platforms. The width of the buffer zone is important in the platform structure, and is determined by the maximum permitted speed of the passing train. It should be marked so as to avoid circulation there.

This zone closest to the edge of the platform should be provided with slip resistance to limit the risk of accidents, which is why the construction and choice of material is important. The design of the protected area is regulated in the TSI for the disabled. The national legislation (National Housing Board ALM) has tightened the design requirements with respect to contrast and slip resistance in relation to TSI, which is an adaptation to the Nordic climate (also see BVS 1586.26).

High-speed trains passing the station may endanger passengers waiting at the platform edge (wind forces, ice or snow falling from the train, protruding load etc.). Passing freight trains can often pose more danger than passing speed trains. The protected area is marked, and important warning signs are also provided (also dynamic, which among other things, alert about the passing trains).

A clearly marked path on the platform ground, preferably in the middle of the platform, enables logical and the safe movement of people to and from the trains. This communication zone also includes route markers for the visually impaired and blind.

<table>
<thead>
<tr>
<th>Speed (km/h)</th>
<th>0-140</th>
<th>&gt;140-200</th>
<th>&gt;200-240</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protected area (m)</td>
<td>1.0</td>
<td>1.5</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Pillars for canopies, fixtures such as ticket machines and wheelchair lifts, and furnishing are also provided in the circulation areas, in a furnished zone. The platform design and fixtures are also regulated by the TSI for the disabled, not only in terms of what should be provided, but also in terms of how the various elements included should be designed.
Protected areas for waiting on the platform reduce the number of people waiting at the edge of the platform. The design of the platform canopy and the placement of columns can discourage passengers from waiting at the platform edge.

The risk of congestion is greatest in the event of traffic problems/stop in traffic. Even at peak hours, sometimes, high congestion on the platform may entail the risk of pushing or someone falling over the edge of the platform. A poorly designed environment can also lead to stress among passengers, which in turn may give rise to risky behaviour, especially when a platform is to be ‘vacated’. Again, marked safety zones and warning signs are important. Location of entrances, stairs, escalators, lifts etc. affect the circulation of people and can contribute to an even spread of passengers along the platform. Accessories such as benches, wastepaper baskets, ticket machines and validators should not be placed in the rises/descents as they impede the flow. A platform centre, which is made prominent by pillar pairs rather than a central column can determine people’s understanding of where on the platform they should wait.

8.1.2 Shelter
Platforms should be designed and equipped to be useful, safe and comfortable, but should not include unnecessary fixtures. Open space is essential for operation and maintenance, snow removal, security etc. However, according to the passenger surveys conducted, there is a demand for platform comfort (e.g. canopy, shelter and seating). A canopy primarily serves as rain and snow protection for passengers, but also protects the platform, stairs and stairwells. A canopy also helps reduce the risk of slipping on the platform, while also facilitating the management, by reducing the need for snow clearance. Protection provided by a roof is limited, because it only protects against rain, snow and sun directly overhead, and it should be complemented with some form of shelter. Solutions
may vary depending on local conditions. The platform roof may be combined with other elements such as walls or screens or entire bus shelters. Heated shelters may also be required at stations exposed to long periods of chill and/or wind. Canopies and shelters should be provided at major stations, whereas only a canopy or shelter should be provided at smaller stations. A canopy and the provision of other shelters along a major portion of the platform allow an even distribution of passengers along its length. Thus, there is an even load on the platform, congestion is avoided and boarding, and alighting from a train is facilitated. Reduced congestion also leads to safer platforms, as pushing is prevented.

Shelters should be glazed, so that they provide a good view of the surroundings as well as of the inside, for enhanced security. Shelters should be designed to accommodate benches and wheelchairs. Shelters should be designed using materials and colours that contrast with the surroundings. Shelters should be designed for wind loads and the load of a passing train, which places demands on the material, dimensions, anchoring etc. (BVS 1583.10 in accordance with EN 1991-2 and EN 1991-1-4). The number of shelters, seats etc. depends on the group, to which the station belongs: in other words, in principle, the number of passengers. As reference, the Greater Stockholm public transport station requires canopies along the whole platform if there are exits at both ends, and along 75% of the length, if there is only one entrance.

8.1.3 Seating
As a platform is more often located far away from a waiting room, and possibly the station building, and many passengers prefer waiting closer to the train, seats are expected on a platform (which is also given as a requirement in TSI). Seating along the platform is, therefore, a basic requirement, even outside the shelter and regardless of the type of station. The design of
seating and benches should comply with the national requirements BFS ALM 1 and 2, and TSI for the disabled. At the side of the seating, there should be room for a wheelchair. Seating on platforms should be attached firmly (fixed, cast or the like).

8.1.4 Lighting
Platform lighting is very important for safety and security, as well as for providing the passenger with a positive experience of the station environment. Lighting is a complement to natural light, which is provided through an open and glazed shelter. Transparency and daylight into the station, and along the way to the platform, provide passengers with the possibility of moving around and finding their way easily, while ensuring safety along the way. It is very important for passengers to see and be seen: lighting thus enables the identification of target areas and risk areas, resulting in increased safety and security.
Lighting should illuminate, bind together and strengthen the platform paths and zones such as walkways, entrances and important target points for the journey. Lighting should be uniform and not dazzling (for the driver either), and should be designed so that the information and signs are readable even by passengers with poor eyesight.

Besides general light on a canopy or on poles, enhanced lighting at the front edge of a canopy against the platform edge should be provided, and possibly supplemented with position lighting along the edge, which marks the security zone. The fixture must be provided on the platform, and must be easily accessible for replacement. Good lighting and daylight are a requirement in the TSI as proper lighting is very important for the visually impaired. The required levels measured in lux are given in the TSI. LEDs are preferred because of the operating costs.
**8.1.5 Usability for the disabled**

The accessibility of a platform (or usability for the disabled) is a prerequisite. It should also be accessible for: families with young children, who have prams and bags; people with reduced mobility or orientation; or any other form of disability. This is regulated by law (national laws BFS 2003: 19 HIN and BFS 2004: 15, ALM). These adjustments provide all passengers with enhanced comfort, and are also conducive to the overall safety of a platform. For wall-suspended fixtures, for example, the height should be adjusted so that it is accessible to wheelchair users without obstructing the way of the visually impaired, who use walls as their natural route marker.

The buffer zone should contrast with other platform coating and should provide slip resistance, for instance by using concrete slabs with textured surfaces. At the centre of a platform, the protected area is provided with visual and tactile marking, to warn visually impaired and blind people.

Route markers should also be provided on a platform to show a safe way to the train for the visually impaired. Their design is described in HIN/ALM, and the Swedish Transport Administration’s Advice and Guidelines.

**8.1.6 Material**

It is important to choose robust materials to facilitate management of the station facility. The choice of materials should be thorough in order to provide effective long-term solutions. Asphalt or prefabricated concrete slabs can be used to pave a platform. Slabs should have the weight class that can handle snow removal vehicles. Choosing for instance, coloured asphalt or coloured concrete slabs can contribute to functional classification, but also create an identity for a station.
A station building can help to reinforce or dampen the sound inflicted on the façade, such as braking or passing trains. This should be taken into account in the design and selection of material.

The material used on the inner side of a canopy is also significant in terms of the sound on the platforms. Frequently it is best to try to reduce the noise as close to the noise source as possible, and thus the platform edges may be equipped with sound absorbers. Sound traps with absorbers can alternatively be built between tracks, which however may constitute a safety problem at work and during snow clearance.

8.1.7 Miscellaneous fixtures

For the journey and a safe platform environment, fixtures that can be located on the platform are required. However, it should be furnished as little as possible. Many commuter train stations also require fixtures such as ticket machines, card readers etc.

The location and design of the place for these fixtures must be included in the early stages of the station planning. This is the Transport Administration’s responsibility, while the respective operator or railway company is responsible for fixtures such as ticket machines and validators. Today, different operators, different systems and machines imply a significant number of fixtures. A neutral location should be selected on the way to the platform, but not in the direct flow path, so that the fixtures do not pose an obstacle for the disabled, or do not imply a safety risk. Ticket machines should be placed visibly, considering passengers’ safety while paying, and to reduce the risk of vandalism and burglary attempts. Ticket machines should primarily be located in the platform connection, directly adjacent to the platform, as passengers are often in a hurry to buy tickets. Their location should also take service (loading and unloading) into account, so that the circulation of people is not disrupted. Conditions of the place, such as the platform width and rises and descents, are crucial.

Vending machines on platforms have sometimes been mentioned as a service that can be valuable to stressed passengers. This feature depends on the commercial operators and commercial opportunities available at each station. See the section below on commercial services.

Transport information and signage on a platform are necessary and important, and are compiled in Chapter 10.
8.2 Platform geometry

Track geometry and passenger needs are important factors for the design of platforms. The width of overpasses, if any, affects the platform width and thus the track position to a large extent, and determines a rigid track layout. If it is discovered later in the planning phase that the staircase is too narrow, it may be impossible and expensive to change the position of the track.

At present the Transport Administration lacks fixed instructions on how a commuter environment should be equipped as standard for lifting packages (lifts and stairs) etc. However, there are some design requirements that affect the station environment, which are described in the BVS 1586.26, ‘Platforms: geometrical requirements for new construction and refurbishment’.

8.2.1 Platform length

Today there is no uniform standard for the length of the platforms. This applies both nationally and regionally, and is rarely stipulated in the Transport Administration’s project-related policy documents such as the Technical Guidelines. The result is that platform lengths vary from project to project, or may be different depending on the track region the project is located in.

It is important that the length of the platform is not adapted to the current traffic. Instead, a survey and adaptation for future traffic patterns and other vehicle combinations are required. For each traffic arrangement, unified platform lengths should be pursued. The length of platforms is tailored to the most common trains and traffic lay-ups and varies between 200 and 340 metres. The length also depends on the night train and freight train traffic. The train length in relation to the platform affects the capacity of the system. The smaller the margin, the more accurate the waiting time of the train should be, and shorter braking dis-
tance requires a lower speed before the station. Longer platforms imply a greater need for visibility and signage.

For the new international high-speed standard (TSI), 400-metre-long trains have been designed, but so far, Denmark and Sweden have been granted a deviation from this requirement. Previously, there was a regulation (SJF 541.7) mandating standardised length of the platforms: 155 metres, 255 metres, 355 metres, and 455 metres. The selection of standard length was based on the route and train category. For example, platforms for long-distance trains between Stockholm and Gothenburg should have a length of 355 m. Roughly, a platform length of 155 metres is recommended for local trains, 255 metres for regional, 355 metres for long distance trains and 455 metres for night trains to Norrland.

8.2.2 Platform width
Platform width is determined by the maximum permitted speed on the nearest track (Sth), walking time for passengers, number of passengers, the presence of vehicular traffic on the platform (e.g. vehicle for freight, catering or snow clearance) and fixtures/objects on the platform. See BVS 1586.26 ‘Platforms - geometrical requirements for new construction and refurbished’. The width of the protected areas, depending on the maximum permitted speed between 1 metre and 2 metres, a walking area of 2 metres is added to this, and:

- Addition for number of passengers: For platform length below 200 metres: 1 m²/passerger, for longer platforms, addition of 0.5 metre/100 people waiting on the platform simultaneously. For bigger stations, the parameter ‘number of passengers’ has great significance for calculating the required platform width. However, there is no governing or supporting documentation for
how to determine or estimate the number of passengers.

Therefore, it becomes arbitrary from case to case and project to project. Platform entrances (the end and/or central exits) greatly affect the final design of platform width.

- **Additions to vehicular traffic**: A pavement widening of 1 metre is required in case of vehicular traffic.

- **Addition for objects and fixtures**: For objects with the longitudinal extension of 1 metre or less, the distance between the object and the inside edge of the protected area should not be less than 1.2 m. For objects of length 1-10 m, there should be a minimum distance of 1.6 metres to the inside edge of the protected area. For objects that are longer than 10 metres, there must be at least a 2 metres to the inner edge of the protected area.

A platform should be designed such that there is always an obstacle-free route of at least 1.6 metres from the barrier-free access road to the platform, see TSI-PRM. The obstacle-free route should have a free height of at least 2.3 metres. It is permitted to have small obstacles of less than 1 metre in the obstacle-free route. However, an obstacle-free route of at least 0.8 metres, between the inside edge of the protected area and these obstacles, should be provided. The width of a platform is also determined by the type of platform. A stairwell in the middle (between the platform’s middle rise) for example, requires a broader platform there. A lift package (stairs, escalators and lifts) and platform fixtures designed only at a late stage in the planning process may result in the need for widening the platform. (More on the platform parts and accessories in Chapter 11 of the platform features.)
8.2.3 Platforms and track geometry

Track geometry rules regulate what should characterise tracks past the station. However, some conditions are also mentioned here that may be useful to know about with respect to the curve radii, vertical radii and gradients. Straight platforms are preferable, but a radius can increase the flexibility of a station location to be fitted into an existing rail yard environment e.g.

Platforms may not be located in a curve with a horizontal radius of less than 500 metres according to BVS 1586.26 ‘Platforms - geometrical requirements for new construction and remodelling’. Platforms in curves reduce visibility along the entire length of the train, thus requiring camera surveillance so that the train staff can see all the doors before they close (easier along the inside of the curve than the outside). Platforms on curves should be avoided because the reduced visibility entails the risk of people getting caught in the closing doors or stuck in the gap between platform and train. The curve radii that are reasonable in the context should be large enough to provide only an insignificant impact on the ‘gap’ between the vehicle and the platform.

Especially in densely populated areas, reduced soil intrusion is an advantage if the station location in a curve outweighs the reduced maximum speed of the passing train (and safety problem described above). The curve radius, as far as predictable, should never be or considered to be, speed limiting for the passing traffic. At Kolbäck station for instance, the tracks have a radius of 1,770 metres, yet they can be passed at 200 km/h.

If the curve cannot be avoided, it is better, from a track alignment perspective, to add a radius along the platform, followed by a straight track after the platform in the respective direction, for the location of (any) switches. Tracks with switches between them do not need to be drawn in parallel.

Vertical radius platform is not expected to be a problem or especially relevant because requirements for other track alignment parameters always provide sufficient vertical radii. The trains must not run after they have stopped at the station, therefore the track gradient at the platform should not exceed 10%, preferably not more than 5% in length. Using hand brakes delays the train start.

8.2.4 Platform height

A high platform in Sweden is 0.76 metres, a medium platform is 0.55 metres, (This is consistent with TSI), and low platforms are rare. The commuter trains in Stockholm (X60) adapted for high platforms can dock at medium platforms, but in that case, there is a step for the passengers, between the platform and the train floor height.
8.2.5 Platform slope
When being refurbished, platforms should have a transverse slope of 2% from the track, to prevent strollers from running into the track area. De-watering, done in the middle of the platform, should be managed well, to avoid accumulation of water in the area frequented by the passengers. Provision of ground heating on the platform reduces the formation of ice, and thus the risk of slipping in winter.

8.3 A platform’s position and location
Whether a side platform or an island platform is preferable is determined by the complexity of the track system.
Location of the platforms, at the side or middle of the track system (often both), is controlled by many factors, including extension of the track system and structure, and affects the passengers and circulations at the station differently.

8.3.1 Side platform
A side platform provides a simple, quick connection between the bus, taxi, car parks and train. The platform can be provided in its entire length relative to the surroundings, resulting in efficient passenger circulation, and with respect to boarding and alighting. This works well when no changes to the train locations are made. A risk is that a platform’s good integration with the surroundings may result in the passengers not noticing that they are out on the platform, and may trip and fall onto the track. A balance between accessibility and safety (some delimitation of the station area) should be pursued. On a side platform, it is often easier to arrange accessibility measures for people with disability by the type of lifts and ramps at any level difference, as there is more space/length to implement the measure (as compared to an island platform).

Side platform on a single track: There are no switches that can lead to complications, nor any possibility for the trains to pass. A side
track locally at the station would enable passage and involve higher safety for people present at the station (but on the other hand, switches entail an interference risk and lower speed). In case of tandem platforms, where extra tracks are placed at the end of the side platform, more trains can operate, thus providing an optimal service for passengers. This is not flexible from a train planning perspective as the number of through passages are reduced. Longer walking is another drawback of this solution.

A side platform adjacent to the station can be complemented with a secondary platform on a side track to allow clearance between trains. To achieve this second platform, some people are required to cross the track. This is a fairly typical station with a single track, with passenger traffic: for example, Rävlanda. In case of double track traffic, a similar situation is encountered with a side platform on each side, with good accessibility from this side, but with the need to cross the track to reach the train on the second track (for example, when changing trains).

8.3.2 Central Platform
An central platform, located between the tracks, allows for a smooth change between two trains. At smaller stations, frequent train changes occur on the same platform, making this the preferred platform type, where passengers change trains, rather than waiting at a place. However, in most cases an central platform requires a grade-separated junction with ramps, stairs and lifts that place requirements on the width of the platform.

Passage to and from platforms takes place only via one or a few communication points. Therefore, it must be dimensioned properly to avoid congestion at major stations. Travel time (the time in the train and walking time to the track) is extended. This results in poor accessibility.
for all passengers, with weak connections to the surroundings.

The major advantage of the island platform, however, is increased flexibility in the frequency. Fast track changes are possible in the event of disturbances such as track and signal failure. Fewer switches are required, which results in a simpler system. The platform width, on the other hand, entails a larger distance between the tracks, resulting in a more complicated track geometry, with transfer curves and circular curves in an otherwise double straight line. The track geometry locks the construction and makes it difficult to build on an existing siding. It is difficult to change and results in reduced velocity of the passing trains.

### 8.3.3 Multiple platforms

For stations with multiple platforms, it is not uncommon for the traffic categories to be separated on different platforms. In a quadruple line, combinations of a central island platform (for instance commuter traffic / regional/local traffic) are employed, surrounded by the side platforms (for long-distance services). All tracks are then accessible from the platform, and access to the place is good from the side platforms. However, exchanges between the long-distance commuter trains entail change of platform (via a grade-separated track junction). One option in this situation consists of two island platforms for quick transfers, but worse connection to the place and uncertain environment for people on the platform when the train passes.

One example of this is Flemingsberg station. From a national local train perspective, it is a very big station, with a very wide island platform for commuter trains. The side platforms of the remote distance trains, however, are narrow because the station as a long-distance station is relatively small.
8.4 The free space

Railway traffic has certain requirements for free space along the track. The free space in height from the top edge of the rail is normally 6.5 metres. The requirement may vary depending on the speed of the train, on whether it is electrified, the design of the contact lines, and the extension of the pavement structure in the longitudinal direction of the railway. (See BVF 583.20 bridge engineering).

On the straight track, the horizontal distance from the track centre to the bridge construction must be at least 3.0 metres. In curves greater distances are required. Normally, however, the recommended minimum distance is 5.5 metres from the centre of the track. It enables construction and future maintenance of the bridge structure without the need to shut down traffic on the railway line.

The regulation (BVF 586.20) distinguishes between short obstacles 1 metre and long obstacles such as support walls, which are also higher than 500. For obstacles longer than 15 metres, a minimum distance of 3.5 metres is applicable from the track centre. For roads passing under the railway line, the free height should normally be at least 4.7 metres from the road to the lower edge of the bridge (heavy construction). For pedestrian and bicycle paths, at least 2.5 metres are required. (Also see VGU)

8.5 Safety in the platform environment

In addition to the requirements of free space, electrical safety regulations should also be followed during construction in the proximity of (electrified) rail. Most of the state rail network is electrified (about 9400 km). High voltage cables are laid 4.8 to 6.0 metres above the rails. Electrical Safety Administration regulations Elsäk 2008:1 applies for the railway power lines.
The regulations stipulate that for electrical safety reasons, buildings or building components should not normally be closer than 5 metres from the part of a railway system that can carry high voltage. For tall buildings, larger distances or special protective measures are required. (See Illustration 35 p. 28 ‘Railway in the community planning’)

According to Elsäk 2008: 1, the horizontal distance between the live part and roadside, should amount to at least 4 metres. Besides this basic value, the minimum distance is influenced by the free space required by the railway, and the speed on road and rail.

If the contact line posts are between the track and the road, however, the minimum distance between the centre of the track and side of the road, amounts to 9 metres. (Also see BVF 586.20 Free space along the path).

From an electrical safety perspective, the horizontal distance from the track centre to the platform roof should not be less than 2.0 metres. When the distance between the platform roof and live wire of less than 3.0 metres, specific electrical safety measures, under BVF 054, should be adopted. ‘Supplement to the Electrical Safety Board’s heavy current regulations for contact lines’.

The probability of regular passengers coming close to the contact line, and encountering a risk of accident, is very small. However, it may happen that someone may have long objects in the luggage, which could, in an unfortunate event, come too close to the contact line. Accidents also occur when children and young people climb on vehicles that are below a live contact line. Warning signs and monitoring reduces the risk of serious incidents.
8.6 Underground platforms
Underground transport places special demands on safety, which of course also applies to stations in tunnels. We will not tackle this problem here, but the risks/problems to consider include air quality (particulate matter), as well as fire and emergency requirements, which are considered in the design of the platform.

In the event of a fire in carriages on the track, platform walls against the track (such as the City line) can reduce the spread of smoke and fire. Stairs at the side of the escalators increase safety, as long as the platform area, at the side of the staircase, is not too narrow.
8.7 For further reading

BVS 1586.26 ‘Platforms - geometrical requirements for new construction and refurbishment.’
9. Connections

A station is often a link between the different sides of the station, bridge barriers and a connection to the surrounding target points. A station serves as a shortcut for some residents, thus increasing circulation of people and resulting in a safer place.

The proper location and design of the connection is also important for a rational construction of an inter-modal station facility with an overview, enabling easy navigation and limits the risk of running on the track.

A strategically located, well-designed passage also enables a smooth division of peripheral functions that are part of the whole journey, such as waiting for taxis and buses on one side of the station and the car park and substitute buses on the other.
Sheltered, glazed and grade-separated passage, Sunderby station
9.1 Underpasses and overpasses

In TSI for the disabled, one of the most important requirements is for an unobstructed path to and from the train always to be available. If an underpass/overpass is located in the obstacle-free route, the Transport Administration’s responsibility is to ensure that a ramp or lift supplements the stairs. Escalators are often added for capacity and efficiency reasons. Often a station also constitutes a bridge between different parts of the city that connects the surrounding parts, while simultaneously shortening the distance to the train. These features must be weighed together and interact for the proper functioning of a station and to provide an effective inter-modal junction.

Passage location affects passenger circulation. An incorrectly located passage can result in dangerous shortcuts across the track area and increase the risk of accidents. The location also affects the capacity of the platform, which can be evacuated quickly if rises/descents are located where most trains stop, near destinations, or if there are several rises and descents.

A grade-separated route to and from the train can be designed as an underground passage or overpass, resulting in different qualities. The tunnel option provides handicap accessibility via ramps and thus an easier passage under the railway area. A tunnel is often easier to fit into the cityscape. The railroad bridge (in other words, the tunnel ceiling) should be made as thin as possible to minimise the distance between the tunnel and the ground level. The height of the tunnel should be at least 3 metres. To this, a bridge structure and platform is added, which gives a height difference of about 5 metres.

A tunnel must be designed so that it is perceived as safe and secure by including good lighting, light inflow and transparency, otherwise...
there is a risk of taking a short cut across the track. The ratio between tunnel length, width and height considerably affect spatiality (about width x height = 15x1).

The more choices and connections in the surroundings, the safer the pedestrian underpass will be, thereby significantly increasing the use of the tunnel. It will be easier to get out of the tunnel to avoid conflict or unwanted encounters. Straight tunnels and long visibility lines with good transparency enable the passengers to easily interpret the surroundings. Rounded or levelled walls with ladders and openings enable looking around the corner in advance.

Passage over the railway on the bridge provides an overview and orientation for the passenger, and is provided for simple and efficient transfers between the modes of transport. A bridge can serve as a waiting space near the platform. From the urban landscape viewpoint, however, the bridge may be more difficult to handle. Another disadvantage is that the difference in height between the bridge and the track becomes larger due to the train’s requirement of free space (usually 6.5 metres - also see BVF 586.20). Stairs, escalators and ramps, if any, will be longer than those in a tunnel. Many passages serve as paths to the train, and as pedestrian and bicycle paths between the surrounding neighbourhoods. A clear separation between pedestrians and cyclists in the form of curbs, colour selections and material differences, and enough space and good transparency, is a prerequisite for increasing safety and accessibility. In order to get a good overall totality, a close cooperation between the responsible operators, the Swedish Transport Administration and the municipalities is required.

With a passage as an entrance to the train, the design of the entrance, with markings in the ground (and roof), lighting etc. is important for clarity. The environment of the passage should
not be perceived only as a street environment, but as a carefully thought out, built passenger environment.

9.1.1 Ramp and staircase
Quick, smooth and easy circulation is necessary for switching between modes of transport, so the platform's connection to the multilevel components, in a logical and simple way, is very important. Small level differences to the platform such as connecting walkways, are managed with ramps and/or steps. At smaller stations, stairs and ramps are often designed without a roof or installation. Roofs may still be preferable even in smaller places to facilitate management and snow clearance, increase accessibility, and reduce the risk of slipping. Not only should the roof follow the slope of the staircase, but there should also be an increase in the stairwell ceiling height, providing major environmental and spatial qualities such as more light and a view.

Stairs should be slip-resistant and comfortable for climbing and descending. The design conditions for stairs to outdoor platforms are flow of people, platform width, platform requirements for security zones next to the stairs, as well as other communications such as a lift for stairs indoors. Large differences in height require landings. Stairs with more than 18 steps should be divided into several flights of stairs with about the same number of steps in each.

A stairway with more than three steps should be supplemented with a ramp, and a ramp higher than three steps should be supplemented with a staircase. The convenience of a ramp depends on its gradient and length. High lift heights and higher demands on accessibility/usability for disabled (lower slope) yields long ramps. A difference in height of 7 metres between the bridge and platform would, for example, with the gradient of 1:20, and landing, give a 166-metre-long ramp.
For ramps up on the island platform, ramps without landings are allowed, to avoid capacity constraints.

Stairs should take disability requirements and personal safety into account. This means that guides should be doubled and be on both sides, and that the stair start and finish should be clearly marked. The finishes should be selected with due consideration to slip resistance, and can be equipped with outdoor ground/floor heating. Also see the Swedish Rail Administration’s ‘Advice and Guidelines - guidance for the physical design of the disabled’ and the TSI for the disabled.

9.1.2 Lift and Escalator
A lift can be an alternative to a ramp, but there must be a ramp if a lift cannot be provided. A lift is required in the case of larger differences in height, and is a feature that provides enhanced comfort. The lift is not considered a general basic feature in all cases, but on the smallest stations, can be replaced with ramps. This is also governed by the TSI.

Lifts are large construction elements affecting platforms and dimensions of grade-separated passages, layouts and flows. The car must measure at least 1.1 x 1.4 metres (Type 2 according to the lift directive), which can accommodate an electric wheelchair for limited outdoor use (accessibility in public spaces BBR 3:11). The internal dimensions of a new lift should be 1.4 x 2 metres (Type 3 according to the lift directive) to accommodate a larger outdoor wheelchair (ALM Section 10). Two-door lifts (lifts with entrances on two sides) are preferable, but if turning around in a wheelchair is not possible (lift type 1 and 2, single-sided lifts), a mirror should be provided according to the lift directive. Byggikapp Handikapp (a handbook about accessibility), (Chapter 3), proposes folding seats in a lift. Acoustic and optical signals should be in accordance with the EN standard.
Call buttons for the lift should be as per Bygg ikapp Handikapp (Chapter 3), and should be provided so that they can be reached from a wheelchair, at a height of 0.9 - 1 metre above the floor. Distance to corners or other obstacles should be at least 0.7 metres, preferably 1 metre. (Minimum according to BBR 0.5 metres) The lift doors should be built as automatic sliding doors with the smallest opening size of 0.8 or preferably 0.9 metres. Glazed lifts provide better visibility and increased safety for passengers, and make the location of the lift prominent.

Escalators are considered as a need-governed feature, not directly dependent on the station size, but more with respect to their function, location, passenger flows and height differences, and the facility’s capacity in general. Escalators are planned with some restraint as these entail high administrative costs. The difficult operating conditions in a platform environment mean that they should always be installed. An escalator is effective for major passenger flows and is therefore important on platforms with large passenger volumes. Usually, it may be enough to have an escalator that can run in both directions. At very highly frequented platforms, two escalators may be required. In order to allow for the passage of the stairs, escalators should be 1.1 metres wide.

The location and design of stairs, ramps, lifts and escalator are important, in terms of encouraging people to use the passage. Steep ramps and stairs as well as the short distance between any doors and stairwell and lift functions give rise to clusters of people that can be a safety issue on the platforms. Ramps and stairs along the way to and from the train are vital for disabled accessibility, and the scope is therefore regulated in TSI. At least one way to and from the platform should be barrier-free and accessible by wheelchair.
9.1.3 Embedded passages, stairs and lifts
A grade-separated connection can also serve as weather protection and offer the passenger the opportunity to wait closer to the train, especially in the event of traffic disruptions. This entails enhanced comfort, demanded by many passengers. Most passengers want to wait in close proximity and have visual contact with the departure point.

Embedded grade separations and stairwells at major stations enable waiting near the train. Incorporating passages over tracks, stairs and lifts is a measure that limits slip and facilitates maintenance, which is necessary at big stations.

9.1.4 Lighting and natural light
Careful, well thought-out illumination that takes into account the lighting conditions during the day and night is one of the basic conditions of a welcoming environment, a basic feature in all connections, at all stations. Good and generous inflow of daylight affects the perceived security.

Access to natural light in a tunnel often means that you have contact with the platforms above and thus can be heard or be seen from several directions. Contrasts in the transition zone between daylight and artificial light are compensated with the help of extra lighting. The surface quality and colour of the material greatly affect the lighting conditions in a tunnel and should interact with lighting principles. A conscious material and colour choice combined with a refined design represent a prerequisite for creating an inviting environment.

The Swedish Rail Administration’s ‘Advice and guidelines - guidance for the physical design for the disabled’ stipulates that the route to a platform should be marked with lights, and the brightness should be set such that the signs etc. can be read by people with visual impairment. The TSI stipulates that the outdoor environments should be illuminated with at least 10 lux, and have an average value of 20 lux.
However, the stairs and start of the ramp should be illuminated with at least 100 lux and 40 lux, above the ambient illumination level. For more, refer to BVS S43.41203. As the revision of the TSI-PRM is in progress, it is important to have relevant information during the planning and design phases.

9.1.5 Seating, usability and material
Grade-separated connections, at least at major stations, should be provided with seats. At a big station, the distance to a waiting room or the like can be so long that the connection is used for waiting, which then must offer a certain degree of comfort. The TSI and national legislation for disabled people also stipulates that they should be able to sit down and rest on their way to the train. See also, for instance, The Swedish Rail Administration’s ‘Advice and guidelines - a guide to physical design for the disabled’.

To increase the accessibility and usability of the grade separation (for the disabled), the choice of ground slopes, materials, colour schemes, route markers and balustrades etc. is very important. Anti-slip flooring slabs should be used on the path to the platform. Bouncing sound and echo in a tunnel should be avoided to improve orientation and perceived security.

When the path to a train includes a grade-separated passage, the place is next to the rise and descent of the entrance to the platform, and should be enhanced to clearly show the entrance. This may include selection of the flooring, reinforced lighting etc.

9.2 Plane transition
This type of transfer always entails a risk of someone getting hit. Illegal crossing under lowered barriers is a way to gain time with little effort, although situational factors, such as a passenger getting stressed or a train changing its platform, can result in a passenger committing offences such as crawling under the lowered barriers. Information about track changes
should be provided in advance. Warning signs affect the passengers’ inner barrier effects. It is important for the route between platforms to be smooth and well-marked to avoid unauthorised entry into the track area. Transitions with good visibility for passengers and train drivers, barriers, light and sound signals, the fence between the tracks and the gates, reduce the risk.
9.2.1 Loitering on the tracks

An insecure passage leads to safety problems, with increased illegal entry to the track area – a shortcut across the track seems more appealing. Designing stations to prevent unauthorised entry to the track area involves ensuring that the environment is such that passengers and others naturally can, and want to use and move around in the environment, as intended. Right sizing, platform size on the basis of the passenger volume and the necessary fixtures, and clear indication of the protection zone are important here. The aim is as simple and short a way as possible to the platform. With access from multiple entrances to the platform and thus the ability to choose the path, safety and security increase, while reducing unwanted entry to the track area.

The Railway Act (SFS 2004: 519), Chapter 9, Section 1 stipulates: “Without the infrastructure manager or a railway company license, no one may enter the track area except in places where it is clear that the public has access.” Every year, people are still hit by trains when they try to take shortcuts across the tracks. The risk is encountered due to the station’s location, platform height and design of the platform ends, connections between the platforms and the environment, as well as fencing and prohibition signs. Gates at the far end of the platform primarily indicate a visual stop.

The cases of people committing suicide, by entering the track area unauthorised, occur frequently at stations, where it is relatively easy to get down on the tracks. Fences and platform doors can reduce accessibility. Camera surveillance and motion detectors linked to the guards in place also reduce the risk of someone getting hurt.
9.3 For further reading

BVS 543.41203
10. Information, safety and security

The Transport Administration is responsible for functional transport information at stations, for all people. In this chapter, the need for transport information in the station’s various parts, as well as the meeting point, is included in the escort service.

The end of the chapter deals with safety and security at the station. It is important to maintain and enhance the general security at stations, especially on platforms and platform connections. This is the Transport Administration’s responsibility.
Reference Signs and illuminated areas at Uppsala Central Station
10.1 Transport information

Good transport information is important to link the Transport Acts, and constitutes one of the most important features of the journey. Information on train departure, delays etc. makes travel easier and safer and helps raise the attractiveness of public transport. The complex environment of a station with multiple types of transport and train departures requires good information and signage. Transport information must be seen as a whole over the entire travel system. That is why it is compiled in the following section.

Transport information at a station must be structured, formed and designed in a consistent and uniform way. The information should be easy to understand, use and recognise, and fragmented solutions should be avoided.

The Swedish Transport Administration is responsible for the dynamic information and fixtures on the platform, in the connections, and on the main street in a station building. The property-owner is responsible for the signage. In a deregulated market with many players, the Transport Administration should provide competitively neutral conditions. Fixtures and signs should be neutral relative to the market players. The Transport Administration's graphic standards for transport information fixtures can be used for all the operators involved: e.g. Jernhusen, municipalities etc. The purpose is to provide uniform signage.

A well-functioning and attractive station area should be easily accessible, functional and flexible. Transport information should be designed to guide various types of passengers. There are a number of general rules on how transport information should be handled in the station environment:

- Transport information carriers should be prioritised before commercial signage. This applies to both the signs of commercial acti-
vities in the station and advertising for other commercial purposes. This is also a requirement in TSI for disabilities.

- However, transport information should be well planned according to the rule ‘maximum guidance with minimal signage.’

- Transport information carriers with important messages and those that cater to many, should be given priority in terms of size, location and lighting.

- Transport information carriers should provide information when needed - not before

- Transport information carriers should interact with the architecture as much as possible and contribute to a good station environment. Adapting the interior or the building for information carriers is wrong, because the building has a longer life and the next generation information carrier may have a new size and design.

- Transport information should be made available to the disabled, for example, by placing visual dynamic information at suitable reading height” e.g. of wheelchair users, short people or people with cognitive disabilities.

10.1.1 Information needs

Passengers’ information needs vary within the station’s different parts and between departing and arriving passengers. The basic need for information on platforms and in arrival zones is equal regardless of the station’s size, but the information carriers vary in number and workmanship.

The fragmented distribution of responsibilities in an arrival zone often leads to a lack of transport information. There is great potential for development in terms of real-time information about connecting traffic: for example, information about train departures at the approach.

10.1.2 Information carrier

Fixtures used for displaying information, known as ‘information carriers’, are divided into the following channels (types):

Visual, dynamic information is used mainly for real-time information about arrival and departure times and information about inconvenience. New technology for dynamic billboards, displays and screens will replace the existing fixtures. Therefore, it is important to focus on the information that the information carrier is intended for and on its location.

An integrated display or real-time information about train services is required on the platform and in the central information hub. On the
platform, dynamic warning for passing train may also be provided, when and if it is required to be integrated (usually) in the existing platform system and loudspeaker system. At grade-separated connections (stairs and lifts) dynamic entrance signs are required, which notify the incoming and departing trains on a platform (if there are more than two platforms). Real-time information about connecting trains/regional bus services facilitates the journey at the local bus terminal in the arrival zone.

There should be a clearly visible clock in the arrival zone, at least at larger stations and commuter stations. In the smaller station locations, it is likely that there is sufficient time at the information hub, as it is often in the arrival zone.

Fixed, visual information mainly includes information signs and marking signs, particularly in the arrival zone and on platforms. Station name sign, track number plate and carriage position sign are all marking signs with fixed rules for location and workmanship, and are therefore more standardised than directional signs and other marking sign.

At main stations, an overview map of the transfer points is required in the arrival zone. At the smallest stations, an overview map may not be necessary, while some larger stations must be assessed case by case, depending on the station's complexity. Station signs (for motorists, cyclists and pedestrians) are most often the municipality's responsibility. For the station to be a well-functioning link in the travel chain, pedestrian and cycle routes that lead to the station, and their signage, are of utmost importance.

Examples of tactile information include tactile track number and tactile orientation maps. The maps are primarily for the visually impaired, but can be useful for everyone. The map is placed adjacent to the route marker at the entran-
ce or in the information hub of larger and more complex stations and in stations with many passengers from the current user group.

Tactile track numbers facilitate orientation to the track. They are placed in spots led by the route markers, either up or down, from the grade-separated access to the platforms.

_Verbal transport information_ is provided via loudspeakers to the passengers; it may include information about any inconvenience and important messages. Information via loudspeakers is especially important in the information hub and on platforms. To complete a loudspeaker system inside the station building, the same information should be distributed via an inductive loop. The inductive loop provides wireless verbal information directly to the people who use hearing aids and significantly increases their ability to understand the information.

A digi-talker is an application that converts a text to synthetic speech in real time. The system is intended primarily for people with visual and hearing impairment, but also for people with reading difficulties. A suitable location is in the arrival zone, at the information hub and on the platform, preferably in conjunction with dynamic transport information; it can be replaced by interactive terminal, see the next paragraph.

_Interactive information_ on special terminals is designed to help people with impaired vision, or hearing or cognitive impairments. Meanwhile, interactive information is an excellent tool for all passengers. Through interactive terminals, information about train services, such as outbound trains and traffic disruptions, is provided both visually and audio-visually.

The terminals can in the future be equipped with different features depending on the station's complexity.
10.1.3 Range and position
There is a manual and a standard for the supply and location of information to passengers at stations. The point of these is to ensure that transport information to passengers is useful, reliable and easy to access and understand. This means that passengers will find the right information at the right place at the right time and the right location.

Transport information should be based on common principles for all stations, thus creating a unified information system. What transport information a station will be equipped with depends a lot on the station’s size and physical design. The standard ‘BVS 728 Standard for Traffic fixtures - Fixtures Levels of 15 ground stations’ covers amount, location and type of transport information fixtures. The stations in this scheme have been classified according to three basic parameters: physical design, the number of passengers and traffic. The classification is based on the grouping method described in Chapter 6.

The handbook BVH 728 ‘Transport information for passengers and at the stations - Help for planning for new construction and re-investments in station environments’ describes how the planning process for new construction and re-investments in the transport information fixtures should be done. The solutions, ideas and instructions in the manual are based on passengers’ needs and ability to absorb information.

The handbook should be applied to all newly built stations, and the reinvestment of transport information fixtures. For minor upgrades of existing systems, such as replacement of individual units, the manual should be followed as far as possible: for example, regarding the amount and placement. There is also a graphic standard, TDOK 2012: 128 and TRV 2012: 002. These should always be applied. The new graphic and technical standards for fixed transport information entails, for example, the modernisation of lighting technology from exterior to interior lighting.

10.1.4 Analysis and Planning
In many of today’s stations, there is no coordination of the information structure and an overview of the whole. An existing station can be analysed at once with respect to the pattern to get a picture of how it works and what can be improved. How the station should be equipped very much depends on its size and physical design. For passengers, there are, from the information perspective, four key zones on the station: the arrival zone, the information hub, the transfer zone and the platform zone. The right information in the right zone and in the right way enables passengers to find various functions on the station easily, and to get easily and quickly to and from trains and other modes of transport.

According to the BVH 728 and BVS 728, one can use the station’s design and size as a base to achieve the right level of fixtures, but above all for the information structure to be as uniform as possible. The same principle applies, although the number of fixtures will vary, for example, with respect to the number of passengers. It is important for the information fixtures to be placed in a proper manner, regardless of the size group of the station. Other influencing factors are transport arrangements and principles for traffic management.
10.1.5 Information node
At the central and most natural meeting point of the station there should be a clear information hub with combined passenger information across all channels. Here, passengers and other visitors should be able to get an overview of the station and its various functions. There should be clear reference signs to buses, taxis and parking. In addition to the visual, dynamic and spoken information, the major stations may also comprise interactive terminals and staff for personal information. If there is no station building, a hub may be located at any other suitable location, for instance at a platform connection.

10.1.6 Meeting point for escorts
According to an EU regulation (EC 1371/2007), a coordinated system for escorting in connection with the train ride, is offered at staffed stations. At these stations, there must be at least a designated meeting place where the passenger can wait for the escort. A Meeting point for escorts consists of a sign, tactile buttons, pictogram and symbols for instructions on the escort service at the station. If there is a station with a waiting room, there should be a thoroughfare both inside and out. The Transport Administration has developed specific signage for thoroughfares.

When there is a station building with a waiting room, the property owner is responsible for paying for, and putting up the thoroughfare sign. The thoroughfare should be located a little off the walkway, but still close to the information and ticket booth, if any. The thoroughfare should have space for seating and wheelchairs/walker, and connection to an obstacle-free road. In the outdoor location, a compiled location, preferably in the station arrival zone, of the information in the form of dynamic signs, tactile station area maps, clock, ticket machines and passing place, is desirable. Good lighting and shelter are obviously a requirement.
10.2 Safety and security

The fact that a station should be safe and secure is obvious when the railway itself is expected to be a safe mode of transport. Security is also one of the reference goals in the transport policy objectives. For these reasons, it is important for public safety, especially on platforms and multilevel units, to be maintained and enhanced. This applies, for example, to the prevention of suicide and unauthorised track access and other types of personal accidents. Platforms and multilevel structures must be designed in a way that minimises these safety risks. The sizing of platforms and fixtures, for instance, is important.

A station environment is a place where the passenger, in a safe and secure way, is able to change, wait and get to and from the train. The real and perceived passenger safety and security are important for rail travel to be perceived as an attractive travel option.

When a station is a place where risks exist, it is important for the planning to take them into account and/or avoid them as much as possible. For example, material selection and management measures that limit the risk of slipping are important for the passengers’ experience of safety and security. Security should be good at all stations, regardless of size.

Safety and security at a station are affected by many factors, and they are handled in this section to increase passenger safety. Railway transport stipulates technical requirements for the safety of the platform design, which were raised in the previous platform section.

The passengers’ perception of safety and security is sometimes subjective and can be greatly affected by the design of the station/station area. During the design phase, great care should be taken to create an environment that is transparent in different places in the station.
area. This is the logical structure that provides security by enabling any passenger to easily find his/her way and to avoid hidden nooks and passages.

Openness and transparency also limits the suicidal tendency of the place, and enables visibility. Shelters must also be transparent.

Human presence is not always positive. Congestion at peak periods can present a risk or fear of being pushed down the track, fear of pickpockets or, more generally, unpleasant to be too close to strangers. Desolate places, on the other hand, give rise to a fear of being assailed or molested, as there are no witnesses. Particular attention must be paid to the design of open, bright and transparent grade-separated connections.

10.2.1 Staffing and monitoring
The passengers’ perception of safety and security is also affected, largely by the extent to which people are moving into the station area and how they perceive the existence of regular monitoring and the presence of people linked to travel or security.

Ideally, according to surveys, passengers see that there are people at the station related to the journey, and secondly people in convenience stores and the like, and then fellow passengers and the public.

Some stations are monitored by security personnel, often in the form of patrols. The different types of staffing at stations have generally declined, and due to this reason, many passengers desire enhanced monitoring. Locking the waiting room is an indirect form of patrolling, which is always done manually to ensure that no one gets locked in. At the biggest stations fixed monitoring is provided. Extended monitoring services can be virtual patrols by security companies and/or an alarm to an alarm centre or security companies.

Monitoring and/or monitoring and surveillance are in principle not linked to the size of the station or passenger volumes. This is more driven by other factors such as the station’s location and staffing. It is also about the station’s vulnerability to graffiti, vandalism and other crime. The needs and measures are assessed case by case. The use of surveillance cameras can also be an asset to detect people who are suicidal as well as a help for the public relation officers.

The use of surveillance cameras is controversial, and it is regulated in the ‘Act (1998: 150) on general camera surveillance’.

There is a conflict between the need to provide security in public environments and demands for privacy. The county board must grant permission for video surveillance, in which the surveillance camera is mounted such that it can be directed to a place where the public has access.

This means that a permit is not required for monitoring the track facility from a safety perspective. Surveillance with recording and emergency telephone is an alternative to staffing and monitoring by present people.
10.2.2 Assault and sabotage

For many passengers, a great risk is perceived with regard to travel in the evenings: the risk of assault or the like, or a risk that is difficult to predict and have control over. The platform and the path should be perceived as safe even at night, which requires good lighting and a number of possible connections to and from.

Bright, transparent materials are preferable, and designs, in which hidden corners are avoided. Even surveillance cameras can be viewed as a safety barrier, which counteracts crime.
10.3 For further reading
Compiled planning documentation - Road safety
Part document person collision
Publication number: TRV 2012: 189

11. Arrival

In the case of major stations, the arrival realm can consist of a variety of features. Many connecting traffic and crossing streams and large distances must be organised well for good functionality and comfort. For the smooth functioning of the journey, the connections between the 'arrival' and the train and bus are very important.

On the other hand, in smaller towns and rural areas it may be of a very simple kind, with only one connecting bus and a small lay-by. The complexity is small, with limited features.
Entrance to Umeå East
11.1 Features for arrival

The whole journey must work for the passenger. That means that all the station features have to be weighed together. Responsibility for the various features are often shared between several parties, such as municipalities, RCM/county transport companies, landowners and estate agents.

Smooth arrival at, and connection to a station and platform vary from one type of station to another. At a commuter station, an entrance parking lot, for instance, is necessary for the journey to work, unlike a large central station, where the arrival is often by other modes of transport.

11.1.1 Car parking and waiting

In order to provide a clear outline at the transfer point and a functional use, where traffic is effectively separated, if possible, a lay-by and car park should be located on one side of the station and a bus terminal on the other. This is obviously not the case at the smallest stations.

Car parking should be given the lowest priority in terms of proximity to the platform entrances. Short-term parking and park-and-ride will be placed closer to the entrance than the long-term parking, but not at the expense of bicycle parking and public transport. An exception is priority seating, which must be in close proximity to the main entrance/street. Priority seats will be available at all stations and are governed by national laws and in the TSI.

Passengers who use long-term parking, for several days, often dedicate more time to switching to trains and can therefore be somewhat further away. It is desirable for long-term parking to be guarded or fenced.

Commuter/entrance parking is mainly provided at the more pronounced commuter stations. For them to work well they need to be located...
near the station entrance. Parking spaces with heating can enhance attractiveness. A commuter car park is mostly a municipal responsibility, but may be operated commercially. Some form of short-term parking and curb parking or zone, where those who provide lifts to the station, are able to drop the passengers (kiss- &-ride) will be available at all stations.

11.1.2 Bicycle parking
When it comes to the accessibility of station entrances, bicycle parking should take precedence over both the public lay-by and car park to send a clear signal that cycling is a priority. Unlike the bus lay-by (which should be well arranged), it is an advantage to distribute bicycle parking spots at all entrances, so as to ensure good accessibility from all directions. Otherwise, it may entail a risk of spontaneous and disorderly parking at secondary entrances.

For it to be easy to cycle down, it should be as close to the platform as possible, in order to make it attractive to cycle to the station. Bicycle parking should be located within a distance of 200 metres from the station. In PBL, Section 15, paragraph 6 stipulates that it is the client's responsibility to arrange parking for vehicles, and even bicycles. The requirement of bicycle parking in the form of well-arranged, clearly designated ground parking and with the possibility of locking bikes is a basic feature of all stations. At major stations, some of the bicycle spots should also be sheltered.

Generally, there should be bicycle parking equal to 10% of the number of passengers on existing stations in all groups. Another recommendation is 15%, which may be implemented, for instance, in connection with refurbishments. In the long term, it is reasonable to have a goal of bicycle parking for 20% of passengers. For new constructions, there should at least be a reserved area for expansion to this level in the long term.
At the very largest stations, it is also desirable to have a secure indoor garage. There may be a potential for developing the service concept where the garage feature can be combined with another offer. A rule of thumb states that it takes 2,000 bicycles for a monitored car park (in combination with bicycle repair shop) to be economically feasible.

An important factor for bicycle parking to work is proper delineation: for example, with walls. The dimensioning of bicycle parking is crucial; each bicycle is about 1.7 metres long, and the optimum distance between bicycles is 0.4 - 0.6 metres (this also depends on the bicycle rack design - also see ‘Cycle Management at train stations’).

Furthermore, it is important for the canopy to allow in light and for the parking lots to be well lit for comfort and to be safe for cycles and passengers.

**11.1.3 Bus landing**

Fast and secure transfers between different types of public transport should be given high priority within the station. The location and design should allow changes to a normal running time. This means that the bus must be parked in close proximity to the main street leading to/from the platforms. In many cases, this means next to the entrance to the central, grade-separated connection. In stations with large terminals and several different types of buses (long-distance, regional and/or local buses), it is also important for the design of the terminal to enable fast, smooth changes between internal buses.

It is important for both flexibility and security that passengers do not have to cross a busy street between the bus and train. For the same reason, even the bus terminal should be designed such that passengers do not have to cross the bus traffic. At small stations, the problem may be solved with stop positions adjacent to a pavement running along the station and at bigger stations, with different path connections.
Another design element that can extend the transfer times is the longitudinal extension of the bus landing. Long terminals where each bus has its own fixed stop position risks becoming extremely area-intensive and results in long walking distance. Major bus landing areas also entail other negative consequences. It can be lonely and unsafe at hours when the transfer point is not frequently used, and it takes the place of other important features that also need to be located as close to the entrances as possible. With modern information technology, it can be easier for passengers to find the right stop even with shared bus stop locations. Terminals with the docking solution usually have similar drawbacks. They take up less space in the longitudinal direction, but conversely give rise to other deserted and sealed off areas.

For bus landing in all station groups, at least one specifically designated bus stop with a sign (which does not need to be unique per line), should be provided. All stations should be provided with weather protection and/or a canopy at the bus stop.

It is important to provide seating even in the lay-by areas, but it is not necessary to provide benches that are specifically intended for bus passengers at smaller stations.

11.1.4 Usability for the disabled
It is the property owner’s responsibility to ensure good accessibility for the disabled in the arrival zone of the transfer point, regardless of the size of the station. Parking spaces for eligible people should be located directly adjacent to the entrance. The TSI requirement applies when there is a station-specific parking area and one of possibly several entrances: in other words, the obstacle-free route to the platform. European or national rules should otherwise apply to parking lots. ALM, Section 16 stipulates a requirement for slip resistance and even coating, with a maximum gradient of 1:50, and the place should be 5 metres wide (if the adjacent walking area cannot be used). The arrival zone should be well lit, and the TSI-driven basic requirements and the obstacle-free route between the station entrance and platform should be illuminated with at least 100 lux (see TSI).

11.2 For further reading
‘Bicycle parking at the travel centre.’ The Swedish Transport Administration and the Municipality of Uppsala, Liselott Söderström and Malena Möller, 2010 (Was taken up in Den Goda Staden and is an ‘update’ of Petra's report)

‘Experience of working with bicycle parking at Uppsala Travel Centre.’ The Swedish Transport Administration and the Municipality of Uppsala, Robin Billsjö and Liselott Söderström, 2010

‘Make room for the bicycle - Guidance and inspiration for planning bicycle parking at stations and travel centres.’ The National Housing Board, Järda Blix, 2010

‘Road to the cycling community - good examples of municipal bicycle planning.’ SKL, 2012

GCM Manual
12. Service

In addition to the distinctive travel features, which are the Transport Administration’s responsibilities, and the associated arrival features at the transfer point (e.g. car parks) that are often the responsibility of the municipality, the operator or property owner, a series of features that fall under the collective term service, will be added. The following describes what should be available at a station location and what the passenger services and commercial services represent.
Store integrated into the station environment, Flintholm Station
12.1 Waiting features

For a ride to work, an opportunity should be provided to spend any waiting time in a convenient manner, regardless of the type of station concerned. For many passengers, waiting at the station entails standing for a few minutes on a platform; for others it may entail sitting for an hour in the waiting room. The general level of service at a station, of course (except the station's size), depends on whether there is a station with a waiting room.

A waiting room with general seating should be provided in a station building, where available. It is important for these to be designed according to current regulations for usability. Any level differences should be addressed with a ramp or lift, not only a staircase, in the obstacle-free path to the station building. While the ramp is short, it is important that the slope is not steeper than 1:12. A ramp of more than 3 steps should be supplemented with stairs. A slope of 1:20 or a flatter ramp should be pursued and the ramp should be at least 1.3 metres (see also HIN 1, Section 6 on the accessibility to public premises). Hearing loops should be provided in the passenger areas of the station building.

12.2 Passenger service features

Service that is necessary or facilitates travel is very important for the passenger. This applies to the management of tickets, the ability to get help and information, and the ability to use the toilets.

12.2.1 Purchase of tickets

Although many passengers have tickets when they arrive at the station, they should be able to buy tickets, renew their monthly card, download discount cards or collect paper tickets. Ticket machines should, therefore, be provided at medium-sized and large stations. The biggest stations should also house a staffed ticket booth for selling tickets manually.
Some agents have a ticket system that enables passengers to validate their ticket upon arrival. This means that agents must set up the so-called validators at the relevant stations. These should be located in a manner that does not disrupt the flow or reduce safety at the station. (see Chapter 8 on platforms).

12.2.2 Toilets
At larger stations with station buildings, toilets should be provided, and it is desirable for all stations to be provided with toilets. At least one toilet should be accessible for people with wheelchairs for limited outdoor use (2.2 x 2.2 metres).

12.2.3 Staffing, luggage and escort
A station staffed with knowledgeable staff, provides security and support during the journey, which is desired by many passengers. At stations with large numbers of long-distance passengers with luggage, or near tourist destinations, luggage boxes, valet luggage storage and luggage trolleys may be needed. For this type of station, it may also be relevant to provide information about the place, and even a staffed tourist office may be required. A map of the site with important numbers, however, is a basic requirement to be found on all major stations. A station host who can help with ticket purchase, orientation etc. may be required at major stations. This need is especially great in crisis situations. Escorting is a help for passengers, to lead them between the train and the approach. It is a service that is specified in the EU regulation (EC 1371/2007) on passenger rights and obligations.

12.2.4 Services for cyclists and motorists
Services such as bicycle rental or access to compressed air, car rental and/or service centres depend completely on the conditions provided at each station, and usually require commercial initiative.

There should be access to pre-ordered taxis at main stations. At the biggest stations, so-called taxi hosts should also be available. The property owner and/or the railway company/operator is responsible for the travel service. The scope of service is dependent on the conditions of each station.

12.3 Features of commercial operations
A station's commercial range varies with its size and the traffic situation in the area, and expansion and content in the area around, local and regional commitment etc. The extent of the commercial offering depends on each station's capabilities and therefore varies from station to station. The commercial provision is linked to the existence of customers and the operation could create conditions for a more pleasant environment provided that the travel support service functions well.

Commercial services of various kinds can result in people coming to the station, even if they are not travelling. Creating station environments that attract people other than passengers can help create crowds, which in turn creates security. It can also contribute to the awareness of public transport among non-travellers. It is important for the design to be such that this kind of commercial support does not interfere with travel. It should always be possible for people to get their bearings quickly in the station environment so that they can easily find their mode of transport. This should be achieved without signage, if possible.
Commercial activities of various kinds can either be housed in a station building or in buildings in close proximity. The municipality may, in its planning, actively develop the area around a transfer point with the possibility of commercial and social activities of the kind that provide added value to the passenger. This depends on the commercial opportunities available at the place, so is rarely offered at small stations. This service is not funded by the station fee or ticket as it is not necessary for the journey.

The commercial range usually includes a café or fast food joint or, at major stations, a restaurant. A kiosk and vending machine at the station building or on the platform can be an option at small stations, or for a stressed passenger. At the main stations, a variety of shops may be possible. These services are completely dependent on the commercial operators and the commercial opportunities available at each station. Payphones may also be provided, even with a mobile phone extension. ATMs and WiFi are obvious requirements of large stations.

12.4 For further reading, Chapters 8-12
Arcadis Nederland BV, ‘Stations en Architectuur’ (unknown year)

‘The Swedish National Rail Administration’s Advice and Guidelines - Guidelines for the design of the physical environment for the disabled, the Swedish National Rail Administration HK-SS.’ Lena Lingqvist and Karin Björkman, 2005

BFS 2004: 15 ALM

BVF 511 ‘Transport information fixtures - dynamic signs for transport information.’

BVS 543.41203 ‘Power supply facilities. Platform lighting.’
BVF 544.70007 ‘Signal system. Design of platform facilities.’

BVF 586.20 ‘Free space along the track.’ 1998

BVS 1586.26 ‘Platforms - geometrical requirements for new construction and refurbishment.’

BVS / BVH 586.40

‘Bicycle Management at the railway stations.’
The Swedish National Rail Administration, Petra Halvarsson

‘Bicycle parking at the travel centre.’ The Swedish Transport Administration and the Municipality of Uppsala, Liselott Söderström and Malena Möller, 2010 (Was taken up in Den Goda Staden and is an ‘update’ of Petra’s report)

‘Experience of working with bicycle parking at Uppsala Travel Centre.’ The Swedish Transport Administration and the Municipality of Uppsala, Robin Billsjö and Liselott Söderström, 2010

‘Make room for the bicycle. Guidance and inspiration for planning bicycle parking at stations and travel centres.’ The National Housing Board, Järda Blix, 2010

‘Road to the cycling community - good examples of municipal bicycle planning.’ SKL, 2012

GCM Manual

ELSÄK-FS 2008: 1 ‘Electrical Safety Board’s regulations and general advice on how the electrical installations must be designed.’ The Swedish Electrical Safety Board

‘Future market, train traffic and capacity in Central Stockholm.’ (Appendix 1). Royal Institute of Technology, Department of Infrastructure

‘Manual on station environments - design platforms.’ White/Banverket, 2004

‘Railway in urban planning, the basis for the application of the Environmental Code and the Planning and Building Act (2009).’ The Swedish Rail Administration

Act (1998:150) on general camera surveillance

‘Location of platforms - principle study.’ Report 2004-01-26, Lars Lagerstrom

SJ standard for platform lengths SJF 541.7
Rail technology. Railway yards and yard devices (3rd edition 1986)

‘The station’s basic features - the basic architecture, features and services’ Ling Qvist & Palmlund, 2010


Road and street design (VGU).’ The Swedish Road Administration and the municipalities and county council of Sweden, 2004


‘Advice for the design programmes and design work in different stages.’ The Swedish Road Administration, Publication number: 2009: 161, Release Date: 22-12-2009

Compiled planning documentation - Road safety
Part document person collision

Publication number: TRV 2012: 189

TDOK 2012: 128

TRV 2012: 002.