Introduction

Status and aims of *Designing Streets*

This document is the first policy statement in Scotland for street design.

The premise upon which the document is based is that good street design should derive from an intelligent response to location, rather than the rigid application of standards, regardless of context. *Designing Streets* does not, thus, support a standards-based methodology for street design but instead requires a design-led approach. This demands taking into account site-specific requirements and involves early engagement with all relevant parties. *Designing Streets* marks the Scottish Government's commitment to move away from processes which tend to result in streets with a poor sense of place and to change the emphasis of policy requirements to raise the quality of design in urban and rural development.

The value of good street design

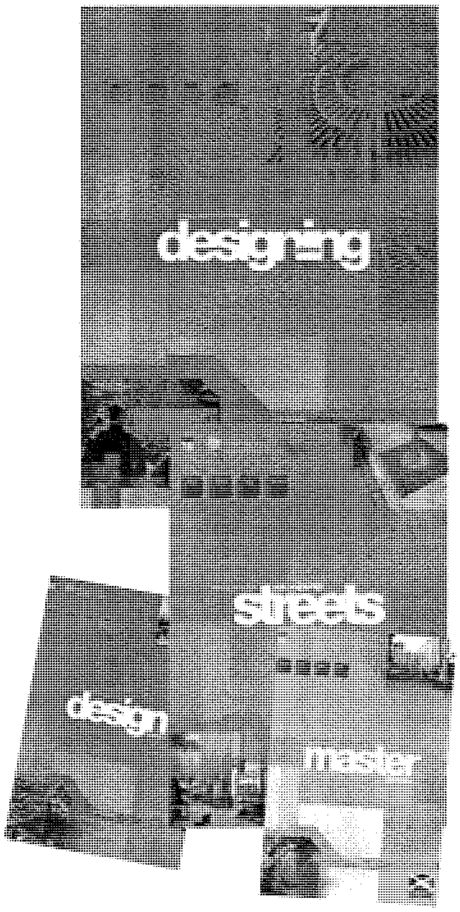
Streets exert an immense influence upon our lifestyles and behaviour. Street design also has a direct influence on significant issues such as climate change, public health, social justice, inclusivity and local and district economies. *Designing Streets* recognises these pressures and seeks to build a collective response through the design of new streets and the regeneration of existing streets that is informed by as wide a range of issues and stakeholders as possible. Through the introduction of this policy, the Scottish Government seeks to ensure that specific interests are no longer promoted without an appreciation of the wider context. Collaboration and awareness between what have often previously existed as singular processes is vital if the aims of *Designing Streets* are to be met.

Policy relationship

This document sits alongside *Designing Places*[1], which sets out government aspirations for design and the role of the planning system in delivering these. Together, they are the Scottish Government's two key policy statements on design and place-making. Both documents are national planning policy and are supported by a range of design-based Planning Advice Notes (PANs).

Designing Streets updates and replaces *PAN 76 New Residential Streets*[2] (which is now withdrawn) and, in doing so, marks a distinct shift, raising the importance of street design issues from the subject of advice to that of policy. In addition, all previous road guidance and standards documents based on *DB32*[3] principles are superseded by *Designing Streets*. Many local authorities in Scotland have developed their own street design guidance and there is still an important role for local guidance to ensure that street design responds to local context. These existing documents may contain information on construction details and local palettes of materials which is still relevant, however information on principles, layout and street geometry which is not consistent with *Designing Streets* should be revised. *Designing Streets* should be adopted by all Scottish local authorities or should provide the basis for local and site-specific policy and guidance.

> Designing Streets is **not a standards-based document**. Balanced decision-making **is at the core** of this policy. **Design-led solutions** must be employed.



Who is *Designing Streets* for?

Designing Streets is aimed at everyone who plays a part in creating or determining the quality of streets; architects, engineers, planners, developers, politicians, local authorities and, indeed, anyone who has an interest in how street design is taken forward. It is important that professionals understand all of the key issues and do not restrict their interest to any one particular area.

Designing Streets is expected to be used predominantly for the design, construction, adoption and maintenance of new streets, but it is also applicable to existing streets subject to re-design.

Development of the document

Designing Streets was developed for the Scottish Government by a multi-disciplinary team of roads and transportation engineers, urban designers, planners and legal advisors, led by WSP UK. The document has been informed by case studies and best practice, and was subject to significant stakeholder consultation. It derives, in essence, from *Manual for Streets*[4], which was produced for the Department for Transport, the Welsh Assembly Government and Communities and Local Government. *Manual for Streets* is evidence-based guidance which focuses on lightly trafficked residential streets and cited and commissioned detailed research. *Designing Streets* has been tailored to meet Scotland's needs and, as a policy document, does not reproduce this evidence in detail.

Streets and roads

Streets have to fulfil a complex variety of functions in order to meet people's needs as places in which to live, to work and to move around. Their design requires a thoughtful approach that balances potential conflicts between different users and objectives. A clear distinction can be drawn in functional terms between roads and streets as follows:

- Roads are thoroughfares whose main function is to facilitate the movement of motor traffic.
- Streets have important public realm functions beyond those related to motor traffic. They are typically lined with buildings and public spaces and, whilst facilitation of movement is still a key function, they normally support a range of social, leisure, retail and commercial functions.

All thoroughfares within urban settings and rural boundaries should normally be treated as streets.

Reference should no longer be made to road hierarchies based on terminology such as local distributor/local access roads.

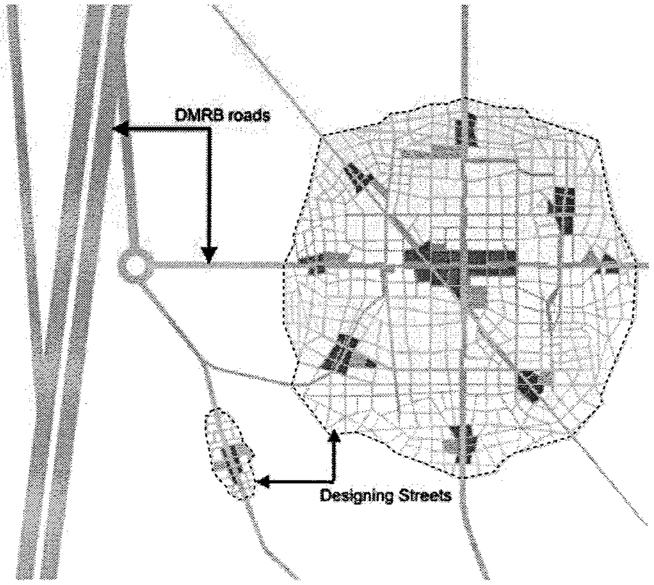
The relationship of *Designing Streets* to main and busy streets

Designing Streets provides policy that should be followed in designing and approving all streets. Whilst its technical advice is aimed particularly at residential and lightly trafficked streets, many of the key principles are also applicable to other types of street, for example rural and high streets. When considering busier streets, the movement function of the street may well become more significant or complex but this should be resolved through an integrated design approach and should not compromise the quality or the sense of place.

Design Manual for Roads and Bridges (DMRB)[5] is the standard for the design, maintenance and improvement of trunk roads and motorways. There are some locations, however, where a more sensitive design that follows the principles of *Designing Streets* may well be appropriate, such as where a small burgh High Street is also a trunk road.

Most importantly, a multi-disciplinary approach, full community engagement and a balanced appreciation of context and function is fundamental to successful outcomes in such cases.

The diagram below shows where streets and roads exist and where they often meet.



Designing Streets policy and guidance should be applied within all urban and rural boundaries

How to use this document

Designing Streets is split into three parts plus an annex:

- **Part 1: General –** Creating streets and places
- **Part 2: Detail –** Getting the design right
- **Part 3: Process –** How to achieve better outcomes

The document begins with an overview of creating places, with street design as a key consideration. It then looks at the detail of how to approach the creation of well-designed streets. This is followed by a description of processes which should be followed in order to achieve the best outcomes. Within each part, the policies are highlighted, and then supported by background information. **The Annex** provides a series of questions and answers on some of the more technical issues.

General

Creating streets and places

01 General

Detail

Getting the design right

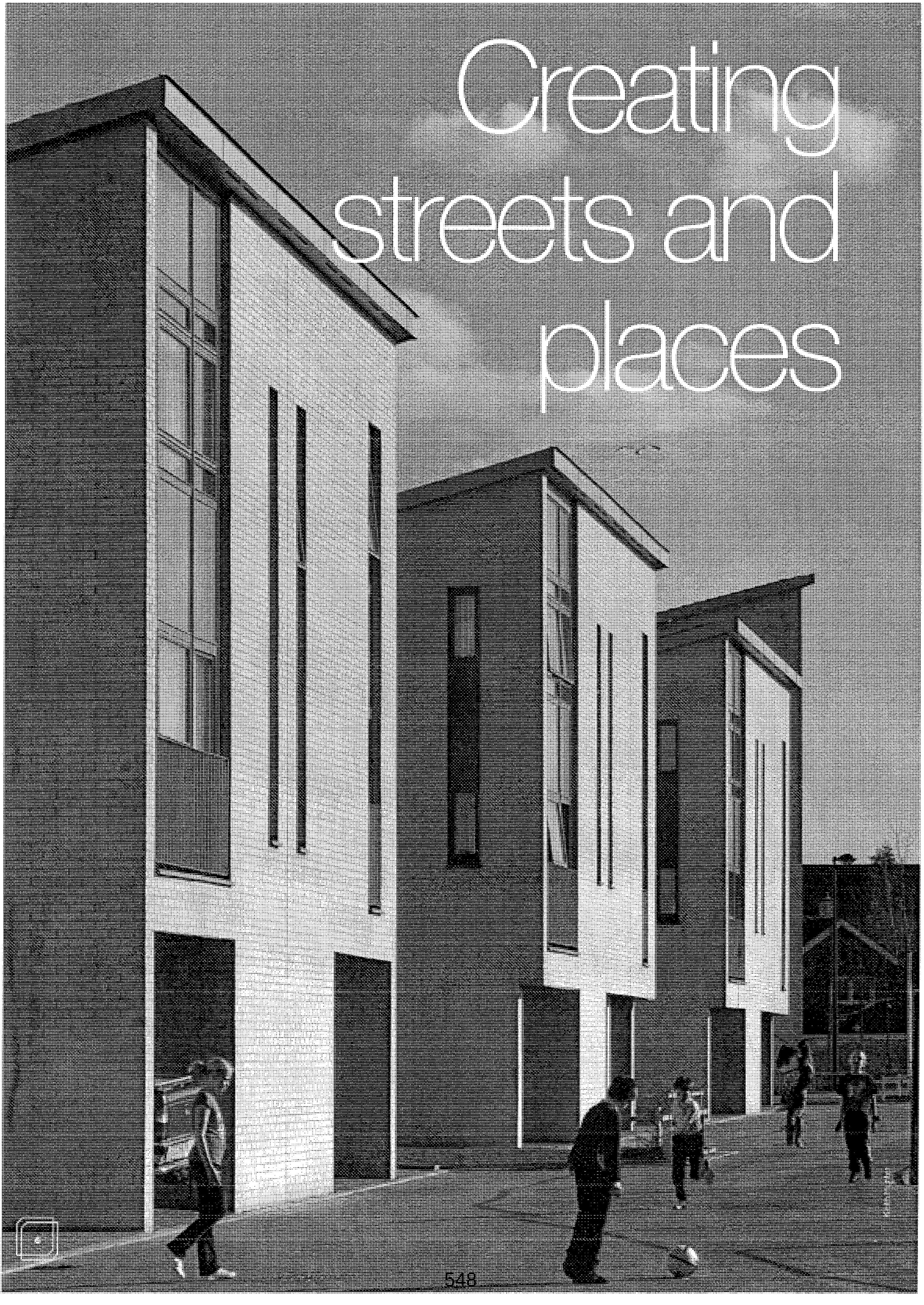
02 Detail

Process

How to achieve better outcomes

03 Process

Creating streets and places



Part 01 General

Creating streets and places

Good street design can promote a better quality of living for everyone. Sustainable patterns of behaviour can be influenced greatly by the intelligent design of streets. It is therefore essential that all parties involved in street design ensure that streets contribute as positively to their environment as is possible.

Creating good streets is not principally about creating successful traffic movement: it is about creating successful places.

policies

- **Street design must consider place before movement**
- **Street design guidance, as set out in this document, can be a material consideration in determining planning applications and appeals**

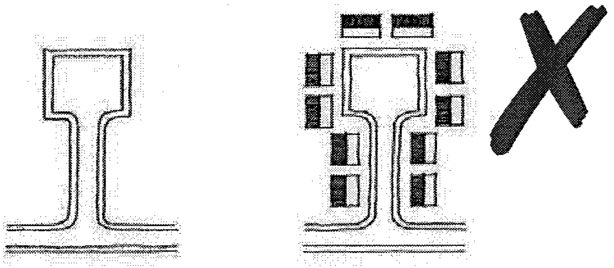
Streets have two key functions: **place** and **movement**.

In the more recent past, vehicle movement has often dominated the design of streets, resulting in many streets being out of context with their location and overly influenced by prescriptive standards. The prime concern of *Designing Streets*, in contrast, is to reverse this trend and shift the focus firmly back to the creation of successful places through good street design.

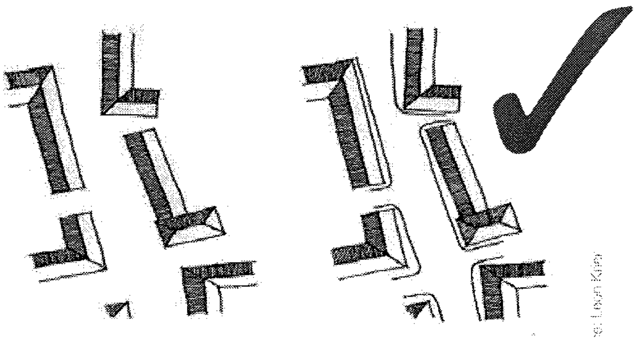
A 'sense of place'

A sense of place can be considered as the character or atmosphere of a place and the connection felt by people with that place. A positive sense of place is fundamental to a richer and more fulfilling environment. It comes largely from creating a strong relationship between the street and the buildings and spaces that frame it. A positive sense of place encompasses a number of aspects, most notably the street's:

- local distinctiveness;
- visual quality; and
- potential to encourage social and economic activity.



Recent modern developments



Streets as places first

Source: Leon Krier

Consider the place before vehicle movement

Movement

Providing for movement along a street is vital, but it should not be considered independently of the street's other functions. The need to cater for motor vehicles is well understood by designers, but the passage of people on foot and cycle has often been neglected. Walking and cycling are important modes of travel, offering a more sustainable alternative to the car, making a positive contribution to the overall character of a place, public health, social interaction and to tackling climate change through reductions in carbon emissions.

Achieving the right balance between place and movement

Streets should no longer be designed by assuming 'place' to be automatically subservient to 'movement'.

Good street design demands that issues of place and movement are considered together. The status of a street is dependent on its relative importance within a network in terms of both these considerations, and its status should commonly determine the design approach taken. It is only by considering both functions that the right balance will be achieved, but the focus of street design should be on creating a positive sense of place that is supported by an appropriate movement pattern. Other than in the design of motorways and some other inter-urban roads, it is seldom appropriate to focus solely on either place or movement functions, even in streets carrying heavier volumes of traffic, such as high streets.

Place status denotes the relative significance of a street, junction or section of a street in human terms. The most important places will usually be near the centre of any settlement or built-up area, but important places will also exist along arterial routes, in district centres, local centres and within neighbourhoods.

In new developments, locations with a relatively high place function would be those where people are likely to gather and interact with each other, such as outside schools, in local town and district centres or near parades of shops. Streets that pass through these areas need to reflect the importance of these places in their design, which in new developments should be identified at the masterplan/scheme design stage.

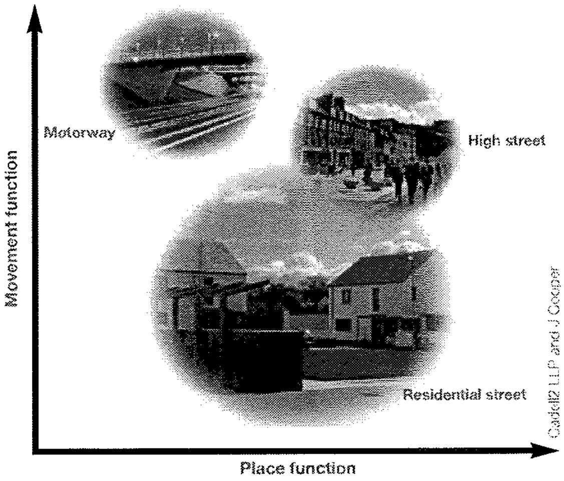
Movement status can be expressed in terms of traffic volume and the importance of the street, or section of street, within a network. Movement status should be considered in terms of all modes of movement, including vehicle traffic, pedestrian and cycle flows and public transport. Movement status can vary along the length of a route. Another way of assessing the movement status of a street is to consider the geographical scale of the destinations it serves. Here, movement status can range from national networks (including motorways) through to city, town, district, neighbourhood and local networks, where the movement function of motor vehicles is slightly lower.

place
comes first

Place and movement matrix

Defining the relative importance of particular streets/roads in terms of place and movement functions should inform subsequent design choices. For example:

- motorways – high movement function, low place function;
- high streets – medium movement function, high place function; and
- residential streets – low to medium movement function, medium to high place function.



Cadell2 LLP and J Cooper

This way of looking at streets can be expressed as a two-dimensional matrix (right) where the axes are defined in terms of place and movement. Areas where people are likely to gather and interact with each other will have a high place function.

The matrix recognises that, whilst some streets are more important than others in terms of traffic flow, some are also more important than others in terms of their place function and deserve to be treated differently. This approach allows designers to break away from previous approaches to hierarchy, whereby street designs were only based on traffic considerations.

Once the relative significance of the movement and place functions has been established, it is possible to set objectives for particular parts of a network. This will allow the local authority to select appropriate design criteria for creating new links or for changing existing ones.

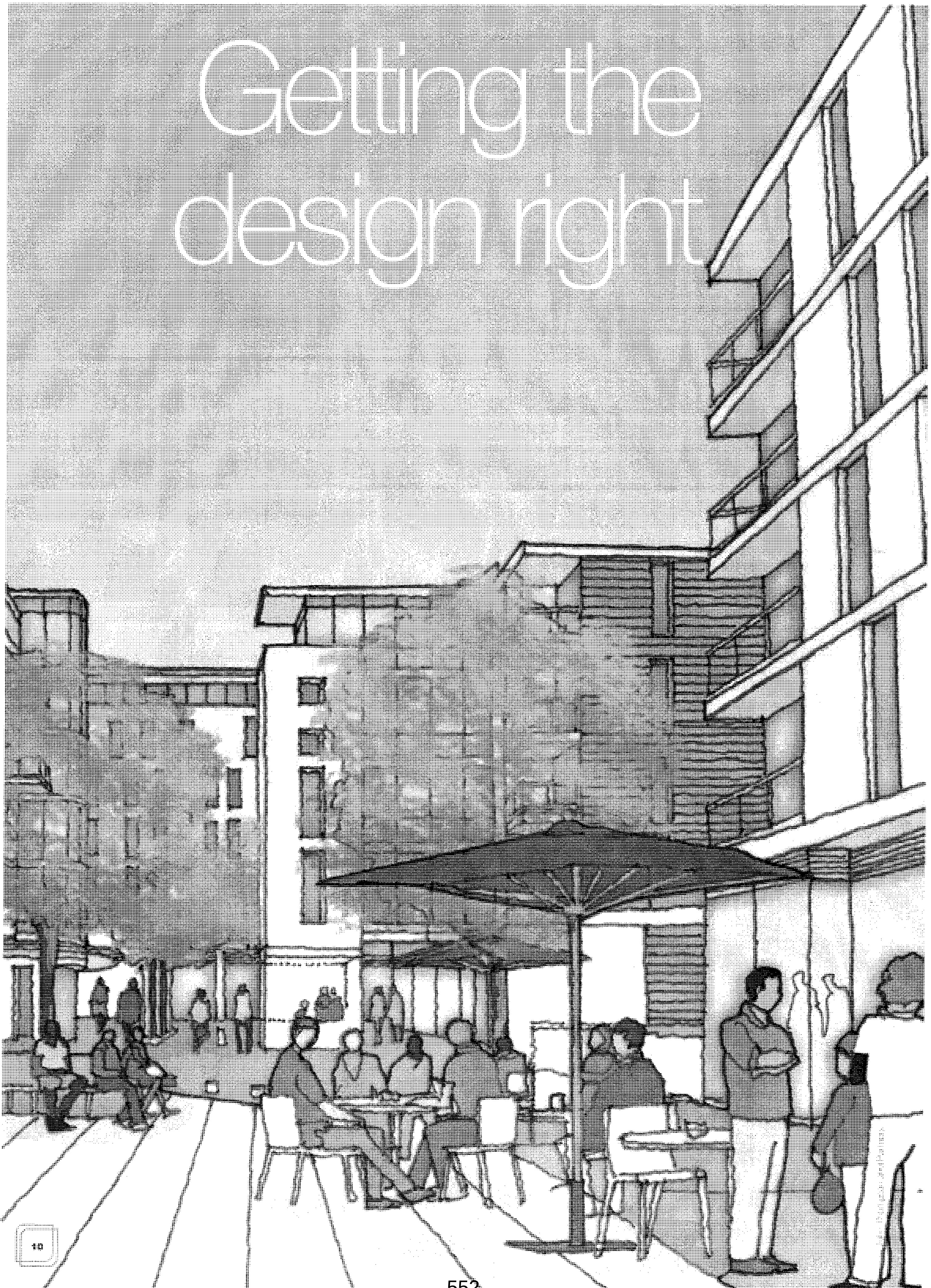
Movement and place considerations are important in determining the appropriate design speeds, speed limits and urban structure, along with the level of adjacent development and traffic composition.

Street design guidance, as set out in this document, can be a material consideration in determining planning applications and appeals

Planning Permission may be refused and the refusal defended at appeal or local review *solely* on design grounds.

Designing Streets is national planning policy and its policies should be taken into account by local authorities when determining planning applications and producing guidance. *Designing Places* and *Designing Streets* stand together as the two key design policy statements for Scotland.

Getting the design right



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Getting the design right

The issues around good street design are highly dependent on context and may vary considerably in their nature and complexity from one circumstance to another. However, an approach which is underpinned by a consideration of the six qualities of successful places set out in *Designing Places* has clear benefits as a methodology to ensure that key issues are addressed. This policy statement elaborates on issues of street design in relation to these qualities and also describes an approach to the development of well-designed streets from large-scale to detailed considerations.

policy

- **Street design should meet the six qualities of successful places, as set out in *Designing Places***

- Distinctive
- Safe & pleasant
- Easy to move around
- Welcoming
- Adaptable
- Resource efficient

These six qualities provide a framework which should be used when considering street design. To help show how they relate to each other, the table on the following pages identifies some of the key considerations which relate to 'quality'. This information is then further supported by more detailed technical information on how to create good street design.

The six qualities of successful places: Key considerations for street design

distinctive

Street design should respond to local context to deliver places that are distinctive

Block structure

- The urban form should be distinctive with landmarks and vistas that provide good orientation and navigation of an area

Context and character

- The requirements and impact of pedestrians, cycles and vehicles should be reconciled with local context to create streets with distinctive character
- Opportunities should be taken to respond to, and to derive value from, relevant elements of the historic environment in creating places of distinctive character

safe & pleasant

Streets should be designed to be safe and attractive places

Pedestrians and cyclists

- Street user hierarchy should consider pedestrians first and private motor vehicles last
- Street design should be inclusive, providing for all people regardless of age or ability

Achieving appropriate traffic speed

- Design should be used to influence driver behaviour to reduce vehicle speed to levels that are appropriate for the local context and deliver safe streets for all

Reducing clutter

- Signs and street markings should be kept to a minimum and considered early in the design process
- Street lighting should be as discreet as possible, but provide adequate illumination
- Street furniture should be located for maximum benefit and to reduce pedestrian obstruction

easy to move around

Streets should be easy to move around for all users and connect well to existing movement networks

Connections within a place

- Street design should provide good connectivity for all modes of movement and for all groups of street users respecting diversity and inclusion

Public transport

- Public transport planning should be considered at an early stage in the design process

Junction types and arrangements

- Junctions should be designed with the considerations of the needs of pedestrians first
- Junctions should be designed to suit context and urban form – standardised forms should not dictate the street pattern

welcoming

Street layout and detail should encourage positive interaction for all members of the community

Walkable neighbourhoods

- Street layouts should be configured to allow walkable access to local amenities for all street users

Streets for people

- Streets should allow for and encourage social interaction

adaptable

Street networks should be designed to accommodate future adaptation

Connections to wider networks

- Street patterns should be fully integrated with surrounding networks to provide flexibility and accommodate changes in built and social environments

Integrating parking

- Parking should be accommodated by a variety of means to provide flexibility and lessen visual impact

Service and emergency vehicles

- Street layouts should accommodate emergency and service vehicles without compromising a positive sense of place

resource efficient

Street design should consider orientation, the integration of sustainable drainage and use attractive, durable materials that can be easily maintained

Orientation

- Orientation of buildings, streets and open space should maximise environmental benefits

Drainage

- Streets should use appropriate SUDS techniques as relevant to the context in order to minimise environmental impacts

Utilities

- The accommodation of services should not determine the layout of streets or footways

Planting

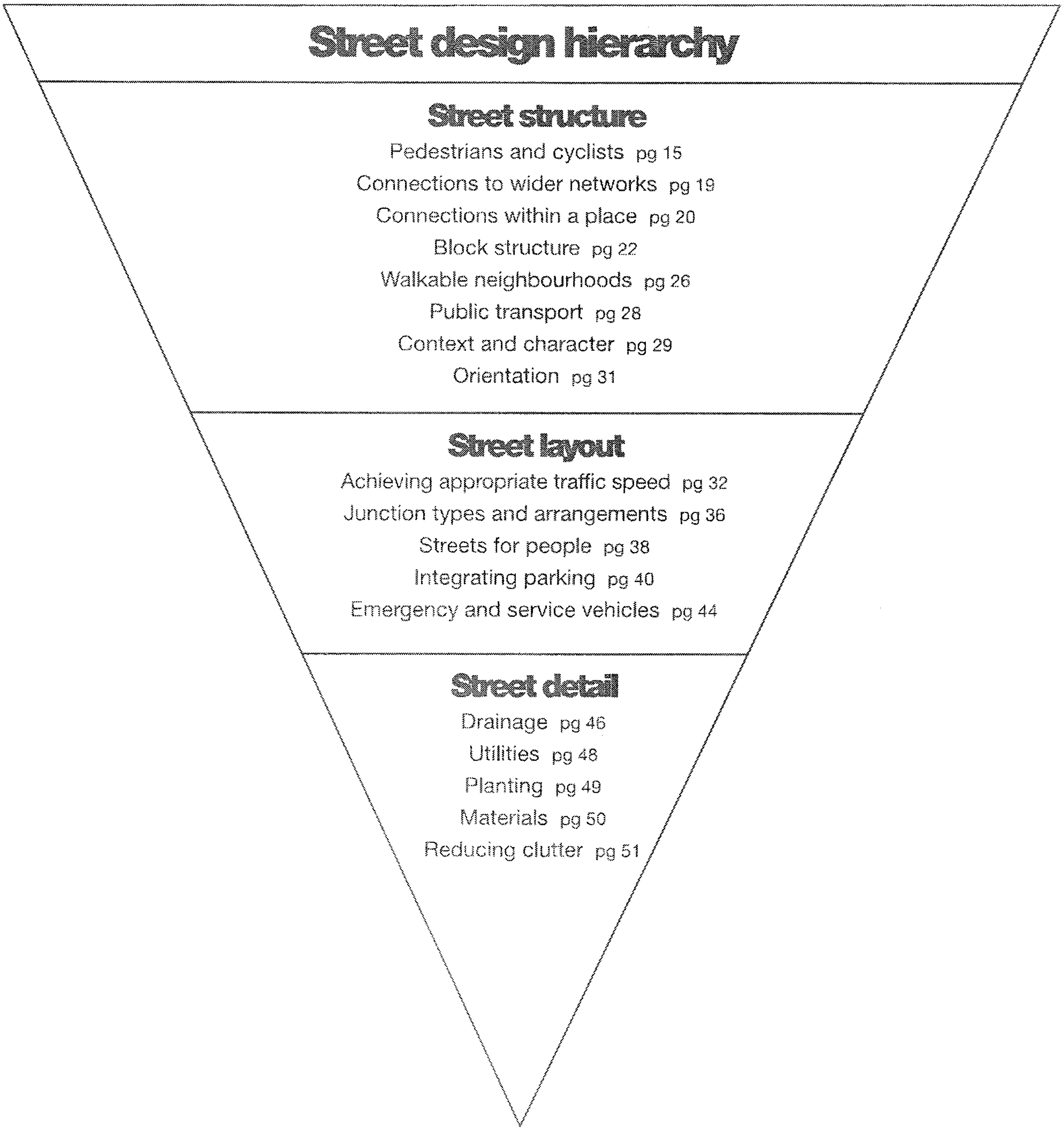
- Street design should aim to integrate natural landscape features and foster positive biodiversity

Materials

- Materials should be distinctive, easily maintained, provide durability and be of a standard and quality to appeal visually within the specific context

When designing streets, it is important to consider the relevant issues in a hierarchical way, working from issues of structure through to layout and geometry and on to matters of detail. The guidance in *Designing Streets* is structured in this way to help inform the understanding and approach of those involved in street design.

Guidance in support of the considerations in the preceding table is now ordered hierarchically, providing information on street design from macro to micro scales. The hierarchy is a guide to understanding and addressing relevant issues, however there will be overlaps between issues dependant on specific circumstances.



Street design hierarchy

Street structure

Pedestrians and cyclists pg 15
Connections to wider networks pg 19
Connections within a place pg 20
Block structure pg 22
Walkable neighbourhoods pg 26
Public transport pg 28
Context and character pg 29
Orientation pg 31

Street layout

Achieving appropriate traffic speed pg 32
Junction types and arrangements pg 36
Streets for people pg 38
Integrating parking pg 40
Emergency and service vehicles pg 44

Street detail

Drainage pg 46
Utilities pg 48
Planting pg 49
Materials pg 50
Reducing clutter pg 51

Street structure

Pedestrians and cyclists

Key considerations

- **Street user hierarchy should consider pedestrians first and private motor vehicles last**
- **Street design should be inclusive, providing for all people regardless of age or ability**

Pedestrians

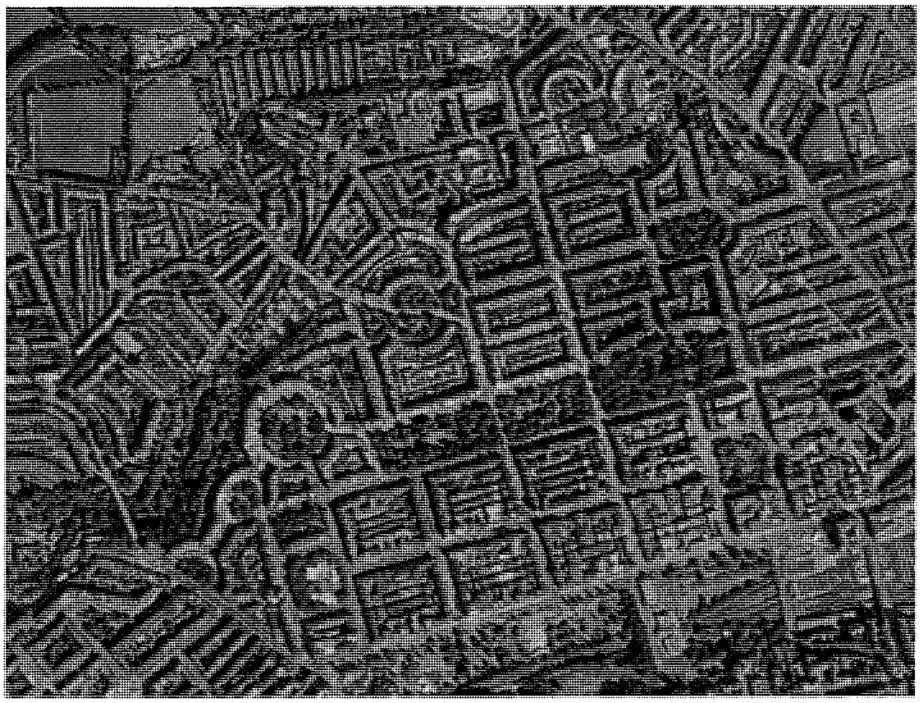
Walking is the most sustainable form of transport. Streets should be designed, not only to allow for walking, but to actively encourage it to take place. The propensity to walk is influenced not only by distance, but also by the quality of the walking experience. All streets should offer a pleasant walking experience. Sightlines and visibility towards destinations or intermediate points are important for navigating and personal security, and they can help people with cognitive impairment. Pedestrians may be walking with purpose or engaging in other activities such as play, socialising, shopping or just sitting. The issues for street design in relation to these activities are explored later in the document.

Gillespies

Within the context of *Designing Streets*, pedestrians include wheelchair users, mobility scooter users and people pushing wheeled equipment such as prams.

Pedestrian movement

The layout of our towns and cities historically suited pedestrian movement though, over time, motor vehicles have come to dominate our streets. A return to the prioritisation of pedestrian movement over vehicle movement has implications for the design of crossings and street interfaces.



Edinburgh New Town

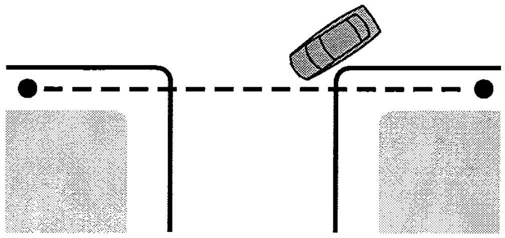
The block dimensions are of a scale that encourages walking

Surface level crossings can be of a number of types, as outlined below:

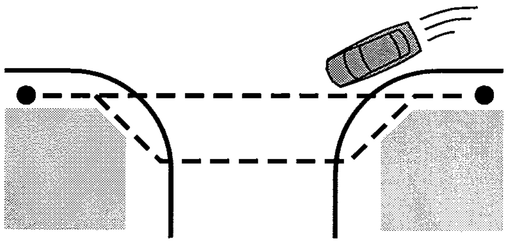
- **Uncontrolled crossings –** should have dropped kerbs.
- **Informal crossings –** can be created through careful use of paving materials and street furniture to indicate a crossing place which encourages slow-moving traffic to give way to pedestrians.
- **Formal crossings –** of which the *Zebra* crossing type involves the minimum delay for pedestrians when used in the right situation. There are four types of Signalised crossings – *Pelican, Puffin, Toucan* and *Equestrian* crossings. *Puffin* crossings have a variable crossing time; they use pedestrian detectors to match the length of the crossing period to the time pedestrians take to cross. *Toucan* and *Equestrian* crossings operate in a similar manner to *Puffin* crossings except that cyclists can also use *Toucan* crossings, while *Equestrian* crossings have a separate crossing for horse riders. *Equestrian* crossings can also be combined with cycle and pedestrian facilities. Signalised crossings are preferred by the older people and people with visual and mobility impairments.

There are a number of general principles which should be observed in the design of crossing places as follows:

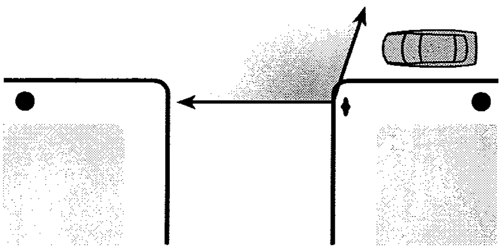
- Consideration should be given to the raising of crossings, of whichever type to footway height where possible. Footway surfacing of contrasting colour should be used to demonstrate pedestrian priority and tactile paving should be used to indicate the change in condition to visually impaired pedestrians.
- Pedestrian refuges and kerb build-outs, used separately, or in combination, effectively narrow the carriageway and so reduce the crossing distance.
- Footbridges and subways should be avoided; they are usually unsuccessful and create hostile environments – the ground level should be prioritised for pedestrians.
- Pedestrian desire lines should be kept as straight as possible at side-street junctions. Small corner radii minimise the need for pedestrians to deviate from their desire line.



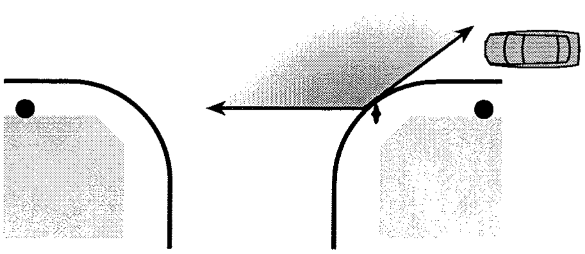
- Pedestrian desire line (– –) is maintained
- Vehicles turn slowly (10-15 mph)



- Pedestrian desire line deflected
- Detour required to minimise crossing distance
- Vehicles turn faster (20-30 mph)



- Pedestrian does not have to look further behind to check for turning vehicles
- Pedestrian can easily establish priority because vehicles turn slowly



- Pedestrian must look further behind to check for fast turning vehicles
- Pedestrian cannot normally establish priority against fast turning vehicles

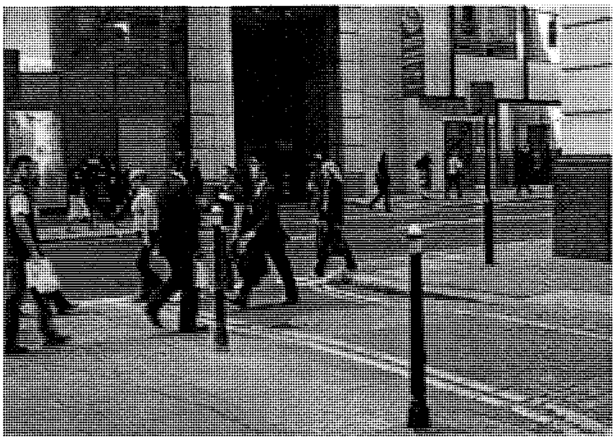
The effects of corner radii on pedestrians

With small corner radii, large vehicles may need to use the full carriageway width to turn. Swept-path analysis can be used to determine the minimum dimensions required. The footway may need to be strengthened locally in order to allow for larger vehicles occasionally overrunning the corner.

The approach to footways and pedestrian movement should be design-led. Any footway should be fit for purpose, but should give primary importance to delivering positive, attractive spaces. There is no maximum width for footways. In lightly-used streets (such as those with a purely residential function), the unobstructed width for pedestrians should generally be 1.5 – 2 m, however this can be varied to accommodate character and practical requirements. Additional width should be considered between the footway and a heavily used carriageway, or adjacent to gathering places, such as schools and shops.

Porch roofs, awnings, garage doors, bay windows, balconies or other building elements should allow for clear movement of pedestrians underneath.

Designers should attempt to keep pedestrian (and cycle) routes as near to level as possible along their length and width, within the constraints of the site. Longitudinal gradients should ideally be no more than 5%, although topography or other circumstances may require steeper gradients.



Andrew Cameron WSP

Raised crossover, but located away from the desire line for pedestrians and therefore ignored – the crossover should be nearer the junction with, in this case, a steeper ramp for vehicles entering the side street

This can cause particular difficulty for pedestrians with mobility or visual impairments

John Thompson & Partners, Queen Elizabeth Park

Inviting pedestrian link

Cyclists

Cyclists should generally be accommodated on the carriageway. Only where traffic volumes and speeds are high should the need for a cycle lane be considered.

Cyclists are more likely to choose routes that enable them to keep moving. Routes that take cyclists away from their desire lines and require them to concede priority to side-street traffic are less likely to be used. Designs should contain direct, barrier-free routes for cyclists.

The design of junctions affects the way motorists interact with cyclists. It is recommended that junctions are designed to promote slow motor-vehicle speeds. This may include short corner radii as well as vertical deflections.

- Cycle tracks are more suited to leisure routes over relatively open spaces. In a built-up area, they should be well overlooked.
- The headroom over routes used by cyclists should normally be 2.7 m (minimum 2.4 m). The maximum gradients should generally be no more than 3%, or 5% maximum over a distance of 100 m or less, and 7% maximum over a distance of 30 m or less. However, topography may dictate the gradients, particularly if the route is in the carriageway. A cycle route with a steep gradient may be better than none at all.

Cycling by Design 2010, alongside the *Cycling Action Plan for Scotland*, is due for publication in April 2010 and will be available at **www.transportscotland.gov.uk**.

Local Transport Note 2/08 Cycle Infrastructure Design[6] contain further details on designing for cycles.

Inclusive design

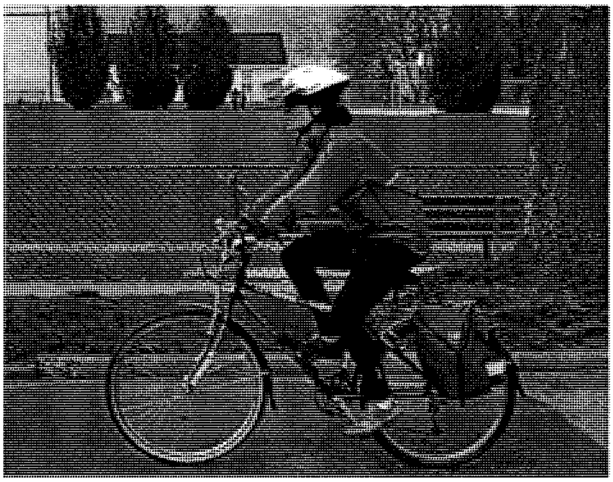
Inclusive design should be a first principle in street design. The *Disability Discrimination Act 2005*[7] makes it unlawful for a public authority, without justification, to discriminate against a disabled person when exercising its functions.

PAN 78, Inclusive Design[8], contains information on inclusion and the roles and responsibilities of those involved in the built environment. An inclusive environment is one which can be used by everyone, regardless of age, gender, ethnicity or disability.

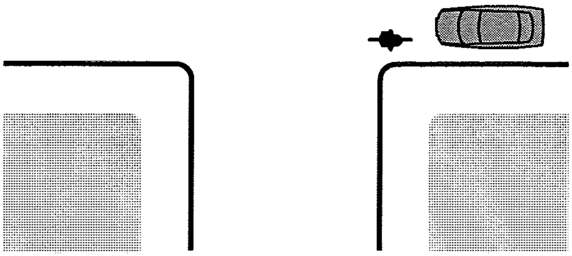
Issues around disability and age are especially relevant to those involved in the design of the external environment. Particular effort should be made to engage with representatives from these groups and consider specific requirements when developing street design. This should be undertaken at an early stage in the design process.

The requirements upon designers and decision makers regarding mobility equality are discussed later in this document in the Annex.

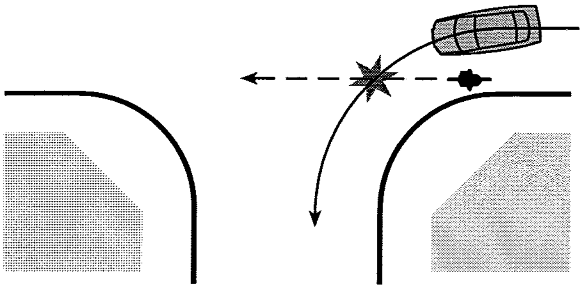
The Department for Transport document, *Inclusive Mobility*[9] provides detailed information on inclusive design. The Transport Scotland document, *Disability Discrimination Act: Good Practice Guide for Roads*[10] contains information on inclusive design in the construction, operation and maintenance of road infrastructure.



John Thompson & Partners



Cycle and car speeds compatible



Devon County Council

Danger from fast-turning vehicles cutting across cyclists

The effect of corner radii on cyclists near turning vehicles

Connections to wider networks

Key consideration

- Street patterns should be fully integrated with surrounding networks to provide flexibility and accommodate changes in built and social environments

Connecting layouts to their surroundings

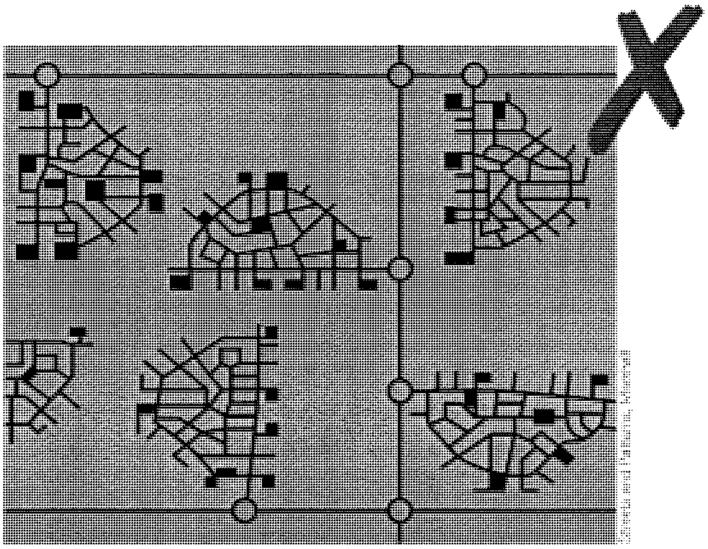
Street networks should, in general, be connected. Connected or 'permeable' networks encourage walking and cycling, and make navigation through places easier. They also lead to a more even spread of motor traffic throughout an area and so avoid the need for distributor roads with less desirable place characteristics.

Permeability of places is a crucial component in good street design. Internal permeability is important, but any area should also be properly connected with adjacent street networks. A development with poor links to the surrounding area creates an enclave which encourages movement to and from it by car rather than by other modes. New developments and alterations to existing street networks should be designed with multiple access points that connect with, and complement, existing street patterns.

The movement framework

A key consideration for achieving sustainable development is how design can influence the way that people choose to travel. Designers need to respond to a wide range of policies aimed at making car use a matter of choice rather than habit or dependence. Regional and local transport strategies can directly inform the design process as part of the policy implementation process.

It is recommended that the movement framework for a new development is based on the user hierarchy in the previous section, *Pedestrians and cyclists*. Applying the hierarchy will lead to a design that increases the attractiveness of walking, cycling and the use of public transport. Delays to cars resulting from adopting this approach are unlikely to be significant in residential areas. The movement framework should also take account of the form of the buildings, landscape and activities that contribute to the character of the street and the links between new and existing routes and places.



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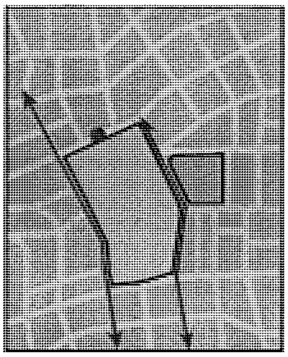
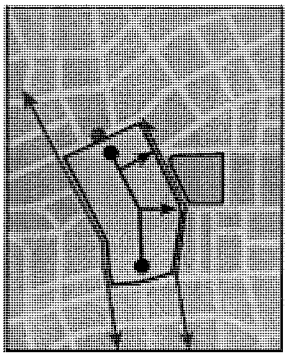
Internally permeable neighbourhoods lacking direct connections with one another – to be avoided

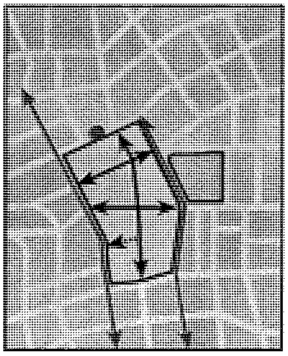
● Bus stop ⟷ Principal routes ⟷ Internal streets



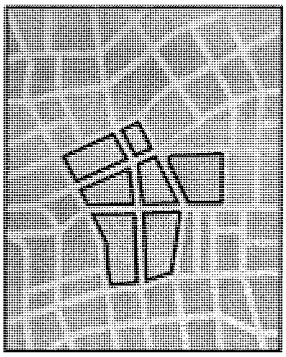
Consider how best the site can be connected with nearby main routes and public transport facilities



The typical cul-de-sac response creates an introverted layout which fails to integrate with its surroundings



A more pedestrian friendly approach that integrates with the surrounding community – it links existing and proposed streets and provides direct routes to bus stops



The street pattern then forms the basis for perimeter blocks which ensure that buildings contribute positively to the public realm

The Urban Design Compendium

Integrating new developments into the existing urban fabric is essential

Connections within a place

Key consideration

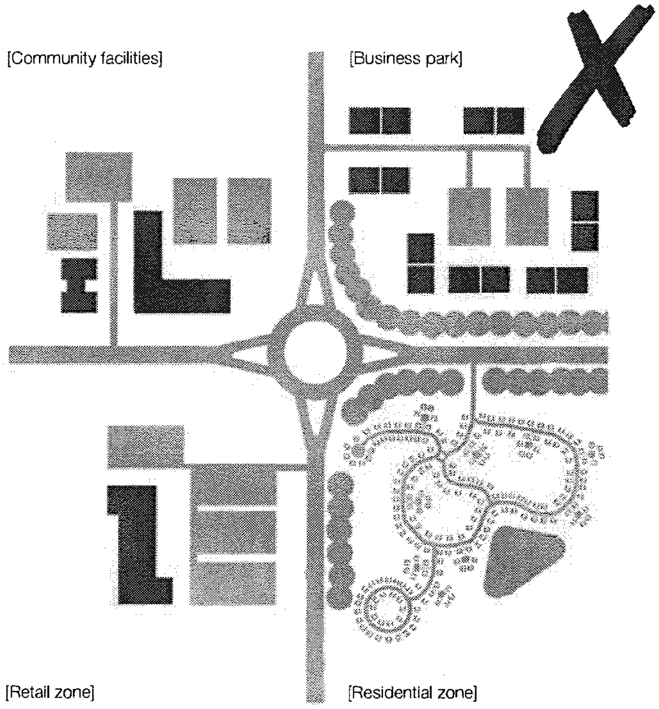
- **Street design should provide good connectivity for all modes of movement and for all groups of street users, respecting diversity and inclusion**

Connected street networks

In recent decades, the dominant patterns of development have been those in which housing, employment, retail and other facilities have been created in a segmentary fashion or zoned in separate areas, which are often poorly connected with one another. Such developments often increase the reliance on car use and discourage movement on foot.

Government policy now supports the creation of mixed-use neighbourhoods with well-connected street patterns, where daily needs are within walking distance of most residents. Layouts built on these more traditional lines are likely to be more adaptable and will lead to lower car use, thus contributing to wider transportation and environmental objectives.

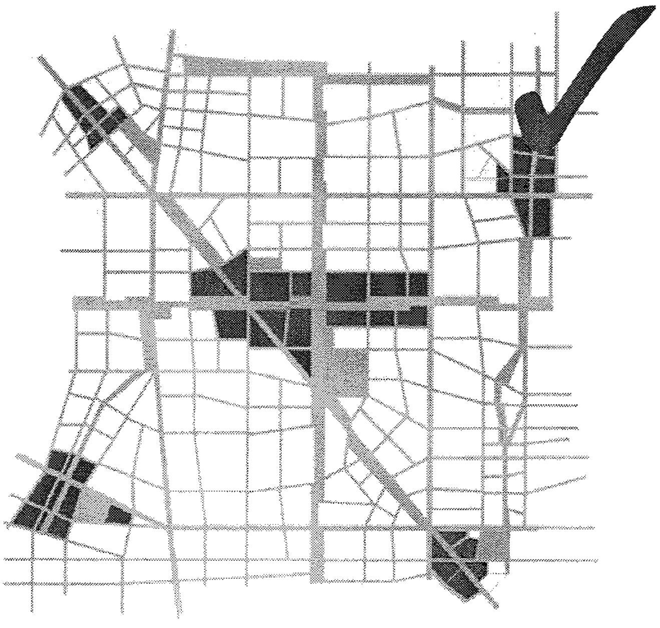
The dispersed and zoned layout, as shown in the suburban sprawl diagram opposite, should not be used when designing new developments and this model should be avoided, where practicable, when considering existing or infill developments.



Suburban sprawl

Developments and streets should generally be structured around a compact and walkable layout. The diagram illustrating mixed and connected neighbourhoods, opposite, illustrates how this can be achieved; these layouts have a mix of uses spread throughout, rather than a zoned approach to use.

To create a permeable network, it is generally recommended that streets with one-way operation are avoided. They require additional signs and result in longer vehicular journeys and higher speed.



Mixed and connected neighbourhoods

Case study

Residential streets: Polnoon

Polnoon is located at the western edge of Eaglesham village, an 18th century Conservation Area village in East Renfrewshire. Planning permission for the site had been obtained in 2006 for the development of housing in a typical standards-led, cul-de-sac layout.

In 2008, the Scottish Government, Mactaggart & Mickel Ltd and East Renfrewshire Council worked in a collaborative process to re-design the site to develop a new neighbourhood in accordance with the principles of Designing Streets and Designing Places.

The sequence of diagrams illustrates the differences between the initial cul-de-sac layout and the more permeable, pedestrian-friendly design developed through the collaborative redesign process.

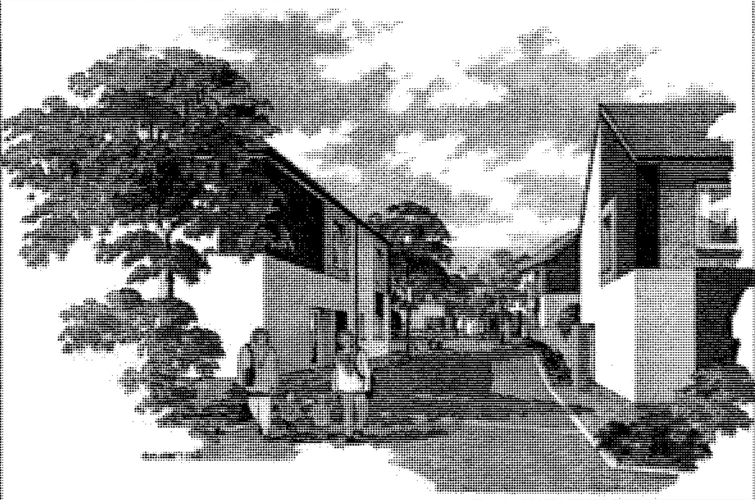
The new layout offers a clear hierarchy of shared surface public realm spaces – streets, lanes, courtyards and a central square – which were designed to reduce vehicle speeds and create a more pedestrian-friendly environment. The redesigned new neighbourhood contains improved spatial permeability, an increased density from 92 to 121 dwellings and a more contextual treatment for standard house type elevations. Planning permission and RCC processes were run in parallel.

B-Plan

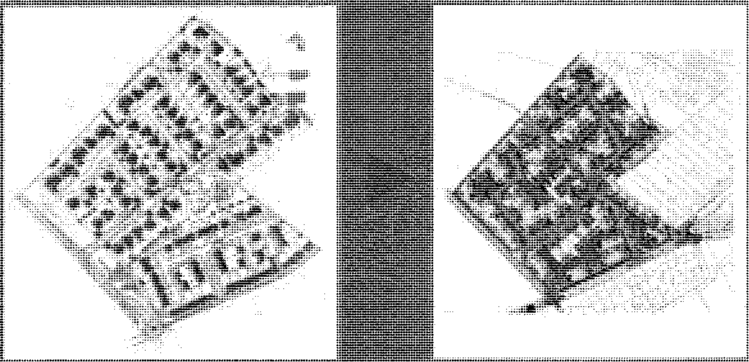
A simple, but key technique which was used in developing the Polnoon masterplan was the Bavarian B-Plan tool. This is an effective method for developing ideas by colour coding the three key issues in a layout; "movement" in yellow, "buildings" in red and "open space" in green. The B-Plan images to the right show the differences between the previous consent and the re-designed masterplan.

The Polnoon project sets a new standard for residential development across Scotland. The project clearly illustrates that, by putting place before movement when considering the design of streets, a better place can be created.

Detailed information on the Polnoon project can be found at: **www.scotland.gov.uk/Topics/Built-Environment/AandP/Projects/Polnoon**

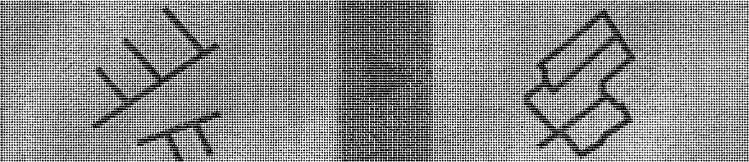


Layout



Before – Cul-de-sac

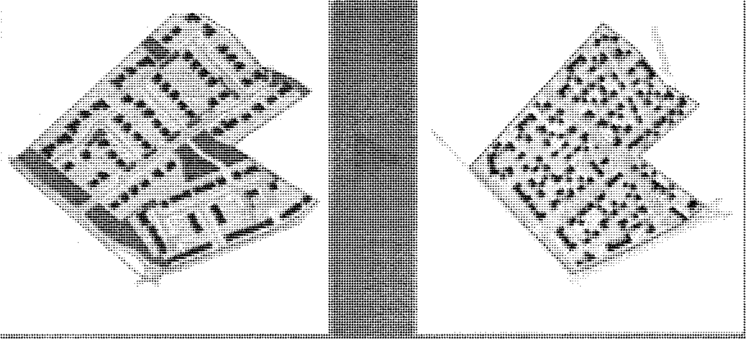
After – Permeable layout



Before

After

Bavarian B Plan: Bringing movement, buildings and open space all together



Before

- ▨ 18% Movement
- ■ 15% Buildings
- ▨ 15% Open space (Public)
- □ 52% Open space (Private)

After

- ▨ 23% Movement
- ■ 21% Buildings
- ▨ 15% Open Space (Public)
- □ 41% Open space (Private)

Block structure

Key consideration

- The urban form should be distinctive with landmarks and vistas that provide good orientation and navigation of an area

Structure

The structure of a street network can take a variety of forms, from formal grid layouts to more irregular arrangements.

It is important to consider the street structures that are appropriate in any given situation. It may be that an existing grid structure is continued in order to maintain connectivity or perhaps it may be more appropriate to break an existing pattern to respond to important external factors such as vistas, topography or significant building lines. What is important is that responses to layout structure should be design-led and responsive to context. They should not be the product of standard approaches or the application of inappropriate models.

The principle of integrated access and movement means that the perimeter block is usually an effective structure for residential neighbourhoods. A block structure works in terms of providing direct, convenient, populated and overlooked routes. In addition, it makes efficient use of land, offers opportunities for enclosed private or communal gardens, and is a tried and tested way of creating quality places.

Within a block structure, the designer has more freedom to create innovative layouts. The layouts illustrated in this section, and variations on them (such as a 'broken grid' with the occasional courtyard), are recommended when planning residential and mixed-use neighbourhoods.

Consideration should be given to the layout and impact of Sustainable Urban Drainage Systems (SUDS) when working on street and block layouts, as these can have determining effects on the overall urban structure. Detailed guidance on SUDS is given in this document in the section *Street detail, Drainage.*

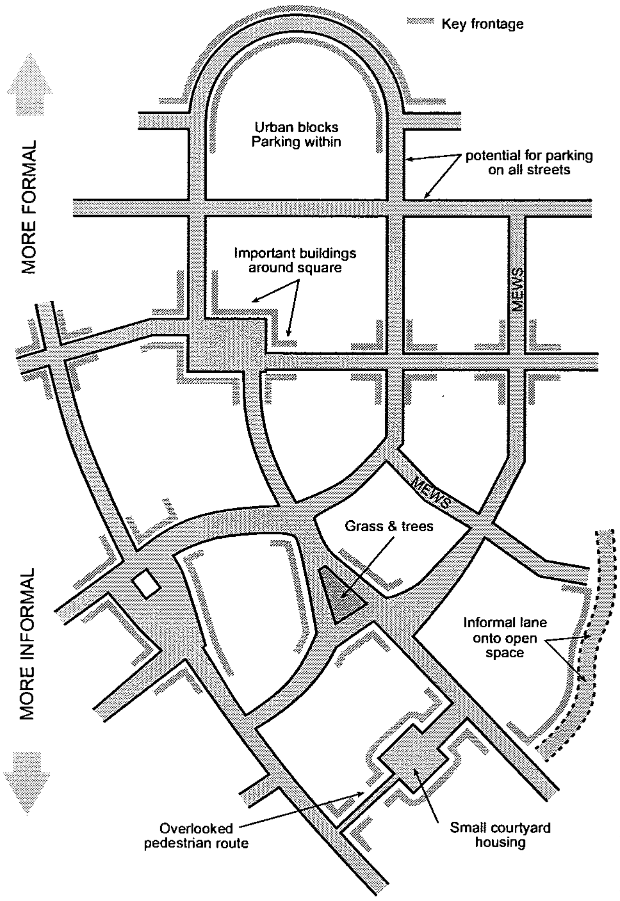

Key frontage
MORE FORMAL
Urban blocks
Parking within
potential for parking on all streets
Important buildings around square
MEWS
MEWS
Grass & trees
MORE INFORMAL
Informal lane onto open space
Overlooked pedestrian route
Small courtyard housing

Diagram illustrating a range of street and place typologies

Andrew Cameron WSP

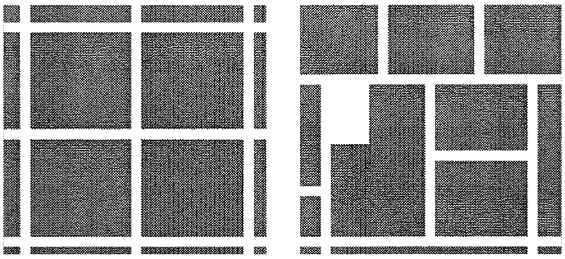
Street patterns

Short and curved or irregular streets can contribute to variety and a sense of place, and may also be appropriate where there are topographical or other site constraints, or where there is a need to introduce some variation for the sake of interest. However, layouts that use excessive or gratuitous curves should be avoided, as they are less efficient, reduce legibility and make access for pedestrians and cyclists less direct.

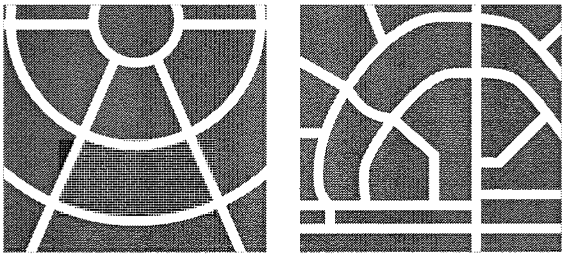
Straight streets maximise connections between places and can better serve the needs of pedestrians who prefer direct routes. The regular spacing of junctions, where drivers are required to slow, can be an effective method for reducing vehicle speeds on straight road layouts.

Conventional culs-de sac, are strongly discouraged. The preference is for networked routes and spaces which connect new residential and mixed use areas together and link with existing development forms.

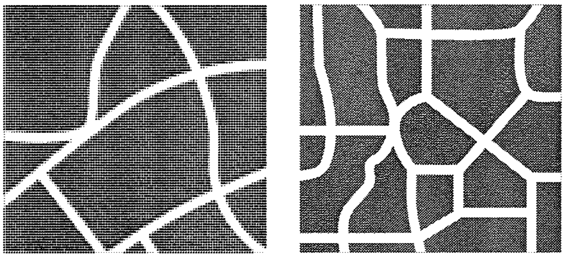
Short culs-de sac may occasionally be required because of topography, boundary or other constraints. Caution must, however, be exercised when planning for culs-de sac, as they concentrate traffic impact on a small number of dwellings, require turning heads that are wasteful in land terms and lead to additional vehicle travel and emissions, particularly by service vehicles. Through connections for pedestrians and cyclists should be provided where possible but should be wide, well lit and well overlooked with active frontages.



Rectilinear grid



Concentric grids designed to promote access to local centres or public transport routes



Irregular layouts

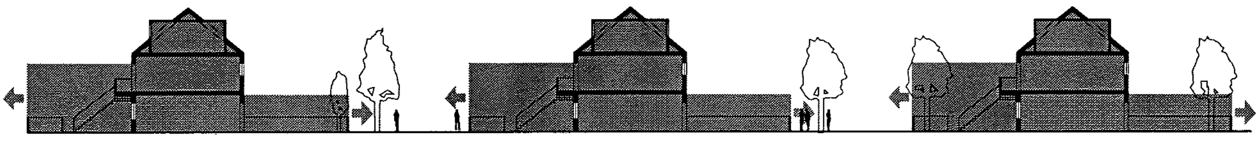
Variations in block structure

Backs and fronts

In general, it is recommended that different treatments are employed in the design of the fronts and backs of houses and other buildings. The basic principle is 'public fronts and private backs'.

Exceptions to this may be employed where the building form contains a double frontage, such as a colony house type. Colony streets can increase the density of a typical terrace and provide positive street edges in a distinctive manner.

Busier streets should also follow this principle. Frontage development and multiple access points on busier streets add to activity intensity and traffic calming as well as a sense of place.



Section through colony street illustrating double frontage

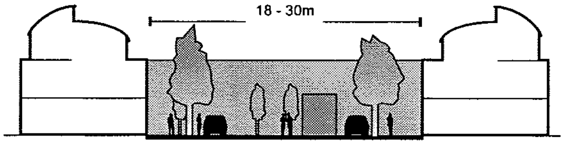
Width

Width between buildings is a key dimension and needs to be considered in relation to function and aesthetics. There are no fixed rules on street widths but account should be taken of the variety of activities taking place in the street and of the scale of the buildings on either side. The distance between frontages in residential streets typically ranges from 10 m to 18 m, although there are examples of widths significantly less than this working well.

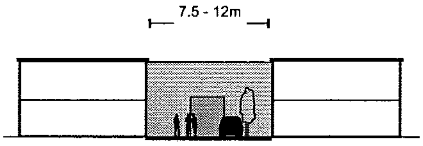
Rigid standards on street widths should be avoided and new streets should be laid out with consideration given to the relationship between scale and the nature of the space created.

Height

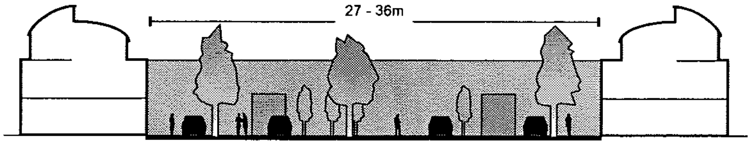
The public realm is defined by height as well as width or, more accurately, the ratio of height to width. It is therefore recommended that the height of buildings (or mature trees where present in wider streets) is in proportion to the width of the intervening public space to achieve the level of enclosure appropriate to the character and function of the street. Where building height is increased, it is important to avoid creating spaces with an oppressive or claustrophobic nature.



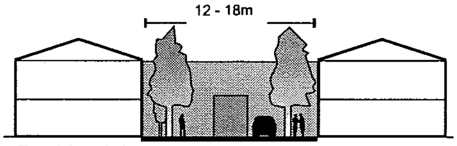
High street



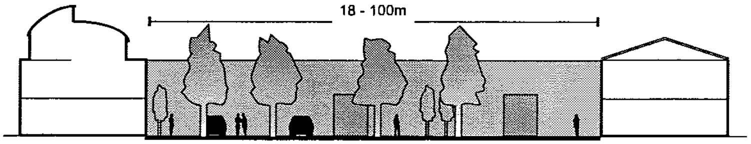
Mews



Boulevard



Residential street



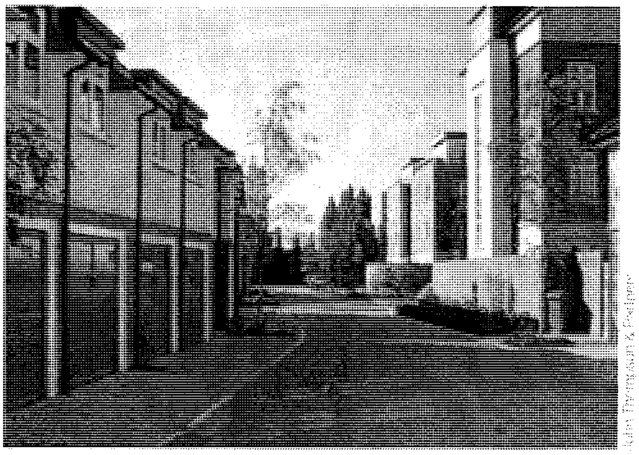
Square

Length

Street length can have a significant effect on the quality of a place. Acknowledging and framing vistas and landmarks can help bring an identity to a neighbourhood and orientate users. However, long straights can encourage high traffic speeds, which should be mitigated through careful design (see *Street Layout* section – *Achieving Appropriate Traffic Speeds*).

Buildings at junctions

The arrangement of buildings and footways has a major influence on defining the space at a junction. It is better to design the junction from this starting point rather than purely on vehicle movement. In terms of streetscape, a wide carriageway with tight, enclosed corners makes a better junction than cutback corners with a sweeping curve. This might involve bringing buildings forward to the corner. Junction treatments are explored in more detail in the *Street Layout* section.



John Thompson & Partners

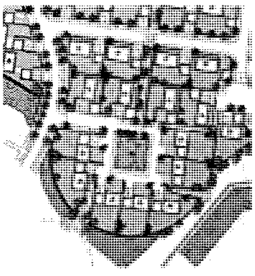
Variation in building height can add visual interest

Squares & spaces

A street and block structure can be enhanced with punctuations of public space. This may take the form of parks, green edges or formal and informal squares. The introduction of small, informal squares in a residential area can support navigation, provide social areas for people to gather and children to play, slow traffic speed and create positive character.

The design of squares, both small and large, should respond to the context of the place. A square will not be successful unless it is aligned with the potential activities of a place and the building forms.

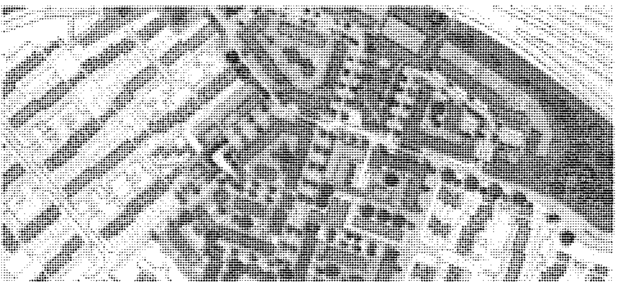
Cadell 2



Malcolm Fraser Architects

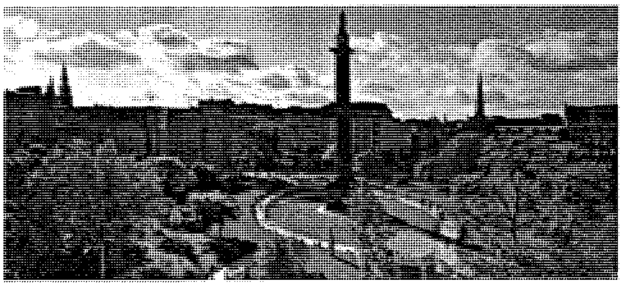
Small residential square

HTA, Oakridge village

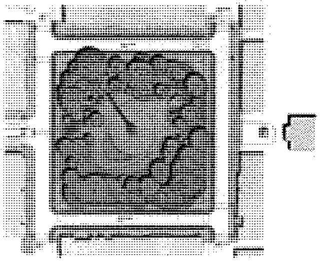


HTA, Oakridge village

Local neighbourhood square



J Cooper



Gillespies

Large urban square

Other layout considerations

The layout of a new housing or mixed-use area should take account of the following factors:

- the need to reduce the dominance of vehicle traffic;
- the need to mitigate noise pollution such as from roads or railways;
- the importance of orientation, variety and visual interest (The provision of views and vistas, landmarks, gateways and focal points are means to emphasise urban structure, hierarchies and connections.);
- the need for crime prevention, including the provision of defensible private and communal space, and active, overlooked streets (An appropriate mix of uses can often encourage activity and movement at all times.);
- the management of the transition from the public to the private realm (The space between the fronts of buildings and carriageways, footways or other public spaces needs to be carefully considered. Continuous building lines are preferred as they provide definition to, and enclosure of, the public realm.);
- the handling of building lines (Where no front garden is provided, the setback of dwellings from the street is a key consideration in terms of: defining the character of the street determining a degree of privacy; amenity space for plants or seating, etc.; and functional space for rubbish bins, external utility meters or storage, including secure parking for bicycles.); and
- the handling of car parking (Keeping garages and parking areas level with, or behind, the main building line can be aesthetically beneficial in streetscape terms.).

Walkable neighbourhoods

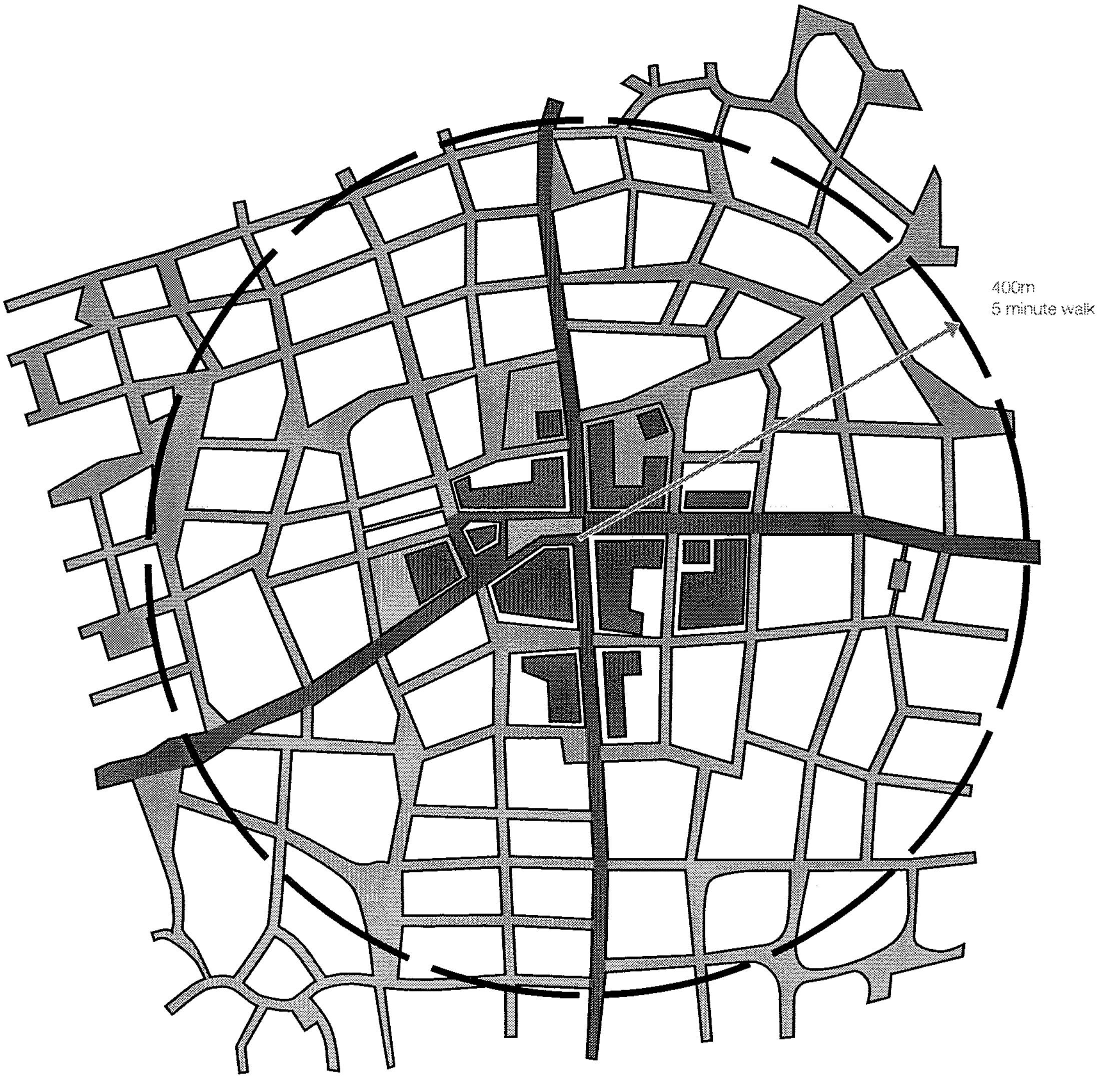
Key consideration

- Street layouts should be configured to allow walkable access to local amenities for all street users

The walkable neighbourhood

Walkable neighbourhoods are characterised by having a range of facilities within 5 minutes (up to about 400m) walking distance of residential areas which residents may access comfortably on foot. Where amenities cannot be provided within this area, good public transport links to relevant facilities should be accessible.

In many cases, it may be better for a new development to reinforce existing centres and facilities rather than providing alternative facilities.

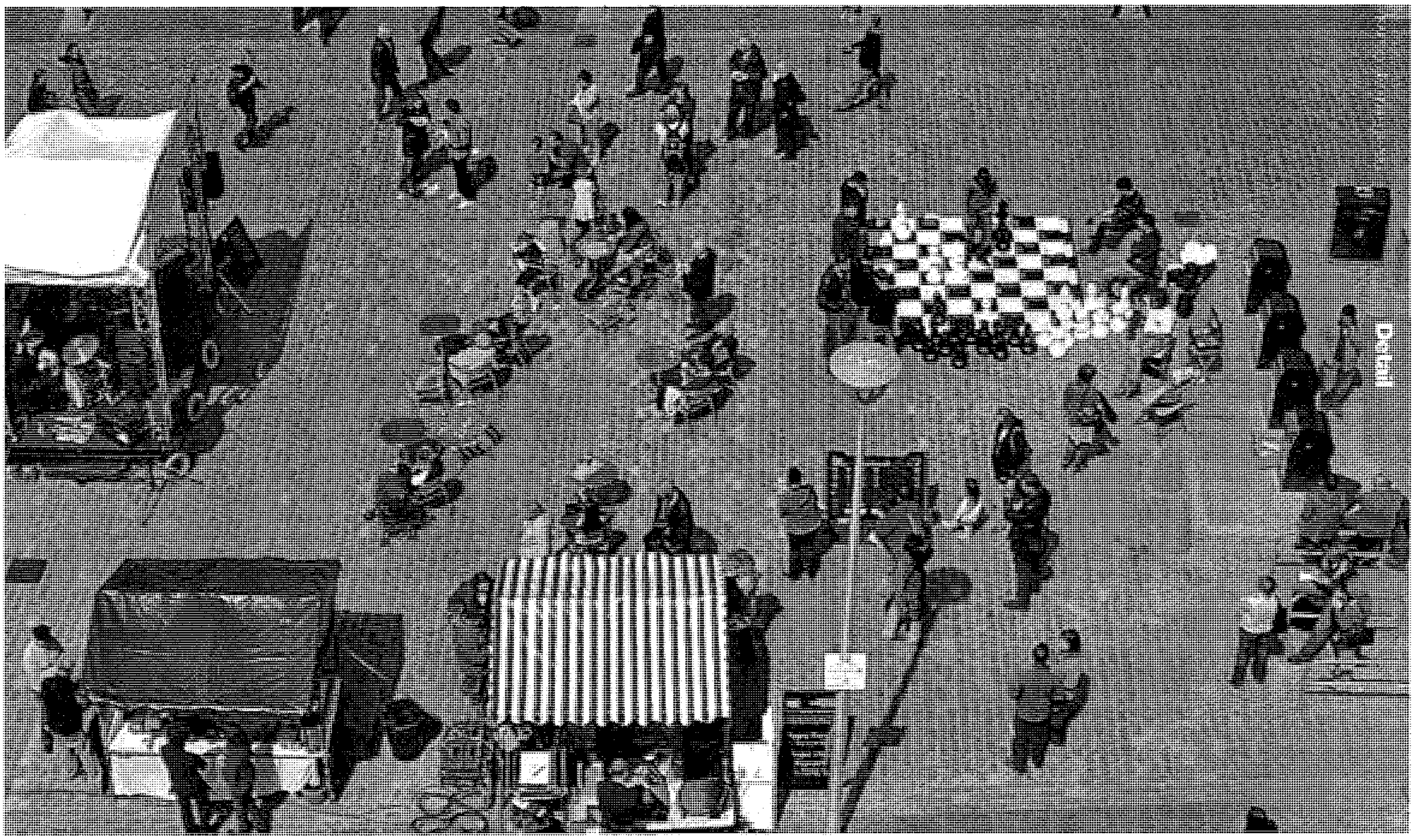


Andrew Cameron WSP

Walkable neighbourhoods should be on an appropriate scale, with pedestrian routes matching desire lines as closely as possible. Permeable networks help minimise walking distances.

Good connectivity and the formation of local or district centres are key to establishing walkable neighbourhoods. By concentrating facilities along key routes and junctions, particularly at the convergence of main routes, neighbourhood centres can be established that contribute both practical services and a local identity to a place. Within the larger context, walkable neighbourhoods should have good linkages to other local centres, building a larger network of distinct neighbourhoods. The hierarchy and scale of these neighbourhoods can vary within a town or city; the greater the density of development, the more facilities can be supported.

Density is also an important consideration in reducing reliance on the private car. *Scottish Planning Policy* encourages a flexible approach to density, reflecting the desirability of using land efficiently and the need to promote higher density development in places well served by public transport. Residential densities should be planned to take advantage of proximity to activities, or to good public transport linking those activities.



Public transport

Key consideration

- Public transport planning should be considered at an early stage in the design process

Bus routes

The principal streets within a development should be the streets on which public transport runs. These should be identified in the design process, working in partnership with public transport operators. Bus routes and stops should form key elements of the walkable neighbourhood. Designers and local authorities should try to ensure that development densities will be high enough to support a good level of service without long-term subsidy. Layouts designed with strong connections to local networks, and which avoid long one-way loops or long distances without passenger catchments, are likely to be more viable.

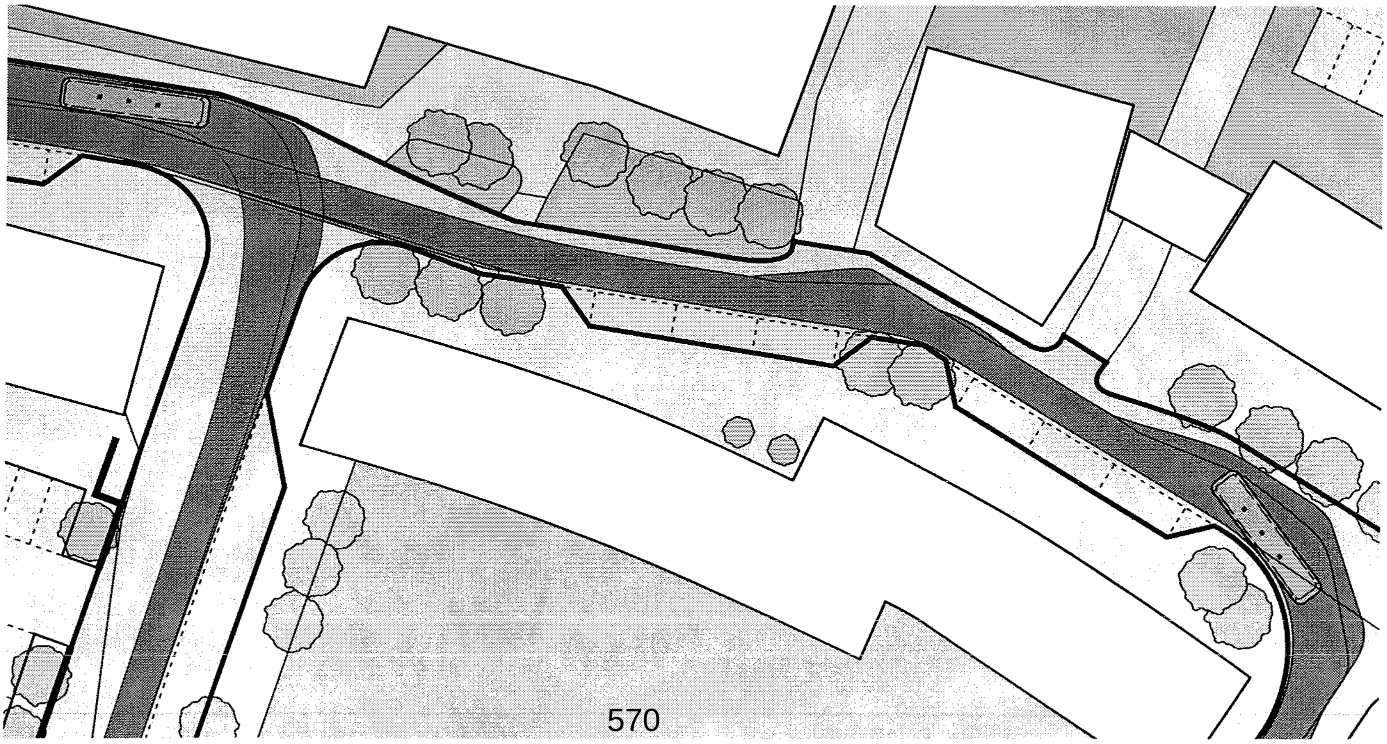
Using a residential street as a bus route need not require restrictions on direct vehicular access to housing. Detailed requirements for streets designated as bus routes can be determined in consultation with local public transport operators. Streets on bus routes should not generally be less than 6.0 m wide (although this could be reduced on short sections with good inter-visibility between opposing flows). The presence and arrangement of on-street parking, and the manner of its provision, may affect width requirements.

Swept-path analysis can be used to determine the ability of streets to accommodate large vehicles. When considering the level of provision required for the movement of buses, account should be taken of the frequency and the likelihood of two buses travelling in opposite directions meeting each other on a route.

Bus stops

In new developments, it is essential to consider the siting of public transport stops and related pedestrian desire lines at an early stage of design. Close co-operation is required between public transport operators, the local authorities and the developer.

- Bus stops should be sited so they can be easily accessed by all pedestrians.
- Bus stops should be placed near junctions so that they can be accessed by more than one route on foot, or near specific passenger destinations. (schools, shops, etc.)
- The bus should generally stop on the street and not in a lay-by.
- Bus stops should be high-quality places that are safe and comfortable to use.
- Footways at bus stops should be wide enough for waiting passengers while still allowing for pedestrian movement along the footway. This may require local widening at the stop.
- Provision should be made within the streetscape for features that that assist passengers getting on and off buses. This may involve areas of raised footway. It is important that such features are integrated within the overall design of the street and do not pose difficulties for those with visual impairments.



Context and character

Key consideration

- **The requirements and impact of pedestrians, cycles and vehicles should be reconciled with local context to create streets with distinctive character**
- **Opportunities should be taken to respond to, and to derive value from, relevant elements of the historic environment in creating places of distinctive character**

Character

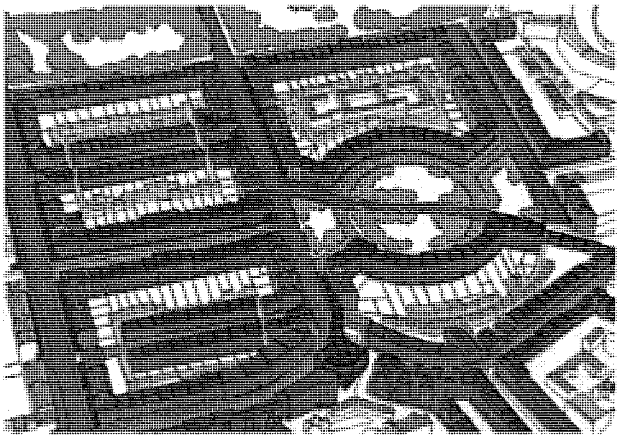
Streets and the public realm at large play an important part in the development and expression of local character and culture. The character of a place is not determined by the particular materials or physical appearance of a place alone, but also by the patterns of movement and social interaction that it produces. When considering the structure of streets, it is important that street and block forms are selected that will enhance the character of an area.

Street character types in new residential developments should be determined by a sensitive response to site conditions as well as the relative importance of both place and movement functions. When developing layouts, consideration should be given to the character of each individual street as well as the overall urban structure.

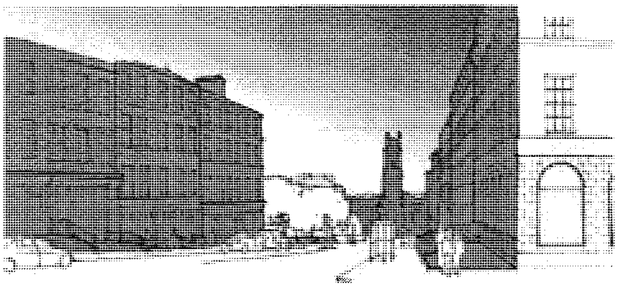
Scotland has a wide range of distinctive street typologies and the successful arrangement of these can result in networks with positive characters. When developing street networks it can be useful to consider typologies such as the following, in order to create distinctive environments:

- **high street**
- **mixed-use street**
- **square**
- **crescent/circus**
- **mews**
- **terrace/row**
- **colony**
- **tenement block**
- **avenue**
- **courtyard**
- **cross**
- **lane/loan**
- **vennel/wynd**

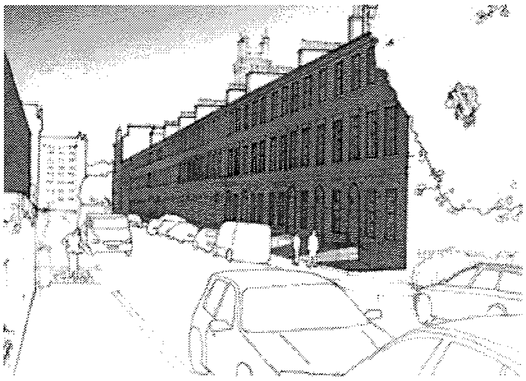
The above list is not exhaustive. It is important that the individual characteristics of any of the above street types are well defined and meaningful. Site specific design codes can ensure that the principal elements of a street's character are controlled and distinct.



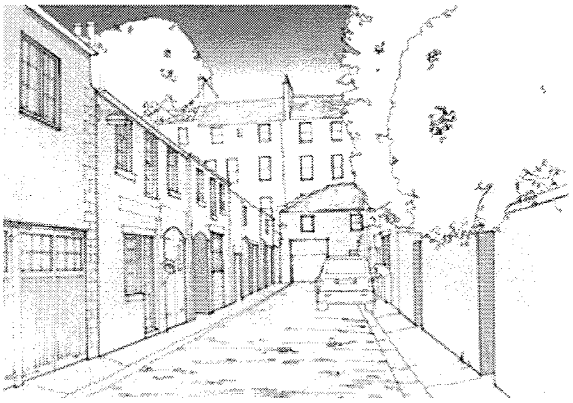
The street hierarchy of Edinburgh New Town accommodates variety of character within a cohesive urban structure



Main avenue mixed-uses/primary zone



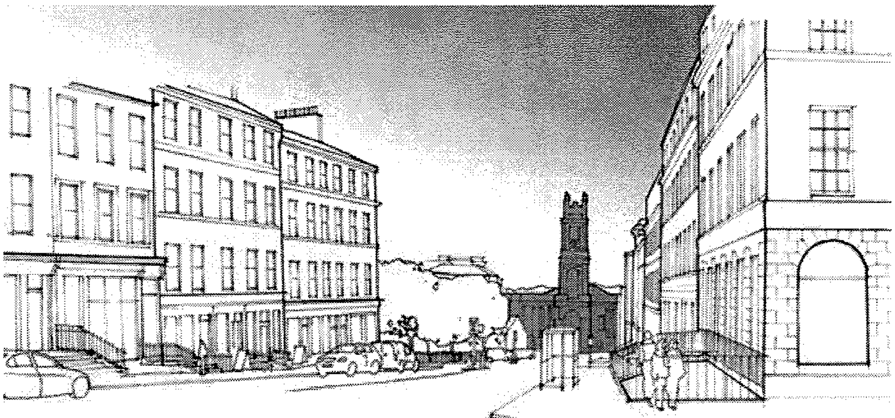
Residential street/secondary zone



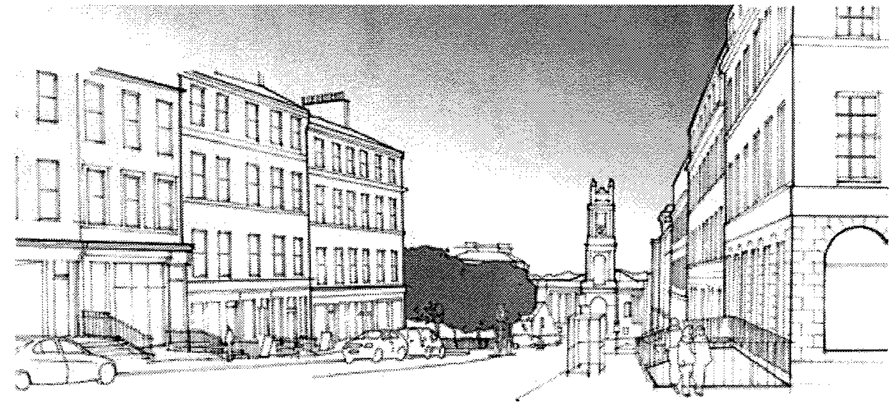
Residential and service/tertiary zone

Variety

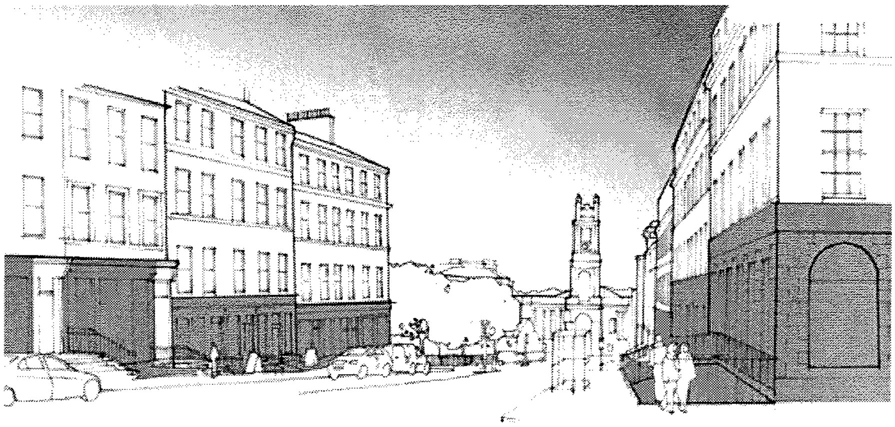
Character can be enhanced and emphasised by variety in the streetscape. Punctuating key views with landmarks or green edges can provide visual cues that aid navigation as well as helping to develop areas of individual character within the overall urban structure. Developing a series of linked spaces with distinctive identities can also aid navigation while providing a cohesive character for a neighbourhood. By employing a network of varied streets, each with particular characteristics, a diverse streetscape with varied visual interest can be achieved. Variation in scale and density can develop areas with distinct physical characteristics as well as reflecting the types of activities that take place in the area.



Landmark/vista stop helps to develop a unique character, emphasise street hierarchy and aid navigation



Green edge signifies a significant junction and a change in street pattern as well as offering visual relief and local amenity



Ground floor commercial and retail space also emphasises the street hierarchy, provides amenity and an active street edge

Orientation

Key consideration

- Orientation of buildings, streets and open space should maximise environmental benefits

The orientation of streets can have a large impact on the environmental performance of buildings as well as contributing to perceptions of safety and attractiveness.

Solar impact

Bright, sunny streets can foster a positive sense of place. The layout of streets should be considered in relation to building heights to maximise the amount of light reaching the public realm. This is particularly important in areas where people gather and activities take place. Local shops and facilities should be arranged to provide southerly aspects to the activities that will most benefit from bright, attractive external space.

By arranging streets so that buildings are able to maximise solar gain, it is possible for buildings to reduce heat and light requirements. Principal elevations should address the sun path wherever possible and the presentation of blank gables to the south should be avoided.

On occasion, it may be that narrow, intimate streets are appropriate to a particular context and will not require to have as direct a relationship to the sun path as a large public boulevard or square.

Prevailing wind

Traditionally, many street layouts evolved to respond directly to the prevailing wind direction. This led to streets where pedestrians were sheltered from the extremities of the environment, ultimately producing streets where people were more likely to gather and take ownership of a place. This also led to patterns of development that were particular or unique to the microclimate of a settlement and helped to evolve a distinctive local design response.

Designers should take prevailing wind conditions into account to maximise on-street shelter and also to minimise the impact of cold air infiltration into buildings. This can have an impact on the direction of streets, the scale of individual buildings, street width and the relationship of a settlement to natural landscape features.

Street layout

Achieving appropriate traffic speed

Key consideration

- Design should be used to influence driver behaviour to reduce vehicle speed to levels that are appropriate for the local context and deliver safe streets for all

For residential streets, a maximum design speed of 20 mph should normally be an objective.

Designers should aim to create streets that control vehicle speeds naturally by well-crafted design from the outset rather than through unsympathetic traffic-calming measures added at the end of the design process.

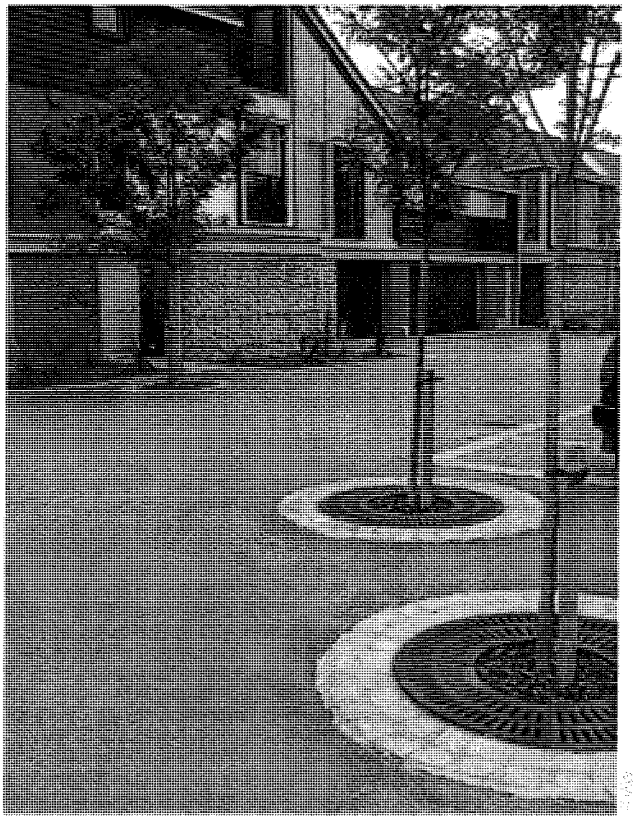
The provision of separate pedestrian and/or cycle routes away from motor traffic should only be considered as a last resort. Research has shown that the presence of pedestrians has an effect in reducing traffic speeds.

Evidence from traffic calming schemes suggests that speed-controlling features are needed at intervals of around 60-80m in order to achieve speeds of 20 mph or less. Straight and uninterrupted links should therefore be limited to this range to help ensure that the arrangement has a natural traffic-calming effect. Designs should not rely solely on conventional traffic calming techniques, such as speed cushions and humps; these do little to develop a positive sense of place. Instead, speed-controlling features should be built into the layout of the street, taking advantage of building alignment, parking, road narrowings, landscaping and other design features, rather than resorting solely to vertical deflection.

The range of traffic-calming measures available act in different ways:

- **Psychology and perception –** play a strong part in influencing driver behaviour. Street features and human activity can influence the speed at which people choose to drive. Features likely to be effective include:
    - edge markings that visually narrow the road – speed reduction is likely to be greatest where the edging is textured to appear unsuitable on which to drive;
    - buildings in close proximity to the street;
    - reduced carriageway width;
    - physical features in the carriageway;
    - features associated with potential activity in, or close to, the carriageway, such as pedestrian refuges;
    - on-street parking, particularly when the vehicles are parked in blocks on alternate sides of the street, either in echelon formation or perpendicular to the carriageway;
    - the types of land use associated with greater numbers of people, for example shops; schools and places of work; and
    - landscaping.
- **Street dimensions –** can have a significant influence on speeds. Keeping lengths of street between junctions short is particularly effective.
- **Reductions in forward visibility –** are associated with reduced driving speeds.
- **Changes in priority/or no priority –** at junctions. This can be used to disrupt flow and therefore bring overall speeds down.
- **Physical features –** involving vertical or horizontal deflection can be very effective in reducing speed.
- **Materials –** can reduce speed by both visual perception and by physical characteristics, such as cobbled surfaces.

Reductions in carriageway width are most effective in reducing driving speed.



Trees planted in the highway at Newhall, Harlow, help to reduce vehicle speeds

Stopping sight distance

The stopping sight distance (SSD) is the distance within which drivers need to be able to see ahead and stop from a given speed.

The SSD values used in *Designing Streets* are based on research into deceleration rates, driver perception-reaction times and speed. These SSD values are appropriate for residential and lightly trafficked streets. The table below shows the effect of speed on SSD. These values are independent of traffic flow or type of road. It is recommended that they are used on all streets with 85th percentile wet weather speeds up to 60 kph.

Below around 20 mph, shorter SSDs themselves may not achieve low vehicle speeds: the design of the whole street and how this will influence speed needs to be considered at the start of the process; e.g. the positioning of buildings and the presence of on-street parking.

Further information on SSDs, including details of the calculation formula, and also the relationship between visibility and speed is available in *TRL Report No. 332*[11] and *TRL Report No. 661*[12].

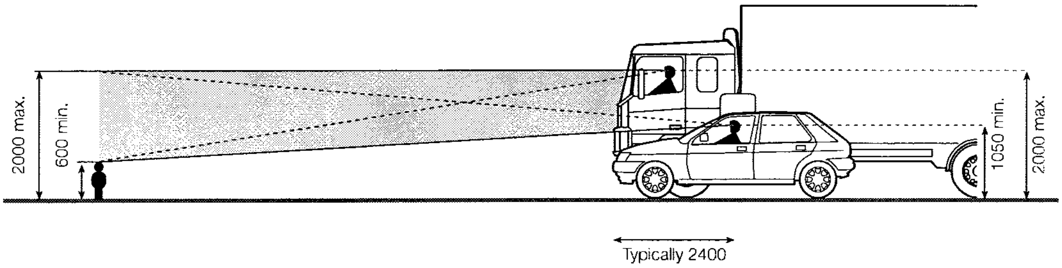
Speed	Kilometres per hour	16	20	24	25	30	32	40	45	48	50	60
	Miles per hour	10	12	15	16	19	20	25	28	30	31	37
	SSD (metres)	9	12	15	16	20	22	31	36	40	43	56
	SSD adjusted for bonnet length	11	14	17	18	23	25	33	39	43	45	59

Visibility requirements

Visibility should be checked at junctions and along the street. Visibility is measured horizontally and vertically.

Using plan views of proposed layouts, checks for visibility in the horizontal plane ensure that views are not obstructed by vertical obstructions.

Checking visibility in the vertical plane is then carried out to ensure that views in the horizontal plane are not compromised by obstructions such as the crest of a hill, or a bridge at a dip in the road ahead. It also takes into account the variation in driver eye height and the height range of obstructions. Eye height is assumed to range from 1.05 m (for car drivers) to 2 m (for lorry drivers). Drivers need to be able to see obstructions 2 m high down to a point 600 mm above the carriageway.



Visibility splays at junctions

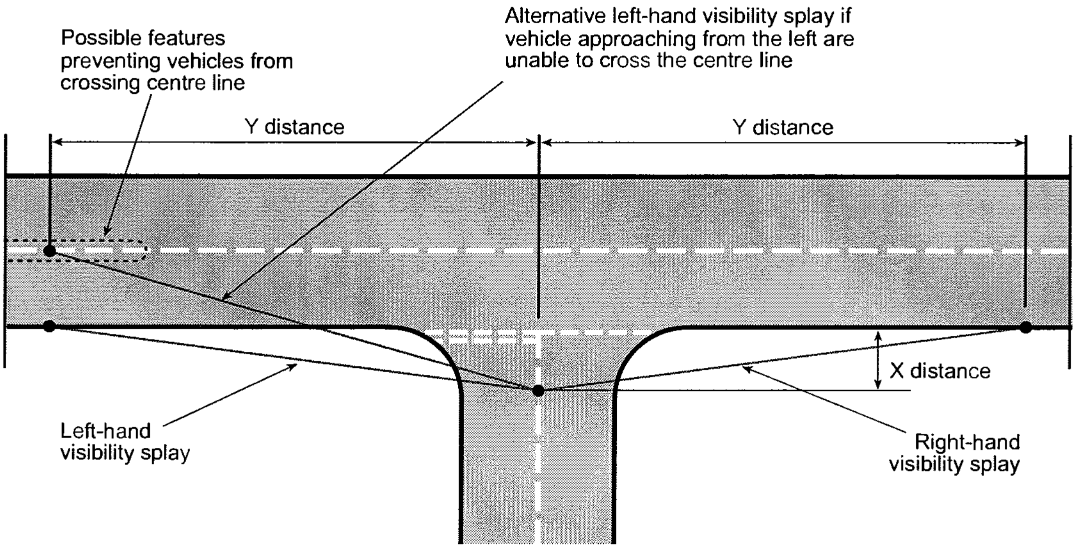
The visibility splay at a junction ensures there is adequate inter-visibility between vehicles on the major and minor arms.

The distance back along the minor arm from which visibility is measured is known as the X distance. It is generally measured back from the 'give way' line (or an imaginary 'give way' line if no such markings are provided). This distance is normally measured along the centreline of the minor arm for simplicity, but in some circumstances (for example where there is a wide splitter island on the minor arm) it will be more appropriate to measure it from the actual position of the driver.

The Y distance represents the distance that a driver who is about to exit from the minor arm can see to his left and right along the main alignment. For simplicity, it is measured along the nearside kerb line of the main arm, although vehicles will normally be travelling a distance from the kerb line. The measurement is taken from the point where this line intersects the centreline of the minor arm (unless, as above there is a splitter island in the minor arm).

When the main alignment is curved and the minor arm joins on the outside of a bend, another check is necessary to make sure that an approaching vehicle on the main arm is visible over the whole of the Y distance. This is done by drawing an additional sight line which meets the nearest wheel track at a tangent.

Some circumstances make it unlikely that vehicles approaching from the left on the main arm will cross the centreline of the main arm – opposing flows may be physically segregated at that point, for example. If so, the visibility splay to the left can be measured to the centreline of the main arm.


Possible features preventing vehicles from crossing centre line
Alternative left-hand visibility splay if vehicle approaching from the left are unable to cross the centre line
Y distance
Y distance
X distance
Left-hand visibility splay
Right-hand visibility splay

X and Y distances

An X distance of 2.4 m should normally be used in most built-up situations, as this represents a reasonable maximum distance between the front of the car and the driver's eye.

A minimum figure of 2 m may be considered in some very lightly-trafficked and slow-speed situations, but using this value will mean that the front of some vehicles will protrude slightly into the running carriageway of the major arm. The ability of drivers and cyclists to see this overhang from a reasonable distance, and to manoeuvre around it without undue difficulty, should be considered.

Using an X distance in excess of 2.4 m is not generally required in built-up areas.

The Y distance should be based on values for SSD.

Forward visibility

Forward visibility is the distance a driver needs to see ahead to stop safely for obstructions in the street. The minimum forward visibility required is equal to the minimum SSD. It is checked by measuring between points on a curve along the centreline of the inner traffic lane. Consideration should be given to vertical geometry and any other obstructions.

There will be situations where it is desirable to reduce forward visibility in conjunction with other methods to control traffic speeds.

Andrew Cameron WSP

An example of the reduction in forward visibility to reduce vehicle speed

Visibility along the street edge

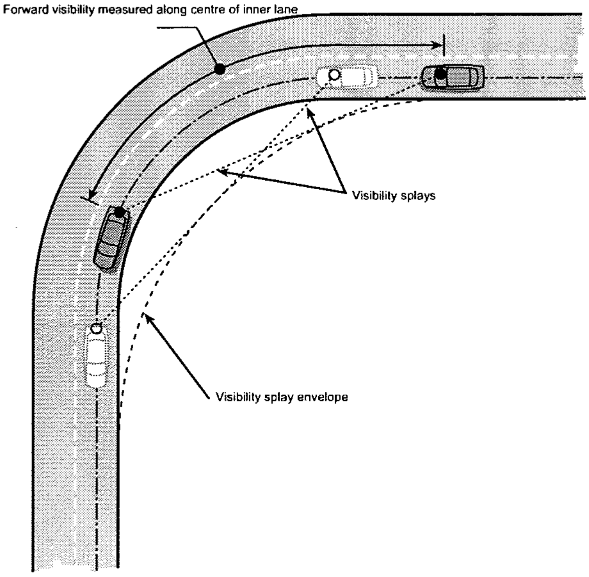
Vehicle exits at the back edge of the footway mean that emerging drivers will have to take account of people on the footway. The absence of wide visibility splays at private driveways will encourage drivers to emerge more cautiously. Consideration should be given to whether this will be appropriate, taking into account the following:

- the frequency of vehicle movements;
- the amount of pedestrian activity; and
- the width of the footway.

Obstacles to visibility

Parking in visibility splays in built-up areas is quite common, yet it does not appear to create significant problems in practice. Defined parking bays can be provided outside the visibility splay if required, and the use of tracked streets that allow for informal parking is also an option. Encroachment of parking space into visibility splays should be avoided where practical.

The impact of other obstacles, such as street trees and street lighting columns, should be assessed in terms of their impact on the overall envelope of visibility. In general, occasional obstacles to visibility that are not large enough to fully obscure a whole vehicle or a pedestrian, including a child or wheelchair user, will not have a significant impact on road safety.



Forward visibility measured along centre of inner lane
Visibility splays
Visibility splay envelope

Measurement of forward visibility