**HiTrans** Best practice guide

# 3

## Public transport & urban design

Development of principles and strategies for introducing **Hi**gh Quality Public **Trans**port in medium sized cities and regions

hi trans

Interreg North Sea Region

HiTrans Best practice guide 3

# Public transport & urban design

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## An introduction to HiTrans

HiTrans is an abbreviation for "the development of principles and strategies for introducing high quality public transport in medium size cities and urban regions". Examples of high quality public transport may be light rail, guided busways or frequent, comfortable buses. But the defining criterion of "high quality public transport" is the ability to compete with the private car for everyday travel in circumstances where car ownership is widespread. Established by a partnership of cities and transport agencies in the United Kingdom and Scandinavia, HiTrans is specifically aimed at cities and urban regions in countries bordering the North Sea that have populations between 100,000 and 500,000 people.

The project is jointly funded by the European Commission's Interreg IIIB North Sea Programme and the following partners:

- Rogaland County Council, Norway, (lead partner)
- Aarhus County Council, Denmark
- Edinburgh City Council, Scotland
- Helsingborg City Council, Sweden
- Stavanger City Council and Sandnes City Council (in partnership), Norway
- Sunderland City Council, England
- Jernbaneverket, the Norwegian National Executive for building and maintaining railways
- NEXUS, which operates the metro in Tyne and Wear, England
- NSB BA, the Norwegian National Railway operator
- Oslo Sporveier, which plans and operates the bus, tram and metro network in Oslo, Norway
- Statens vegvesen, the Norwegian Public Roads Administration.

The North Sea region is characterised by urban networks with few large but many medium sized cities and urban regions. Urban land use is generally low density when compared to other parts of Europe. There are also similarities in terms of urban culture and climate in the North Sea region that can affect the use of different transport modes. Car ownership and usage in European cities is generally increasing, and providing public transport that can compete with the private car is a challenge throughout Europe. But there are some challenges that particularly apply to medium sized cities and urban regions. In contrast to that of large cities, public transport in medium size cities and urban regions tends to be based on relatively low quality bus services. Smaller populations and thus lower passenger demand mean that expensive infrastructure such as heavy rail or subways cannot normally be justified.

Medium size cities that are looking for alternatives to normal bus services rarely have the resources to adequately research the advantages and disadvantages of emerging technologies and concepts of high quality public transport, particularly as these would apply in their circumstances.

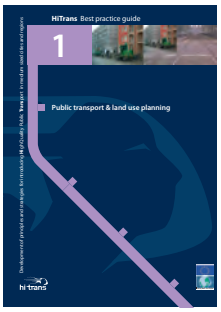
HiTrans is a cooperative research effort to obtain this knowledge; to find suitable and cost effective solutions for such cities, and to learn from the best examples of relevant cities throughout the world.

But the aim is not just for high quality public transport. The aim is for high quality cities.

Most new concepts of high quality public transport require new infrastructure. It is a challenge to make such infrastructure fit into – and better still, enhance – the qualities of the urban landscape.

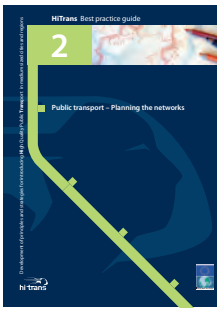
High quality public transport can also be used to restructure our cities to enhance the accessibility of the people who live in them without the choking traffic that diminishes our quality of life. At the same time it is expected that spatial planning oriented towards a city's high quality public transport network can be a critical factor in building patronage that in turn can justify more service.

HiTrans' work has been organised through 5 work packages called *strands*. This work has resulted in 5 best practice guides.



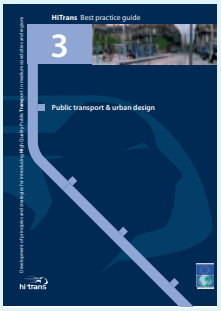

**Best practice guide 1**
**Public transport & land use planning**

How can we reshape our cities to facilitate the use of public transport? A series of case studies provides some inspirational illustrations of what can be done – as well as some salutary lessons of what to avoid. There are examples of cities regenerating run-down areas, curtailing urban sprawl, building successful public transport oriented communities, ridding themselves of traffic-chocked city streets, as well as examples of cities reinventing themselves as attractive places in which to invest and to live.
Main consultant: Lynn Devereux (WSP, Cambridge)



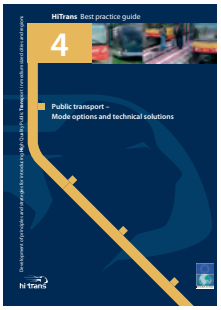

**Best practice guide 2**
**Public transport – Planning the networks**

Medium size cities face special challenges when introducing high quality public transport. How can the patronage be raised to generate the frequencies needed to make public transport a viable alternative to the car? This challenge is on top of well-known dilemmas that lie behind questions such as how far apart stops should be and whether resources should be spread between dense network of routes, or concentrated in a few, higher frequency routes. Illustrations and graphs demonstrate principles of network design, introducing concepts that simplify and clarify the planning public transport services. Also the report gives an overview of various legislative frameworks and their effects on the provision of public transport.
Main consultant: Gustav Nielsen (Civitas, Oslo)



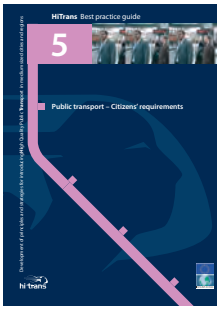

**Best practice guide 3**
**Public transport & urban design**

The introduction of high quality public transport can have profound implications for a city's urban design. It may be introduced with-out any thought about how it will look or its impact on people's ability to move about and enjoy the city's public spaces. On the other hand, it may be carefully designed to reinforce or en-hance these aspects – or to play a crucial part in the reinvention of the city's image. This guide uses case studies to examine the variety of urban design factors that should be considered when introducing high quality public transport: overhead wiring, rails, signs, stations, stops, guideways, safety barriers, as well as the vehicles themselves. It also provides advice on advertising and preventing vandalism.
Main consultant: Marie Burns (Burns+Nice, London)




**Best practice guide 4**
**Public transport – Mode options and technical solutions**

There is a wide range of options available for those planning the introduction of high quality public transport. Rail-based options range from ultra light rail to heavy rail, with various permutations and combinations such as tramtrains, light metros, metrotrains and so on. Cities opting for bus-based transport will have to choose between different forms and combinations of propulsion, as well as whether to use bus only streets, busways, and/or to adopt one of the evolving technologies to guide buses. The experiences of numerous cities are used to provide lessons of how to introduce cost effective solutions that suit the local circumstances, and avoid costly mistakes.
Main consultant: Trevor Griffin (Interfleet Technology, Derby)




**Best practice guide 5**
**Public transport – Citizens' requirements**

This report investigates what the citizens of medium sized cities require from the public transport system. The report is split into two parts. Part 1 is a desktop study analysing the findings of previous research into the requirements of both users and non-users of public transport. Part 2 presents case studies of medium sized cities and regions that are perceived as being successful in providing high quality public transport. The study identifies the qualities that have made a difference, as for example fare structure, speed, reliability and frequency.
Main consultant part 1: Alan Howes (Colin Buchanan and Partners, Edinburgh)
Main consultant part 2: Tom Rye (Napier University, Edinburgh)

**Contributors**

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(Burns+Nice Ltd, UK.

Through regular meetings the author has consulted the HiTrans Strand 3 working group consisting of:
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Hugh Daglish, City of Sunderland
Marco Zanussi, City of Sandnes
Ulf Bakke, NSB

Rob van der Bijl, Amsterdam, has given expert advice and Ian Radbone of QED, Adelaide, has given editorial advice.

The HiTrans international steering group (ISG) is the main responsible body of the HiTrans reports. All HiTrans partners have a member in the ISG.

## The HiTrans project

The HiTrans research project is being undertaken by a partnership formed of cities and regions bordering the North Sea. This project is examining the principles and strategies necessary for the introduction of better and more competitive high quality public transport into medium size cities and urban regions with populations of between 100,000 and 500,000.

In order to explore the Project's aims comprehensively five areas of work or 'strands' of investigation have been defined. The strands are independent studies, which are complementary in addressing the HiTrans' remit.

The key aims of Strand 3 of the HiTrans Project are to investigate:

- the best ways of making new infrastructure **fit** within an existing environment.
- how a new public transport system can be used to **enhance** qualities of the urban landscape.

The Partners of Strand 3 agreed that the following themes were to be addressed as part of evaluating best practice and creating a set of urban design principles.

**Advice on new public transport infrastructure and its interaction with the surrounding environment**

- the definition of appropriate urban design,
- the planning and design processes needed to generate the best outcomes in urban design, including the use of master plans, public consultations etc,
- the minimisation of the impact of new infrastructure on the natural environment,
- control of advertising,
- design to address potential vandalism and physical damage from the outset.

**Advice on infrastructure in the public realm**

- the best approach to new transport infrastructure within historic areas,
- integration of new infrastructure into the streetscape,
- minimising the impact of rails or dedicated tracks on the urban environment,
- minimising the impact of power supply equipment, including electricity substations, on the urban environment,
- sharing road space when public transport involves on-street running
- creation of a new public realm.

**Advice on station and stop surroundings**

- the best way to ensure that new infrastructure will have high architectural / aesthetic qualities, whilst retaining common design elements,
- integration of stops with public spaces and adjacent buildings,
- integration of new stops with existing and new modes of transport,
- how stops can be made visible to potential passengers, but not visually intrusive.

**Advice on city marketing and branding**

- how the new infrastructure and trams can enhance the public image of a city
- how the enhanced image can be used to market and brand a city.

The focus of Strand 3 is to explore the opportunities that a new high quality transport system can bring to the redefinition or creation of the public realm. The perspective of urban design within the context of this study is that of integration and opportunity of a new transport system within the urban environment physically and visually. The Strand seeks to establish the means by which urban integration can be achieved plus the additional benefits that such a scheme offers to a place by looking beyond the provision of a public transport system. The study seeks to identify those aspects of urban design that can be addressed and given further meaning by the introduction of a new high quality transport system. The aim of this Strand is to clarify the role that a high quality public transport system can have within a comprehensive urban design strategy that has at its core the public realm. The significance of the public realm within this study reflects the focus of high quality transport modes selected which run on-street and therefore directly impact with the public fabric of a place; its streets and urban spaces.


F 1.1 Montpellier


F 1.2 Nottingham


F 1.3 Oslo


F 1.4 Manchester

**Outputs of Strand 3.**

- a **best practice guide** on urban design when introducing new infrastructure for high quality public transport in medium size cities.
- a **set of principles for urban design**, elaborated into checklists on the interrelation of urban design with public transport, which can be applied as a toolkit by transport authorities and local government when introducing high quality public transport infrastructure.

*"Urban Design is the art of making places for people. It includes the way places work and matters such as community safety, as well as how they look. It concerns the connections between people and places, movement and urban form, nature and the built fabric, and the processes for ensuring successful villages, towns and cities".*
(DETR & CABE 'Urban Design in the Planning System: Towards Better Practice')

**Context of the study within urban design literature and practice**
Strand 3 is concerned with two distinct scales of urban design; how a new public transport system can be physically integrated within an existing urban environment at the detail level and to what extent the new infrastructure project can provide the opportunity to enhance the urban design qualities of a place at the strategic level.

In order to respond to the Strand 's brief a literature search has been undertaken to establish the new emerging principles of urban design. The second part of the literature review focuses on the role of the public realm within the urban environment. The impact of a new public transport system, running at ground level, is located and experienced within the public realm, that of the streets and spaces of a city or town. The significance or role of the public realm is investigated to enable the design opportunities of introducing a new public transport project to be identified.

The third aspect of the literature review for Strand 3 is that of public realm strategies. The literature review is concerned with urban design and the public realm and establishes the design principles or opportunities at an 'academic' level. The significance of Strand 3 is that its remit is concerned with translating and applying emerging urban design philosophies into practice. To satisfy this practice element of the study a series of public realm strategies have been reviewed.

**Case study selection**
The research has explored the integration of high quality public transport systems those of train, light rail, tram and guided bus, within medium sized cities or regions with populations of between 100,000 and 500,000 inhabitants. The modes of transport selected by the Partners were chosen for two main reasons, firstly these transport modes are on-street and therefore have a physical and visual impact on a city or town, which meant that metro systems were not considered as part of this study. Secondly the choice of transport modes reflected the spectrum of potential new transport systems that could or may be considered by the Partners in the future for their respective cities or towns. The purpose of Strand 3 has been to explore the design approaches taken when introducing a new high quality transport system. The size of the city or region was not sensitive, as it is the physical details of each scheme that are being reviewed in order to draw comparisons between the case studies to enable a series of design guidelines to be established.

## Project approach

The criteria used to select the case studies has been based on the following:

- **geographic distribution**: the case studies have been selected from a number of European countries to enable a range of design approaches to public transport to be explored.
- **settlement patterns**: the population size of the case studies were able to vary given the subject matter of Strand 3, however case studies were identified from smaller settlements to illustrate examples of public transport extending beyond the city centre location.
- **high quality transport systems**: those of rail, light rail, tram and kerb guided bus were included in the case study selection to enable the varying urban design impacts of each particular transport mode to be compared. The type of transport modes were selected for their potential impact on the public realm as they run on-street and those modes were seen as potential considerations by the Partners.
- **availability of information**: each case study has been visited to assess at first hand the design approaches adopted and to take photographic record. Information about each case study has been researched via, where possible, speaking to officials responsible for the design of the schemes, undertaking literature reviews and searching the web.
- **age of system**: best practice need not be chronological, yet more recently completed schemes were thought to be able to illustrate innovative or contemporary urban design approaches and materials.

**Data and survey information for case studies**
For each case study the following information has been identified where possible:

A range of methods: site visits, speaking to officials, literature reviews and searching the web have been used to collect background information for each scheme.

- city / town country
- population size
- infrastructure type
- date of scheme completion
- extent of scheme and number of stops

Site Visits

These visits obtained

- a photographic record illustrating the urban context of scheme, stop design and the project's infrastructure, details of materials, street furniture and accessibility
- an appreciation of the urban form of the case studies, its vehicle and pedestrian movement patterns and public transport network including public transport interchanges
- knowledge of vehicle livery
- maps of transport route showing extent of system, number of stops
- city / town maps
- where possible information and views from the officials involved with design or running of the scheme regarding project aims and design approach, costs and financial arrangements

Further information on each case study has been identified

- costs of the scheme
- sources of finance
- reasons for selection of transport system by authorities
- policy objectives
- implementation time scale.
- implementation problems, and how these were overcome.
- availability of city marketing material
- design approaches to avoid vandalism of the stops and infrastructure

Chapter Two sets out to establish an urban design context for Strand 3 by reviewing the development of urban design theory with particular reference to the public realm and the contribution of public realm strategies to setting out a framework into which public transport is but an element.


F 1.5 Zwickau


F 1.6 Heilbronn


F 1.7 Strasbourg


F 1.8 Leeds

## Emerging principles of urban design

This review considers the question of how life in general with high quality public transport in particular can best be accommodated in urban and semi-urban places. There is a long history of attempts to answer that question by considering what qualities a place can offer and how those qualities can be created.

The literature review focuses on how the urban design context for high quality public transport can be set by:

- the aesthetic dimension of structures and spaces
- understanding how urban spaces work, based on careful observation and formal methods of analysis
- the development and use of urban design principles
- collaborative processes for guiding design and development
- role of the public realm

These are the elements of theory and practice that must be brought together, in the unique combination that is always the hallmark of successful urban design, wherever the aspiration is for a high quality public transport project that will enhance the places it serves.

**The aesthetic dimension**
The 'aesthetic' dimension can be defined as that which possesses a sense of beauty; relating to the perception of the senses, visual appearance and their effects. The philosopher Roger Scruton (1979) suggests that aesthetic pleasure is not immediate, unlike purely sensual pleasures, rather it depends on, and is affected by, processes of thought.

Urban design is an activity concerned with both function and appearance. The search for a set of urban design principles was grounded in a particular concern for visual appearance, for creating places that were beautiful. The aesthetic dimension is appreciated in a well-designed building, structure or urban scene in which one part seems to fit naturally with another. Each part seems to have been designed with the others in mind. This realisation gives pleasure and helps to make a comfortable environment.

**Picturesque qualities**
The Austrian urban design theorist, architect and planner Camillo Sitte (1843-1903) analysed urban spaces in terms of their picturesque qualities. Sitte has been a significant influence of thinking about the aesthetics of urban design ever since his book City Planning According to Artistic Principles (Der Städtebau) appeared in 1889.

He pioneered the study of townscape:

- urban form and its visual appearance
- the appearance of streets
- the way the components of a street combine in a way that is distinctive to a particular locality
- the principles of composition

In Sitte's view, a successful picturesque composition would create a sense of

- **enclosure** (for example, by ensuring that a person standing in a square should not be able to see out of the square along more than one street at a time),
- **continuity** (with buildings being joined to one another rather than being freestanding)
- **proportion** (with the size of a space relating to the size of the main building bordering it)

Sitte advocated irregular layouts, emulating the variety found in medieval and renaissance towns, and the careful placing of monuments to act as landmarks and enhance a space's sense of character.

**The townscape movement**
From the 1940s the townscape movement in the UK followed Sitte in proposing that each building should be seen as part of the urban composition. This aesthetic approach to urban design was later criticised for being merely visual. The use of the term 'townscape' was developed through writers associated with the Architectural Review, including Thomas Sharp, Ian Nairn and Gordon Cullen.

An influential urban designer, draughtsman and writer, Gordon Cullen (1914-94) noted that places are experienced by people who are moving through them. His technique of 'serial vision' (drawing a series of images of the changing view on a walk through an urban area) was a way of analysing this. The enjoyment of a place, Cullen suggested, is enhanced by the experience of seeing buildings and structures in changing juxtaposition, and of the anticipation of features coming into view. Accordingly the urban environment should be designed with the moving viewer in mind.

Cullen's techniques developed into many of the analytical techniques that urban designers still use, but the townscape movement was much less concerned with the functions of urban space than urban designers are today.

# Emerging principles of urban design

**People and places**

The extent to which urban design has more than just an aesthetic dimension owes much to the early influence of the Patrick Geddes (1854-1932) A biologist, botanist, ecologist, geographer, town planner, educator and social philosopher, Geddes saw himself primarily as a sociologist. His aim was to show how social processes and the environment interacted, and how the processes of urban and social change could be managed in the interests of the social development of the individual.

Geddes pioneered the use of the concept of the region (and the technique of regional survey) as the basis for social, economic and environmental analysis. At the start of his career he organised practical, low-cost improvements in Edinburgh's historic, decayed Royal Mile, involving residents and volunteers in the process. He developed the technique he called 'conservative surgery'. This was an incremental approach to area improvement, which involved the people who lived and worked there and, unlike much practice then and since, ensured that they were able to remain there and benefit from the improvements. His later report, City Development: a study of parks, gardens and culture-institutes, published in 1905, presented an inspiring vision of how local people could participate in and learn from the process of town planning and regeneration.

Throughout his work Geddes insisted on planning and urban design being based on rigorous survey and understanding of the particular place. Design was not just a matter of aesthetics, and it could not be left to the experts. Planning, he insisted, was 'the development of a local life… capable of improvement and development in its own way and upon its own foundations, not something which can be done from above, on general principle easily laid down, which can be learned in one place and imitated in another'.

Geddes wrote: 'Architecture and town planning… are not the mere products of the quiet drawing-office… they are the expressions of the local history, the civic and national changes of mood and contrasts of mind.' He wanted to present a contrary view to 'those town planners who design a shell, and then pack their snail of a would-be progressive city into it, not discerning that the only real and well-fitting shell is that which the creature at its growing periods throws out from its own life'.

**Rediscovering the street**
The writer and urban activist Jane Jacobs (b1916) rediscovered for a new generation many of the things that Geddes had advocated and that had since been forgotten. Jacobs is best known for her book The Death and Life of Great American Cities, one of the most influential in the history of planning and urbanism. Published in 1961, it attacked contemporary planning practice and passionately advocated traditional, mixed-use neighbourhoods. Never before had the essential complexity of urban life been so revealingly described. Jacobs has been one of the most effective and influential advocates of the street as the focus for urban life.

**How urban spaces work**
The urbanist and sociologist William H 'Holly' Whyte followed on from Jane Jacobs' work. His influential studies based on close observation of how people used streets and plazas include The Social Life of Small Urban Spaces (1980). 'It's hard to design a space that will not attract people,' he wrote. 'What is remarkable is how often this has been accomplished.'

This same tradition has been continued by the Danish architect and urban designer Jan Gehl (b1936), who is noted in particular for his close analysis and understanding of what makes successful streets and public spaces. Gehl seeks to understand public space by asking what it is for. He divides the use of public space into three activities:

- necessary activities, whose incidence is only slightly influenced by the physical setting. Examples include going to school or work, shopping or waiting for a bus
- optional activities which are undertaken voluntarily, if time and place allow, and if weather and setting invite them. Examples include going for a walk to get a breath of fresh air, stopping for a coffee in a street café or people-watching
- social activities which depend on the presence of others in public space, and occur spontaneously as a direct consequence of people moving about and being in the same space at the same time. Examples include greetings and conversations, communal activities, and seeing and hearing other people.

# Emerging principles of urban design

**Methods of analysis**

The urban designer and planner Kevin Lynch (1918-1984) was a major influence on the development of modern urban design, and his methods of analysing and graphically notating urban form are the most commonly used by urban designers today. Lynch defined seven criteria in Good City Form, published in 1984. They are:

- **vitality**: the degree to which the form of the settlement supports the vital functions, the biological requirements and capabilities of human beings; above all, how it protects the survival of the species
- **sense**: the degree to which the settlement can be clearly perceived and mentally differentiated, and structured in time and space by its residents, and the degree to which that mental structure connects with their values and concepts: the mental capabilities, and our cultural constructs
- **fit**: the degree to which the form and capacity of spaces, channels, and equipment in a settlement match the pattern and quantity of actions that people customarily engage in, or want to engage in; that is, the adequacy of the behaviour settings, including their adaptability to future action.
- **access**: the ability to reach other persons, activities, or places, including the quantity and diversity of the elements that can be reached
- **control**: the degree to which the use and access to spaces and activities, and their creation, repair, modification and management are controlled by those who use, work, or reside in them.
- **efficiency**: the cost, in terms of other valued things, of creating and maintaining the settlement, for any given level of attainment of the environmental dimensions listed above.
- **justice**: the way in which environmental benefits and costs are distributed among persons, according to some particular principle such as equity, need, intrinsic worth, ability to pay, effort expended, potential contribution, or power. Justice is the criterion that balances the gains among person, while efficiency balances the gains among different values.

Lynch explained that the last two criteria (efficiency and justice) apply to each of the other five. The first five 'are meaningless until costs and benefits have been defined by specifying the prior basic values. In each case, one asks: first, what is the cost (in terms of anything else we choose to value) of achieving this degree of vitality, sense, fit, access, or control? And, second, who is getting how much of it?' Lynch has gone well beyond aesthetics, and instead judges city form by how it creates a setting for the lives of the people who use and experience it.

**Responsive environments**

Much of this thinking was introduced to the UK in 1985 with the publication of Responsive Environments, an influential primer of urban design by Bentley, Alcock, Murrain, McGlynn and Smith. The book sets out seven urban design principles:

- **permeability**: there should be a choice of alternative ways through any environment
- **variety**: places should offer varied experiences through their range of uses
- **legibility**: people should be able to understand the layout of a place
- **robustness**: places should be usable for many different purposes
- **visual appropriateness**: the appearance of a place should make people aware of the choices it offers
- **richness**: detailed design, materials and construction techniques should contribute to increasing the sense-experiences users can enjoy
- **personalisation**: people should be able to put their own stamp on their environment

**New Urbanism**
In America the Congress for the New Urbanism (CNU) has set out what it sees as the principles of traditional town planning and urban design. The CNU was convened in 1993 and drew up its charter in 1996. The charter outlines a set of prescriptive principles or codes to guide public policy, development practice, urban planning and design, aimed at restoring existing urban centres and towns within coherent metropolitan regions, reconfiguring sprawling suburbs into communities of real neighbourhoods and diverse districts, conserving natural environments, and preserving the built heritage.

The charter declares that the neighbourhood, the district and the corridor are the essential elements of development and redevelopment in the metropolis:

- **neighbourhoods:** should be compact, pedestrian-friendly and mixed-use
- **districts:** generally emphasise a special single use
- **corridors:** (ranging from boulevards and railway lines to rivers and parkways) are regional connectors of neighbourhoods and districts

Many activities of daily living should occur within walking distance. Schools should be within walking or cycling distance for children. Neighbourhoods should have a broad range of housing types and price levels. Appropriate building densities and land uses should be within walking distance of public transport. Concentrations of civic, institutional and commercial activity should be embedded in neighbourhoods and districts, not isolated in single-use complexes.

A primary task of all urban architecture and landscape design is the physical definition of streets and public spaces as places of shared use. The design of streets and buildings should reinforce safe environments, but not at the expense of accessibility and openness. Streets and squares should be safe, comfortable and interesting to the pedestrian. Architecture and landscape design should grow from local climate, topography, history and building practice.

**Traffic calming**
In the past few years measures known collectively as 'traffic calming' have been taken to reduce the speed of motor traffic, particularly in residential areas. These measures include education, enforcement and engineering. A distinction is sometimes made between volume control measures, which generally divert traffic to streets better able to handle it, and speed control measures, which alter the roadway to reduce speeds. The term traffic calming was introduced as a translation of the German Verkehrsberuhigung by the transport planner Carmen Hass-Klau. She traced the concept back to Colin Buchanan's advocacy of environmental areas, the first of which were designated in British towns in the 1960s.

## Emerging principles of urban design

The campaigner, planner and urban designer David Engwicht (2003) insists that traffic-calming initiatives must be considered in a wider context. Everyone has had their quality of life diminished by excessive traffic, he argues, even those whole live in quiet cul-de-sacs or on traffic-calmed streets. 'They must breathe poisoned air; endure noise and fumes when shopping; send their children to schools located on major roads; be mired in traffic congestion; become a full-time chauffeur to their children; drive more than they need because public transport is inadequate; or take their life in their hands every time they want to walk or cycle. Our entire society has paid a very high social and cultural price for the loss of the street as the epicentre of community life.'

Over the last couple of years traffic calming has developed into what has become known as 'second-generation traffic calming'. This approach to traffic engineering and urban design breaks down barriers between people and vehicles. One of its advocates, Ben Hamilton-Baillie (2001), notes that traffic engineering and urban design have developed as separate professional disciplines. He points to new ideas and experiments in mainland Europe that since the late 1990s have challenged the traditional separation of social activities and vehicular movement in urban areas. 'These new design principles use legibility and an enhanced sense of place as the cornerstone of traffic engineering,' he writes, 'making a clear distinction between the regulated world of the highway and the culturally defined public realm of social zones.'

The new approach to shared space in urban areas combines clear gateways, lower traffic speeds, the use of eye contact with the removal of road markings, signage and the conventional regulations of the state. 'The history of traffic engineering is the effort to rationalize what appeared to be chaos,' Hamilton-Baillie says. 'Today, we have a better understanding that chaos can be productive… The more you post the evidence of legislative control, such as traffic signs, the less the driver is trying to use his or her own senses.

David Engwicht (2004) comments: 'Second-generation traffic calming accepts that it is impossible to plan changes to people's physical environment without taking into account their 'mental topography' (their beliefs, values, mythologies and many "frames of mind"). This includes, Engwicht writes, an understanding of their contradictory desires and values and how they are currently resolving that conflict, and 'an understanding of the "psychology of space" how the arrangement of physical space can change a person's mental space and hence what they value at any one point in time.' Engwicht concludes: 'To change physical realities you must integrate planning in three domains: mental, physical and social / cultural.'

**The self-reading street**
Second-generation traffic calming has introduced the concept of the 'self-reading street': one whose users have to watch other users carefully to judge how they are likely act, rather than being able to depend on hardware such as traffic lights, road signs, street bumps and lane markings. Advocates of self-reading streets claim that such hardware makes road users less aware of (and therefore more dangerous to) each other.

**From aesthetics to the qualities of successful places**
The debate about the role of planning in relation to design in the 1970s and '80s centred on the control of the aesthetic qualities of development. This led to confusion, with planners failing to explain why aesthetic matters were a valid concern of public policy. In 1980 UK government planning policy was focused solely on land uses, and was not concerned with what were considered to be matters of design. The government's view was that aesthetics and the physical form of buildings and structures were matters for developers and their designers alone, and should not be the concern of public policy. The government declared that 'planning authorities should recognise that aesthetics is an extremely subjective matter. They should not therefore impose their tastes on developers'.

Later this attitude softened. In 1992 government guidance noted that 'aesthetic judgements are to some extent subjective and authorities should not impose their taste on applicants'. By 1997 the government had nothing to say about the subjectivity of aesthetic matters, decreeing bluntly that 'local authorities should reject poor design' (Carmona, Heath, Oc and Tiesdell, 2003). The change in attitude came about partly as a result of the conservation movement, which had made the case that some historic places were so valuable and valued that their physical fabric must be protected by the planning system. This led to the acceptance that not just historic places but all places are of value or have the potential to be valued, and that places which have an urban environment of low quality have a particular need for planning protection, as they – all places where people live or work – are most likely to have more low-quality development inflicted on them. It is now accepted that urban design is relevant from the largest to the smallest scale, and from the most historic town centre to the newest suburban development.

By the 1990s the government had become convinced that the physical form of buildings and the quality of development were matters of public concern, and should come within the remit of the planning system. The DETR / CABE guide By Design (2000) was a response to this. Subtitled Urban Design in the Planning System, it sets out a framework through which the planning system can take account of urban design. It focuses on:

- the qualities that we look for in a place
- the elements of a place's physical form
- the processes by which policy and guidance can shape the physical form in a way that makes it more likely that those qualities will be achieved

The term aesthetic control, which had been the focus of much controversy in discussions of planning, has been hardly heard since the late 1990s. The architect Lord Rogers wrote in 2000 of his experience of chairing the Urban Task Force: 'Civil servants and politicians in this country will always shy away from any discussion of even the most commonplace aesthetic values… Again and again while writing the Urban Task Force's report… I was strongly advised not to use words like "beauty," "harmony," "aesthetic" and even "architecture" if I wanted the report to be taken seriously by those who counted. And sure enough those words hardly appear, replaced by less alarming euphemisms: "good design," "planning" or, better still, "construction".'

It is now generally recognised that aesthetic matters should be a concern of the planning system, but they are best treated as an integral part of design rather than an abstract quality that bears little relation to the practical matters of how a place works. The authors of By Design, accordingly, hardly used the term aesthetics, but they covered aesthetic issues in considering the wider issue of the physical form of development. By Design did this by asking: what makes a successful place?

By Design notes that successful streets, spaces, villages, towns and cities tend to have qualities in common. These are the qualities that all development, whether of transport facilities or any other use, should contribute to. It identifies the seven qualities of successful places as:

- **character**: a place with its own identity
- **continuity and enclosure**: a place where public and private space are clearly distinguished
- **convivial public realm**: a place with public spaces and routes that are attractive, lively and pleasant to use
- **ease of movement**: connectivity and permeability: a place that is easy to get to and move through
- **legibility**: ease of understanding: a place that has a clear image and is easy to understand
- **adaptability:** ease of change: a place that can change easily
- **diversity and choice:** a place with variety and mixed uses

## Emerging principles of urban design

In By Design, aesthetics are implicitly included in the quality of a 'convivial public realm'. And one of the five aspects of development form described in By Design – 'appearance (details and materials)' relates directly to aesthetics. This confirms that matters of aesthetics are at the heart of urban design, and that the planning system now has a clear structure for dealing with them.

**Urban design guidance**
The general understanding that making places socially, economically and environmentally successful depends on high standards of urban design raises the question of how good design can be delivered. The challenge is to influence the development process, not only on high-profile sites but wherever urban change is reshaping places.

Local authorities need a framework of planning and design policy (currently set out in their development plans) complementing the new generation of community plans and neighbourhood renewal strategies. The effectiveness of all of these tools in delivering effective planning and good design depends on urban design guidance, such as public realm strategies, urban design frameworks, development briefs and master plans.

There are four types of guidance that can usually be distinguished from one another.

- guidance relating to specific places: urban design frameworks [for areas], development briefs [for sites] and master plans [for sites]
- guidance relating to specific topics: including public realm strategies, and design guides on topics such as shopfronts, house extensions, lighting and cycling
- guidance relating to specific policies: examples are policies on conservation areas, transport corridors, waterfronts, promenades and green belts
- guidance relating to a whole local authority area: these may give general urban design guidance for the whole district or county

**The public realm**

Analysis of a town's or city's public realm goes back at least as far as Giambattista Nolli, whose famous plan of Rome was the forerunner of today's common technique of using figure-ground (or figure and ground, or Nolli) diagrams. Such plans show the relationship between built form and publicly accessible space (including streets and the interiors of public buildings such as churches) by presenting the former in black and the latter as a white background, or the other way round. Katherine Shonfield (1998) writes: 'The great strength of this method of describing space is that it throws into full relief both the spaces themselves and the network of interconnections of these public places, and shows you precisely where such interconnection is aborted or cut off.'

Much discussion today focuses on the extent to which public space is actually public. There are many alternative ways of classifying what is or is not public realm, and assessing its quality. Criteria include whether or when people are charged for being there; whether it is publicly or privately owned; whether there are restrictions on when or how it is used (whether photography is allowed or whether people are welcome who are not engaged in the space's primary function, for example, such as in the case of many shopping malls or exclusive housing developments); and whether it is privately or publicly managed. Spaces that may or may not be classified as being public, depending on the circumstances, include shopping malls, shops, public transport, cinemas, pubs and private housing developments. In the words of Katherine Shonfield: 'All time spent outside the home and workplace is public time, and all places where that time is spent are public spaces.'

David Engwicht (2003) writes that cities are composed of two types of space: exchange space and movement space. 'The more space a city devotes to movement, the more the exchange space becomes diluted and scattered,' he writes. 'The more diluted and scattered the exchange opportunities, the more the city begins to lose the very thing that makes a city a city: a concentration of exchange opportunities.'

The urban design historian Spiro Kostof (1992) noted the decline of the public realm but thought that the situation was not completely hopeless. 'Our public places were proud repositories of a common history,' Kostof writes. 'We have largely abandoned that sense of a shared destiny, and our public places show it. What is left may not be much, but it is crucial. We still want to be with other people, if not engaging them directly at least watching them stroll by. The public places unique to our time may be thoroughly privatised. Their motive may be no more noble than to lure us to buy. But having been drawn to the mall or boutiqued-up old town square for "recreational shopping" and the obligatory stop for food, we discover each other and might remember the place when we want to stage a public event, or celebrate a private event in public.'

The links between transport, development and the public realm are explored in transit-oriented development (TOD), a development concept pioneered by the California-based, English urban designer Peter Calthorpe. Development is concentrated around public transport stops at a scale that encourages walking, with some workplaces and local services. Terraces of family housing are served by on-street car parking. Similarly the planners, Michael Bernick and Robert Cervero, have promoted the concept of a transit village as one of a series of relatively high-density, mixed-use developments on a public transport route.

# Learning from public realm strategies

**Public realm strategies**
A public realm strategy is likely to be the key to providing a framework in which public transport infrastructure can be designed successfully in an urban setting. A successful public realm strategy, like any other planning and design framework, is based on finding the appropriate balance of four factors that influence the development process. These are:

- a review of relevant policy set out mainly by central and local government
- a feasibility review based on an understanding of economic and market conditions locally and regionally
- a context appraisal of the site or area, its setting and the people who may be affected by development
- the creative input of the people who draw up the planning and design principles in response to the policy and feasibility reviews and the context appraisal.

A public realm strategy may complement, or be complemented by, guidance relating to some of the specific places to which it applies. Such documents may be:

- **urban design frameworks:** describing and illustrating how planning and design policies and principles should be implemented in areas where there is a need to control, guide and promote change. Such areas include urban quarters, transport interchanges and corridors, regeneration areas and town centres. Urban design frameworks are used to coordinate more detailed development briefs and master plans. The framework will include a vision of future infrastructure requirements
- **development briefs:** provide guidance on how a specific site of significant size or sensitivity should be developed in line with the relevant planning and design policies. The brief will usually contain some indicative, but flexible, vision of future development form
- **master plans:** charting the master planning process and explaining how a site or a series of sites will be developed. It will describe how the proposal will be implemented, and it will set out the costs, phasing and timing of development.

**Examples of public realm strategies**
The examples are intended, not to give comprehensive summaries of the strategies, but to give a sense of the nature of the public realm strategy approach and its relevance to provide frameworks for integrating high quality public transport into an urban environment.

Common themes to the public realm case studies are;

- significance of survey and analysis
- historic development
- use of the existing public realm
- coherent design approach to materials and street furniture
- creating connections and legibility (Pool of London Public Realm Framework Strategy)
- defining the meaning of place (Fleet Street)
- development of design guidelines / design code (Barking Town Centre)

**Pool of London Public Realm Framework Strategy**
Client - Pool of London Partnership, Corporation of London, Tower Hamlets Borough Council
Consultant: Burns + Nice

The Strategy intends to identify priorities, set standards and realise the full potential of the public realm in the Pool of London, building upon the planned environmental improvements and major projects already underway around the Tower of London. The aim is to create a clear implementation strategy to enhance and improve the environment and establish a clean, safe, friendly and attractive environment for people to live, work and visit.


*F 2.1 Tower of London*

**Historical development and the built environment**
The historic development of the Study Area has significantly contributed to the current urban form of the area and provides a unique resource, which through high quality interpretation, can inform and enhance the enjoyment of the public realm throughout the area. Assessing the extent of designations within the study area shows the importance of the World Heritage Site, the three Conservation Areas and how these designations can inform treatment within their designations.


*F 2.2 Historical mapping*

**Character areas**
Drawing on the historic development and the assessment of the public realm and spaces, a number of areas with locally distinctive characteristics were identified which have been used to inform and enhance the environmental improvement projects within the Strategy.

**Public realm**
Although the area is densely developed there are many open spaces for passive recreation. The report distinguished public spaces, privately owned accessible spaces and privately owned non accessible spaces of visual importance. These spaces were assessed for quality using the following criteria:- biodiversity, connectivity, streetscape, signage, lighting, public art and management, the resulting guidelines allow a strategy to improve the public realm as a unified whole yet retaining site specific individual uses and character.


*F 2.3 Built age*

**Transport and the pedestrian environment**
In ascertaining popular destinations, existing and possible high frequency pedestrian routes were highlighted. An assessment of major traffic corridors, secondary corridors, local and access roads, vehicle courts and cycle routes and their crossings together with pedestrian barriers identified underused routes and spaces within the public realm, informing the approach to the design of the strategy to improve permeability and use of space.


*F 2.4 Public open space*

**Masterplan**
The audit and assessment of the existing public realm and consultations with residents, businesses and key stakeholders identified important issues that need to be addressed. The area as a whole as well as the local character areas within, contain important assets around which the Master Plan has been developed. These assets and the approach to their use include:

- character areas
- reconnection and strengthening of the historic street pattern
- interpretation of, and focus on, the archaeology and historic built environment
- linkage and improvement of open spaces
- enhancement of, and improved access to, the Thames Riverside


*F 2.5 Traffic corridors*


*F 2.6 Masterplan*

# Learning from public realm strategies

**Fleet Steet Courts and Lanes Design Strategy, London**
Client - Corporation of London
Consultant: Burns + Nice

The study investigates and evaluates enhancements to the courts and lanes public realm network within the Fleet Street Conservation Area. The study develops a design strategy and guidelines, which reflect both recent contemporary developments and the historic fabric to improve the accessibility, safety, appearance and function of the courts and lanes.

**Historic form and the built environment**
A study of historical mapping, historical texts and searches of local records explains the growth of the study area from the origin of Fleet Street, through periods of development, war damage, introduction of transport systems, social and industrial trends to the current built environment. A pattern of building age, building size and building footprint emerges, and the network of roads, courts, lanes and spaces directly associated.

**Land use and activity patterns**
A survey categorises building function, the entrances and exits used and the resulting impact on the surrounding spaces, these uses occur at different times of day for different activities and different social groups. Private space, although often inaccessible is visually important, therefore contributing to the perception of character for an area. Landmark buildings and long distance and sequential views navigate pedestrians, influencing movement patterns.

**Permeability**
Analysis of traffic routes and positioning of crossings is crucial to pedestrian flows. Instances of conflict between pedestrians and traffic inform a unified strategy for traffic calming, pedestrianisation and positioning of crossings to improve the public realm and its permeability. An access audit highlights potential problems or difficulties for able bodied and disabled pedestrians alike.

**Audit**
An extensive audit of the physical elements gives a more detailed picture of the study area as a whole. Pavement materials, planting, street furniture and lighting can enhance or detract from this character.

**Character areas**
Clear defined areas emerge as a result of the survey information, the style and age of the buildings, their footprints, their relationships to the spaces between them and the materials used create distinct sub-divisions with intrinsic characteristics, these in turn attract different usage patterns. Primary and secondary roads contribute by forming clear boundaries between these character areas.

**Design guidelines**
Covered entrances, pedestrian lanes, pedestrian courts and streets are common elements within the whole of Fleet Street. A unified strategy of works to improve accessibility, permeability and the legibility of direction of routes has been applied to each of these categories. A palette of suggested materials furnishings and approaches ranging from traditional through to high quality contemporary were chosen to complement each individual character area. This ensures each character area builds on its unique attributes and yet is consistent and legible throughout the whole study area.


*F 2.7 Built age*


*F 2.8 Historic court*


*F 2.9 Pedestrian / traffic audit*


*F 2.10 Character areas*


*F 2.11 Concept design*


*F 2.12 Montage*

**Barking Town Centre Code 'Town Code'**
Client - London Borough of Barking and Dagenham
Consultant: Burns + Nice

Barking is the subject of a comprehensive regeneration initiative through a partnership between local government, regional bodies and national agents. The report seeks to improve Barking's urban environment for residents and visitors alike through better connections and properly organised spaces, in addition the reports' aim is to identify the materials, products and construction techniques to be applied in the public spaces through the 'Town Code' and four pilot schemes.

The main criteria that the 'Town Code' and pilot schemes reflect are:

- quality in design and materials
- pedestrian priority
- sustainability
- community safety
- access for all

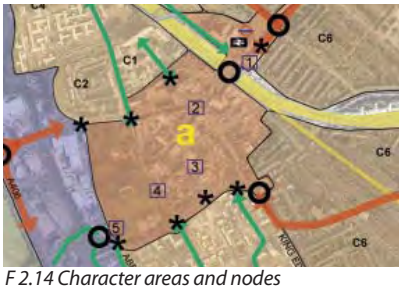
**Character areas**
The current built layout and associated spaces can be explained by historical activities, the introduction and growth of transport systems and social and cultural issues. Four character areas have been identified:- High Street Network containing the retail centre with the rail station and the market, Abbey Green open space containing the historic heart of Barking, Riverside containing the Roding valley corridor and Residential Areas containing the Victorian terraces and the public housing estates. Many landmark buildings within Barking help define these character areas and help guide pedestrians through the public realm.

**Public realm hierarchy**
The document highlights the significance of existing and proposed public spaces and their role in the future of the Town Centre. The public spaces, major pedestrian routes, key junctions and river walk provide the public realm hierarchy, analysis of this highlights key nodes and specific examples of public realm in need of improvement. Existing road and rail routes and proposed transport systems into and out of Barking Town Centre and the wider area have been integrated into the public realm to create a unified environment.

**'Town Code'**
The 'Town Code' has been developed for the character areas and the public realm. This sets out a list of materials, furnishings and design approaches for each character area. All of these have been chosen to complement the intrinsic qualities of each area and yet are all part of a wider complementary package that creates a coherent public realm throughout Barking.

**Pilot projects**
Four pilot projects, one from each character area were identified, to illustrate the inventiveness and flexibility of the 'Town Code'. The schemes promote innovation, shape streets of interest and help to develop a distinctive character for Barking's Town Centre. Principles were chosen to ensure that the approach of the 'Town Code' was equitable and applicable to all areas and achievable within the resources available. The successful implementation of these projects is dependent on the quality of detailing and workmanship. Their long term sustainability is dependent upon effective maintenance and management.


*F 2.13 Aerial view*



*F 2.14 Character areas and nodes*


*F 2.15 Pedestrian routes*


*F 2.16 Pilot project*


*F 2.17 Montage*

## Introduction to case studies

In order that the case studies can be compared and evaluated with regard to their contribution to urban design when introducing a new high quality public transport system, each case study is considered under the same headings.

Data is provided for each case study that illustrates its location and records population and settlement type, together with information on the transport system: the transport type, date of opening, extent of the system. The number of stops and construction costs is set out separately from the main text so that an immediate context for the case study can be appreciated. The construction costs should be seen as an order of costs of the scheme. This is because obtaining financial information is sensitive and not available in a consistent format of expenditure.

The description of each case study is divided into the following sections:

**General Introduction**
The brief introduction to the case studies sets out the key reasons for the new public transport system and its aims. Particular aspects of the scheme that influence the urban design outcome are recorded, such as the role of the public realm or politics in determining the design approach.

**Platform and stop design**
The design approach taken to the platforms and the stops are described such as the height of platform and its paving materials together with the paving detail between tracks. The components of the stops are recorded. These include the design of the shelters, seats, ticket machines, litter bins, lighting, railings and hand rails. The impact of advertising on the environment of the stop is noted. Other elements within the stop for example closed dircuit television (CCTV), public announcement systems, planting and the use of colour within the design approach are discussed. Accessibility issues such as the use of ramps, steps, tactile paving and paving colours complete the description of the platform.

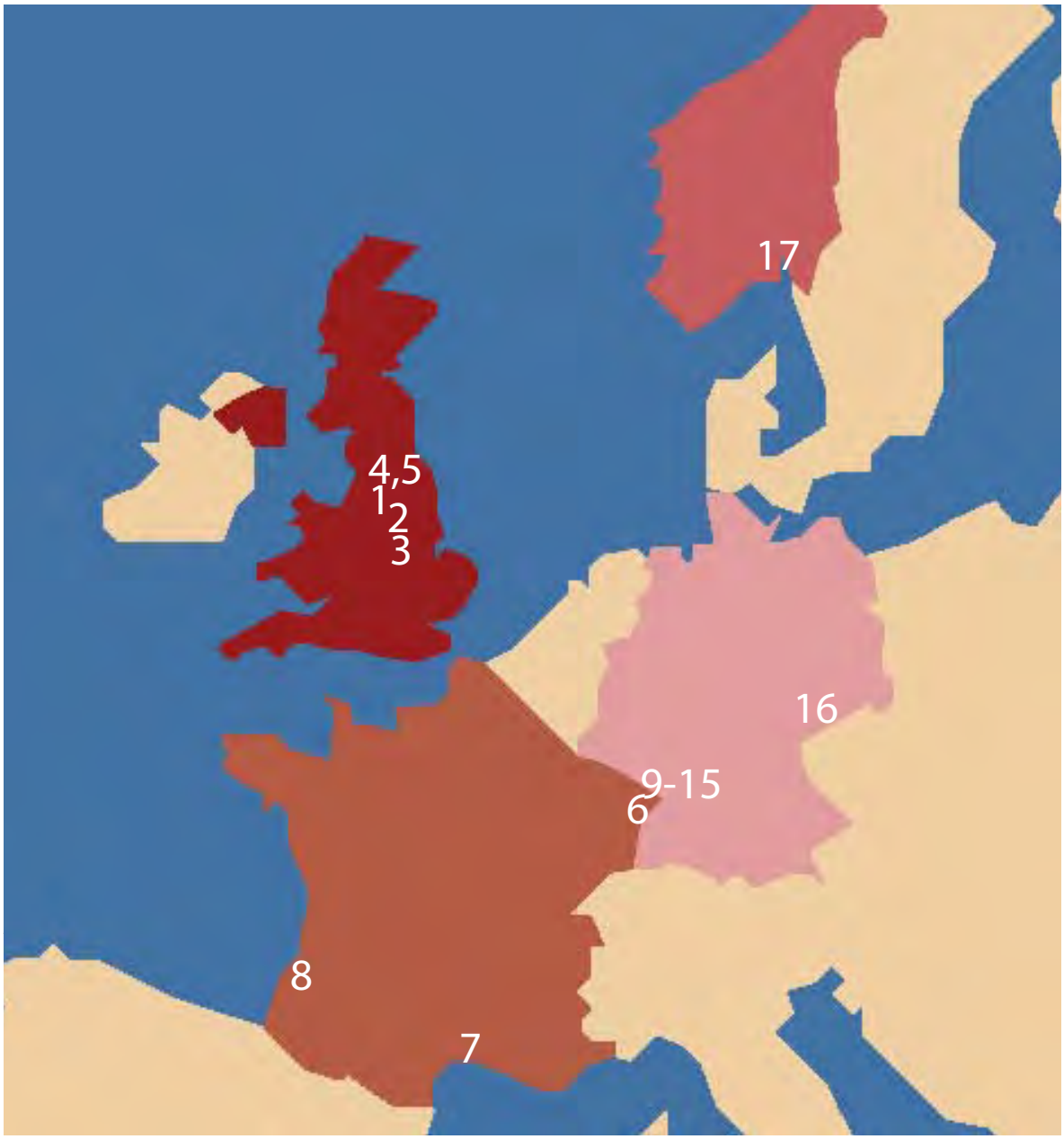
**Track design**
The design approach used for the tracks and their level of integration within the streetscape is recorded with its impact on redefining or creating the public realm. The paving materials used and the retention or the removal of existing kerbs are described and discussed, together with the location and impact within the urban environment of pedestrian barriers in association with the tracks.

**Power supply and wirescape**
The design approaches within the case studies to power supply are described including the overhead wirescape and the supports used. Implications as to their effect on the urban design qualities of the case study are explored.

**Vehicles**
The interior and exterior livery of the vehicles including the use of advertising, colour and accessibility characteristics are described including what effect the experience of the vehicle may have on the urban design character of the case study.

**Urban design issues**
In this final section the key aspects of the case study are noted in terms of their contribution to best practice and design guidelines when introducing a high quality public transport system into a built environment. Successful and unsuccessful qualities that set the case study apart in urban design terms are highlighted. This section of the case study includes the implications of wider urban design issues such as city branding or public transport integration.

Each case study is illustrated with a series of photographic images, that serve to show the scheme within its built context as well as demonstrating the urban design qualities of the system.




**United Kingdom**

| | | |
|---|---|---|
| 1 | Manchester | light rail |
| 2 | Sheffield | tram |
| 3 | Nottingham | tram |
| 4 | Leeds | kerb guided bus |
| 5 | Bradford | kerb guided bus |

**France**

| | | |
|---|---|---|
| 6 | Strasbourg | tram |
| 7 | Montpellier | tram |
| 8 | Bordeaux | tram |

**Germany**

| | | |
|---|---|---|
| 9 | Blankenloch | light rail |
| 10 | Wörth am Rhein | tram-train |
| 11 | Rheinstetten | light rail |
| 12 | Wolfartsweier | tram |
| 13 | Heilbronn | tram-train |
| 14 | Bad Wildbad | tram-train |
| 15 | Saarbrücken | tram-train |
| 16 | Zwickau | train-tram |

**Norway**

| | | |
|---|---|---|
| 17 | Oslo | tram |

# Manchester

Transport mode
Light rail

Date of opening
Phase 1 1992
Phase 2 2000

Extent of system km
Phase 1 31
Phase 2 8.2

Number of stops
Phase 1 28
Phase 2 9

Construction costs in euros
Phase 1 215 million
Phase 2 237 million

Population
420 000

Settlement type
City

Opened in 1992, Metrolink was England's first new on-street light rail system, although only 3km actually runs on-street. The reason for the Metrolink was to reduce traffic congestion in the city centre and to link Piccadilly and Victoria Stations. Metrolink is a hybrid between light rail and heavy rail, chosen for its ability to use existing rail track and existing stations. The tracks are at street level within the city centre and in some locations share the carriageway with vehicular traffic. Outside the city centre the system is confined to segregated routes.

**Platform and stop design**
There are two design approaches to Metrolink's stops those on-street within the city centre and those on re-used sections of rail track. The four new stops, within the city centre have platforms of 90cm height, with ramped access at both ends. Tactile paving demarcates the edge of the platform. The new stops have standard metal-framed shelters with glass back and side panels and a curved polycarbonate roof. Stops that have re-used existing railway stations have received no alterations as part of the Metrolink project.

The on-street platforms, except for St Peter's stop, are paved with red pre-cast concrete paviors laid in a herringbone pattern, edged with a large pre-cast tactile unit. The stop in St Peter's Square is paved in York stone, with tactile York stone edging.

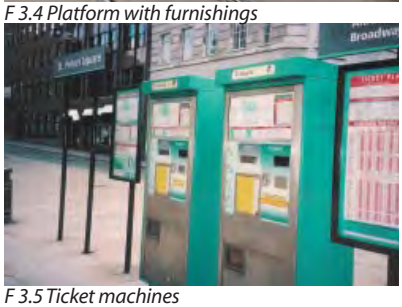
Within the shelters street furniture is limited to an information or advertising panel, Benches are provided in some locations. The platforms are comprised of stop signage, litterbins, ticket machines, information boards and telephone boxes. Pedestrian barriers are required at some of the stops due to the height of the platforms. All the street furniture is standard and painted black. The ticket machines are in the operator's corporate colour.

**Track design**
The integration of the tracks within the streetscape of the city centre has been minimal. In the city centre, with bus and light rail traffic, the tracks are within block paviors laid in a herringbone pattern. Existing kerbs were retained. Outside this area the tracks are cut into the existing tarmacadam of the roads. Where Metrolink runs on segregated tracks, within a railway corridor, the tracks are supported on sleepers with ballast in-between.


*F 3.2 Livery*


*F 3.3 Stop shelter*


*F 3.4 Platform with furnishings*


*F 3.5 Ticket machines*


*F 3.6 Platforms*


*F 3.7 Reused rail station*

**Power supply and wirescape**
Within the city centre Metrolink's route is dominated, physically and visually, by the use of columns and overhead cables. One street section does have the cables supported by wires from adjacent buildings. Within the segregated sections of the system large galvanized arches straddle the two tracks.

**Vehicles**
The exterior of the tram is white with a black and turquoise strip along the base. This corporate colour of the operator, is also used for much of the street furniture within the on-street stops. The vehicles are angular in design with relatively small windows, the height of the vehicle and the exposed wheels and axles, gives a now dated character to the system.

Advertising is restricted to two rectangular hoardings on each side of the roof.

**Urban design issues**
The main comments on the scheme are concerned with its lack of integration within the city centre due to the following:

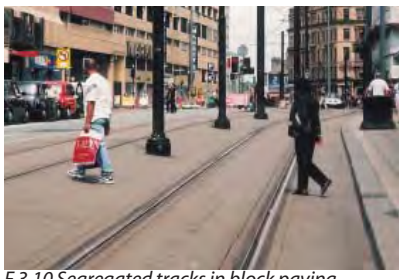
- urban design issues were not within the design of Metrolink
- no urban design master plan
- lack of positive design approach to on-street section
- the high platforms are inadequately detailed to be integrated
- the detail of the wirescape added to street clutter
- the new paving around the tracks is inappropriate for the character of he city centre and limited in its extent
- street furniture has no design coherency
- there is no integration with adjacent public open spaces

Metrolink did have constraints in terms of its design and contractual arrangements and a limited remit in terms of extent of paving. Deregulation of bus services limits the ability of the local authority to restrict bus movements. This has limited the opportunity to create of pedestrian-tram only streets.

As the city with England's first modern on-street light rail system, Manchester did initially use the new public transport system as a marketing tool.


*F 3.8 Tracks cut into tarmacadam*


*F 3.9 Columns and cables*


*F 3.10 Segregated tracks in block paving*


*F 3.11 Public open space*

# Sheffield

Transport mode
Tram

Date of opening
1995

Extent of system km
29

Number of stops
48

Construction costs in euros
325 million

Population
520 000

Settlement type
City

The aim of introducing Supertram was to regenerate Sheffield by reducing its traffic and parking problems, encourage the redevelopment of the Lower Don Valley and connect the city centre to Meadowhall, Europe's then largest out of town shopping centre.

The scheme did make use of an existing rail route to Meadowhall from the city centre. Elsewhere Supertram runs on-street either sharing road space with other vehicles or on dedicated tracks within road central reservations.

The Supertram system is low floored and fully accessible. Conductors have replaced ticket machines to reduce fare dodging and improve passenger safety. Sheffield's Supertram includes four park and ride facilities.

**Platform and stop design**
The design approach to the stops is divided into three:

- the stops outside the city centre have standard blue bus shelters with seating if space on the pavements allow
- in the city centre attention has been given to two key stops to provide a sense of place: Cathedral stop has black painted street furniture, although standard in design, new lighting columns with crests and York stone paving. The stop at Castle Square has been designed as part of a new public space with artist designed railings
- the stop at Meadowhall has been designed as an extension to the shopping centre, using the shopping centre's corporate colours. A purpose design shelter covers both platforms of the stop

Street furniture at the stops is minimal, the shelters contain location maps and sometimes a bench or perch seat. Tactile paving and yellow paint denote the edge of the platform. There are no ticket machines. Pedestrian guardrails are used where the stops are located adjacent to roads or within central reservations.

**Track design**
The design approach taken to the tracks within the city centre was to repave most of the width of the streets with York stone on the pavements and patterned coloured tarmacadam in the form of cobbles where the tracks run. There is an extensive use of pedestrian barriers in city centre where tramway and road run parallel. Where the tracks are located within a road outside the city centre, tarmacadum has been used. Within segregated sections of the Supertram network or where the tracks have been located within a central reservation, a conventional railway detail of sleepers with ballast has been used.

*F 3.12 Livery*


*F 3.13 Stop shelter*


*F 3.14 Platform with furniture*


*3.15 Segregated tracks in paving*


*F 3.16 Tracks cut into tarmacadum*


*F 3.17 Conventional railway tracks*

**Power supply and wirescape**
There are three broad approaches to the wirescape of Supertram:

- within the city centre the wires have been supported from the adjacent buildings, reducing street clutter.
- outside the city centre the wires are supported on columns set at the back of the pavement across road.
- where the tram's tracks are in segregated sections or within a road's central reservation the wires are supported by columns set in between the tracks with arms over each track.

**Vehicles**
The carriages are decorated in the corporate colours of the operators Stagecoach, a blue, red and orange horizontal strip on a white background. The trams, being lower floored than the Metro with more window area sit more readily in the street.

Advertising appears on many of the trams ranging from a small strip along the top of the tram to large adverts over the entire side of the tram.

**Urban design issues**
The Supertram was restricted by the design, build and operating contract used to implement the project. Deregulated bus services meant that traffic management within the city could not be adequately reviewed, leading to duplication of tram routes and traffic congestion where the tram shares road space with other vehicles. The use of standard street furniture for most of the system has not provided Supertram with a distinct image.

What Supertram did address was the opportunity to give the city centre an identity by re-paving the entire width of pavement and carriageway, by using sympathetic paving materials (within budget constraints) and changing the colour of street furniture to re-iterate a sense of place. In terms of reducing visual clutter within the city centre buildings where used to support wires. A new public square was created as part of the scheme as well as a new pedestrian connection, Park Square, from the city to nearby residential areas. Public art was also included within the Supertram project, the fencing at Castle Square was specifically commissioned.

Sheffield did set aside 1.5m euros to pay for consultation with businesses and residents during the course of the project's design and implementation. In terms of city branding the image of the Supertram continues to appear on post cards.


*F 3.18 Cables suspended from buildings*


*F 3.19 Columns and cables*


*F 3.20 Stop at Cathedral*


*F 3.21 On street running*

# Nottingham

Transport mode
Tram

Date of opening
2004

Extent of system km
14

Number of stops
23

Construction costs in euros
247 million

Population
270 000

Settlement type
City

Nottingham Express Transit (NET) operates on two-way working except for a section through Hyson Green where street space is too restrictive. The nature of the city centre street pattern requires the trams to be able to manoeuvre within a radius of 18.5m. The NET runs on-street for 4km of its 14km length. The tram, when on-street, shares road space with other vehicles. Elsewhere the tram runs on segregated track. Like Sheffield, there are no ticket machines at the stops, as fares are paid to conductors on the tram.

The new tram system is part of a long-term strategic approach to traffic management and public transport provision within Nottingham. Improving access to public transport was a key aim of the project. Tram - rail interchanges have been made accessible at Hucknall and Station Street stops. Five park and ride facilities have been newly built or adapted from existing car parks as part of the project.

The maintenance of the stops is divided between the City of Nottingham which is responsible for the platforms, and the operator Arrow Light Rail Ltd, which cleans the trams and infrastructure including the stop furniture.

**Platform and stop design**
There has been a coherent approach to the platform and stop design. The street furniture has been custom designed, in association with a manufacturer, with a restrained colour scheme of pale grey and stainless steel accented by NET's corporate green. The shelters have a grey metal structure with glass panels and a curved canopy. The shelters contain only perch seats with information and advertisement panels. The platforms have large advertisement panels, bins and lighting columns either placed centrally on a double sided platform or behind a drainage channel on a single sided platform. Stainless steel pedestrian guard rail fencing is employed on some single sided platforms.

The platforms are 30cm high and are fully accessible. Platforms within the city centre are paved in York stone with tactile paving at the platform edge and a drainage channel to mark the back of the stop. Platforms outside the city centre are constructed using pre-cast concrete paving slabs with similar details of tactile paving and drainage strips.

There is no requirement for ticket machines or pedestrian barriers at the on-street stops. The layout of the on street furniture and the multiple use of lamp columns to mount CCTV or the stop signage has resulted in uncluttered and legible stops that are pedestrian friendly.

**Track design**
The on-street sections of track are laid within tarmacadum with a rolled gravel finish. Footways have been repaved using York stone in the city centre. The segregated sections have a standard railway detail, that of ballast and sleepers, single or one-track working. There is no pedestrian barriers required within the city centre however along the segregated sections, mild steel railings or chain-link fencing is used either side of the tracks.

*F 3.22 Livery*


*F 3.23 Stop shelter*


*F 3.24 Platform with furniture*


*F 3.25 Attention to paving detail*


*F 3.26 Tracks*


*F 3.27 Tram within streetscape*

**Power supply and wirescape**
The power supply is treated in different ways depending on location. In the city centre, the cables are supported on wires from the buildings to reduce street clutter. Where this is not achievable either due to failed negotiation or width of space, then columns light grey in colour are used.

On segregated sections with single track working, columns painted green at the base and grey on top are located on one side of the track with an arm extended over the tracks. The segregated two-way working sections have a column in the centre of the tracks with an arm over each track.

In the city centre electrical intake cabinets are located at some distance from the stop to reduce their visual and physical impact on the stops. The substations outside the city centre are substantial in scale. There has been an attempt to mitigate their impact by the use of planting or architectural screens.

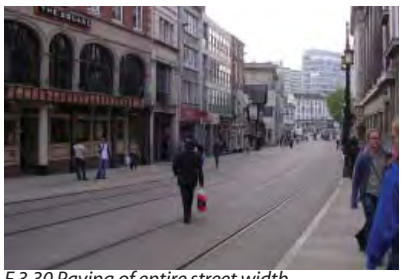
**Vehicles**
This is a low floor level tram with a glazed and curved front. The lines of the tram livery are flowing with large, tinted windows and fully glazed doors. The green and grey colour scheme is the NET's corporate colour. The train has advertising on the outside, which obstructs views and detracts from its otherwise simple appearance. Ticket conductors travel on the trams. The interior is spacious and comfortable with clear bright colours.

**Urban design issues**
Urban design issues were addressed during development and construction of the project. The main constraints on the project has been the design, build, operate and maintenance contract and the deregulated running of the bus services. Key aspects of NET scheme are:-

- traffic and public transport strategy established as context for tram
- pragmatic use of materials within carriageway
- renewal of carriageway and footways within trams' route
- low level trams and platforms have reduced impact on the street environment
- the street furniture and paving is clear and well designed
- reduced street clutter
- use of buildings for wire supports
- improved pedestrian movement in city centre
- lack of fencing at city centre stops contributes to visual integration
- Royal Centre stop adjacent to theatre; new public space created with piece of public art as focal point
- 5 park and ride facilities included in scheme but no positive design expression of these facilities
- rationalised car parking and service access within city centre
- cycle routes complement traffic management
- interchange created from Station Street tram stop to Nottingham's main railway station by foot bridge
- interchanges at Hucknall and Bulwell with Robin Hood Line trains


*F 3.28 Cables suspended from buildings*


*F 3.29 Columns and cables*


*F 3.30 Paving of entire street width*


*F 3.31 Public realm*


*F 3.32 Transport interchange*

# Leeds

Transport mode
Kerb guided bus

Date of opening
2001

Extent of system km
2.1

Number of stops
11

Construction costs in euros
15 million

Population
715 404

Settlement type
City

The kerb guided bus system is part of the city's overall Supertram proposals. However a tram route has not been viewed as economically viable. The kerb guided bus serves the areas outside the city centre that have a high car dependency. The kerb guided bus brings people from the suburbs to the city centre without being affected by traffic congestion at peak times. The bus lane is a single segregated route, which runs within the central reservation of the highway.

The kerb guided bus corridor is located outside city centre of Leeds between the outer and inner ring road. The scheme is transport driven in terms of its planning and aims. The project was determined by cost and expediency in terms of physically accommodating the tracks without demolishing properties or having to purchase land. There are no plans for extending the scheme further into the city centre due to the space requirements of the bus-way, which would necessitate the purchase and removal of buildings.

Since the introduction of the system there has been a 7% mobile shift from car use which is in response to a frequent, reliable and fast service, together with three park and ride facilities included with the scheme. To deter illegal parking along the route of the bus, a bus clearway was introduced.

**Platform and stop design**
The bus shelters were designed specifically for the guided bus-ways, although based on a standard shelter. As part of the overall East Leeds quality bus initiative, 330 stops were reconstructed and 150 shelters replaced.

The location of the stops within the centre of the dual carriage way and the choice of materials that are used for the shelters have reduced the incidences of vandalism. There are no ticket machines at the bus stops as fares are paid to the driver. The kerbs at the bus stops are 16cm high to accommodate access onto kneeling buses. Security issues were a priority in terms of design so large areas of transparency within the shelters, were created by the use of glazed panels for the shelters including the roofs. Lighting is included in the roof of the shelter. Street furniture is limited to an integrated perch seat within each shelter.

*F 3.153 Livery*

*F 3.154 Stop shelter*

*F 3.155 Stop and platform*

*F 3.156 Guided route*

*F 3.157 Guided route*

Each platform and shelter has the same design irrespective of location. The platforms are paved with pre-cast concrete paving slabs with a pre-cast tactile strip and pedestrian guard-rails. Guard railing is used to direct pedestrian movement to crossing points beyond the stop. The crossing points are defined with concrete barriers.

**Track design**
The bus-way is located within the central reservation of the carriage-way and fenced off from pedestrians. The concrete construction for the bus-way consists of two tracks for the wheels with the area between the tracks in-filled with concrete or gravel. Deterrent paving is laid adjacent to footways to stop pedestrians crossing at the bus-way. There is extensive use of pedestrian guard-rail along the route, each pedestrian crossing is controlled by railings with tactile paving at the threshold.

**Power supply and wirescape**
No wirescape is required.

**Vehicles**
The buses are fully accessible to all passengers. Over 40 new 78 seater double-decker buses have been introduced as part of the guided bus scheme. The fleet of buses are advertised as 'quality buses' with the brand name 'elite' at stops and on the buses. Commercial advertising is used on the outside of the buses.

**Urban design issues**
The kerb guided or quality bus scheme was not conceived as part of an urban design strategy for Leeds other than to reduce traffic congestion along certain routes into the city centre. Although successful in encouraging people to change from using their cars, the scheme is not successful as a project that is integrated or has high or good design qualities. More could have been achieved within the confines of the project to provide an identity to the scheme by having particular elements purpose designed together with a project design code.


*F 3.158 Guided route*


*F 3.159 Stop shelter*


*F 3.160 Track construction*

# Bradford

Transport mode
Kerb guided bus

Date of opening
2002

Extent of system km
2.3

Number of stops
8

Construction costs in euros
16 million

Population
467 668

Settlement type
City

The aim of the kerb guided bus project was to alleviate traffic congestion by providing an alternative means of transport to bring people from the suburbs into the city centre. The scheme is 3.7km long and includes 2.3km of kerb guided bus lane, together with 1.2 km, of dedicated bus lanes. The kerb guided bus lane is segregated from other road users and occupies the central reservation of the highway.

Local people have been involved in the development of the scheme through extensive consultation and publicity, including newsletters, press and radio information and discussions at public meetings. The scheme as well as providing improved bus services includes additional pedestrian crossings, new footways, seats and benches, and landscaping and environmental works.

**Platform and stop design**

The Bradford scheme has six purpose designed 'special' bus shelters, including two 'Super Shelters' that have associated wind turbines to power the heated seats. Three of these six new shelters house special audio or visual art installations. The shelters are painted bright red.

As with Leeds materials that are not easily damaged have been used and the stops are located within dual carriage ways. Therefore vandalism has been minimal. There are no ticket machines at the bus stops as fares are paid to the driver. The kerbs at the bus stops are 16cm high to accommodate access onto kneeling buses. Security issues were a priority in terms of design so large areas of transparency within the shelters were created by the use of glazed panels for the shelters including the roofs. Lighting is included in the roof of the shelter. Street furniture is limited to an integrated perch seat within each shelter, information panels and occasional litter bins, painted red.

The platforms are paved with pre-cast concrete paving slabs with a pre-cast tactile strip. Guard railing is used to control pedestrian movement to crossing points beyond the stop. Fencing associated with the major stops is painted bright red.

No new lighting along the stops was included in the scheme. Platforms are reliant on the existing street lighting.


*F 3.161 Livery*

*F 3.162 Stop and shelter*

*F 3.163 Stop and platform*

*F 3.164 Guided route*

*F 3.165 Pedestrian crossing*

**Track design**
The bus-way is located within the central reservation of the carriage-way and fenced off from pedestrians. The concrete construction for the bus-way consists of two tracks for the wheels, with the area between the tracks in-filled with concrete or gravel. Pre-cast concrete block paving is used either side of the bus-way. There is an extensive use of pedestrian guard-rails along the route.

**Power supply and wirescape**
No wirescape is required.

**Vehicles**
The buses are fully accessible to all passengers. The fleet of buses are advertised as 'quality buses' with the brand name 'elite' at stops and on the buses. Commercial advertising is used on the outside of the buses.

**Urban design issues**
As with Leeds, the kerb guided or quality bus scheme was not conceived as part of an urban design strategy for Bradford other than reducing traffic congestion along certain routes into the city centre. The scheme although successful in encouraging people to change from using their cars, is not successful as a project that is integrated or has high or good design qualities. However, the design of the shelters by the collaboration of artists and engineers has given the scheme an identity within the roadscape.


*F 3.166 Track construction*


*F 3.167 Custom designed shelter*


*F 3.168 Pedestrian crossing*

# Strasbourg

Transport mode
Tram

Date of opening
Phase 1 1994
Phase 2 2000

Extent of system km
Phase 1 10
Phase 2 12.3

Number of stops
Phase 1 18
Phase 2 24

Construction costs in euros
Phase 1 296 million
Phase 2 248 million

Population
260 000

Settlement type
City

The main aim of the fully accessible tram system was to eliminate traffic congestion from the city's historic core, which was detrimentally affecting public spaces in terms of air pollution and restricting pedestrian movement. Strasbourg used the new tram system to redefine its public realm, creating extensive areas for pedestrians by controlling vehicle movement within the city centre. Strasbourg set out a vision for the city, that was one of pedestrian priority, improved public spaces and a better quality of life. The tramway was the catalyst to achieve goals for the city's re-invention, beyond that of a transport solution.

**Platform and stop design**
The stop design for the Strasbourg system has focused on the development of a multi-purpose kiosk that includes the ticket machine, local and city mapping, timetable and real time information, the name of the stop, a public announcement facility and advertising opportunities. The kiosks serve to announce the location of the stops within the street, creating a series of local landmarks within the city.

The design approach taken to the tram stops is restrained and uncomplicated in terms of type and amount of street furniture. Most stops have a shelter with glass canopy, back and side panels, advertising opportunities have been exploited at the end panels of some stops. Each shelter contains integrated seating, standard litterbins and lighting columns are also used at the stops. Where space allows tree planting is included.

The design approach taken to the stops is uniform across the tram network with the exception of Place Kléber in the city centre, Hoenheim and Gare. At Place Kléber a large circular steel and glass canopy defines the new pedestrian space as well as acting as a gateway feature to Strasbourg's medieval core, which is a World Heritage Site.

The platforms are 25cm high with access ramps at each end. A pedestrian guardrail is only required where the stops are adjacent to roads, given the extensive traffic free areas within the city centre the stops are visually and physically well integrated into the streetscape. Paving materials within the stops have been chosen to reflect location. Granite paving and kerbs are used in the city centre with granite setts laid between the tracks. Outside the city centre pre-cast concrete paving slabs are used for the paving and kerb materials with pre-cast concrete block paving between the tracks. The edge detail for the stops is formed by a series of contrasting materials, in terms of colour and texture. A band of pre-cast concrete tactile paving with a white kerb into which lights are recessed define the edge of the stop.

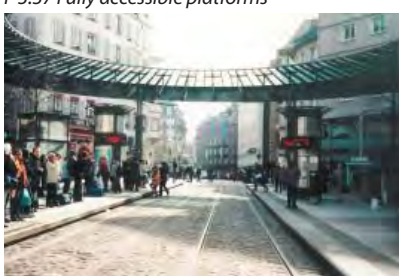

*F 3.33 Livery*


*F3.34 Stop shelter*


*F3.35 Platform with furniture*


*F 3.356Ticket machine*


*F 3.37 Fully accessible platforms*


*F 3.38 Place Kléber*

**Track design**
The materials used between the tracks, as with the stops, reflects their location within the city. Granite setts are used within the historic core, with pre-cast concrete paving outside the historic centre. Grass has been used where the tram is within the suburbs or within the university quarter, the tramway has been used to define this area of the city. In the university quarter the tram tracks have been located within the central reservation of the road. Tree and shrub planting with the grass treatment between the tracks create a distinct character that complements the 19th century street pattern.

Where the tramway crosses a road is indicated by chequerboard design painted onto the tarmac surface of the road.


*F3.39 Tracks in street*

**Power supply and wirescape**
Within the city's historic core the wirescape is supported by cables that are attached to buildings. In situations where streets are wide or within open spaces the wirescape is supported by cables from columns on either side of the tracks. The columns are also used to house the street lighting for the area. In the suburbs columns have been erected centrally between the tracks, with an arm over each track.


*F3.40 Columns and cables*

**Vehicles**
The low-level, fully accessible tram has large windows, which maximise the views out and give a sense of spaciousness and comfort. The tram has distinctive curved green glazing to the driver's compartments, the flowing lines of the glazing is complemented by the skirts that have been fitted over the wheels and axles. The amount of tinted glass used in the vehicle reflects the tram's environment as it moves through the streets, visually integrating the vehicle within the cityscape. There is no advertising on the exterior of the tram to detract from this visual integration.


*F3.41 Planting*

**Urban design issues**
Strasbourg demonstrates a new approach to the integration of a public transport system within an urban environment by the development of a citywide agenda based on improvements to the quality of life experienced by residents and those working in the city. The main attributes of the project are:

- the tram as an element within a master plan for the city
- a vision of a city for pedestrians and cyclists
- integration within streetscape has been achieved by low level platforms and restrained design approach to stops
- re-design and re-definition of the public realm includes tracks and stops
- development of integrated policies for traffic management and public transport
- paving materials used to differentiate areas within the city
- design of the tram as part of the new image for the city
- use of tramway to market city


*F3.42 Public realm*

# Montpellier

Transport mode
Tram

Date of opening
2000

Extent of system km
15.2

Number of stops
28

Construction costs in euros
349 million

Population
230 000

Settlement type
City

Montpellier is a historic city on the Mediterranean, that is fast expanding. The introduction of the tram system into Montpellier has been used as a catalyst to redefine the public realm and to re-brand the city to attract inward investment and professional workers. The tram system was used to re-assess the traffic and public transport movement within the city to enable extensive pedestrian areas to be created, as well as making existing and new suburbs accessible.

**Platform and stop design**

A comprehensive design approach has been taken to the stops and associated street furniture using a limited palette of materials: glass and stainless steel. The stops are highlighted by the blue of the tram used for the stop names, seats and canopies. The shelters are a metal framework with glass canopy, back and side panels. The glass canopy has been designed to act as a sunscreen by the incorporation of horizontal blue lines. The detail has reference to the local bamboo sunshades.

The shelter contains an integrated blue seat, a grey ticket machine incorporating information and advertising. Some shelters incorporate specific advertising panels and real time countdown screens. The purpose-designed furniture includes tapering stainless steel litterbins, curved handrails, stainless steel and timber seating and bollards. The furniture within the stops is located to maximise pedestrian movement to and around the stops and to reduce street clutter.

There are design adaptations at specific stops to reflect their location and function within the tramway system:

- park and ride facilities celebrated within a suburban location by architectural structures.
- use of public art to give significance to the city centre stop of Hotel de Ville.
- role of the key public transport inter-change stop, Corum, highlighted in the urban environment by an extensive architectural canopy and waterfeature.

The trams are low level, requiring 25cm high platforms usually ramped at both ends or along the back of the platform for full accessibility.

High quality materials such as granite and limestone are used for paving most of the platforms. At Hotel de Ville and Comedie timber has been used. A tactile paving strip, in wood or stone depending on platform material, defines the edge of the platform.

*F 3.43 Livery*

*F 3.44 Stop shelter*

*F 3.45 Public art Hotel de Ville*

*F 3.46 Stop furniture*

*F 3.47 Tracks in historic street*

*F 3.48 Corum*

**Track design**
The integration of the tracks within the urban environment has been achieved by the use of different materials to reflect areas within the city. The new paving extends from building façade to building façade, there are no kerbs within the streets of the historic centre giving full accessibility. Granite paving has been used within the city's historic core. In the suburbs grass is used where the tracks are located within the centre of a road. Pedestrian guardrails are only required where the route is adjacent to traffic. Within the city centre traffic management barriers are located across the tracks to control traffic access.


*F 3.49 Tracks in grass*

**Power supply and wirescape**
In the historic core much of the wirescape is attached to buildings. Where street widths are wide the wires are suspended from street lighting columns. In the suburbs large arches span the two tracks. These also incorporate lighting.


*F 3.50 Columns and cables*

**Vehicles**
The low level tram has a stylish exterior with a custom designed motif of the hirondelle bird in white on a blue background. This gives the tram a unique appearance which has become synonymous with a new image of Montpellier. The tram has large windows, which maximise the views out and give a sense of spaciousness and comfort. The body of the vehicle is sleek with uninterrupted lines and no advertising. The interior is custom designed to be aesthetic as well as functional and complements the design approach of the platforms and stops.


*F 3.51 Tracks in public open space*

**Urban design issues**
Montpellier is an example of how a new public transport system can be used as a symbol of regeneration of a city. The tramway was instrumental in enabling the city and its suburbs to be redefined, creating identity and means of accessibility. Some of the ways this projects has been successful include:

- a comprehensive approach to regeneration and roles of public transport and the public realm
- a distinctive tram livery in association with its stop motif
- a coherent design of street furniture and paving materials
- removal of street clutter
- public realm streets and squares redesigned as part of project
- clarity and identity given to city areas using structures and water within the scheme
- traffic management and public transport integrated into the approach
- public arts strategy developed around the tramway
- tram system used to brand and advertise the city


*F 3.52 Public art*

# Bordeaux

Transport mode
Tram

Date of opening
2004

Extent of system km
25

Number of stops
47

Construction costs in euros
634 million

Population
215 000

Settlement type
City

The introduction of the tram system in Bordeaux has enabled the city to recreate its public realm by rationalising access to public transport and restricting traffic movement within the city. The significance of Bordeaux's tram system to this study is the housing of power supply infrastructure below ground within the historic core of the city centre eliminating the need for columns or wirescape. Outside the historic centre overhead power is used requiring columns to support the power lines.

**Platform and stop design**

The components of each stop have been purposely designed as a signature to the new tram system and its role within the city. The colours used at the stops are tones of grey with an accent of blue, which complements the livery of the tram. The design approach of the stops is restrained, elegant and functional, the amount of glass used provides a lightness to the structures and transparency at the stops. Each stop has a shelter with glass canopy, back and side panels. The shelters have the following features:

- side panels with images of maps of the world printed on the glass, with blue depicting the seas, re-iterating the significance of water to Bordeaux's history
- the laminated glass of the canopy and back panels are detailed to provide screening from the sun
- real time countdown and integral lighting within the structure of the canopy
- wooden slatted benches Other wooden seats are sited elsewhere within the stop to provide additional seating. The name of stop etched on to free-standing glass panel. The panel is adaptable in that it offers the opportunity to incorporate city maps or information within specified dimensions. Some free-standing advertising boards have also been added to some stops.

Other features of the stops are:

- ticket machines with a glass canopy independently sited from the shelters. Public transport network and city mapping are included in ticket machines
- purpose designed tapered litter-bins, lights and bollards
- tram signals and responder at end of each stop
- (where space allows) tree planting with purpose designed tree grilles

Where stops are adjacent to a road there is need for a physical demarcation at the back of stops, when this is required alternative approaches have been used:

- glass panelled fencing where stop adjacent to a road
- use of bollards
- street furniture such as seats, lights, litter bins or tree planting located in continuous line to restrict pedestrian movement

*F 3.53 Livery*

*F 3.54 Stop shelter*

*F 3.55 Platform with furniture*

*F 3.56 Stop furniture*

*F 3.57 Fully accessible platform*

*F 3.58 Attention to paving detail*

The paving materials used between the tracks at the stops reflect their location within the city. Within the historic city centre, granite setts are used on the streets, with granite paviors in pedestrianised streets and squares. Bound gravel is used within the open spaces of the city centre as well as the new squares outside the city centre where stops are located. A drainage channel within the tracks defines the physical extent of the stop.

The platforms are 16cm high and accessed by ramps from both ends. The tactile edge of the stop is formed by granite with inset stainless steel studs. The tactile edge is further physically and visually reinforced by the continuation of the line of tactile paving that delimits the tram tracks beyond the stops. Pre-cast concrete paving has been used for all platforms. The paving throughout the scheme is well detailed and executed.

Lighting is incorporated into the shelters. The purpose designed amenity lighting columns used on the platforms has been designed as part of the platform furniture. LED strip lights are used between the tracks. Outside the city centre high-level columns have been used. Along the new boulevards lights have been incorporated into the columns supporting the power wires.

**Track design**
Bordeaux operates a two-way system. The materials between the tracks respond to their location within the city. Granite paving has been used in pedestrian areas and historic places and granite setts where the tram is segregated from vehicular traffic. Bound gravel has been employed where the tram is within parks, and grass is used where the tram is in suburbs or moving within tree lined boulevards. Tarmacadam is used where pedestrian crossing points occur within the grass tracks.

**Power supply and wirescape**
The Bordeaux tram is powered from ground level within the city's historic core, negating the need for overhead power cables. However technical problems with this innovative system may require overhead power cables to be installed in the future. In the suburbs columns with or without integral lighting are centrally placed with an arm over each track, in other locations a column is constructed to the side, with a long arm over both tracks.

**Vehicles**
Bordeaux's low-level tram is in dark blue and silver grey, with large dark tinted windows to the driver's cabin and carriages. The large windows maximise views out of the tram as well as giving a sense of spaciousness and comfort when inside. The curved glazing and its reflective quality visually integrate the tram within the urban environment. There is no advertising on the exterior of the tram.

**Urban design issues**
Bordeaux's new tram project is the catalyst for enabling citywide strategies to be identified and realised. The key aspects of the project that inform this study are as follows:

- all street lighting has been replaced as part of the lighting strategy for the city. In the historic city core new lights have been mounted on to buildings to remove visual and physical clutter
- new boulevards in association with the tramway are being planted as part of the overall public realm strategy for Bordeaux
- a coherent design approach has been adopted to stop design and furniture
- the low platforms and transparency of stops integrate the stops with surrounding
- areas paving materials define city areas
- traffic and public transport are integrated, complementing the public realm strategy
- the new public realm is used to promote the city's regeneration


*F 3.59 Tracks within public realm*


*F 3.60 Columns and cables*


*F 3.61 Traffic integration*


*F 3.62 Public open space enhanced*

# Blankenloch

Transport mode
Light rail

Date of opening
1997

Extent of system km
7.1

Number of stops
12

Construction costs in euros
36 million

Population
11 500

Settlement type
Town

Blankenloch is one of four small towns of Stutensee, situated to the north of Karlsruhe. It is an important industrial and recreational area, with a castle and a forest.

The significance of this case study is twofold. Firstly, this is the first example where local politics influenced not only the decision making process of the scheme but also its design outcome. The mayor at the time saw the integration of the new line into Blankenloch not only as a means of addressing traffic problems in the town but also as a way to improve the quality of life for residents, by improving the pedestrian environment with the provision of improved crossings and reduced traffic speeds.

Secondly, the system's technology enables two-way working on a single set of tracks, which has been advantageous when integrating the tracks within the confines of the town's narrow streets. However the system, with its one way directional working, did require a turning facility at Blankenloch Nord.

**Platform and stop design**
There are two contrasting design approaches for the stops within this scheme. First are those stops within the segregated sections of the route outside the towns, which have shelters, including street furniture and signage that are standard designs for the Karlsruhe system. The platforms, which are 15cm high in the town centre and 38cm outside, have pre-cast concrete block paving with no tactile paving at the kerb edge.

The second approach to the stops is one of purpose design, chosen via a local competition, to integrate the stops within Blankenloch and to provide a sense of place. The shelters vary in size, responding to single or two way working as well as the location within the town. The common element is the pitch and timber detail of the shelter's roof. The on-street stops are further accentuated by blue rendered end panels, which complement the yellow ticket machines. The ticket machines have been integrated within the shelter's design have panels for timetables and advertising posters, together with the name of the stop. A purpose design wooden bench and litterbin complete the stop's street furniture elements. Shelters are lit from lights mounted within the canopy. At Blankenloch Nord and Blankenloch Tolna-Platz the stops have large shelters with pitched roofs that incorporate cycle racks and toilet facilities.

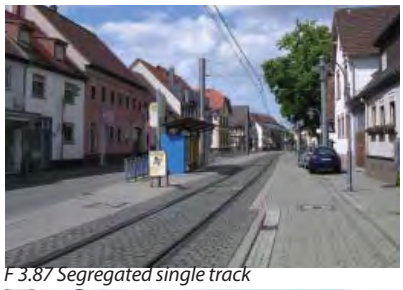
Pedestrian barriers are used at the on-street stops where the stops back on to a road. There are columns, with integral street lighting, that support the power lines on the platforms. The platforms are paved with pre-cast concrete blocks with no tactile edge strip. The on-street stops have been integrated into the streetscape by having 15cm platform heights and the use of angled concrete edging units, which further reduces the visual impact of the level change. The same colour of pre-cast concrete block paving of the platforms is used throughout the town's footways, giving visual coherency to the streetscene.


*F 3.83 Livery*


*F 3.84 Stop shelter*


*F 3.85 Stop with shelter*


*F 3.86 Tracks in paving*


*F 3.87 Segregated single track*


*F 3.88 Turning facility*

**Track design**
Within Blankenloch the tracks vary from one and two way working, depending on whether the route is on-street or segregated. Within the town the detailing of the on-street tracks as one or two way working also depends on local traffic movement and car parking. The pre-cast concrete blocks used within the tracks are a darker colour than the adjacent footways. There is no change of level between the track corridor, footways and the roadway, which has maximised the opportunity to re-assess the width of the space for movement, parking or access.

Where the scheme is segregated the tracks are on sleepers with ballast in between.


*F 3.89 Custom designed columns*


*F 3.90 Custom designed columns*

**Power supply and wirescape**
The columns within the town were custom designed. The columns associated with the single track running sections have a distinctive standard curved top, which accommodate the supports for the wires. The columns were designed to include integral street lighting.

The width of the two-way working sections of the scheme and at the stops meant that the arched column could not be used. At these points there are columns on either side of the tracks. These structures, some of which provide power from nearby intake cubicles, are bulky compared to the transparent effect of the single-track columns.

**Vehicles**
The vehicles are part of the Karlsruhe network, with its standard livery of yellow ochre body and black and red trims. Many of the carriages have advertising on the exterior. The interiors are bright and spacious with good views to the outside. However, accessibility is an issue, with the light rail vehicle having 90cm floor heights.

**Urban design issues**
Blankenloch demonstrates the success of using a new public transport system to address not only transport needs but to improve the public realm and the quality of life of a place. This has been achieved by the following:

- political determination and vision
- appreciation of settlement pattern and flexibility of transport mode
- use of a competition to design components of the scheme
- integration of public transport by choice of materials and details
- elimination of kerb lines
- use of low level on-street platforms
- innovative design of power / lighting columns
- use of colour
- integration of stops with bus and cycle routes

# Wörth am Rhein

Transport mode
Tram - train

Date of opening
2003

Extent of system km
1.3

Number of stops
3

Construction costs in euros
11 million

Population
19 000

Settlement type
Town

Wörth is a town located west of the Rhein River on Germany's French border. The new route consists of three stops and links the swimming park via an 80 metre long tunnel to the centre of Wörth. The aim of the scheme was to reduce commuter traffic congestion by creating a direct public transport link from Wörth to Karlsruhe. A by-product of the new connection to the city has been the increased use and marketing of the Badepark.

**Platform and stop design**

The route is for the most part segregated, with occasional on-street sections. The approach to the stop and platform design has been to use standard street furniture of the Karlsruhe public transport system and pre-cast concrete block paving.

The shelter and metalwork of the stops have been painted blue and there is tactile paving at the edge of the platforms. The furniture comprises simple wooden slatted seating. The seats are often incorporated within the shelters, while some are freestanding on the platform, a;long with a few litterbins. There are no ticket machines or advertising on the platforms.


*F 3.91 Livery*

*F 3.92 Platform*

*F 3.93 Tracks and crossing*

**Track design**
There are two approaches to the design detail of the tracks. Segregated sections have ballast and sleepers to support the tracks. On-street sections have block paving.

**Power supply and wirescape**
The columns supporting the wires are of a simple design with triangular arms and painted blue. They are centrally placed between the two track sections in the segregated sections, while the on street sections have columns located on either side of the track.

**Vehicles**
As with Blankenloch the vehicles are part of the Karlsruhe network, with its standard livery of yellow ochre body and black and red trims. Many of the tram-trains have advertising on the exterior. The interiors are bright and spacious with good views to the outside.

**Urban design issues**
The successful or innovative aspects of this case study are limited due to the transport focus of the scheme. The purpose of the route has been one of accessibility, first, to the city of Karlsruhe, which has resulted in a reduction in local commuter traffic and secondly, creating access to Badepark, the swimming park. The scheme has been used as part of a television and marketing campaign to increase tourism to the swimming park, which has had increased attendance of 800%.


*F 3.94 Columns and cables*


*F 3.95 Segregated single track*

# Rheinstetten

Transport mode
Light rail

Date of opening
1999

Extent of system km

Number of stops

Construction costs in euros

Population
20 000

Settlement type
Town

The extension of the Karlsruhe system to the commuter town of Rheinstetten was undertaken to provide improved and direct access by public transport into the city. The town is composed of almost coalescing settlements arranged in a linear form. The light rail vehicle follows the main route that connects these settlements. The new connection demonstrates the flexibility of the system in changing from one to two-way working but with the limitation of the current vehicles needing a turning facility.

**Platform and stop design**

The platforms, which are 15cm high in the town centre and 38cm outside, are consistent with the Karlsruhe network. This applies to the other features of the stops with standard signage, shelters, including integral lighting and ticket machines. The shelters are comprised of a glass roof and glass rear and side panels within a dark brown metal framework. Timetables and advertising occupy two of the glass panels. A clock is a non-standard fitting that is included within some of the stops and provides a positive visual element. Individual standard design lighting columns and fittings are used along the platforms.

The terminating stop of Bach West includes a separate covered cycle park and toilet facilities. The stop has a turning circle for the train.

The choice of materials is straightforward, with pre-cast concrete blocks used for the platforms. There is no tactile strip. The tracks at the stops within the segregated section are on sleepers with ballast in between. Where the vehicle runs on street the platform and area between the tracks are treated with contrasting colours of pre-cast concrete block paving.

*F 3.96 Livery*


*F 3.97 Stop shelter*


*F 3.98 Shelter Furniture*


*F 3.99 Single track in paving*


*F 3.100 Single track in grass verge*


*F 3.101 Turning facility*

**Track design**
The use of tracks in this case study varies depending on location or space availability. In built up areas single working sections of track have been laid to accommodate other vehicular uses and access alongside. The tracks are discrete and are not shared by other vehicles (unlike in the English case studies where sections of tram and other road users share the same road space). The materials used around the tracks within the built up areas include:

- pre-cast concrete block paving, which contrasts in colour to the adjacent footpaths' pre-cast concrete block paviors in the case of on-street sections
- grass, where the tracks move off the main road and are adjacent to green spaces

Outside the built up areas the tracks become two-way and are generally segregated with sleeper and ballast infill.

Landscape schemes have been implemented along the route to mitigate its effect on the surrounding rural and suburban areas.

**Power supply and wirescape**
Columns are used to support the overhead cables throughout the route. Where two sets of tracks occur the standard columns are centrally placed, where there is only a single set of tracks the columns are placed to one side.

**Vehicles**
The vehicles are part of the Karlsruhe network, with its standard livery of yellow ochre body and black and red trims. Many of the carriages have advertising on the exterior. The interiors are bright and spacious with good views to the outside. Accessibility is an issue as the floor height of the vehicles is 90cm.

**Urban design issues**
The case study highlights the advantages of one way working to either reduce the impact of a scheme on the built form or to accommodate the route within restricted spaces.

Within the built up areas the width of the road space was repaved to differentiate train movement and that of other vehicles and pedestrians. This approach has contributed to an improved public realm in terms of legibility and pedestrian safety.

The varied detail of the tracks from pre-cast concrete blocks to grass and associated landscape, has enabled the scheme to be successfully integrated into a small-scale setting. The design approach has meant that there is a clear differentiation between being the built up area and beyond. Therefore the distinct qualities of each section of Rheinstetten have been reinforced.


*F 3.102 Power columns and cables*


*F 3.103 power columns and cables*


*F 3.104 Public realm*


*F 3.105 Cycle shelter*

# Wolfartsweier

Transport mode
Tram

Date of opening
2004

Extent of system km
4.6

Number of stops
13

Construction costs in euros
30 million

Population
3250

Settlement type
Suburb

Wolfartsweier is a suburb built during the 1960s within the city limits of Karlsruhe. The new route passes through residential areas and public open space linking Wolfartsweier to the Karlsruhe network at Durlach. The aim of the new line was to reduce traffic and parking problems locally and provide an environmentally friendly, faster and more comfortable alternative to car use.

The new line was 12 years in the planning stage and took two and a half years to build. There was controversy over the alignment of the route which has divided an existing public open space in two. The line is fully accessible to all users, this contrasts with most of the Karlsruhe network, which due to the existing vehicle stock remains inaccessible.

**Platform and stop design**
The treatment of the platforms, which are 32cm high, has the same approach as has been taken for most of the Karlsruhe network. This also applies to the other features of the stop. The shelters, with integral lighting, are comprised of a glass roof, back and side panels within a metal framework. Seating, and (when provided) ticket machines, are located within the shelters. At the Wolfartsweier Nord stop there is a large purpose designed shelter incorporating a sub station and cycle park facility.

Standard lighting is either integrated with the wirescape supports or freestanding at the back of the platforms, aligned with signage and furniture. There is tactile paving at the edge of the platforms, another innovative feature when compared with the rest of the Karlsruhe system.

The detail of the tracks within the stops vary from segregated sections where ballast and sleepers are used such as at Wolfsartsweier or grass where the stop is within an open space to grasscrete in the suburban situation of Gritznerstrasse.

*F 3.106 Livery*


*F 3.107 Custom designed shelter*


*F 3.108 Shelter with furniture*


*F 3.109 Tracks in grasscrete*


*F 3.110 Tracks within public open space*

**Track design**
The tracks are two-way, with stops generally opposite one another where space allows. The design approach to the tracks reflects their location:

- grass within public open spaces
- ballast and sleepers outside built up areas
- grasscrete in a suburban section near Durlach
- tarmacadum where roads are crossed

The tracks are segregated throughout the route either by planting or fencing where the line is accessible to pedestrians or vehicles. Where the line runs through Wolfsartweier's main public open space galvanised fencing separates the tracks. While there are crossing points at frequent intervals, the use of this space has been detrimentally affected by the tramway alignment.


*F 3.111 Tracks in grass*

**Power supply and wirescape**
Columns support the wirescape of the line. The columns are located either side of the two-way track, some with street lamps. The visual impact of the supports and wirescape is low, except where additional power is required along the route. This could have been lessened by more careful consideration to location.


*F 3.112 Power columns and cables*

**Vehicles**
A new fleet of vehicles was introduced for this line, They have the same livery as for the rest of the Karlsruhe system. The vehicles are more streamlined than the existing tram-trains of the network and are fully accessible from the platforms.

**Urban design issues**
The new line has been successful in providing a fully accessible public transport link and reducing local traffic congestion. However the alignment and extensive fencing has disrupted the use and movement through an important public open space. The route has been integrated with the local bus network by the provision of new bus stops.


*F 3.113 Power columns and cables*

# Heilbronn

Transport mode
Tram - train

Date of opening
2001

Extent of system km
1.64

Number of stops
4

Construction costs in euros
39 million

Population
120 000

Settlement type
City

Heilbronn is an expanding city 80km to the east of Karlsruhe. Before the tram-train scheme, Heilbronn's town centre was economically stagnant and the population was in decline. In the suburbs the population of young people was fast expanding but isolated from the centre.

The aim of the new public transport scheme was to establish Heilbronn as a 'style centre' that was as attractive as any city centre to visitors and investors. The new transport scheme was referred to as the 'motor of the style project'. It was recognised that the new transport experience had to be an attractive alternative to the car. The goal was to shift 50% of the forecasted growth of motorised individual transport to the tram-train system. The first phase of the new system consists of four stops and links Heilbronn main station to Friedensplatz.

The scheme's focus was not solely public transport provision, but to integrate the new transport system with improvements to the town's public realm.

**Platform and stop design**
The street furniture and shelters were custom designed by the same architects to provide a coherent design vocabulary. The brief for the stops was that they were to be comfortable, with an attractive layout and easily recognisable.

The custom designed shelters have glass canopies with glass back and side panels. The shelters have integrated lighting, seating and timetable information. The freestanding ticket machines are blue (compared to the yellow used elsewhere within the Karlsruhe network) and are located within the shelters. The platforms also have clocks that are used as sculptural elements within the stops. Each stop has an information point, public address system and CCTV cameras. The shelter outside the station is a vast glass canopy that symbolises the new gateway into Heilbronn. This stop has a freestanding panel that provide timetables and other local information.

Three out of the four stops have 55cm high platforms, which are fully accessible by ramps. The stop within the pedestrianised section of the route has a low kerb for two reasons, firstly to enable the stop to be integrated within the streetscape and secondly to facilitate the use of the stop by buses.

Paving within the pedestrianised section of the route is uninterrupted by the siting of the tram-train / bus stop. A dark tactile strip and localised level change along the kerb serve to denote the stop. At the other three stops the platform is paved in white concrete slabs with a dark grey tactile strip.

There is an absence of fencing associated with the stops except Schumacher Place which is the only stop located centrally between two roads. Grey mild steel fencing is used along the entire length of this stop to direct pedestrian movement to the crossing points at either end of the stop.

*F 3.114 Livery*

*F 3.115 Stop shelter*

*F 3.116 Platform with furniture*

*F 3.117 Gateway feature*

*F 3.118 Tracks in shared surface*

**Track design**
The design approach taken to the tracks was one of integration with the surrounding urban environment. At Harmonie the tracks are laid within a new public open space that extends from the new stop to the theatre. Within the pedestrianised street the tracks are set within paving units. The width of the street has been re-paved. The level differences between the pavements and roads have been removed to create a fully accessible environment. The tracks are located within a corridor defined by granite kerbs laid flat. The streetscape is completed by specially designed amenity lighting columns that alternate with tree planting and colourful planters.

When located within the centre of the road, the tracks are laid within a dedicated route that is above road level. As the route approaches the station the tracks moved to one side of the roadway. A pedestrian guard rail is used to control movement for pedestrians and vehicles along this section.

**Power supply and wirescape**
Specialist engineers were commissioned to design the wirescape of the scheme. The grey columns used to support the wires are purpose designed in association with the lamp columns and shelter uprights. The columns have a dual purpose being used for street lighting as well.

**Vehicles**
The vehicles are part of the Karlsruhe network and so have the corporate livery. There is limited advertising on the exterior of the tram-trains.

**Urban design issues**
The project was seen as part of an overall master plan or regeneration strategy for the town. The renewal of the whole public realm, together with a coherent design approach for the street furniture, the wirescape, paving and planting, ensured the physical integration of the project within the urban environment.

Other lessons that can be learnt from this experience include:

- creating the right team for the project
- having a public realm strategy
- traffic management control by siting of tree planting, planters and of street furniture
- integration of bus routes with, buses sharing stops and running on the tram-train tracks
- creation of landmarks and spaces such as the station and the theatre
- use of public art on the bridge
- care in material selection and detailing
- marketing the scheme to attract commerce and to aid in branding of the town


*F 3.119 Tracks with central platform*


*F 3.120 Power columns and cables*


*F 3.121 Planting in public realm*


*F 3.122 Transport interchange*


*F 3.123 Public realm*

# Bad Wildbad

Transport mode
Tram - train

Date of opening
2003

Extent of system km
0.8

Number of stops
3

Construction costs in euros
6 million

Population
11 000

Settlement type
Spa town

Bad Wildbad is a spa town in the Black Forest to the south of Karlsruhe. The town is historically a 'healthy town'. The aims behind the new line were to improve access from and to the town and to create a new public realm that would attract more visitors. The new route allows people from Bad Wildbad to go to Karlsruhe for shopping and the nightlife. It also allows people from Karlsruhe to go to Bad Wildbad for weekend breaks.

The system operates on a single-track rail, but the double-ended vehicle used means that no turning facility is required. A holistic approach was required to successfully integrate the new public transport scheme within the small scale, historic environment of Bad Wildbad.

**Platform and stop design**
The street furniture has been purpose designed, with aquamarine coloured glass roofed shelters announcing the location of the stops within the townscape. The shelters are elegantly designed using a steel framework with glass and timber panels, with fully integrated seating and lighting. Brightly coloured green ticket machines are located within the shelters. Other street furniture elements are in stainless steel, such as the lighting columns with integrated clocks, sign posts and pedestrian guard railing.

The platforms are 55cm high and are accessible by ramps. The change of level of the platform in the centre of town, Bad Wildbad Uhlandplatz, has been well detailed, working with the topography of the street,to minimise its visual impact. At the final stop, Bad Wildbad Kurpark, the shelter is set back from the stop, creating a small piazza between the hospital, stop and park.

Light grey granite paving has been used throughout the scheme which contrasts with the dark granite used for the tactile paving.

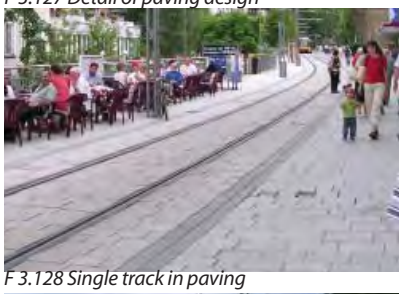
Changes in paving, drainage channels, positioning of street lighting and furniture, custom built granite planters and fencing all clearly demarcate pedestrian areas, tracks and pavements.


*F 3.124 Livery*


*F 3.125 Stop shelter*


*F 3.126 Platform*


*F 3.127 Detail of paving design*


*F 3.128 Single track in paving*


*F 3.129 Single track in grass verge*

**Track design**
The streets in Bad Wildbad are very narrow, however the use of the same paving material throughout the width of the street gives a sense of order and visual continuity to the town. The width of the tram-train tracks are delineated by dark grey granite kerbs laid flat. The drainage gulleys are detailed within this granite kerb.

Where the tracks enter the town a grass threshold has been created that separates the system from the segregated section that starts at the railway station.

The landscaping that has been undertaken as part of the scheme has served to integrate the scheme into the townscape. Pedestrian guard railing has been replaced together with the river's retaining wall coping, to completeso the refurbishment of the streetscene.

**Power supply and wirescape**
Within the spa town the cable supports have been custom designed to complement the scheme's street furniture. The supports are simple, with an extended arm over the track. The supports are located along the river's edge, which maximises pedestrian and vehicular movement within the street and reduces their visual impact by not being close to the buildings.

Outside the main street where power sources change, bulkier columns have had to be used, which have a detrimental visual impact on the street scene. Beyond the railway stop is a substation that has been clad in timber to reduce its visual impact on the immediate area.

**Vehicles**
The tram-train used has driving compartments at both ends, which means that no turning facility is needed. The vehicles are not fully accessible. The livery is that of the Karlsruhe network.

**Urban design issues**
The extension of the Karlsruhe network to Bad Wildbad was seen as a way to regenerate the town's tourism appeal by redefining its public realm. The scheme has been successful in the following:

- creating opportunities for a more convivial public realm eg outdoor cafes
- extending the public realm of the town with additional seating / play area
- integrating the scheme with the town's park
- carefully locating of stops and street furniture to maximise use of the street
- demarcating the town using the detail of tracks
- new bridges connect and integrate the scheme with the town
- providing a coherent design approach to stops, paving and landscape
- adopting a comprehensive approach to changing the streetscape, including coping the river wall
- paying careful attention to detail throughout the scheme


*F 3.130 Power columns and cables*


*F3.131 Power station*


*F 3.132 Paving of entire street width*


*F 3.133 Public realm*

# Saarbrücken

Transport mode
Tram - train

Date of opening
Phase 1 1997
Phase 2 2001

Extent of system km
Phase 1 19
Phase 2 14

Number of stops
Phase 1 15
Phase 2 8

Construction costs in euros
Phase 1 + 2
nearly 300 million

Population
185000

Settlement type
Regional Capital

Saarbrücken, situated on the border with France, is the capital of the Saar Region. The primary aim of the new public transport project was to reduce traffic congestion in the city by 20%. In order to achieve this the local bus system would have had to increase its capacity by 65%, which was not feasible. Therefore an alternative mode of transport was needed. The choice of a low floor tram-train was regarded by local politicians and planners as the only mode of transport that would appeal to the public and fulfil expectations of speed, comfort and frequent service.

The scheme involved upgrading existing railway tracks outside the city centre and creating an on-street section, of some 4km, together with stops within the city centre. Within the city centre the tram-train runs on dedicated tracks except for the area outside the railway station, where buses share the tracks.

**Platform and stop design**
Some stops were introduced into the city centre and along part of the reused rail corridor. The design approach to the new stops is consistent in terms of street furniture. There are differences in the amount of street furniture used, which reflects space availability at some stops. Some old stations on the existing rail corridor have not been refurbished, while other stations such as Brebach have been partially refurbished with new shelters and flagpoles.

The typical stop design in the city is composed of a shelter with a steel frame, an opaque glass roof, integrated lighting, and transparent back and side panels. Within the shelter is a ticket machine, painted in the corporate blue of the local transport system, bench seating and a timetable within part of the back glazed panel. A pedestrian guardrail with glass panelling complements the shelter design and runs the length of many of the platforms. The platforms also contain white electrical in-take units, free-standing stop signs and real time countdown information.

At Johanneskirche the shelter on one of the platforms is an art installation. There are a series of high level shelters at Hauptbahnhof which are custom designed. The shelters extend over the bus / tram interchange, creating a gateway to the city.

The platforms are 35cm high within the on-street sections and are accessible by ramps from either end of the stop. The stop locations vary, reflecting two-way track alignment from being in the centre of a road to being on one side of the road space. The platforms are paved with pre-cast concrete blocks with. A dark tactile paving strip contrasts with the white pre-cast concrete kerb.

Standard lighting is built on freestanding columns along platforms, or in some cases hung on a line from the power cables above the tracks.


*F 3.134 Livery*


*F 3.135 Stop shelter*


*F 3.136 Reused railway station*


*F 3.137 Transport interchange*


*F 3.138 Segregated tracks*


*F 3.139 Traffic management*

**Track design**
The on-street section of the system runs on raised dedicated routes paved with pre-cast concrete blocks, which contrast with the adjacent roadway's tarmacadum. The rails on which the Saarbrücken system runs are deeper and wider than the French and English trams, which creates problems for pedestrians and cyclists. This lack of accessibility restricts the application of the system in pedestrian areas and within cyclle routes. The tracks within the segregated sections outside the city centre are detailed as railway tracks with concrete sleepers and ballast. The on-street section from Rastpfuhl to the Riegelsberg-Sud stop is segregated, being located away from the road in what would have been roadside verge. The detail is that of sleepers and ballast.

Within the on-street sections of the route few pedestrian guardrails are used. Street lighting along the tracks is for the most part catenary. Bollards are used in the city centre to control traffic movement.

**Power supply and wirescape**
The power supply within the on-street sections is treated in different ways depending on location:

- built up areas with narrow streets: the cables are supported on wires from the buildings
- wider streets: staggered / alternating columns extend over one track
- wider streets: two columns and wire support create an arch over the tracks
- outside the city centre from Malstatt to Riegelberg-Sud: the columns are centrally located between the tracks

**Vehicles**
This is a low floor level tram with a glazed and curved front, and large windows. The mechanics of the wheels and axles are hidden. The blue, white and grey livery of the vehicle was selected at a meeting attended by public and private representatives and local government officers. The exterior and interior of the vehicle are free from advertising. The interior is spacious and comfortable, with colours similar to the exterior. There is no highlight colour such as yellow to assist the visually impaired. The hand loops clutter the internal view.

**Urban design issues**
The Saarbrücken scheme aimed to be visually attractive to encourage patronage. However the design approach remains transport driven, with integration within the urban environment less than it could have been.

Urban design comments include:

- the tracks detail in the on-street section does not vary to reflect different city areas
- there is no service within the pedestrianised streets due to rail dimensions
- glass used within stops makes them more transparent within the streetscape
- the tunnel outside the station enabled a new tram-train / bus interchange to be created
- there is limited use of public art
- there is limited planting associated with scheme
- the scheme has been used to market the city as a place with a good quality of life and environment


*F 3.140 Power columns and cables*


*F 3.141 Power cables suspended from buildings*


*F 3.142 Tunnel*


*F 3.143 Public realm*

# Zwickau

Transport mode
Train - tram

Date of opening
1999

Extent of system km
1.3

Number of stops
2

Construction costs in euros
89 million

Population
103 008

Settlement type
City

The mainline station of Zwickau is situated outside the town centre and is inconvenient and unattractive for commuters to use. As the economy of the town has grown, more vehicular traffic has been generated, resulting in congestion of the town centre. The reasons for an improvement to the public transport system in the town were:

- to reduce traffic congestion within the town by providing a positive alternative to the car for commuters
- to give priority to the train at road junctions
- to define Zwickau's historic core by improving the public realm
- to attract more tourists

The innovative solution was effectively to move the regional railway connection into the town centre. The extension of the railway network from Zwickau's mainline station into the centre of the town was achieved by the addition of a third track laid beyond the existing tram lines which allowed the gauge requirements of the diesel trains to be met, and secondly to restrict operations to single track in one section, to enable the train to be accommodated within the confined space of the town's historic core.

**Platform and stop design**
The new line from the railway station has two stops, both providing interchanges with the local tram system. Both stops have the same street furniture and canopies. The key elements within the stops are orange rendered panels, which are visually striking. They divide the platform in two and provide locations for integral seating, advertising posters and timetable information. The canopies are high and do not give adequate shelter from the rain. Their construction is heavy with only part of the canopy being glazed, which has a visually detrimental impact on the surrounding townscape. The stops have real time countdown information panels and standardised stop names.

The platforms are paved with pre-cast concrete square paviors, with a white tactile strip before the platform's kerb. At the Zentrum stop, which is the terminus of the line, there is a red railway buffer. The platforms are 55 cms high and accessible by ramps at either end.

Lighting is incorporated into the canopy of the shelters. The platforms also contain freestanding lighting columns, centrally located. There are no ticket machines, as tickets are purchased on the train.


*F 3.144 Livery*


*F 3.145 Stop shelter*


*F 3.146 Platform*


*F 3.147 Tracks in paving*


*F 3.148 Tracks in granite setts*

**Track design**
The train runs as a two-way system, except for a small section approaching the Zentrum stop, which is single track. The tracks are on-street from the Hallestadt stop to Zentrum and are laid within pre-cast concrete block or granite sett paving, to allow vehicle access over the tracks at road junctions. The train tracks share the same route as the tram, which is segregated from other road users and pedestrians by low fencing and shrub planting. Where the train and tram move towards the Zentrum stop the track is integrated within the new public square.

The route from the mainline station to Hallestadt is within a new segregated railway line, with the tracks laid on sleepers surrounded by ballast.


*F 3.149 Tracks*

**Power supply and wirescape**
The diesel train does not require overhead power cables. In Zwickau the shared running of the train with the tram system means that there are columns and wirescape associated with the tram.


*F 3.150 No overhead power requirements*

**Vehicles**
The vehicles visually dominate the streetscape due to their width and height above ground level. This effect could be tempered with a change in livery colour from the existing white and green. The trains have large low windows maximising views to the outside. The width of trains and the interior design gives an excellent feeling of space from within the carriage. Ticket machines are on board.


*F 3.151 Accessibility*

**Urban design issues**
The Zwickau case study demonstrates the role of public transport within on overall town strategy. Here the centre of the town has been re-established by effectively 'moving' the mainline station and improving the public realm within the historic core. The new transport connection links the main station with the stadium and retail park at Hallestadt, and with the town centre at Zentrum along a landscaped corridor.

The lack of overhead wirescape and the potential to use one-way working does make the use of diesel tram - trains as an on-street transport mode a viable alternative to be considered as part of the selection process for a new public transport system.


*F 3.152 Planting as pedestrian barriers*

The local tourist board has used the new system to promote Zwickau as an easy and direct destination by train.

# Oslo

Transport mode
Tram

Date of opening
Project A 1995
Project B 1998
Project C 2004

Extent of system km
Project A 1.75
Project B 1.5
Project C 1.1

Number of stops
Project A 4
Project B 5
Project C 4

Construction costs in euros
Project A 6 million
Project B 12 million
Project C

Population
500 000

Settlement type
Capital city

Oslo has an extensive and integrated public transport system based on five transport modes: buses, trams, metro, trains and boats. The tramway network is being extended to create a more comprehensive transport system in association with the development of the city's metro. Oslo provides a case study where new tram lines are being built that are part of an established network, similar to the case studies that are part of the Karlsruhe system in Germany.

The case study of Oslo is divided into three:

- Project A: new line linking two existing tram stops Solli and Kongens gate via Aker brygge, so connecting the city centre to Oslo's waterfront regeneration area
- Project B: new line from John Collets plass to Rikshospitalet, which connects the city centre to Oslo's new hospital. The line also has an interchange with the metro at Forskningsparken
- Project C: new tram vehicles have instigated the renewal of existing lines within the city. The line from Frogner plass to Majorstuen is presently under refurbishment

**Platform and stop design**
Glass canopies and panels are common elements to most but not all of the tram stops. The freestanding panels, in the corporate dark blue of the tram's livery, offer a flexible system that can include integral seating and litter bins as well as provide opportunities for advertising. The purpose designed glass canopies and panels are common denominators within the schemes in terms of material, form and colour.

The design approach taken to the tram stops falls into the following categories:

- glass canopies with other custom designed elements of street furniture
- glass canopies with freestanding panel
- freestanding panel without canopies
- stop signage only

Ticket machines are not found at every stop in Oslo, as tickets can be bought from shops, stations or from the driver. New advertising boards have been introduced to some stops in an ad hoc manner, which creates a cluttered environment.

**Project A platform and stop design**
There are two contrasting approaches to stop design within this new section of tramway, which reflect the location of stops within the city's public realm:

- within public open spaces: a purpose designed glass panel is used at stop Aker brygge. At stop Radhusplassen the standard blue panel is used. An art installation of granite creates the walls to both the stops, integral seating is included within the wall. Timetables are displayed on the stops' panels

*F 3.63 Livery*


*F 3.64 Stop shelter project A*


*F 3.65 Stop shelter project B*


*F 3.66 Stop shelter project C*


*F 3.67 Platform with furniture project A*


*F 3.68 Platform with furniture project B*

- on-street locations where space is limited to the width of footway there has been a very low key and pragmatic approach to the design of the stops with the use of small signs with timetables fixed to poles and, stainless steel litter bins sited near the stop. There is no seating provided.

The choice and design approach taken to the paving materials of the stops reflects the significance of the stop within Oslo's public realm. The stop Aker brygge is located within the re-designed Radhusplassen, Oslo's major public open space. The stop is integrated within the new square by use of the same granite paving for the platforms and between the tracks. Between the platforms the paving is laid in the same direction as the paving to the Radhusplassen public space. There is no tactile paving.

The stop Radhusplassen demarks the boundary of the Radhusplassen with Hoymagasinet. This change of one public space to another is expressed by a change in paving material and detail between the tram tracks. The use of grass between the tracks reflects the nature of the Hoymagasinet and contrasts with the hard landscape of the Radhusplassen. Pre-cast concrete paving slab blocks are used at the stop, there is no tactile paving.

The other stops of the new line are on-street, sharing the road space with other vehicles. The paving at the stops is the same tarmacadum paving as the footways.

**Project B platform and stop design**
The new line extends out from Oslo's suburbs into a rural environment. The stops have different amounts of street furniture, ranging from the tramway's 'standard' glass shelter and freestanding panel with integral litterbin and seat; to the freestanding advertising panel and ticket machine to having only the freestanding blue panel.

The platforms are paved with red pre-cast concrete paviors, the edge of the platforms are in light grey granite. There is no tactile paving within the stops, although ramped access is available at either end of the platform. At John Colletts plass, where the stop is located adjacent to a car park, post and rail tubular steel fencing is used at the back of stop. Throughout the scheme at the stops tarmac is used between the tracks. At the hospital stop Rikshositalet, granite setts have been used between tracks with standard pre-cast concrete paving on platforms.

**Project C platform and stop design**
The refurbishment of the stops from Frogner plass to Majorstuen have provided an opportunity to create the first fully accessible section of Oslo's tramway and to integrate the line within the streetscape by repaving adjacent roads and pavements.

The stops have glass canopies over freestanding blue panels. The panels display a plan of the tram network, timetables and a city map. Another glass panel within the shelter has an integral bench. The purpose-designed lighting at the stops is column mounted, which at Frogner plass also serve to support the power cables of the tram.

The platforms are well detailed and paved with standard pre-cast concrete slabs with granite setts between the tracks at the stops. There is ramped access to the platforms. The edges of the platforms have a tactile paving strip and a light grey granite kerb.

The stop at Frogner plass has been created within a previous traffic junction. The stop itself forms a roundabout that includes a new public space in turn creating a context in to which the stop sits.

At Frogner plass a granite wall, with integral seating, is used to define the boundary of the stop and control pedestrian movement to designated crossing points. Stainless steel studs have been used in the paving from the pedestrian crossings to the platform to help guide those people who are visually impaired.


*F 3.69 Attention to paving detail*


*F 3.70 Stop project A*


*F 3.71 Stop project B*

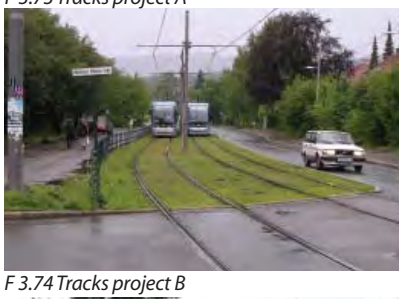

*F 3.72 Stop project C*

# Oslo

**Track design**
All the tramways are street running and the detail associated with the section of the tracks reflects their location within the city's urban form.

- Project A: the tramway as it traverses the Radhusplassen is laid within textured granite paving that is subtly different from the un-textured paving of the public open space. At the historic Hoymagasinet the tracks are between grass which integrates the tracks with the park and setting of the castle. The on-street section of the route is within tarmacadum with granite setts to demarcate the tramway.
- Project B: the rural character of the route is reflected in a low key design approach. Where tracks share road with other vehicles, tarmac has been specified. Adjacent to the university grass is used to segregate the tracks and retain the qualities of the rural environment. At the hospital terminus the tracks are laid within paving that complements the buildings' colour and materials.
- Project C: grass is being introduced within the central reservation of the road as the tracks are being replaced. The grass is irrigated. The grass detail integrates the refurbished tramway with its setting of suburb housing and the tourist attraction of Vigelandsparken. Where the tram's tracks cross the roadways they are simply laid in tarmacadum. Project C has a designated cycle track running within the roadway. This is Oslo's first and was put in as part of the tramway refurbishment.


*F 3.73 Tracks project A*


*F 3.74 Tracks project B*


*F 3.75 Tracks project C*


*F 3.76 Columns and cables Project A*


*F 3.77 Columns and cables Project B*


*F 3.78 Track design Project C*

**Power supply and wirescape**

- Project A: bespoke columns to support the cables, with integrated lighting at the base have been used within the Radhusplassen and grass tracks of Hoymagasinet. Their design reference is a ship's mast in the harbour. The columns have been designed to be positioned either centrally between the tracks, with extended arms over each track, or at one side of the tracks with an arm over both tracks. The on-street sections in city use buildings to support the power lines

- Project B: centrally located columns, with arms to support the power cables, have been used where the tramway runs on segregated section. Where tramway and other vehicles share road space, columns are located at the back of the footway with connecting wires that support power cables. Independent standard light columns are used where the tracks are in grass. Where the tram shares running with other vehicles the street lighting is integral with the cable supports

- Project C: purpose designed columns with lighting support the power cables at Frogner plass stop. Where the tramway is in the centre of the road within a grassed reservation, columns are centrally located with arms over each track


*F 3.79 Columns and cables project B*


*F 3.80 Furnishings*

**Vehicles**

Existing Oslo trams are used. The carriages are light grey with two shades of blue. Large windows create a bright and spacious interior with good views out. The interior has blue seats with yellow bars, to help the visually impaired. There is some advertising on the outside of the tram.


*F 3.81 Detail of paving*

**Urban design issues**

The contribution of Oslo as a case study is as follows:

- creation of new city connections
- sensitive design to integrate scheme with rural and suburban environments
- use of bespoke design elements to highlight particular stops / areas within network / city
- low platform heights and restrained design approach to street furniture enables the stops to be integrated within the city environment
- attention to detailed design contributes to the success of the schemes
- creation of new and redefinition of existing public realm
- use of public art as integral components of some stops
- pragmatic view on where design inputs are best used within systems
- tramways sharing road space and within dedicated routes
- refurbishment of tramway uses opportunity to upgrade route in terms of accessibility and improved integration


*F 3.82 Public open space*

## Defining urban design

The introduction of a new high quality transport system into an urban environment provides the opportunity to re-evaluate the role of public transport beyond that of pure function. The case studies have shown a variety of design approaches that have been taken when accommodating a new on street public transport system within existing cities, towns and villages. The on-street nature of the case studies demonstrate the impact that a new public transport system can have in redefining or creating a new public realm.

The following sections review particular aspects of design from the case studies that illustrate:

- the best ways of making new infrastructure **fit with an existing environment**
- how a new infrastructure can **enhance qualities of the public realm**

**Defining urban design**
Urban design is not an abstract ideal. It is a matter of creating the right conditions to make places work. Urban design is concerned with people and their use of space within the public realm. Through the literature search a series of urban qualities were identified which focus on the significance of the public realm within the urban environment.

**Urban design qualities**

- **character**: a place with its own identity
- **continuity and enclosure**: a place where public and private space are clearly distinguished
- **convivial public realm**: a place with public spaces and routes that are attractive, lively and pleasant to use
- **ease of movement:** connectivity and permeability, a place that is easy to get to and move through
- **legibility**, ease of understanding: a place that has a clear image and is easy to understand
- **adaptability**: ease of change: a place that can change easily
- **diversity and choice**: a place with variety and mixed uses

There is an opportunity when considering a new on-street public transport system to evaluate the condition and function of the existing public realm and to develop a design framework that can re-define the character and quality of the urban environment.

A new public transport system needs to be seen as an element within a comprehensive agenda of urban change or regeneration strategy. Public transport can contribute to a higher quality of life, a greater economic vitality, a more efficient use of resources and a rationalisation of public urban space. In many of the case studies, particularly those in France, the agenda for introducing a new public transport system is one of re-defining the public realm by reviewing traffic movement and existing public transport, enabling a series of high profile public realm projects to be identified.

Extensive changes within the public realm of many of the projects have been determined by local politicians together with the availability of sufficient funding to undertake aspects of the schemes beyond that of provision of the transport infrastructure. For example in Blankenloch / Stutensee the mayor, saw the tram-train extension into the villages as a way of improving their environment as well as their economies. In Heilbronn, the local administration's design approach to the comprehensive re-design of the main street in response to introducing the tram-train was to create an attractive and 'stylish' town centre that would improve the local economy and the environment, as well as improve accessibility for commuters.

In Montpellier the tramway's political agenda was the re-branding of the city to attract inward investment. The tram and its logo are synonymous with the vitality of the city. In Strasbourg, objectives for the tramway, were environmental, concerned with improved air quality, reduction of traffic and the creation of a pedestrian historic centre.

The case studies have demonstrated that the successful urban design has been highest where there has been an overall agenda that includes a public realm strategy and that sees public transport as an integral component of the whole urban system. The common feature of those case studies with high urban design qualities is the master plan. In France Montpellier, Strasbourg and Bordeaux all have strategic frameworks of regeneration that focus on renewal of the public realm. Each French case study has developed a citywide public realm strategy that has at its core a new tram system. Without the tram the rationalisation of traffic within the city centres could not have taken place. This rationalisation has allowed the re-allocation of the public realm for pedestrian use and the creation of new streets, squares and boulevards.

In Strasbourg the removal of through traffic from the city centre was achievable by planning and building alternative roads and making access to the city reliant on the new tram system. In Strasbourg the change in traffic management was incremental, with the tramways development part of a political determination to re-brand Strasbourg as a city for pedestrians and cyclists. The image of Strasbourg as promoted by politicians is a city where quality of life and environmental issues are taken seriously and the tram has made these radical policies happen.

The Montpellier case study showed how a new high quality transport system could not only redefine a city centre in terms of rationalising movement of traffic by adopting a citywide approach but also how the new transport infrastructure could give identity and access to suburbs outside the city centre. This has been achieved by using architectural structures to announce the tramway connection within the urban landscape for example at Mosson in La Pallade, a large new town built in the 1960's which was previously isolated from Montpellier's city centre. In the new developing area of Port Marianne, to the south-east of the city centre, the tramway is celebrated at the terminus of Odysseum by an architectural structure that embraces the stop and adjacent park and ride facilities.


*F 4.1 Blankenloch*


*F 4.2 Heilbronn*


*F 4.3 Montpellier*


*F 4.4 Strasbourg*


*F 4.5 Montpellier*

## Creating the context for successful urban design in high quality public transport schemes

Bordeaux is embarking on a city-wide regeneration strategy that is to radically restructure the public realm by re-allocating traffic movement within the city centre and adjacent to the banks of the Garonne River. The new tram system is the catalyst for this ambitious master plan. Bordeaux has established a master plan that has at its core a series of complementary agendas that bring city-wide economic, social and environmental, (including traffic and public transport), strategies together.

The use of a master plan to provide economic and environmental improvements need not be at a city scale. In Germany, the towns of Heilbronn and Bad Wildbad used their public transport projects to re-invent the public realm as a means of creating new identities and economic destinations. In Heilbronn the design approach to the tram-train system was taken to attract inward investment to the town, whereas Bad Wildbad's aim was to develop the spa town's tourism trade. In contrast to the French case studies, the public realm improvements in Heilbronn and Bad Wildbad were focused only on the actual route of the tram-train, which is confined to the main street of each town.

The use of a master plan for a place enables a series of complementary agendas to be set out, creating a context or rational for a new public transport infrastructure. Where a master plan includes a public realm improvement strategy the physical integration of a new transport system has been successful. This has been demonstrated by the French and some of the German case studies. It should be noted that their success has been achieved in part by an existing administratively integrated public transport system. In contrast deregulation of the buses in England has limited the potential of the new tram systems in terms of their positive impact within the public realm.

As well as the preparation of master plans and public realm strategies, a successful transport system in terms of its urban design benefits depends on the composition of the design team. The case studies illustrate that where a wide range of professionals have been involved, the integration with the urban environment is greater. Where schemes have been transport led, seen as having only a transport function, the level of integration is low. For example in Leeds and Bradford the route of the guided bus does not 'interact' with the public realm. In Manchester the opportunities to integrate the Metro with the city centre was compromised by the engineered approach taken. The composition of a project team reflects the aims of the infrastructure projects beyond that of creating a transport route. The involvement of designers in the schemes is demonstrated in the end product. For example contrast the stop design and detail of the tracks at Blankenloch Kirch to Manchester's city centre stops and on-street route.

*F 4.6 Bad Wildbad*

*F 4.7 Blankenloch*

*F 4.8 Manchester*

Successful schemes within the case studies, where radical changes in a city's traffic management are required to maximise the benefits within a new public transport system, have been supported by a marketing strategy. In France there is a very robust and comprehensive approach taken to marketing material, including exhibitions that focus on the benefits of a new high quality transport system. The new tramways are portrayed as symbols of civic re-invention, of innovation and celebration of a future urban lifestyle. Where marketing has been used, the emphasis being on information rather than consultation. Sheffield spent some 1.5m euros on marketing the Supertram to local residents and businesses. In Montpellier, in particular, the marketing of the tram has continued after the tramway was complete.


*F 4.9 Nottingham*


*F 4.10 Bad Wildbad*

The success of a scheme is appreciated by what is built on the ground, the design approach, the materials used and the workmanship applied. However, not all contractual arrangements maintain the integrity of the design detail. In England the Private Financial Initiative (PFI) adopted for public transport infrastructure schemes resulted in design and build contracts (with additional scope to include operate as in Manchester or operate and maintain, as in Nottingham). The design and build contracts are financially driven and provide limited protection of the design details. Nottingham did endeavour to address this problem within the NET project by setting up a joint project steering group for the construction phase.

In summary the following factors should be addressed if a new public transport scheme is to achieve maximum urban design benefits:

- political aspiration or agenda
- master plan
- public realm strategy
- composition of the design team
- marketing strategy
- procurement method

During the discussion on the planning and design of a new scheme the role of funding has not been referred to. The availability of funding is greatly driven by political circumstances. In France where money from local taxes is ring fenced for public transport projects, administrations are financially more autonomous. Local politicians are in a stronger decision making situation than are their counterparts in England for example. However a large budget is not a pre-requisite for a well designed scheme. The French case studies do have high budgets, however the physical extent of the schemes, the scale of other complementary projects, the amount of purpose built elements and the care to design detail are all high. In comparison the Oslo tram case studies show how focusing on particular areas within a scheme in terms of costs / design effort, having a pragmatic approach, can work. The French case studies and those in Oslo, in Heilbronn and Bad Wildbad are successful not solely because of the available funding but because there was a master plan and public realm strategy that created the context into which the new transport systems were fitted.

## How to minimise the impact of new infrastructure on the natural environment

The successful integration of a new public transport system within a natural environment is challenging in that a transport system requires a physical corridor. In Sheffield part of the Supertram network extends to the countryside beyond the city, as does the line extending from the main station in Zwickau to the stop at Hallestadt. Here both lines are segregated with ballast between the tracks as a conventional 'railway' detail, with no sensitivity to the natural environment. Although not natural in terms of having a countryside location, some of the case studies provide examples of different detailed design approaches that could be adopted to integrate a new public transport system within a natural environment.

Part of the line to Wolfartsweier bisects a public open space. The use of grass between the tracks reduces their visual impact, and the sound of the tram-train, but cannot mitigate the detrimental visual impact of the fencing adjacent to the tracks and the associated wirescape. Oslo has been more successful in retaining the rural character of the area adjacent to the University of Blinderm. by using a meadow grass mix around the tracks and no fencing. The design approach to the wirescape and its supports is restrained and fits the location. The design approach to the stops allows the rural setting to continue to dominate the view by using minimal structures.

In Strasbourg outside the city centre the tracks are generally defined by grass, with planting around the fencing. The careful use of planting, location and type of fencing will allow movement of plant seeds and mammals along the corridor to continue.

The following guidelines to mitigate the effects of a new transport infrastructure on the natural environment have been drawn from the case studies:

- use wildflower grass mixes between the tracks
- simplify the design of the columns that support the wirescape
- where barriers are needed, use colour, form and height to retain views
- provide pedestrian crossing points within the fencing
- retain existing planting
- reflect the local ecology with new planting
- reduce the visual impact of a stop by limiting the amount of structures and using sympathetic materials
- reduce the sound of vehicles by grass mixes between tracks

*F4.11 Sheffield*

*F 4.12 Wolfartsweier*

*F 4.13 Oslo*

*F 4.14 Strasbourg*

*F 4.15 Sheffield*

Advertising is part of the modern urban environment. The location of advertising in the public realm is determined by where people are. Public transport presents a captive audience for advertisers, whether at the stops or on the vehicles. The case studies illustrate a range of approaches to advertising, from prescriptive locations and sizes of adverts (such as in Bordeaux), to ad hoc locations of advert panels within stops (as in Oslo) or to using the vehicle as an advert hoarding (as in Nottingham).

New public transport systems may need to accommodate within the design of the stops the visual and physical impact of advertising. In Bordeaux the stops have been designed to allow advertising space to a predetermined size, location and panel. In this way the advertising is part of the overall design of the stop and not an alien element. The size of the advertising image is important to ensure that it does not dominate its immediate environment. Bordeaux's use of free-standing glass panels as a recognisable component of its stop vocabulary provides flexibility in that the panel can be used for advertising or, if not, for another use such as information on city events.

The stop design in Oslo has as its signature a freestanding blue panel. The design of this panel is such that it can be subdivided to accommodate seats or litterbins, information notices, timetables and advertising. More advertising is being introduced into the public realm as local authorities seek additional funding streams. However the size and location of these adverts needs to be controlled so as to retain the character or quality of the local environment. The ad hoc location of advertising at transport stops impedes accessibility as well as contributing to clutter. Advertisers want to maximise the visual impact of their advert, which may be at odds with pedestrian movement and the design coherency of the stop.

Advertising extends to changing the livery of the public transport vehicles, but the questions remain as to how much of the vehicle's livery should display advertising and whether this should extend to the windows. The case study of Nottingham illustrates the detrimental visual impact of this form of advertising, which envelopes the vehicle's windows, from outside and inside the vehicle. In Oslo advertising is restricted to the top section of the tram, as in Germany, where adverts are on sections of the vehicle. In both these case studies the livery of the vehicle remains dominant. In France there are no adverts on the trams. From the case studies there is an argument to be made that the application of adverts on public transport vehicles detracts from the visual qualities of the urban landscape.

Within vehicles advertising is minimal if not absent, so as not to attract vandalism.

If advertising is required as part of a new public transport system, the following aspects should be considered:

- advertising needs to be part of stop design
- location, design and size of panels should be predetermined
- adverts on the vehicle should be minimal, if at all


*F 4.16 Bordeaux*


*F 4.17 Oslo*


*F 4.18 Nottingham*

*F 4.19 Oslo*


*F 4.20 Heilbronn*

## How to design to address potential vandalism and physical damage

Being in the public domain, public transport vehicles and stops are susceptible to potential vandalism and physical damage. In the 1980's Karlsruhe commissioned a report by psychologists to determine how vandalism could be reduced. The report's findings included the use of glass and aluminium in the design of stops, as glass is less prone to damage for fear of injury and aluminium can be easily re-painted. Glass was suggested for stops and vehicle design, in that natural light is a deterrent to vandalism. Therefore large windows or glass panels reduce anti-social behaviour. Glass panels at stops means that people are visible at the stop and there are fewer places for people to hide, reducing the fear of crime. The report also stated that within the vehicles there should be bright warm colours and no advertising.

In Oslo the designers of the tram infrastructure have found that vandalism has reduced as a result of the new shelters and better designed street furniture. In all the case studies, except Manchester and outside Sheffield's city centre, the shelters use glass panels. In France, as in Nottingham CCTV provides surveillance of the stops. Public address systems complement the CCTV cameras, as do the help buttons at stops in Nottingham and Heilbronn, for example. In Sheffield and Nottingham conductors provide additional surveillance of the trams. At stops and within the vehicles good lighting levels help reduce vandalism.

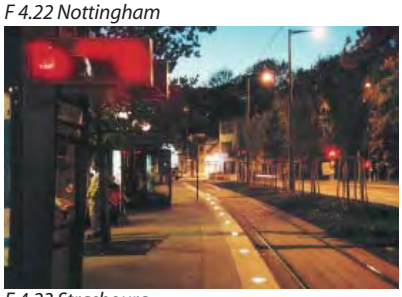
Efficient cleaning and maintenance of the stops and vehicles are important in discouraging misbehaviour. Maintenance of the stops is divided in some of the case studies, such as Oslo, where maintenance is undertaken by the city, the operator and the advertising company, JCDecaux. In Germany the vehicles are designed with seat covers that can be easily replaced by drivers at the end of a shift. The key to reducing vandalism is to replace damaged elements and clear up graffiti swiftly.

From the case studies the following approaches have been used to reduce the potential of vandalism:

- use of glass and aluminium materials at stops
- public address system at stops
- CCTV at stops and on board vehicles
- cleaning and maintenance of stops and vehicles
- help buttons at stop and in vehicles
- good lighting at stops and within vehicles
- no advertising in vehicles
- warm bright colours in vehicles
- conductors
- large windows
- easy to change / clean upholstery

*F 4.21 Oslo*


*F 4.22 Nottingham*


*F 4.23 Strasbourg*


*F 4.24 Heilbronn*

**Understanding a place**

A new public transport system presents the opportunity to re-assess and clarify the meaning and function of an existing urban environment. The benefits of higher levels of accessibility need to be assessed against potential detrimental environmental impacts, particularly in an historic setting. In order to make that judgement there needs to be an understanding of the place in terms of its historic development and morphology. From the historical analysis of the existing urban environment a series of historic character areas of a place can be identified, based on age of street patterns and buildings, width of streets, scale of buildings, location of historic squares, key historic buildings and landmarks, topography and visual cells.

*F 4.25 Strasbourg*

*F 4.26 Montpellier*

The historic character areas should inform the development of a strategic and complementary framework for movement patterns (public transport, traffic, cyclists and pedestrians) and the role of the public realm within the city or town. For example the medieval centres of Strasbourg and Montpellier have been virtually pedestrianised as a consequence of their respective tramways. The pedestrianisation in both case studies was part of a citywide traffic management scheme to eliminate city centre traffic, in order to re-structure the public realm, for pedestrian and tram use, and to improve the cities' legibility.

The definition of the historic zones within a place can be used to assess where a new public transport system could be routed in terms of providing local identity and city connections and where a new public transport system can be physically accommodated. The medieval cores of Strasbourg and Montpellier are not directly accessible to the tram systems as the narrow streets are unsuitable. However the routes of the trams physically define the historic areas, running in part along the site of the medieval walls.

The basis of understanding a place is to look at its past and to explore its future opportunities in terms of use and meaning. This can be undertaken by investigating the following:

- historic development
- scale of buildings, width of streets,
- topography and visual cells
- definition of historic character areas
- movement and the role of the public realm
- local identity and city connections

## How to approach the provision of new transport infrastructure within historic areas

**Implications of infrastructure choice**

The analysis of the urban morphology will contribute to the discussion on space availability and perhaps the type of infrastructure that could be used, or whether there should be one or two way working or combinations of these. The case studies have shown that narrow historic streets can accommodate a new public transport system if single-track working is used, such as in Bad Wildbad, Blankenloch and Zwickau's Zentrum stop. In Nottingham part of the tram route has been split, as there is inadequate space to achieve two way working. The guided bus-ways of Leeds and Bradford do not extend into the centre of the cities, as there is inadequate space to accommodate a dedicated bus-way.

In France the trams run along the 18th and 19th century streets within the historic areas of Bordeaux, Montpellier and Strasbourg, which provide sufficient space for two way working. The removal or reduction of traditional height kerbs has increased the areas of movement for the trams.

Vehicle design can be influenced by spatial constraints, for example the need to negotiate some of the city centre's streets in Nottingham and Oslo and to determine the choice of tram and the skirt detail. The livery of the vehicle should be considered in relation to the historic setting. In Bordeaux the trams are without advertising, their high gloss livery and clean lines results in the trams being visually accommodated within and reflective of the urban setting. Montpellier, by contrast, has successfully introduced a tram with a modern livery that acts as a counterpoint to its historic context.

The type of vehicle used, whether kerb guided bus, tram, tram-train or train, has physical and visual impacts on the historic streetscape by its requirements for power, signals and platform heights. These elements need to be reviewed against the historic significance of buildings and building heights.

In Bordeaux there is no wirescape or columns required, as the power supply is below ground. This has resulted in a clutter free streetscape within the city's historic core. The diesel Regiosprinter in Zwickau has no cable requirements, due to its power source. From the case studies it can be seen that where power lines are required, their visual impact is reduced, as well as the potential clutter of columns, if they are able to be supported from adjacent buildings. Consideration of the new transport route should be taken within historic areas particularly where it runs in areas away from buildings, such as parks or squares. Here columns may be required. These need to be sensitively designed and sited.

The historic character and context of a place should inform design decisions on the following elements:

- infrastructure type
- vehicle detail and livery
- catenary wirescape

*F 4.27 Bad Wildbad*

*F 4.28 Montpellier*

*F 4.29 Bordeaux*

*F 4.30 Nottingham*

*F 4.31 Zwickau*

**Design approach to stops within historic areas**

The location of stops within a historic area should be assessed with regard to their potential visual and physical impacts. A stop's relationship to key historic buildings or public open spaces should be considered as a means of creating a sense of place by linking the new transport scheme with the history of the place. In Montpellier the location of the tram stop within the Place de Comedie near the opera house, re-iterates the new significance of this public square at the heart of the city as a new urban space that connects to other parts of Montpellier; the Opera, the market, the cultural quarter and retail centre.

As well as being carefully designed and located to fit their context, the stops should be uncluttered and 'transparent'. In the case studies of Nottingham, Bordeaux and Oslo transparency is achieved by the use of glass and a minimum number of street furniture elements. The street furniture should be used to reduce the need for pedestrian barriers. This approach has been used successfully in Bordeaux.

The height of the platforms could make their integration within a historic setting problematic. However by comparing Bad Wildbad with its 55cm platform height with Bordeaux's 16cm it can be seen that the impact of Bad Wildbad's platform is tempered by the use of paving materials and the design of the shelter and associated furniture. In Bad Wildbad the design coherency of the paving material and stop within the scheme as a whole, together with the location of the stop, which is adjacent to river with buildings beyond, integrates the stop with its small-scale historic setting. In contrast Manchester with its high platforms, fails to integrate its on-street stops within the historic city centre, despite having the benefit of wider streets. This is a result of poor and inappropriate paving materials and street furniture.

In some of the case studies, the historic setting of stops has been celebrated by a departure from the design approach used at other stops. For example, in Saarbrücken the location of the tram-train stop Johanneskirche by the city's cathedral has been highlighted by the incorporation of art into the stop. A steel structure, with integral seating, forms the stop's shelter. The use of sculpture can create a contemporary landmark within a historic setting.

In Sheffield the design of the stop adjacent to the city's cathedral was carefully considered to complement the stop's backdrop, with attention given to the colour and detail of the street furniture and paving materials. Although using the Supertram's standard shelter, the shelter has been painted black (as opposed to blue) and the railings at the back of the stop, again standard, have been customised for the location by being painted black with gold painted embellishments on the finials. The historic location has been acknowledged by the use of York stone paving on the platform and with granite sett textured concrete between the tracks. Coats of arms have been fixed to the lamp columns that define the cathedral's entrance.

In all the case studies the signage at the stops remained consistent for the whole system, with the exception of Saarbrücken's Johanneskriche as described above.

The demand for advertising space within the public realm is high. A new public transport scheme should develop a prescriptive approach to the location, size and display panel design for advertising, that is part of the design philosophy for the scheme.

A design approach to stops within historic areas should consider these aspects:

- visual and physical impact of stops
- creating a sense of place
- transparency of stops
- signage
- materials / tactile paving
- use of public art
- street furniture colour
- advertising


*F 4.32 Bordeaux*


*F 4.33 Bad Wildbad*


*F 4.34 Saarbrücken*


*F 4.35 Sheffield*

## How to approach the provision of new transport infrastructure within historic areas

**The design of tracks and infrastructure within an historic context**

The case studies have shown a range of design approaches to the integration of tracks within an historic environment. The new transport system provides the opportunity to re-assess how the character of an historic area can be reinforced by changes within the public realm such as the removal of existing superfluous street clutter and the use of more appropriate paving materials. New infrastructure is often accompanied by other elements such as power lines, columns, pedestrian and traffic barriers, which require careful attention to their siting and detail so as not to add to or cause physical and visual clutter that may detract from the historic setting.

If the infrastructure is street running, the paving material used within historic areas should be accessible to all forms of pedestrian movement and visually coherent within its setting. Where kerbs are not used the demarcation of the vehicles' routes is needed through a change in the colour or texture of the paving material. The inclusion of tracks within an historic setting requires consideration to be made as to whether the existing historic kerb lines should be retained, as in Nottingham and Oslo, or whether the level change of the kerb is removed and the new kerb is laid at grade, such as in Montpellier.

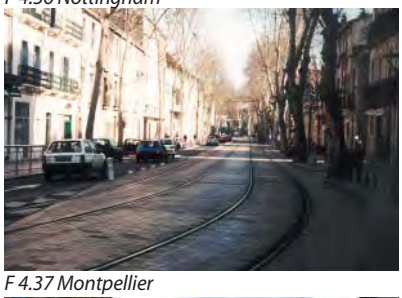
In Bad Wildbad and Bordeaux the full extent of the street from building to building has been redesigned and repaved as part of the integration of the tracks and associated street furniture. In Bad Wildbad a different tonal change in the light grey granite used for the paving, demarcates the extent of the tracks. In Bordeaux the track detail changes to reflect its location within the city's historic core. For example within historic squares and parks gravel is used, in streets with traffic, granite setts differentiate the tracks from the adjacent roadway. In pedestrian areas large units of granite paving are used with LEDs (light emitting diodes) indicating the route of the tram's tracks.

The design approach taken within Nottingham's city centre has been to retain the 'traditional' street design vocabulary. Here the tram's tracks are set within tarmacadum on the carriage way and York stone paving on the footways. A traditional kerb defines the route of the tram.

Oslo has used the detailing of the tracks to define different areas within the city's historic centre. The main public open space, Town Square, has large granite slabs as the paving material. The tram tracks are laid within the square's paving. To differentiate the location of the tram's sweep path, the granite has been textured, providing a slightly darker tone to the adjacent paving. Within the historic area of Oslo's castle, grass is used between the tracks to visually link the tramway with the parkland area that leads up to the castle. Strasbourg has also used grass between the tracks to integrate the tramway with the public park at La Republique within the university quarter.

The introduction of a new transport system provides an opportunity to remove street clutter that detracts from a historic context and rationalise required street elements or signage to enhance the historic environment. Bordeaux removed all column street lighting within its historic centre and replaced it with lighting on buildings. In Bad Wildbad existing street lighting was replaced by lighting that used the supports of the power lines. Nottingham also introduced multipurpose columns to reduce the potential visual and physical clutter.

*F 4.36 Nottingham*



*F 4.37 Montpellier*

*F 4.38 Bad Wildbad*

*F 4.39 Oslo*

*F 4.40 Strasbourg*

Within historic areas the need for power lines and supports requires careful consideration to reduce their negative impact. The decision by Bordeaux to have no overhead cables within its historic core has had a twofold effect; no wirescape and no columns detracting from the streetscape. In Zwickau the Regiosprinter with its diesel engines, has no requirements for overhead power or columns. Where overhead power lines are supported from buildings, the permission of the building owners must be obtained, as in Nottingham and Sheffield city centres. In contrast, the number of columns used for the Manchester's Metro at Piccadilly Gardens has a detrimental impact on the streetscene.

Traffic barriers are used in Montpellier and Bordeaux, where there is controlled vehicle access within the historic centres. The restrained design approach of the barriers, satisfy their function and do not detract from the historic character of the streets. Bollards are used extensively in Bordeaux to demarcate traffic and pedestrian movement. Their visual impact is tempered by the use of tall, narrow, bollards painted mid grey, which do not interrupt the view of the street. In Bordeaux the same bollard is used throughout the scheme, whereas in Montpellier different bollard types are used - stainless steel or stone depending on location within the city.

The columns within historic centres need to be carefully selected or designed. In Bad Wildbad a lightweight structure was purpose-designed using a standard base. Painted pale grey, the columns fade into the streetscape of grey granite. The columns designed for Oslo's Town Square, reflect its harbour location, being made to look like ships' masts. They are tapered, with lighting in the base. There are small spherical finials at the top of the mast and at the end of the arms, providing elegance to the composition.

The guided bus systems of Leeds and Bradford are confined to routes outside the city. The space requirements of guided routes, together with their visual and physical impact on the streetscape does not make this transport mode appropriate for historic settings.

Detailing of tracks and infrastructure within historic areas requires that decisions are taken based on a design code that seeks to define the historic qualities of the area and create visual coherence. In order to develop a design code that respects and evolves the integrity of the place, together with meeting the functional requirements of elements associated with the new transport, the following aspects should be considered:

- historic area and its components
- appropriate paving materials and details
- significance of historic street lines
- retention of kerbs
- place definition and identity
- removal of street clutter
- location of lighting
- design of power supports and wirescape
- need for traffic barriers
- design of pedestrian barriers
- track dimensions


*F 4.41 Zwickau*


*F 4.42 Sheffield*


*F 4.43 Manchester*


*F 4.44 Montpellier*


*F 4.45 Bordeaux*


*F 4.46 Bad Wildbad*

## Minimising the impact of rails or dedicated tracks on the urban environment

The case studies have shown that there has been a variety of design approaches taken to how tracks or dedicated rails have been treated within the urban environment. The kerb guided busways in Leeds and Bradford run on dedicated track within the central reservation of the cities' suburbs. Their detailed design, concrete up-stand kerb and railings, make no attempt to integrate with the surrounding areas. Potentially buses within city centres offer a high level of urban integration as they have little infrastructure requirements.

*F 4.47 Bradford*

Accessibility and ease of movement across the tracks, where a new transport system is not physically segregated, is a key requirement of the materials and detail. The detail of the tracks should positively contribute to and not detract from the character of the urban area, yet their route needs to be clearly indicated for safety reasons. Minimising the impact of tracks within the urban environment is as much concerned with their physical and visual integration as their contribution to the meaning and understanding of a place.

*F 4.48 Nottingham*

**Materials**

The case studies illustrate a variety of approaches to the use of materials associated with tracks in the urban environment, from Nottingham and Manchester, which use tarmacadum, to Bad Wildbad's use of granite and grass, to Bordeaux's use of five different materials. The selection of material should reflect the design philosophy of the scheme in responding to legibility of a place and its character. In Nottingham the retention of the existing street layout and the shared road space by other vehicles resulted in a pragmatic approach to the selection of materials. In this case study tarmacadum was used as a traditional finish to the carriageways, with York stone on the footpath. The important aspect of this approach has been the renewal of the street materials across the whole width of the street, defining the city centre and associating the new tram with renewal of the public realm and Nottingham's regeneration.

*F 4.49 Manchester*

The Nottingham approach contrasts with Manchester where tarmac is also used between the on-track sections in the city centre. In Manchester the works were associated with the tracks only, with the remaining road space and footways remaining unaltered. The result has been a missed opportunity in contributing to a sense of place in the city centre and its legibility.

In Bordeaux the choice of paving materials for the tracks has been based on defining discrete character areas within the city. In Bordeaux, as in the other French case studies, the public realm within the route of the tram has been completely renewed. This extent of change has enabled Bordeaux to redefine its public realm, add legibility and create different character areas within the city. In the historic core granite paving is used within the pedestrian streets. In streets where there is one-way traffic, raised grey granite setts define the tramway. Gravel is used in the historic squares and parks, with grass demarcating the city's new boulevards and civic spaces. The rationale associated with the materials for the tracks and the relationship to location within the city minimises the visual and physical impact of the tracks.

*F 4.50 Bordeaux*

In Oslo the use of different paving materials defines particular city areas such as the Town Square. The tracks have been well integrated into the square, by the use of large granite slabs that have been laid in a strong diagonal pattern, into which the tracks have been incorporated. The on-street sections of the tram route use granite setts to demarcate the tram's route.

*F 4.51 Oslo*

In Bad Wildbad grass between the tracks is used to create a threshold into the spa town. The main street is paved from shop front to river edge with granite. The tram-train's single track is integrated into the paving by careful detailing of edge treatment and drainage channels. High quality materials do not always need to be used to create a successful scheme. The Heilbronn case study reveals a coherent design approach and care to detail that make the integration of the tracks into the urban environment successful. The whole of the main street, Kaiserstrasse, from the railway station to Heilbronn Harmonie has been completely repaved. Where the tracks are within the pedestrianised section of Kaiserstrasse the paving from shop front to shop front is at grade. In the section of the street that accommodates traffic the tracks are segregated from the road within a central route of tarmac with brushed-in gravel, which is raised from the adjacent carriageway.

*F 4.52 Saarbrücken*

The use of a consistent detail for accommodating tracks does not contribute to the complexity of an urban environment. Unlike other schemes the Saarbrücken system does not run within the pedestrian streets of the city due to the dimensions of the rail. In Saarbrücken the on-street portions of the tram-train system are located on raised segregated routes of brown pre-cast concrete blocks within carriageways. The design approach to the tracks in Saarbrücken is one of a linear experience, which does not respond in urban design terms to the city areas that are being travelled through. Compare this approach to that of the French cases where the morphology of the cities is reflected in the design treatment of the tram tracks.


*F 4.53 Blankenloch*

In Blankenloch grey pre-cast concrete paving units are used successfully to minimise the impact of the tracks within the village. In Blankenloch the single track and pavements are treated with the same material, which provides a sense of coherency to the street. In Saarbrücken the street has not been designed as a whole, a series of railings further disrupts the streetscene. There are no railings in Blankenloch.


*F 4.54 Zwickau*

**Fencing**
The need for pedestrian barriers associated with tracks visually and physically detracts from the urban environment. In Heilbronn and Saarbrücken large unbroken lengths of railing either side of the tracks have been used to control pedestrian movement. In Montpellier and Strasbourg chain-link fencing with associated planting has been used in the suburbs. In Sheffield railings are also used in the city centre to control pedestrian movement.

**Planting**
Planting associated with tracks falls into two categories, planting that is used instead of fencing, as in Zwickau, and planting that is part of a citywide framework into which a transport system is accommodated, for example in Bordeaux and Montpellier. The planting that is associated with a citywide landscape strategy is successful in integrating the tracks into an urban environment. This is achieved as the planting itself is a legible city element into which the tracks can be visually and physically accommodated. Planting detracts less from the streetscape compared to the use of railings. Locally the planting does give a sense of place or identity to the street.


*F 4.55 Bordeaux*

In summary the minimisation of tracks within the urban environment can be achieved by appreciating the role that the treatment of tracks can play within the urban environment to define or create character areas, to provide clarity of pedestrian and vehicular movement, and to improve and extend legibility. The tracks must not be seen as functional elements only. The design approach taken to the tracks embodies the meaning of the new transport system to the urban environment. The case studies have illustrated that where a complex, coherent and informed design approach to the tracks has been taken their integration within an urban environment has been successful.

The following issues should be reviewed when considering the integration of the tracks into an urban context:

- defining character areas within an urban environment
- improving quality of legibility
- ease of movement
- need for adaptable spaces
- extent of on-street running
- pedestrian or segregated running
- location of tracks / dedicated rails / track details
- coherence of material choices within overall design guidelines
- extent of re-paving in street
- care to detailed design
- level changes
- fencing requirements
- planting opportunities

## Minimising the impact of power supply equipment, including electricity substations, on the urban environment

On-street power requirements for a new public transport system vary, depending on infrastructure type and specification of stop design such as the inclusion of real time information displays, lighting, CCTV or public announcement systems. How power is provided to a system requires careful consideration so as not to have a detrimental physical and visual impact on the urban environment. Guided buses (Leeds, Bradford) and diesel trains (Zwickau), which are self-powered vehicles, have no street power requirements for signals and stops. Different approaches have been taken by the other case studies with respect to the design and integration of power needs.

*F 4.56 Leeds*

*F 4.57 Blankenloch*

*F 4.58 Bad Wildbad*

*F 4.59 Oslo*

*F 4.60 Wolfartsweier*

**Design approaches to wirescape**

Bordeaux's decision to have a below ground power supply eliminated the need for a wirescape within the historic core of the city. In Montpellier, Sheffield and Nottingham agreements were made with owners to use their buildings to fix cables to, negating the need for columns within the streetscape. This approach has greatly benefited the urban environment, reducing visual clutter and potential physical obstacles.

Where columns are required, their design, colour and location within the public realm are significant in limiting adverse physical and visual impacts. Their design needs to be part of the design vocabulary developed for the scheme, such as materials, form and colour, to provide coherence and contribute to increasing legibility. To reduce the potential for street clutter, columns should be considered for multipurpose uses. For example in Bordeaux columns used for cable supports also have street lighting. The location of columns needs to be taken with consideration of the existing street elements that are to remain, to avoid visual and physical conflicts. In France all street furniture and below ground services were renewed as part of the works associated with the tramways. Therefore the columns, where required, could be designed and located without any constraints from existing elements.

In Blankenloch Kirche the purpose designed curved columns provide a structural quality and sense of place to the street. As well as supporting the vehicle power supply the columns have been used for the village's street lighting. The location of columns within the footpaths has harmonised their visual impact with the adjacent buildings. In Bad Wildbad, the location of the columns for the single-track tram-train is away from the buildings to maximise access to the shops. The columns are purposed designed, again with light fittings, and have used a standard base with a lightweight structure above. The columns are light grey in colour, which is consistent with the scheme's street furniture.

The need for a voltage converter has a detrimental visual impact within the urban environment. Examples of these are shown in Bad Wildbad, Blankenloch Kirche and Saarbrücken.

Where two-way working and columns are required, the columns are located between the tracks, such as in Strasbourg, or either side of the tracks, as in Montepellier and Wolfartsweier. In Heilbronn the columns are located within the balustrade detail of the bridge. In Saarbrücken the columns, when required, and associated wirescape of the tram-train are seen with the wires of the street lighting, which together presents a confused impact on the streetscene.

The use of columns within streets and their successful integration is dependent on the width of the streets to accommodate a two-column approach, and the location of existing street furniture, particularly lighting. The spacing of the columns needs to be one of rhythm, providing a positive coherent contribution to the legibility and character of the area.

The location of columns, if required, within a public space needs careful consideration so that the character of the area is enhanced and not compromised in terms of creating a convivial and adaptable space. In Bordeaux the underground power source has meant that the use and character of the existing public spaces associated with the tram system are unaffected. In Manchester the use of columns adjacent to Piccadilly Gardens has created a cluttered space that cannot be successfully integrated with the city's key public open space.

The design approach taken in Oslo illustrates how columns can be successfully integrated within a public square, contributing to its definition and character. The tram within Town Square arcs around the perimeter of the public space, creating a threshold between the city centre and the harbour area of the city including Aker Brygge. The design of the columns echoes the masts of the ships in the harbour, giving a sense of place and a local identity. The columns are centrally located between the tracks, with two arms, except where the arc is most acute. Here the columns are sited on the outside of the curve, with an arm that extends over both tracks. This detail means that the spacing of the columns and arms do not lose their visual rhythm.

**Integration of electrical intake cubicles**

As well as power lines and columns, there is a requirement for electrical intake cubicles as part of a new public transport system. Their dimensions vary, reflecting a scheme's specification. In Nottingham the intake cubicles were sited away from the tram stops within the city centre for two reasons: to reduce their visual impact and not to compromise ease of pedestrian movement to and around the stops. In the city centre the cubicles have been painted with grey anti-graffiti paint (city centre colour palette) to integrate with the streetscape. Outside the city centre the cubicles are green, again anti-graffiti paint is used.

In Saarbrücken and Blankenloch Kirche small but conspicuous, (being painted white), intake cubicles are located on the stops. In Oslo the need for intake cubicles and substations is reduced as power is supplied to the tramways via the city's metro system.

**Design approaches to substations**

The integration of substations within the urban environment is more challenging. In Strasbourg and Nottingham the substations have been located some distance from the tram stops. In Bad Wildbad the substation has been clad with wood. The colour and nature of the wood, together with its location outside the village, has been successful in mitigating its impact. The doors to the substation have been located behind the building away from street views. In France the substations are sited below ground to reduce their visual impact, while in Nottingham substations have been located within existing structures such as the bridge viaduct.

In Wolfartsweier Nord the electrical substation building is combined with bike / seating shelter. Although architecturally uninspiring the idea of providing a dual function to the substation building is an innovative way to integrate these structures. Other ways that could be explored, without compromising safety and access to the substations, is the use of planting, murals or advertising.

Power is a requirement of most public transport systems. There should be a conscious design approach taken to the location, form and colour of each element to respond positively within the urban environment in terms of improving legibility, ease of movement, and place identity. In order to explore the design issues the following aspects need to be considered:

- the possibility of using a below ground power source
- the possibility of fixing the overhead wiring system from buildings
- existing street furniture locations
- effects on public open spaces
- the ability to provide coherent and consistent street furniture
- the location, design and colour of columns
- the possibilities of making use of columns for multiple uses, such as lighting and signage
- size / access requirements of intake cubicles and substations
- location and colour of intake cubicles
- location / orientation and colour / cladding of substations
- alternative uses of substation structures


*F 4.61 Bordeaux*


*F 4.62 Manchester*


*F 4.63 Oslo*


*F 4.64 Strasbourg*


*F 4.65 Bad Wildbad*


*F 4.66 Wolfartsweier*

# How road space can be optimised with on-street running

The case studies have shown how road space can be optimised to maintain traffic movement, while providing an on-street running public transport system.

An analysis of the morphology of the urban form, together with the existing spatial qualities of the public realm establish the basis for identifying potential routes that can accommodate on-street running public transport and vehicular traffic. The public realm in this context includes the full width of roads, identifying central reservations, roundabouts, cycle routes, footways, road verges, parks and urban squares. In order to identify the potential opportunities to optimise road space, the network of public transport provision, existing and proposed, should be reviewed in collaboration with existing and proposed traffic management schemes. Optimising road space for traffic movement needs to be assessed against the positive or negative impacts this may have on the new public transport system in terms of compromising efficiency and environmental improvements.

**Roadway use**
The German case studies adopting a heavy railway design approach to on-street running, such as Rheinstetten, demonstrate the advantages of one-way working, where road access can be maintained and a dedicated public transport route provided, within confined carriageway widths. Two-way stops are accommodated within the wider sections of the village. In Zwickau the Regiosprinter, although limited in extent, shows that one way working is a possibility with this form of transport.

In Nottingham a section of the tramway has been split into separate one-way tracks where there was inadequate road space to accommodate the system's usual two-way working together with existing road needs for access and parking. This case study illustrates that a two-way working system can be divided, for part of its route. The most significant concern when splitting a two-way system is to keep the stops within the two-way lengths.

In Nottingham, as in Sheffield and Oslo, trams share road space with all other vehicles such as buses and cars. This approach does compromise the running of the trams, particularly in Sheffield, where traffic congestion delays the running of the trams. To minimise the conflict of traffic with public transport, sharing of road space can be rationalised to buses and tram-train or tram only. For example in Heilbronn the pedestrianised section of Kaiserstrasse is shared by tram-train and buses. In Saarbrücken the tram-train and buses share the same road space into the area outside the railway station, the tram-trains are not in regular service at this point.

One of the key aims of the Bordeaux Montpellier and Strasbourg projects has been to reduce traffic congestion and improve the condition and use of the public realm. Therefore the citywide traffic management schemes developed for each of the French case studies are based on a more segregated approach to the running of the trams, with no shared road space. In Bordeaux the tram's two-way working has been accommodated within a one-way traffic system, with parking spaces, where space allows. The same has been used for part of Saarbrücken's on-street sections, where road space is limited as the tram-train moves towards the city centre.

In many of the case studies wide streets have presented the opportunity to use an existing or create a central reservation to accommodate the new public transport systems. In Leeds and Bradford the guided bus-way located within a central reservation has had no effect on the number of traffic lanes. In Sheffield grassed reservations were removed to accommodate the Supertram outside the city centre, with no alterations to the existing road space. In Saarbrücken the generously wide roadways have allowed the location of the tram-train within a central reservation for most of its on-street running.


*F 4.67 Blankenloch*


*F 4.68 Nottingham*


*F 4.69 Zwickau*


*F 4.70 Heilbronn*


*F 4.71 Saarbrücken*

The design approach to the creation or re-use of a central reservation can alter the width of the remaining road space available for traffic as part of a management scheme to reduce or concentrate traffic movement. In Bordeaux and Strasbourg new boulevards have been created within the central reservations of their main roads to accommodate their tramways.

Road space has been optimised in terms of traffic movement for sections of the Heilbronn and Montpellier schemes, where the route of the new public transport system is accommodated through a traffic roundabout, negating the need for traffic lights. In Montpellier and Bordeaux sections of the pedestrianised areas of the city centres available road space has been optimised by removing kerbs (level changes) to maximise access across the streets to allow the trams to negotiate change of direction and to allow other vehicles into the areas during particular times.

So as not to compromise the existing road space and traffic movement, the use of tunnels has complemented the on-street running of the tram in Montpellier and the tram-train in Saarbrücken.

**Use of green spaces**
In some of the case studies the new public transport systems have been accommodated outside the highway within adjacent green verges, as in Saarbrücken and Sheffield. In Sheffield this approach was necessary for two reasons - first where there was inadequate road space for the tram and the traffic and second where the tram could not negotiate the local gradients. Other green spaces that could be used if road space was required to remain are parks. For example in Wolfartsweier Nord the tram is located within a local park.

The optimisation of road space while accommodating on-street running needs to be appreciated from an urban-wide perspective, as well as from the opportunities existing at a detailed level. In order to analyse and arrive at a series of solutions that reflect a place's morphology and the new transport system, in terms of aims and technology, the following should be considered:

- urban morphology and spatial qualities
- traffic and public transport management proposals
- spatial needs of transport system
- removal of kerbs to accommodate vehicle movement
- benefit / risk analysis to the new public transport system
- on-street and off-street running
- shared road space with all other road users
- shared routes with buses
- two-way working routes
- one-way working routes
- split-two way working
- one-way traffic systems
- timed access arrangements
- tunnels
- central reservation
- use of footways
- use of green verges
- use of public open spaces


*F 4.72 Strasbourg*


*F 4.73 Montpellier*


*F 4.74 Saarbrücken*


*F 4.75 Sheffield*


*F 4.76 Wolfartsweier*

## Complementing the creation of a new public realm

The introduction of a new public transport system provides the opportunity to evaluate the use and meaning of the existing public realm and to consider the role of a public transport system in contributing to and enabling change in the public realm to happen. The complementary role of public transport within the urban environment can vary in terms of scale, from the citywide such as Bordeaux, to that of a project specific, as in Oslo's Town Square. In contrast the requirements of guided buses do not integrate with the public realm.

In Strasbourg, Montpellier and Bordeaux citywide public realm strategies were developed, with the new tramways being the catalyst for the initiatives. The public realm strategies, from the identification of city quarters to a series of indivdual projects, set out a coherent approach to the hierarchy of public spaces. In support of the public realm strategies design guidelines were prepared for paving materials and street furniture.

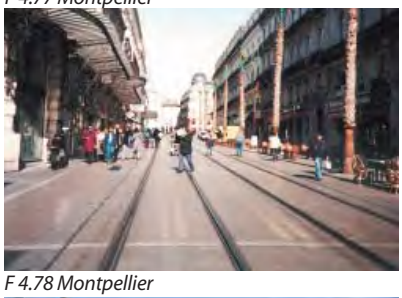
The case studies have shown how a new transport system can contribute to the improvement or definition of the public realm. The basis of a public realm strategy must be the distribution and quality of pedestrian spaces and their connections. The vitality of the public realm reflects land uses, accessibility, safety and comfort. The integration of a public transport system can enable the public realm to be more convivial and active by linking city destinations, freeing streets and places from traffic and increasing legibility and connectivity by creating places and ease of movement within the urban environment.

In Strasbourg, Heilbronn and Saarbrücken new landmarks have been formed within the public realm that increase legibility and create a sense of place and identity. In Strasbourg an architectural structure defines the Homme de Fer, in Heilbronn and Saarbrücken canopies celebrate the new bus and train interchanges with the tram-train systems.

New transport infrastructures by their nature have the potential to create new nodes or connections within the urban environment, for example Corum in Montpellier, a new public transport interchange and cultural venue. In Zwickau and Heilbronn access to a stadium and theatre respectively was created by the new public transport systems. On a smaller scale new pedestrian town connections were created within Bad Wildbad focusing on the route of the tram-train by bridging the river.

The approach taken by the use of materials within the public realm can establish a series of character areas, reflecting accessibility and pedestrian movement. For example in Bordeaux pedestrian only areas are defined by the use of granite paviors, where as in streets with traffic, footways have been retained with the tram running within a granite sett corridor.

*F 4.77 Montpellier*



*F 4.78 Montpellier*

*F 4.79 Saarbrücken*

*F 4.80 Zwickau*

The case studies indicate that the contribution of the new transport systems to the public realm is most successful when the entire width of the public realm is physically renewed. The quality of the paving material is not as significant as that of its geographical extent and attention to detail. This is most widely seen in the comparison of Manchester and Nottingham.

The public transport system, with its requirements for stops and other street furniture elements, offers the opportunity to introduce a design coherency to the public realm, as well as a signature for the new transport system. The design of the stops and street furniture elements can be purpose designed as in Montpellier, Bordeaux, Blankenloch Kirche and Nottingham, harmonising choice of materials and colour with an overall design intent. Where standard street furniture has been used such, as in Manchester and Sheffield, the contribution to the public realm has been less successful.

The changes of paving materials, street lighting and the opportunity to rationalise signage, increases legibility within the urban environment by reducing street clutter and providing visual and physical continuity within the public realm.

Complementary improvements to the public realm, as part of a public transport scheme, include planting and public art. For example in Bordeaux an ambitious planting programme is in place to create extensive boulevards through which the tram runs. In Montpellier public art was commissioned to give particular sections of the tramway identity and a sense of place within the urban environment. Public art has been used in Heilbronn as an integral part of the re-design of the bridge in the centre of the town with the introduction of the tram-train project.

A new public transport system can be significant in redefining, creating and complementing the public realm by looking at the following aspects:

- public realm strategies
- improved legibility
- landmarks and nodes
- city quarters
- place creation
- movement patterns
- city destinations
- vitality in the public realm
- materials
- removing street clutter
- street furniture
- lighting
- signage
- planting
- public art


*F 4.81 Bordeaux*


*F 4.82 Manchester*


*F 4.83 Nottingham*


*F 4.84 Bordeaux*


*F 4.85 Montpellier*

## How to ensure the new infrastructure will have high design and aesthetic qualities, whilst retaining common design elements

The common denominator of those case studies that have high design and aesthetic qualities is the level of design control. It is control and the appreciation of the project as a designed totality, made up of many components, from paving to litter bins, from kerb details to shelters. Each plays a significant part in the end product, the scheme, as seen and used by people.

Good quality design is not the sole preserve of purpose-designed elements. Good design is achieved by establishing a robust and appropriate design philosophy that is seen through to each element of the scheme. Good design is about judgement, whether in the selection of materials or street furniture, or the distilling of the process when designing purpose-designed elements. It is the same approach to that of making spaces and functional elements work.

The success of Nottingham, Bordeaux, Oslo, Heilbronn or Bad Wildbad is the coherency of the design with respect to all aspects of the scheme. In each case there is a design approach to the materials, stop layout and street furniture that forms a family of streetscape components, which in turn provides identity to the scheme and place. These components need not be purpose-designed. Elements can be designed in collaboration with street furniture manufacturers, as in Nottingham and Oslo, so providing a unique identity but without the associated costs. Having a standard design approach has the benefit of easier and cheaper replacements costs.

Montpellier's design approach was to have the tram's livery, including its interior and all the street furniture, designed by one designer for design consistency. The significance of the project is a total experience for passengers.

In Strasbourg the design approach to the stops has focused on the ticket machines as the tramway's icon or symbol. By contrast other features are restrained, with standard shelters, seats and lighting. In Oslo the common theme of the stops is the blue panel, which can be used on its own free standing or can be associated with a canopy. The panel is adaptable in that it can accommodate seats, litterbins, advertising or timetable information.

Colour is used as part of a transport system's brand or public realm signature, for example green and silver in Nottingham, blue in Bordeaux and Montpellier. The control of advertising, whether at stops or as part of the vehicles' livery needs to be considered carefully to ensure design coherence is maintained.

A design approach should also anticipate changes in need, whether in a prescriptive way such as in Bordeaux, with its glass panel that can be used for advertising, or in Oslo, where ticket machines have been omitted in anticipation of smart technology.

The key to successful design is attention to detail, such as the location of street furniture elements in association with paving as in Bordeaux, or the paving detail and kerb details in Bad Wildbad. Careful consideration of how materials and other elements are to be juxtaposed is paramount in ensuring a high quality design outcome.

Design within the public realm should be controlled, consistent, restrained in form and colour so as not to dominate the urban environment. It should be robust and easy to maintain. There should be no additional clutter to the street scene as part of the new infrastructure's requirements. To achieve high quality consistent design, the following aspects should be considered:

- design control
- design philosophy
- coherent design guidelines
- common and adaptable elements
- maintenance and replacement
- attention to detail of layouts and materials
- colour
- advertising
- anticipating change

*F 4.86 Heilbronn*

*F 4.87 Bordeaux*

*F 4.88 Montpellier*

*F 4.89 Bordeaux*

Integration is as much about celebration as it is about subtlety. Compare the definition of space at Homme de Fer in Strasbourg, with its structural canopy to that of the stops in Bordeaux, which are restrained and transparent in character. In both situations integration is achieved by the elegance of the design solution and the coherence of the design approach to the schemes.

In Oslo's Town Square it is the paving material of the square itself that serves to integrate the tram stop with the public space. The module and direction of the granite slabs and their size are visually important in the square, onto which is laid the stop and its platforms. The simplicity of the columns through the stop, echoing the masts of the ships, integrates the stop visually and physically with the harbour. Compare this design response to the understanding of place and detail to that of Manchester, where the size and number of columns near Piccadilly Gardens renders the space devoid of purpose.

Oslo is also an example of integrating a stop with nearby buildings. In this instance it is the new hospital. The physical and visual integration has been achieved by the use of sympathetic building materials and the creation of a small piazza in front of the stop that is the pedestrian route between the hospital blocks. In Heilbronn the paving design at Harmonie stop extends to include the theatre, marrying the theatre and stop together by the creation of a new public square.

In Manchester the visual intrusion of stops within the city centre is not solely about the height of the platforms, it is concerned with the location of the stops within the streets and the extent of the paving material and its colour. The Market Street stop is situated in the middle of a short, narrow, pedestrianised street. The location of the stop is physically and visually detrimental to the space, forcing pedestrians against the shops. In Oslo stops are staggered where space is inadequate. In Bad Wildbad the high level stops have been successfully integrated into the street scene by using the same paving materials throughout the scheme.

The location and successful integration of stops within the public realm also reflects where stops are in relation to pedestrian areas. In Saarbrücken and Nottingham the new public transport is not part of the pedestrianised network within the cities, in contrast to the French cities of Montpellier, Strasbourg and Bordeaux. In these examples tram stops are located within the pedestrian areas of the city centres, integrating the stops with pedestrian movement.

In Heilbronn and Saarbrücken the stops created outside the railway stations have been made into landmarks within the cities by the use of large canopies. This bold design approach has integrated the stops within the urban environment by creating a new urban context within the city, which celebrates the gateway qualities of the stop to the city, as well as its role as an interchange.

The successful location of new stops within the public realm or adjacent to buildings is concerned with the design responses that enables their integration. This is achieved by a local analysis of the interaction of the stop and its immediate surroundings. Below is a checklist of some issues that should be considered as part of this process:

- design coherence
- route and spatial analysis
- location of stops / analysis
- relationship of stops to the public realm and / or buildings
- celebration or subtlety
- materials
- extent of new paving
- legibility
- place connectivity
- attention to detail
- use of public art / structures


*F 4.90 Strasbourg*


*F 4.91 Oslo*


*F 4.92 Manchester*


*F 4.93 Bordeaux*


*F 4.94 Heilbronn*

## Integrating new stops with existing modes of transport

The introduction of a new public transport system provides the opportunity to rationalise existing networks or create new networks and connections with existing transport modes. Mainland Europe benefits from integrated transport systems, whereas in England the case studies have been restricted in their design and subsequent levels of patronage by the competition from the deregulated running of local buses.

In France the new tramways have been used as a catalyst to review and rationalise public transport. Whereas in Manchester, Sheffield and to an extent in Nottingham there is duplication of bus and tram routes. In France the trams and buses are segregated, with interchanges being created as part of the new tramways. The design approach taken to these interchanges varies from Bordeaux, which is a functional response where the tram stops and bus stops are adjacent to each other, to Montpellier where the main transport interchange in the city centre, Corum, is celebrated by a glass canopy which covers the bus and tram stops. In Bordeaux the use of common elements such as signage and shelters, visually combines both transport modes as well as highlights their integrated nature.

In Heilbronn the interchange between the railway station, buses and tram-trains have been designed in a similar way, with glass canopies highlighting the significance of the interchanges within the networks, together with the urban environment. In Heilbronn the design of the interchange includes the creation of a new public square between the tram-train / bus stops and the entrance to the mainline railway station. The significance of the Heilbronn case study is the re-alignment of the tram-train's route from the mainline station into the public realm, thereby creating a more high-profile, visually and physically accessible interchange.

Heilbronn and Saarbrücken are also examples of where buses and tram-trains share the same road space and stops. In both case studies this occurs within pedestrianised sections of the road. However in Sheffield and Manchester, where buses share road space with the trams, the result is one of congestion because - in the case of Sheffield - other vehicles share the same road as in Sheffield, and - in the case of Manchester - of the shear number of buses in the city centre.

In Zwickau the Regiosprinter stops in the city centre, where it has two interchanges with the tram system, at Hallestadt and Zentrum. The platform is shared by both transport modes, with passengers able to move from one form of transport to another easily.

*F 4.95 Montpellier*

*F 4.96 Heilbronn*

*F 4.97 Sheffield*

*F 4.98 Zwickau*

*F 4.99 Oslo*

Within the case studies of Oslo, there are examples interchanges from the tram system with boats, buses and the metro. The city centre stop in Oslo, within the Town Square, provides an interchange with the boat services in the harbour. There is no formal interchange, in terms of physical connection, such as a canopy between the harbour and the tram stop. Rather the tram stop has been appropriately located between the harbour and the pedestrian routes between the city centre and Aker brygge. At Forsknings Parken, in the north of the city, tram and metro lines intersect. The intersection occurs at different levels, with the tram route going under the metro line. The interchange is accommodated by a series of ramps and steps. Within the city centre trams and buses share the same carriageway and stops.


F 4.100 Oslo

The transport interchange opportunities were examined during the design process of Nottingham's NET tram project. Interchanges have been made to connect the tram system with other forms of public transport. The use of existing railway lines for the tramway created the opportunity for interchanges (Hucknall Station, Bulwell Station). Issues of accessibility and lack of a corporate design approach have made these interchanges less successful than other cities. The interchange at Nottingham Station is more successful, with a new structure connecting the tram and mainline route. The architectural approach to this interchange facility provides a landmark within the tram system and from the adjacent streets. This positive approach contrasts with Sheffield's Supertram and the city's main station, where the tram stop is some distance from the station and there has been no attempt to highlight the significance of the tram stop within the city's public transport system.


F 4.101 Nottingham

The consideration of cycle routes and provision of cycle parking varied considerably across the case studies. In Blankenloch Nord cycle parking has been included within the design of the stop's shelter. In Strasbourg cycle parking is included in the majority of the tram stops. In Oslo bicycle hire facilities are being introduced into the city, and are being located at or close to the tram stops.


F 4.102 Blankenloch

Park and ride facilities need to be part of a new public transport system. In Montpellier the design response to these elements has been to use visually strong architectural statements that create local landmarks. This approach contrasts to Nottingham, where the five park and ride facilities are located alongside the tram stop but without any features to advertise the facilities.


F 4.103 Montpellier

To integrate a new public transport system with other forms of transport the following elements should be addressed:

- the whole public transport system
- location of stops in relation other public transport
- pedestrian routing at interchanges
- the hierarchy of interchanges within entire public transport system
- cycle routes networks
- car parking / park and ride
- corporate design
- common design components
- possibilities for creating a new public realm
- architectural structures

## Making stops visible to potential passengers but not visually intrusive

Stops need to be visible yet not dominate the urban environment. Stops and their components need to set out a legible code to passengers through good design and its repetition within the public realm. The case studies show a range of design approaches - from the less successful examples of Manchester and outside the city centre in Sheffield, with their use of standard shelters and signage - to the successes of Bordeaux and Nottingham, with their purpose designed street furniture.

In order not to be visually intrusive the stops need to have a restrained design vocabulary that co-ordinates materials, colour, form and juxtaposition. In Bordeaux the palette of materials and colour has been limited to glass and greys. The accent of the stop is the blue of the world maps in the narrow end side panels of the canopy. The colour blue selected and the transparency of the stop can be read from a long distance within the streetscape.

Stops, in order not to be visually intrusive, should work at different levels. For example from a long distance you can recognise the location of the stop, and as you approach other familiar elements become apparent, such as the platform, lighting or the real time countdown.

In Strasbourg the ticket machine and integral countdown display forms the visual marker of the tramway within the public realm. The choice of the colour for this drum has been taken so that it is the form of the drum that dominates, not the colour. The other components of the stop, reserved in colour and material, are set apart from the drum. Nottingham established a prescriptive layout for the tram stop in terms of street furniture, materials and colour. In order to reduce street clutter, there are no ticket machines at the stops in Nottingham. In Oslo a blue panel defines the tram stops, which are usually associated with glass canopies.

Stops need to be laid out so as not to impede pedestrian movement. Therefore consideration needs to be given to ticket machines or fencing requirements. In Manchester the colour and form of the ticket machines are visually and physically intrusive compared to those in Bordeaux. The extent, colour and design of the railings used in Bradford at the guided bus stops are wholly inappropriate for their integration within the streetscape. In Saarbrücken and Heilbronn the potential detrimental impact of pedestrian barriers has been addressed by using glass infill panels.

Integration can be achieved by creating the context for the stops. For example in the French case studies the paving within the public realm has been completely repaved, establishing a context into which the new stops could be designed and located.

The following aspects should be considered when locating and designing new stops:

- streetscape analysis: colours and scale
- stops and the creation of visual links
- types of materials
- the role of the stop as a "signature" for the scheme
- the stop as a feature within the streetscape
- day and night time effects
- required elements at the stop
- need for transparency
- stop layout
- reduce fencing / fencing design
- the need to minimize clutter
- extent of paving
- control of advertising
- signage
- colour

*F 4.104 Bordeaux*

*F 4.105 Blankenloch*

*F 4.106 Nottingham*

*F 4.107 Saarbrücken*

*F 4.108 Strasbourg*

The introduction of a new public transport system in to a city, town or village provides the opportunity to re-evaluate how life is experienced in that place and what can be altered to improve the quality of life for residents, businesses and visitors.

The public image of a place within urban design is concerned with the quality of the public realm, the streets, squares and parks. Successful places and spaces within an urban environment need to be accessible and safe, to encourage and create activity. Their functions may change from day to night.

A new public transport system can in itself contribute to the public image of a place by embodying a new urban order in terms of how life is lived within a city, town or village. Lessons can be learnt from the case studies as to how a new public image can be created as a result of a new public transport system, such as:

- local information, consultation and public relation strategies that explain urban changes and the role of the new transport scheme to achieve those changes
- creating the public transport system as a symbol of change and regeneration within a place beyond that of transport
- high design inputs and attention to detail, move away from 'transport' approach and design mediocrity
- demonstrate that the new transport system provides solutions to local issues
- development of innovative solutions to urban problems such as public transport integration or traffic management
- development of new identity for place by integration of a transport scheme with an urban environment
- coherent design strategy for rationalisation and improvements to the public realm, including improved street lighting
- development of pedestrianised areas
- improved urban legibility
- improved accessibility
- improved maintenance of the public realm
- design and type of vehicles
- local campaigns to advertise what successes have been achieved since the transport system was opened


*F 4.109 Montpellier*

*F 4.110 Zwickau*


*F 4.111 Heilbronn*


*F 4.112 Nottingham*

## How the enhanced image can be used to market and brand a city or town

The French case studies have shown that an enhanced public image can be used to market as well as brand a city. In Montpellier and Strasbourg one of the aims of the new tramways was to attract new investment and employees. The tramways have been used to advertise the quality of life that is now experienced in Strasbourg and Montpellier. In Montpellier the marketing of the tram has made the tram and the city synonymous. The tramway is the city's brand.

The English cities have not used their projects to market themselves, although Stagecoach in Sheffield has an awareness campaign running that includes development of city maps and advertising at tram stops and in the local press. In Manchester a new marketing strategy is starting in autumn 2004 in an attempt to attract students to use the tram.

In Germany, Heilbronn has used its new public image to advertise accessibility and the quality of life experienced in the town. In Zwickau and Bad Wildbad the new public image is one of accessibility and an improved public realm. In Oslo the public transport system is marketed as providing improved city connections through a developing and integrated system.

*F 4.113 Montpellier*

*F 4.114 Bad Wildbad*

The shape, design, colour, patterning and size of the carriages of the vehicle are all important in terms of the impact the vehicle has on its environment whether in the historic city centre or travelling through the countryside between suburbs. The case studies show a range of approaches to vehicles, from custom designed examples, such as the trams of Bordeaux and Montpellier, to the guided buses of Leeds and Bradford, or the vehicles of the Karlsruhe region.

The three French examples are new systems. The trams have been designed as part of the whole system, with colour coordination internally and externally, excellent accessibility and flowing form. Each cities tram is highly distinctive and is a form of branding. The guided bus ways of Leeds and Bradford, the Karlsruhe vehicle examples and Oslo trams are part of an existing network, and so the livery and design is predetermined.

In Nottingham the tram is based on Strasbourg's tram, well designed and incorporating the city colours, which have been reflected in the stops and furnishings. The same is true of Saarbrücken, Strasbourg and Bordeaux. The trams of Montpellier are particularly distinctive and eye catching. The sea blue colour incorporating the Hirondelle motif is a direct marketing tool in itself and is used throughout the city.

Advertising has been used on the livery of some of the vehicle systems. This is a source of revenue for the operators and the local councils. The adverts on the Nottingham trams reduce visibility from within the carriages. The use of advertising can be detrimental to the appearance of a vehicle within its environment.

Large and deep windows within the carriages create a light and spacious atmosphere, and allow pedestrians to view their surroundings with ease. The degree of visibility improves actual and perceived safety. These large windows are extremely important and are used in most of the tram-trains, trams and train-trams. The use of colour within the carriages has been well detailed in Montpellier.

Accessibility is crucial if the tram is to be used comfortably and safely. Many of the more recent systems have low floor heights that are level with the equally low platforms, such as Nottingham and the French examples. Some of the Karlsruhe vehicles have been fitted with extending or sloping steps. However due to the varying platform heights throughout the system the trams often require a step up to enable access.

In following aspects should be considered in the design of the vehicle:

- the provision of full accessibility
- carriage form and appearance
- consistency with the rest of the system
- minimal advertising
- colour scheme inside and out
- large windows
- minimal clutter


F 4.115 Wolfartsweier


F 4.116 Strasbourg


F 4.117 Manchester


F 4.118 Bordeaux


F 4.119 Nottingham

F 4.120 Montpellier

## Does good design cost?

Funding arrangements across the case studies vary from country to country. These arrangements determine the extent and the design control of the project. For example the schemes in France, Germany and Norway have been undertaken varying contributions from different levels of government:

- In Germany funding has three sources for its public transport projects: federal 60%, state 25% and local authority15%.
- In France the local councils have more financial autonomy in determining the type and scale of their transport projects. This situation is supported by a local tax collected solely for transport improvements from employers with over 9 staff. In Montpellier funding has been based on the following contributions: 18.2% central government, 6.6% department and 75.2% district.
- In England the funding is based on Private Finance Initiatives, which although relying on some government contribution are contractor led in terms of implementation and design. For example Manchester's Phase 1 was 33% funded by central government and Phase 2 only 11%.

The costs for each scheme have been assessed in terms of their 2004 expenditure to enable some broad comparisons and conclusions to be drawn as to the level of success a scheme has demonstrated in urban design terms, and what order of cost can be attributed to that success.

The case studies need to be seen in two distinct groups, those that are extensions of existing networks such as Oslo and those immediately outside of Karlsruhe, and those case studies that are completely new like Nottingham or Bordeaux.

The re-use of existing railway tracks and corridors can potentially reduce costs, but at the expense of reducing the opportunity to integrate the scheme within its urban context. In Saarbrücken 60% of the scheme is on new track but only a third of that new investment is on-street. In Nottingham 30% of the scheme is on-street with remainder within existing corridors. Manchester Phase 1 has 10% on street and re-uses existing corridors and stations outside the city centre.

Strasbourg Phase 1 is the most expensive scheme. All the French case studies are expensive. The scope of each of the schemes needs to be recognised: underground parking, purpose designed street furniture, underground services renewed, extensive paving scheme, public art and landmark structures, major re-design of the public realm and street lighting. Each city has been physically transformed.

Funding allocation for a public transport project needs to reflect the aspirations associated with that project. Funding needs to be realistic to achieve the physical changes that enable integration and design benefits to an urban environment to be successful.

The cost of a scheme can be assessed simply in terms of the success of its integration as a transport system and/or as a component of its immediate urban environment. However consideration should also be given to the benefits that the scheme will bring to the wider area in the long term.

In contrast to the French experience, the introduction of guided buses into Leeds and Bradford has been less expensive. However their costs need to be seen in terms of the guided bus infrastructure and its application within an urban environment. The track requirements of a guided bus system are not suitable for pedestrian areas as accessibility is compromised. The visual and physical integration of a guided bus into historic settings would be difficult to achieve.

The cost of a scheme needs to be seen within the context of the place, the aims of the public transport system and the aspirations associated with the new transport system. If funding is not available to undertake the wider environmental improvements identified within a city master plan, the implementation of a scheme may be seen as part of a phased programme. This pragmatic approach means that the added benefits that complement a new public transport system within an urban environment can be achieved. The costs of a new public transport scheme within a city or town needs to be seen as an urban investment that embraces the quality of life of a place, its economy and social well being.

| Place | Length in Km | No. of stops | millions of euros | millions of euros 2004 | Date opened | million euros per km (2004 |
|---|---|---|---|---|---|---|
| | | | | | | |
| Bad Wildbad | 0.8 | 3 | 6 | 6.09 | 2003 | 7.6 |
| Blankenloch | 7.1 | 12 | 36 | 42.84 | 1997 | 6.0 |
| Bordeaux | 25 | 47 | 634 | 634 | 2004 | 25.4 |
| Bradford | 2.3 | 8 | 16 | 19.04 | 2002 | 8.3 |
| Heilbronn | 1.64 | 4 | 39 | 41.15 | 2001 | 25.1 |
| Leeds | 2.1 | 11 | 15 | 19.65 | 2001 | 9.4 |
| Manchester phase 1 | 31 | 28 | 215 | 281.65 | 1992 | 9.1 |
| Manchester phase 2 | 8.2 | 9 | 237 | 256 | 2000 | 31.2 |
| Montpellier | 15.2 | 28 | 349 | 377 | 2000 | 24.8 |
| Nottingham | 14 | 23 | 266.4 | 266.4 | 2004 | 19 |
| Oslo project A | 1.75 | 4 | 6 | 7.56 | 1995 | 4.3 |
| Oslo project B | 1.5 | 5 | 12 | 13.8 | 1998 | 9.2 |
| Oslo project C | 1.1 | 4 | | | 2004 | |
| Rheinstetten | | | | | 1999 | |
| Saarbrücken | 23 | 33 | 300 | 333 | 1997 / 2001 | 14.5 |
| Sheffield | 29 | 48 | 356 | 448.56 | 1995 | 15.5 |
| Strasbourg phase 1 | 10 | 18 | 296 | 376 | 1994 | 37.6 |
| Strasbourg phase 2 | 12.3 | 24 | 248 | 268 | 2000 | 21.8 |
| Wolfartsweier | 4.6 | 13 | 30 | 30 | 2004 | 6.5 |
| Wörth am Rhein | 1.3 | 3 | 11 | 11.17 | 2003 | 8.6 |
| Zwickau | 1.3 | 2 | | | 1999 | |

● Information not made available

*F 4.121 Cost comparisons between case studies*

| Place | million euros per km |
|---|---|
| | |
| Strasbourg phase 1 | 37.6 |
| Manchester phase 2 | 31.2 |
| | |
| Heilbronn | 25.1 |
| Bordeaux | 25.4 |
| Montpellier | 24.8 |
| Strasbourg phase 2 | 21.8 |
| Nottingham | 19 |
| Sheffield | 15.5 |
| Saarbrücken | 14.5 |
| Leeds | 9.4 |
| Oslo project B | 9.2 |
| Manchester phase 1 | 9.1 |
| Wörth am Rhein | 8.6 |
| Bradford | 8.3 |
| Bad Wildbad | 7.6 |
| Wolfartsweier | 6.5 |
| Blankenloch | 6.0 |
| Oslo project A | 4.3 |

*F 4.122 Price per kilometre*

## Conclusions

This chapter has discussed those elements of best practice as identified from the case studies with regard to how the principles of urban design can be used to enable the successful integration of new high quality public transport systems within an urban environment. Fundamental to this outcome is the appreciation of the role of urban design in setting a framework and rationale for redefining a place and the role of public transport within that strategy.

The success of a scheme's integration with an existing built environment is based on the urban design context established for a place and the role of the new public transport system within that agenda or vision. Public transport needs to be appreciated beyond that of passenger movement, it needs to be seen as a component within a comprehensive strategy for a place that includes social and economic aims and environmental improvements. A common denominator among the best practice schemes has been the role of the public realm and the opportunity taken to re-define it's meaning as part of the realisation of a new high quality public transport system.

The case studies have demonstrated that each mode of public transport explored, with the exception of the guided bus, can be successfully integrated into an urban environment.

The track requirements of kerb guided buses limit their integration, having a detrimental physical and visual impact on the urban environment. The kerb guided buses of Leeds and Bradford are located in the suburbs to alleviate local traffic congestion and do not extend into their respective city centres. Within city or town centres buses do not require a physically demarcated route. Potentially with little infrastructure requirement, buses could have high levels of urban integration. However, compared with other transport modes, buses have a limited passenger capacity and consequently the number of buses that would potentially be needed to satisfy demand would have a further negative impact on the urban environment.

The key aspect that leads to a successfully integrated scheme is the design approach taken to stops and the extent of re-paving of streets or public spaces. This design approach is based on appreciating the street or public space as one entity into which the public transport system is fitted. The size of a vehicle and its power and platform height requirements do impact on the urban environment. There is obviously a difference between high level platforms within a street compared to low level ones. However the case studies have illustrated that it's the overall design approach to a scheme that determines integration. For example Heilbronn and Bad Wildbad with high platforms that have been successfully integrated into the streetscapes by adopting an extensive and comprehensive re-paving programme with high quality materials and attention to details.

In Zwickau the size of the train-tram vehicle, particularly its width, can be incompatible with an urban setting, particularly a historic one. However the lack of overhead power sources and the extensive planting and re-paving along its route into the town's historic centre does achieve a level of urban assimilation. In contrast the high level platforms in Manchester are intrusive as a result of the design approach taken, which does not complement or contribute to the existing urban environment.

The case studies have highlighted the role of a new public transport within a town or city. There are two reasons for a new public transport system:

- to provide connection to an existing system, for example the extension of the Karlsruhe network
- to create a new independent system within a town or city, such as the French and English tramways

A new public transport system allows the possibility of new technologies to be included within a scheme. The creation of a new independent transport system is expensive, with none of the advantages of extending a network with an existing infrastructure such as vehicles and depots. However there are disadvantages to extending a network in that the limitations of an existing system can be repeated, such as the use of vehicles that are inaccessible.

The case studies have illustrated the re-use of existing or disused railway corridors as part of a new public transport system. For example in Saarbrucken the new tram-train uses existing rail routes outside the city and new tracks within the city centre. In Bad Wildbad a new tram-train connection has been extended into the town from the railway station. This approach has also been used in Heilbronn where the stop in the rail station was moved to outside the station as part of the new on-street section.

The re-working of existing or disused rail corridors is significant, as many smaller settlements cannot afford a completely new transport system. However extending or re-using a railway may help justify the investment, as was the case with the innovative extension of the train-tram into the centre of Zwickau.

The extent to which a scheme can be integrated with its urban context reflects the funding available, the types of paving materials used and the extent of any re-paving programme. A pragmatic approach to re-defining the public realm could be applied to a project by having a phased programme of improvements, as finances become available.

The case studies have shown that the actual transport modes is less of an issue in determining successful integration than the need to have a robust urban design framework and detailed design approach. The important aspect of a public transport project, beyond achieving its transport function, is that the new system needs to leave a legacy that fulfils the aspirations of those who live or work in the city or town. A legacy that is based on urban design principles to create a new social and economic order, that redefines and enhances the public realm and provides an improved quality of life, that is associated with the provision and use of public transport.

## Introduction

**Design guidelines for a new public transport system within an urban environment**
Many public transport systems have been planned and constructed without considering their impact on the existing urban form, and as a result urban design issues were ignored. The case studies have shown that a new public transport system - its aims, design and realisation - are inextricably linked to urban design and in particular to that of the public realm. The quality of the public realm is significant in determining the built environment and the quality of life experienced, as well as people's response to a place and civic pride.

**Urban design principles**
A set of urban design principles describe what makes a place successful, these principles or qualities should underpin and guide the decision making process of a scheme.

The successful integration of a new public transport system within an urban environment should:

- create a place with its own identity and character
- distinguish public and private space
- create a convivial public realm with public spaces and routes that are attractive, lively and pleasant to use
- improve connectivity and permeability to encourage pedestrian movement
- improve legibility and the physical understanding of a place
- consider the adaptability of the public realm
- encourage variety of activities within the public realm, giving diversity and choices
- create a place where land use, transport and natural environment are well integrated

This section sets out a series of checklists, that reflect those aspects of best practice highlighted in the case studies, that demonstrate how a new public transport system can be successfully integrated into an urban design strategy and secondly how the strategy can be translated into practice and achieved. To illustrate the aspects of the checklist, annotated photographs of some of the case studies are included at the end of this chapter.

Successful schemes do not happen by accident. Success requires a positive working environment based on political determination, local support and positive team working.

**Scheme leadership and support**
Public transport schemes are long-term projects. The success of a scheme is dependent on many factors, however the key factor in developing and realising a scheme is that of political and administrative support. Marketing strategies and consultation with the public and local stakeholders are also essential. There needs to be local consensus for the scheme.

The following factors characterise a public transport system whose design is successfully integrated into the the urban environment:

- a defined political aspiration or agenda
- a supportive local authority with design champions, design panels and the necessary in-house skills
- public and stakeholder participation programmes
- a marketing strategy identifying where and how the scheme will give local benefit.
- adequate funding allocation
- a clearly established contractual route to be used

**A collaborative process**
Context is involved with leadership and the setting up of a team of professionals that are able to seek and appreciate opportunities for the project across local agendas, including urban design, regeneration, traffic, transport and management, environmental, social and economic areas. Successful integration of a public transport system within an existing urban environment needs the project team's recognition of the following:

- the inter- and intra-relationships that exist between urban design and public transport
- the role of urban design in defining a design philosophy or strategy for the project
- the importance of design at all levels, and appreciation of its impact
- time required to achieve design solutions within the programme
- the understanding and allocation of funding for the design elements
- that successful projects are dependent on people working together effectively

## Stage 2: the strategic context

**Regulatory regime and policy frameworks**
To ensure successful integration within the urban environment a public transport scheme needs:

- an appropriate regulatory regime
- an adequate policy framework

**Master plan and cross cutting agendas**
A city-wide master plan should set out a vision into which the new public transport system contributes. The master plan should be comprehensive with complementary agendas that include:

- urban design
- the public realm
- pedestrian movement
- public transport
- traffic management
- social inclusion
- economic prosperity
- environmental sustainability

An urban design strategy is a pre-requisite for the successful integration of a public transport system. A public transport system offers an opportunity to re-assess the public realm, its use and extent.

**Understanding a place: the urban design strategy**
To understand existing urban qualities and to establish an urban design strategy into which the new public transport system fits, the following factors have to be considered:

- historic development of the locality
- morphology: the scale of buildings, width of streets
- topography and visual cells
- natural resources
- the way places are used - day, evening and night
- planning designations and the implications of these eg development sites
- movement patterns, traffic, car parks, public transport routes and interchanges, pedestrian and cycle routes
- public realm quality, streets, squares, footpaths and parks
- street lighting
- local land marks
- local details and paving materials,
- potential to minimize street clutter
- existing maintenance and management programmes and responsibilities

**Understanding the needs of the public transport infrastructure**
The development of a successful project is dependent upon the appreciation of the needs of a new public transport system:

- infrastructure type: bus, tram, tram-train, train-tram, light rail
- vehicle detail and livery
- power requirements
- wirescape requirements
- track requirements

**Addressing vandalism**
The following factors can minimize vandalism:

- use of glass and aluminium materials at stops
- real time countdown
- public address system at stops
- CCTV at stops and on board vehicles
- cleaning and maintenance of stops and vehicles
- help button at stops and in vehicles
- good lighting at stops and within vehicles
- no advertising in vehicles
- warm bright colours in vehicles
- conductors
- large windows
- easy to change / clean upholstery

**Advertising needs**
Policy on advertising should include:

- advertising needs to be part of stop design
- location, design and size of panels should be predetermined
- adverts on the vehicle should be minimal if at all

## Stage 4: the design synthesis

Collaborative planning and innovative design responses, based on a shared understanding of the project's aims amongst the design team, are required to maximise the urban design aspirations and accommodate the needs of the public transport system, thereby enabling opportunities to be seized and constraints to be resolved.

The role of scale is significant in the development of a coherent design approach, in that a design must be established at a strategic level and responded to at the detailed level.

**The public realm issues**
A new public transport system can be significant in redefining, creating and complementing the public realm by looking at the following aspects:

**Strategic level**

- definition of historic or city character areas including rural areas
- creation of city areas
- movement: pedestrian and vehicular
- the role of the public realm
- local identity and city connections
- improved legibility
- landmarks and nodes
- city destinations
- vitality in the public realm
- planting strategy

**Detail level**

- materials
- street clutter removal
- street furniture
- lighting
- signage
- planting
- public art
- advertising

**Transport infrastructure issues**

**Strategic level**

- existing urban morphology and spatial qualities
- existing traffic and public transport management proposals
- spatial needs of transport system
- location of stops
- removal of kerbs to accommodate vehicle movement
- on-street and off-street running
- shared road space with all other road users
- shared routes with buses

**Detail level**

- two-way working routes
- one-way working routes
- split-two way working
- one-way traffic systems
- timed access arrangements
- use of tunnels
- use of central reservations
- use of footways
- use of green verges
- use of public open spaces

**Issues with sources of power**

**Strategic level**

- below ground power source
- fixing from buildings
- effects on public open spaces
- existing street furniture locations
- size / access requirements of intake cubicles and substations
- location of columns
- multipurpose use of substation structure

**Detail level**

- a coherent set of design guidelines for a scheme's street furniture
- column design(s) and colour
- multipurpose use of columns: lighting, signage
- location and colour of intake cubicles
- location, orientation, colour and cladding of substations

# Stage 5: the detailed design

To achieve the overall quality in the public realm it is important that there is great attention to detail throughout the scheme.

**Stops**
To integrate a new public transport system with other forms of transport the following elements should be addressed:

**Context**

- route and spatial analysis
- visual and physical impact of stops
- creating a sense of place
- creating a new public realm
- the whole public transport system
- location of stops in relation to other public transport
- hierarchy of interchanges within entire public transport system
- relationship of stops to the public realm and / or buildings
- car parking / park and ride
- cycle routes networks
- advertising needs
- location, design and size of advertising panels
- reduction of potential vandalism through design / elements

**Detail**

- corporate design approach
- coherent design approach to stop components
- purpose-designed, standard furniture
- transparency of stops
- signage
- materials / tactile paving
- kerbs /ramps
- use of public art
- architectural structures
- cctv needs
- use of colour

**Tracks**
The following issues should be reviewed when considering the integration of the tracks into an urban context:

**Context**

- characteristics of local areas
- degree of legibility
- ease of movement
- ability to create adaptable spaces
- extent of on-street running
- pedestrian or segregated running
- consistent use of materials
- extent of re-paving in street
- removal of street clutter
- location of lighting

**Detail**

- significance of historic street lines
- level changes / retain kerbs
- place definition and identity
- design of power supports and wirescape
- need for traffic barriers
- care to detailed design
- fencing requirements
- planting opportunities

## Stage 6: the scheme implementation and management

The implementation stage of a project is crucial in terms of the impact that the scheme has within the public realm. The quality of workmanship is a critical part of the implementation process and must be maintained across a variety of procurement methods. Quality control procedures need to be in place to ensure the quality of workmanship. These should include:

**Quality of workmanship**

- sufficient allocation of funding for those aspects of urban design
- inclusion in programme of adequate design and procurement periods
- use of an integrated design team with knowledge of approach and quality of detailing to be adopted
- provision of fully detailed design drawings and specifications
- design that is compatible with maintenance resources
- use of skilled labour for appropriate operations
- use of sample panels to determine agreed standard to be applied throughout works
- no agreement to reduction in acceptable standard once agreed
- inspection and supervision by design and construction professionals

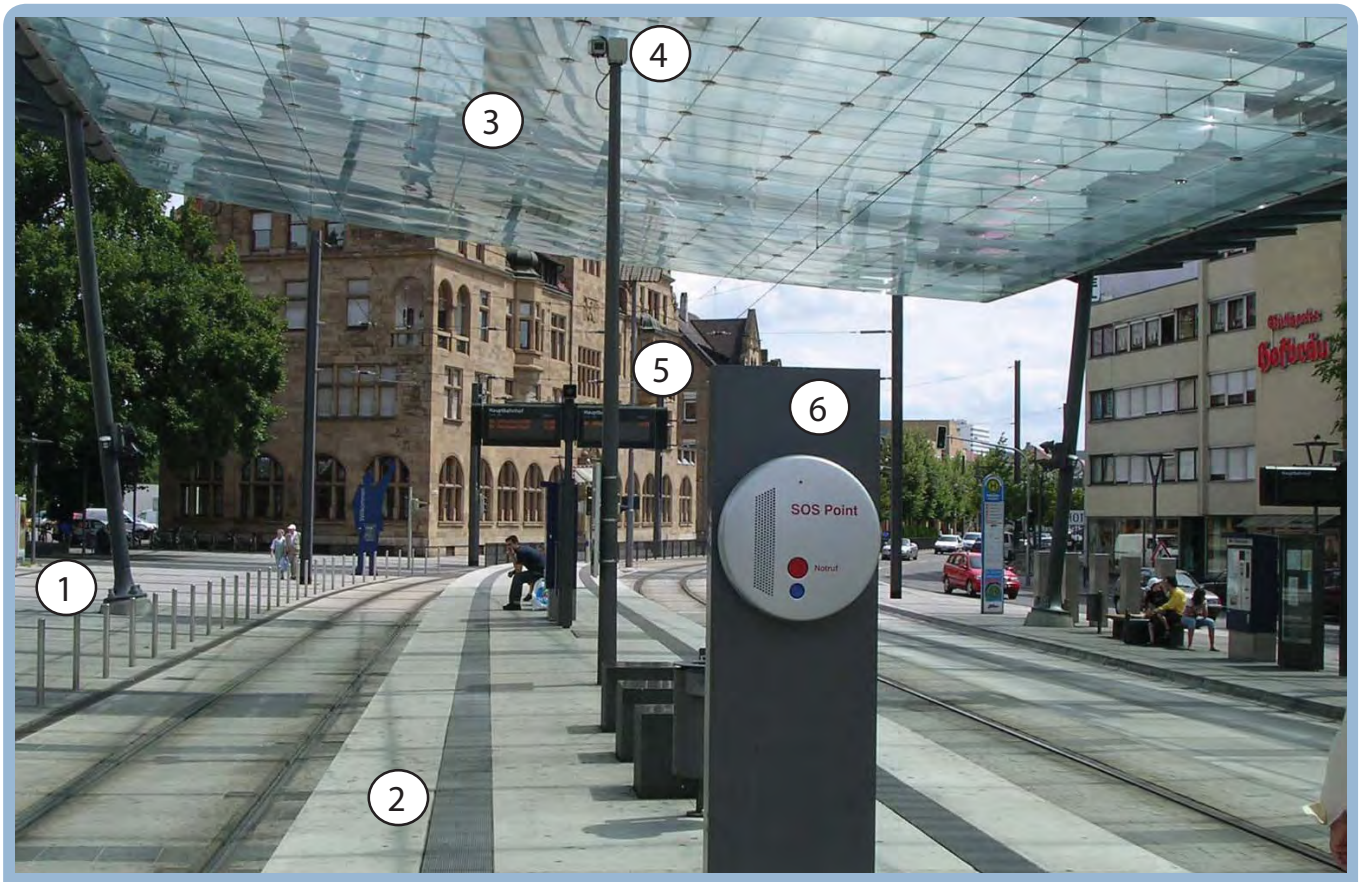
**Maintenance & management manuals**

- it is important to ensure a scheme's original high standards, details and specification, to that end, management and maintenance manuals should be produced
- maintenance and management operations and responsibilities should be identified in the manuals

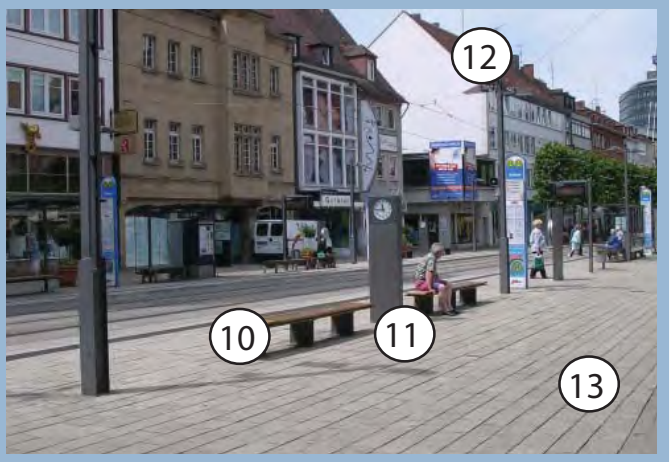
Completion of the scheme should be followed up by regular monitoring to:

- evaluate robustness of design elements and materials
- assess incidents of vandalism: scale, type, time and location
- review maintenance and management procedures
- assess impact of new developments or initiatives on existing scheme eg advertising, pedestrianisation
- consider extension to public transport system: review best practice from existing scheme
- determine what lessons have been learnt from scheme: process, design, implementation and management

## Illustrations of design guidelines



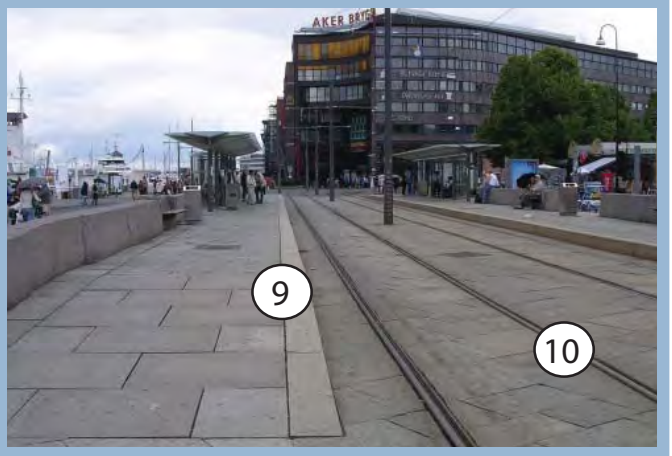





1 Bollards used as permeable pedestrian boundary
2 Tactile and contrasting coloured paving defines platform edge
3 Architectural canopy celebrates transport interchange and creates gateway feature for the city
4 CCTV camera
5 Realtime countdown system
6 Help point designed as part of furniture range
7 Train - tram stop shared with buses
8 Two way track system
9 Planting incorporated as part of infrastructure project
10 Street furniture: attention to location and reduction of clutter
11 Clock feature part of stop design
12 New street lighting
13 Whole street and public space repaved for coherent impact

*F 5.1 Heilbronn*

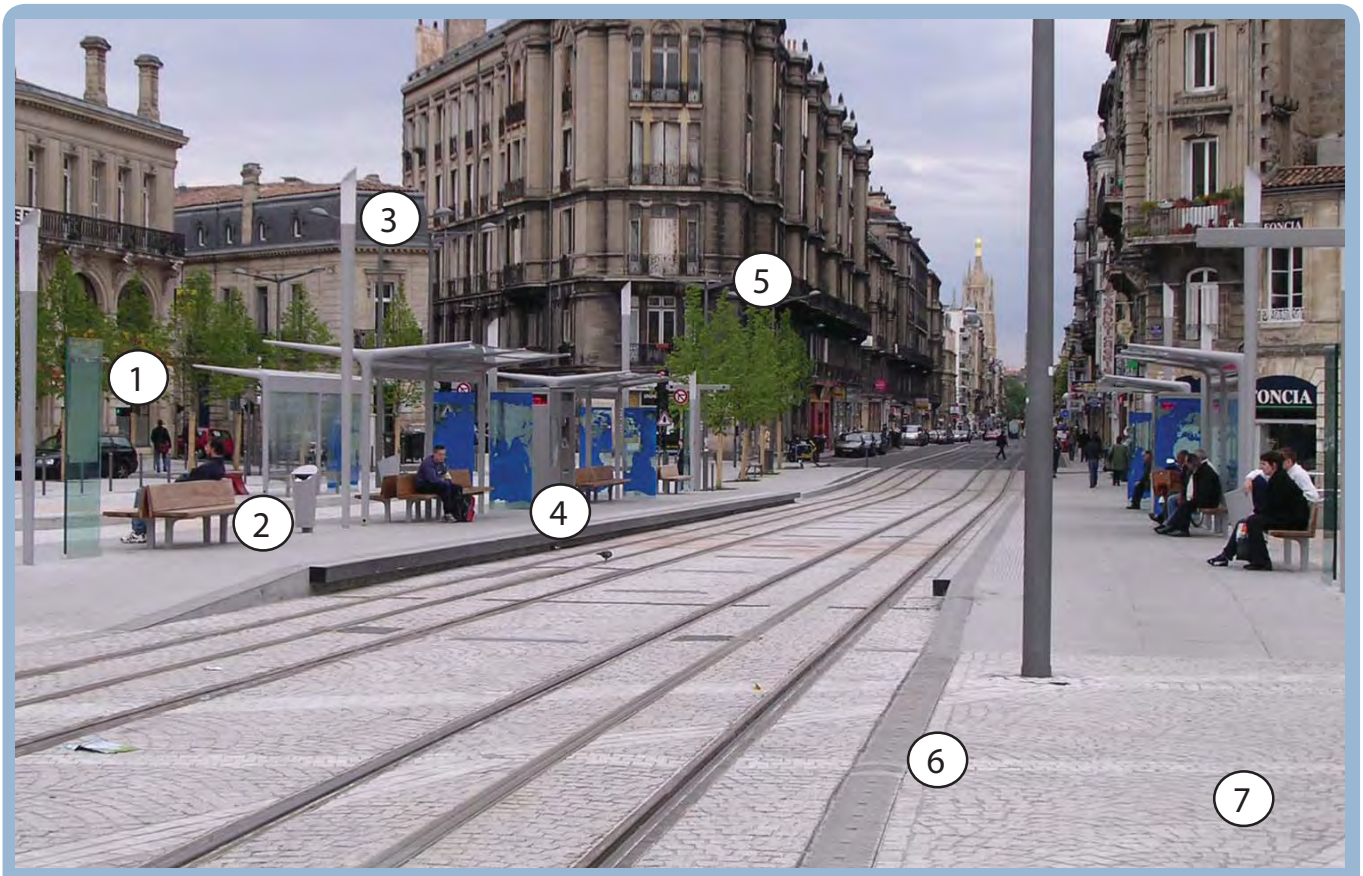





1 Consistent use of materials for walls and paving
2 Stop located as interchange with harbour
3 Lighting incorporated into power column
4 Glass and aluminium materials reduce vandalism and provides views through stop
5 Advertising panels incorporated into stops
6 Custom designed columns
7 Attention to detail of how paving defines route of tram
8 Paving continues into public realm
9 Ramps and the paving pattern defines stop location
10 Two way tracks within public realm

*F 5.2 Oslo*

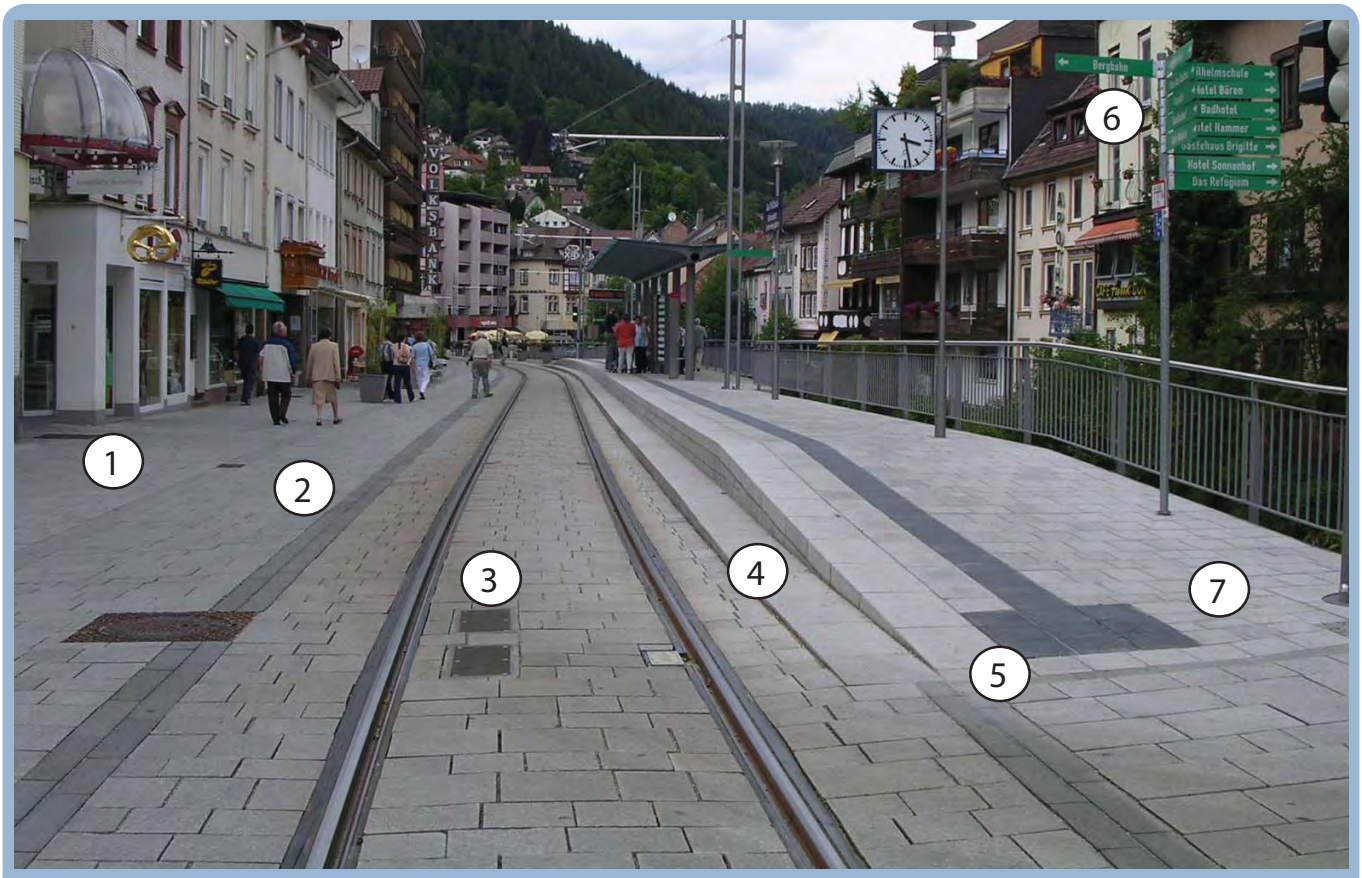
## Illustrations of design guidelines

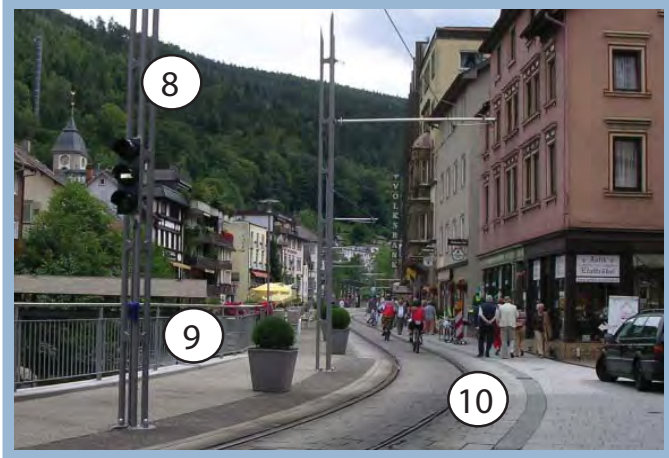





1 Glass panels incorporate maps or advertising as part of coherent stop design
2 Street furniture located for ease of pedestrian movement around stop
3 Good lighting
4 Use of colour / art within stops
5 Use of planting as part of system and public realm
6 Attention to detailed design
7 Extent of paving integrates stop with new public realm
8 Two way tracks within new future boulevard
9 Underground power source reduces street clutter
10 Custom designed stop with aluminium and glass and realtime countdown system
11 No advertising on tram, large reflective windows

*F 5.3 Bordeaux*



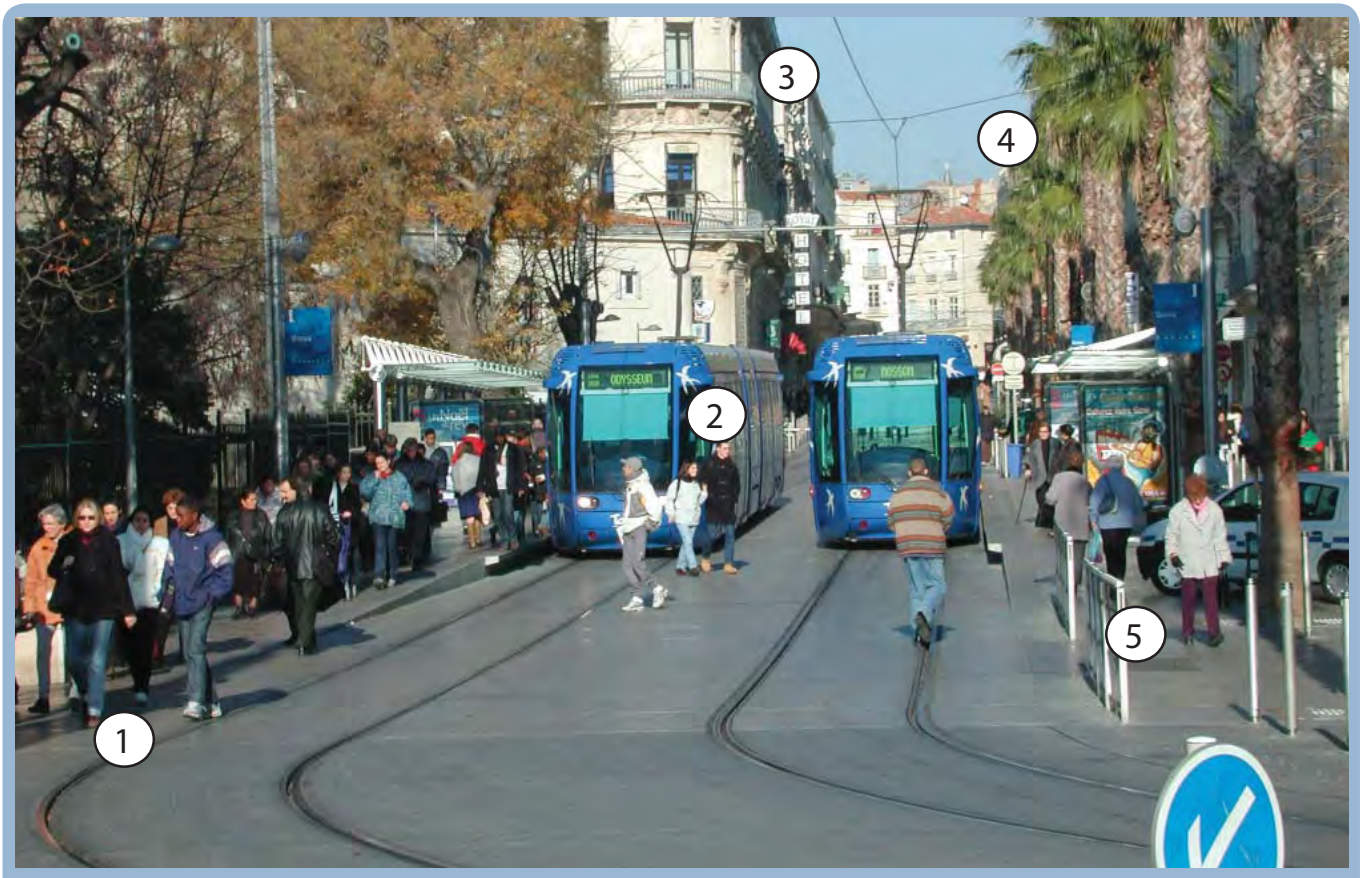





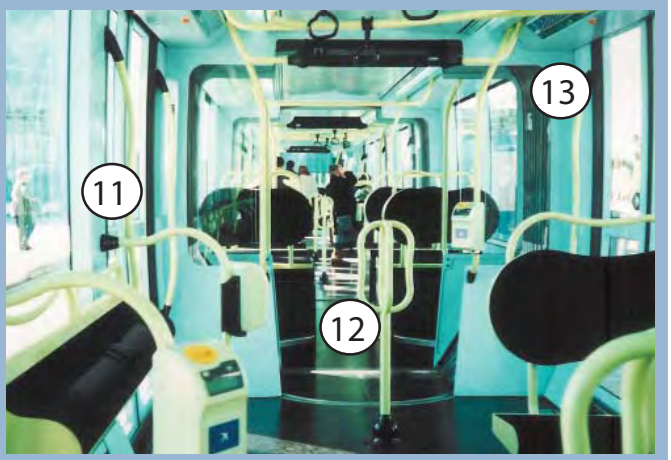
1 Continuous level paving extends across whole width of street
2 Tracks defined by change of colour and laying of paving material
3 Single track system
4 Reduced impact platform level change by inclusion of step
5 Steps, ramp and tactile paving and attention to detailed design
6 Coherent street furniture design: signage, clocks, fencing and lighting
7 Street furniture located at back of stop to maximize pedestrian movement
8 Custom designed power column incorporates tram signals and lighting, all part of coherent street furniture design
9 Planting incorporated as part of street furnishings
10 Track shared with pedestrians and traffic
11 Verges planted as part of track system
12 Design and cladding of substation reduces visual impact

*F 5.4 Bad Wildbad*

## Illustrations of design guidelines

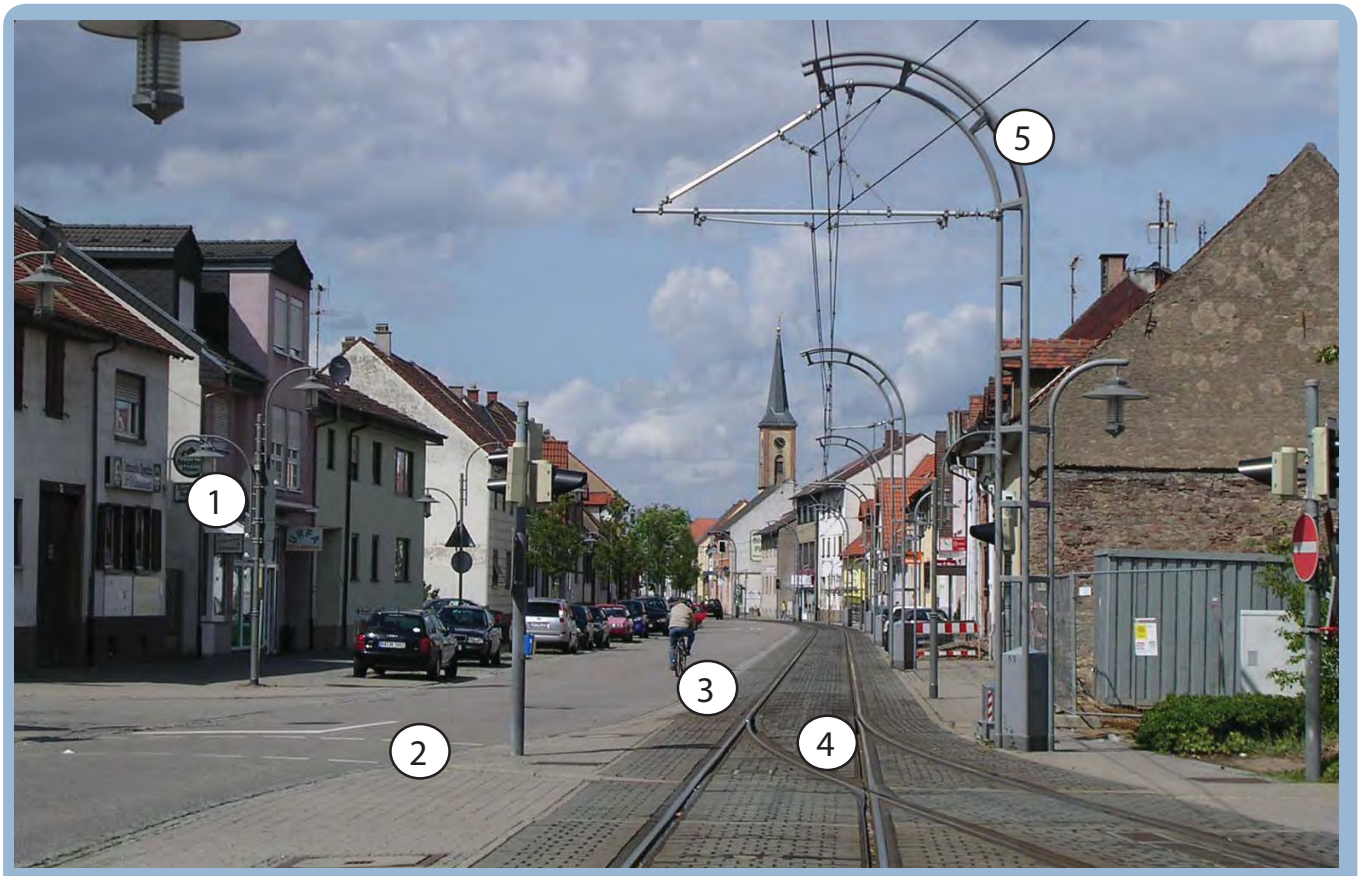


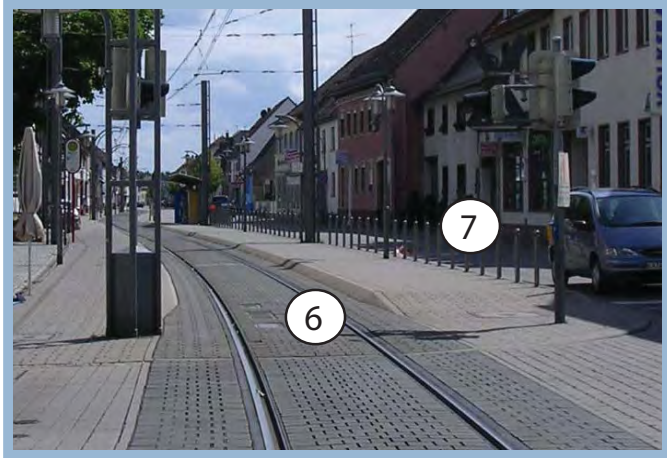


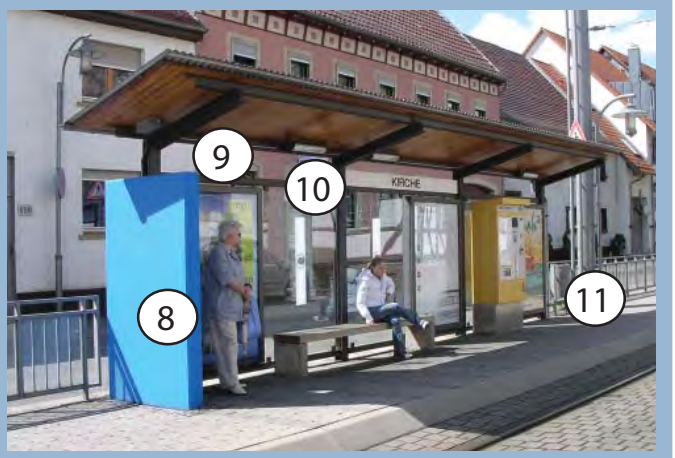



1 Continuous paving and attention to detail for two way system
2 Tram livery symbol of Montpellier
3 Power cables from columns
4 Planting as part of streetscape design
5 Barriers designed as part of street furniture range
6 Custom designed stop
7 Advertising and transport information as part of panel within stop
8 Public address system and countdown information
9 Custom designed furniture throughout trams and stops
10 Glass reduces impact of stop in streetscape
11 Big windows improves visibility and travel experience
12 Bright colours and furniture part of coherent furniture design
13 No advertising within tram

*F 5.5 Montpellier*




1 Street furniture designed as part of whole scheme
2 Continuous paving with no kerbs
3 One way working reduces physical impact of tracks and wirescape and column requirements
4 Paving colour differentiates route of tram - train
5 Custom designed power columns incorporate street lighting
6 Low platforms with ramped access minimises impact on street
7 Traffic separated by bollards at stops
8 Use of colour at stops
9 Advertising, local information and timetables incorporated at stops in specified panels
10 Glass helps reduce vandalism and to visually integrate stop with street
11 Custom designed street furniture

*F 5.6 Blankenloch*

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**Photographs**

Are Kristiansen p75
Hans Magnar p67, 106
Metro p7, 56, 58, 72, 74

All other photographs by Marie Burns (BURNS + NICE)

*Some of the terms that will be used in the HiTrans Project.*

**accessibility:** the ease with which a building, place or facility can be reached by people and/or goods and services. Accessibility can be shown on a plan or described in terms of pedestrian and vehicle movements, walking distance from public transport, travel time or population distribution.
**alweg design:** a type of monorail developed by the Alweg company.
**beam:** a rail that monorail trains run on.
**beamway:** a continuous series of beams forming a track for monorail trains. Also called a guideway.
**bespoke:** specifically made, commissioned street furniture
**bus rapid transit:** an express bus service with infrequent stops, fast loading, unloading and fare collection. The buses may use bus-only lanes or buses-only streets, and they may be able to make traffic lights turn green as they approach. In some cases the buses stop at platforms, avoiding the need for stairs and wheelchair lifts.
**column:** a post that supports a monorail beamway or guideway. Also called a pylon.
**configuration:** the way the urban grid is put together.
**destination:** a place where people arrive. Compare *origin*.
**dwell time:** the length of time a train or other vehicle waits at a station.
**elevated railway:** one that runs on a raised structure, avoiding disrupting traffic and pedestrian movement.
**grade:** 1 The surface of the ground. 2 (or gradient) The slope along a length of road, track or other surface.
**guideway:** a continuous series of beams forming a track for monorail trains. Also called a beamway.
**high quality public transport:** that which is able to compete with private vehicles in terms of convenience, speed, price and reliability. The term is used to include light rail, guided bus ways and particularly high-quality bus networks.
**layout:** the way buildings, routes and open spaces are placed in relation to each other.
**legibility:** the degree to which a place can be easily understood by its users and the clarity of the image it presents to the wider world.
**light rail:** trams and other relatively low-capacity, frequently stopping forms of railway.
**link:** a connection between two nodes in a transport network.
**live edge:** provided by a building or other feature whose use is directly accessible from the street or space which it faces; the opposite effect to a blank wall.
**mag lev:** a system of transport that uses magnetic levitation. Magnet fields hold the train slightly above the guideway, reducing the friction and allowing high speeds.
**movement:** people and vehicles going to and passing through buildings, places and spaces.
**natural surveillance (or supervision):** the discouragement to wrong-doing by the presence of passers-by or the ability of people to see out of windows. Also known as passive surveillance (or supervision).
**node:** a point of origin or destination in a transportation system. In the case of the monorail, each station is a node. A place where activity and routes are concentrated.
**origin:** a place from where people leave. Compare *destination*.
**paving blocks:** pre-cast concrete paving units usually 100 x 200mm
**paviors:** pre-cast concrete paving units, varying in dimensions
**permeability:** the degree to which a place has a variety of pleasant, convenient and safe routes through it.
**personal rapid transit:** small computer-controlled vehicles travelling over a fixed guideway.

**public realm:** the parts of a village, town or city (whether publicly or privately owned) that are available, without charge, for everyone to use or see, including streets, squares and parks. Also called public domain.
**public transport:** a system of conveyance (typically bus, train and tram) provided collectively – by the public sector or the private sector, or a mixture of the two.
**public transport acceptability:** a measure determined by factors such as the attitude of staff, the quality of waiting facilities, the cleanliness of vehicles and the general character of other passengers.
**public transport accessibility:** a measure of the ease with which all categories of passenger can use public transport. This includes the quality of service, and the ease of getting to it and finding information about it. Price frequency, reliability and punctuality would seem to be other obvious criteria.
**public transport availability:** a measure determined by the available routes, and the frequency and timings of services.
**public transport environment:** the setting of a bus stop, or bus or train station, including the distance and quality of the route needed to reach it.
**pylon:** see column.
**setts:** natural stone small scale paving units
**straddle bent:** an inverted U-shaped structure whose legs straddle a street to support a monorail guideway.
**street furniture:** structures in and adjacent to the highway which contribute to the street scene, such as bus shelters, litter bins, seating, lighting and signs.
**switch:** a device that moves the rails of a railway or the beams of a monorail to allow a train to move from one track or guideway to another.
**tarmacadum:** bituminous road surface material also known as tarmac, bitumen asphalt.
**tram:** a public transport vehicle running on rails set in the carriageway.
**tram-train:** light Rail Vehicle (LRV) designed to operate on both main line railways and on light rail or tramway systems.
**transit oriented development (TOD):** a new urbanist development concept pioneered by the California-based, Peter Calthorpe. Development is concentrated around public transport stops at a scale that encourages walking, with some workplaces and local services. Terraces of family housing are served by on-street car parking.
**transport development area (TDA):** an area of mixed uses and relatively high density with good access to public transport. A local authority can grant planning permission for development in a TDA at higher density than the development plan would allow, if the developer contributes to improving transport locally.
**urban design:** the collaborative and multi-disciplinary process of shaping the physical setting for life in cities, towns and villages; the art of making places; design in an urban context.
**urban grain:** the pattern of the arrangement and size of buildings and their plots in a settlement; and the degree to which an area's pattern of street-blocks and street junctions is respectively small and frequent, or large and infrequent.
**urban grid:** the organisation of groups of contiguous buildings in outward-facing, fairly regular clumps, among which is defined a continuous system of space.
**urban structure:** the framework of routes and spaces that connect locally and more widely, and the way developments, routes and open spaces relate to one another.
**visual cells:** subdivision of urban spaces through analysis of visual containment

HiTrans Best practice guide 3
Public transport & urban design

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**HiTrans**

HiTrans is an EU sponsored Interreg IIIB (North Sea Region) project seeking to improve public transport in medium sized cities with 100,000–500,000 inhabitants. The full official project title is *Development of principles and strategies for introducing High Quality Public Transport in medium sized cities and regions*. "High Quality" refers to modes that are perceived as offering higher quality than ordinary bus-solutions. However HiTrans also recognises the important role buses will have to play in any medium sized city.

HiTrans is a partnership between

- Rogaland County Council, Norway (lead partner),
- Edinburgh City Council, Scotland,
- Helsingborg City Council, Sweden,
- Jernbaneverket (The Norwegian National Rail Administration),
- NEXUS (PTE of Tyne and Wear), England,
- NSB (Norwegian National Rail Operator),
- AS Oslo Sporveier (Oslo public Transport Ltd), Norway,
- Statens vegvesen (Norwegian public Roads Administration),
- Stavanger and Sandnes City Councils, Norway,
- Sunderland City Council, England,
- Aarhus County Council, Denmark.

For more information on HiTrans, visit www.hitrans.org

**HiTrans best practice guides**

As part of its activities, the HiTrans partnership has produced five best practice guides:

1 Public transport & land use planning
2 Public transport – Planning the networks
3 Public transport & urban design
4 Public transport – Mode options and technical solutions
5 Public transport – Citizens' requirements.

3

**Best practice guide 3**
**Public transport & urban design**

The introduction of high quality public transport can have profound implications for a city's urban design. It may be introduced with-out any thought about how it will look or its impact on people's ability to move about and enjoy the city's public spaces. On the other hand, it may be carefully designed to reinforce or en-hance these aspects – or to play a crucial part in the reinvention of the city's image. This guide uses case studies to examine the variety of urban design factors that should be considered when introducing high quality public transport: overhead wiring, rails, signs, stations, stops, guideways, safety barriers, as well as the vehicles themselves. It also provides advice on advertising and preventing vandalism.

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